Biological and Water Quality Assessment of Upper Des Plaines River: 2020

Des Plaines River upstream McClure Ave. (13-2)

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

Report citation:

Midwest Biodiversity Institute (MBI). 2022. Biological and Water Quality Assessment of Upper Des Plaines River: 2020. Lake County, Illinois. Technical Report MBI/2022-3-1. Columbus, OH 43221-0561. 75 pp. + appendices.

Biological and Water Quality Assessment of Upper Des Plaines River: 2020

Lake County, IL

Technical Report MBI/2022-3-1

May 15 2022

Prepared for:

Des Plaines River Watershed Workgroup
500 W. Winchester Road
Ashley Strelcheck, DRWW Project Manager
AStrelcheck@lakecountyil.gov
Steve Waters, Monitoring Committee Chair
StWaters@northshorewrd.org

Submitted by:

Midwest Biodiversity Institute
P.O. Box 21561
Columbus, OH 43221-20561
Chris O. Yoder, Research Director
cyoder@mwbinst.com

Table of Contents

APPENDICES....iv
LIST OF FIGURES....iv
LIST OF TABLES....vii
ACKNOWLEDGMENTS....x
FOREWORD....xi
What is a Biological and Water Quality Survey?....xi
Scope of the 2020 Biological and Water Quality Assessment....xi
EXECUTIVE SUMMARY....1
Summary of Findings....1
Aquatic Life Condition Assessment....1
Causes and Sources of Non-attainment[1]....3
IPS Restorability, Susceptibility, and Threat Results....5
Synthesis of Results....5
Recreational Use Assessment....6
Study Area Description....10
General Landscape Setting....10
Major Point Sources....11
NPDES Permit Special Conditions....12
Nutrient Assessment Reduction Plan (NARP)....14
Nonpoint Sources....15
Sampling Sites Selection and Locations....15
Spatial Survey Design....15
METHODS....18
Chemical/Physical Water Quality – Methods....18
Water Column Sampling....18
Nutrient Effects Assessment Procedure....18
Biological Assemblage Sampling....19
Fish Assemblage Methods....19
Macroinvertebrate Methods....20
Area of Degradation and Attainment Values....21

Habitat Assessment 22
Data Management 22
Determining Use Attainability 23
Causal Diagnosis 23
Hierarchy of Water Indicators 23
Causal Associations 25
RESULTS - CHEMICAL/PHYSICAL WATER QUALITY 25
Flow Regime 26
Point Source Effluent Quality 26
Lake Co. DPW Mill Creek WWTP 27
NSWRD Waukegan WRF 27
NSWRD Gurnee WRF 29
Libertyville WWTP 29
Mundelein WWTP 29
Lake Co. DPW New Century Town WWTP 29
Lake Co. DPW Des Plaines WWTP 30
Water Column Chemistry 30
Exceedances of Biological Effect and Reference Thresholds 30
Demand and Nutrient Related Parameters 31
Dissolved Oxygen (D.O.) 31
pH 36
Temperature 38
Ammonia-Nitrogen (N) 38
Total and Dissolved Phosphorus 41
Total Nitrate-N (NO_3-N) 44
Total Kjeldahl Nitrogen (TKN) 45
Total Suspended Solids (TSS) 46
Nutrient Effects Assessment 47
Ionic Strength Parameters 49
Chlorides 49
Conductivity 50

Physical Habitat Quality for Aquatic Life – QHEI 54
Des Plaines River 2020 Mainstem Habitat Assessment Results 54
Mill Creek and North Mill Creek 2020 Habitat Assessment Results 57
Biological Assemblages – Macroinvertebrates 57
Des Plaines River 2020 Macroinvertebrate Assemblage Results 57
Mill Creek and North Mill Creek 2020 Macroinvertebrate Assemblage Results 59
Biological Assemblages – Fish 60
Des Plaines River 2020 Fish Assemblage Results 62
Mill Creek and North Mill Creek 2020 Macroinvertebrate Assemblage Results 64
SYNTHESIS 66
References 71

APPENDICES

APPENDIX A A-1
APPENDIX B B-1
APPENDIX C C-1
APPENDIX D D-1

LIST OF FIGURES

Figure 1. Major categorical causal groupings associated with aquatic life impairments in the upper Des Plaines River mainstem in 2020 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). 4
Figure 2. Location of biological, chemical, and habitat sampling sites in the DRWW study area in 2020. Site codes correspond to the sites listed in Table 5. 16
Figure 3. The hierarchy of administrative and environmental indicators which can be used to support monitoring and assessment, reporting, and an evaluation of the effectiveness of pollution controls on a receiving stream. This is atterned after a model developed by U.S. EPA (1995a,b) and enhanced by Karr and Yoder (2004). 24
Figure 4. Daily flow measured at the USGS gauge on the Des Plaines River (USGS 05528500) near Gurnee, IL during the calendar years 2016, 2018, and 2020. The horizontal lines are the flood stage, 75th percentile, 50th percentile, and the seven-day, ten year ($Q_{7,10}$) critical low flows. The span of biological collection in 2020 is indicated by shaded bars. 26

Figure 5. Proportions of effluent flow (MGD) and pollutant loadings (lbs./day) discharged by seven (7) major WWTPs to the mainstem Des Plaines River in 2020. Proportions and loadings are based on the annual averages of each parameter. Discharges are listed in order from upstream to downstream in the inset table (bottom). 28
Figure 6. Dissolved oxygen (D.O.) concentrations (mg/L) measured continuously by Datasondes deployed for 3-4 day periods during August 21-24 and 24-27, 2020 at 13 locations in the 2020 and at 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 August-February minimum (3.5 mg/L) and the 7-day average D.O. criteria 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. 37
Figure 7. pH values measured continuously by Datasondes deployed for 3-4 day periods during August 21-24 and 24-27, 2020 at 12 locations and continuous data at three locations in the 2020. 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. A key to sources (arrows and numbers) is in the table above the figure along with flow and loads from each. 39
Figure 8. Temperatures measured continuously by Datasondes deployed for 3-4 day periods during August 21-24 and 24-27, 2020 at 12 locations and continuous data at three locations in the 2020. Box-and-whisker plots show the minimum, maximum, 25th and 75th percentiles, median, and outlier (>2 interquartile ranges from the median) values. The solid and dashed lines are the Ohio EPA maximum and average summer period criteria for similarly sized rivers and streams in the Ohio River basin. A key to sources (arrows and numbers) is in the table above the figure along with flow and loads from each. 40
Figure 9. Concentrations of mean ammonia-N in the upper Des Plaines River mainstem during June-October 2016-2020. 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 the table above the figure along with flow and loads from each..... 41
Figure 10. Concentrations of median total phosphorus in the upper Des Plaines River mainstem during June-October 2016-2020. 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 the table above the figure along with flow and loads from each. 42
Figure 11. Concentrations of median total (open symbols) and dissolved phosphorus (blue symbols) in the upper Des Plaines River mainstem during June-October 2016-2020. Dashed and solid lines represent IPS derived effect thresholds for total P correlated with ranges of biological quality and as listed in Table 7. A key to sources (arrows and numbers) is in the table above the figure along with flow and loads from each. 43
Figure 12. Concentrations (mg/L) of median nitrate-N in the upper Des Plaines River mainstem during June-October 2016-2020. Dashed and solid lines represent IPS derived effect thresholds correlated with ranges of biological quality and as listed in Table 10. A key to

sources (arrows and numbers) is in the table above the figure along with flow and loads from each. 44
Figure 13. Concentrations (mg/L) of median total Kjeldahl nitrogen (TKN) in the upper Des Plaines River mainstem during June-October 2016-20. 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 the table above the figure along with flow and loads from each. 45
Figure 14. Concentrations (mg/L) of median total suspended solids (TSS, upper) in the upper Des Plaines River mainstem during June-October 2016-2020. Dashed and solid lines represent IPS derived effect thresholds correlated with ranges of biological quality and as listed in Table 10. A key to sources (arrows and numbers) is in the table above the figure along with flow and loads from each. 46
Figure 15. Concentrations (mg/L) of median total chloride in the upper Des Plaines River mainstem during June-October 2016-2020. 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 the table above the figure along with flow and loads from each. 51
Figure 16. 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. 52
Figure 17. Median specific conductance in the upper Des Plaines River mainstem during June-October 2016-20. 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 the table above the figure along with flow and loads from each. 53
Figure 18. Qualitative Habitat Evaluation Index (QHEI) scores in the upper Des Plaines River mainstem in 2016, 2018, and 2020. 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 the table above the figure along with flows and loads from each. 55
Figure 19. Illinois macroinvertebrate IBI scores in the upper Des Plaines River mainstem in 2016, 2018, and 2020. 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 the table above the figure along with flows and loads from each. 59
Figure 20. Two (2) Round Gobies (Neogobius melanostomus) collected at site 16-1 (RM 71.7) on August 14, 2020. Twenty-one (21) Round Goby individuals were collected at the four downstream most sites during the 2020 survey of the upper Des Plaines River mainstem. 62
Figure 21. Illinois fish IBI (fIBI) scores for the upper Des Plaines River in 2016, 2018, and 2020. 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 the table above the figure along with flows and loads from each. 63
Figure 22. Modified Index of Well-Being (MIwb) for the upper Des Plaines River in 2016, 2018, and 2020. A key to sources (arrows and numbers) is in the table above the figure along with flow and loads from each. 64
Figure 23. 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, and 2020 (upper and middle panels). The miles of full and non-attainment appear in the lower panel..... 67

LIST OF TABLES

Table 1. Aquatic life use attainment status in the 2020 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); 2018 sources are listed for comparison. 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..... 2
Table 2. E. coli values (cfu/100 ml) for samples collected in the Year 2 Upper Des Plaines River study area during May-October 2015 thru 2018. Yellow shaded values exceed the recommended U.S. EPA (2012) 90-day geometric mean (126 cfu/100 mL) and red shaded values exceeded the maximum STV (410 cfu/100 mL) recreation use criteria..... 7
Table 3. Level IV subregions of the 2016 Upper Des Plaines River watershed study area and their key attributes (from Woods et al. 1995)..... 11
Table 4. Major wastewater treatment facilities that discharge either directly or via tributaries (river miles are indicated) to the 2018 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)..... 12
Table 5. Locations of sampling sites in the Year 2 Des Plaines River study area in 2020 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 1-4 designation..... 17
Table 6. Summary of the number of water chemistry parameters and samples collected by parameter category in 2020. 19

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}. 32

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}. 33

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}. 34

Table 10. Median values for 11 selected chemical/physical water quality parameters and mean ammonia-N at 20 sites in the Year upper Des Plaines River study area in 2020. 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. 35

Table 11. Exceedances of the different parts of the Illinois dissolved oxygen (D.O.) water quality standard among the three continuously operated Datasondes in the upper Des Plaines River during the summer-early fall period of 2020. 36

Table 12. Results of applying a modified Stream Nutrient Assessment Procedure to the 2020 Year 4 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, but were included for comparison of the biological attainment status, habitat quality, and nutrient parameters that were available. Sestonic chlorophyll a scores for sites with no sestonic chlorophyll a values were based on adjacent sites. 48

Table 13. QHEI matrix of good and modified habitat attributes for sites in the upper Des Plaines River Year 4 study area during 2020. 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. 56
Table 14. The fifteen (15) most abundant macroinvertebrate taxa collected in the upper Des Plaines River mainstem including sites collected, numbers collected, taxa group, functional group, and taxa tolerance assignments. 58
Table 15. Selected macroinvertebrate assemblage attributes for sites sampled in the Upper Des Plaines Year 4 study area in 2020. 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). 60
Table 16. 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). 61
Table 17. Selected fish assemblage attributes for sites sampled in the Upper Des Plaines Year 4 study area in 2020. 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). 65
Table 18. Key chemical, physical, and biological response indicators of impairment observed at each site in the Upper Des Plaines River study area in 2020. 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. 68

ACKNOWLEDGMENTS

Chris O. Yoder, MBI, served as the report editor and project manager. Technical contributions to the report and the analyses were made by Edward T. Rankin, Matthew A. Sarver, Vickie L. Gordon, Martin J. Knapp, and Blair A. Prusha, all of MBI. Database management and data analysis were provided by Edward T. Rankin and Vickie L. Gordon. Field crew leaders were Blair Prusha (macroinvertebrate assemblage), Matthew Sarver (fish assemblage and habitat), and Vickie L. Gordon (Datasonde and Benthic Chlorophyll a). Field sampling assistance was provided by Alex Roller-Knapp, Paul DeRolf, Michael Whitacre, and McKenzie Thompson. Logistical and administrative support at MBI was provided by Allison Boehler, Chelsea Dingess, and Emily Frechette. Chemical analysis was provided by Suburban Labs for samples collected by DRWW and by the University of Washington for benthic chlorophyll a. Overall DRWW project management was originally directed by Beth Adler, DRWW, and Joe Robinson, DRWW Monitoring Committee Chair. Ashley Strelcheck and Mike Prusila, DRWW assumed the project management role and Steve Waters the DRWW Monitoring Committee Chair in 2021 and coordinated a review of the draft and final report. All members of the DRWW Monitoring Committee are acknowledged for their review and edits. We also recognize DRWW for assistance provided with the location of and access to sampling sites.

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 2020 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 mainstem located in Cook County. All of these sites were previously sampled in 2016 biological assemblages and habitat and a portion of the mainstem annually since 2015 for water chemistry. The principal focus of the 2020 bioassessment is on the status of the Illinois General Use for aquatic life and recreation.

Scope of the 2020 Biological and Water Quality Assessment

The Midwest Biodiversity Institute (MBI) was contracted by the Des Plaines Watershed Workgroup (DRWW) to develop a biological and water quality monitoring and assessment plan for 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. 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), or the Year 3 watershed assessment of the Mill Creek, Bull Creek, and Upper Des Plaines River Tributary Subwatersheds (MBI 2021).

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

The 2020 Year 4 assessment followed the Year 2 2018 mainstem assessment and continued to utilize the analyses and outputs of the Northeastern Illinois Integrated Prioritization System (NE IL IPS; MBI 2020a). 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 of 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 better stressor thresholds and across five condition categories this has provided more certainty of the assignment of causes and sources of impairment and threats.

EXECUTIVE SUMMARY

Summary of Findings

Aquatic Life Condition Assessment

The primary indicators of the status of the Illinois General Use for aquatic life are the Illinois fish and macroinvertebrate Indices of Biotic Integrity and generally following the guidance in the 2018 Integrated Report (IEPA 2018) with certain exceptions. The status of aquatic life is reported here in an attainment table (Table 1) and expressed as full, partial, or non-support and based on the most limiting of either the fish or macroinvertebrate results. Non-support is further subdivided into non-support fair and non-support poor; the partial support category was added to clarify instances where only one of the two assemblages attains the General Use support fish or macroinvertebrate threshold. The 2020 results showed a single site in full attainment of the General Use for aquatic life, down from five (5) sites in full attainment in 2018 (MBI 2020b). The fish assemblage was limiting as the macroinvertebrate IBI met its criteria at all except two (2) sites in the effluent affected portion of the upper mainstem. The 2020 fIBI scores declined at the formerly attaining sites by anywhere from 2.0 to 7.5 fIBI units with two sites missing by 1.5 fIBI units. The introduction 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. 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 are primarily from nonpoint sources being exacerbated by the habitat and hydrological modifications in the upper watershed as the major limiting sources to aquatic life.

Only a single site (16-2) was in full attainment of the General Use for aquatic life in 2020 down from five sites in 2018 all in the effluent dominated reach of the study area (Table 1). Partial attainment was observed in the reach between site 13-1 (RM 94.2) and site 16-3 (RM 76.70) with the exception of site 16-8 (RM 82.90) which was non-fair. Each of these sites were limited by non-attainment of the fIBI biocriterion with most scores marginally lower than in 2018. The sites immediately upstream and downstream from the Libertyville and Mundelein WWTPs missed full attainment by only 1.5 units. The discovery of Round Goby at the four (4) downstream most sites also adds an unknown factor for the aquatic assemblages[1]. With no barriers until the Wetland Research riffle the species will likely move farther upstream, possibly having deleterious effects on the already marginal fish assemblage. 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 five upstream most sites that were in non-fair and non-poor attainment status and with four (4) of five (5) fIBI scores in the poor range.

[1] See https://nas.er.usgs.gov/queries/factsheet.aspx?SpeciesID=713 for potential adverse impacts to native species.

***Table 1**. Aquatic life use attainment status in the 2020 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); 2018 sources are listed for comparison. 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.*

Site ID	River Mile	Drain-age Area (mi.^{2})	AQLU Status	fIBI	mIBI	QHEI	2020 Causes by Stressor Threshold Narrative Category			2020 Sources	2018 Sources	IPS Restor-ability Score	IPS Suscep-tibility Score	IPS Threat Score
							Very Poor[11]	Poor[11]	Fair[11]					
Des Plaines River														
13-6	109.30	123.7	**NON-Fair**	28.5	26.5	53.0	Substr; Diel DO; Org. Enrich; #Poor attr.	Imperv-30C; Max DO; Min DO; Chan; QHEI Ratio; Org Enrich; Diel DO; TSS	TKN; QHEI; #Good, Poor attr.	Altered Flow; Habitat Modification, NPS	Altered Flow; Habitat Modification, NPS	46.48		
13-5	106.60	137.3	**NON-Fair**	26.0	22.8	42.0	Substr; TSS	Imperv-30C; QHEI; Chan; TSS; QHEI ratio; Diel DO; Org. Enrich; #Poor attr.	Imperv-500m;Imperv-30; TKN; #Good attr.; Min DO; Max DO; Chloride	Altered Flow; Habitat Modification, NPS	Altered Flow; Habitat Modification, NPS	44.82		
13-4	102.90	145.6	**NON-Fair**	27.0	35.8	47.0	Substr;	QHEI; Chan; Min DO;	TKN; QHEI ratio; #Good & Poor attr.; Diel DO; Chloride	Altered Flow; Habitat Modification, NPS	Altered Flow; Habitat Modification, NPS	56.12		
13-18	99.72	213.2	**[NON-Fair**	23.0		47.0	Substr; Chan; #Poor attr.	QHEI; Min DO; Diel DO	Low DO; TKN; Turbidity;QHEI ratio; #Good & Poor Attr.; Chloride	Altered Flow; Habitat Modification, NPS	Altered Flow; Habitat Modification, NPS	57.29		
13-19	99.30	212.9	**NON-Fair**	32.0	26.9	70.5	Org Enrich	Diel DO; Org Enrich; TSS; #Good attr.	TKN; QHEI; Substr; TSS; ; Min DO	Habitat Modificaiton, NPS	Habitat Modificaiton, NPS	71.04		
13-3	98.70	220.3	**NON-Fair**	32.0	34.7	79.5		Org. Enrich; TKN	Imperv-500m; Low DO; Substr; Turbidity; Sed. Metals; #Poor attr.; Min DO; Chloride	Upstream Flow & Urban NPS	Upstream Flow & Habitat Modification, NPS	69.83		
13-2	96.82	225.4	**NON-Fair**	31.0	41.2	82.5			Imperv-500m;TP; Min DO; TKN; Org Enrich	NPS	Modification, NPS	71.47		
13-1	94.20	232.0	**Partial**	35.5	49.6	72.3	Diel DO	Nitrates	Imperv-500m;TP; Min DO; TKN; Nitrate; QHEI; Substr; Org Enrich; Chloride	Urban NPS, WWTP	**FULL ATTAINMENT - No Causes Assigned**	70.62		
13-16	90.60	253.8	**Partial**	37.0	55.8	68.5		Nitrates, Ammonia	Imperv-500m;TP; TKN; Nitrate; QHEI; Substr; Chan; #Poor attr.; Chloride	Urban NPS, WWTP	**FULL ATTAINMENT - No Causes Assigned**	64.07		
16-6	87.10	261.4	**Partial**	39.5	55.7	71.0		Nitrates; Org. Enrich	TP; TKN; Nitrate; QHEI; Chan; #Good & Poor Attr.	Urban NPS, WWTP	**Causes Assigned**	66.06		
16-7	84.60	266.5	**Partial**	39.5	42.9	79.5	Nitrates	Ammonia	Imperv-500m;Imperv-30;Imperv-30C;TP; TKN; Nitrate; Substr; Chloride; Ammonia; Org Enrich; Min DO	Urban NPS, WWTP	**FULL ATTAINMENT - No Causes Assigned**	68.16		
16-5	83.60	268.1	**Partial**	36.0	47.5	72.0	#Poor attr.		Imperv-500m;Imperv-30;TP; TKN; QHEI; Chan; #Good attr.; Org Enrich	Urban NPS, WWTP	Urban NPS, WWTP	62.11		
16-8	82.90	268.9	**Non-Fair**	32.5	36.4	62.5	Ammonia	Nitrates	Imperv-500m;TP; TKN; Nitrate; QHEI; Substr; Chan; Org Enrich	Urban NPS, WWTP	Urban NPS, WWTP	58.24		
16-4	80.00	273.2	**Partial**	36.0	57.6	68.5		Diel DO; Nitrates; #Poor attr.	Imperv-500m;Imperv-30;Imperv-30C;TP; TKN; Nitrate; QHEI; Chan; #Good attr.; Org Enrich; Min DO	Urban NPS, WWTP, Habitat Modification	Urban NPS, WWTP	60.2		
16-3	76.70	314.7	**Partial**	32.0	57.4	58.5	Ammonia; #Poor attr.	Substr; Chan; Org Enrich; Nitrates	TP; Nitrate; TKN; QHEI; #Good attr.; Min DO	Urban NPS, WWTP, Habitat Modification	Urban NPS, WWTP	57.4		
16-2	75.40	324.0	**FULL**	43.0	53.2	57.5	#Poor attr.	Imperv-30;Imperv-30C; Substr; Nitrates	Imperv-500m;TP; TKN; Nitrate; QHEI; Chan; TSS; Org Enrich; Min DO	**FULL ATTAINMENT - No Causes Assigned**	**FULL ATTAINMENT - No Causes Assigned**		74.09	60
16-1	71.70	358.7	**NON-Fair**	33.0	39.9	68.0			Imperv-500m;TP; TKN; Nitrate; QHEI; Chan; #Good & Poor attr.; Min DO; TSS	Urban NPS, WWTP, Habitat Modification	Urban NPS, WWTP	62.91		
Mill Creek														
11-2	1.71	62.3	**NON-Fair**	29.5	53.3	75.5		Org. Enrich	Low DO; TKN; Substr; TSS; Turbidity; Sed. Metals; #Poor attr.	NPS		69.6		
North Mill Creek														
10-7	11.3	19.2	**[NON-Fair]**	20.5	-	42.5	Substr;	QHEI; Chan; QHEI Ratio; #Poor attr.	Urban-WS;Dev-WS; TKN; Chloride; Org Enrich	Urban NPS		52.18		
10-1	1.1	31.9	**Partial**	19.5	55.8	63.0		#Poor attr.	TKN; QHEI; Substr; Chan; TSS; #Good attr.; Org Enrich	Habitat Modificaiton, NPS		61.56		
Condition Category Thresholds		Excellent	FULL	≥50	>73	>84.5						Very High	Very Low	Very Low
		Good	FULL	>41-49	41.8-72.9	>75.9						High	Low	Low
		Fair	Non-Fair	30- <41	30-41.7	<75.9						Moderate	Moderate	Moderate
		Poor	Non-Poor	>15-29	>15-29	<50.1						Low	High	High
		Very Poor	Non-V.Poor	<15	<15	<25						Very Low	Very High	Very High
Source			**IPS**	**IPS**	**IEPA**	**IEPA**	**IPS**					**IPS**	**IPS**	**IPS**

Causes and Sources of Non-attainment[1]

Causes and sources were determined for each impaired site and included categorical or parameter level associations and their sources (if known). 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 2020a) assigning causes could be weighted by exceedances of very poor, poor, and fair IPS threshold values. This approach still involves using a line of evidence approach where chemical and physical threshold exceedances generated by the NE IL IPS within a causal category (or for a parameter) is better related to a biological impairment. This goes well beyond the association of a coincidental exceedance of a 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).

Nineteen (19) causes across four (4) major categories and six (6) major sources were identified for the upper Des Plaines River mainstem in 2020 (Figure 1). Of the 19 causes, six (6) were habitat related, nine (9) were chemical, three (3) D.O., and two (2) land use. The proportion of causes was assessed based on the number of observations and weighted observations (Figure 1), the latter being based on the severity of the expression of the specific stressors within a causal category. A higher weighting was assigned based on the narrative rating of an exceedance with 5 for very poor, 3 for poor, and 1 for fair. 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 were restricted to the uppermost five (5) sites in 2020, but one or two exceedances occurred sporadically at all except the downstream most site in 2020. 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.

Macro Habitat Related (39.5%) was the most pervasive cause followed closely by Organic/Nutrient Enrichment (36.5%) based on the weighted frequency of each. D.O. related issues at 13.8% comprised about one-third of the observations of either Macro Habitat Related or Organic/Nutrient Enrichment issues with Urban Related causes at 10.2%. There were no Toxics Related causes observed in 2020 which is likely related to the omission of sediment chemistry in 2020. The Macrohabitat Related, Organic/Nutrient Enrichment, and D.O. Related had the only poor and very poor values that were primarily observed in the 10 mile long modified upper reach upstream from the Wetland Research Riffle with observations of very poor and poor Organic/Nutrient Enrichment issues observed immediately downstream of the Wetland Research Riffle. Very poor and poor nutrient exceedances occurred sporadically in the middle and lower reaches of the mainstem. Very poor and poor ammonia-N levels occurred downstream from the Libertyville and Mundelein WTTPs, but none of these values would have exceeded the Illinois WQC for ammonia-N. Elevated levels of Nitrate-N and total P in the poor and most frequently in the fair range 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

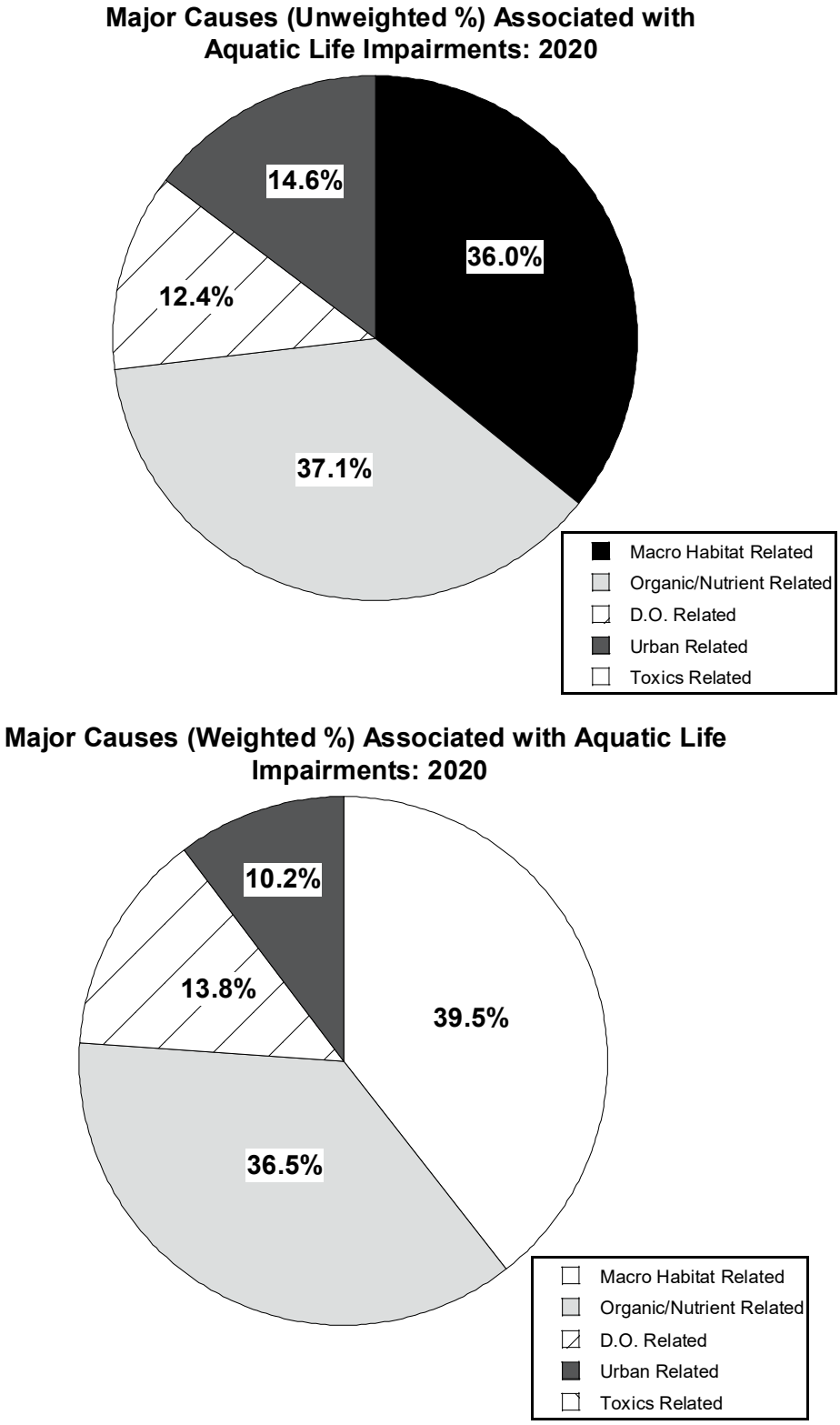


***Figure 1**. Major categorical causal groupings associated with aquatic life impairments in the upper Des Plaines River mainstem in 2020 based on the number of observations (upper) and weighted observations (lower), the latter based on the narrative rating of IPS threshold exceedances (very poor = 5, poor = 3, and fair = 1).*

Impervious Cover-30 meter buffer occurred at the two upstream most sites. These results are similar to the 2018 results although the 2020 causal categories were further refined in 2020.

IPS Restorability, Susceptibility, and Threat Results

The Northeast Illinois Integrated Prioritization System (IPS; MBI 2020a,b)) was used to calculate the Restorability scores for non-attaining and partially attaining sites and Susceptibility and Threat scores for the single fully attaining sites. Fifteen non-supporting and partially supporting sites had Restorability scores and one (1) fully supporting site had Susceptibility and Threat score calculated. In terms of Restorability 10 of the 15 non and partially attaining mainstem sites had Restorability scores ranked as high. The high rankings mean that the likelihood of reaching full attainment is plausible and likely accomplished without major physical restoration interventions. The remaining five (5) impaired mainstem sites ranked as moderate. None of these sites had any very poor causes assigned and three were impacted by hydromodifications located immediately upstream. The highest ranked sites were located downstream of the Wetland Research Riffle and the reach receiving the majority of the municipal wastewater that enters the mainstem. Two (2) sites in the lower watershed (16-3 and 16-8) missed a high Restorability ranking by only 3.6 and 1.8 points respectively. The other four (4) moderate ranked sites occurred in the upper mainstem that have been subject to more severe hydromodifications including legacy channelization with little or no recovery and flow alteration. These sites also exhibited multiple poor and very poor causes of impairment including low D.O., excessive diel D.O. swings, elevated turbidity, siltation, and a predominance of modified QHEI attributes. Addressing these impairments would require structurally oriented restoration actions to address the modified habitat (i.e., reduce or eliminate the modified habitat attributes) and altered flow conditions which would be a significant undertaking for a river channel of that size.

For the single fully supporting site, Susceptibility and Threat scores were applied. In terms of the narrative assignments being used at present (see Table 1, bottom), the Susceptibility ranking was low and the Threat ranking was also low. The Threat ranking for site 16-2 of 60 barely meets the threshold for a low score. Several factors influenced the Threat ranking and the ability of the assemblages to meet full use attainment status. Elevated levels of ammonia-N and nitrate-N emanated from the general vicinity of Libertyville downstream to just above the DesPlaines River WRF. Habitat quality limitations including a high number of poor attributes and only a moderate number of good attributes yielded a fair ratio of modified to good habitat attributes. The full attainment at site 16-2 in 2020 indicates that the impacts from upstream sources can be mitigated through the introduction of properly treated wastewater despite some habitat limitations. The reach with the four (4) previously attaining sites in 2018 that were in partial attainment in 2020 had very poor concentrations of ammonia-N and elevated nitrate-N levels in 2020. Habitat is not limiting at any of these sites.

Synthesis of Results

The influx of large volumes of treated municipal wastewater continues to offset the detrimental impacts of the upstream, modified section. Better habitat and flow conditions in the lower

watershed provide improved habitat conditions for aquatic assemblages, where nine (9) of the 11 sites downstream of the Wetland Research Riffle at least partially attaining the General Use criterion, and 16-2 (RM 75.4) fully attaining. The Susceptibility Score and the IPS Threat Score were low for 16-2. The majority of sites located downstream of the Wetland Research Riffle that were in partial attainment possess high Restorability rankings. Sites 16-7, 16-6, 13-16, and 13-1 previously fully attained in 2018, however, departed the General Use for the fIBI by fewer than 6 points. These four (4) sites have high Restorability rankings. The site below the Wetland Research Riffle and the Waukegan WRF (13-3) was in non-attainment (Fair) with fIBI and mIBI missing attainment by 9 and 8.2 points respectively. Further downstream an incremental improvement in the mIBI was observed at 13-2, however, the fIBI did not significantly differ. Partial attainment was observed downstream of the Gurnee WRF, Libertyville and Mundelein WRFs, and New Century Town WRF with the fIBI failing to meet the General Use biocriterion. The upper watershed sites generally had the lowest mIBI and fIBI as well as the lowest Restorability rankings in the mainstem. The AQLU status did not exceed low-fair at any site and the Restorability rankings were moderate at all sites. The historic channelization and wetland nature of the upper watershed provide limitations to the attainment of the General Use criteria for both the macroinvertebrate and fish assemblages. Despite the observed declines in the overall quality of both assemblages in the lower watershed, and if wastewater effluent quality is improved upon, then the full attainment observed can be expanded from the five (5) locations.

Recreational Use Assessment

Levels of fecal bacteria in the form of *Escherichia coli* (*E. coli*) cfu^2/100 mL were used to assess the status of recreation in and on the water. The IEPA General Use criteria are expressed as counts of fecal coliform bacteria, which were not measured here, hence the U.S. EPA national criteria for *E. coli* were used instead. The U.S. EPA *E. coli* criteria are expressed in terms of a 90-day geometric mean and a statistical threshold value (STV) which is the 90th percentile of the data distribution that is not be exceeded by more than 10 percent of the samples. Given the small sample size limitations of this survey, mean values of 2-3 samples were used as an approximation of the 90-day geometric mean and maximum values as the STV. The U.S. EPA recommended 90-day geometric mean criteria value is 126 cfu/100 ml and the STV criteria value is 410 cfu/100 ml (U.S. EPA 2012).

E. coli results for the Des Plaines River mainstem at 17 locations were available from 2020, at 16 locations in 2018 and 2019, and at 12 locations in 2015, 2016, and 2017 each (Table 2). The frequency of exceedances of the U.S. EPA recommended geometric mean and STV criteria have generally declined since 2015, however, exceedances in the geometric mean or maximum STV was observed at all sites in 2019. A majority of the sites had exceedances of both. The high number of exceedances is attributed to the higher levels of precipitation in 2019 that caused increased runoff. Only 16-7 (RM 84.6) did not exceed the maximum STV and only 16-5 (RM 83.6) did not exceed the geometric mean. The frequency of exceedances declined in 2020 to levels equivalent to observations in 2018. Among the 17 sites sampled for *E. coli* in 2020, four (4) had maximum values that exceed 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

***Table 2**. E. coli values (cfu/100 ml) for samples collected in the Year 2 Upper Des Plaines River study area during May-October 2015 thru 2018. Yellow shaded values exceed the recommended U.S. EPA (2012) 90-day geometric mean (126 cfu/100 mL) and red shaded values exceeded the maximum STV (410 cfu/100 mL) recreation use criteria.*

Site ID	River Mile	Samples	Minimum	Geometric Mean	Maximum STV
Upper Des Plaines River 2020					
13-6	109.3	3	41.4	107.9	344.1
13-5	106.6	3	44.1	82.6	190.4
13-4	102.9	3	52.8	66.6	83.6
13-19	99.72	3	23.5	134.4	2419.6
13-18	99.3	3	23.5	44.4	61.7
13-3	98.7	3	24.6	79.4	517.2
13-2	96.82	3	53	116.1	290.9
13-1	94.2	3	62.4	245.5	648.8
13-16	90.6	3	95.9	149.2	248.1
16-6	87.1	3	40.2	50.6	63.1
16-7	84.6	3	68.3	134.1	235.9
16-5	83.6	3	1	7.7	60.5
16-8	82.9	3	59.4	114.2	285.1
16-4	80	3	77.6	121.4	218.7
16-3	76.7	3	53.7	94.3	201.4
16-2	75.4	3	68.3	106.8	248.9
16-1	71.7	3	23.1	101.8	517.2
Upper Des Plaines River 2019					
13-6	109.3	6	61.7	389.6	2419.6
13-5	106.6	5	64.4	474.2	2419.6
13-4	102.9	4	75.4	935.2	2419.6
13-18	99.3	4	81.6	342.1	2419.6
13-3	98.7	4	75.4	287.9	2419.6
13-2	96.82	4	72.7	374.9	2419.6
13-1	94.2	5	108.6	278.1	1553.1
13-16	90.6	4	81.3	287.3	2419.6
16-6	87.1	6	78	370.4	2419.6
16-7	84.6	4	111.2	236.6	344.8
16-5	83.6	5	7.3	122.3	2419.6
16-8	82.9	5	110.6	227.2	1011.2
16-4	80	5	73.8	198.5	2419.6
16-3	76.7	5	88.2	265.8	2419.6
16-2	75.4	5	86	225.3	1732.9
16-1	71.7	7	121.1	297.8	1553.1

***Table 2**. E. coli values (cfu/100 ml) for samples collected in the Year 2 Upper Des Plaines River study area during May-October 2015 thru 2018. Yellow shaded values exceed the recommended U.S. EPA (2012) 90-day geometric mean (126 cfu/100 mL) and red shaded values exceeded the maximum STV (410 cfu/100 mL) recreation use criteria.*

Upper Des Plaines River 2018					
13-6	109.3	3	70.3	159.8	325.5
13-5	106.6	3	40.4	140.3	410.6
13-4	102.9	3	26.5	73.7	228.2
13-18	99.3	3	34.1	71.1	107.1
13-3	98.7	3	99	109.4	126.7
13-2	96.82	3	101.7	173.1	238.2
13-1	94.2	3	65	120.0	344.8
13-16	90.6	3	29.8	46.5	65.7
16-6	87.1	3	35.9	116.6	770.1
16-7	84.6	3	52	223.2	1553.1
16-5	83.6	3	14.6	22.6	34.1
16-8	82.9	3	5.2	41.5	121.0
16-4	80	3	50.4	77.0	165.8
16-3	76.7	3	32.8	77.8	325.5
16-2	75.4	3	10.7	63.9	1119.9
16-1	71.7	2	32.7	34.9	37.3
Upper Des Plaines River 2017					
13-6	109.3	4	6.3	65.2	214.0
13-5	106.6	4	49.6	102.2	276.0
13-4	102.9	4	39.9	80.8	123.0
13-3	98.7	4	27.9	57.8	105.0
13-2	96.82	4	20.4	57.3	99.0
13-1	94.2	5	7.5	115.0	579.0
16-6	87.1	4	30.9	86.8	921.0
16-5	83.6	4	1	8.0	39.0
16-4	80	4	1	53.0	1410.0
16-3	76.7	4	52.1	160.2	1550.0
16-2	75.4	4	1	17.2	75.9
16-1	71.7	4	1	16.2	56.5
Upper Des Plaines River 2016					
13-6	109.3	4	27.2	90.5	387.0
13-5	106.6	4	1	14.1	121.0
13-4	102.9	4	42.2	129.4	548.0
13-3	98.7	4	1	41.6	488.0
13-2	96.82	4	158	307.2	1200.0
13-1	94.2	4	111	151.2	179.0
16-6	87.1	4	81.6	118.3	326.0

***Table 2**. E. coli values (cfu/100 ml) for samples collected in the Year 2 Upper Des Plaines River study area during May-October 2015 thru 2018. Yellow shaded values exceed the recommended U.S. EPA (2012) 90-day geometric mean (126 cfu/100 mL) and red shaded values exceeded the maximum STV (410 cfu/100 mL) recreation use criteria.*

16-5	83.6	4	55.4	108.0	248.0
16-4	80	4	64.4	117.8	225.0
16-3	76.7	4	65.1	125.6	411.0
16-2	75.4	4	54.6	108.8	308.0
16-1	71.7	4	52.9	174.6	2420.0
Upper Des Plaines River 2015					
13-6	109.3	2	70.6	96.9	133.0
13-5	106.6	2	59.4	88.2	131.0
13-4	102.9	2	42.8	83.0	161.0
13-3	98.7	2	144	388.8	1050.0
13-2	96.82	2	236	438.8	816.0
13-1	94.2	2	88.4	139.1	219.0
16-6	87.1	2	108	144.0	192.0
16-5	83.6	2	125	233.2	435.0
16-4	80	2	219	223.5	228.0
16-3	76.7	2	140	167.7	201.0
16-2	75.4	2	86	149.8	261.0
16-1	71.7	2	52	141.9	387.0

13-18 (RM 99.72) are attributed to nonpoint runoff as are exceedances at 13-1 (RM 94.2) despite being located 1.2 miles downstream of the Gurnee WRF outfall which has consistently low cfu/100 mL counts. The exceedance of the geometric mean at 16-7 (RM 84.6) also occurred at the site in 2018, which is located 0.2 miles downstream of the Mundelein and Libertyville WWTPs. Years with lower observed flows saw exceedances of *E. coli* from point sources, while in years with higher flows nonpoint sources exacerbate increased concentrations (MBI 2020b). 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*.

Biological and Water Quality Assessment of the Upper Des Plaines River: Year 4 Rotation 2020

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 2020 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 nonforested wetlands replacing them with urban and suburban development. However, wooded areas, lakes, and wetlands are still common, especially in the extensive forest preserves.

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.

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, 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).

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 2020 study area. Eight (8) are major discharges (Table 4) which comprise 80 million gallons per day (MGD; average annual flows) of treated

wastewater. The North Shore Water Reclamation District Gurnee (NSWRD; 23.6 MGD), NSWRD Waukegan (22.0 MGD), and Lake Co. Dept. of Public Works (LCDPW) Des Plaines River WWTPs (16.0 MGD). The 2020 (Year 4) study area includes seven (7) of the eight (8) major discharges in upper DesPlaines River watershed. 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 4 study area. Six (6) facilities have phosphorus removal technology and all seven (7) facilities monitor for N and P (MBI 2017).

***Table 4**. Major wastewater treatment facilities that discharge either directly or via tributaries (river miles are indicated) to the 2018 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 R.	1.0/102.0	42°25'00"N	87°55'40"W	2.1	AWT	P
NSSD Waukegan WRF	Des Plaines R.	98.1	42°22'15"N	87°54'53"W	22.0	AWT	P
NSSD 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 R.	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 NH3-N; 12-24 mg/L TSS; Secondary – generally 30 mg/L CBOD5/TSS, and no NH3-N removal; [3] M – nutrient (N and P) monitoring only; P – 1.0 mg/L limitation.

NPDES Permit Special Conditions

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

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

The second special condition states:

> *The 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. All of the major WWTPs that are members of the DRWW have initiated planning for meeting the NARP requirements. Depending on the findings of the DRWW NARP process additional controls on discharges of N and P could be forthcoming.

Nonpoint Sources

Nonpoint sources in the 2020 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 evident in the upper mainstem.

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 is the initial sampling of the mainstem Des Plaines River outside of the yearly rotation. The 2020 site locations are a continuation of previous surveys.

Spatial Survey Design

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

The 2020 study area included 20 sites total 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. Macroinvertebrates were not collected at 13-19 due to water being too deep to sample. Twelve (12) sites were sampled with YSI Datasonde recorders continuously with one-half deployed for consecutive one-week periods during August 2020. Benthic chlorophyll-a samples were collected during the same week of deployment at the same sites in which Datasondes were deployed. DRWW grab water samples in 2020 were collected in accordance with designations as Tier 1-3, for which specific analytes varied (Table 5). No water samples were collected at Tier 4 sites, only the four (4) parameters were measured with a handheld water quality meter.

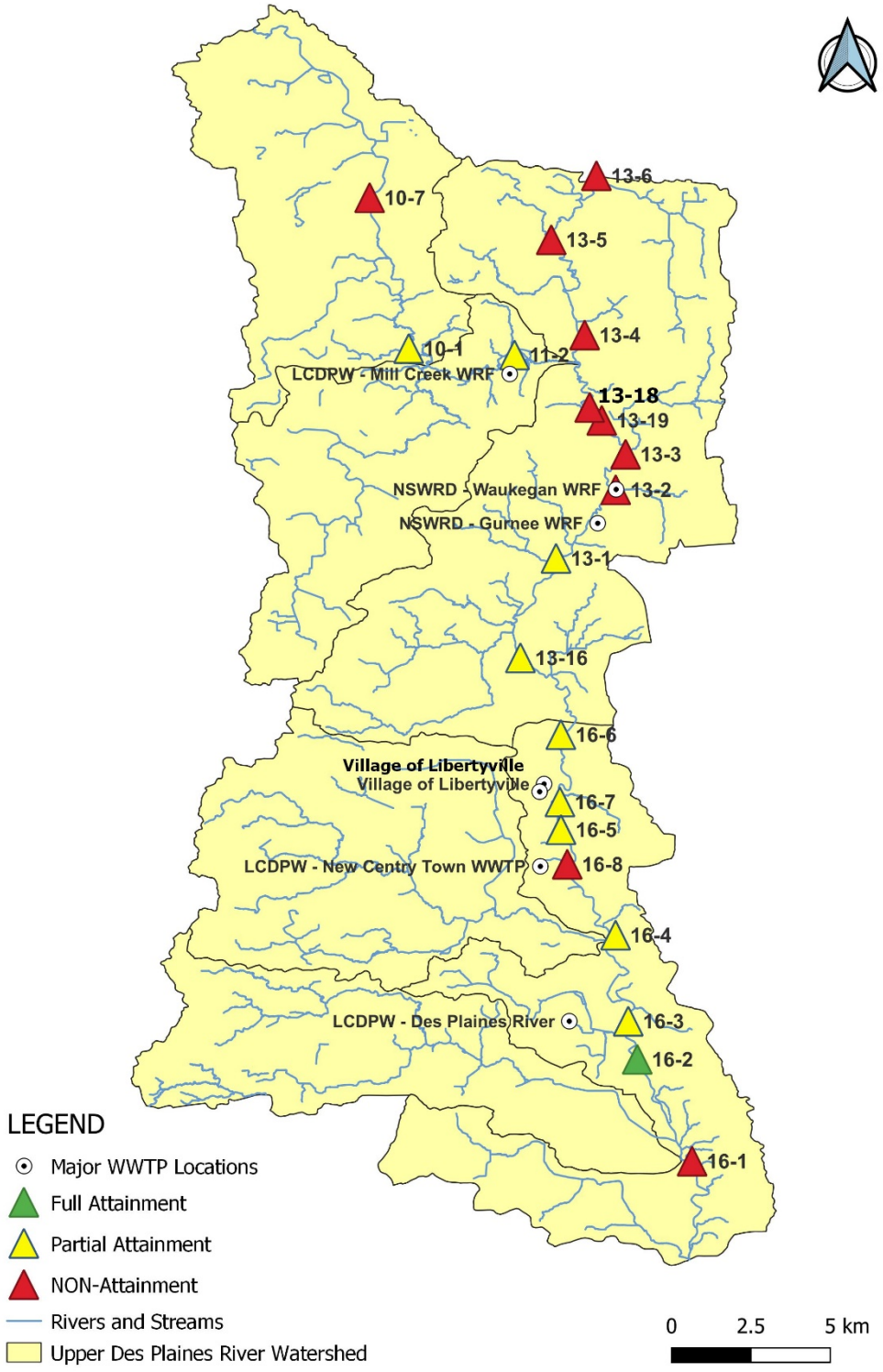


Figure 2. *Location of biological, chemical, and habitat sampling sites in the DRWW study area in 2020. Site codes correspond to the sites listed in Table 5.*

Table 5. *Locations of sampling sites in the Year 2 Des Plaines River study area in 2020 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 1-4 designation.*

Site ID	River	Location	River Mile	Gradient	Drainage Area (mi^2)	Biota	Habitat	Datasonde	Benthic Chlorophyll a	Water Chemistry			
										Tier 1	Tier 2	Tier 3	Tier 4
13-6	Des Plaines River	Russel Rd	109.3	5.64	123.7	F, MH	QHEI	DRWW	x	1			
13-5	Des Plaines River	IL 173	106.6	5.15	137.3	F, MH	QHEI	x	x		2		
13-4	Des Plaines River	Wadsworth Rd	102.9	4.67	145.6	F, MH	QHEI	x	x		2		
13-18	Des Plaines River	Above Riffle Structure	99.7	2.63	213.2	F	QHEI	x	x				4
13-19	Des Plaines River	Below Riffle Structure	99.3	2.63	213.9	F, MH	QHEI	x	x				4
13-3	Des Plaines River	US Rt. 41	98.7	4.26	220.3	F, MH	QHEI	x	x	1			
13-2	Des Plaines River	McClure Rd	96.8	4.04	225.4	F, MH	QHEI	x	x	1			
13-1	Des Plaines River	IL 120	94.2	3.61	232.0	F, MH	QHEI	DRWW	x	1			
13-16	Des Plaines River	Buckley Rd	90.6	3.32	253.8	F, MH	QHEI						4
16-6	Des Plaines River	Rockland Rd	87.1	2.70	261.4	F, MH	QHEI	x	x	1			
16-7	Des Plaines River	Hollister Dam Site	84.6	2.77	266.5	F, MH	QHEI	x	x				4
16-5	Des Plaines River	IL 60 (Town Line Rd)	83.6	2.72	268.1	F, MH	QHEI		x	1			
16-8	Des Plaines River	Wright Woods Dam Site	82.9	2.64	268.9	F, MH	QHEI						4
16-4	Des Plaines River	Half Day Rd	80.0	2.39	273.2	F, MH	QHEI	DRWW	x	1			
16-3	Des Plaines River	Deerfield Rd	76.7	2.24	314.7	F, MH	QHEI	x	x			3	
16-2	Des Plaines River	E Lake Cook Rd	75.4	2.19	324.0	F, MH	QHEI	x	x	1			
16-1	Des Plaines River	Palatine Frontage Rd	71.7	2.13	358.7	F, MH	QHEI	x	x	1			
11-2	Mill Creek	Ust Mill Creek WWTP	1.7	7.30	62.3	F, MH	QHEI		x		2		
10-7	North Mill Creek	Ust Edwards Rd	11.3	2.60	19.2	F, MH	QHEI						4
10-1	North Mill Creek	Dst Millburn Rd	1.1	5.24	31.9	F, MH	QHEI		x			3	

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 Suburban Labs. The chemical/physical parameter categories (demand, nutrients, metals, and organics) and the frequency of sample collection are summarized in DRWW (2016, 2018). DRWW assigned ties to the sampling sites 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:** Two (2) sites (1 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.
- **Tier 4:** Six (6) sites (5 Des Plaines River, 1 North Mill Creek) were not sampled for water chemistry. These sites were sampled with a water quality meter during each fish sampling event.

Nutrient Effects Assessment Procedure

The 2020 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 dissolved inorganic nitrogen (nitrates + nitrites). Other nutrient related parameters such as total suspended solids and total Kjeldahl nitrogen (TKN) were included when they were collected at one of the 13 Datasonde and benthic chlorophyll-a locations (Table 6). Datasondes were deployed by MBI for 4-5 day periods during times of low streamflow and elevated summer ambient temperatures (YSI 2012, 2017). DRWW operated three continuous monitoring locations starting in June 2020 and the corresponding data was also used in the SNAP

assessment. Together these results 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 weighted scoring process. That 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 comprise the highest weighted primary variables. The QHEI score, total P, and maximum D.O. were weighted less as secondary parameters, with nitrate-N, minimum D.O., TSS, and TKN weighted the least as tertiary parameters. The sum of parameter scores were normalized to a 0-100 scale for each site with adequate data with lower scores indicating greater effects of nutrient enrichment.

Table 6*. Summary of the number of water chemistry parameters and samples collected by parameter category in 2020.*

Parameters/Category	Water	
	Parameters	**Samples**
All	18	4915
E. coli	1	213
Field pH & Temperature	2	641
Demand[1]	1	37
Nutrients[2]	7	1870
Ionic Strength[3]	4	1373
Suspended Materials[4]	1	355
Metals	2	426
Organic Compounds	0	0
Other (Cyanide)	0	0

[1] Includes dissolved oxygen and turbidity
[2] Includes total ammonia, total phosphorus, total nitrate, TKN, benthic chlorophyll a, sestonic chlorophyll a
[3] Includes total chloride, and conductivity
[4] Includes total suspended solids and volatile suspended solids

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:

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

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 2020 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 3 and includes a hierarchical continuum from administrative to true environmental indicators. The six "levels" of indicators include:

- Level 1 - actions taken by regulatory agencies (permitting, enforcement, grants);
- Level 2 - responses by the regulated entity (treatment works, pollution prevention);
- Level 3 - changes in discharged quantities (pollutant loadings);
- Level 4 - changes in ambient conditions (chemical/physical water quality, habitat);
- Level 5 - changes in uptake and/or assimilation (tissue contamination, biomarkers, assimilative capacity); and,
- Level 6 - changes in health, ecology, or other effects (ecological condition, human and wildlife health).

In this process, the results of administrative activities (levels 1 and 2) are linked to water quality (levels 3, 4, and 5) which translates to a response (level 6). The administrative steps taken by Illinois EPA to issue NPDES permits (Level 1) and the steps taken by the permit holders (Level 2) 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

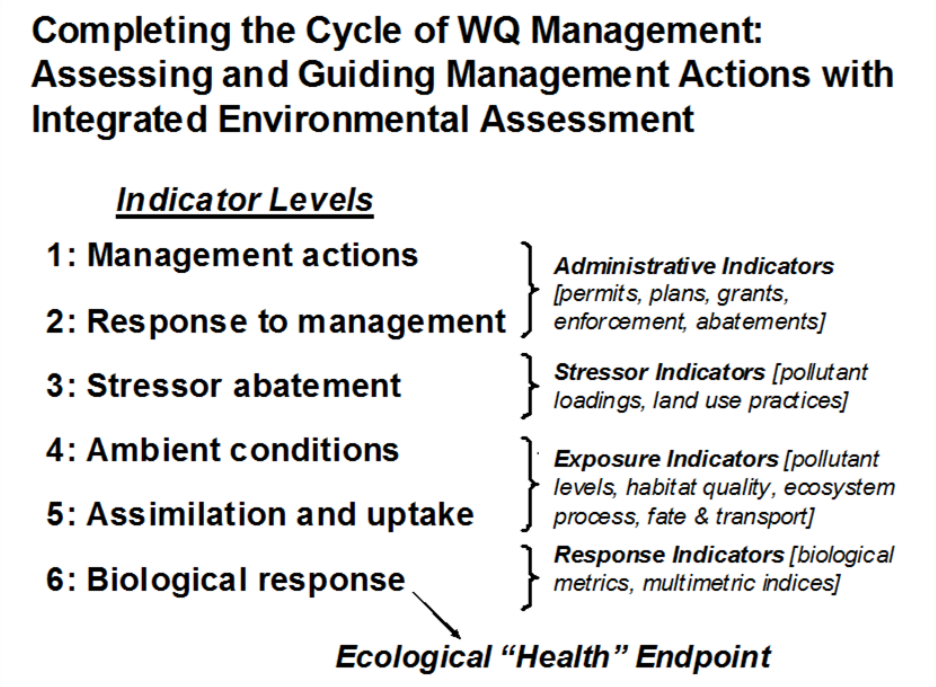


***Figure 3**. The hierarchy of administrative and environmental indicators which can be used to support monitoring and assessment, reporting, and an evaluation of the effectiveness of pollution controls on a receiving stream. This is atterned after a model developed by U.S. EPA (1995a,b) and enhanced by Karr and Yoder (2004).*

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 2020 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 2020 study area during the period of May 1 – October 31 for 2016, 2018, and 2020 monitoring years was based on the U.S. Geological Survey gauge on the Des Plaines River at Gurnee, IL (05528000; Figure 4). The flow regime was comparatively higher in 2020 than in 2016, but peak flows were lower in 2020 as opposed to 2018. Flows during the 2020 sampling period did not fall below the $Q_{7,10}$ and were consistently above the 50th percentile. Flows were at acceptable levels in August-September to conduct the biological survey.

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

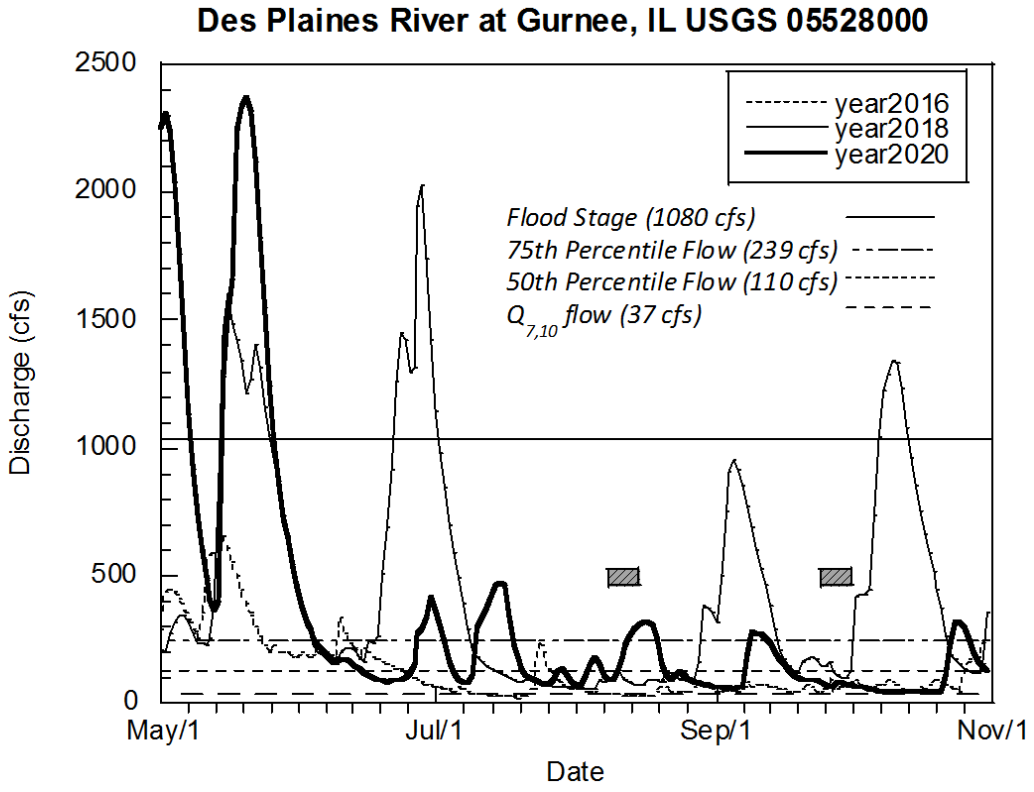


***Figure 4**. Daily flow measured at the USGS gauge on the Des Plaines River (USGS 05528500) near Gurnee, IL during the calendar years 2016, 2018, and 2020. The horizontal lines are the flood stage, 75th percentile, 50th percentile, and the seven-day, ten year ($Q_{7,10}$) critical low flows. The span of biological collection in 2020 is indicated by shaded bars.*

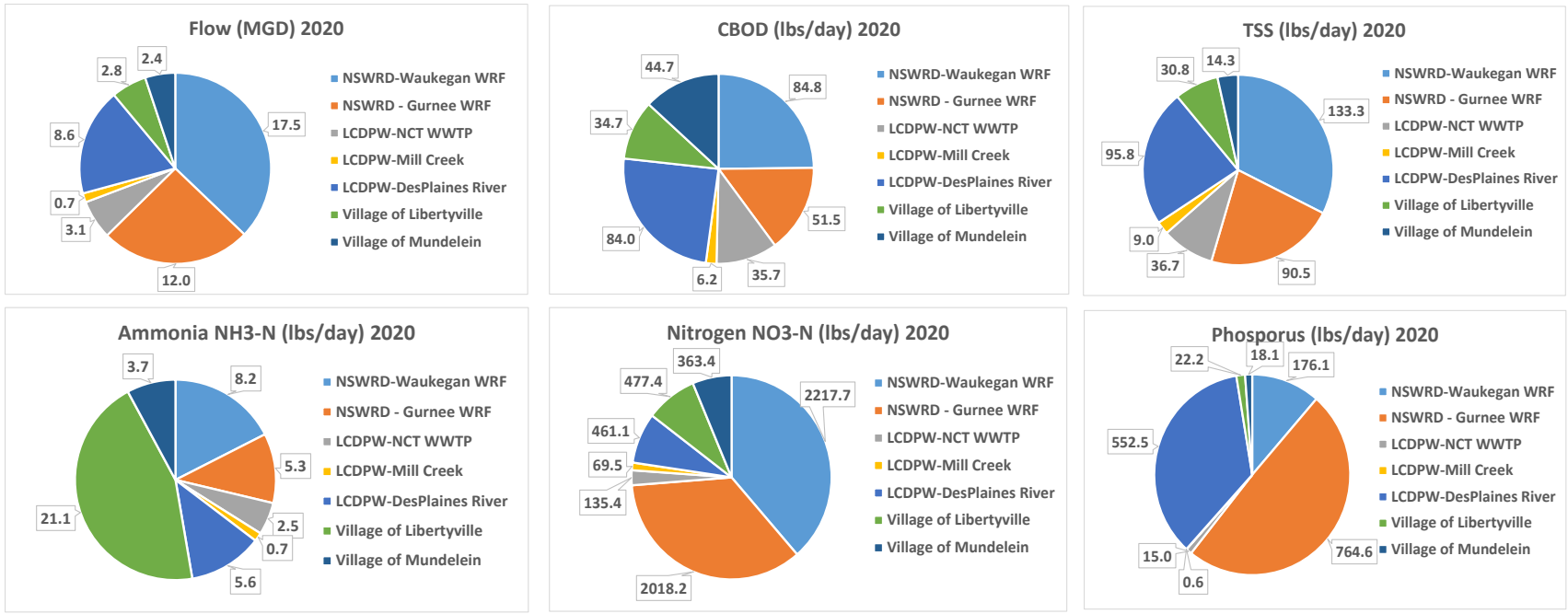
(MGD; or 146.2 cubic feet/second [cfs]) among seven (7) major wastewater treatment plants (WWTPs; Table 4). This total comprises 79.8% of the $Q_{7,10}$ flow of 37 cfs[4] at the USGS Gurnee Gage and 57.1% of the median flow (110 cfs at the USGS Gurnee Gage). In 2020, the annual average discharge flow totaled 47.2 MGD (73.0 cfs) of treated wastewater (60% of the average design flows) which comprised 48% of the median flow (110 cfs at the USGS Gurnee Gage). As a result, the upper Des Plaines is considered to be "effluent dominated" which consists primarily of discharged treated wastewater and runoff from urban and agricultural areas (Onnis-Hayden et al. 2006). The NSWRD Waukegan, NSWRD Gurnee, and Lake Co. DPW Des Plaines facilities comprised 41-96% of the flow and loadings discharged to the Des Plaines River. A major exception was for NH_3-N where Libertyville comprised 45% of the total loadings with the other three facilities contributing 41% of the total NH3-N load. Summaries of 2020 flow and loads from each facility follow in the order of occurrence along the Des Plaines River mainstem from upstream to downstream (Figure 5).

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 5). The Mill Creek WWTP discharges to Mill Creek one mile upstream of the confluence with the Des Plaines River and it is the uppermost major facility on 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 2020 effluent quality, the Mill Creek WWTP discharged the lowest proportion of loadings of $CBOD_5$ (1.8%), TSS (2.2%), NH3-N (1.4%), NO3-N (1.2%), and total P (0.4%; Figure 4).

NSWRD Waukegan WRF

The North Shore Water Reclamation District (NSWRD) Waukegan Water Reclamation Facility (WRF) discharged an annual average flow of 17.5 MGD (NPDES Permit No. IL0030244) which was 37.1% 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 2020 the Waukegan WRF discharged the highest proportion of loadings of $CBOD_5$ (24.8%) TSS (32.5%), and NO3-N (38.6%), and the second highest loadings of NH3-N (17.5%). Total P (11.4%) was the third highest among the seven treatment plants (Figure 5).



Facility	RM	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	6.2	9.0	0.7	69.5	0.6
2 - NSWRD-Waukegan WRF	98.1	17.5	84.8	133.3	8.2	2217.7	176.1
3 - NSWRD - Gurnee WRF	95.5	12.0	51.5	90.5	5.3	2018.2	764.6
4 - Village of Libertyville	84.8	2.8	34.7	30.8	21.1	477.4	22.2
5 - Village of Mundelein	84.6	2.4	44.7	14.3	3.7	363.4	18.1
6 - LCDPW-New Centry Town WWTP	82.3	3.1	35.7	36.7	2.5	135.4	15.0
7 - LCDPW-DesPlaines River	76.4	8.6	84.0	95.8	5.6	461.1	552.5
Total Flow/Loading		**47.2**	**341.5**	**410.3**	**47.0**	**5742.7**	**1549.2**

Figure 5*. Proportions of effluent flow (MGD) and pollutant loadings (lbs./day) discharged by seven (7) major WWTPs to the mainstem Des Plaines River in 2020. Proportions and loadings are based on the annual averages of each parameter. Discharges are listed in order from upstream to downstream in the inset table (bottom).*

NSWRD Gurnee WRF

The NSWRD Gurnee Water Reclamation Facility (WRF) discharged an annual average flow of 12.0 MGD (NPDES Permit No. IL0035092) which was 25.4% 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 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 2020 effluent quality the Gurnee WRF discharged the third highest proportion of loadings of $CBOD_5$ (15.1%), TSS (22.0%), and NH3-N loading (11.2%), and the highest proportion of NO3-N (38.6%) and total P (49.4%; Figure 5).

Libertyville WWTP

The Libertyville WWTP discharged an annual average flow of 2.8 MGD (NPDES Permit No. IL0029530) which was 5.9% 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 2020 effluent quality the Libertyville WWTP discharged the highest proportion of loadings of NH3-N (44.8%), the third lowest proportion of loadings of TSS (7.5%), fourth lowest total P (1.4%), and second lowest loadings of $CBOD_5$ (10.2%) and third highest NO3-N (8.3%; Figure).

Mundelein WWTP

The Mundelein WWTP discharged an annual average flow of 2.4 MGD (NPDES Permit No. IL0029530) which was 5.1% 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 2020 effluent quality the Mundelein WWTP discharged the third lowest proportion of loadings of NH3-N (7.9%) and total P (1.2%), the fourth lowest loadings of NO3-N (6.3%) and $CBOD_5$ (13.1%), and second lowest TSS (3.5%; Figure).

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 3.1 MGD (NPDES Permit No. IL0022071) which was 6.6% 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 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 2020 effluent quality the Lake Co. Des Plaines WWTP discharged the third lowest proportion of loadings of $CBOD_5$ (10.4 %), fourth lowest proportion of TSS (9.0%), and second lowest NO3-N (2.4%), NH3-N (5.2%), and total P (1.0%; Figure 5).

Lake Co. DPW Des Plaines WWTP

The Lake Co. Department of Public Works (DPW) Des Plaines WWTP discharged an annual average flow of 8.6 MGD (NPDES Permit No. IL0022055) which was 18.2% 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 on 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 2020 effluent quality the Lake Co. Des Plaines WWTP discharged the second highest proportion of loadings of $CBOD_5$ (24.6%) and TSS (23.3%), third highest NH3-N (11.9%), fourth highest NO3-N (8.0%), and the second highest of total P (35.7%; Figure 5).

Water Column Chemistry

The water column chemistry results were analyzed for spatial (longitudinal) patterns made possible by the pollution survey design in the 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 biological effect thresholds derived from the NE Illinois IPS were assessed in the Year 4 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 associated causes of biological impairments. 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 have been 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 2020) thresholds for water column chemical, sediment, and habitat and land use parameters appear in Tables 7-9 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 4 study area. NE Illinois derived sediment chemical thresholds are provided in Table 8 and were supplemented with the threshold and probable effect levels (TEL and PEL) established by MacDonald et al. (2000) and 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) were used to support the assignment of causes of biological impairment provided that there was a logical linkage of the chemical exceedance with the biological impairment. The chemical water column grab sample results are displayed graphically and in tabular format (Table 10) for selected parameters and with exceedances of IPS derived effect thresholds. With the exception of D.O., there were no exceedances of parameters that have IEPA water quality criteria.

Demand and Nutrient Related Parameters

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

Dissolved Oxygen (D.O.)

Exceedances of dissolved oxygen (D.O.) were assessed primarily with continuous data obtained from three (3) DRWW permanent Datasonde locations and additional short-term deployments at 12 locations during August. The data from the continuously deployed locations were used to evaluate the weekly and rolling average aspects of the IEPA D.O. criteria in addition to the seasonally varied minimums. Exceedances of the minimum D.O. (5.0 mg/L) occurred at site 13-6 (RM 109.3) in June for four (4) days, the 7-day minimum (4.0 mg/l) from August 14-21, and the 7-day average (<6.0 mg/l) on two separate occasions (June 29-July 6 and July 12 (Table 11). Exceedances of the minimum D.O. criteria was observed at site 13-1 (RM 94.2) for six (6) days in July and the 7-day average on two separate occasions in July (July 2-8 and July 12-24). The third Datasonde located at 16-4 (RM 80.0) had an exceedance of the 7-day average D.O. criterion during July 4-28. All of the significant exceedances occurred well upstream of the discharges of the largest loadings of oxygen demanding substances from municipal wastewater treatment facilities to the Des Plaines River mainstem. This data was further evaluated as symptom of excessive nutrient enrichment in the modified SNAP assessment at 13 sites which includes the short-term data obtained at 10 sites.

The short-term deployments of more numerous Datasonde continuous recorders in late August 2020 recorded exceedances of portions of the IEPA D.O. criteria (Figure 6). All of these deployments were made after August 1 hence the minimum was evaluated against the 3.5 mg/L criterion and the 6 mg/L 7-day average criterion. There was insufficient data to evaluate

***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)	Reference Site N
							Excellent	Good	Fair	Poor	Very Poor		
P665	Total Phosphorus	mg/L	Nutrients	Fish	0.04	1464	≤0.106	>0.106	>0.277	>1.002	>1.726	0.088 (0.062-0.115)	35
P94	Conductivity	µS/cm	Ionic	Fish	0.05	1464	≤739	≥739	>1038	>1208	>1378	922 (705-1158)	40
P70300	Total Dissolved Solids	mg/L	Ionic	Fish	0.10	1464	≤453.8	>453.8	>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	<3.4	8.6 (6.5-9.6)	29
P1092	Zinc, Total	µg/L	Metal_Tox	Fish	0.13	1464	≤7.47	>7.47	>9.78	>11.00	>12.22	2.0 (2.0-7.0)	23
P625	Total Kjeldahl Nitrogen	mg/L	Demand	Macros	0.14	985	≤1.07	>1.07	>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	>40.00	>120.0	>184.9	>249.8	154 (80.3-171.3)	33
P310	BOD (5-Day)	mg/L	Demand	Macros	0.21	985	≤1.30	>1.30	>2.35	>3.45	>4.54	2 (2.0-2.2)	27
P610	Total Ammonia	mg/L	Nutrients	Macros	0.28	985	≤0.084	>0.084	>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	>3.767	>5.045	>7.344	>9.643	0.39 (0.29-0.97)	32
P929	Sodium, Total	mg/L	Ionic	Fish	0.29	1464	≤16275	>16275	>45000	>79056	>113112	14200 (10375-22500	21
P530	Total Suspended Solids	mg/L	Demand	Fish	0.32	1464	≤17.50	>17.50	>31.60	>35.15	>38.69	9.2 (5.4-20.3)	33
P1027	Cadmium, Total	µg/L	Metal_Tox	Fish	0.93	1464	≤0.937	>0.937	>0.974	>0.983	>0.991	<MDL (0.17)	23
DO_MAX	Maximum DO	mg/L	Demand	Macros	0.94	985	≤10.36	≥10.36	>12.21	>14.24	>16.28	8.74 (8.21-9.45)	29
P1042	Copper, Total	µg/L	Metal_Tox	Fish	1.75	1464	--	≤4.480	>4.480	>4.969	>5.458	2.00 (1.96-4.15)	22
P1051	Lead, Total	µg/L	Metal_Tox	Macros	2.11	985	≤2.851	>2.851	>3.335	>3.884	>4.434	0.24 (0.20-0.57)	23
P82078	Turbidity	NTU	Demand	Macros	2.61	985	--	≤19.3	>19.3	>25.9	>32.5	11.0 (4.5-24.5)	7
P1055	Manganese, Total	µg/L	Metal_Tox	Macros	2.74	985	≤53.71	>53.71	>77.03	>107.1	>137.2	32.0 (24.1-38.2)	23
P549	Volatile Suspended Solids	mg/L	Demand	Fish	2.81	1464	≤5.000	>5.000	>7.769	>9.825	>11.88	6.0 (4.8-7.4)	5
P1067	Nickel, Total	µg/L	Metal_Tox	Macros	3.26	985	--	≤3.470	>3.470	>9.585	>15.70	5 (1.5-21)	14
P945	Sulfate, Total	mg/L	Ionic	Macros	6.49	985	≤58.27	>58.27	>73.10	>83.45	>93.81	74.6 (61.8-81.8)	4
P1002	Arsenic	µg/L	Metal_Tox	Macros	9.19	985	--	≤3.616	>3.455	>5.029	>6.603	Insufficient Data	
P937	Potassium, Total	mg/L	Ionic	Macros	10.13	985	≤3158	>3158	>6300	>7718	>9129	2400 (1574-2817)	21
P1007	Barium, Total	µg/L	Metal_Tox	Fish	4.77	1464	≤74.1	>74.09	>84.88	>101.8	>118.6	56.3 (44.3-64.7)	21
P1034	Chromium, Total	µg/L	Metal_Tox	Fish	10.17	1464	≤1.398	>1.398	>1.540	>2.682	>3.824	1.73 (1.30-2.00)	6
P1082	Strontium	µg/L	Metal_Tox	Fish	2.69	1464	≤169.1	>169.1	>190.8	>280.4	>370.1	150 (135-181)	21
P1105	Aluminum, Total	µg/L	Metal_Tox	Fish	4.54	1464	≤310.0	>310.0	>393.3	>560.2	>727.0	200 (128-449)	21
P916	Calcium, Total	mg/L	Ionic	Fish	Unimodal	1464	≤84425	>84425	>86067	>86313	>86559	54,000 (80-74,250)	21
P299	Mean Dissolved Oxygen	mg/L	Demand	Macros	0.21	985	≥9.42	<9.42	<9.25	<6.11	<3.05	8.6 (7.9-9.0)	40
P615	Nitrite-N	mg/L	Nutrients	Macros	0.41	985	≤0.014	>0.014	>0.040	>0.068	>0.096	0.01 (0.01-0.01)	27
P720	Cyanide, Total	µg/L	Metal_Tox	Macros	5.17	985	≤8	>8	>10	>10	>10	3 (2-10)	6

***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 Code	Variable Name	Units	Parameter Group	Limiting Assemblage	FIT Score	Sample N	Thresholds by Narrative Condition Category					Reference Site Values Median (IQR)
							Excellent	Good	Fair	Poor	Very Poor	
P1093	Zinc	mg/kg	Metal_Tox	Macros	2.22	985	≤75.00	>75.00	>100.0	>133.9	>167.8	Insufficient Data
P34524	Benzo(g,h,i)perylene	µg/kg	PAH	Macros	2.32	985	--	< 335.0	>335.0	>792.1	>1249	
P34406	Indeno(1,2,3-cd)pyrene	µg/kg	PAH	Macros	2.41	985	--	< 260.5	>260.5	>623.3	>986.2	
P1043	Copper	mg/kg	Metal_Tox	Macros	2.42	985	≤19.00	>19.00	>29.78	>40.45	>51.12	
P34233	Benzo(b)fluoranthene	µg/kg	PAH	Macros	2.51	985	--	<520.8	>520.8	>1437	>2354	
P1068	Nickel	mg/kg	Metal_Tox	Macros	2.67	985	--	<19.50	>19.50	>22.52	>25.53	
P34250	Benzo(a)pyrene	µg/kg	PAH	Macros	2.85	985	--	<230.0	>230.0	>798.3	>1367	
P34472	Pyrene	µg/kg	PAH	Macros	2.85	985	--	< 393.0	>393.0	>1570	>2747	
P1052	Lead	mg/kg	Metal_Tox	Macros	3.01	985	≤15.50	>15.50	>24.80	>33.04	>41.27	
P34529	Benzo[a]anthracene	µg/kg	PAH	Macros	3.48	985	--	< 239.0	>239.0	>699.4	>1160	
P34323	Chrysene	µg/kg	PAH	Macros	3.51	985	--	<266.0	>266.0	>958.3	>1651	
P34379	Fluoranthene	µg/kg	PAH	Macros	3.91	985	--	<774.0	>774.0	>2432	>4091	
P1083	Strontium	mg/kg	Metal_Tox	Macros	4.44	985	--	<81.80	>81.80	>106.8	>131.9	
P34559	Dibenz(a,h)anthracene	µg/kg	PAH	Macros	4.57	985	--	< 101.0	>101.0	>167.3	>233.7	
P34223	Anthracene	µg/kg	PAH	Macros	5.10	985	--	<78.00	>78.00	>119.9	>161.8	
P34464	Phenanthrene	µg/kg	PAH	Macros	5.10	985	--	< 243.5	>243.5	>803.3	>1363	
P1003	Arsenic	mg/kg	Metal_Tox	Macros	6.21	985	--	≤8.65	>8.65	>15.82	>23.67	
P1029	Chromium	mg/kg	Metal_Tox	Macros	6.29	985	≤20.53	>20.53	>23.30	>26.22	>29.15	
P1053	Manganese	mg/kg	Metal_Tox	Macros	7.08	985	≤841.0	>841.0	>845.5	>996.8	>1148	
P1078	Silver	mg/kg	Metal_Tox	Macros	7.11	985	--	<0.483	>0.483	>1.261	>2.039	
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	>132.0	>150.3	>168.7	
P1028	Cadmium	mg/kg	Metal_Tox	Macros	11.00	985	--	≤0.933	>0.745	>1.354	>1.963	
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	985	--	<8.86	>11.00	>16.73	>24.60	
P34203	Acenaphthylene	µg/kg	PAH	Macros	ND	985	--	<86.38	>86.38	>103.6	>120.9	
P34208	Acenaphthene	µg/kg	PAH	Macros	ND	985	--	<84.25	>84.25	>104.8	>125.3	
P34262	Delta-BHC	µg/kg	PAH	Macros	ND	985	--	<2.098	>2.098	>6.19	>10.28	
P34384	Fluorene	µg/kg	PAH	Macros	ND	985	--	<84.25	>84.25	>104.8	>125.3	
P34445	Naphthalene	µg/kg	PAH	Macros	ND	985	--	< 86.38	>86.38	>103.6	>120.9	

***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	>1.3	>1.6	>2.4	>3.2	2 (2-2)	29
Urban	Urban (Ust. WS)	Wtd. %	Land Use	Fish	0.03	2657	≤8.8	>8.8	>45.0	>63.2	>81.3	8.7 (3.0-9.5)	48
QHEI	QHEI Score	QHEI Units	Habitat	Fish	0.04	1393	≥84.5	>75.9	<75.9	<50.1	<25.0	84 (76-90)	34
SUBSTRAT	Substrate Score	QHEI Units	Habitat	Fish	0.04	1393	≥16.0	<16.0	<15.0	<9.9	<5.0	8 (7-9)	33
WWH_ATTR	Good Habitat Attributes	Number	Habitat	Fish	0.04	1393	≥9	<9	<8	<5	<2	16 (15-17)	34
Imperv	Impervious (30 m)	Wtd. %	Land Use	Fish	0.04	2657	≤18.3	>18.3	>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	>13.4	>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	<16.8	<14.00	<9.2	<4.6	16 (13-19)	34
COVER	Cover Score	QHEI Units	Habitat	Fish	0.07	1393	≥16.0	<16.0	<14.0	<9.2	<4.6	16 (16-17)	34
SILTCOVE	Silt Cover Score	QHEI Units	Habitat	Fish	0.07	1393	≤2.0	<2.0	>2.0	>2.7	>3.33	2 (2-3)	29
Develop	Developed (Ust. WS)	Wtd. %	Land Use	Fish	0.07	2657	≤9.1	>9.1	>45.6	>63.6	>81.5	9.1 (2.9-9.6)	48
RIPARIAN	Riparian Score	QHEI Units	Habitat	Fish	0.10	1393	≥6.0	>6.0	<6.0	<4.0	<2.0	7.0 (6.0-9.5)	34
Imperv	Impervious (Ust. WS)	Wtd. %	Land Use	Macros	0.10	3096	≤5.6	>5.6	>13.2	>41.8	>70.5	5.2 (2.1-5.4)	48
DEPTH	Depth Score	QHEI Units	Habitat	Fish	0.11	1393	≥10.0	>10.0	<10.0	<6.6	<3.3	10 (9-11)	33
MWH_ATTR	Poor Habitat Attributes	Number	Habitat	Fish	0.12	1393	≤1	<1	>1	>3	>6	2 (1-5)	20
HYD_QHEI	Hydro-QHEI	QHEI Units	Habitat	Fish	0.13	1393	≥17.0	>17.0	<19.5	<12.9	<6.4	20 (14-22)	33
CURRENT	Current Score	QHEI Units	Habitat	Fish	0.14	1393	≥7.0	>7.0	<7.0	<4.6	<2.3	11 (5.8-11.0)	33
POOL	Pool Score	QHEI Units	Habitat	Fish	0.15	1393	≥11.3	<11.3	<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	>7.7	>29.3	>52.6	>76.0	5.5 (1.1-6.0)	48
RIFFLE	Riff< Score	QHEI Units	Habitat	Fish	0.27	1393	≥5.8	≥5.8	<5.8	<3.9	<1.9	6 (5-7)	34
GRAD_S	Gradient Score	QHEI Units	Habitat	Fish	0.31	1393	≥10.0	>10.0	<10.0	<6.6	<3.3	10 (10-10)	34
Ag	Agricultural (Ust. WS)	Wtd. %	Land Use	Macros	4.82	3096	≤87.1	<87.1	>62.1	>74.6	>87.1	83.9 (11.7-85.4)	48
GRADIENT	Gradient (ft/mi)	feet/mile	Habitat	Fish	12.20	1393	≥8.8	<8.8	<4.3	<2.8	<1.4	8.6 (4.9-11.3)	34
Ag	Agricultural (30 m)	Wtd. %	Land Use	Macros	16.66	3096	≤87.2	<87.2	>43.2	>61.9	>80.7	0.0 (0.0-0.4)	48

***Table 10**. Median values for 11 selected chemical/physical water quality parameters and mean ammonia-N at 20 sites in the Year upper Des Plaines River study area in 2020. 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.)	Chloride	Total Suspended Solids (TSS)	Sulfate	Specific Conductance[1] (µS/cm)	Ammonia-N	Total Kjeldahl Nitrogen (TKN)	Total Nitrate-N	Total Phosphorus (P)	Orthophosphate (as P)	Total P minus Ortho P	Conductivity[2] (µS/cm)	pH (S.U.)	Temperature (°C)
Des Plaines River 2020															
13-6	109.30	123.7	87.5	33.7	55.3	746	ND	1.42	0.73	0.206	0.053	0.153	805	8.1	24.3
13-5	106.60	137.3	135.5	5.4	50.2	719	ND	1.68	0.77	0.189	0.061	0.128	943	8.0	24.5
13-4	102.90	145.6	136.0	17.2	43.0	759	ND	1.64	0.59	0.176	0.050	0.126	995	8.0	25.0
13-19	99.72	213.2	127.5	8.0	30.1	720	ND	1.40	0.41	0.126	0.027	0.099	928	8.0	25.4
13-18	99.30	212.9	129.0	11.2	30.3	713	ND	1.53	0.50	0.147	0.030	0.117	980	8.0	21.8
13-3	98.70	220.3	119.0	6.6	41.0	686	ND	1.63	0.38	0.143	0.020	0.123	974	8.2	24.4
13-2	96.82	225.4	137.0	12.2	32.7	778	ND	1.43	2.34	0.269	0.200	0.069	915	8.1	23.3
13-1	94.20	232.0	130.0	6.2	56.2	840	ND	1.31	6.17	0.398	0.285	0.113	976	7.8	20.9
13-16	90.60	253.8	123.0	6.6	56.1	838	ND	1.27	4.27	0.360	0.300	0.060	938	7.9	24.0
16-6	87.10	261.4	110.5	10.0	49.6	920	ND	1.16	9.14	0.313	0.280	0.033	873	8.0	22.3
16-7	84.60	266.5	111.5	17.9	53.4	946	0.208	1.55	9.09	0.433	0.350	0.083	894	7.8	23.0
16-5	83.60	268.1	91.5	17.4	34.1	905	ND	1.49	5.81	0.246	0.050	0.196	827	8.2	24.0
16-8	82.90	268.9	83.0	18.4	50.9	891	0.296	1.53	6.94	0.424	0.350	0.074	771	8.1	22.8
16-4	80.00	273.2	80.8	21.8	51.6	933	0.158	1.28	8.96	0.458	0.360	0.098	780	8.0	22.3
16-3	76.70	314.7	83.7	19.2	51.5	901	0.332	1.13	7.75	0.310	0.270	0.040	764	8.0	22.6
16-2	75.40	324.0	91.8	28.0	55.6	935	ND	1.23	7.49	0.333	0.260	0.073	792	8.1	21.7
16-1	71.70	358.7	87.0	32.0	56.5	924	ND	1.40	4.72	0.328	0.260	0.068	786	7.9	26.7
Mill Creek 2020															
11-2	1.71	62.3	74.9	40.0	43.4	707	0.100	1.74	0.48	0.149	0.020	0.129	719	7.9	25.3
North Mill Creek 2020															
10-7	11.30	19.2	126.0	13.4	39.0	759	ND	1.59	0.17	0.072	0.020	0.052	762	8.0	26.1
10-1	1.10	31.9	59.1	54.4	51.1	708	ND	1.48	1.45	0.227	0.069	0.158	657	8.3	22.2
Condition Category Thresholds		**Excellent**	<40.0	≤17.5	<58.3	<739	<0.084	<1.07	≤ 3.77	≤ 0.106			<739		
		Good	<120.0	<31.6	<73.1	<1038	<0.100	<1.12	<5.05	<0.277			<1038		
		Fair	<184.9	<35.2	<83.5	<1208	<0.190	<1.63	<7.34	<1.020		>0.10	<1208		
		Poor	<249.8	<38.7	<93.8	<1378	<0.280	<2.14	<9.64	<1.730			<1378		
		Very Poor	≥249.8	>38.7	≥93.8	≥1378	≥0.280	≥2.14	≥9.64	≥1.730			>1378		
Source			**IPS**	**IPS**	**IPS**	**IPS**	**IPS**	**IPS**	**IPS**	**IPS**		**MBI**	**IPS**		

Footnotes: [1] - Specific conductance @25°C measured in laboratory; [2] - Conductivity (relative) measured in the field.

Table 11. *Exceedances of the different parts of the Illinois dissolved oxygen (D.O.) water quality standard among the three continuously operated Datasondes in the upper Des Plaines River during the summer-early fall period of 2020.*

Site ID	River	Year	River Mile	Month/Date/Duration	Criterion	Narrative Standard
13-6	Des Plaines River	2020	109.3	June - #Days: 4	<5.0 mg/l	Not to exceed
13-6	Des Plaines River	2020	109.3	6/29 - 7/ 6	<6.0	7-day Average
13-6	Des Plaines River	2020	109.3	July - #Days: 11	<5.0 mg/l	Not to exceed
13-6	Des Plaines River	2020	109.3	7/12 - 7/24	<6.0	7-day Average
13-6	Des Plaines River	2020	109.3	8/14 - 8/21	<4.0 mg/l	7-day Minimum
13-1	Des Plaines River	2020	94.2	July - #Days: 6	<5.0 mg/l	Not to exceed
13-1	Des Plaines River	2020	94.2	7/ 2 - 7/ 8	<6.0	7-day Average
13-1	Des Plaines River	2020	94.2	7/12 - 7/24	<6.0	7-day Average
16-4	Des Plaines River	2020	80.0	7/ 4 - 7/28	<6.0	7-day Average

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 3.5 mg/L minimum criterion occurred only at 13-18 (RM 99.72), immediately upstream of the Wetland Research riffle. Wide D.O. swings were observed at 13-5 (RM 106.6), 13-18 (RM 99.72), and 13-19 (99.3) in which the median values ranged by more than 6.0 mg/L. Sites 13-5 is downstream of Rosecrans Rd, 13-18 is immediately upstream of the Wetland Research Riffle, and site 13-19 is immediately downstream of the Wetland Research Riffle. Exceedances of the 6.0 mg/L average occurred at three (3) sites 13-4 (RM 102.9), 13-3 (RM 98.7), and 16-6 (RM 87.1) with most values at 16-6 below the 6.0 mg/L 7-day average.

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 period and continuously using Datasonde units that were deployed for 4-5 days between August 21 and September 1, 2020. The latter was done at 12 sites in addition to the three (3) units that were continuously operated by DRWW beginning in June 2020. The permanently deployed Datasondes were deployed at sites 13-6 (RM 109.30), 16-7 (RM 84.60), and 16-4 (RM 80.00) for the first time in 2020. Sites 16-4 and 16-7 did not have pH data from the MBI Datasondes due to a failure of the pH probe during deployment resulting in pH data being available for 12 sites total. The upper Des Plaines Datasonde recorded median pH levels generally declined from >8.0 S.U. upstream to 7.5-8.0 S.U. downstream with the highest median and widest diel swing values being observed at site 13-6 in the highly modified upstream reach in the upper mainstem (Figure 7). Site 13-18 (RM 99.30) had the same median as at site 13-16, but with a lesser diel swing. The highest recorded maximum value was also observed at site 13-6 with the next highest value being observed downstream from the New

Facility	RM	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	6.2	9.0	0.7	69.5	0.6
2 - NSWRD-Waukegan WRF	98.1	17.5	84.8	133.3	8.2	2217.7	176.1
3 - NSWRD - Gurnee WRF	95.5	12.0	51.5	90.5	5.3	2018.2	764.6
4 - Village of Libertyville	84.8	2.8	34.7	30.8	21.1	477.4	22.2
5 - Village of Mundelein	84.6	2.4	44.7	14.3	3.7	363.4	18.1
6 - LCDPW-New Centry Town WWTP	82.3	3.1	35.7	36.7	2.5	135.4	15.0
7 - LCDPW-DesPlaines River	76.4	8.6	84.0	95.8	5.6	461.1	552.5
Total Flow/Loading		**47.2**	**341.5**	**410.3**	**47.0**	**5742.7**	**1549.2**

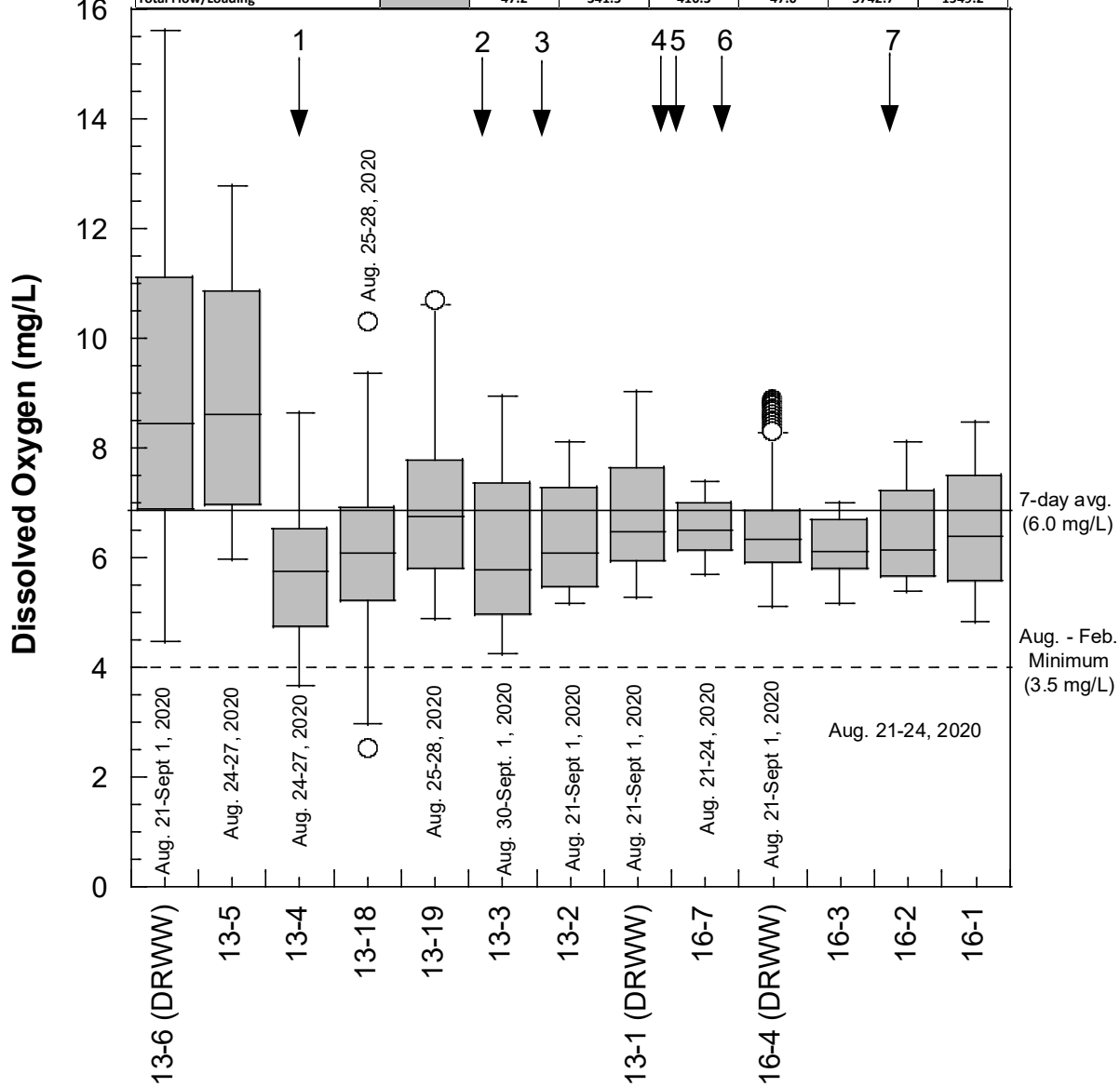


***Figure 6**. Dissolved oxygen (D.O.) concentrations (mg/L) measured continuously by Datasondes deployed for 3-4 day periods during August 21-24 and 24-27, 2020 at 13 locations in the 2020 and at 3 long term locations operated by DRWW. Box-and-whisker plots show the minimum, maximum, 25th and 75th percentiles, median, and outliers (>2 interquartile ranges from the median) values. The IEPA August-February minimum (3.5 mg/L) and the 7-day average D.O. criteria 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.*

Century Town WWTP (16-4). Slight increases in median pH values were observed downstream from the Mill Creek WWTP (13-18), and downstream from the Libertyville and Mundelein WRFs (16-7). A decline in the median pH was observed downstream from the Waukegan WRF (13-3) and a further decline downstream from the Gurnee WRF (13-2). The median pH values from the grab sample results ranged from 7.8-8.2 in the mainstem with the highest value occurring in the North Fork of Mill Creek at site 10-1 (RM 1.1) near the mouth (Table 10). Taken together, the continuous data results at all except site 13-6 reflected only slight to moderate effects from nutrient enrichment on pH.

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 15 locations, 12 of which were short-term deployments and three (3) that were continuously operated by DRWW. The continuous results are displayed a box-and-whisker plots that include a median, upper and lower quartile, maximum, minimum, and outlier values. 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 109.30) and highest median at site 13-5 (RM 106.60) both of which are in the channel modified reach in the upper mainstem (Figure 8). Temperatures declined by 4.0-4.5°C at site 13-2 (RM 96.82) downstream from the NSWRD Gurnee WRF outfall. Temperatures increased from the low values at site 13-2 by 2.0-2.5°C at site 13-1 (RM 94.20) and remaining at that level through the reminder of the mainstem. The median values from the grab sample data ranged from a low of 20.9°C at site 13-1 (RM 94.2) to high value of 26.9°C at site 16-1 (RM 71.70; Table 10). Temperatures in Mill and North Mill Creeks ranged from a low of 22.2°C at site 10-1 (RM 1.10) in North Mill Creek to 26.1 at site 10-7 (RM 11.3) located 10.2 miles upstream. 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. 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. The two maximum values from the Datasonde results at sites 13-6 and 13-5 exceeded the summer average criterion of 29.4°C, but none of the remaining maximum values nor any of the median values approached that level.

Ammonia-Nitrogen (N)

Levels of ammonia-N were either below or just above or at the mean detection level (MDL) in 2016, 2017, and 2018 with no values that would suggest significant chronic or acutely toxic effects to aquatic life during those surveys. Mean values in 2020 were less frequently detected than in 2018, but at substantially higher concentrations at four (4) sites in 2020 (Figure 9; Table 10). Concentrations of ammonia-N in 2020 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 mean 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

Facility	RM	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	6.2	9.0	0.7	69.5	0.6
2 - NSWRD-Waukegan WRF	98.1	17.5	84.8	133.3	8.2	2217.7	176.1
3 - NSWRD - Gurnee WRF	95.5	12.0	51.5	90.5	5.3	2018.2	764.6
4 - Village of Libertyville	84.8	2.8	34.7	30.8	21.1	477.4	22.2
5 - Village of Mundelein	84.6	2.4	44.7	14.3	3.7	363.4	18.1
6 - LCDPW-New Centry Town WWTP	82.3	3.1	35.7	36.7	2.5	135.4	15.0
7 - LCDPW-DesPlaines River	76.4	8.6	84.0	95.8	5.6	461.1	552.5
Total Flow/Loading		**47.2**	**341.5**	**410.3**	**47.0**	**5742.7**	**1549.2**

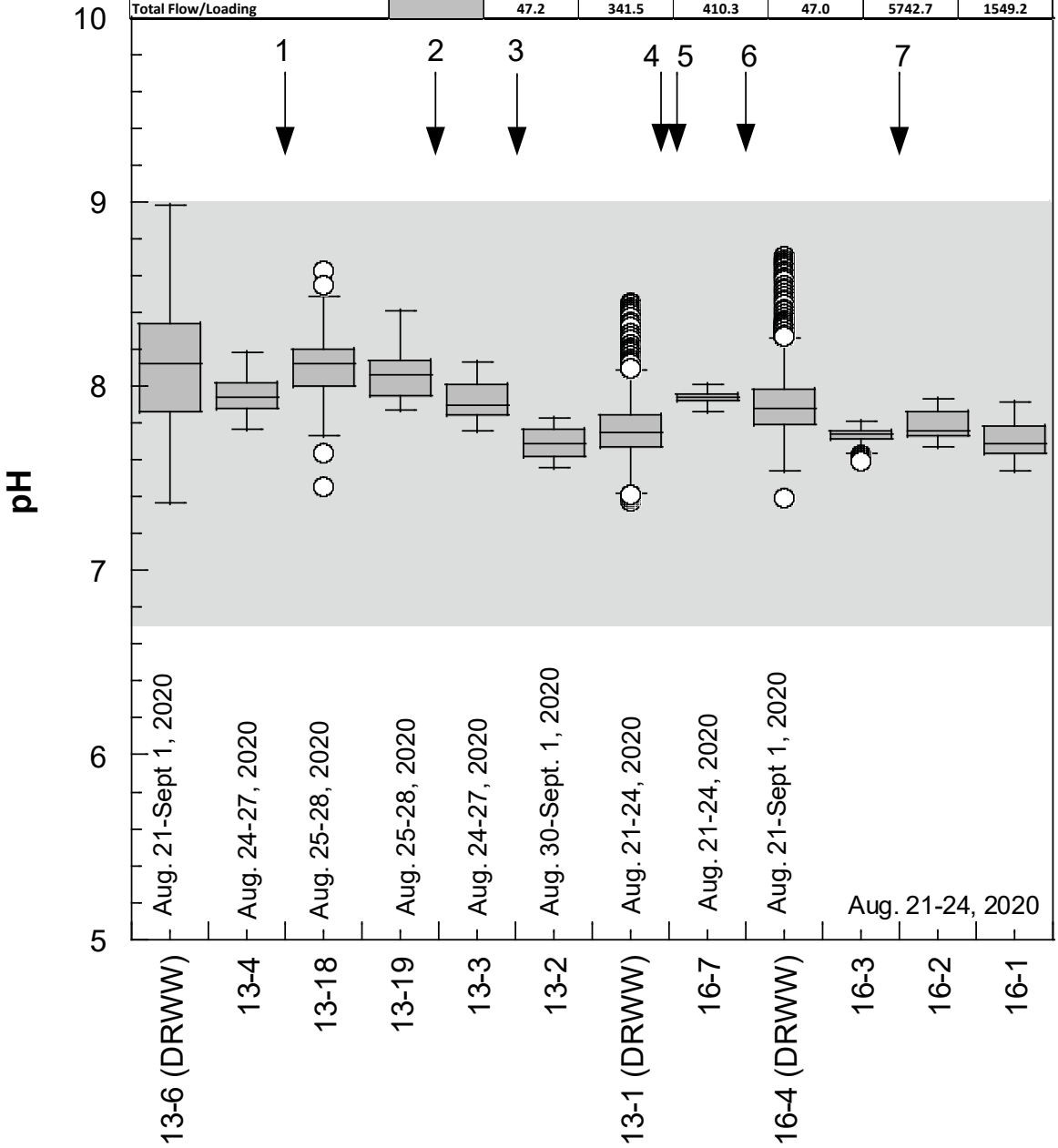


***Figure 7**. pH values measured continuously by Datasondes deployed for 3-4 day periods during August 21-24 and 24-27, 2020 at 12 locations and continuous data at three locations in the 2020. Box-and-whisker plots show the minimum, maximum, 25th and 75th percentiles, median, and outlier (>2 interquartile ranges from the median) values. The shaded area is the range of the Illinois pH standard of 6.5-9.0 S.U. A key to sources (arrows and numbers) is in the table above the figure along with flow and loads from each.*

Facility	RM	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	6.2	9.0	0.7	69.5	0.6
2 - NSWRD-Waukegan WRF	98.1	17.5	84.8	133.3	8.2	2217.7	176.1
3 - NSWRD - Gurnee WRF	95.5	12.0	51.5	90.5	5.3	2018.2	764.6
4 - Village of Libertyville	84.8	2.8	34.7	30.8	21.1	477.4	22.2
5 - Village of Mundelein	84.6	2.4	44.7	14.3	3.7	363.4	18.1
6 - LCDPW-New Centry Town WWTP	82.3	3.1	35.7	36.7	2.5	135.4	15.0
7 - LCDPW-DesPlaines River	76.4	8.6	84.0	95.8	5.6	461.1	552.5
Total Flow/Loading		**47.2**	**341.5**	**410.3**	**47.0**	**5742.7**	**1549.2**

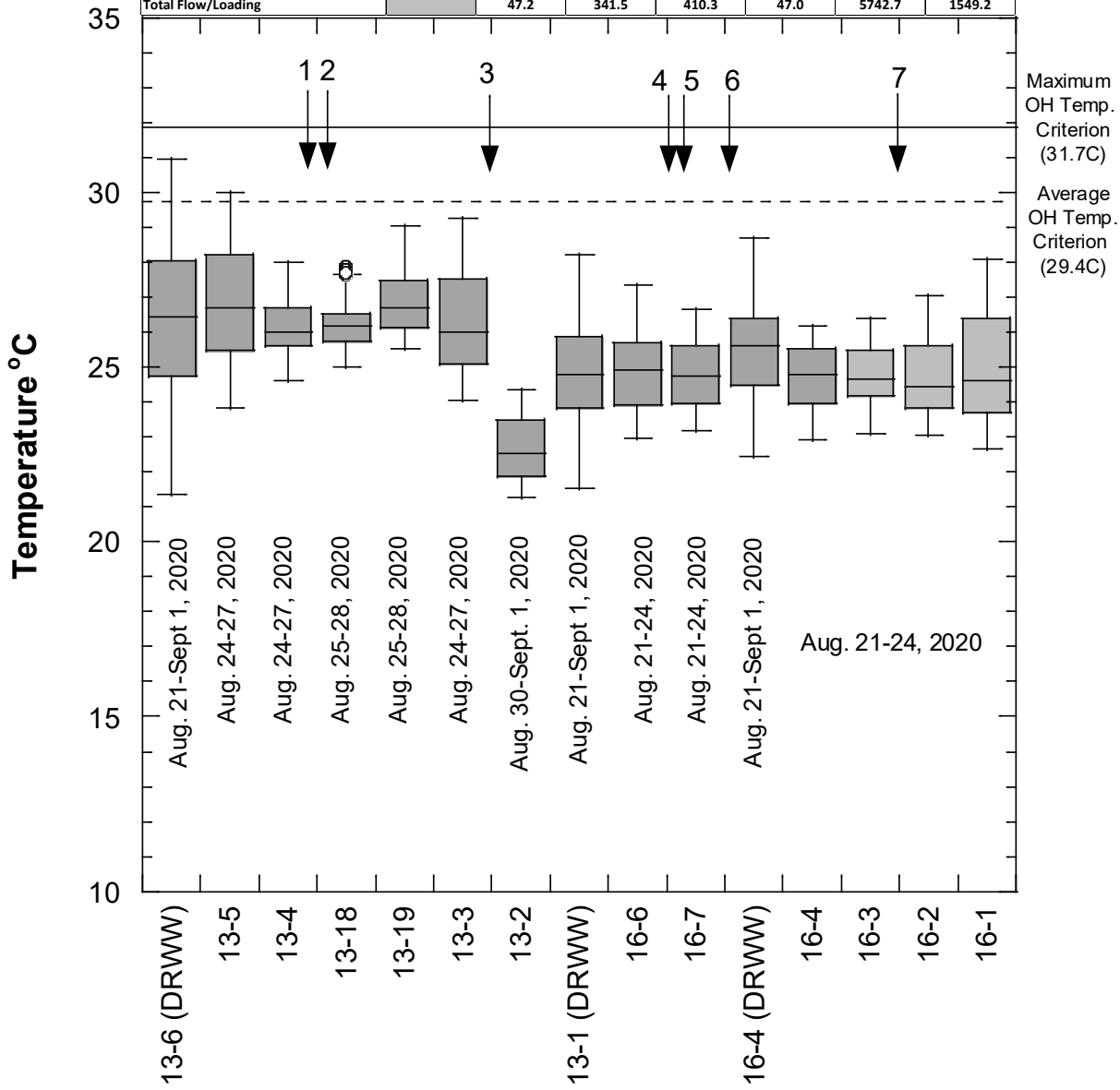


***Figure 8**. Temperatures measured continuously by Datasondes deployed for 3-4 day periods during August 21-24 and 24-27, 2020 at 12 locations and continuous data at three locations in the 2020. Box-and-whisker plots show the minimum, maximum, 25th and 75th percentiles, median, and outlier (>2 interquartile ranges from the median) values. The solid and dashed lines are the Ohio EPA maximum and average summer period criteria for similarly sized rivers and streams in the Ohio River basin. A key to sources (arrows and numbers) is in the table above the figure along with flow and loads from each.*

Facility	RM	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	6.2	9.0	0.7	69.5	0.6
2 - NSWRD-Waukegan WRF	98.1	17.5	84.8	133.3	8.2	2217.7	176.1
3 - NSWRD - Gurnee WRF	95.5	12.0	51.5	90.5	5.3	2018.2	764.6
4 - Village of Libertyville	84.8	2.8	34.7	30.8	21.1	477.4	22.2
5 - Village of Mundelein	84.6	2.4	44.7	14.3	3.7	363.4	18.1
6 - LCDPW-New Centry Town WWTP	82.3	3.1	35.7	36.7	2.5	135.4	15.0
7 - LCDPW-DesPlaines River	76.4	8.6	84.0	95.8	5.6	461.1	552.5
Total Flow/Loading		**47.2**	**341.5**	**410.3**	**47.0**	**5742.7**	**1549.2**

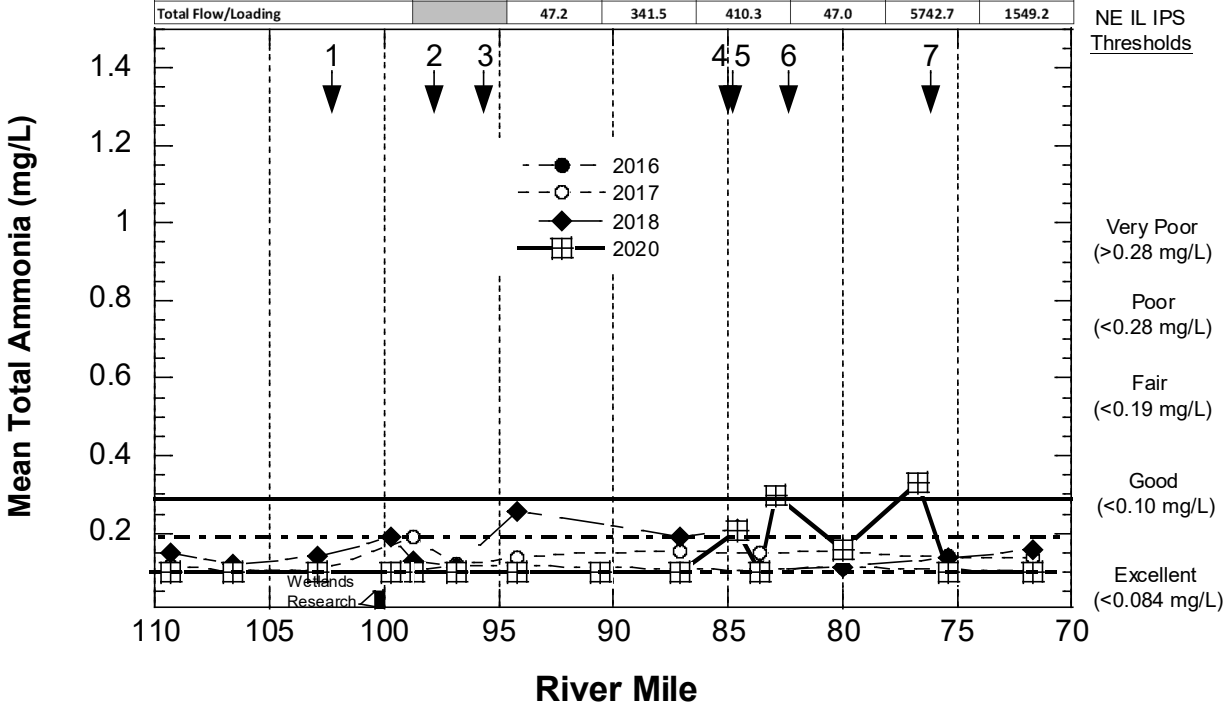


Figure 9. *Concentrations of mean ammonia-N in the upper Des Plaines River mainstem during June-October 2016-2020. Dashed and solid lines represent IPS derived effect thresholds correlated with ranges of biological quality and as listed in Table 7. A key to sources (arrows and numbers) is in the table above the figure along with flow and loads from each.*

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 mean 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 mean of 0.10 mg/L and below the MDL at both sites in North Mill Creek (Table 10).

Total and Dissolved Phosphorus

Median total phosphorus levels based on grab samples in the mainstem ranged from good to fair in the IPS derived thresholds in all years 2016-2020. Median total P values in 2020 reflected a similar pattern to the values observed in 2017 and were about twice the 2018 median values downstream from the Wetland Research riffle (Figure 10). Median total P values in the highly modified section of the upper Des Plaines mainstem were just above the good range

downstream to site 16-7. The median declined into the good range downstream from Libertyville where it remained downstream to site 16-1. The longitudinal pattern that was indicative of wastewater treatment plant inputs in 2016 has not been observed since. Median total phosphorus levels ranged from good to excellent in Mill Creek and North Mill Creek (Table 10). Total phosphorus concentrations were below the excellent threshold at the upstream most site in North Mill Creek (10-7) with both sites in the lower section of North Mill (10-1) Creek and Mill Creek (11-2) below the good threshold. The dissolved form of inorganic phosphorus was also measured as orthophosphate in 2020 which was compared to the total P results (Figure 11). The results are 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 0.10 mg/L as a benchmark 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 large difference was also observed

Facility	RM	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	6.2	9.0	0.7	69.5	0.6
2 - NSWRD-Waukegan WRF	98.1	17.5	84.8	133.3	8.2	2217.7	176.1
3 - NSWRD - Gurnee WRF	95.5	12.0	51.5	90.5	5.3	2018.2	764.6
4 - Village of Libertyville	84.8	2.8	34.7	30.8	21.1	477.4	22.2
5 - Village of Mundelein	84.6	2.4	44.7	14.3	3.7	363.4	18.1
6 - LCDPW-New Centry Town WWTP	82.3	3.1	35.7	36.7	2.5	135.4	15.0
7 - LCDPW-DesPlaines River	76.4	8.6	84.0	95.8	5.6	461.1	552.5
Total Flow/Loading		**47.2**	**341.5**	**410.3**	**47.0**	**5742.7**	**1549.2**

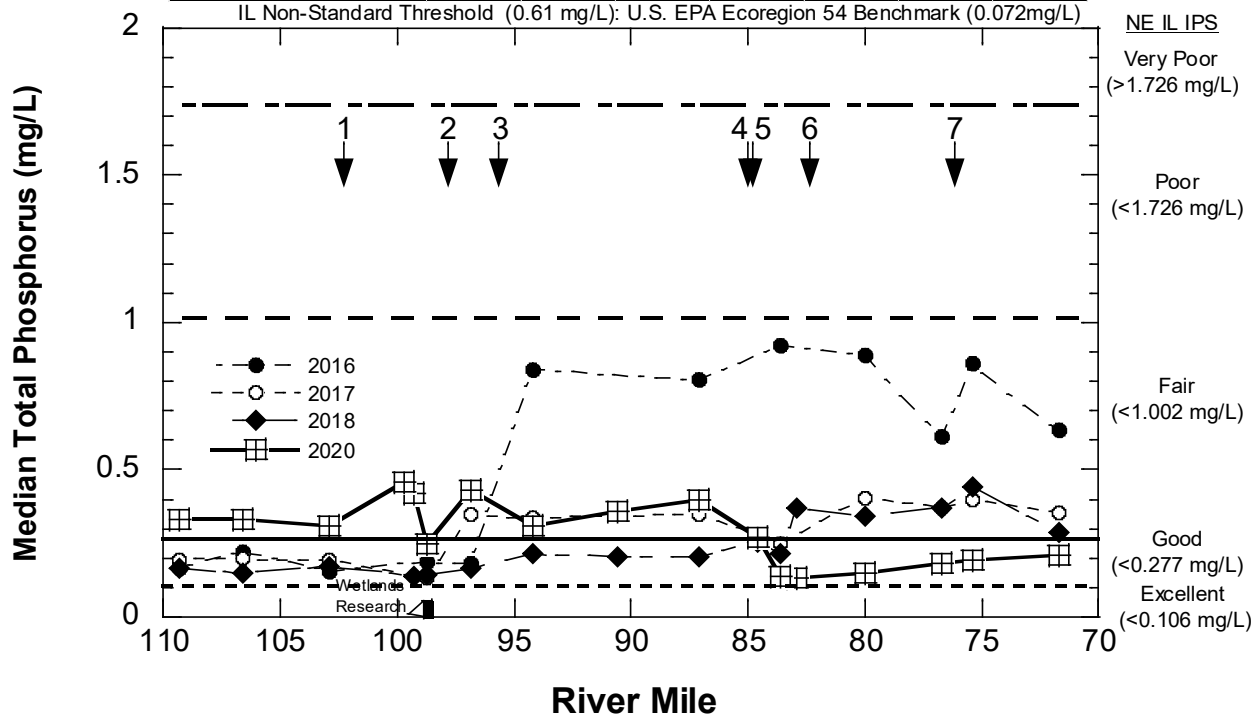


***Figure 10**. Concentrations of median total phosphorus in the upper Des Plaines River mainstem during June-October 2016-2020. Dashed and solid lines represent IPS derived effect thresholds correlated with ranges of biological quality and as listed in Table 7. A key to sources (arrows and numbers) is in the table above the figure along with flow and loads from each.*

in the North Fork Mill Creek at site 10-1 (RM 1.10). 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.

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 (Table 10).

Facility	RM	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	6.2	9.0	0.7	69.5	0.6
2 - NSWRD-Waukegan WRF	98.1	17.5	84.8	133.3	8.2	2217.7	176.1
3 - NSWRD - Gurnee WRF	95.5	12.0	51.5	90.5	5.3	2018.2	764.6
4 - Village of Libertyville	84.8	2.8	34.7	30.8	21.1	477.4	22.2
5 - Village of Mundelein	84.6	2.4	44.7	14.3	3.7	363.4	18.1
6 - LCDPW-New Centry Town WWTP	82.3	3.1	35.7	36.7	2.5	135.4	15.0
7 - LCDPW-DesPlaines River	76.4	8.6	84.0	95.8	5.6	461.1	552.5
Total Flow/Loading		**47.2**	**341.5**	**410.3**	**47.0**	**5742.7**	**1549.2**

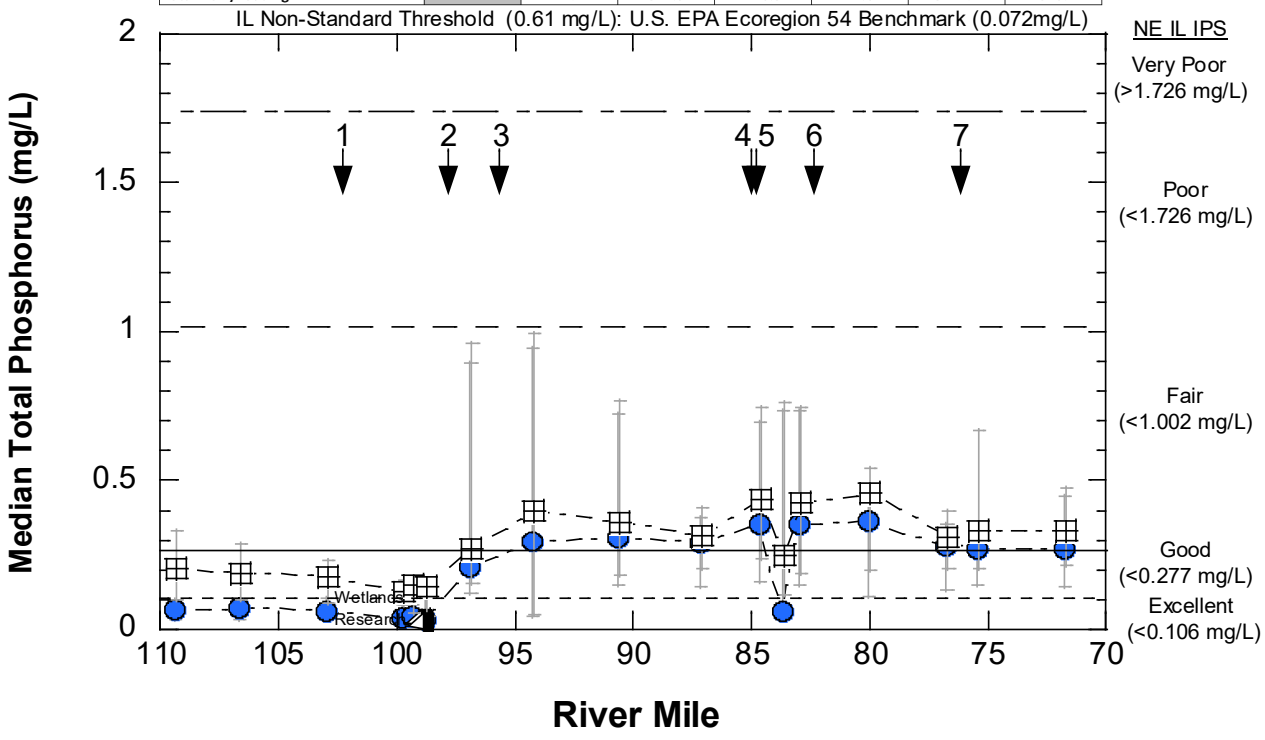


***Figure 11**. Concentrations of median total (square symbols) and dissolved phosphorus (blue symbols) in the upper Des Plaines River mainstem during June-October 2016-2020. Dashed and solid lines represent IPS derived effect thresholds for total P correlated with ranges of biological quality and as listed in Table 7. A key to sources (arrows and numbers) is in the table above the figure along with flow and loads from each.*

Total Nitrate-N (NO_3-N)

Median total nitrate-N concentrations were very low being mostly <1.00 mg/L in the upper mainstem downstream to site 13-2 (RM 96.82) located just downstream from the NSWRD Waukegan WRF where concentrations steadily increased downstream (Figure 12). Values were in the excellent range of the IPS thresholds at and upstream from site 13-2. The median value at site 13-1 (RM 94.2) downstream from the NSWRD Gurnee WRF increased into the fair range. The highest median values in the poor range were observed immediately upstream and downstream from the Libertyville and Mundelein WWTPs at sites 16-6 (RM 87.1) and 16-7 (RM84.6) and downstream from the New Century Town WRF at site 16-4 (RM 80.00). The longitudinal pattern was similar to the 2016 and 2018 results except with consistently higher nitrate-N concentrations in the lower mainstem in 2020. Median total nitrate-N concentrations in the tributary sites were in the excellent 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.

Facility	RM	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	6.2	9.0	0.7	69.5	0.6
2 - NSWRD-Waukegan WRF	98.1	17.5	84.8	133.3	8.2	2217.7	176.1
3 - NSWRD - Gurnee WRF	95.5	12.0	51.5	90.5	5.3	2018.2	764.6
4 - Village of Libertyville	84.8	2.8	34.7	30.8	21.1	477.4	22.2
5 - Village of Mundelein	84.6	2.4	44.7	14.3	3.7	363.4	18.1
6 - LCDPW-New Centry Town WWTP	82.3	3.1	35.7	36.7	2.5	135.4	15.0
7 - LCDPW-DesPlaines River	76.4	8.6	84.0	95.8	5.6	461.1	552.5
Total Flow/Loading		**47.2**	**341.5**	**410.3**	**47.0**	**5742.7**	**1549.2**

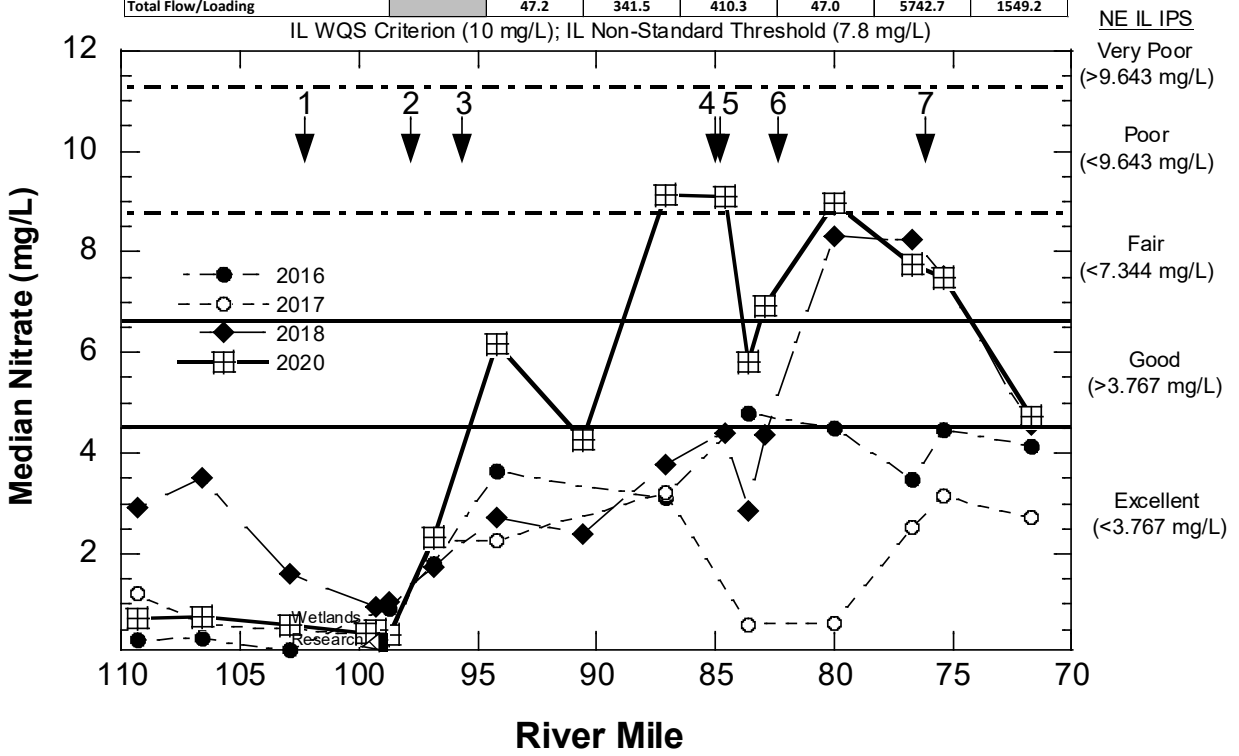


***Figure 12**. Concentrations (mg/L) of median nitrate-N in the upper Des Plaines River mainstem during June-October 2016-2020. Dashed and solid lines represent IPS derived effect thresholds correlated with ranges of biological quality and as listed in Table 10. A key to sources (arrows and numbers) is in the table above the figure along with flow and loads from each.*

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 ranged from mostly fair to poor at three mainstem sites (Figure 13). The poor median TKN value of 1.68, 1.64,and 1.63 mg/L were observed at sites 13-5, 13-4, and 13-3 (Table 10). Overall, median concentrations of TKN were generally lower than in 2018, particularly in the wastewater effluent dominated reach of the mainstem. The longitudinal pattern in the 2020 resembled 2016 and 2017 in that all three years were lower than 2018. With the exception of borderline poor values in the upper modified reach, there was little variation in TKN concentrations. TKN values at the Mill and North Mill Creek sites were elevated in the fair range (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 (Ohio EPA 2015b).

Facility	RM	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	6.2	9.0	0.7	69.5	0.6
2 - NSWRD-Waukegan WRF	98.1	17.5	84.8	133.3	8.2	2217.7	176.1
3 - NSWRD - Gurnee WRF	95.5	12.0	51.5	90.5	5.3	2018.2	764.6
4 - Village of Libertyville	84.8	2.8	34.7	30.8	21.1	477.4	22.2
5 - Village of Mundelein	84.6	2.4	44.7	14.3	3.7	363.4	18.1
6 - LCDPW-New Centry Town WWTP	82.3	3.1	35.7	36.7	2.5	135.4	15.0
7 - LCDPW-DesPlaines River	76.4	8.6	84.0	95.8	5.6	461.1	552.5
Total Flow/Loading		**47.2**	**341.5**	**410.3**	**47.0**	**5742.7**	**1549.2**

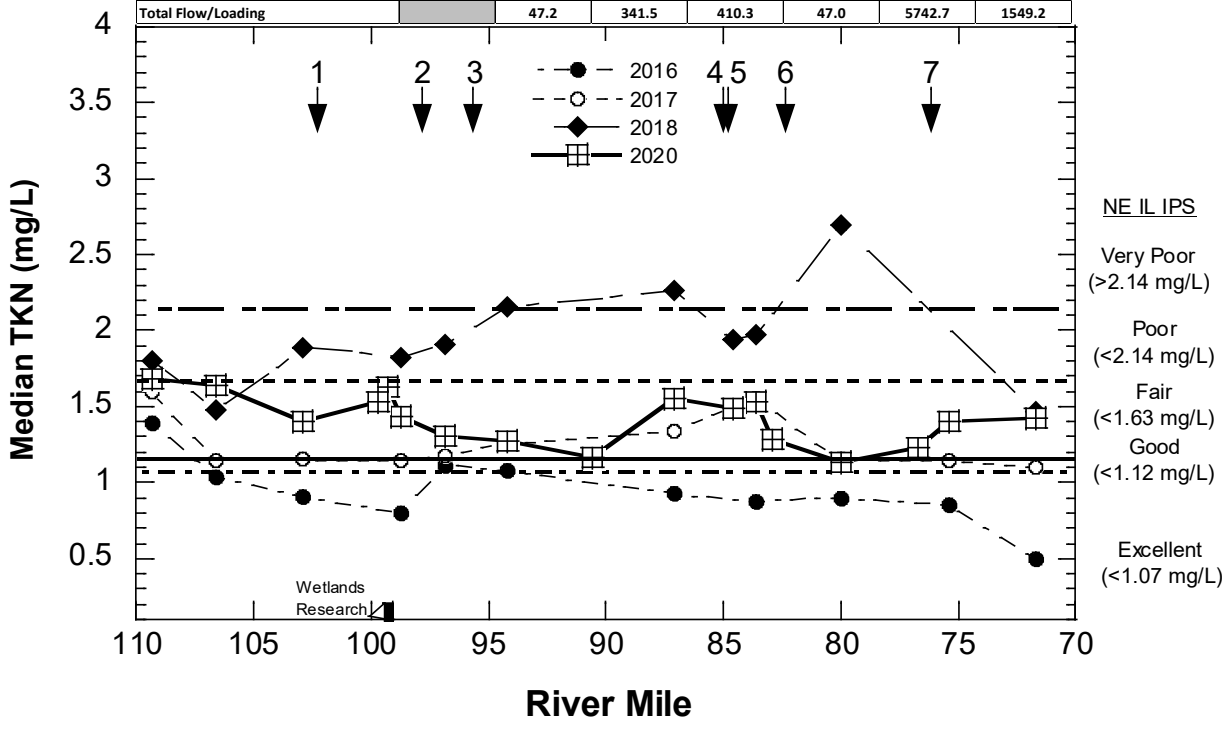


***Figure 13**. Concentrations (mg/L) of median total Kjeldahl nitrogen (TKN) in the upper Des Plaines River mainstem during June-October 2016-20. Dashed and solid lines represent IPS derived effect thresholds correlated with ranges of biological quality and as listed in Table 6. A key to sources (arrows and numbers) is in the table above the figure along with flow and loads from each.*

Total Suspended Solids (TSS)

Total suspended solids (TSS) can reflect either inorganic suspended sediment and/or organic matter in the form of sestonic algae. 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 (Figure 14). The longitudinal pattern suggests that the input of treated wastewater generally coincided with decreased concentrations of TSS in the effluent dominated reach of the Des Plaines River. Very small spikes in TSS occurred in this latter reach, but were negligible compared to the comparatively elevated values in the upstream modified reach. Two exceedances of the poor threshold occurred at site 11-2 (RM 1.71) in Mill Creek and site 10-1 (RM 1.10) in North Mill Creek (Table 10). 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).

Facility	RM	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	6.2	9.0	0.7	69.5	0.6
2 - NSWRD-Waukegan WRF	98.1	17.5	84.8	133.3	8.2	2217.7	176.1
3 - NSWRD - Gurnee WRF	95.5	12.0	51.5	90.5	5.3	2018.2	764.6
4 - Village of Libertyville	84.8	2.8	34.7	30.8	21.1	477.4	22.2
5 - Village of Mundelein	84.6	2.4	44.7	14.3	3.7	363.4	18.1
6 - LCDPW-New Centry Town WWTP	82.3	3.1	35.7	36.7	2.5	135.4	15.0
7 - LCDPW-DesPlaines River	76.4	8.6	84.0	95.8	5.6	461.1	552.5
Total Flow/Loading		**47.2**	**341.5**	**410.3**	**47.0**	**5742.7**	**1549.2**

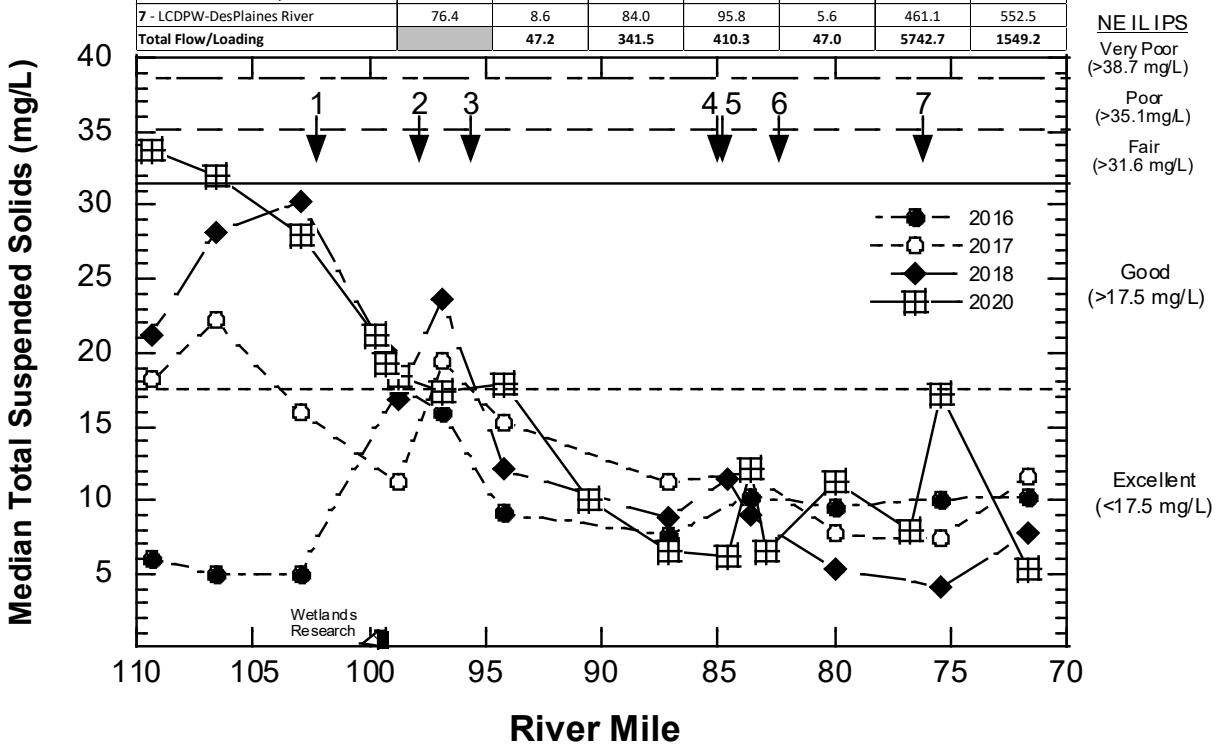


Figure 14. *Concentrations (mg/L) of median total suspended solids (TSS, upper) in the upper Des Plaines River mainstem during June-October 2016-2020. Dashed and solid lines represent IPS derived effect thresholds correlated with ranges of biological quality and as listed in Table 10. A key to sources (arrows and numbers) is in the table above the figure along with flow and loads from each.*

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 combined effects of nutrient enrichment were assessed to better integrate the preceding descriptions of concentrations of each of the key nutrient related parameters and the other non-chemical factors described previously. 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 score, total P, nitrate-N, TKN, the maximum and minimum D.O. (based on Datasondes), the width of the diel D.O. swing, benthic chlorophyll a (as biomass), sestonic chlorophyll a and 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 for 13 sites in the 2020 study area (Table 12). The SNAP score results from summing parameters specific SNAP scores that are weighted higher for five primary indicators – the fIBI, mIBI, diel D.O. swing, benthic chlorophyll a, and sestonic chlorophyll a, less for three secondary parameters – QHEI, total phosphorus, and the maximum D.O., and the least for four tertiary parameters – total nitrate-N, minimum D.O., TSS, and TKN and normalizing the values to a 0-100 scale with nutrient enrichment increasing inversely to the total SNAP score (see bottom of Table 12). 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 where 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 Possible Nutrients narrative is assigned where there a predominance of fair exceedances, but an insufficient number and/or magnitude of poor or very poor exceedances to warrant an Enriched status. Hence it serves as an indication

***Table 12**. Results of applying a modified Stream Nutrient Assessment Procedure to the 2020 Year 4 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, but were included for comparison of the biological attainment status, habitat quality, and nutrient parameters that were available. Sestonic chlorophyll a scores for sites with no sestonic chlorophyll a values were based on adjacent sites.*

Site ID	River Mile	Drainage Area ($mi.^2$)	fIBI	fIBI Score	Miwb	mIBI	mIBI Score	QHEI	QHEI Score	AQLU Attainment Status	Mean TP (mg/L)	Total P Score	Mean Nitrate-N (mg/L)	NO_3-N Score	Contin-uous Max. D.O. (mg/L)	Max. D.O. Score	Contin-uous Min D.O. (mg/L)	Min. D.O. Score	Max. Diel D.O. Swing (mg/L)	Diel Swing Score	Benthic Chloro-phyll a (mg/m^3)	BChl a Score	Mean Sestonic Chloro-phyll a (µg/L)	Sest-onic Chl a Score	Mean TSS (mg/L)	TSS Score	Mean TKN (mg/L)	TKN Score	Total SNAP Score	Overall Enrichment Status
Des Plaines River 2020																														
13-6	109.30	123.67	28.5	8.0	9.06	26.5	5.0	53.0	2.0	NON - Fair	0.270	1.0	0.35	0.0	15.61	4.0	3.52	1.5	10.8	10.0	37.3	1.0	15.5	7.0	73.5	2.0	1.42	1.0	57.5	Highly Enriched
13-5	106.60	137.29	26.0	8.0	8.67	22.8	5.0	42.0	4.0	NON - Fair	0.238	1.0	0.10	0.0	12.78	2.0	5.97	1.0	6.4	5.0	22.4	0.0		7.0	67.2	2.0	1.68	1.5	63.5	Enriched
13-4	102.90	145.55	27.0	8.0	9.01	35.8	3.0	47.0	4.0	NON - Fair	0.176	1.0	0.10	0.0	8.63	0.0	3.66	1.5	4.6	3.0	25.6	0.0	12.7	3.0	28.4	0.5	1.64	1.5	74.5	Possible Nutrients
13-18	99.72	212.87	32.0	3.0	9.84		3.0	70.5	2.0	NON - Fair	0.146	1.0	0.42	0.0	10.29	0.0	2.52	1.5	5.2	5.0	30.3	0.0	18.8	7.0	21.2	0.5	1.40	1.0	76.0	Possible Nutrients
13-19	99.30	213.17	23.0	8.0	8.47	26.9	5.0	47.0	4.0	NON - Fair	0.152	1.0	0.20	0.0	10.69	1.0	4.88	1.0	5.8	5.0	28.2	0.0		7.0	34.9	1.5	1.53	1.0	65.5	Enriched
13-3	98.70	220.29	32.0	3.0	9.91	34.7	3.0	79.5	1.0	NON - Fair	0.143	1.0	0.14	0.0	8.94	0.0	4.25	1.0	3.9	1.0	15.9	0.0	21.8	7.0	27.2	0.5	1.63	1.5	81.0	Possible Nutrients
13-2	96.82	225.36	31.0	3.0	8.50	41.2	3.0	82.5	1.0	NON - Fair	0.469	2.0	5.36	1.0	8.09	0.0	5.16	1.0	2.9	1.0	27.1	0.0	18.2	7.0	23.7	0.0	1.43	1.0	80.0	Possible Nutrients
13-1	94.20	232.03	35.5	3.0	9.33	49.6	1.0	72.3	2.0	NON - Partial	0.695	2.0	7.53	1.5	9.02	0.0	5.13	1.0	3.5	1.0	40.5	1.0	10.4	3.0	18.7	0.5	1.31	1.0	83.0	Not Nutrients
13-16	90.60	253.75	37.0	3.0	8.91	55.8	1.0	68.5	2.0	NON - Partial	0.567	2.0	8.74	1.5											10.0	0.0	1.27			
16-6	87.10	261.41	39.5	3.0	8.79	55.7	1.0	71.0	2.0	NON - Partial	0.348	2.0	9.37	1.5							24.5	0.0	5.8	3.0	9.1	0.0	1.16			
16-7	84.60	266.48	39.5	3.0	8.93	42.9	1.0	79.5	1.0	NON - Partial	0.460	2.0	9.95	2.0	7.37	0.0	5.69	1.0	1.4	0.0	19.6	0.0		3.0	8.4	0.0	1.55	1.0	86.0	Not Nutrients
16-5	83.60	268.07	36.0	3.0	7.96	47.5	1.0	72.0	2.0	NON - Partial	0.359	2.0	5.81	1.0							49.5	1.0	10.8	3.0	8.8	0.0	1.49			
16-8	82.90	268.9	32.5	3.0	8.76	36.4	3.0	62.5	2.0	NON - Fair	0.444	2.0	9.39	1.5											9.5	0.0	1.53			
16-4	80.00	273.21	36.0	3.0	8.74	57.6	1.0	68.5	2.0	NON - Partial	0.458	2.0	9.19	1.5	8.89	0.0	5.10	1.0	2.7	1.0	12.4	0.0	6.2	3.0	13.5	0.0	1.28	1.0	84.5	Not Nutrients
16-3	76.70	314.68	32.0	3.0	8.82	57.4	1.0	58.5	2.0	NON - Partial	0.353	2.0	8.14	1.5	7.00	0.0	5.15	1.0	1.4	0.0	42.1	1.0			10.9	0.0	1.13	1.0	87.5	Not Nutrients
16-2	75.40	323.96	43.0	1.0	8.68	53.2	1.0	57.5	2.0	Full	0.367	2.0	7.49	1.5	8.09	0.0	5.39	1.0	2.6	1.0	34.1	0.0			22.7	0.5	1.23	1.0	89.0	Not Nutrients
16-1	71.70	358.68	33.0	3.0	7.29	39.9	3.0	68.0	2.0	NON - Fair	0.355	2.0	6.02	1.0	8.45	0.0	4.82	1.0	3.1	1.0	33.0	0.0	4.6	1.0	5.4	0.0	1.40	1.0	85.0	Not Nutrients
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	<35	0	<2.5	0	≤17.50	0	<1.07	0	≥94	Not Nutrients
		Good	>41-49	1		≥41.8	1	>75.9	1	FULL	<0.277	1	<5.05	0.5	<12.2	1	>6.0	0.5	<4.0	1	<79	1	<5.1	1	>17.50	0.5	<1.12	0.5	≥82	Not Nutrients
		Fair	30- <41	3		≤41.7	3	<75.9	2	NON-Partial	<1.020	2	<7.34	1	<14.2	2	>4.0	1	<5.0	3	<150	3	<13.8	3	>31.60	1	<1.63	1	≥70	Likely Nutrients
		Poor	>15-29	7		≤29	7	<50.1	5	NON-Fair	<1.726	5	<9.64	1.5	<16.3	5	>2.0	1.5	<6.5	7	<320	7	<28.9	7	>35.15	1.5	<2.14	1.5	≥60	Enriched
		Very Poor	<15	10		<15	10	<25	6	NON-Poor	≥1.726	6	≥9.64	2	≥16.3	6	<2.0	2	≥6.5	10	≥320	10	>28.9	10	>38.69	2	≥2.14	2	<60	Highly Enriched
Source			**IPS**	**IEPA**			**IEPA**		**IPS**		**IPS**			**IPS**						**MBI/SNAP**		**MBI/SNAP/NSAC**		**MBI/NSAC**		**IPS**		**IPS**		**MBI/SNAP**	

where a threat for adverse effects from nutrient enrichment exists. The Not Nutrients narratives rule out nutrient effects as a cause of impairment and it is always assigned to sites that exhibit full attainment of the General use biocriteria. Sites that do not attain the General Use biocriteria are their narratives based on the total SNAP score (Table 12).

The updated SNAP results for 2020 showed that overall nutrient enrichment status was the most serious in the upper mainstem particularly in the flow and habitat modified reach where the Highly Enriched status was assigned to site 13-6 (RM 109.30) and Enriched to site 13-5 (RM 106.60). The only other Enriched status in the 2020 study area was at site 13-19 just downstream from the Wetland Research riffle and impoundment. Possible Nutrients status assignments bracketed the Wetlands Research riffle and included sites 13-4 (RM 102.90) upstream from Mill Creek and site 13-18 I the Wetlands Research impoundment. The only other Possible Nutrient sites occurred immediately downstream at sites 13-3 (RM 98.60) and 13-2 (RM 96.82) which bracket the NSWRD Waukegan WRF effluent. The remaining sites were all rated as Not Nutrients Good due primarily to a lack of fair, poor, or very poor exceedances of the primary SNAP indicators even though total P concentrations increased into the fair range beginning at site 13-2 and extending downstream through the remainder of the study area.

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 2020 results in the mainstem were similar to the 2018 results which was the first application of the SNAP method to the upper Des Plaines River mainstem albeit using a more qualitative approach to determining the enrichment status. The 2020 results confirmed the conclusion of the 2018 assessment that the predominant source of nutrient enrichment is presumably from nonpoint sources in the upper watershed and the effects of which are exacerbated by the combination 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.

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 point source effluents and some are associated with urban runoff specifically. These include parameters measured in the water column and commonly include conductivity, total dissolved solids, and ions such as chlorides and sulfate. Typically our analyses have been geared to urban parameters which includes common heavy metals, but these were not analyzed in the water nor sediment samples in 2020.

Chlorides

In temperate climates such as exist in northern Illinois, dissolved materials in the form of chlorides are an emerging problem because they accumulate in soils and shallow groundwater

and have been documented to reach concentrations that can threaten and impair aquatic life. Of particular concern in urban areas with high road density is the concentration of chlorides from winter road salt applications and point source loadings from water treatment blowdown. Kelly et al. (2012) identified a steadily increasing trend in chloride levels in the Illinois River at Peoria where the median increased from 20 mg/L in 1947 to nearly 100 mg/L in 2004 with high values in the 1940s of <40 mg/L rising to >300 mg/L by 2003. Chlorides do not exhibit a simple runoff and export mode of effect, but rather accumulate in near surface groundwater (Kelly 2008), soils, and land surfaces adjacent to streams. Seasonal studies have shown that elevated summer concentrations are correlated with higher and acute concentrations during late winter and spring periods (Kaushal et al. 2005). Research in New England (Kaushal et al. 2005) and Minnesota (Novotny et al. 2008) show that chlorides can accumulate in watersheds and that there is a strong association between high winter and elevated summer concentrations. Novotny et al. (2008) identified that 78% of the road salt applied in a Minnesota watershed accumulated in a given year and contributed to an increase in summer chloride concentrations.

Median total chloride concentrations (mg/L) in the upper Des Plaines mainstem ranged from good to just exceeding fair values in 2020 (Figure 15). The 2020 median values were the lowest of the four years of data 2016-18 and 2020. Chloride levels were in the good range downstream to site 16-6 (RM 87.1) downstream from which all except one site exceeded the lower fair range. The general pattern was a 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) and effluent dominance. Median chloride values were the highest during the low flow year of 2016 while the 2020 values were lower than in 2017-2018, which had somewhat higher flows. Median chloride values were in the good range at sites 11-2 (RM 1.71) in Mill Creek and 10-1 in North Mill Creek (RM 1.10). The median in North Mill Creek at site 10-7 (RM 11.3) was in the fair range (Table 10).

Conductivity

Dissolved materials are also measured by specific conductance or conductivity which is depicted in Figure 16 for continuous data and Figure 17 and Table 10 for grab sample data. The continuous conductivity data 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. Sites 13-18 (RM 99.72), 16-7 (RM 84.6), and 16-1 (RM 71.7) had poor and very poor values which all occurred downstream from wastewater discharges. The downstream most site (16-1) is located adjacent to the Chicago Executive Airport and downstream from Buffalo Creek. The site downstream from the Libertyville and Mundelein WWTPs (16-7) had conductivity values primarily in the very poor range which potentially reflect those wastewater discharges to the mainstem. The site in the Wetland Research impoundment had consistently poor values with very poor maximum and outlier values. This site is located downstream of the confluence of Mill Creek which receives effluent from the Lake Co. DPW Mill Creek WRF. The three upper sites (13-6, 13-5, and 13-4) in the habitat and flow modified reach had the lowest values in the study area and were the only sites to not be influenced by a major wastewater discharge.

Facility	RM	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	6.2	9.0	0.7	69.5	0.6
2 - NSWRD-Waukegan WRF	98.1	17.5	84.8	133.3	8.2	2217.7	176.1
3 - NSWRD - Gurnee WRF	95.5	12.0	51.5	90.5	5.3	2018.2	764.6
4 - Village of Libertyville	84.8	2.8	34.7	30.8	21.1	477.4	22.2
5 - Village of Mundelein	84.6	2.4	44.7	14.3	3.7	363.4	18.1
6 - LCDPW-New Centry Town WWTP	82.3	3.1	35.7	36.7	2.5	135.4	15.0
7 - LCDPW-DesPlaines River	76.4	8.6	84.0	95.8	5.6	461.1	552.5
Total Flow/Loading		**47.2**	**341.5**	**410.3**	**47.0**	**5742.7**	**1549.2**

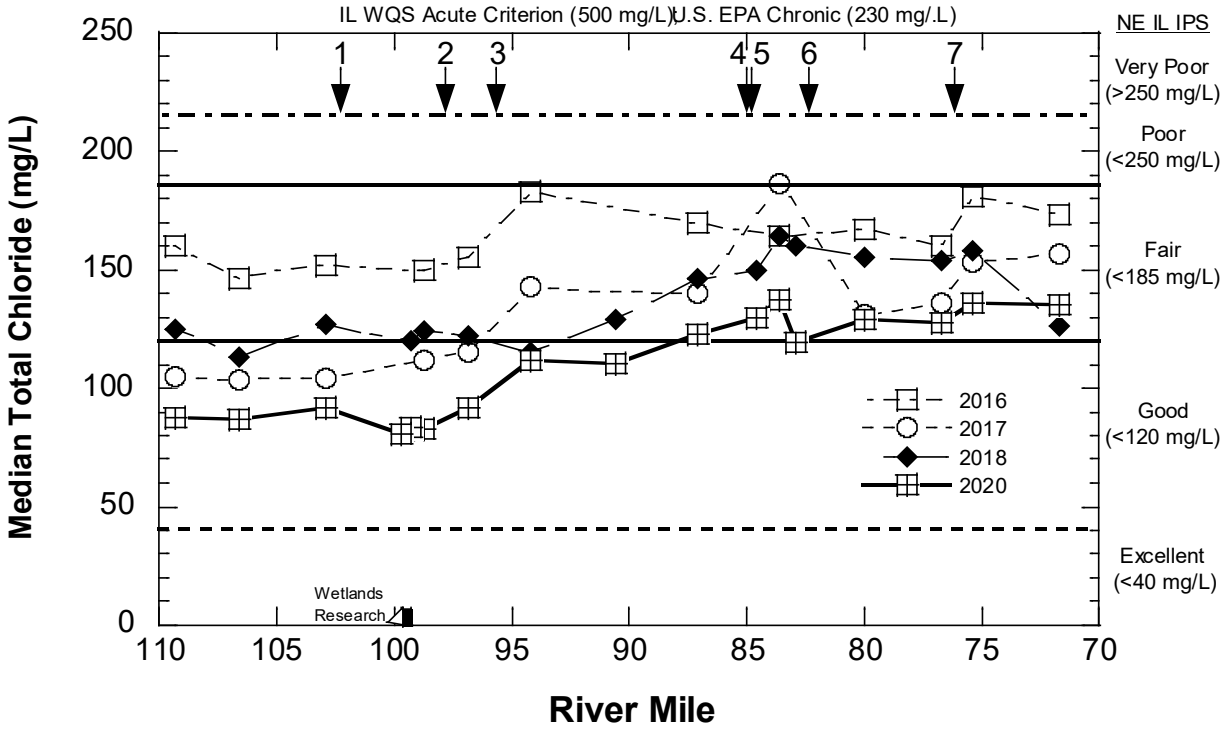


***Figure 15**. Concentrations (mg/L) of median total chloride in the upper Des Plaines River mainstem during June-October 2016-2020. Dashed and solid lines represent IPS derived effect thresholds correlated with ranges of biological quality and as listed in Table 7. A key to sources (arrows and numbers) is in the table above the figure along with flow and loads from each.*

Median conductance values (µS/cm) based on grab samples from the mainstem showed a similar response to that exhibited by chloride (Figure 17), but none of the poor and very poor exceedances revealed by the continuous results (Figure 16). Median conductance values in 2020 ranged from fair to good and followed a pattern of increase from upstream to downstream as the watershed changed from agricultural and suburban land uses to a prevalence of urban land uses, which alone does not suggest inputs by point sources. The longitudinal plot shows the 2020 median conductance values being the lowest compared to the previous years despite flows being lower than in 2017-2018. The highest median values in 2016 occurred under substantially lower flows. An examination of the maximum conductivity grab sample values shows a different result with all maximums exceeding the fair threshold in the upper mainstem and increasing markedly to the poor range beginning at site 13-1 (RM 94.20) and peaking into the very poor range beginning at site 16-7 (RM 84.60) and extending to site

Facility	RM	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	6.2	9.0	0.7	69.5	0.6
2 - NSWRD-Waukegan WRF	98.1	17.5	84.8	133.3	8.2	2217.7	176.1
3 - NSWRD - Gurnee WRF	95.5	12.0	51.5	90.5	5.3	2018.2	764.6
4 - Village of Libertyville	84.8	2.8	34.7	30.8	21.1	477.4	22.2
5 - Village of Mundelein	84.6	2.4	44.7	14.3	3.7	363.4	18.1
6 - LCDPW-New Centry Town WWTP	82.3	3.1	35.7	36.7	2.5	135.4	15.0
7 - LCDPW-DesPlaines River	76.4	8.6	84.0	95.8	5.6	461.1	552.5
Total Flow/Loading		**47.2**	**341.5**	**410.3**	**47.0**	**5742.7**	**1549.2**

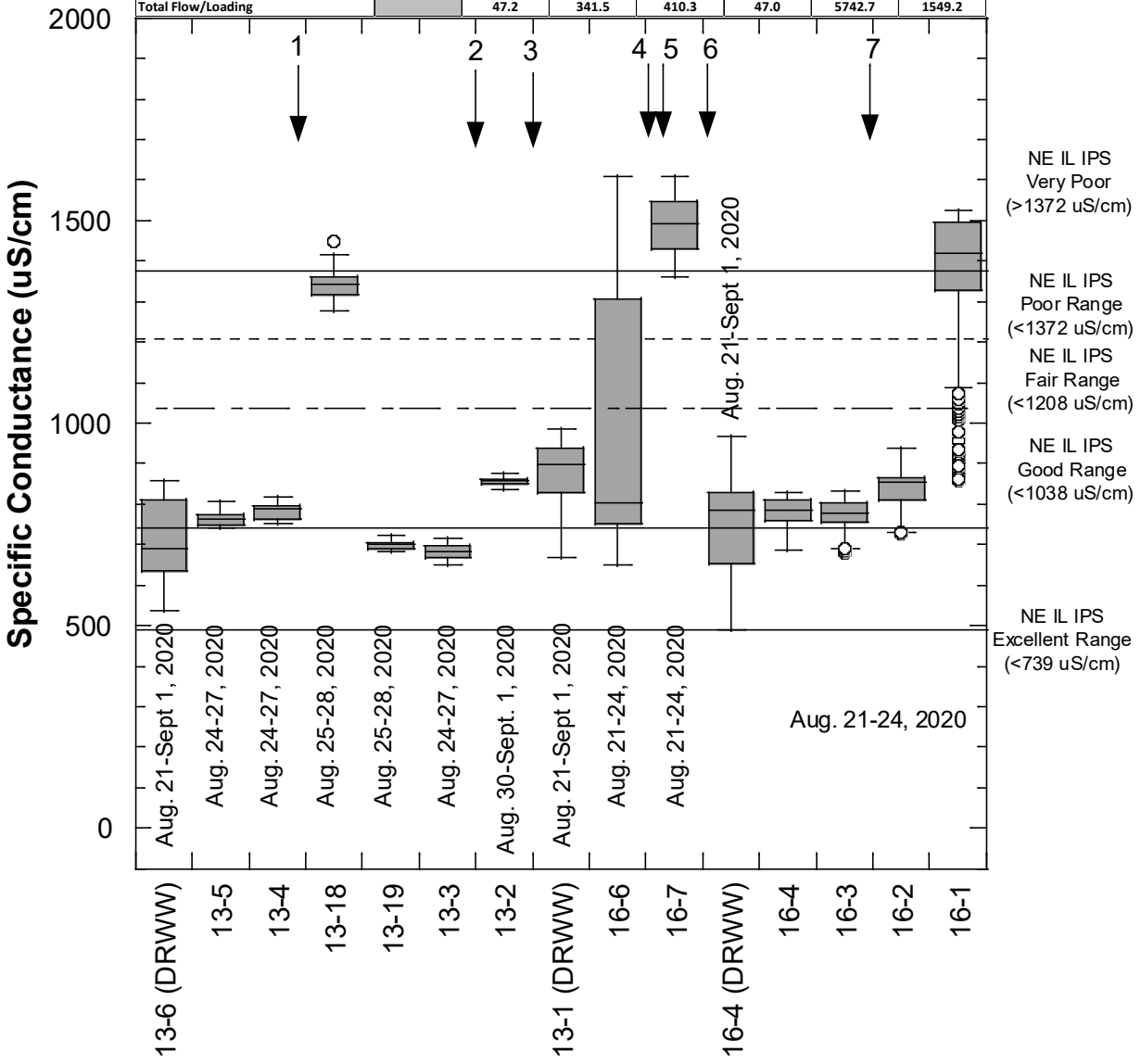


***Figure 16**. Specific conductance (µS/cm) measured continuously by Datasondes deployed for multiday periods during mid-August at 15 locations in the 2020 study area. Box-and-whisker plots show the minimum, maximum, 25th and 75th percentiles, median, and outlier (>2 interquartile ranges from the median) 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.*

Facility	RM	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	6.2	9.0	0.7	69.5	0.6
2 - NSWRD-Waukegan WRF	98.1	17.5	84.8	133.3	8.2	2217.7	176.1
3 - NSWRD - Gurnee WRF	95.5	12.0	51.5	90.5	5.3	2018.2	764.6
4 - Village of Libertyville	84.8	2.8	34.7	30.8	21.1	477.4	22.2
5 - Village of Mundelein	84.6	2.4	44.7	14.3	3.7	363.4	18.1
6 - LCDPW-New Centry Town WWTP	82.3	3.1	35.7	36.7	2.5	135.4	15.0
7 - LCDPW-DesPlaines River	76.4	8.6	84.0	95.8	5.6	461.1	552.5
Total Flow/Loading		**47.2**	**341.5**	**410.3**	**47.0**	**5742.7**	**1549.2**

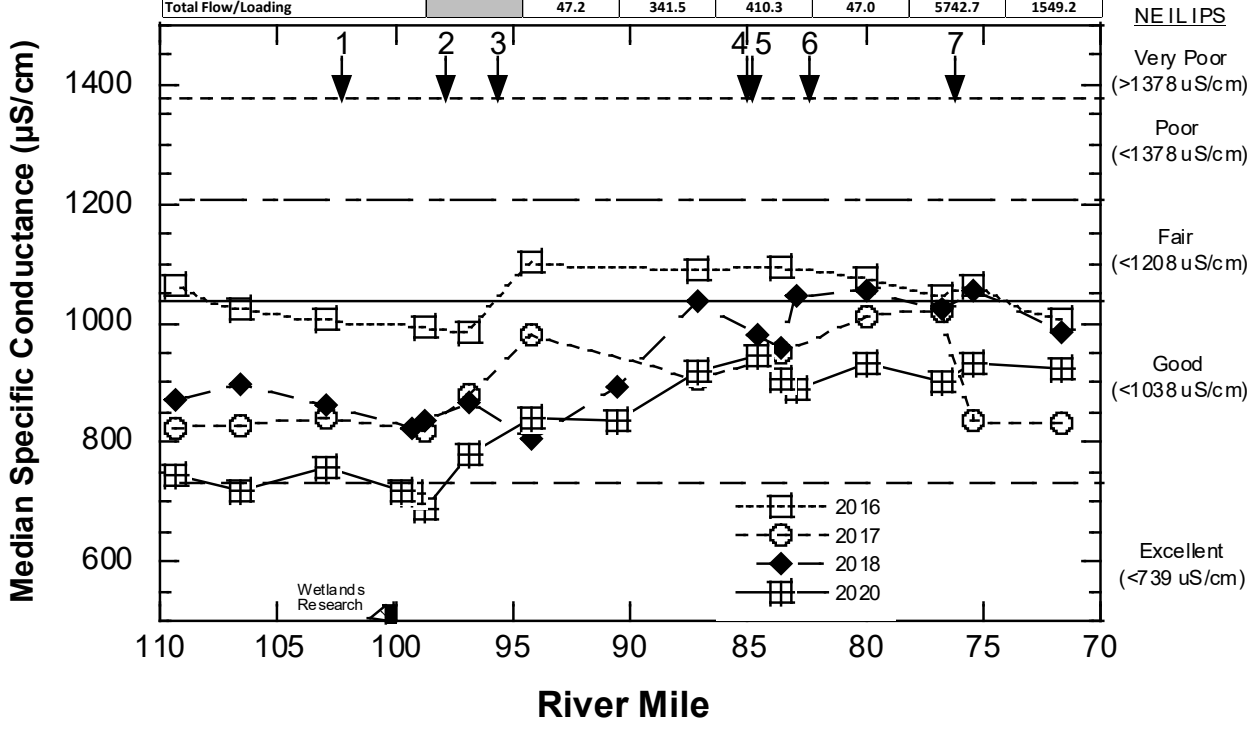


Figure 17*. Median specific conductance in the upper Des Plaines River mainstem during June-October 2016-20. Dashed and solid lines represent IPS derived effect thresholds correlated with ranges of biological quality and as listed in Table 6. A key to sources (arrows and numbers) is in the table above the figure along with flow and loads from each.*

16-2 where the maximum remained in the very poor range. This reach of river is dominated by wastewater effluent where the maximums better reflect the continuous results. The difference between the median and maximum values suggests that the poor and very poor values are intermittently present and most likely due to 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 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 mainstem.

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 riffle habitats and are oftentimes run and glide dominated, but can still offer a diversity of substrates, well developed pool habitats, and well developed instream cover features associated with woody debris and aquatic macrophytes. The Qualitative Habitat Evaluation Index (QHEI) categorically scores basic components of stream 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 2020 Mainstem Habitat Assessment Results

Habitat quality in the upper Des Plaines River ranged from poor (3 sites) to good (2 sites) in 2020 with the majority of the mainstem sites in the upper fair range (Figure 18). The upstream most sites scored in the low fair and poor range (42.0-53.0). This was the result of the extensive hydrological and physical modifications in the upper mainstem and watershed. The poor QHWEI score 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 2020 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, ranging from the mid-fair to upper-good range (Figure 18). There has been an incremental decline in QHEI scores between 2016 and 2018 and 2020 in the lower mainstem beginning at site 16-5 (RM 83.60) from good and marginally good QHEI scores to consistently fair scores.

QHEI Attributes Matrix 2020

High influence modified attributes were present only at the four sites in the upper modified reach which resulted in the poor and low-fair QHEI scores (Table 13). High influence attributes included silt/muck substrates (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). These high influence attributes have increased since 2016 and 2018 (MBI 2017, 2020). Moderate influence modified attributes were numerous with the highest number (8) occurring at sites 16-2 (RM 75.4) and 16-3 (RM 76.7). The highest ratios of modified to good attributes continues to occur at the sites upstream of the Wetland Research riffle (4.50) at 13-6 and 13-5. The ratio of modified:good attributes was fair (>2.00) at two of the upper modified reach sites and poor (>4.00) at the two upstream most sites. These sites also had a high number of moderate influence modified attributes ranging from 5-7 the latter a poor result. Modified: good ratios >2.00 generally indicate an extent of habitat modification and predominance of modified attributes that would

Facility	RM	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	6.2	9.0	0.7	69.5	0.6
2 - NSWRD-Waukegan WRF	98.1	17.5	84.8	133.3	8.2	2217.7	176.1
3 - NSWRD - Gurnee WRF	95.5	12.0	51.5	90.5	5.3	2018.2	764.6
4 - Village of Libertyville	84.8	2.8	34.7	30.8	21.1	477.4	22.2
5 - Village of Mundelein	84.6	2.4	44.7	14.3	3.7	363.4	18.1
6 - LCDPW-New Centry Town WWTP	82.3	3.1	35.7	36.7	2.5	135.4	15.0
7 - LCDPW-DesPlaines River	76.4	8.6	84.0	95.8	5.6	461.1	552.5
Total Flow/Loading		**47.2**	**341.5**	**410.3**	**47.0**	**5742.7**	**1549.2**

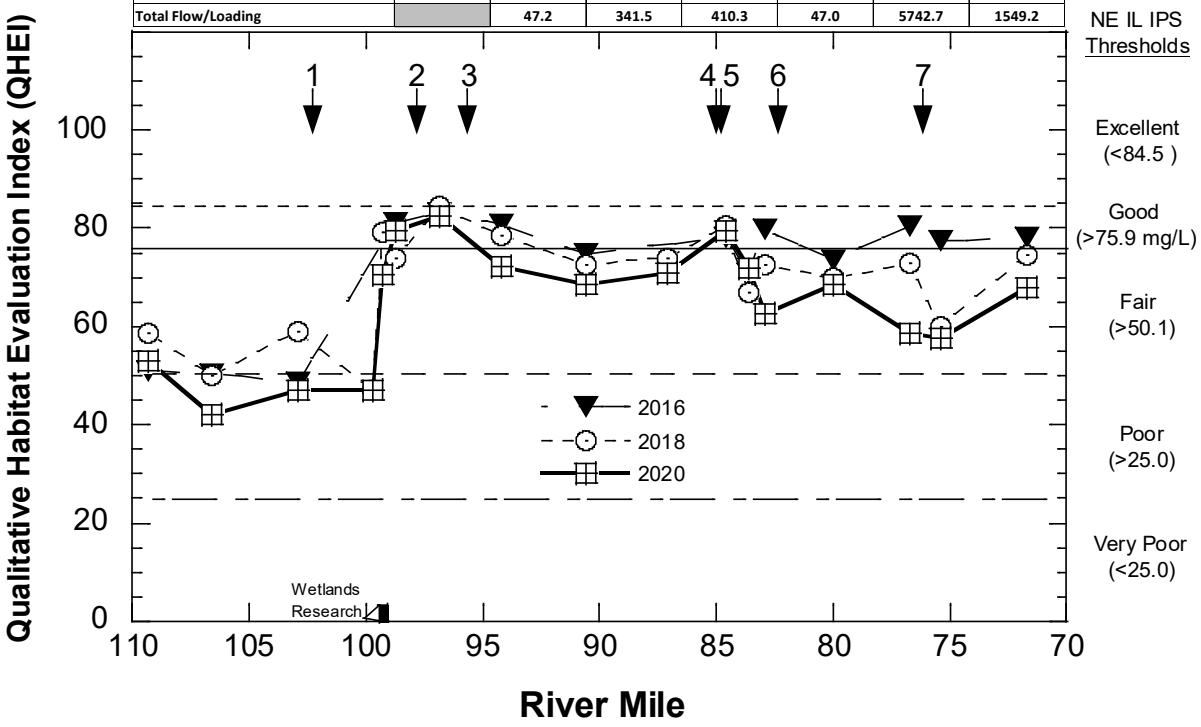


Figure 18*. Qualitative Habitat Evaluation Index (QHEI) scores in the upper Des Plaines River mainstem in 2016, 2018, and 2020. The IPS narrative ranges of QHEI scores from excellent to very poor are indicated by solid and dashed lines. A key to sources (arrows and numbers) is in the table above the figure along with flows and loads from each.*

require direct mitigation to reverse. It also means that meeting the General Use biocriteria would likely be precluded by habitat regardless of water quality conditions raising concerns about use attainability (Rankin 1995). The sites with modified:good ratios <2.00 is the result of having 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) and 16-7 (RM 84.6), reflecting the low gradient of the upper Des Plaines River mainstem. Sand substrates were observed at all sites excluding the three (3) most upstream sites that had muck/silt substrates. Moderate to high silt cover, moderate-extensive embeddedness, moderate-extensive riffle embeddedness, and fair-poor development were also the most commonly moderate influence modified attributes observed during the 2020 survey. An increase in the number of good habitat attributes offset the number of modified attributes downstream from the Wetland Research riffle with modified:good ratios <2.00 at all sites except sites 16-2 (RM 76.70) and 16-3 (RM 75.40).

***Table 13**. QHEI matrix of good and modified habitat attributes for sites in the upper Des Plaines River Year 4 study area during 2020. 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
Upper Desplaines River 2020																																			
13-6	109.30	53.0						■			■		**2**		●		●		**2**	●	●			●	●			●	●	●		**7**	1.00	4.50
13-5	106.60	42.0					■				■		**2**	●	●		●		**3**		●			●	●			●	●		●	**6**	1.50	4.50
13-4	102.90	47.0					■	■			■		**3**	●	●		●		**2**		●			●				●	●		●	**5**	0.67	2.33
13-18	99.72	47.0					■	■			■		**3**		●				**1**		●	●		●	●			●	●		●	**7**	0.33	2.67
13-19	99.30	70.5	■	■		■	■	■			■		**6**						**0**		●	●		●				●	●	●		**6**	0.00	1.00
13-3	98.70	79.5	■	■		■	■	■			■	■	**7**						**0**		●	●						●	●			**4**	0.00	0.57
13-2	96.82	82.5	■	■		■	■	■	■	■	■	■	**9**						**0**			●										**1**	0.00	0.11
13-1	94.20	72.3	■	■		■	■	■		■	■	■	**8**						**0**			●						●				**2**	0.00	0.25
13-16	90.60	68.5		■		■	■	■		■	■		**6**						**0**	●	●	●						●		●		**5**	0.00	0.83
16-6	87.10	71.0		■		■		■		■	■		**5**						**0**	●		●			●			●		●		**5**	0.00	1.00
16-7	84.60	79.5	■	■		■	■	■	■	■	■	■	**9**						**0**			●						●				**2**	0.00	0.22
16-5	83.60	72.0		■		■		■		■	■	■	**6**						**0**	●		●		●	●			●		●		**6**	0.00	1.00
16-8	82.90	62.5		■			■	■			■		**4**						**0**	●	●	●		●				●	●	●		**7**	0.00	1.75
16-4	80.00	68.5		■		■		■		■	■		**5**						**0**	●		●		●	●			●		●		**6**	0.00	1.20
16-3	76.70	58.5		■				■			■		**3**						**0**	●	●	●		●	●			●	●	●		**8**	0.00	2.67
16-2	75.40	57.5		■		■		■			■		**4**						**0**	●	●	●		●	●			●	●	●		**8**	0.00	2.00
16-1	71.70	68.0		■			■	■		■	■		**5**						**0**	●		●		●				●		●		**5**	0.00	1.00
Mill Creek 2020																																			
11-2	1.71	75.5	■	■		■	■	■	■		■	■	**8**						**0**		●							●	●			**3**	0.00	0.38
North Mill Creek 2020																																			
10-3	11.30	42.5						■			■		**2**	●	●	●			**3**		●			●				●	●		I	**5**	1.50	4.00
10-1	1.10	63.0		■			■	■			■		**4**						**0**	●	●			●				●	●	●		**6**	0.00	1.50
Excellent		≥84.5											9						0													>0	0.00	0.50
Good		75.9-84.0											8						0													0	0.50	1.00
Fair		50.1-75.0											5						1													2	1.00	2.00
Poor		25-50											2						3													5	2.00	4.00
Very Poor		<25											0						5													>5	>2.00	>6.00

Mill Creek and North Mill Creek 2020 Habitat Assessment Results

The three tributary sites that were a part of the 2020 study area were likewise assessed for habitat quality with the QHEI. The single site in Mill Creek (11-2) and downstream site in North Mill Creek (10-1) had fair habitat scores of 75.5 and 63.0, respectively (Table 11). The upstream site in North Mill Creek (10-3) had poor habitat quality with a QHEI score of 42.5. High influence modified attributes were observed only at site 10-3 consisting of no recovery from channelization, silt-muck substrates, and no sinuosity. Moderate influence modified attributes included moderate-high silt cover and moderate-extensive embeddedness at all three tributary sites. Modified:good attribute ratios were 0.38 (good) and 1.50 (good) in Mill Creek (site 11-2) and the downstream North Mill Creek (site 10-1), respectively. The modified:good ratio was 4.00 at the upstream North Mill Creek site (10-3). Habitat in Mill Creek at site 11-2 has remained fairly stable with QHEI scores of 79.0 in 2016 (MBI 2017) and 80.0 in 2017 (MBI 2018). In North Mill Creek QHEI scores at the downstream site (10-1) varied from 70.0 in 2016, 59.0 in 2017, and 63.0 in 2020 with somewhat elevated modified:good ratios in 2017 (2.00) and 2020 (1.50). The upstream site in North Mill Creek declined markedly in 2020 from QHEI scores of 52.0 in 2016 and 59.0 in 2017. The modified:good ratios were 1.20 in 2016, 1.67 in 2017, and elevated to 4.00 in 2020 and indication of declining habitat quality over time.

Biological Assemblages – Macroinvertebrates

There were 130 unique macroinvertebrate taxa collected in the upper Des Plaines River mainstem in 2020 (Appendix B). This is an increase from 103 (2016) and 104 (2018) taxa collected in previous 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), *Corbicula fluminea* (Asiatic clams), *Gammarus sp.*(a Crustacean), and *Baetis intercalaris* (a Mayfly taxon; Table 14).

Des Plaines River 2020 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 (Figure 17). Seven (7) of the 16 mainstem sites met the mIBI General Use biocriterion of 41.8, four (4) fewer than in 2018 . The six (6) upstream most sites were all impaired - three (3) sites upstream from the Wetland Research riffle and the three (3) sites downstream. The site located in the Wetland Research pool was not sampled by the macroinvertebrate crew due to the inability to collect a multihabitat sample due to non-wadeable depths in the impoundment. The mIBI increased steadily downstream from the Wetlands Research riffle to site 13-2 (RM 96.82) where the mIBI of 41.2 just missed General Use and site 13-1 (RM 94.60) downstream from the NSWRD Waukegan WRF where the General Use mIBI was attained. Only two MIBI values feel below the General Use at site 16-8 (RM 82.9) downstream from the Libertyville and Mundelein WWTPs and site 16-1 (RM 71.70) downstream from Buffalo Creek. An increase in the total number of taxa, Mayfly taxa, intolerant taxa, and percent EPT taxa. No macroinvertebrate samples were collected at 10-7 (RM 11.3), the most upstream site in North Mill Creek.

***Table 14**. The fifteen (15) most abundant macroinvertebrate taxa collected in the upper Des Plaines River mainstem including sites collected, numbers collected, taxa group, functional group, and taxa tolerance assignments.*

Taxa Code	Taxa Name	Sites Collected	Number Collected	Taxa Group	IL Functional Group	IL Tolerance Score
3600	*Oligochaeta*	18	670	N	CG	10
16700	*Tricorythodes sp*	13	493	MA	CG	5
97601	*Corbicula fluminea*	13	485	N	CF	4
06800	*Gammarus sp*	17	410	N	CG*	3
11130	*Baetis intercalaris*	14	403	MA	CG	4
83300	*Glyptotendipes (G.) sp*	11	324	N	CF	10
52200	*Cheumatopsyche sp*	16	254	CA	CF	6
69400	*Stenelmis sp*	17	197	CO	SC	7
18100	*Anthopotamus sp*	9	123	MA	CG	4
06201	*Hyalella azteca*	9	120	N	CG	4
82730	*Chironomus (C.) decorus group*	6	118	N	CG	10
80420	*Cricotopus (C.) bicinctus*	13	107	N	SH	8
01801	*Turbellaria*	11	102	PR	PR	6
85625	*Rheotanytarsus sp*	13	99	T	CF	6
98200	*Pisidium sp*	13	98	N	CF	5

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

Table 15 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 for all except two results occurred upstream from site 13-2 (RM 96.82) which is just upstream from the NSWRD Waukegan WRF discharge. None of the aforementioned sites met the General Use mIBI biocriterion. Only a single very poor result occurred, this for %organic enrichment taxa at site 13-19 (RM 99.3) downstream from the Wetland Research riffle. Poor results for the same response indicator occurred in the upper mainstem at sites 13-6, 13-5, and 13-3. Other poor results at site 13-2 and upstream included %EPT at five of six sites, %tolerant taxa at three of six sites, and a low number of intolerant taxa at a single site. The good numbers of taxa and the absence of any toxic responses suggest an impairment due to organic enrichment that is exacerbated by the modified habitat and hydrologic regime in the upper mainstem. Only one (1) site exceeded the fair threshold (13-1) for %toxic tolerant taxa, while all other sites ranged from good to excellent. The total number of taxa collected at each site ranged from 22-32 taxa. The number of EPT taxa ranged 2-10 with all except 13-6 and 13-5 reflecting good conditions. The % EPT taxa ranged from 2.8-67.3% with six (6) sites of good quality, four (4) sites of fair quality, and five (5) sites of poor quality. The number of intolerant taxa ranged from 1-6, with half the sites not exceeding the good threshold, three (3) sites in the poor range, and the remainder (5) reflecting fair conditions. Of

Facility	RM	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	6.2	9.0	0.7	69.5	0.6
2 - NSWRD-Waukegan WRF	98.1	17.5	84.8	133.3	8.2	2217.7	176.1
3 - NSWRD - Gurnee WRF	95.5	12.0	51.5	90.5	5.3	2018.2	764.6
4 - Village of Libertyville	84.8	2.8	34.7	30.8	21.1	477.4	22.2
5 - Village of Mundelein	84.6	2.4	44.7	14.3	3.7	363.4	18.1
6 - LCDPW-New Centry Town WWTP	82.3	3.1	35.7	36.7	2.5	135.4	15.0
7 - LCDPW-DesPlaines River	76.4	8.6	84.0	95.8	5.6	461.1	552.5
Total Flow/Loading		**47.2**	**341.5**	**410.3**	**47.0**	**5742.7**	**1549.2**

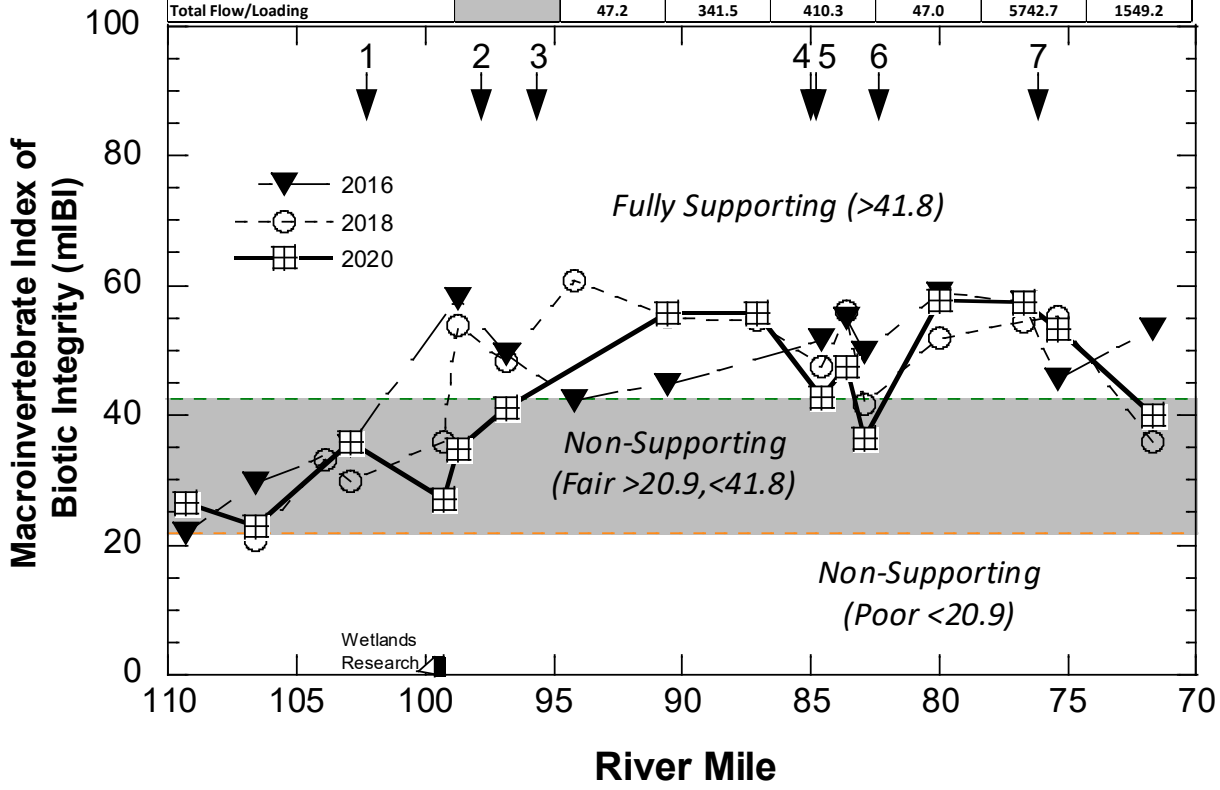


Figure 19. *Illinois macroinvertebrate IBI scores in the upper Des Plaines River mainstem in 2016, 2018, and 2020. IEPA thresholds for determining full support, non-support-fair, and non-support-poor of the General Use for aquatic life are indicated by dashed lines and grey shading. A key to sources (arrows and numbers) is in the table above the figure along with flows and loads from each.*

the eight (8) sites that did not meet the General Use biocriterion, five (5) possessed poor values of %EPT, and three (3) possessed poor values of %EPT and %tolerant taxa.

Mill Creek and North Mill Creek 2020 Macroinvertebrate Assemblage Results

Macroinvertebrates were sampled at a single site each in Mill Creek (11-2) and North Mill Creek (10-1) in 2020. Both had mIBI scores that met the General Use biocriterion (Table 15). The 2020 mIBI of 53.3 in Mill Creek at site 11-2 was a significant improvement from the 2016 results that had a fair mIBI of 25.3 (no sample was collected at 11-2 in 2019). The North Mill Creek mIBI of 55.8 at site 10-1 was unchanged from the mIBI of 55.3 in 2016 and only slightly lower than the mIBI of 55.8 in 2019. No poor or very poor responses were observed with mostly good responses. Mill Creek had two fair responses and North Mill Creek had three (Table 15).

***Table 15**. Selected macroinvertebrate assemblage attributes for sites sampled in the Upper Des Plaines Year 4 study area in 2020. 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	26.5	22	2	27.0	2	2.8	7.4	0.0	48.4
13-5	106.60	137.3	22.8	23	1	39.8	2	5.1	8.3	2.2	47.6
13-4	102.90	145.6	35.8	29	3	18.3	6	11.5	6.6	1.0	31.2
13-19	99.30	212.9	26.9	24	2	39.3	5	3.9	8.7	1.4	75.0
13-3	98.70	220.3	34.7	28	2	31.1	6	6.7	7.4	0.7	48.8
13-2	96.82	225.4	41.2	32	2	12.6	5	6.6	5.2	4.2	18.0
13-1	94.20	232.0	49.6	27	4	6.8	5	31.4	5.6	10.6	6.4
13-16	90.60	253.8	55.8	29	4	9.1	7	48.6	5.1	2.8	8.9
16-6	87.10	261.4	55.7	31	6	19.1	10	19.6	6.3	0.6	25.0
16-7	84.60	266.5	42.9	27	1	4.6	8	38.0	5.5	4.7	15.8
16-5	83.60	268.1	47.5	27	5	12.6	5	27.5	5.6	1.9	13.4
16-8	82.90	268.9	36.4	28	2	15.0	6	10.3	5.8	2.0	15.8
16-4	80.00	273.2	57.6	30	4	5.4	10	67.3	5.1	0.3	6.3
16-3	76.70	314.7	57.4	32	4	9.2	8	40.8	5.3	0.6	20.2
16-2	75.40	324.0	53.2	23	1	2.9	6	58.9	5.1	0.3	8.1
16-1	71.70	358.7	39.9	24	4	10.0	6	9.2	4.9	0.7	3.3
Mill Creek											
11-2	1.71	62.3	53.3	32	4	8.1	6	40.4	5.9	0.0	12.4
North Mill Creek											
10-1	1.10	31.9	55.8	33	5	23.4	7	27.4	6.6	0.7	27.0
Exceptional			>65.0	≥ 36	> 5	≤10	≥6	> 49	≤ 5.2	0	<5
Good			≥41.8	< 36	≤ 5	≤ 15	≥3	>24.5 - 49	≥5.2	<5	<15
Fair			<41.8	≤27	≤ 3	≤ 20	2	> 10 -24.5	≥6.0	<20	≥15
Poor			≤20.9	≤ 22	≤2	< 28	1	5 - 10	≥7.6	≥35	≥35
Very Poor				≤ 16	0	≥ 28	0	< 5	≥9.0	>60	>60

Biological Assemblages – Fish

Forty-six (46) native and three (3) non-native fish species were collected along with four (4) hybrids in the Year 4 study area in 2020. The fish assemblage continued to be predominated by tolerant, moderately tolerant, and intermediate fish species (Table 16). Bluegill *(Lepomis macrochirus),* Bluntnose Minnow *(Pimephales notatus),* Spotfin Shiner *(Cyprinella spiloptera),* and Largemouth Bass *(Micropterus salmoides)* were the most numerous species collected in 2020. Common Carp *(Cyprinus carpio),* White Sucker *(Catostomus commersoni),* Northern Pike *(Esox lucius),* Channel Catfish *(Ictalurus punctatus),* and Largemouth Bass *(Micropterus salmoides)* predominated in terms of biomass. Of the top 15 species, five (5) are highly tolerant, two (2) moderately tolerant, and only one, Hornyhead Chub *(Nocomis biguttatus)* is intolerant. Many of these species are also common in low gradient and wetland influenced rivers while others are ubiquitous to rivers and streams throughout the region. The 2020 rankings are not substantially different than in 2016 or 2018 with the exception if certain species rankings.

***Table 16**. 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).*

Species	Tolerance		Number Collected	% By Number	Species	Tolerance		Weight Collected	% By Weight
	IL	OH				IL	OH		
Species Ranks by Numbers					**Species Ranks by Weight**				
Bluegill		P	2878	22.07	Common Carp	T	T	12.26	26.67
Bluntnose Minnow	T	T	2418	18.54	White Sucker	T	T	6.61	14.37
Spotfin Shiner			1221	9.36	Northern Pike			3.66	7.96
Largemouth Bass			955	7.32	Channel Catfish			3.63	7.90
Pumpkinseed		P	640	4.91	Largemouth Bass			3.35	7.29
Hornyhead Chub	I	I	596	4.57	Spotted Sucker			3.12	6.78
Green Sunfish	T	T	560	4.29	Bluegill		P	3.03	6.60
Spottail Shiner			454	3.48	Bowfin			1.62	3.53
White Sucker	T	T	444	3.40	Common Carp x Goldfish	T	T	1.00	2.18
Gizzard Shad			408	3.13	Yellow Bullhead	T	T	0.78	1.69
Golden Shiner	T	T	305	2.34	Hornyhead Chub	I	I	0.69	1.51
Common Carp	T	T	279	2.14	Black Crappie			0.69	1.49
Blackstripe Topminnow			221	1.69	Pumpkinseed		P	0.67	1.45
Blackside Darter			159	1.22	Smallmouth Bass		M	0.59	1.29
Spotted Sucker			155	1.19	Gizzard Shad			0.59	1.28

I - Intolerant; M - Moderately Intolerant; P - Moderately Tolerant; T - Highly Tolerant

Stonecat Madtom *(Noturus flavus),* Hornyhead Chub, and Brook Silverside *(Labidesthes sicculus)* all increased in 2020. However, certain species that were collected in 2018 were either reduced in numbers or not present in the collections in 2020. Several species including Rock Bass *(Ambloplites rupestris),* Carmine Shiner *(Notropis percobromus),* Pirate Perch (Aphredoderus sayanus), Logperch *(Percina caprodes),* Blackside Darter *(Percina maculata)*, and Sand Shiner *(Notropis stramineus)* were reduced by more than 50-90% compared to 2018. Blackchin Shiner (Notropis heterodon) numbered 48 in 2018, but were absent in 2020 in addition to Western Banded Killifish (Fundulus diaphanus menona) both of which are Illinois endangered species. The 2018 occurrence of Blackchin Shiner were likely related to restoration efforts in certain upper Des Plaines River watershed lakes (Bland 2013). A new species in 2020 is the invasive Round Goby *(Neogobius melanostomus)* which is a non-native of intercontinental origin that has been expanding from its original introduction in ship ballast water in the late 1980s. There were 21 individuals collected in 2020.

Figure 20*. Two (2) Round Gobies (Neogobius melanostomus) collected at site 16-1 (RM 71.7) on August 14, 2020. Twenty-one (21) Round Goby individuals were collected at the four downstream most sites during the 2020 survey of the upper Des Plaines River mainstem.*

Des Plaines River 2020 Fish Assemblage Results

Fish IBI (fIBI) scores are the mean of two sampling passes within the summer-early fall index period. The General Use Criterion of 41 was met or surpassed at only a single site in 2020 (Figure 21; Table 17). This is a decrease from the five (5) sites that met the General Use fIBI biocriterion in 2018 with scores at these sites being 2.0 to 7.0 less than n 2018. Only two sites (13-1 and 13-16) in the upper mainstem had a 4.0 or greater departure from the General Use fIBI biocriterion, while the other two (sites 16-16 and 16-7) had 1.5 unit departures. The fIBI scores were lowest in the upper most reach of the mainstem as in 2016 and 2018. Scores increased into the mid to high 30s downstream of the Wetland Research riffle through the be observed downstream from the Libertyville and Mundelein WWTPs then recovering to meeting the fIBI General Use biocriterion at site 16-2 (RM 75.40) downstream from the DPW mainstem

Facility	RM	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	6.2	9.0	0.7	69.5	0.6
2 - NSWRD-Waukegan WRF	98.1	17.5	84.8	133.3	8.2	2217.7	176.1
3 - NSWRD - Gurnee WRF	95.5	12.0	51.5	90.5	5.3	2018.2	764.6
4 - Village of Libertyville	84.8	2.8	34.7	30.8	21.1	477.4	22.2
5 - Village of Mundelein	84.6	2.4	44.7	14.3	3.7	363.4	18.1
6 - LCDPW-New Centry Town WWTP	82.3	3.1	35.7	36.7	2.5	135.4	15.0
7 - LCDPW-DesPlaines River	76.4	8.6	84.0	95.8	5.6	461.1	552.5
Total Flow/Loading		**47.2**	**341.5**	**410.3**	**47.0**	**5742.7**	**1549.2**

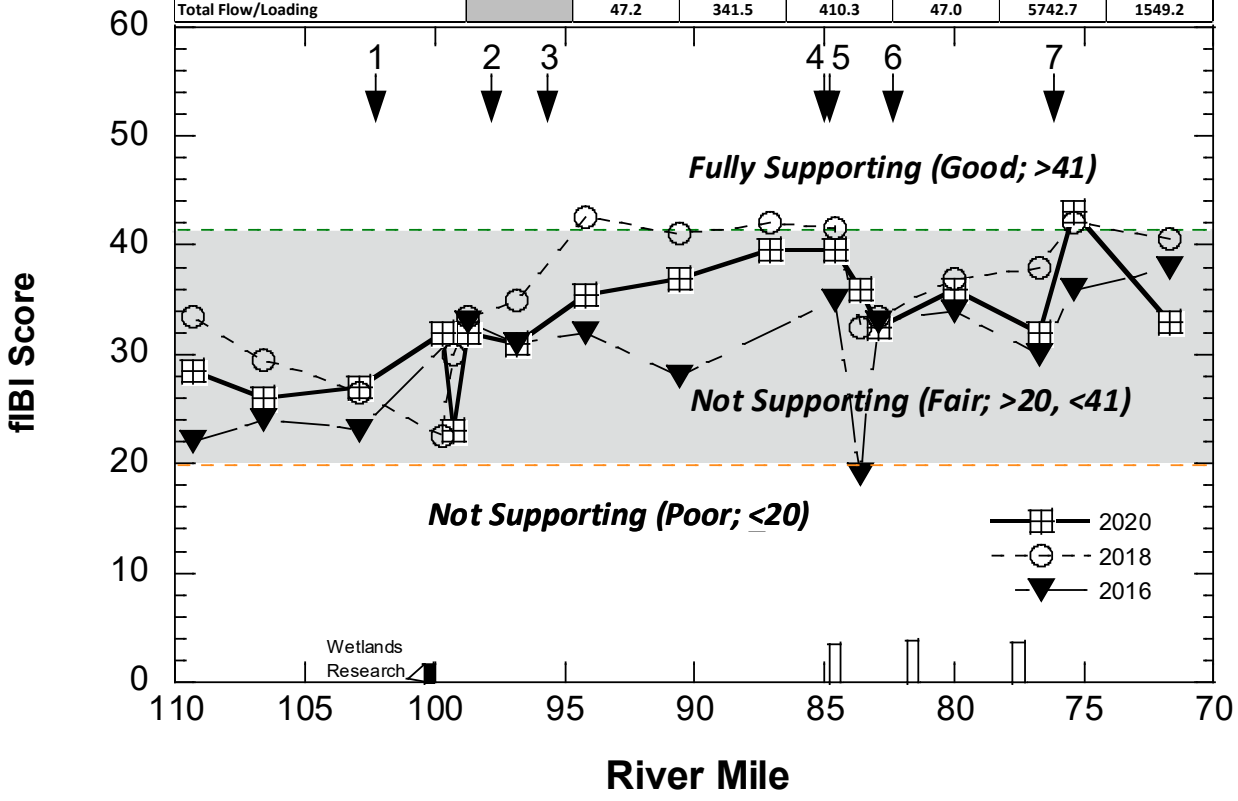


***Figure 21**. Illinois fish IBI (fIBI) scores for the upper Des Plaines River in 2016, 2018, and 2020. IEPA thresholds for determining full support, non-support-fair, and non-support poor of the General Use for aquatic life are indicated by dashed lines and grey shading. A key to sources (arrows and numbers) is in the table above the figure along with flows and loads from each.*

where habitat and flow conditions were improved. Localized declines continued to DesPlaines WWTP. The Modified Index of Well-Being (MIwb) has no formal biocriteria in Illinois, but using the Ohio biocriteria it attained the Ohio equivalent of the General Use at 16 of the 17 sites, and was rated fair only at site 16-1 (Figure 23). Overall, the MIwb was improved at most sites compared to the 2016 and 2018 surveys, and attained an excellent narrative (MIwb >9.0) at sites 13-18 and 13-3. Although the MIwb excludes highly tolerant species from the biomass and numbers metrics, it can be increased by moderately 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 after stressor abatements have been 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.

Facility	RM	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	6.2	9.0	0.7	69.5	0.6
2 - NSWRD-Waukegan WRF	98.1	17.5	84.8	133.3	8.2	2217.7	176.1
3 - NSWRD - Gurnee WRF	95.5	12.0	51.5	90.5	5.3	2018.2	764.6
4 - Village of Libertyville	84.8	2.8	34.7	30.8	21.1	477.4	22.2
5 - Village of Mundelein	84.6	2.4	44.7	14.3	3.7	363.4	18.1
6 - LCDPW-New Centry Town WWTP	82.3	3.1	35.7	36.7	2.5	135.4	15.0
7 - LCDPW-DesPlaines River	76.4	8.6	84.0	95.8	5.6	461.1	552.5
Total Flow/Loading		**47.2**	**341.5**	**410.3**	**47.0**	**5742.7**	**1549.2**

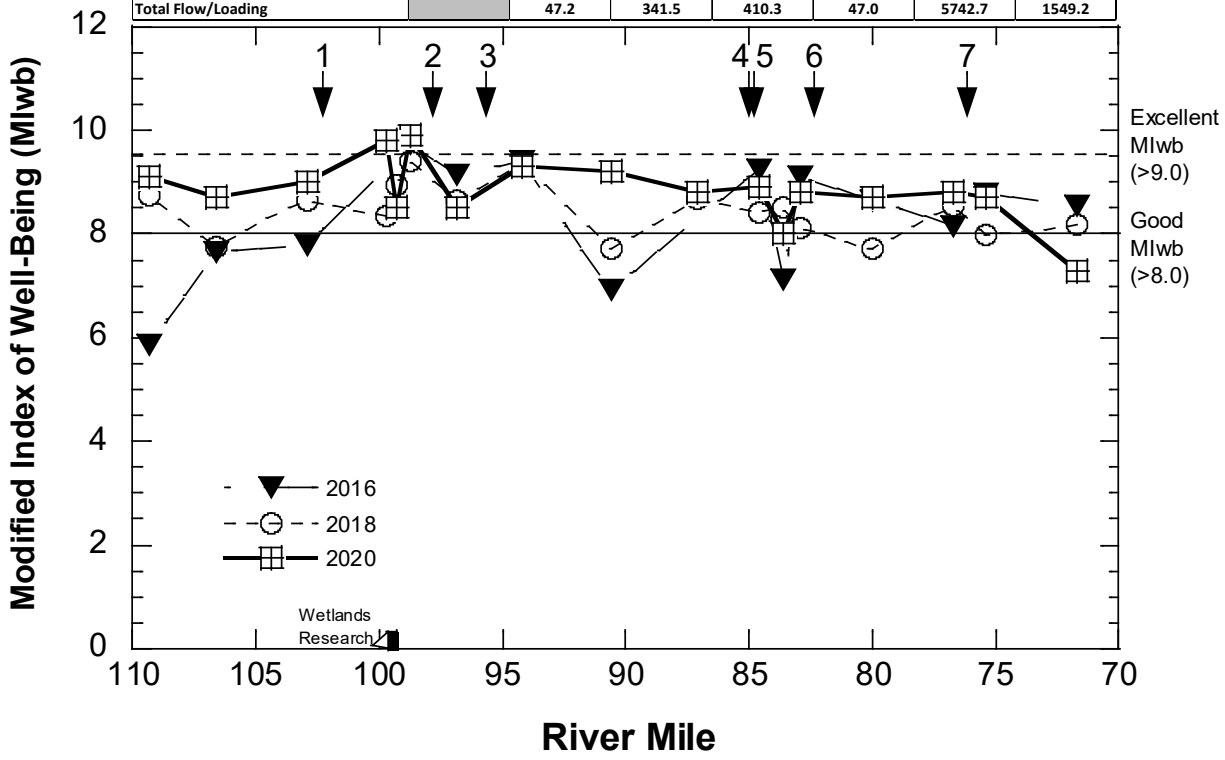


***Figure 22**. Modified Index of Well-Being (MIwb) for the upper Des Plaines River in 2016, 2018, and 2020. A key to sources (arrows and numbers) is in the table above the figure along with flow and loads from each.*

Table 17 lists the fIBI, selected fIBI metrics, and other fish assemblage attributes one of which exhibits key biological response signatures associated with both organic enrichment and toxic impacts, %DELT anomalies. Metrics and attributes that had values predominantly in the good range were %DELT anomalies with six (6) sites recording zero (0) anomalies. The %tolerant species ranged from 23.9-31.8% with 13 sites in the good range and the remainder fair. Intolerant species ranged from 1-4 with good values at eight (8) sites, fair values at five (5) sites, and the remaining four (4) sites being poor (<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. These results were mostly unchanged from 2018.

Mill Creek and North Mill Creek 2020 Fish Assemblage Results

Fish were sampled at a single site each in Mill Creek (11-2) and two sites in North Mill Creek (10-7 and 10-1) in 2020. Mill Creek (11-2) had a fair fIBI score and North Mill Creek had fIBI scores that were at (10-7) and within (10-1) the poor narrative (Table 17). The 2020 fIBI of 29.5

***Table 17**. Selected fish assemblage attributes for sites sampled in the Upper Des Plaines Year 4 study area in 2020. 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})	Fish Assemblage Attributes						
			fIBI	MIwb	Native Sp.	%DELT	Intolerant Species	%Mineral Spawners	%Tolerant
Des Plaines River									
13-6	109.30	123.7	28.5	9.10	21.0	0.31	1.0	2.9	26.2
13-5	106.60	137.3	26.0	8.70	17.5	0.56	1.0	1.6	31.5
13-4	102.90	145.6	27.0	9.00	17.5	0.50	1.0	5.2	28.6
13-18	99.72	213.2	32.0	9.80	25.0	0.11	2.0	2.3	24.0
13-19	99.30	212.9	23.0	8.50	16.0	0.00	1.0	1.2	31.3
13-3	98.70	220.3	32.0	9.90	23.0	0.39	2.0	7.4	26.1
13-2	96.82	225.4	31.0	8.50	19.0	0.00	2.5	12.3	26.6
13-1	94.20	232.0	35.5	9.30	24.0	0.11	2.5	19.2	25.0
13-16	90.60	253.8	37.0	9.20	21.5	0.13	3.0	19.3	27.9
16-6	87.10	261.4	39.5	8.80	23.5	0.00	4.0	17.9	25.6
16-7	84.60	266.5	39.5	8.90	22.5	0.00	4.0	20.6	24.7
16-5	83.60	268.1	36.0	8.00	20.5	0.00	3.5	12.4	27.2
16-8	82.90	268.9	32.5	8.80	21.0	0.58	3.0	6.2	30.9
16-4	80.00	273.2	36.0	8.70	23.0	0.10	3.0	17.9	23.9
16-3	76.70	314.7	32.0	8.80	22.0	0.67	2.0	9.1	31.8
16-2	75.40	324.0	43.0	8.70	23.0	0.00	3.5	22.1	24.1
16-1	71.70	358.7	33.0	7.30	21.5	0.75	3.0	9.4	28.1
Mill Creek									
11-2	1.71	62.3	29.5	9.05	25.0	0.40	1.00	0.8	28.00
North Mill Creek									
10-7	11.30	19.2	20.5		7.0	0.0	0.0	0.0	43.8
10-1	1.10	31.9	19.5	6.31	10.0	0.5	0.0	0.0	47.3
Exceptional			>50	>9.6	≥24	0	≥6	>44	≤16.1
Good			≥41	>8.5	≥16	<1.3	≥4	>23	<30.3
Fair			<41	>5.8	≤13	<3.0	<3	>10	<40
Poor			≤20	<5.8	≥9	>10	1	>5	>50
Very Poor				<4.0	<9	>20	0	0	≥70

in Mill Creek at site 11-2 was only slightly lower than the 2016 result that had a fair fIBI of 31.0, but better than the poor fIBI of 23 in 2019. The North Mill Creek poor fIBI of 19.5 at site 10-1 was similar to the fIBI of 22.0 in 2016 and the poor fIBI of 18.0 in 2019. The barely fair fIBI of 20.5 at site 10.7 was only a slight improvement over the poor fIBI of 18 in 2019 (site 10-7 was not sampled in 2016). Mill Creek at 11-2 had two poor responses and North Mill Creek site 10-7 had two poor and two very poor responses and 10-1 had four poor and one very poor response signature (Table 17).

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 adding 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 upper portion of the effluent dominated reach of the mainstem with the pollution footprint varying somewhat between years. Overall, biological performance improved from 2016 to 2018 with the longest reach of full attainment occurring over nearly 10 miles from site 13-1 (RM 94.2) to site 16-7 (RM 84.6) where habitat quality improved as was the increased flow with the introduction of treated wastewater from several point sources. 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 of 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 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, and 2020. The ADV/AAV is calculated individually for each index and was done here for the fIBI and mIBI (Figure 22) 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 entry of significant volumes of treated wastewater. The ADVs for the fIBI and the mIBI reveal the severity and extent of impairment of the General Use for aquatic life in the upper mainstem in 2020 that was essentially unchanged from that observed in 2016 and 2018. It continues to reflect the chemical, hydrological, and habitat alterations in this reach. In the lower reach downstream from Mill Creek no AAV was observed in 2020 due to the fIBI failing to meet the General Use at any except a single site in 2020. Though the fIBI failed to attain the General Use criterion in 2020 resulting in an increase in the ADV from 2018, it was smaller than in 2016 (Figure 22). The macroinvertebrate AAV declined slightly in 2020 from 2018 due to three (3) fewer sites attaining the mIBI General Use biocriterion, but the ADV remained unchanged. The ADV continues to reflect the non-attainment of both the fish and macroinvertebrate assemblages in the upper watershed and the overall non-attainment in the lower watershed in 2020. The overall trajectory is unchanged in the modified upper reach and a slight improvement from

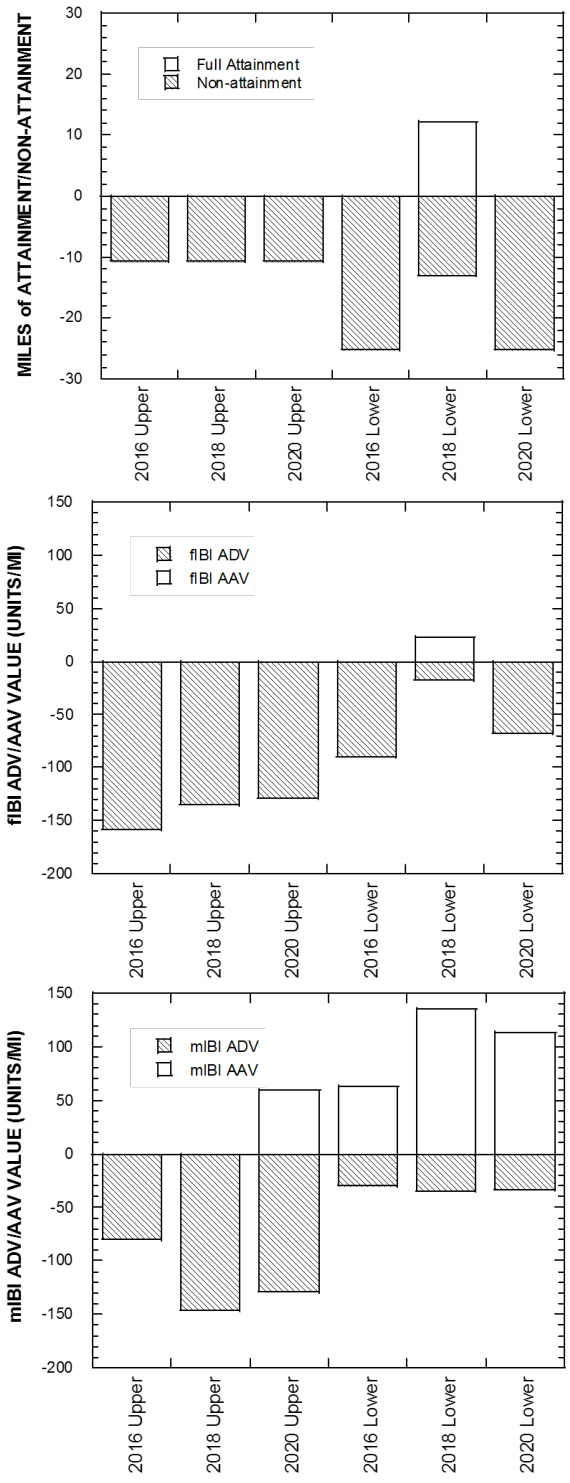


***Figure 23**. Area of Degradation (ADV; cross hatched) and Area of Attainment (AAV; open shading) values in the upper reach and remaining lower reach of the upper Des Plaines River in 2016, 2018, and 2020 (upper and middle panels). The miles of full and non-attainment appear in the lower panel.*

2016. The miles of attainment reflecting more of a pass/fail assessment increased between 2018 and 2020 to levels similar to 2016 in both reaches of the mainstem.

NE Illinois IPS thresholds for water and sediment chemistry and physical habitat attributes were used in concert with other variables to determine causes of impairment. The thresholds across five narrative categories (excellent, good, fair, poor, and very poor) provides a graded approach to the assignment of causes and sources for the Illinois General Use for aquatic life impairments. These tools were integrated with previously used tools and indicators to assign associated causes to the biological impairments observed in 2020 and offers the semblance of a tiered aquatic life use (AQLU) stratification of goals to support local restoration and protection efforts by the respective watershed groups and stakeholders.

The biological criteria for fish and macroinvertebrates used by Illinois EPA (2020) establish the thresholds by which impaired sites and reaches are determined. The assignment of causes in this analysis generally attempts to follow the overall intent of the Illinois Integrated Report assessment guidelines, but is supplemented by the more extensive biological effect thresholds provided by the IPS tools and dashboard (MBI 2020a). 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 19 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, the new IPS nutrient index, new IPS

***Table 18**. Key chemical, physical, and biological response indicators of impairment observed at each site in the Upper Des Plaines River study area in 2020. 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.*

Site ID	River Mile	Drainage Area (sq. mi.)	AQLU Status	fIBI	mIBI	QHEI	QHEI Modified: Good Ratio	Max. D.O. (Sonde)	Min. D.O. (Sonde)	Diel D.O. Swing	Overall Enrichment Status	>Poor Chemical Threshold	%Organic Enrich-ment Signatures	%Toxic Tolerant Signatures	2020 Causes by IPS Stressor Threshold Narrative Category			Restora-bility Score (0-100)	Suscept-ibility Score (0-100)	IPS Threat Score (0-100)
															Very Poor	Poor	Fair			
Des Plaines River (95-656) - 2020																				
13-6	109.30	123.67	Non - Fair	28.5	26.5	53	4.50	15.61	2.71	10.8	Highly Enriched	None	48.40	0.31	Substr; Diel DO; Org. Enrich; #Poor attr.	Imperv-30C; Max DO; Min DO; Chan; QHEI Ratio; Org Enrich; Diel DO; TSS	TKN; QHEI; #Good, Poor attr.	46.48		
13-5	106.60	137.29	Non - Fair	26	22.8	42	4.50	12.78	5.97	6.4	Enriched	None	47.60	0.56	Substr; TSS	Imperv-30C; QHEI; Chan; TSS; QHEI ratio; Diel DO; Org. Enrich; #Poor attr.	Imperv-500m;Imperv-30; TKN; #Good attr.; Min DO; Max DO; Chloride	44.82		
13-4	102.90	145.55	Non - Fair	27	35.8	47	2.33	8.63	3.66	4.6	Possible Nutr.	None	31.20	0.50	Substr;	QHEI; Chan; Min DO;	TKN; QHEI ratio; #Good & Poor attr.; Diel DO; Chloride	56.12		
13-18	99.72	212.87	Non - Fair	32		47	1.00	10.29	2.52	5.2	Possible Nutr.	TKN		0.11	Substr; Chan; #Poor attr.	QHEI; Min DO; Diel DO	Low DO; TKN; Turbidity;QHEI ratio; #Good & Poor Attr.; Chloride	57.29		
13-19	99.30	213.17	Non - Fair	23	26.9	70.5	2.67	10.69	4.88	5.8	Enriched	None	75.00	0.00	Org Enrich	Diel DO; Org Enrich; TSS; #Good attr.	TKN; QHEI; Substr; TSS; ; Min DO	71.04		
13-3	98.70	220.29	Non - Fair	32	34.7	79.5	0.57	8.94	4.25	3.9	Possible Nutr.	None	48.80	0.39		Org. Enrich; TKN	Imperv-500m; Low DO; Substr; Turbidity; Sed. Metals; #Poor attr.; Min DO; Chloride	69.83		
13-2	96.82	225.36	Non - Fair	31	41.2	82.5	0.11	8.09	5.16	2.9	Possible Nutr.	None	18.00	0.00			Imperv-500m;TP; Min DO; TKN; Org Enrich	71.47		
13-1	94.20	232.03	Partial	35.5	49.6	72.25	0.25	9.02	4.48	7.1	Not Nutrients	NO3	6.40	0.11	Diel DO	Nitrates	Imperv-500m;TP; Min DO; TKN; Nitrate; QHEI; Substr; Org Enrich; Chloride	70.62		
13-16	90.60	253.75	Partial	37	55.8	68.5	0.83					NH3,NO3	8.90	0.13		Nitrates, Ammonia	Imperv-500m;TP; TKN; Nitrate; QHEI; Substr; Chan; #Poor attr.; Chloride	64.07		
16-6	87.10	261.41	Partial	39.5	55.7	71	1.00					None	25.00	0.00		Nitrates; Org. Enrich	TP; TKN; Nitrate; QHEI; Chan; #Good & Poor Attr.	66.06		
16-7	84.60	266.48	Partial	39.5	42.9	79.5	0.22	7.37	5.69	1.4	Not Nutrients	NH3,NO3	15.80	0.00	Nitrates	Ammonia	Imperv-500m;Imperv-30;Imperv-30C;TP; TKN; Nitrate; Substr; Chloride; Ammonia; Org Enrich; Min DO	68.16		
16-5	83.60	268.07	Partial	36	47.5	72	1.00					NO3	13.40	0.00	#Poor attr.		Imperv-500m;Imperv-30;TP; TKN; QHEI; Chan; #Good attr.; Org Enrich	62.11		
16-8	82.90	268.9	Non - Fair	32.5	36.4	62.5	1.75					NH3,NO3	15.80	0.58	Ammonia	Nitrates	Imperv-500m;TP; TKN; Nitrate; QHEI; Substr; Chan; Org Enrich	58.24		
16-4	80.00	273.21	Partial	36	57.6	68.5	1.20	8.89	5.09	5.8	Not Nutrients	NO3	6.30	0.10		Diel DO; Nitrates; #Poor attr.	Imperv-500m;Imperv-30;Imperv-30C;TP; TKN; Nitrate; QHEI; Chan; #Good attr.; Org Enrich; Min DO	60.2		
16-3	76.70	314.68	Partial	32	57.4	58.5	2.67	7.00	5.15	1.4	Not Nutrients	None	20.20	0.67	Ammonia; #Poor attr.	Substr; Chan; Org Enrich; Nitrates	TP; Nitrate; TKN; QHEI; #Good attr.; Min DO	57.4		
16-2	75.40	323.96	Full	43	53.2	57.5	2.00	8.09	5.39	2.6	Not Nutrients	None	8.10	0.00	#Poor attr.	Imperv-30;Imperv-30C; Substr; Nitrates	Imperv-500m;TP; TKN; Nitrate; QHEI; Chan; TSS; Org Enrich; Min DO		74.09	60
16-1	71.70	358.68	Non - Fair	33	39.9	68	1.00	8.45	4.82	3.1	Not Nutrients	None	3.30	0.75			Imperv-500m;TP; TKN; Nitrate; QHEI; Chan; #Good & Poor attr.; Min DO; TSS	62.91		
Mill Creek (95-995) - 2020																				
11-2	1.71	62.25	Partial	29.5	53.3	75.5	0.38					TSS	25.00	0.40		Org. Enrich	Low DO; TKN; Substr; TSS; Turbidity; Sed. Metals; #Poor attr.	69.6		
North Mill Creek (95-995) - 2020																				
11-3	11.30	19.23	Non - Fair	20.5		42.5	4.00					None	15.80	0.00	Substr;	QHEI; Chan; QHEI Ratio; #Poor attr.	Urban-WS;Dev-WS; TKN; Chloride; Org Enrich	52.18		
10-1	1.10	31.93	Non - Poor	19.5	55.8	63	1.50					TSS	13.40	0.50		#Poor attr.	TKN; QHEI; Substr; Chan; TSS; #Good attr.; Org Enrich	61.56		
Narrative Rating Scale		**Excellent**	FULL	≥50	>73	>84.5	<0.50		≥6.0	< 2.0	<10	None	0	0				Very High	Very Low	Very Low
		Good	FULL	>41-49	41.8-72.9	>75.9	<2.00		≥5.0	>2.0-4.0	10-15	None	<5	<1.3				High	Low	Low
		Fair	PARTIAL	30-<41	30-41.7	<75.9	≥2.00		≥3.5	>4.0-5.0	15-25	≤1	<20	<3.0				Moderate	Moderate	Moderate
		Poor	NON-Fair	>15-29	>15-29	<50.1	≥4.00		<3.5	>5.0-6.5	25-35	≤3	>35	>10				Low	High	High
		Very Poor	NON-Poor	≤15	≤15	<25.0	≥6.00		<2.0	>6.50	>35	>3	<60	>20				Very Low	Very High	Very High

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 2020 follows:

- **Macro Habitat Related** (64 observations; weighted frequency of 39.5%) – the number of high influence or moderate influence poor or good attributes in the QHEI attributes matrix (Table 13), a fair, poor, or very poor QHEI score, or an IPS habitat factor;
- **Organic/Nutrient Enrichment** (66 observations; weighted frequency of 36.5%) – any ammonia-N, total P, nitrate-N, or TKN median value exceedance of IPS fair, poor, or very poor (Table 10; TKN used as a proxy for BOD per Miltner 2018), and any fair, poor, or very poor organic enrichment response signature (Tables 15 and 17);
- **D.O. Related** (22 observations; weighted frequency of 13.8%) – any fair, poor, or very poor maximum of minimum D.O. or diel D.O. swing from continuous measurements (Table 12).
- **Urban Related** (26 observations; weighted frequency of 10.2%) – any chloride, conductivity, or TSS median value exceedance of IPS fair, poor, or very poor threshold in Table 10 and any IPS derived urban land use variable exceeding fair, poor, or very poor threshold.
- Toxics (0 observations; weighted frequency 0.0%) – 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 15 and 17).

Macro Habitat Related was the most pervasive cause followed closely by Organic/Nutrient Enrichment based on the weighted frequency of each. D.O. related issues at 13.8% comprised about one-third of the observations of either Macro Habitat Related or Organic/Nutrient Enrichment issues with Urban Related causes at 10.2%. The Macrohabitat Related, Organic/Nutrient Enrichment, and D.O. Related had the only poor and very poor values that were primarily observed in the 10 mile long modified upper reach upstream from the Wetland Research Riffle with observations of very poor and poor Organic/Nutrient Enrichment issues observed immediately downstream of the Wetland Research Riffle. Very poor and poor nutrient exceedances occurred sporadically in the middle and lower reaches of the mainstem. Very poor and poor ammonia-N levels occurred downstream from the Libertyville and Mundelein WTTPs, but none of these values would have exceeded the Illinois WQC for ammonia-N. Elevated levels of Nitrate-N and total P in the poor and most frequently in the fair range 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. These results are similar to the 2018 results although the 2020 causal categories were further refined in 2020.

The introduction 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. 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.

Only a single site (16-2) was in full attainment of the General Use for aquatic life in 2020 down from five sites in 2018 all in the effluent dominated reach of the study area. Partial attainment was observed in the stretch between site 13-1 (RM 94.2) and site 16-3 (RM 76.70) with the exception of site 16-8 (RM 82.90) which was non-fair. Each of these sites were limited by non-attainment of the fIBI biocriterion with most scores marginally lower than in 2018. The sites immediately upstream and downstream from the Libertyville and Mundelein WWTPs missed full attainment by only 1.5 units. The discovery of Round Goby at the four (4) downstream most sites also adds an unknown factor for the aquatic assemblages. With no barriers until the Wetland Research riffle the species will likely move farther upstream, possibly having deleterious effects on the already marginal fish assemblage. 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 five upstream most sites that were in non-fair and non-poor attainment status and with four (4) of five (5) fIBI scores in the poor range.

References

Bertrand, B. 1984. Des Plaines River Basin fisheries assessment. Illinois Dept. of Conservation, Div. of Fish and Wildlife Resources, Northern Streams Program. 100-11-84. 44 pp.

Bilger, E.E., M.J. Dreslik, and C.A. Phillips. 2016. Biotic integrity of macroinvertebrate communities along the Illinois routes 53 & 120 corridor. ITHA RR-14-4228. Prairie Research Institute, Illinois Natural History Survey. Champaign, IL. 27 pp.

Bland, J.K. 2013. How do you spell success? The rare fish variety, that is. Part I: Grading success in rearing threatened and endangered species. American Currents 38(4): 11-22.

Day, D. M. 1991. The Des Plaines River: Monitoring the Fish Resources of an Urban River (1978-1991) Streams Program, Illinois Department of Conservation, Aledo, IL.

Des Plaines River Watershed Workgroup (DRWW). 2018. 2018 Monitoring Strategy for the Des Plaines River Watershed. Lake County, IL. DRWW, 500 W. Winchester Rd., Libertyville, IL. 7 pp. http://www.drww.org/plans/reports.

Healy, R. W. 1979. River mileages and drainage areas for Illinois streams- Volume 1, Illinois except Illinois River Basin. U.S. Geological Survey, Water Resources Investigations 79- 110.

Heidinger, R. C.1989. Fishes in the Illinois portion of the upper Des Plaines River. Transactions of the Illinois Academy of Science 82: 85-96.

Illinois DNR. 2010a. Rivers and Streams Fisheries Data Set: Fish Collection Procedures (Electrofishing). Fisheries Manual of Operations Fish Collection Procedures (Electrofishing). Illinois DNR/Illinois NHS. Springfield, IL. 2 pp.

Illinois DNR. 2010b. Rivers and Streams Fisheries Data Set: Field Sampling Protocols For Rivers and Streams. Fisheries Manual of Operations Fish Collection Procedures (Electrofishing). Illinois DNR/Illinois NHS. Springfield, IL. 9 pp.

Illinois EPA. 2022. Illinois Integrated Water Quality Report and Section 303(d) List, 2020/2022. Clean Water Act Sections 303(d), 305(b) and 314. Water Resource Assessment Information and List of Impaired Waters. Volume I: Surface Water. Bureau of Water, Springfield, IL. 58 pp. + appendices.

Illinois EPA. 2014a. Illinois Water Monitoring Strategy 2015-2020. Bureau of Water. Springfield, IL. 138 pp.

Illinois EPA. 2012a. Surface Water Section. Standard Operating Procedure for Stream Water Quality Sample Monitoring. Document Control No. 184. IEPA BOW SOP012-01-0512. Revision No. 1. 16 pp.

Illinois EPA. 2011a. Standard Operating Procedure for Calibration and Use of Hydrolab MiniSonde 5. Surface Water Section, Document Control No. 180. IEPA BOW SOP010-00-1111. Revision No. 0. Springfield, IL. 8 pp.

Illinois EPA. 2011b. Standard Operating Procedure for Surficial Sediment Collection. Surface Water Section. Document Control No. 174. IEPA BOW SOP008-00-1111. Revision No. 0. 8 pp.

Illinois EPA. 2011c. Standard Operating Procedure for Method to Collect Aquatic Macroinvertebrates from Wadeable Streams for Biotic Integrity Assessments. Surface Water Section. Document Control No. 168. IEPA BOW SOP002-00-1111. Revision No. 0. 8 pp.

Illinois EPA. 2011d. Methods Utilized to Determine the Types and Amounts of Pertinent Macroinvertebrate Habitats in Perennial Wadeable Streams for 20-Jab Allocation. Surface Water Section. Document Control No. 177. IEPA BOW ID003-00-1111. Revision No. 0. 6 pp.

Illinois EPA. 2011e. Standard Operating Procedure for Sample Processing for the Macroinvertebrate Index of Biotic Integrity (mIBI). Surface Water Section. Document Control No. 167. IEPA BOW SOP001-00-1111. Revision No. 0. 14 pp.

Illinois EPA. 2011f. Macroinvertebrate Tolerance List and Functional Feeding Group Classification. Surface Water Section. Document Control No. 176. IEPA BOW ID002-00-1111. Revision No. 0. 75 pp.

Illinois EPA. 2011g. Genus-List: Macroinvertebrate-Index of Biotic Integrity (m-IBI) Tolerance List and Functional Feeding Group Classification. Surface Water Section. Document Control No. 178. IEPA BOW ID004-00-1111. Revision No. 0. 31 pp.

Illinois DNR. 2010a. Rivers and Streams Fisheries Data Set: Fish Collection Procedures (Electrofishing). Fisheries Manual of Operations Fish Collection Procedures (Electrofishing). Illinois DNR/Illinois NHS. Springfield, IL. 2 pp.

Illinois DNR. 2010b. Rivers and Streams Fisheries Data Set: Field Sampling Protocols For Rivers and Streams. Fisheries Manual of Operations Fish Collection Procedures (Electrofishing). Illinois DNR/Illinois NHS. Springfield, IL. 9 pp.

Illinois EPA. 2006. Recommendations for Illinois EPA users on how to interpret or record information relevant to scoring the Qualitative Habitat Evaluation Index. Surface Water Section, Springfield, IL. 8 pp.

Kaushal, S.S., Groffman, P.M., Likens, G.E., Belt, K.T., Stack, W.P., Kelly, V.R., Band, L.E., and Fisher, G.T. 2005. Increased salinization of fresh water in the northeastern United States. Proc. Natl. Acad. Sci. 102(38):13517-13520.

Kelly, W.R., S.V. Panno, and K. Hackley. 2012. The Sources, Distribution, and Trends of Chloride in the Waters of Illinois. Illinois State Water Survey, Prairie Research Institute, University of Illinois at Urbana-Champaign.

Kelly, W.R. 2008. Long-term trends in chloride concentrations in shallow aquifers near Chicago. Ground Water. 46(5):772-781.

Lake Co. Stormwater Management Commission (LCSMC). 2018. Des Plaines River Watershed – Based Plan. Lake Co. Stormwater Management Commission, 500 W Winchester Road, Libertyville, Illinois 60048. 552 pp. + appendices.

Langbein, J. R. and H. L. Wright. 1976. Inventory of the fishes of the Des Plaines River Basin for1974. Illinois Department of Conservation, 37 pp.

Midwest Biodiversity Institute (MBI). 2021. Biological and Water Quality Assessment of Upper Des Plaines River Subwatersheds: Year 3 Rotation 2019. Mill Creek, Bull Creek, and Des Plaines River Tributary Subwatersheds. Lake County, Illinois. Technical Report MBI/2021-7-7. Columbus, OH 43221-0651. 76 pp. + appendices.

Midwest Biodiversity Institute (MBI). 2020a. Integrated Prioritization System (IPS) for Northeastern Illinois: Technical Documentation and Atlas of Stressor Relationships [DRAFT]. Technical Report MBI/2020-5-10. Project Number 10180900. Columbus, OH 43221-0561.

Midwest Biodiversity Institute (MBI). 2020b. Biological and Water Quality Assessment of Upper Des Plaines River: Year 2 Rotation 2018. Mainstem and Selected Tributaries. Lake County, Illinois. Technical Report MBI/2020-1-2. Columbus, OH 43221-0561. 65 pp. + appendices.

Midwest Biodiversity Institute (MBI). 2018. Biological and Water Quality Assessment of Upper Des Plaines River Subwatersheds: Year 1 Rotation 2017. Indian, Buffalo, and Aptakisic Creek Subwatersheds. Lake County, Illinois. Technical Report MBI/2018-12-10. Columbus, OH 43221-0561. 59 pp. + appendices.

Midwest Biodiversity Institute (MBI). 2017. Biological and Water Quality Assessment of the Upper Des Plaines River and Tributaries 2016. Lake County, Illinois. Technical Report MBI/2017-8-7. Columbus, OH 43221-0561. 101 pp. + appendices.

Midwest Biodiversity Institute (MBI). 2015. Integrated Prioritization System (IPS) Documentation and Atlas of Biological Stressor Relationships for Southwest Ohio. Technical

Report MBI/2015-12-15. MSD Project Number 10180900. Columbus, OH 43221-0561. 32 pp. + appendices. www.midwestbiodiversityinst.org/publications/

Miltner, R.J. 2018. Eutrophication endpoints for large rivers in Ohio, USA. Environ. Monit. Assess. 190: 55

Miltner, R.J., R.F. Mueller, C.O. Yoder, and E.T. Rankin. 2010. Priority rankings based on estimated restorability for stream segments in the DuPage River and Salt Creek watersheds. Technical Report MBI/2010-11-6. Report to the DuPage River Salt Creek Working Group, Naperville, IL. 63 pp. (available at http://drscw.org/wp/projectidentification- and-prioritization-system/).

Ohio Environmental Protection Agency. 2015a. Biological criteria for the protection of aquatic life (revised June 26, 2015). Volume III: Standardized biological field sampling and laboratory methods for assessing fish and macroinvertebrate communities. Tech. Rept. EAS/2015-06-01. Division of Surface Water, Ecological Assessment Section, Columbus, Ohio. 66 pp. https://www.epa.ohio.gov/dsw/bioassess/BioCriteriaProtAqLife.

Ohio EPA. 2015b. Draft Ohio Draft Stream Nutrient Assessment Procedure (SNAP). Division of Surface Water, Columbus, OH. Nutrients_TAG_Recommendations_12-4-2015_GO4- Final Draft - 4828-0819-7931.1.pdf. http://epa.ohio.gov/dsw/wqs/NutrientReduction.aspx#146064467-tag.

Ohio Environmental Protection Agency. 2006. Methods for assessing habitat in flowing waters: using the qualitative habitat evaluation index (QHEI). Division of Surface Water, Ecological Assessment Section, Columbus, OH. 23 pp.

Ohio EPA. 1999. Association between nutrients, habitat, and the aquatic biota in Ohio Rivers and streams. Ohio EPA Technical Bulletin MAS/1999-1-1. Jan. 7, 1999.

Ohio Environmental Protection Agency. 1996. Ohio EPA's guide to DELT anomalies (deformities, erosions, lesions, and tumors). Division of Surface Water, Ecological Assessment Section, Columbus, OH. 19 pp.

Page, L. M., H. Espinosa-Pérez, L. T. Findley, C. R. Gilbert, R. N. Lea, N. E. Mandrak, R. L., Mayden, and J. S. Nelson. 2013. Common and scientific names of fishes from the United States, Canada, and Mexico, 7th edition. American Fisheries Society, Special Publication 34, Bethesda, Maryland. 384 pp.

Pescitelli S. M. and R. C. Rung. 2010b. Evaluation of the Des Plaines River Ecosystem Restoration Project: Summary of Pre-project Fish Sampling 1998 – 2010. Illinois Department of Natural Resources, Division of Fisheries Streams Program, Plano, IL.

Rankin, E. T. 1995. The use of habitat assessments in water resource management programs, pages 181-208. in W. Davis and T. Simon (eds.). Biological Assessment and Criteria: Tools for Water Resource Planning and Decision Making. Lewis Publishers, Boca Raton, FL.

Rankin, E.T. 1989. The Qualitative Habitat Evaluation Index (QHEI): Rationale, Methods, and Application. Ohio EPA, Division of Water Quality Planning and Assessment, Ecological Analysis Section, Columbus, Ohio.

Sanders, R. S., R. J. Miltner, C. O. Yoder, and E. T. Rankin. 1999. The use of external deformities, erosions, lesions, and tumors (DELT anomalies) in fish assemblages for characterizing aquatic resources: a case study of seven Ohio streams, pages 225-248. In T.P. Simon (ed.), Assessing the Sustainability and Biological Integrity of Water Resources Using Fish Communities. CRC Press, Boca Raton, FL.

Smogor, R. 2000. Draft Manual for Calculating Index of Biotic Integrity Scores for Streams in Illinois, August 2000. Prepared for: Illinois Environmental Protection Agency and Illinois Department of Natural Resources. 23 pp.

State of Illinois. 2018. Illinois nutrient loss reduction strategy. Biennial report 2015-17. Illinois Dept. of Agriculture, Springfield, IL. 83 pp.

U.S. EPA (Environmental Protection Agency). 2012. 2012 Recreational Water Quality Criteria. Office of Water EPA - 820-F-12-061, 4305T, December 2012. Washington D.C.

U.S. EPA (Environmental Protection Agency). 2011. A Field-Based Aquatic Life Benchmark for Conductivity in Central Appalachian Streams. Office of Research and Development, National Center for Environmental Assessment, Washington, DC. EPA/600/R-10/023F. 276 pp.

Woods, A., J.M. Omernik, C.S. Brockman, T.D. Gerber, W.D. Hosteter, and S.H. Azevedo. 1995. Ecoregions of Ohio and Indiana. U.S. EPA, Corvallis, OR. 2 pp.

YSI Incorporated. 2012. 6-Series Multiparameter Water Quality Sondes User Manual. 6-Series: 6600 V2, 6600EDS V2, 6920 V2, 6820 V2, 600 OMS V2, 600XL, 600XLM, 600LS, 600R, and 600QS. Environmental Monitoring Systems Operations Manual. Item # 069300, Revision J. Yellow Springs, OH. 379 pp.

YSI Incorporated. 2017. EXO User Manual. Item# 603789REF, Revision G. Yellow Springs. OH. 154 pp.

Zheng, L. and Paul, M.J. 2009. Effects of Eutrophication on Stream Ecosystems. Tetratech, Inc. n-steps. tetratech-ffx. com/PDF&otherFiles/literature_review/Eutrophication% 20effects% 20on% 20streams.pdf.

APPENDIX A

Upper Des Plaines 2020 Fish Assemblage Data

A1: Fish Index of Biotic Integrity (fIBI) Metrics & Scores
A-2: Fish Species Grand (all sites combined)
A-3: Fish Species by Sampling Event

Appendix Table A-1. Fish IBI results for data collected in the Upper Des Plaines River study area in 2020

Site ID	River Mile	Type	Date	DA sq mi	Wetted Width (ft)	IL IBI Reg.	Number of: Native species	Sunfish species	Sucker species	Intolerant species	Benthic Invert. species	Minnow species	Percent: Mineral Substrate Spawners	Tolerant Fish (as Species)	Generalist Feeders	Specialized Benthic Invert-ivores	Rel.No. /(0.3km)	IBI	Modified Iwb
DES PLAINES RIVER - (95656)																			
Year: 2020																			
13-6	109.30	P	08/10/2020	122.8	84.2	3	23(5)	7(6)	2(2)	1(1)	3(2)	4(3)	2(1)	26(5)	67(5)	1(1)	1036	31.0	9.5
13-6	109.30	P	09/28/2020	122.8	84.2	3	19(4)	6(6)	2(2)	1(1)	1(1)	4(3)	4(1)	26(5)	78(3)	0(0)	478	26.0	8.6
13-5	106.60	P	08/10/2020	137.2	86.1	3	17(3)	5(5)	2(2)	1(1)	2(2)	4(3)	2(1)	35(4)	75(4)	1(1)	342	26.0	8.3
13-5	106.60	P	09/29/2020	137.2	86.1	3	18(4)	5(5)	1(1)	1(1)	1(1)	4(3)	1(1)	28(5)	67(5)	0(0)	540	26.0	9.0
13-4	102.90	P	08/10/2020	144.8	87.2	3	18(4)	7(6)	2(2)	1(1)	1(1)	3(2)	6(1)	28(5)	61(5)	0(0)	434	27.0	8.9
13-4	102.90	P	09/29/2020	144.8	87.2	3	17(3)	7(6)	2(2)	1(1)	1(1)	2(2)	4(1)	29(5)	57(6)	0(0)	596	27.0	9.2
13-18	99.72	P	10/01/2020	212.8	94.2	3	25(5)	6(6)	3(3)	2(2)	3(2)	5(4)	2(1)	24(5)	81(3)	0(1)	1973	32.0	9.8
13-19	99.30	P	08/15/2020	213.1	94.2	3	16(3)	6(6)	2(2)	1(1)	1(1)	3(2)	1(1)	31(5)	84(2)	0(0)	664	23.0	8.5
13-3	98.70	P	08/09/2020	220.2	94.8	3	23(5)	7(6)	2(2)	2(2)	2(2)	4(3)	7(2)	26(5)	68(4)	2(1)	1020	32.0	10.0
13-3	98.70	P	09/27/2020	220.2	94.8	3	23(5)	7(6)	2(2)	2(2)	3(2)	5(4)	7(2)	26(5)	80(3)	1(1)	1518	32.0	9.8
13-2	96.82	P	08/13/2020	225.3	95.2	3	17(3)	5(5)	2(2)	3(3)	2(2)	6(4)	8(2)	29(5)	76(3)	1(1)	394	30.0	7.7
13-2	96.82	P	09/28/2020	225.3	95.2	3	21(4)	6(6)	2(2)	2(2)	4(3)	3(2)	17(3)	24(5)	71(4)	1(1)	754	32.0	9.3
13-1	94.20	P	08/13/2020	237.7	95.8	3	24(5)	7(6)	2(2)	2(2)	3(2)	6(4)	14(3)	25(5)	71(4)	1(1)	380	34.0	9.1
13-1	94.20	P	09/28/2020	237.7	95.8	3	24(5)	7(6)	2(2)	3(3)	3(2)	6(4)	24(4)	25(5)	61(5)	2(1)	878	37.0	9.6
13-16	90.60	P	08/13/2020	253.7	97.4	3	21(4)	5(5)	2(2)	3(3)	2(2)	6(4)	17(3)	29(5)	61(5)	1(1)	390	34.0	8.7
13-16	90.60	P	09/28/2020	253.7	97.4	3	22(5)	6(6)	2(2)	3(3)	5(4)	6(4)	22(4)	27(5)	65(5)	5(2)	796	40.0	9.1
16-6	87.10	P	08/15/2020	261.3	98.0	3	23(5)	7(6)	2(2)	4(4)	2(2)	7(5)	15(3)	26(5)	69(4)	1(1)	472	37.0	8.5
16-6	87.10	P	09/30/2020	261.3	98.0	3	24(5)	6(6)	2(2)	4(4)	5(4)	9(6)	21(4)	25(5)	73(4)	6(2)	784	42.0	9.1
16-7	84.60	P	08/12/2020	266.4	98.3	3	24(5)	6(6)	2(2)	4(4)	4(3)	8(5)	16(3)	21(5)	71(4)	4(2)	496	39.0	8.4

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 study area in 2020

Site ID	River Mile	Type	Date	DA sq mi	Wetted Width (ft)	IL IBI Reg.	Number of: Native species	Sunfish species	Sucker species	Intolerant species	Benthic Invert. species	Minnow species	Percent: Mineral Substrate Spawners	Tolerant Fish (as Species)	Generalist Feeders	Specialized Benthic Invert-ivores	Rel.No. /(0.3km)		IBI	Modified Iwb
16-7	84.60	P	09/30/2020	266.4	98.3	3	21(4)	4(4)	2(2)	4(4)	4(3)	7(5)	25(5)	29(5)	68(5)	9(3)	772		40.0	9.5
16-5	83.60	P	08/12/2020	268.0	98.4	3	17(3)	7(6)	2(2)	3(3)	3(2)	4(3)	7(2)	29(5)	76(3)	2(1)	324		30.0	7.4
16-5	83.60	P	09/30/2020	268.0	98.4	3	24(5)	7(6)	2(2)	4(4)	5(4)	6(4)	17(3)	25(5)	57(6)	9(3)	518		42.0	8.5
16-8	82.90	P	08/12/2020	268.9	98.5	3	20(4)	6(6)	2(2)	2(2)	2(2)	6(4)	4(1)	30(5)	82(3)	1(1)	516		30.0	8.0
16-8	82.90	P	09/30/2020	268.9	98.5	3	22(5)	6(6)	2(2)	4(4)	3(2)	6(4)	8(2)	32(5)	70(4)	3(1)	520		35.0	9.5
16-4	80.00	P	07/28/2020	273.2	98.8	3	25(5)	7(6)	1(1)	3(3)	4(3)	7(5)	16(3)	24(5)	70(4)	6(3)	970		38.0	9.1
16-4	80.00	P	08/12/2020	273.2	98.8	3	21(4)	7(6)	1(1)	3(3)	2(2)	6(4)	19(4)	24(5)	75(4)	1(1)	608		34.0	8.4
16-3	76.70	P	08/09/2020	314.6	101.4	3	22(4)	7(6)	2(2)	2(2)	3(2)	4(3)	4(1)	32(5)	76(3)	1(1)	442		29.0	8.9
16-3	76.70	P	09/27/2020	314.6	101.4	3	22(4)	8(6)	2(2)	2(2)	4(3)	4(3)	15(3)	32(5)	73(4)	7(3)	454		35.0	8.8
16-2	75.40	P	08/09/2020	315.8	101.9	3	22(4)	7(6)	2(2)	3(3)	5(4)	5(4)	12(2)	27(5)	71(4)	10(4)	558		38.0	9.1
16-2	75.40	P	09/27/2020	315.8	101.9	3	24(5)	7(6)	2(2)	4(4)	7(5)	7(5)	32(6)	21(5)	49(6)	11(4)	508		48.0	8.2
16-1	71.70	P	08/14/2020	358.6	103.8	3	20(4)	8(6)	2(2)	3(3)	2(2)	4(3)	9(2)	30(5)	79(3)	1(1)	372		31.0	7.8
16-1	71.70	P	10/01/2020	358.6	103.8	3	23(5)	7(6)	2(2)	3(3)	5(4)	4(3)	10(2)	26(5)	76(3)	3(2)	470		35.0	6.8
MILL CREEK - (95995)																				
Year: 2020																				
11-2	1.71	D	07/18/2020	62.2	71.6	3	25(5)	7(6)	1(1)	1(1)	4(3)	5(3)	1(1)	24(5)	70(4)	2(1)	566		30.0	8.9
11-2	1.71	D	09/02/2020	62.2	71.6	3	25(5)	7(6)	1(1)	1(1)	3(2)	6(4)	1(1)	32(5)	81(3)	1(1)	2960		29.0	9.2
NORTH MILL CREEK - (95996)																				
Year: 2020																				
11-3	11.30	E	07/18/2020	19.2	50.0	3	8(1)	3(4)	1(1)	0(0)	1(1)	0(0)	0(0)	38(4)	60(5)	9(3)	94	*	19.0	5.5
11-3	11.30	E	09/22/2020	19.2	50.0	3	6(1)	2(3)	0(0)	0(0)	1(1)	1(1)	0(0)	50(4)	37(6)	23(6)	70	*	22.0	5.0

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 study area in 2020

Site ID	River Mile	Type	Date	DA sq mi	Wetted Width (ft)	IL IBI Reg.	Number of: Native species	Sunfish species	Sucker species	Intolerant species	Benthic Invert. species	Minnow species	Percent: Mineral Substrate Spawners	Tolerant Fish (as Species)	Generalist Feeders	Specialized Benthic Invert-ivores	Rel.No. /(0.3km)	Modified IBI	Modified Iwb
10-1	1.10	E	07/18/2020	31.9	59.3	3	11(2)	3(4)	1(1)	0(0)	0(0)	3(2)	0(0)	55(3)	65(5)	0(0)	216	17.0	6.2
10-1	1.10	E	09/22/2020	31.9	59.3	3	10(2)	3(4)	1(1)	0(0)	1(1)	2(2)	0(0)	40(4)	58(6)	5(2)	224	22.0	6.4

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

Rivers: *DesPlaines River; Mill Creek; North Mill Creek*

Years: 2020

Number of Samples: 38 Data Sources: 99 Data Types: D; E; P

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
77-009	BLUEGILL SUNFISH	I	P	C	S	2878	169.8	22.07	3032	6.60	17.8
43-043	BLUNTNOSE MINNOW	O	T	C	N	2418	142.7	18.54	334	0.73	2.3
43-032	SPOTFIN SHINER	I		M	N	1221	72.0	9.36	167	0.36	2.3
77-006	LARGEMOUTH BASS	C		C	F	955	56.4	7.32	3352	7.29	59.4
77-013	PUMPKINSEED SUNFISH	I	P	C	S	640	37.8	4.91	668	1.45	17.6
43-004	HORNYHEAD CHUB	I	I	N	N	596	35.2	4.57	692	1.51	19.6
77-008	GREEN SUNFISH	I	T	C	S	560	33.0	4.29	383	0.83	11.6
43-028	SPOTTAIL SHINER	I	P	M	N	454	26.8	3.48	120	0.26	4.4
40-016	WHITE SUCKER	O	T	S	W	444	26.2	3.40	6607	14.37	252.2
20-003	GIZZARD SHAD	O		M		408	24.1	3.13	588	1.28	24.4
43-003	GOLDEN SHINER	I	T	M	N	305	18.0	2.34	128	0.28	7.1
43-001	COMMON CARP	O	T	M	G	279	16.5	2.14	12261	26.67	744.9
54-002	BLACKSTRIPE TOPMINNOW	I		M		221	13.0	1.69	18	0.04	1.3
80-005	BLACKSIDE DARTER	I		S	D	159	9.4	1.22	45	0.10	4.8
40-018	SPOTTED SUCKER	I		S	R	155	9.2	1.19	3116	6.78	340.8
80-003	YELLOW PERCH			M		144	8.5	1.10	234	0.51	27.5
77-002	BLACK CRAPPIE	I		C	S	125	7.4	0.96	686	1.49	93.0
47-004	YELLOW BULLHEAD	I	T	C		109	6.4	0.84	777	1.69	120.9
47-002	CHANNEL CATFISH			C	F	103	6.1	0.79	3629	7.90	597.2
37-003	NORTHERN PIKE	P		M	F	96	5.7	0.74	3660	7.96	646.3
80-011	LOGPERCH	I	M	S	D	88	5.2	0.67	101	0.22	19.5
77-010	ORANGESPOTTED SUNFISH	I		C	S	81	4.8	0.62	38	0.08	8.1
77-003	ROCK BASS	C		C	S	75	4.4	0.58	481	1.05	108.8
80-014	JOHNNY DARTER	I		C	D	66	3.9	0.51	6	0.01	1.6
43-117	CARMINE SHINER	I	I	S	N	61	3.6	0.47	10	0.02	3.0
77-004	SMALLMOUTH BASS	C	M	C	F	53	3.1	0.41	594	1.29	190.1
47-008	STONECAT MADTOM	I	I	C		50	3.0	0.38	35	0.08	12.2
43-034	SAND SHINER	I	M	M	N	47	2.8	0.36	8	0.02	2.9
70-001	BROOK SILVERSIDE	I	M	M		38	2.2	0.29	3	0.01	1.4
77-007	WARMOUTH SUNFISH	C		C	S	35	2.1	0.27	91	0.20	44.2
15-001	BOWFIN	P		C		34	2.0	0.26	1622	3.53	808.8
77-015	GREEN SF X BLUEGILL SF					28	1.7	0.21	79	0.17	48.0
87-001	ROUND GOBY				E	21	1.2	0.16	18	0.04	14.7
43-045	COMMON CARP X GOLDFISH	O	T		G	17	1.0	0.13	1000	2.18	997.0
34-001	CENTRAL MUDMINNOW	I	T	C		11	0.2	0.08	0	0.01	4.0
37-001	REDFIN PICKEREL	P	P	M		8	0.5	0.06	14	0.03	31.2
47-006	BLACK BULLHEAD	I	P	C		8	0.5	0.06	76	0.17	161.2
10-004	LONGNOSE GAR	P		M		7	0.4	0.05	21	0.05	52.8
43-002	GOLDFISH	O	T	M	G	7	0.4	0.05	430	0.94	1041.4
74-006	YELLOW BASS	P	P	M		5	0.3	0.04	20	0.04	70.0

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

Rivers: *DesPlaines River; Mill Creek; North Mill Creek*

Years: 2020

Number of Samples: 38 Data Sources: 99 Data Types: D; E; P

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
43-013	CREEK CHUB	G	T	N	N	4	0.1	0.03	0	0.00	6.2
47-013	TADPOLE MADTOM	I		C		4	0.2	0.03	1	0.00	8.2
77-029	BLUEGILL SF X WARMOUTH SF			C		4	0.2	0.03	5	0.01	22.5
43-026	COMMON SHINER	I		S	N	3	0.2	0.02	1	0.00	6.6
43-044	CENTRAL STONEROLLER	H		N	N	3	0.2	0.02	1	0.00	10.0
68-001	PIRATE PERCH	I		C		3	0.2	0.02	1	0.00	7.3
80-001	SAUGER	P		S	F	3	0.2	0.02	89	0.19	503.3
43-042	FATHEAD MINNOW	O	T	C	N	2	0.1	0.02	0	0.00	4.0
80-002	WALLEYE	P		S	F	2	0.1	0.02	206	0.45	1750.0
37-004	MUSKELLUNGE	P		M	F	1	0.1	0.01	277	0.60	4700.0
40-004	SMALLMOUTH BUFFALO	I		M	C	1	0.1	0.01	194	0.42	3300.0
43-033	BIGMOUTH SHINER	I		M	N	1	0.1	0.01	0	0.00	3.0
47-015	BROWN BH X BLACK BH	I		C		1	0.1	0.01	23	0.05	400.0

No Species: 53 **Nat. Species:** 46 **Hybrids:** 4 **Total Counted:** 13042 **Total Rel. Wt. :** 45966

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

Site ID: River: 95-656 DesPlaines River RM: 109.30 Date: 08/10/2020

Time Fished: 2239 Distance: 0.500 Drainge (sq mi): 123.6 Depth: 0

Location: dst. Russell Rd Lat: 42.48920 Long: -87.92570

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
43-043	BLUNTNOSE MINNOW	O	T	C	N	121	242.0	23.36	660	0.99	2.7
77-013	PUMPKINSEED SUNFISH	I	P	C	S	111	222.0	21.43	5300	7.95	23.8
77-009	BLUEGILL SUNFISH	I	P	C	S	68	136.0	13.13	3860	5.79	28.3
43-028	SPOTTAIL SHINER	I	P	M	N	65	130.0	12.55	460	0.69	3.5
77-006	LARGEMOUTH BASS	C		C	F	33	66.0	6.37	5640	8.46	85.4
43-003	GOLDEN SHINER	I	T	M	N	19	38.0	3.67	500	0.75	13.1
43-032	SPOTFIN SHINER	I		M	N	17	34.0	3.28	100	0.15	2.9
77-008	GREEN SUNFISH	I	T	C	S	15	30.0	2.90	230	0.35	7.6
20-003	GIZZARD SHAD	O		M		12	24.0	2.32	1600	2.40	66.6
43-001	COMMON CARP	O	T	M	G	11	22.0	2.12	16700	25.06	759.0
40-018	SPOTTED SUCKER	I		S	R	8	16.0	1.54	3840	5.76	240.0
37-003	NORTHERN PIKE	P		M	F	5	10.0	0.97	12800	19.20	1280.0
47-004	YELLOW BULLHEAD	I	T	C		5	10.0	0.97	1800	2.70	180.0
15-001	BOWFIN	P		C		4	8.0	0.77	5400	8.10	675.0
77-002	BLACK CRAPPIE	I		C	S	4	8.0	0.77	740	1.11	92.5
77-007	WARMOUTH SUNFISH	C		C	S	4	8.0	0.77	310	0.47	38.7
40-016	WHITE SUCKER	O	T	S	W	3	6.0	0.58	1560	2.34	260.0
80-014	JOHNNY DARTER	I		C	D	3	6.0	0.58	6	0.01	1.0
77-010	ORANGESPOTTED SUNFISH	I		C	S	2	4.0	0.39	40	0.06	10.0
80-003	YELLOW PERCH			M		2	4.0	0.39	280	0.42	70.0
80-005	BLACKSIDE DARTER	I		S	D	2	4.0	0.39	20	0.03	5.0
43-045	COMMON CARP X GOLDFISH	O	T		G	1	2.0	0.19	2400	3.60	1200.0
47-002	CHANNEL CATFISH			C	F	1	2.0	0.19	2400	3.60	1200.0
54-002	BLACKSTRIPE TOPMINNOW	I		M		1	2.0	0.19	2	0.00	1.0
70-001	BROOK SILVERSIDE	I	M	M		1	2.0	0.19	2	0.00	1.0

No Species: 24 **Nat. Species:** 23 **Hybrids:** 1 **Total Counted:** 518 **Total Rel. Wt. :** 66650

IBI: 34.0 **MIwb:** 9.5

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

Site ID: River: 95-656 DesPlaines River RM: 109.30 Date: 09/28/2020

Time Fished: 1203 Distance: 0.500 Drainge (sq mi): 123.6 Depth: 0

Location: dst. Russell Rd Lat: 42.48920 Long: -87.92570

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		51	102.0	21.34	2300	4.74	22.5
43-028	SPOTTAIL SHINER	I	P	M	N	36	72.0	15.06	300	0.62	4.1
77-013	PUMPKINSEED SUNFISH	I	P	C	S	32	64.0	13.39	1200	2.47	18.7
43-043	BLUNTNOSE MINNOW	O	T	C	N	29	58.0	12.13	140	0.29	2.4
77-009	BLUEGILL SUNFISH	I	P	C	S	20	40.0	8.37	740	1.52	18.5
43-003	GOLDEN SHINER	I	T	M	N	11	22.0	4.60	300	0.62	13.6
77-006	LARGEMOUTH BASS	C		C	F	10	20.0	4.18	820	1.69	41.0
40-018	SPOTTED SUCKER	I		S	R	9	18.0	3.77	6400	13.19	355.5
43-001	COMMON CARP	O	T	M	G	8	16.0	3.35	18900	38.95	1181.2
77-008	GREEN SUNFISH	I	T	C	S	8	16.0	3.35	120	0.25	7.5
43-032	SPOTFIN SHINER	I		M	N	7	14.0	2.93	40	0.08	2.8
40-016	WHITE SUCKER	O	T	S	W	5	10.0	2.09	5600	11.54	560.0
15-001	BOWFIN	P		C		2	4.0	0.84	3200	6.59	800.0
47-002	CHANNEL CATFISH			C	F	2	4.0	0.84	6400	13.19	1600.0
77-002	BLACK CRAPPIE	I		C	S	2	4.0	0.84	320	0.66	80.0
77-010	ORANGESPOTTED SUNFISH	I		C	S	2	4.0	0.84	40	0.08	10.0
80-003	YELLOW PERCH			M		2	4.0	0.84	100	0.21	25.0
37-003	NORTHERN PIKE	P		M	F	1	2.0	0.42	1600	3.30	800.0
68-001	PIRATE PERCH	I		C		1	2.0	0.42	4	0.01	2.0
70-001	BROOK SILVERSIDE	I	M	M		1	2.0	0.42	2	0.00	1.0

No Species: 20 **Nat. Species:** 19 **Hybrids:** 0 **Total Counted:** 239 **Total Rel. Wt. :** 48526

IBI: 30.0 **MIwb:** 8.6

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

Site ID: River: 95-656 DesPlaines River RM: 106.60 Date: 08/10/2020

Time Fished: 1508 Distance: 0.500 Drainge (sq mi): 137.2 Depth: 0

Location: dst. Rosecrans Rd. Lat: 42.46483 Long: -87.94288

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
77-009	BLUEGILL SUNFISH	I	P	C	S	41	82.0	23.98	3000	10.58	36.5
43-043	BLUNTNOSE MINNOW	O	T	C	N	32	64.0	18.71	200	0.71	3.1
43-028	SPOTTAIL SHINER	I	P	M	N	19	38.0	11.11	260	0.92	6.8
77-013	PUMPKINSEED SUNFISH	I	P	C	S	19	38.0	11.11	800	2.82	21.0
77-006	LARGEMOUTH BASS	C		C	F	16	32.0	9.36	1480	5.22	46.2
20-003	GIZZARD SHAD	O		M		9	18.0	5.26	740	2.61	41.1
43-032	SPOTFIN SHINER	I		M	N	7	14.0	4.09	40	0.14	2.8
43-003	GOLDEN SHINER	I	T	M	N	6	12.0	3.51	160	0.56	13.3
77-008	GREEN SUNFISH	I	T	C	S	5	10.0	2.92	100	0.35	10.0
43-001	COMMON CARP	O	T	M	G	4	8.0	2.34	13000	45.87	1625.0
40-018	SPOTTED SUCKER	I		S	R	3	6.0	1.75	1000	3.53	166.6
37-003	NORTHERN PIKE	P		M	F	2	4.0	1.17	2800	9.88	700.0
77-002	BLACK CRAPPIE	I		C	S	2	4.0	1.17	260	0.92	65.0
80-014	JOHNNY DARTER	I		C	D	2	4.0	1.17	4	0.01	1.0
15-001	BOWFIN	P		C		1	2.0	0.58	1000	3.53	500.0
40-016	WHITE SUCKER	O	T	S	W	1	2.0	0.58	1800	6.35	900.0
47-002	CHANNEL CATFISH			C	F	1	2.0	0.58	1100	3.88	550.0
47-004	YELLOW BULLHEAD	I	T	C		1	2.0	0.58	600	2.12	300.0

No Species: 18 **Nat. Species:** 17 **Hybrids:** 0 **Total Counted:** 171 **Total Rel. Wt. :** 28344

IBI: 34.0 **MIwb:** 8.3

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

Site ID: River: 95-656 DesPlaines River RM: 106.60 Date: 09/29/2020

Time Fished: 1810 Distance: 0.500 Drainge (sq mi): 137.2 Depth: 0

Location: dst. Rosecrans Rd. Lat: 42.46483 Long: -87.94288

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
77-009	BLUEGILL SUNFISH	I	P	C	S	60	120.0	22.22	3800	10.02	31.6
20-003	GIZZARD SHAD	O		M		47	94.0	17.41	2860	7.54	30.4
77-013	PUMPKINSEED SUNFISH	I	P	C	S	34	68.0	12.59	1440	3.80	21.1
77-006	LARGEMOUTH BASS	C		C	F	28	56.0	10.37	3400	8.96	60.7
54-002	BLACKSTRIPE TOPMINNOW	I		M		21	42.0	7.78	60	0.16	1.4
43-043	BLUNTNOSE MINNOW	O	T	C	N	17	34.0	6.30	80	0.21	2.3
77-008	GREEN SUNFISH	I	T	C	S	15	30.0	5.56	120	0.32	4.0
43-032	SPOTFIN SHINER	I		M	N	14	28.0	5.19	40	0.11	1.4
43-028	SPOTTAIL SHINER	I	P	M	N	9	18.0	3.33	18	0.05	1.0
43-001	COMMON CARP	O	T	M	G	7	14.0	2.59	10740	28.31	767.1
40-018	SPOTTED SUCKER	I		S	R	4	8.0	1.48	4400	11.60	550.0
43-003	GOLDEN SHINER	I	T	M	N	4	8.0	1.48	20	0.05	2.5
15-001	BOWFIN	P		C		3	6.0	1.11	7600	20.03	1266.6
77-002	BLACK CRAPPIE	I		C	S	2	4.0	0.74	760	2.00	190.0
37-003	NORTHERN PIKE	P		M	F	1	2.0	0.37	1400	3.69	700.0
47-002	CHANNEL CATFISH			C	F	1	2.0	0.37	360	0.95	180.0
47-004	YELLOW BULLHEAD	I	T	C		1	2.0	0.37	600	1.58	300.0
47-006	BLACK BULLHEAD	I	P	C		1	2.0	0.37	240	0.63	120.0
70-001	BROOK SILVERSIDE	I	M	M		1	2.0	0.37	2	0.01	1.0

No Species: 19 **Nat. Species:** 18 **Hybrids:** 0 **Total Counted:** 270 **Total Rel. Wt. :** 37940

IBI: 36.0 **MIwb:** 9.0

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

Site ID: River: 95-656 DesPlaines River RM: 102.90 Date: 08/10/2020

Time Fished: 2122 Distance: 0.500 Drainge (sq mi): 145.5 Depth: 0

Location: Dst. Wadsworth Rd. Lat: 42.42856 Long: -87.93017

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
77-009	BLUEGILL SUNFISH	I	P	C	S	79	158.0	36.41	3800	7.38	24.0
77-013	PUMPKINSEED SUNFISH	I	P	C	S	53	106.0	24.42	2200	4.27	20.7
40-018	SPOTTED SUCKER	I		S	R	13	26.0	5.99	4640	9.01	178.4
43-003	GOLDEN SHINER	I	T	M	N	11	22.0	5.07	200	0.39	9.0
77-006	LARGEMOUTH BASS	C		C	F	10	20.0	4.61	2060	4.00	103.0
43-001	COMMON CARP	O	T	M	G	9	18.0	4.15	12000	23.31	666.6
43-043	BLUNTNOSE MINNOW	O	T	C	N	8	16.0	3.69	60	0.12	3.7
37-003	NORTHERN PIKE	P		M	F	5	10.0	2.30	10600	20.59	1060.0
15-001	BOWFIN	P		C		4	8.0	1.84	10080	19.58	1260.0
20-003	GIZZARD SHAD	O		M		4	8.0	1.84	400	0.78	50.0
77-008	GREEN SUNFISH	I	T	C	S	4	8.0	1.84	200	0.39	25.0
37-001	REDFIN PICKEREL	P	P	M		3	6.0	1.38	320	0.62	53.3
43-028	SPOTTAIL SHINER	I	P	M	N	3	6.0	1.38	20	0.04	3.3
77-007	WARMOUTH SUNFISH	C		C	S	3	6.0	1.38	800	1.55	133.3
80-003	YELLOW PERCH			M		3	6.0	1.38	180	0.35	30.0
77-010	ORANGESPOTTED SUNFISH	I		C	S	2	4.0	0.92	26	0.05	6.5
40-016	WHITE SUCKER	O	T	S	W	1	2.0	0.46	900	1.75	450.0
47-002	CHANNEL CATFISH			C	F	1	2.0	0.46	2400	4.66	1200.0
77-002	BLACK CRAPPIE	I		C	S	1	2.0	0.46	600	1.17	300.0

No Species: 19 **Nat. Species:** 18 **Hybrids:** 0 **Total Counted:** 217 **Total Rel. Wt. :** 51486

IBI: 38.0 **MIwb:** 8.9

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

Site ID: River: 95-656 DesPlaines River RM: 102.90 Date: 09/29/2020

Time Fished: 2255 Distance: 0.500 Drainge (sq mi): 145.5 Depth: 0

Location: Dst. Wadsworth Rd. Lat: 42.42856 Long: -87.93017

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
77-013	PUMPKINSEED SUNFISH	I	P	C	S	74	148.0	24.83	1440	1.53	9.7
77-009	BLUEGILL SUNFISH	I	P	C	S	59	118.0	19.80	1640	1.74	13.8
20-003	GIZZARD SHAD	O		M		47	94.0	15.77	6200	6.58	65.9
43-003	GOLDEN SHINER	I	T	M	N	27	54.0	9.06	180	0.19	3.3
77-006	LARGEMOUTH BASS	C		C	F	23	46.0	7.72	3320	3.53	72.1
54-002	BLACKSTRIPE TOPMINNOW	I		M		15	30.0	5.03	40	0.04	1.3
40-018	SPOTTED SUCKER	I		S	R	13	26.0	4.36	10120	10.75	389.2
43-001	COMMON CARP	O	T	M	G	9	18.0	3.02	28800	30.58	1600.0
15-001	BOWFIN	P		C		6	12.0	2.01	21000	22.30	1750.0
77-008	GREEN SUNFISH	I	T	C	S	6	12.0	2.01	160	0.17	13.3
47-002	CHANNEL CATFISH			C	F	4	8.0	1.34	14200	15.08	1775.0
43-043	BLUNTNOSE MINNOW	O	T	C	N	3	6.0	1.01	8	0.01	1.3
77-002	BLACK CRAPPIE	I		C	S	3	6.0	1.01	600	0.64	100.0
77-010	ORANGESPOTTED SUNFISH	I		C	S	3	6.0	1.01	46	0.05	7.6
37-003	NORTHERN PIKE	P		M	F	2	4.0	0.67	4200	4.46	1050.0
77-007	WARMOUTH SUNFISH	C		C	S	2	4.0	0.67	210	0.22	52.5
40-016	WHITE SUCKER	O	T	S	W	1	2.0	0.34	2000	2.12	1000.0
70-001	BROOK SILVERSIDE	I	M	M		1	2.0	0.34	2	0.00	1.0

No Species: 18 **Nat. Species:** 17 **Hybrids:** 0 **Total Counted:** 298 **Total Rel. Wt. :** 94166

IBI: 36.0 **MIwb:** 9.2

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

Site ID: River: 95-656 DesPlaines River RM: 99.72 Date: 10/01/2020

Time Fished: 2104 Distance: 0.450 Drainge (sq mi): 213.1 Depth: 0

Location: dst. Wetland Riffle Lat: 42.39609 Long: -87.92368

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
77-009	BLUEGILL SUNFISH	I	P	C	S	421	935.5	47.41	42995	27.34	45.9
43-043	BLUNTNOSE MINNOW	O	T	C	N	143	317.8	16.10	1333	0.85	4.1
77-013	PUMPKINSEED SUNFISH	I	P	C	S	76	168.9	8.56	4399	2.80	26.0
43-032	SPOTFIN SHINER	I		M	N	59	131.1	6.64	399	0.25	3.0
20-003	GIZZARD SHAD	O		M		33	73.3	3.72	2977	1.89	40.6
77-006	LARGEMOUTH BASS	C		C	F	33	73.3	3.72	16887	10.74	230.3
43-001	COMMON CARP	O	T	M	G	22	48.9	2.48	19109	12.15	390.9
40-016	WHITE SUCKER	O	T	S	W	12	26.7	1.35	9999	6.36	375.0
43-004	HORNYHEAD CHUB	I	I	N	N	12	26.7	1.35	666	0.42	25.0
80-003	YELLOW PERCH			M		9	20.0	1.01	777	0.49	38.8
77-007	WARMOUTH SUNFISH	C		C	S	8	17.8	0.90	666	0.42	37.5
77-008	GREEN SUNFISH	I	T	C	S	8	17.8	0.90	444	0.28	25.0
77-002	BLACK CRAPPIE	I		C	S	7	15.6	0.79	3021	1.92	194.2
15-001	BOWFIN	P		C		6	13.3	0.68	10043	6.39	753.3
37-003	NORTHERN PIKE	P		M	F	6	13.3	0.68	20042	12.74	1503.3
40-018	SPOTTED SUCKER	I		S	R	6	13.3	0.68	3777	2.40	283.3
43-003	GOLDEN SHINER	I	T	M	N	5	11.1	0.56	222	0.14	20.0
43-045	COMMON CARP X GOLDFISH	O	T		G	4	8.9	0.45	5555	3.53	625.0
43-028	SPOTTAIL SHINER	I	P	M	N	3	6.7	0.34	66	0.04	10.0
54-002	BLACKSTRIPE TOPMINNOW	I		M		2	4.4	0.23	6	0.00	1.5
74-006	YELLOW BASS	P	P	M		2	4.4	0.23	444	0.28	100.0
77-015	GREEN SF X BLUEGILL SF					2	4.4	0.23	244	0.16	55.0
80-011	LOGPERCH	I	M	S	D	2	4.4	0.23	44	0.03	10.0
40-004	SMALLMOUTH BUFFALO	I		M	C	1	2.2	0.11	7332	4.66	3300.0
47-002	CHANNEL CATFISH			C	F	1	2.2	0.11	3999	2.54	1800.0
47-004	YELLOW BULLHEAD	I	T	C		1	2.2	0.11	199	0.13	90.0
47-006	BLACK BULLHEAD	I	P	C		1	2.2	0.11	577	0.37	260.0
47-015	BROWN BH X BLACK BH	I		C		1	2.2	0.11	888	0.57	400.0
70-001	BROOK SILVERSIDE	I	M	M		1	2.2	0.11	2	0.00	1.0
77-029	BLUEGILL SF X WARMOUTH SF			C		1	2.2	0.11	133	0.08	60.0

No Species: 26 **Nat. Species:** 25 **Hybrids:** 4 **Total Counted:** 888 **Total Rel. Wt. :** 157259

IBI: 40.0 **MIwb:** 9.8

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

Site ID: River: 95-656 DesPlaines River RM: 99.30 Date: 08/15/2020

Time Fished: 2655 Distance: 0.500 Drainge (sq mi): 212.8 Depth: 0

Location: ust. Wetland Riffle Lat: 42.40099 Long: -87.92827

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
77-009	BLUEGILL SUNFISH	I	P	C	S	179	358.0	53.92	7200	10.64	20.1
43-003	GOLDEN SHINER	I	T	M	N	62	124.0	18.67	100	0.15	0.8
77-006	LARGEMOUTH BASS	C		C	F	29	58.0	8.73	3960	5.85	68.2
43-043	BLUNTNOSE MINNOW	O	T	C	N	12	24.0	3.61	20	0.03	0.8
20-003	GIZZARD SHAD	O		M		11	22.0	3.31	520	0.77	23.6
77-013	PUMPKINSEED SUNFISH	I	P	C	S	10	20.0	3.01	440	0.65	22.0
54-002	BLACKSTRIPE TOPMINNOW	I		M		6	12.0	1.81	10	0.01	0.8
15-001	BOWFIN	P		C		4	8.0	1.20	14000	20.69	1750.0
40-018	SPOTTED SUCKER	I		S	R	4	8.0	1.20	4080	6.03	510.0
43-001	COMMON CARP	O	T	M	G	4	8.0	1.20	18800	27.78	2350.0
43-032	SPOTFIN SHINER	I		M	N	3	6.0	0.90	12	0.02	2.0
47-002	CHANNEL CATFISH			C	F	3	6.0	0.90	15600	23.05	2600.0
40-016	WHITE SUCKER	O	T	S	W	1	2.0	0.30	2200	3.25	1100.0
70-001	BROOK SILVERSIDE	I	M	M		1	2.0	0.30	2	0.00	1.0
77-002	BLACK CRAPPIE	I		C	S	1	2.0	0.30	700	1.03	350.0
77-008	GREEN SUNFISH	I	T	C	S	1	2.0	0.30	20	0.03	10.0
77-010	ORANGESPOTTED SUNFISH	I		C	S	1	2.0	0.30	10	0.01	5.0

No Species: 17 **Nat. Species:** 16 **Hybrids:** 0 **Total Counted:** 332 **Total Rel. Wt. :** 67674

IBI: 38.0 **MIwb:** 8.5

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

Site ID: River: 95-656 DesPlaines River RM: 98.70 Date: 08/09/2020

Time Fished: 2914 Distance: 0.500 Drainge (sq mi): 220.2 Depth: 0

Location: ust. Skokie Hwy Lat: 42.38319 Long: -87.91460

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
77-009	BLUEGILL SUNFISH	I	P	C	S	145	290.0	28.43	7580	11.15	26.1
43-043	BLUNTNOSE MINNOW	O	T	C	N	122	244.0	23.92	620	0.91	2.5
77-013	PUMPKINSEED SUNFISH	I	P	C	S	53	106.0	10.39	3100	4.56	29.2
77-006	LARGEMOUTH BASS	C		C	F	36	72.0	7.06	8640	12.71	120.0
43-032	SPOTFIN SHINER	I		M	N	28	56.0	5.49	136	0.20	2.4
43-004	HORNYHEAD CHUB	I	I	N	N	17	34.0	3.33	440	0.65	12.9
77-008	GREEN SUNFISH	I	T	C	S	13	26.0	2.55	600	0.88	23.0
80-003	YELLOW PERCH			M		11	22.0	2.16	1200	1.77	54.5
77-002	BLACK CRAPPIE	I		C	S	10	20.0	1.96	1340	1.97	67.0
40-016	WHITE SUCKER	O	T	S	W	9	18.0	1.76	1860	2.74	103.3
47-004	YELLOW BULLHEAD	I	T	C		9	18.0	1.76	3900	5.74	216.6
40-018	SPOTTED SUCKER	I		S	R	8	16.0	1.57	1500	2.21	93.7
80-005	BLACKSIDE DARTER	I		S	D	8	16.0	1.57	106	0.16	6.6
37-003	NORTHERN PIKE	P		M	F	5	10.0	0.98	6000	8.83	600.0
54-002	BLACKSTRIPE TOPMINNOW	I		M		5	10.0	0.98	22	0.03	2.2
77-003	ROCK BASS	C		C	S	5	10.0	0.98	1800	2.65	180.0
77-007	WARMOUTH SUNFISH	C		C	S	5	10.0	0.98	440	0.65	44.0
20-003	GIZZARD SHAD	O		M		4	8.0	0.78	140	0.21	17.5
43-001	COMMON CARP	O	T	M	G	4	8.0	0.78	9000	13.24	1125.0
47-002	CHANNEL CATFISH			C	F	3	6.0	0.59	12000	17.66	2000.0
77-029	BLUEGILL SF X WARMOUTH SF			C		3	6.0	0.59	260	0.38	43.3
15-001	BOWFIN	P		C		2	4.0	0.39	4900	7.21	1225.0
47-006	BLACK BULLHEAD	I	P	C		2	4.0	0.39	900	1.32	225.0
43-003	GOLDEN SHINER	I	T	M	N	1	2.0	0.20	80	0.12	40.0
43-045	COMMON CARP X GOLDFISH	O	T		G	1	2.0	0.20	1400	2.06	700.0
70-001	BROOK SILVERSIDE	I	M	M		1	2.0	0.20	2	0.00	1.0

No Species: 24 **Nat. Species:** 23 **Hybrids:** 2 **Total Counted:** 510 **Total Rel. Wt. :** 67966

IBI: 38.0 **MIwb:** 10.0

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

Site ID: River: 95-656 DesPlaines River RM: 98.70 Date: 09/27/2020

Time Fished: 2549 Distance: 0.500 Drainge (sq mi): 220.2 Depth: 0

Location: ust. Skokie Hwy Lat: 42.38319 Long: -87.91460

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
43-043	BLUNTNOSE MINNOW	O	T	C	N	282	564.0	37.15	1600	1.82	2.8
77-009	BLUEGILL SUNFISH	I	P	C	S	151	302.0	19.89	11100	12.64	36.7
20-003	GIZZARD SHAD	O		M		48	96.0	6.32	2700	3.08	28.1
77-006	LARGEMOUTH BASS	C		C	F	47	94.0	6.19	15460	17.61	164.4
77-013	PUMPKINSEED SUNFISH	I	P	C	S	46	92.0	6.06	2160	2.46	23.4
43-032	SPOTFIN SHINER	I		M	N	45	90.0	5.93	200	0.23	2.2
40-016	WHITE SUCKER	O	T	S	W	27	54.0	3.56	16500	18.79	305.5
40-018	SPOTTED SUCKER	I		S	R	27	54.0	3.56	9420	10.73	174.4
43-004	HORNYHEAD CHUB	I	I	N	N	17	34.0	2.24	700	0.80	20.5
80-003	YELLOW PERCH			M		12	24.0	1.58	1420	1.62	59.1
37-003	NORTHERN PIKE	P		M	F	11	22.0	1.45	17840	20.32	810.9
77-003	ROCK BASS	C		C	S	8	16.0	1.05	3360	3.83	210.0
43-003	GOLDEN SHINER	I	T	M	N	6	12.0	0.79	340	0.39	28.3
47-004	YELLOW BULLHEAD	I	T	C		6	12.0	0.79	2300	2.62	191.6
77-002	BLACK CRAPPIE	I		C	S	6	12.0	0.79	1220	1.39	101.6
77-008	GREEN SUNFISH	I	T	C	S	6	12.0	0.79	460	0.52	38.3
80-005	BLACKSIDE DARTER	I		S	D	3	6.0	0.40	30	0.03	5.0
43-001	COMMON CARP	O	T	M	G	2	4.0	0.26	400	0.46	100.0
43-028	SPOTTAIL SHINER	I	P	M	N	2	4.0	0.26	16	0.02	4.0
47-002	CHANNEL CATFISH			C	F	2	4.0	0.26	40	0.05	10.0
10-004	LONGNOSE GAR	P		M		1	2.0	0.13	200	0.23	100.0
47-006	BLACK BULLHEAD	I	P	C		1	2.0	0.13	180	0.21	90.0
77-007	WARMOUTH SUNFISH	C		C	S	1	2.0	0.13	100	0.11	50.0
77-015	GREEN SF X BLUEGILL SF					1	2.0	0.13	40	0.05	20.0
80-011	LOGPERCH	I	M	S	D	1	2.0	0.13	12	0.01	6.0

No Species: 24 **Nat. Species:** 23 **Hybrids:** 1 **Total Counted:** 759 **Total Rel. Wt. :** 87798

IBI: 32.0 **MIwb:** 9.8

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

Site ID: River: 95-656 DesPlaines River RM: 96.82 Date: 08/13/2020

Time Fished: 2845 Distance: 0.500 Drainge (sq mi): 225.3 Depth: 0

Location: dst. McClare Ave. Lat: 42.36964 Long: -87.91836

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
43-032	SPOTFIN SHINER	I		M	N	56	112.0	28.43	280	0.72	2.5
77-009	BLUEGILL SUNFISH	I	P	C	S	44	88.0	22.34	3500	9.03	39.7
40-016	WHITE SUCKER	O	T	S	W	12	24.0	6.09	16400	42.31	683.3
43-004	HORNYHEAD CHUB	I	I	N	N	12	24.0	6.09	360	0.93	15.0
43-043	BLUNTNOSE MINNOW	O	T	C	N	12	24.0	6.09	120	0.31	5.0
77-006	LARGEMOUTH BASS	C		C	F	9	18.0	4.57	3500	9.03	194.4
77-013	PUMPKINSEED SUNFISH	I	P	C	S	9	18.0	4.57	300	0.77	16.6
20-003	GIZZARD SHAD	O		M		8	16.0	4.06	160	0.41	10.0
54-002	BLACKSTRIPE TOPMINNOW	I		M		8	16.0	4.06	30	0.08	1.8
43-003	GOLDEN SHINER	I	T	M	N	6	12.0	3.05	160	0.41	13.3
43-001	COMMON CARP	O	T	M	G	4	8.0	2.03	9200	23.74	1150.0
77-008	GREEN SUNFISH	I	T	C	S	4	8.0	2.03	100	0.26	12.5
80-003	YELLOW PERCH			M		4	8.0	2.03	440	1.14	55.0
77-002	BLACK CRAPPIE	I		C	S	3	6.0	1.52	360	0.93	60.0
43-045	COMMON CARP X GOLDFISH	O	T		G	2	4.0	1.02	3400	8.77	850.0
40-018	SPOTTED SUCKER	I		S	R	1	2.0	0.51	440	1.14	220.0
43-028	SPOTTAIL SHINER	I	P	M	N	1	2.0	0.51	6	0.02	3.0
43-117	CARMINE SHINER	I	I	S	N	1	2.0	0.51	4	0.01	2.0
80-005	BLACKSIDE DARTER	I		S	D	1	2.0	0.51	0	0.00	0.0

No Species: 18 **Nat. Species:** 17 **Hybrids:** 1 **Total Counted:** 197 **Total Rel. Wt. :** 38760

IBI: 34.0 **MIwb:** 7.7

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

Site ID: River: 95-656 DesPlaines River RM: 96.82 Date: 09/28/2020

Time Fished: 2094 Distance: 0.500 Drainge (sq mi): 225.3 Depth: 0

Location: dst. McClare Ave. Lat: 42.36964 Long: -87.91836

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
43-032	SPOTFIN SHINER	I		M	N	94	188.0	24.93	600	0.52	3.1
43-004	HORNYHEAD CHUB	I	I	N	N	50	100.0	13.26	2640	2.28	26.4
77-009	BLUEGILL SUNFISH	I	P	C	S	50	100.0	13.26	5800	5.01	58.0
43-043	BLUNTNOSE MINNOW	O	T	C	N	44	88.0	11.67	380	0.33	4.3
40-016	WHITE SUCKER	O	T	S	W	43	86.0	11.41	43180	37.30	502.0
77-006	LARGEMOUTH BASS	C		C	F	25	50.0	6.63	9500	8.21	190.0
20-003	GIZZARD SHAD	O		M		14	28.0	3.71	640	0.55	22.8
37-003	NORTHERN PIKE	P		M	F	9	18.0	2.39	17760	15.34	986.6
40-018	SPOTTED SUCKER	I		S	R	7	14.0	1.86	8820	7.62	630.0
54-002	BLACKSTRIPE TOPMINNOW	I		M		7	14.0	1.86	20	0.02	1.4
77-008	GREEN SUNFISH	I	T	C	S	7	14.0	1.86	160	0.14	11.4
77-013	PUMPKINSEED SUNFISH	I	P	C	S	6	12.0	1.59	260	0.22	21.6
43-001	COMMON CARP	O	T	M	G	4	8.0	1.06	18420	15.91	2302.5
80-003	YELLOW PERCH			M		3	6.0	0.80	600	0.52	100.0
80-005	BLACKSIDE DARTER	I		S	D	3	6.0	0.80	60	0.05	10.0
47-004	YELLOW BULLHEAD	I	T	C		2	4.0	0.53	700	0.60	175.0
77-002	BLACK CRAPPIE	I		C	S	2	4.0	0.53	260	0.22	65.0
80-011	LOGPERCH	I	M	S	D	2	4.0	0.53	120	0.10	30.0
37-001	REDFIN PICKEREL	P	P	M		1	2.0	0.27	120	0.10	60.0
43-045	COMMON CARP X GOLDFISH	O	T		G	1	2.0	0.27	2800	2.42	1400.0
47-008	STONECAT MADTOM	I	I	C		1	2.0	0.27	60	0.05	30.0
77-003	ROCK BASS	C		C	S	1	2.0	0.27	460	0.40	230.0
80-002	WALLEYE	P		S	F	1	2.0	0.27	2400	2.07	1200.0

No Species: 22 **Nat. Species:** 21 **Hybrids:** 1 **Total Counted:** 377 **Total Rel. Wt. :** 115760

IBI: 38.0 **MIwb:** 9.3

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

Site ID: River: 95-656 DesPlaines River RM: 94.20 Date: 08/13/2020

Time Fished: 2469 Distance: 0.500 Drainge (sq mi): 232.0 Depth: 0

Location: dst. Belvidere Rd. Lat: 42.34355 Long: -87.94106

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
77-009	BLUEGILL SUNFISH	I	P	C	S	50	100.0	26.32	3500	5.34	35.0
43-032	SPOTFIN SHINER	I		M	N	21	42.0	11.05	100	0.15	2.3
43-004	HORNYHEAD CHUB	I	I	N	N	18	36.0	9.47	780	1.19	21.6
40-016	WHITE SUCKER	O	T	S	W	17	34.0	8.95	23460	35.79	690.0
77-006	LARGEMOUTH BASS	C		C	F	16	32.0	8.42	3880	5.92	121.2
43-043	BLUNTNOSE MINNOW	O	T	C	N	15	30.0	7.89	100	0.15	3.3
43-003	GOLDEN SHINER	I	T	M	N	11	22.0	5.79	120	0.18	5.4
77-013	PUMPKINSEED SUNFISH	I	P	C	S	9	18.0	4.74	300	0.46	16.6
77-008	GREEN SUNFISH	I	T	C	S	8	16.0	4.21	260	0.40	16.2
40-018	SPOTTED SUCKER	I		S	R	4	8.0	2.11	7700	11.75	962.5
20-003	GIZZARD SHAD	O		M		3	6.0	1.58	60	0.09	10.0
37-003	NORTHERN PIKE	P		M	F	3	6.0	1.58	14200	21.66	2366.6
47-004	YELLOW BULLHEAD	I	T	C		2	4.0	1.05	740	1.13	185.0
77-003	ROCK BASS	C		C	S	2	4.0	1.05	1080	1.65	270.0
80-003	YELLOW PERCH			M		2	4.0	1.05	120	0.18	30.0
37-001	REDFIN PICKEREL	P	P	M		1	2.0	0.53	40	0.06	20.0
43-028	SPOTTAIL SHINER	I	P	M	N	1	2.0	0.53	8	0.01	4.0
43-042	FATHEAD MINNOW	O	T	C	N	1	2.0	0.53	6	0.01	3.0
47-002	CHANNEL CATFISH			C	F	1	2.0	0.53	4200	6.41	2100.0
77-002	BLACK CRAPPIE	I		C	S	1	2.0	0.53	180	0.27	90.0
77-007	WARMOUTH SUNFISH	C		C	S	1	2.0	0.53	70	0.11	35.0
80-002	WALLEYE	P		S	F	1	2.0	0.53	4600	7.02	2300.0
80-005	BLACKSIDE DARTER	I		S	D	1	2.0	0.53	20	0.03	10.0
80-011	LOGPERCH	I	M	S	D	1	2.0	0.53	30	0.05	15.0

No Species: 24 **Nat. Species:** 24 **Hybrids:** 0 **Total Counted:** 190 **Total Rel. Wt. :** 65554

IBI: 36.0 **MIwb:** 9.1

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

Site ID: River: 95-656 DesPlaines River RM: 94.20 Date: 09/28/2020

Time Fished: 2542 Distance: 0.500 Drainge (sq mi): 232.0 Depth: 0

Location: dst. Belvidere Rd. Lat: 42.34355 Long: -87.94106

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
43-004	HORNYHEAD CHUB	I	I	N	N	86	172.0	19.59	3400	2.45	19.7
77-009	BLUEGILL SUNFISH	I	P	C	S	81	162.0	18.45	7600	5.48	46.9
43-032	SPOTFIN SHINER	I		M	N	57	114.0	12.98	300	0.22	2.6
43-043	BLUNTNOSE MINNOW	O	T	C	N	44	88.0	10.02	440	0.32	5.0
40-016	WHITE SUCKER	O	T	S	W	42	84.0	9.57	55480	40.04	660.4
77-006	LARGEMOUTH BASS	C		C	F	33	66.0	7.52	3340	2.41	50.6
43-003	GOLDEN SHINER	I	T	M	N	15	30.0	3.42	120	0.09	4.0
54-002	BLACKSTRIPE TOPMINNOW	I		M		14	28.0	3.19	60	0.04	2.1
37-003	NORTHERN PIKE	P		M	F	7	14.0	1.59	11200	8.08	800.0
40-018	SPOTTED SUCKER	I		S	R	7	14.0	1.59	13600	9.81	971.4
43-001	COMMON CARP	O	T	M	G	7	14.0	1.59	26500	19.12	1892.8
43-028	SPOTTAIL SHINER	I	P	M	N	5	10.0	1.14	60	0.04	6.0
77-013	PUMPKINSEED SUNFISH	I	P	C	S	5	10.0	1.14	200	0.14	20.0
80-005	BLACKSIDE DARTER	I		S	D	5	10.0	1.14	100	0.07	10.0
47-004	YELLOW BULLHEAD	I	T	C		4	8.0	0.91	1500	1.08	187.5
77-002	BLACK CRAPPIE	I		C	S	4	8.0	0.91	1140	0.82	142.5
77-008	GREEN SUNFISH	I	T	C	S	4	8.0	0.91	120	0.09	15.0
37-001	REDFIN PICKEREL	P	P	M		3	6.0	0.68	140	0.10	23.3
77-003	ROCK BASS	C		C	S	3	6.0	0.68	660	0.48	110.0
80-003	YELLOW PERCH			M		3	6.0	0.68	160	0.12	26.6
80-011	LOGPERCH	I	M	S	D	3	6.0	0.68	140	0.10	23.3
74-006	YELLOW BASS	P	P	M		2	4.0	0.46	40	0.03	10.0
37-004	MUSKELLUNGE	P		M	F	1	2.0	0.23	9400	6.78	4700.0
43-026	COMMON SHINER	I		S	N	1	2.0	0.23	4	0.00	2.0
43-045	COMMON CARP X GOLDFISH	O	T		G	1	2.0	0.23	2100	1.52	1050.0
77-004	SMALLMOUTH BASS	C	M	C	F	1	2.0	0.23	720	0.52	360.0
77-015	GREEN SF X BLUEGILL SF					1	2.0	0.23	40	0.03	20.0

No Species: 25 **Nat. Species:** 24 **Hybrids:** 2 **Total Counted:** 439 **Total Rel. Wt. :** 138564

IBI: 40.0 **MIwb:** 9.6

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

Site ID: River: 95-656 DesPlaines River RM: 90.60 Date: 08/13/2020

Time Fished: 2573 Distance: 0.500 Drainge (sq mi): 253.7 Depth: 0

Location: dst. Buckley Rd. Lat: 42.30568 Long: -87.95461

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
77-009	BLUEGILL SUNFISH	I	P	C	S	56	112.0	28.72	5100	6.69	45.5
43-004	HORNYHEAD CHUB	I	I	N	N	27	54.0	13.85	1000	1.31	18.5
77-006	LARGEMOUTH BASS	C		C	F	26	52.0	13.33	4600	6.04	88.4
43-043	BLUNTNOSE MINNOW	O	T	C	N	15	30.0	7.69	120	0.16	4.0
43-032	SPOTFIN SHINER	I		M	N	12	24.0	6.15	60	0.08	2.5
40-016	WHITE SUCKER	O	T	S	W	10	20.0	5.13	15340	20.13	767.0
20-003	GIZZARD SHAD	O		M		6	12.0	3.08	140	0.18	11.6
77-013	PUMPKINSEED SUNFISH	I	P	C	S	6	12.0	3.08	300	0.39	25.0
54-002	BLACKSTRIPE TOPMINNOW	I		M		5	10.0	2.56	20	0.03	2.0
47-002	CHANNEL CATFISH			C	F	4	8.0	2.05	8942	11.73	1117.7
80-003	YELLOW PERCH			M		4	8.0	2.05	280	0.37	35.0
43-001	COMMON CARP	O	T	M	G	3	6.0	1.54	29600	38.83	4933.3
43-028	SPOTTAIL SHINER	I	P	M	N	3	6.0	1.54	40	0.05	6.6
43-117	CARMINE SHINER	I	I	S	N	3	6.0	1.54	10	0.01	1.6
47-004	YELLOW BULLHEAD	I	T	C		3	6.0	1.54	1100	1.44	183.3
40-018	SPOTTED SUCKER	I		S	R	2	4.0	1.03	2800	3.67	700.0
77-002	BLACK CRAPPIE	I		C	S	2	4.0	1.03	320	0.42	80.0
77-008	GREEN SUNFISH	I	T	C	S	2	4.0	1.03	140	0.18	35.0
10-004	LONGNOSE GAR	P		M		1	2.0	0.51	40	0.05	20.0
37-003	NORTHERN PIKE	P		M	F	1	2.0	0.51	4800	6.30	2400.0
43-003	GOLDEN SHINER	I	T	M	N	1	2.0	0.51	20	0.03	10.0
43-045	COMMON CARP X GOLDFISH	O	T		G	1	2.0	0.51	1400	1.84	700.0
77-015	GREEN SF X BLUEGILL SF					1	2.0	0.51	30	0.04	15.0
80-011	LOGPERCH	I	M	S	D	1	2.0	0.51	20	0.03	10.0

No Species: 22 **Nat. Species:** 21 **Hybrids:** 2 **Total Counted:** 195 **Total Rel. Wt. :** 76222

IBI: 40.0 **MIwb:** 8.7

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

Site ID: River: 95-656 DesPlaines River RM: 90.60 Date: 09/28/2020

Time Fished: 2411 Distance: 0.500 Drainge (sq mi): 253.7 Depth: 0

Location: dst. Buckley Rd. Lat: 42.30568 Long: -87.95461

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
77-009	BLUEGILL SUNFISH	I	P	C	S	107	214.0	26.88	12200	10.72	57.0
43-004	HORNYHEAD CHUB	I	I	N	N	66	132.0	16.58	2620	2.30	19.8
43-043	BLUNTNOSE MINNOW	O	T	C	N	64	128.0	16.08	280	0.25	2.1
40-016	WHITE SUCKER	O	T	S	W	35	70.0	8.79	43880	38.55	626.8
77-006	LARGEMOUTH BASS	C		C	F	25	50.0	6.28	10160	8.93	203.2
43-032	SPOTFIN SHINER	I		M	N	21	42.0	5.28	160	0.14	3.8
80-005	BLACKSIDE DARTER	I		S	D	10	20.0	2.51	140	0.12	7.0
43-028	SPOTTAIL SHINER	I	P	M	N	8	16.0	2.01	80	0.07	5.0
47-004	YELLOW BULLHEAD	I	T	C		7	14.0	1.76	2000	1.76	142.8
80-014	JOHNNY DARTER	I		C	D	7	14.0	1.76	20	0.02	1.4
43-003	GOLDEN SHINER	I	T	M	N	6	12.0	1.51	240	0.21	20.0
77-002	BLACK CRAPPIE	I		C	S	6	12.0	1.51	420	0.37	35.0
77-008	GREEN SUNFISH	I	T	C	S	5	10.0	1.26	140	0.12	14.0
80-003	YELLOW PERCH			M		5	10.0	1.26	340	0.30	34.0
37-003	NORTHERN PIKE	P		M	F	3	6.0	0.75	2240	1.97	373.3
40-018	SPOTTED SUCKER	I		S	R	3	6.0	0.75	6800	5.97	1133.3
43-001	COMMON CARP	O	T	M	G	3	6.0	0.75	26800	23.55	4466.6
47-008	STONECAT MADTOM	I	I	C		3	6.0	0.75	200	0.18	33.3
54-002	BLACKSTRIPE TOPMINNOW	I		M		3	6.0	0.75	10	0.01	1.6
77-003	ROCK BASS	C		C	S	3	6.0	0.75	1200	1.05	200.0
80-011	LOGPERCH	I	M	S	D	3	6.0	0.75	120	0.11	20.0
77-013	PUMPKINSEED SUNFISH	I	P	C	S	2	4.0	0.50	300	0.26	75.0
43-045	COMMON CARP X GOLDFISH	O	T		G	1	2.0	0.25	3400	2.99	1700.0
43-117	CARMINE SHINER	I	I	S	N	1	2.0	0.25	4	0.00	2.0
77-015	GREEN SF X BLUEGILL SF					1	2.0	0.25	60	0.05	30.0

No Species: 23 **Nat. Species:** 22 **Hybrids:** 2 **Total Counted:** 398 **Total Rel. Wt. :** 113814

IBI: 38.0 **MIwb:** 9.1

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

Site ID: River: 95-656 DesPlaines River RM: 87.10 Date: 08/15/2020

Time Fished: 2829 Distance: 0.500 Drainge (sq mi): 261.4 Depth: 0

Location: dst. Rockland Rd. Lat: 42.27644 Long: -87.93922

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
77-009	BLUEGILL SUNFISH	I	P	C	S	54	108.0	22.88	3260	7.63	30.1
43-032	SPOTFIN SHINER	I		M	N	40	80.0	16.95	300	0.70	3.7
43-043	BLUNTNOSE MINNOW	O	T	C	N	34	68.0	14.41	220	0.52	3.2
43-004	HORNYHEAD CHUB	I	I	N	N	26	52.0	11.02	840	1.97	16.1
77-006	LARGEMOUTH BASS	C		C	F	19	38.0	8.05	2720	6.37	71.5
40-016	WHITE SUCKER	O	T	S	W	15	30.0	6.36	23200	54.33	773.3
77-008	GREEN SUNFISH	I	T	C	S	8	16.0	3.39	260	0.61	16.2
37-003	NORTHERN PIKE	P		M	F	6	12.0	2.54	4360	10.21	363.3
54-002	BLACKSTRIPE TOPMINNOW	I		M		6	12.0	2.54	20	0.05	1.6
40-018	SPOTTED SUCKER	I		S	R	3	6.0	1.27	4400	10.30	733.3
43-003	GOLDEN SHINER	I	T	M	N	3	6.0	1.27	10	0.02	1.6
77-013	PUMPKINSEED SUNFISH	I	P	C	S	3	6.0	1.27	80	0.19	13.3
80-003	YELLOW PERCH			M		3	6.0	1.27	300	0.70	50.0
10-004	LONGNOSE GAR	P		M		2	4.0	0.85	40	0.09	10.0
20-003	GIZZARD SHAD	O		M		2	4.0	0.85	100	0.23	25.0
43-028	SPOTTAIL SHINER	I	P	M	N	2	4.0	0.85	10	0.02	2.5
43-117	CARMINE SHINER	I	I	S	N	2	4.0	0.85	6	0.01	1.5
80-005	BLACKSIDE DARTER	I		S	D	2	4.0	0.85	30	0.07	7.5
43-034	SAND SHINER	I	M	M	N	1	2.0	0.42	4	0.01	2.0
47-004	YELLOW BULLHEAD	I	T	C		1	2.0	0.42	460	1.08	230.0
77-003	ROCK BASS	C		C	S	1	2.0	0.42	20	0.05	10.0
77-004	SMALLMOUTH BASS	C	M	C	F	1	2.0	0.42	2000	4.68	1000.0
77-010	ORANGESPOTTED SUNFISH	I		C	S	1	2.0	0.42	40	0.09	20.0
77-015	GREEN SF X BLUEGILL SF					1	2.0	0.42	20	0.05	10.0
43-001	COMMON CARP	O	T	M	G	0	0.0	0.00	0	0.00	*****.*

No Species: 24 **Nat. Species:** 23 **Hybrids:** 1 **Total Counted:** 236 **Total Rel. Wt. :** 42700

IBI: 40.0 **MIwb:** 8.5

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

Site ID: River: 95-656 DesPlaines River RM: 87.10 Date: 09/30/2020

Time Fished: 2376 Distance: 0.500 Drainge (sq mi): 261.4 Depth: 0

Location: dst. Rockland Rd. Lat: 42.27644 Long: -87.93922

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
43-043	BLUNTNOSE MINNOW	O	T	C	N	89	178.0	22.70	600	1.69	3.3
43-032	SPOTFIN SHINER	I		M	N	82	164.0	20.92	520	1.47	3.1
77-009	BLUEGILL SUNFISH	I	P	C	S	58	116.0	14.80	6000	16.94	51.7
43-004	HORNYHEAD CHUB	I	I	N	N	43	86.0	10.97	1100	3.11	12.7
77-006	LARGEMOUTH BASS	C		C	F	19	38.0	4.85	4700	13.27	123.6
77-008	GREEN SUNFISH	I	T	C	S	17	34.0	4.34	600	1.69	17.6
80-005	BLACKSIDE DARTER	I		S	D	15	30.0	3.83	160	0.45	5.3
40-016	WHITE SUCKER	O	T	S	W	13	26.0	3.32	3920	11.07	150.7
43-117	CARMINE SHINER	I	I	S	N	10	20.0	2.55	60	0.17	3.0
43-028	SPOTTAIL SHINER	I	P	M	N	8	16.0	2.04	100	0.28	6.2
80-011	LOGPERCH	I	M	S	D	6	12.0	1.53	240	0.68	20.0
43-034	SAND SHINER	I	M	M	N	5	10.0	1.28	16	0.05	1.6
47-004	YELLOW BULLHEAD	I	T	C		5	10.0	1.28	1400	3.95	140.0
43-001	COMMON CARP	O	T	M	G	4	8.0	1.02	5600	15.81	700.0
43-044	CENTRAL STONEROLLER	H		N	N	3	6.0	0.77	60	0.17	10.0
43-003	GOLDEN SHINER	I	T	M	N	2	4.0	0.51	8	0.02	2.0
47-008	STONECAT MADTOM	I	I	C		2	4.0	0.51	60	0.17	15.0
77-004	SMALLMOUTH BASS	C	M	C	F	2	4.0	0.51	2200	6.21	550.0
77-013	PUMPKINSEED SUNFISH	I	P	C	S	2	4.0	0.51	60	0.17	15.0
80-014	JOHNNY DARTER	I		C	D	2	4.0	0.51	4	0.01	1.0
37-003	NORTHERN PIKE	P		M	F	1	2.0	0.26	4800	13.55	2400.0
40-018	SPOTTED SUCKER	I		S	R	1	2.0	0.26	2800	7.91	1400.0
43-026	COMMON SHINER	I		S	N	1	2.0	0.26	6	0.02	3.0
77-003	ROCK BASS	C		C	S	1	2.0	0.26	380	1.07	190.0
80-003	YELLOW PERCH			M		1	2.0	0.26	20	0.06	10.0

No Species: 25 **Nat. Species:** 24 **Hybrids:** 0 **Total Counted:** 392 **Total Rel. Wt. :** 35414

IBI: 38.0 **MIwb:** 9.1

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

Site ID: River: 95-656 DesPlaines River RM: 84.60 Date: 08/12/2020

Time Fished: 2738 Distance: 0.500 Drainge (sq mi): 266.4 Depth: 0

Location: ust. Dam site Lat: 42.25084 Long: -87.93958

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
77-009	BLUEGILL SUNFISH	I	P	C	S	39	78.0	15.73	2100	2.53	26.9
43-032	SPOTFIN SHINER	I		M	N	28	56.0	11.29	200	0.24	3.5
40-016	WHITE SUCKER	O	T	S	W	27	54.0	10.89	34020	40.96	630.0
43-004	HORNYHEAD CHUB	I	I	N	N	25	50.0	10.08	900	1.08	18.0
43-043	BLUNTNOSE MINNOW	O	T	C	N	21	42.0	8.47	140	0.17	3.3
43-028	SPOTTAIL SHINER	I	P	M	N	13	26.0	5.24	120	0.14	4.6
43-034	SAND SHINER	I	M	M	N	13	26.0	5.24	100	0.12	3.8
77-006	LARGEMOUTH BASS	C		C	F	13	26.0	5.24	5196	6.26	199.8
77-013	PUMPKINSEED SUNFISH	I	P	C	S	13	26.0	5.24	960	1.16	36.9
43-001	COMMON CARP	O	T	M	G	9	18.0	3.63	26600	32.03	1477.7
43-003	GOLDEN SHINER	I	T	M	N	8	16.0	3.23	180	0.22	11.2
77-008	GREEN SUNFISH	I	T	C	S	8	16.0	3.23	220	0.26	13.7
80-011	LOGPERCH	I	M	S	D	6	12.0	2.42	280	0.34	23.3
20-003	GIZZARD SHAD	O		M		4	8.0	1.61	160	0.19	20.0
43-117	CARMINE SHINER	I	I	S	N	3	6.0	1.21	20	0.02	3.3
10-004	LONGNOSE GAR	P		M		2	4.0	0.81	120	0.14	30.0
47-002	CHANNEL CATFISH			C	F	2	4.0	0.81	8200	9.87	2050.0
77-002	BLACK CRAPPIE	I		C	S	2	4.0	0.81	460	0.55	115.0
77-004	SMALLMOUTH BASS	C	M	C	F	2	4.0	0.81	16	0.02	4.0
80-005	BLACKSIDE DARTER	I		S	D	2	4.0	0.81	20	0.02	5.0
80-014	JOHNNY DARTER	I		C	D	2	4.0	0.81	4	0.00	1.0
37-003	NORTHERN PIKE	P		M	F	1	2.0	0.40	1200	1.44	600.0
40-018	SPOTTED SUCKER	I		S	R	1	2.0	0.40	520	0.63	260.0
43-026	COMMON SHINER	I		S	N	1	2.0	0.40	30	0.04	15.0
43-045	COMMON CARP X GOLDFISH	O	T		G	1	2.0	0.40	1000	1.20	500.0
54-002	BLACKSTRIPE TOPMINNOW	I		M		1	2.0	0.40	2	0.00	1.0
77-015	GREEN SF X BLUEGILL SF					1	2.0	0.40	280	0.34	140.0

No Species: 25 **Nat. Species:** 24 **Hybrids:** 2 **Total Counted:** 248 **Total Rel. Wt. :** 83048

IBI: 36.0 **MIwb:** 8.4

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

Site ID: River: 95-656 DesPlaines River RM: 84.60 Date: 09/30/2020

Time Fished: 2752 Distance: 0.500 Drainge (sq mi): 266.4 Depth: 0

Location: ust. Dam site Lat: 42.25084 Long: -87.93958

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
43-028	SPOTTAIL SHINER	I	P	M	N	65	130.0	16.84	600	0.48	4.6
43-004	HORNYHEAD CHUB	I	I	N	N	51	102.0	13.21	1800	1.44	17.6
43-043	BLUNTNOSE MINNOW	O	T	C	N	47	94.0	12.18	460	0.37	4.8
43-032	SPOTFIN SHINER	I		M	N	40	80.0	10.36	280	0.22	3.5
77-009	BLUEGILL SUNFISH	I	P	C	S	26	52.0	6.74	2780	2.22	53.4
77-006	LARGEMOUTH BASS	C		C	F	25	50.0	6.48	15300	12.20	306.0
80-011	LOGPERCH	I	M	S	D	25	50.0	6.48	1080	0.86	21.6
40-016	WHITE SUCKER	O	T	S	W	23	46.0	5.96	19860	15.83	431.7
43-001	COMMON CARP	O	T	M	G	19	38.0	4.92	33000	26.31	868.4
43-003	GOLDEN SHINER	I	T	M	N	15	30.0	3.89	100	0.08	3.3
47-002	CHANNEL CATFISH			C	F	9	18.0	2.33	30610	24.41	1700.5
77-008	GREEN SUNFISH	I	T	C	S	9	18.0	2.33	380	0.30	21.1
80-005	BLACKSIDE DARTER	I		S	D	9	18.0	2.33	100	0.08	5.5
43-117	CARMINE SHINER	I	I	S	N	6	12.0	1.55	60	0.05	5.0
37-003	NORTHERN PIKE	P		M	F	3	6.0	0.78	8600	6.86	1433.3
40-018	SPOTTED SUCKER	I		S	R	3	6.0	0.78	6600	5.26	1100.0
43-034	SAND SHINER	I	M	M	N	3	6.0	0.78	20	0.02	3.3
47-004	YELLOW BULLHEAD	I	T	C		2	4.0	0.52	540	0.43	135.0
77-004	SMALLMOUTH BASS	C	M	C	F	2	4.0	0.52	2020	1.61	505.0
80-003	YELLOW PERCH			M		2	4.0	0.52	500	0.40	125.0
47-008	STONECAT MADTOM	I	I	C		1	2.0	0.26	10	0.01	5.0
80-001	SAUGER	P		S	F	1	2.0	0.26	720	0.57	360.0

No Species: 22 **Nat. Species:** 21 **Hybrids:** 0 **Total Counted:** 386 **Total Rel. Wt. :** 125420

IBI: 36.0 **MIwb:** 9.5

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

Site ID: River: 95-656 DesPlaines River RM: 83.60 Date: 08/12/2020

Time Fished: 2422 Distance: 0.500 Drainge (sq mi): 268.0 Depth: 0

Location: dst. Townline Rd. Lat: 42.24026 Long: -87.93919

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
77-009	BLUEGILL SUNFISH	I	P	C	S	60	120.0	37.04	4300	8.11	35.8
77-008	GREEN SUNFISH	I	T	C	S	21	42.0	12.96	520	0.98	12.3
77-006	LARGEMOUTH BASS	C		C	F	15	30.0	9.26	2540	4.79	84.6
40-016	WHITE SUCKER	O	T	S	W	13	26.0	8.02	23200	43.74	892.3
43-043	BLUNTNOSE MINNOW	O	T	C	N	13	26.0	8.02	120	0.23	4.6
43-001	COMMON CARP	O	T	M	G	10	20.0	6.17	13000	24.51	650.0
77-002	BLACK CRAPPIE	I		C	S	8	16.0	4.94	2420	4.56	151.2
77-003	ROCK BASS	C		C	S	4	8.0	2.47	700	1.32	87.5
43-004	HORNYHEAD CHUB	I	I	N	N	3	6.0	1.85	120	0.23	20.0
77-013	PUMPKINSEED SUNFISH	I	P	C	S	3	6.0	1.85	140	0.26	23.3
43-032	SPOTFIN SHINER	I		M	N	2	4.0	1.23	12	0.02	3.0
80-011	LOGPERCH	I	M	S	D	2	4.0	1.23	100	0.19	25.0
40-018	SPOTTED SUCKER	I		S	R	1	2.0	0.62	1800	3.39	900.0
43-028	SPOTTAIL SHINER	I	P	M	N	1	2.0	0.62	6	0.01	3.0
43-045	COMMON CARP X GOLDFISH	O	T		G	1	2.0	0.62	3000	5.66	1500.0
47-004	YELLOW BULLHEAD	I	T	C		1	2.0	0.62	420	0.79	210.0
77-004	SMALLMOUTH BASS	C	M	C	F	1	2.0	0.62	200	0.38	100.0
77-015	GREEN SF X BLUEGILL SF					1	2.0	0.62	140	0.26	70.0
80-003	YELLOW PERCH			M		1	2.0	0.62	260	0.49	130.0
80-005	BLACKSIDE DARTER	I		S	D	1	2.0	0.62	40	0.08	20.0

No Species: 18 **Nat. Species:** 17 **Hybrids:** 2 **Total Counted:** 162 **Total Rel. Wt. :** 53038

IBI: 34.0 **MIwb:** 7.4

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

Site ID: River: 95-656 DesPlaines River RM: 83.60 Date: 09/30/2020

Time Fished: 2234 Distance: 0.500 Drainge (sq mi): 268.0 Depth: 0

Location: dst. Townline Rd. Lat: 42.24026 Long: -87.93919

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
77-009	BLUEGILL SUNFISH	I	P	C	S	41	82.0	15.83	4220	6.75	51.4
77-006	LARGEMOUTH BASS	C		C	F	35	70.0	13.51	10640	17.02	152.0
77-008	GREEN SUNFISH	I	T	C	S	26	52.0	10.04	600	0.96	11.5
43-001	COMMON CARP	O	T	M	G	19	38.0	7.34	15800	25.27	415.7
43-004	HORNYHEAD CHUB	I	I	N	N	18	36.0	6.95	840	1.34	23.3
80-005	BLACKSIDE DARTER	I		S	D	17	34.0	6.56	140	0.22	4.1
54-002	BLACKSTRIPE TOPMINNOW	I		M		16	32.0	6.18	40	0.06	1.2
40-016	WHITE SUCKER	O	T	S	W	14	28.0	5.41	20100	32.15	717.8
43-028	SPOTTAIL SHINER	I	P	M	N	14	28.0	5.41	80	0.13	2.8
43-043	BLUNTNOSE MINNOW	O	T	C	N	12	24.0	4.63	120	0.19	5.0
43-032	SPOTFIN SHINER	I		M	N	7	14.0	2.70	20	0.03	1.4
43-003	GOLDEN SHINER	I	T	M	N	6	12.0	2.32	40	0.06	3.3
47-004	YELLOW BULLHEAD	I	T	C		5	10.0	1.93	240	0.38	24.0
77-002	BLACK CRAPPIE	I		C	S	5	10.0	1.93	2520	4.03	252.0
80-014	JOHNNY DARTER	I		C	D	4	8.0	1.54	8	0.01	1.0
47-008	STONECAT MADTOM	I	I	C		3	6.0	1.16	140	0.22	23.3
77-003	ROCK BASS	C		C	S	3	6.0	1.16	1220	1.95	203.3
77-013	PUMPKINSEED SUNFISH	I	P	C	S	3	6.0	1.16	220	0.35	36.6
43-117	CARMINE SHINER	I	I	S	N	2	4.0	0.77	8	0.01	2.0
77-004	SMALLMOUTH BASS	C	M	C	F	2	4.0	0.77	1400	2.24	350.0
80-011	LOGPERCH	I	M	S	D	2	4.0	0.77	60	0.10	15.0
20-003	GIZZARD SHAD	O		M		1	2.0	0.39	60	0.10	30.0
37-003	NORTHERN PIKE	P		M	F	1	2.0	0.39	900	1.44	450.0
40-018	SPOTTED SUCKER	I		S	R	1	2.0	0.39	700	1.12	350.0
43-045	COMMON CARP X GOLDFISH	O	T		G	1	2.0	0.39	2400	3.84	1200.0
47-002	CHANNEL CATFISH			C	F	1	2.0	0.39	10	0.02	5.0

No Species: 25 **Nat. Species:** 24 **Hybrids:** 1 **Total Counted:** 259 **Total Rel. Wt. :** 62526

IBI: 38.0 **MIwb:** 8.5

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

Site ID: 16-8 River: 95-656 DesPlaines River RM: 82.90 Date: 08/12/2020

Time Fished: 2364 Distance: 0.500 Drainge (sq mi): 268.9 Depth: 0

Location: ust. Dam site Lat: 42.23113 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.
77-009	BLUEGILL SUNFISH	I	P	C	S	85	170.0	32.95	5040	6.28	29.6
43-001	COMMON CARP	O	T	M	G	34	68.0	13.18	24600	30.63	361.7
77-006	LARGEMOUTH BASS	C		C	F	23	46.0	8.91	5500	6.85	119.5
40-016	WHITE SUCKER	O	T	S	W	18	36.0	6.98	24900	31.00	691.6
43-032	SPOTFIN SHINER	I		M	N	17	34.0	6.59	100	0.12	2.9
77-008	GREEN SUNFISH	I	T	C	S	13	26.0	5.04	260	0.32	10.0
43-043	BLUNTNOSE MINNOW	O	T	C	N	12	24.0	4.65	100	0.12	4.1
43-028	SPOTTAIL SHINER	I	P	M	N	10	20.0	3.88	80	0.10	4.0
20-003	GIZZARD SHAD	O		M		9	18.0	3.49	820	1.02	45.5
43-003	GOLDEN SHINER	I	T	M	N	8	16.0	3.10	200	0.25	12.5
80-003	YELLOW PERCH			M		5	10.0	1.94	220	0.27	22.0
37-003	NORTHERN PIKE	P		M	F	4	8.0	1.55	7480	9.31	935.0
77-003	ROCK BASS	C		C	S	4	8.0	1.55	1040	1.29	130.0
40-018	SPOTTED SUCKER	I		S	R	3	6.0	1.16	5800	7.22	966.6
77-002	BLACK CRAPPIE	I		C	S	3	6.0	1.16	620	0.77	103.3
43-117	CARMINE SHINER	I	I	S	N	2	4.0	0.78	10	0.01	2.5
77-013	PUMPKINSEED SUNFISH	I	P	C	S	2	4.0	0.78	200	0.25	50.0
80-005	BLACKSIDE DARTER	I		S	D	2	4.0	0.78	20	0.02	5.0
43-034	SAND SHINER	I	M	M	N	1	2.0	0.39	6	0.01	3.0
47-002	CHANNEL CATFISH			C	F	1	2.0	0.39	3000	3.74	1500.0
47-004	YELLOW BULLHEAD	I	T	C		1	2.0	0.39	280	0.35	140.0
77-015	GREEN SF X BLUEGILL SF					1	2.0	0.39	40	0.05	20.0

No Species: 21 **Nat. Species:** 20 **Hybrids:** 1 **Total Counted:** 258 **Total Rel. Wt. :** 80316

IBI: 32.0 **MIwb:** 8.0

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

Site ID: 16-8 River: 95-656 DesPlaines River RM: 82.90 Date: 09/30/2020

Time Fished: 2411 Distance: 0.500 Drainge (sq mi): 268.9 Depth: 0

Location: ust. Dam site Lat: 42.23113 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.
77-009	BLUEGILL SUNFISH	I	P	C	S	57	114.0	21.92	5100	4.82	44.7
43-028	SPOTTAIL SHINER	I	P	M	N	54	108.0	20.77	340	0.32	3.1
77-006	LARGEMOUTH BASS	C		C	F	40	80.0	15.38	12000	11.35	150.0
40-016	WHITE SUCKER	O	T	S	W	17	34.0	6.54	26800	25.35	788.2
40-018	SPOTTED SUCKER	I		S	R	11	22.0	4.23	13000	12.30	590.9
43-003	GOLDEN SHINER	I	T	M	N	9	18.0	3.46	40	0.04	2.2
43-043	BLUNTNOSE MINNOW	O	T	C	N	8	16.0	3.08	60	0.06	3.7
37-003	NORTHERN PIKE	P		M	F	7	14.0	2.69	11740	11.11	838.5
47-004	YELLOW BULLHEAD	I	T	C		7	14.0	2.69	2260	2.14	161.4
77-013	PUMPKINSEED SUNFISH	I	P	C	S	7	14.0	2.69	820	0.78	58.5
80-005	BLACKSIDE DARTER	I		S	D	6	12.0	2.31	60	0.06	5.0
77-008	GREEN SUNFISH	I	T	C	S	5	10.0	1.92	160	0.15	16.0
43-001	COMMON CARP	O	T	M	G	4	8.0	1.54	19600	18.54	2450.0
43-032	SPOTFIN SHINER	I		M	N	4	8.0	1.54	20	0.02	2.5
47-002	CHANNEL CATFISH			C	F	4	8.0	1.54	10000	9.46	1250.0
77-002	BLACK CRAPPIE	I		C	S	4	8.0	1.54	480	0.45	60.0
80-003	YELLOW PERCH			M		4	8.0	1.54	500	0.47	62.5
77-015	GREEN SF X BLUEGILL SF					3	6.0	1.15	160	0.15	26.6
43-117	CARMINE SHINER	I	I	S	N	2	4.0	0.77	6	0.01	1.5
54-002	BLACKSTRIPE TOPMINNOW	I		M		2	4.0	0.77	6	0.01	1.5
10-004	LONGNOSE GAR	P		M		1	2.0	0.38	340	0.32	170.0
43-002	GOLDFISH	O	T	M	G	1	2.0	0.38	2200	2.08	1100.0
43-004	HORNYHEAD CHUB	I	I	N	N	1	2.0	0.38	4	0.00	2.0
77-004	SMALLMOUTH BASS	C	M	C	F	1	2.0	0.38	20	0.02	10.0
80-014	JOHNNY DARTER	I		C	D	1	2.0	0.38	2	0.00	1.0

No Species: 24 **Nat. Species:** 22 **Hybrids:** 1 **Total Counted:** 260 **Total Rel. Wt. :** 105718

IBI: 40.0 **MIwb:** 9.5

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

Site ID: River: 95-656 DesPlaines River RM: 80.00 Date: 07/28/2020

Time Fished: 2438 Distance: 0.500 Drainge (sq mi): 273.2 Depth: 0

Location: dst. Halfday Rd. Lat: 42.20013 Long: -87.91841

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
43-043	BLUNTNOSE MINNOW	O	T	C	N	156	312.0	32.16	960	1.31	3.0
77-009	BLUEGILL SUNFISH	I	P	C	S	71	142.0	14.64	5500	7.49	38.7
43-032	SPOTFIN SHINER	I		M	N	51	102.0	10.52	400	0.55	3.9
77-006	LARGEMOUTH BASS	C		C	F	47	94.0	9.69	14900	20.30	158.5
43-004	HORNYHEAD CHUB	I	I	N	N	38	76.0	7.84	2080	2.83	27.3
80-011	LOGPERCH	I	M	S	D	19	38.0	3.92	680	0.93	17.8
20-003	GIZZARD SHAD	O		M		13	26.0	2.68	860	1.17	33.0
40-016	WHITE SUCKER	O	T	S	W	13	26.0	2.68	4240	5.78	163.0
43-034	SAND SHINER	I	M	M	N	12	24.0	2.47	40	0.05	1.6
43-117	CARMINE SHINER	I	I	S	N	9	18.0	1.86	60	0.08	3.3
80-005	BLACKSIDE DARTER	I		S	D	9	18.0	1.86	100	0.14	5.5
43-028	SPOTTAIL SHINER	I	P	M	N	8	16.0	1.65	60	0.08	3.7
43-001	COMMON CARP	O	T	M	G	6	12.0	1.24	32200	43.88	2683.3
47-004	YELLOW BULLHEAD	I	T	C		5	10.0	1.03	680	0.93	68.0
54-002	BLACKSTRIPE TOPMINNOW	I		M		5	10.0	1.03	14	0.02	1.4
77-002	BLACK CRAPPIE	I		C	S	5	10.0	1.03	880	1.20	88.0
37-003	NORTHERN PIKE	P		M	F	3	6.0	0.62	8000	10.90	1333.3
77-003	ROCK BASS	C		C	S	3	6.0	0.62	1120	1.53	186.6
47-008	STONECAT MADTOM	I	I	C		2	4.0	0.41	120	0.16	30.0
77-008	GREEN SUNFISH	I	T	C	S	2	4.0	0.41	60	0.08	15.0
43-003	GOLDEN SHINER	I	T	M	N	1	2.0	0.21	8	0.01	4.0
47-002	CHANNEL CATFISH			C	F	1	2.0	0.21	20	0.03	10.0
77-004	SMALLMOUTH BASS	C	M	C	F	1	2.0	0.21	20	0.03	10.0
77-013	PUMPKINSEED SUNFISH	I	P	C	S	1	2.0	0.21	0	0.00	0.0
77-015	GREEN SF X BLUEGILL SF					1	2.0	0.21	60	0.08	30.0
80-003	YELLOW PERCH			M		1	2.0	0.21	280	0.38	140.0
80-014	JOHNNY DARTER	I		C	D	1	2.0	0.21	2	0.00	1.0
87-001	ROUND GOBY				E	1	2.0	0.21	40	0.05	20.0

No Species: 27 **Nat. Species:** 25 **Hybrids:** 1 **Total Counted:** 485 **Total Rel. Wt. :** 73384

IBI: 36.0 **MIwb:** 9.1

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

Site ID: River: 95-656 DesPlaines River RM: 80.00 Date: 08/12/2020

Time Fished: 2458 Distance: 0.500 Drainge (sq mi): 273.2 Depth: 0

Location: dst. Halfday Rd. Lat: 42.20013 Long: -87.91841

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
77-009	BLUEGILL SUNFISH	I	P	C	S	72	144.0	23.68	3300	4.14	22.9
43-043	BLUNTNOSE MINNOW	O	T	C	N	64	128.0	21.05	600	0.75	4.6
43-004	HORNYHEAD CHUB	I	I	N	N	40	80.0	13.16	1700	2.13	21.2
40-016	WHITE SUCKER	O	T	S	W	31	62.0	10.20	20960	26.29	338.0
77-008	GREEN SUNFISH	I	T	C	S	22	44.0	7.24	460	0.58	10.4
43-032	SPOTFIN SHINER	I		M	N	16	32.0	5.26	160	0.20	5.0
77-006	LARGEMOUTH BASS	C		C	F	12	24.0	3.95	8780	11.01	365.8
43-034	SAND SHINER	I	M	M	N	9	18.0	2.96	80	0.10	4.4
43-001	COMMON CARP	O	T	M	G	8	16.0	2.63	32600	40.88	2037.5
43-117	CARMINE SHINER	I	I	S	N	8	16.0	2.63	60	0.08	3.7
77-003	ROCK BASS	C		C	S	3	6.0	0.99	560	0.70	93.3
77-004	SMALLMOUTH BASS	C	M	C	F	3	6.0	0.99	4700	5.89	783.3
80-011	LOGPERCH	I	M	S	D	3	6.0	0.99	120	0.15	20.0
20-003	GIZZARD SHAD	O		M		2	4.0	0.66	60	0.08	15.0
77-002	BLACK CRAPPIE	I		C	S	2	4.0	0.66	500	0.63	125.0
77-015	GREEN SF X BLUEGILL SF					2	4.0	0.66	140	0.18	35.0
43-028	SPOTTAIL SHINER	I	P	M	N	1	2.0	0.33	8	0.01	4.0
47-002	CHANNEL CATFISH			C	F	1	2.0	0.33	3000	3.76	1500.0
47-004	YELLOW BULLHEAD	I	T	C		1	2.0	0.33	240	0.30	120.0
54-002	BLACKSTRIPE TOPMINNOW	I		M		1	2.0	0.33	4	0.01	2.0
77-013	PUMPKINSEED SUNFISH	I	P	C	S	1	2.0	0.33	100	0.13	50.0
80-001	SAUGER	P		S	F	1	2.0	0.33	1600	2.01	800.0
80-005	BLACKSIDE DARTER	I		S	D	1	2.0	0.33	4	0.01	2.0

No Species: 22 **Nat. Species:** 21 **Hybrids:** 1 **Total Counted:** 304 **Total Rel. Wt. :** 79736

IBI: 34.0 **MIwb:** 8.4

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

Site ID: River: 95-656 DesPlaines River RM: 76.70 Date: 08/09/2020

Time Fished: 2442 Distance: 0.500 Drainge (sq mi): 314.6 Depth: 0

Location: dst. Deerfield Rd. Lat: 42.16738 Long: -87.91360

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
77-009	BLUEGILL SUNFISH	I	P	C	S	89	178.0	40.27	5640	8.94	31.6
77-006	LARGEMOUTH BASS	C		C	F	22	44.0	9.95	5040	7.99	114.5
43-028	SPOTTAIL SHINER	I	P	M	N	17	34.0	7.69	140	0.22	4.1
43-043	BLUNTNOSE MINNOW	O	T	C	N	13	26.0	5.88	40	0.06	1.5
77-008	GREEN SUNFISH	I	T	C	S	13	26.0	5.88	300	0.48	11.5
43-032	SPOTFIN SHINER	I		M	N	12	24.0	5.43	60	0.10	2.5
77-013	PUMPKINSEED SUNFISH	I	P	C	S	10	20.0	4.52	600	0.95	30.0
77-002	BLACK CRAPPIE	I		C	S	8	16.0	3.62	1640	2.60	102.5
20-003	GIZZARD SHAD	O		M		7	14.0	3.17	300	0.48	21.4
43-001	COMMON CARP	O	T	M	G	5	10.0	2.26	25000	39.63	2500.0
40-016	WHITE SUCKER	O	T	S	W	4	8.0	1.81	5000	7.93	625.0
37-003	NORTHERN PIKE	P		M	F	2	4.0	0.90	5000	7.93	1250.0
40-018	SPOTTED SUCKER	I		S	R	2	4.0	0.90	4400	6.98	1100.0
43-003	GOLDEN SHINER	I	T	M	N	2	4.0	0.90	10	0.02	2.5
77-003	ROCK BASS	C		C	S	2	4.0	0.90	100	0.16	25.0
77-004	SMALLMOUTH BASS	C	M	C	F	2	4.0	0.90	2008	3.18	502.0
80-003	YELLOW PERCH			M		2	4.0	0.90	300	0.48	75.0
80-005	BLACKSIDE DARTER	I		S	D	2	4.0	0.90	20	0.03	5.0
43-002	GOLDFISH	O	T	M	G	1	2.0	0.45	2400	3.80	1200.0
43-045	COMMON CARP X GOLDFISH	O	T		G	1	2.0	0.45	3000	4.76	1500.0
47-002	CHANNEL CATFISH			C	F	1	2.0	0.45	1300	2.06	650.0
47-004	YELLOW BULLHEAD	I	T	C		1	2.0	0.45	4	0.01	2.0
47-006	BLACK BULLHEAD	I	P	C		1	2.0	0.45	500	0.79	250.0
47-008	STONECAT MADTOM	I	I	C		1	2.0	0.45	20	0.03	10.0
74-006	YELLOW BASS	P	P	M		1	2.0	0.45	260	0.41	130.0

No Species: 24 **Nat. Species:** 22 **Hybrids:** 1 **Total Counted:** 221 **Total Rel. Wt. :** 63082

IBI: 40.0 **MIwb:** 8.9

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

Site ID: River: 95-656 DesPlaines River RM: 76.70 Date: 09/27/2020

Time Fished: 2292 Distance: 0.500 Drainge (sq mi): 314.6 Depth: 0

Location: dst. Deerfield Rd. Lat: 42.16738 Long: -87.91360

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
43-028	SPOTTAIL SHINER	I	P	M	N	50	100.0	22.03	720	0.97	7.2
43-043	BLUNTNOSE MINNOW	O	T	C	N	44	88.0	19.38	300	0.40	3.4
77-009	BLUEGILL SUNFISH	I	P	C	S	23	46.0	10.13	1880	2.53	40.8
80-005	BLACKSIDE DARTER	I		S	D	16	32.0	7.05	140	0.19	4.3
43-032	SPOTFIN SHINER	I		M	N	13	26.0	5.73	60	0.08	2.3
77-004	SMALLMOUTH BASS	C	M	C	F	11	22.0	4.85	240	0.32	10.9
77-006	LARGEMOUTH BASS	C		C	F	9	18.0	3.96	3240	4.36	180.0
77-008	GREEN SUNFISH	I	T	C	S	8	16.0	3.52	140	0.19	8.7
77-002	BLACK CRAPPIE	I		C	S	7	14.0	3.08	2460	3.31	175.7
40-016	WHITE SUCKER	O	T	S	W	6	12.0	2.64	7620	10.25	635.0
40-018	SPOTTED SUCKER	I		S	R	5	10.0	2.20	8000	10.76	800.0
43-001	COMMON CARP	O	T	M	G	5	10.0	2.20	33920	45.62	3392.0
43-003	GOLDEN SHINER	I	T	M	N	5	10.0	2.20	40	0.05	4.0
80-003	YELLOW PERCH			M		5	10.0	2.20	120	0.16	12.0
37-003	NORTHERN PIKE	P		M	F	4	8.0	1.76	6400	8.61	800.0
43-002	GOLDFISH	O	T	M	G	3	6.0	1.32	5200	6.99	866.6
47-004	YELLOW BULLHEAD	I	T	C		2	4.0	0.88	680	0.91	170.0
77-013	PUMPKINSEED SUNFISH	I	P	C	S	2	4.0	0.88	40	0.05	10.0
43-045	COMMON CARP X GOLDFISH	O	T		G	1	2.0	0.44	2600	3.50	1300.0
47-002	CHANNEL CATFISH			C	F	1	2.0	0.44	0	0.00	0.0
47-008	STONECAT MADTOM	I	I	C		1	2.0	0.44	40	0.05	20.0
54-002	BLACKSTRIPE TOPMINNOW	I		M		1	2.0	0.44	4	0.01	2.0
77-003	ROCK BASS	C		C	S	1	2.0	0.44	300	0.40	150.0
77-010	ORANGESPOTTED SUNFISH	I		C	S	1	2.0	0.44	20	0.03	10.0
77-015	GREEN SF X BLUEGILL SF					1	2.0	0.44	80	0.11	40.0
80-014	JOHNNY DARTER	I		C	D	1	2.0	0.44	2	0.00	1.0
87-001	ROUND GOBY				E	1	2.0	0.44	100	0.13	50.0

No Species: 25 **Nat. Species:** 22 **Hybrids:** 2 **Total Counted:** 227 **Total Rel. Wt. :** 74346

IBI: 34.0 **MIwb:** 8.8

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

Site ID: River: 95-656 DesPlaines River RM: 75.40 Date: 08/09/2020

Time Fished: 2146 Distance: 0.500 Drainge (sq mi): 323.9 Depth: 0

Location: dst. Lake Cook Rd. Lat: 42.15285 Long: -87.91016

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
77-009	BLUEGILL SUNFISH	I	P	C	S	73	146.0	26.16	8120	14.86	55.6
43-043	BLUNTNOSE MINNOW	O	T	C	N	43	86.0	15.41	280	0.51	3.2
77-006	LARGEMOUTH BASS	C		C	F	26	52.0	9.32	13500	24.71	259.6
43-028	SPOTTAIL SHINER	I	P	M	N	25	50.0	8.96	140	0.26	2.8
77-008	GREEN SUNFISH	I	T	C	S	21	42.0	7.53	440	0.81	10.4
43-032	SPOTFIN SHINER	I		M	N	19	38.0	6.81	120	0.22	3.1
43-004	HORNYHEAD CHUB	I	I	N	N	10	20.0	3.58	300	0.55	15.0
80-005	BLACKSIDE DARTER	I		S	D	10	20.0	3.58	40	0.07	2.0
80-014	JOHNNY DARTER	I		C	D	9	18.0	3.23	40	0.07	2.2
80-011	LOGPERCH	I	M	S	D	8	16.0	2.87	300	0.55	18.7
77-002	BLACK CRAPPIE	I		C	S	7	14.0	2.51	1160	2.12	82.8
40-016	WHITE SUCKER	O	T	S	W	5	10.0	1.79	2780	5.09	278.0
47-004	YELLOW BULLHEAD	I	T	C		4	8.0	1.43	700	1.28	87.5
43-001	COMMON CARP	O	T	M	G	3	6.0	1.08	18000	32.95	3000.0
77-004	SMALLMOUTH BASS	C	M	C	F	3	6.0	1.08	1634	2.99	272.3
47-002	CHANNEL CATFISH			C	F	2	4.0	0.72	3810	6.97	952.5
77-015	GREEN SF X BLUEGILL SF					2	4.0	0.72	340	0.62	85.0
87-001	ROUND GOBY				E	2	4.0	0.72	80	0.15	20.0
20-003	GIZZARD SHAD	O		M		1	2.0	0.36	60	0.11	30.0
37-003	NORTHERN PIKE	P		M	F	1	2.0	0.36	600	1.10	300.0
40-018	SPOTTED SUCKER	I		S	R	1	2.0	0.36	2000	3.66	1000.0
43-003	GOLDEN SHINER	I	T	M	N	1	2.0	0.36	4	0.01	2.0
47-013	TADPOLE MADTOM	I		C		1	2.0	0.36	40	0.07	20.0
77-003	ROCK BASS	C		C	S	1	2.0	0.36	80	0.15	40.0
77-013	PUMPKINSEED SUNFISH	I	P	C	S	1	2.0	0.36	60	0.11	30.0

No Species: 24 **Nat. Species:** 22 **Hybrids:** 1 **Total Counted:** 279 **Total Rel. Wt. :** 54628

IBI: 36.0 **MIwb:** 9.1

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

Site ID: River: 95-656 DesPlaines River RM: 75.40 Date: 09/27/2020

Time Fished: 1972 Distance: 0.500 Drainge (sq mi): 323.9 Depth: 0

Location: dst. Lake Cook Rd. Lat: 42.15285 Long: -87.91016

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
43-004	HORNYHEAD CHUB	I	I	N	N	25	50.0	9.84	720	1.30	14.4
43-043	BLUNTNOSE MINNOW	O	T	C	N	25	50.0	9.84	280	0.51	5.6
77-009	BLUEGILL SUNFISH	I	P	C	S	25	50.0	9.84	2700	4.87	54.0
77-006	LARGEMOUTH BASS	C		C	F	23	46.0	9.06	3000	5.42	65.2
43-032	SPOTFIN SHINER	I		M	N	21	42.0	8.27	140	0.25	3.3
77-003	ROCK BASS	C		C	S	17	34.0	6.69	2280	4.12	67.0
80-005	BLACKSIDE DARTER	I		S	D	17	34.0	6.69	140	0.25	4.1
47-004	YELLOW BULLHEAD	I	T	C		13	26.0	5.12	2300	4.15	88.4
77-008	GREEN SUNFISH	I	T	C	S	13	26.0	5.12	480	0.87	18.4
43-117	CARMINE SHINER	I	I	S	N	11	22.0	4.33	60	0.11	2.7
87-001	ROUND GOBY				E	11	22.0	4.33	320	0.58	14.5
43-001	COMMON CARP	O	T	M	G	9	18.0	3.54	36000	64.99	2000.0
43-028	SPOTTAIL SHINER	I	P	M	N	9	18.0	3.54	100	0.18	5.5
77-004	SMALLMOUTH BASS	C	M	C	F	8	16.0	3.15	3660	6.61	228.7
80-014	JOHNNY DARTER	I		C	D	6	12.0	2.36	12	0.02	1.0
40-016	WHITE SUCKER	O	T	S	W	4	8.0	1.57	100	0.18	12.5
77-002	BLACK CRAPPIE	I		C	S	3	6.0	1.18	240	0.43	40.0
80-011	LOGPERCH	I	M	S	D	3	6.0	1.18	140	0.25	23.3
43-034	SAND SHINER	I	M	M	N	2	4.0	0.79	6	0.01	1.5
77-013	PUMPKINSEED SUNFISH	I	P	C	S	2	4.0	0.79	20	0.04	5.0
40-018	SPOTTED SUCKER	I		S	R	1	2.0	0.39	2600	4.69	1300.0
43-033	BIGMOUTH SHINER	I		M	N	1	2.0	0.39	6	0.01	3.0
47-002	CHANNEL CATFISH			C	F	1	2.0	0.39	10	0.02	5.0
47-008	STONECAT MADTOM	I	I	C		1	2.0	0.39	10	0.02	5.0
47-013	TADPOLE MADTOM	I		C		1	2.0	0.39	10	0.02	5.0
54-002	BLACKSTRIPE TOPMINNOW	I		M		1	2.0	0.39	2	0.00	1.0
77-015	GREEN SF X BLUEGILL SF					1	2.0	0.39	60	0.11	30.0

No Species: 26 **Nat. Species:** 24 **Hybrids:** 1 **Total Counted:** 254 **Total Rel. Wt. :** 55396

IBI: 42.0 **MIwb:** 8.2

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

Site ID: River: 95-656 DesPlaines River RM: 71.70 Date: 08/14/2020

Time Fished: 2451 Distance: 0.500 Drainge (sq mi): 358.6 Depth: 0

Location: ust. Palatine Rd. Lat: 42.11409 Long: -87.88931

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
77-009	BLUEGILL SUNFISH	I	P	C	S	64	128.0	34.41	2700	5.48	21.0
77-008	GREEN SUNFISH	I	T	C	S	53	106.0	28.49	1220	2.47	11.5
77-006	LARGEMOUTH BASS	C		C	F	14	28.0	7.53	960	1.95	34.2
43-001	COMMON CARP	O	T	M	G	11	22.0	5.91	15000	30.43	681.8
77-003	ROCK BASS	C		C	S	5	10.0	2.69	1360	2.76	136.0
43-028	SPOTTAIL SHINER	I	P	M	N	4	8.0	2.15	30	0.06	3.7
43-032	SPOTFIN SHINER	I		M	N	4	8.0	2.15	20	0.04	2.5
77-002	BLACK CRAPPIE	I		C	S	4	8.0	2.15	240	0.49	30.0
77-004	SMALLMOUTH BASS	C	M	C	F	4	8.0	2.15	60	0.12	7.5
47-002	CHANNEL CATFISH			C	F	3	6.0	1.61	13600	27.59	2266.6
40-018	SPOTTED SUCKER	I		S	R	2	4.0	1.08	4000	8.11	1000.0
43-004	HORNYHEAD CHUB	I	I	N	N	2	4.0	1.08	200	0.41	50.0
43-043	BLUNTNOSE MINNOW	O	T	C	N	2	4.0	1.08	4	0.01	1.0
77-013	PUMPKINSEED SUNFISH	I	P	C	S	2	4.0	1.08	80	0.16	20.0
80-005	BLACKSIDE DARTER	I		S	D	2	4.0	1.08	20	0.04	5.0
87-001	ROUND GOBY				E	2	4.0	1.08	40	0.08	10.0
40-016	WHITE SUCKER	O	T	S	W	1	2.0	0.54	2200	4.46	1100.0
43-002	GOLDFISH	O	T	M	G	1	2.0	0.54	4600	9.33	2300.0
47-004	YELLOW BULLHEAD	I	T	C		1	2.0	0.54	1800	3.65	900.0
47-006	BLACK BULLHEAD	I	P	C		1	2.0	0.54	340	0.69	170.0
54-002	BLACKSTRIPE TOPMINNOW	I		M		1	2.0	0.54	6	0.01	3.0
77-007	WARMOUTH SUNFISH	C		C	S	1	2.0	0.54	20	0.04	10.0
77-015	GREEN SF X BLUEGILL SF					1	2.0	0.54	100	0.20	50.0
80-001	SAUGER	P		S	F	1	2.0	0.54	700	1.42	350.0

No Species: 23 **Nat. Species:** 20 **Hybrids:** 1 **Total Counted:** 186 **Total Rel. Wt. :** 49300

IBI: 34.0 **MIwb:** 7.8

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

Site ID: River: 95-656 DesPlaines River RM: 71.70 Date: 10/01/2020

Time Fished: 0 Distance: 0.500 Drainge (sq mi): 358.6 Depth: 0

Location: ust. Palatine Rd. Lat: 42.11409 Long: -87.88931

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
43-043	BLUNTNOSE MINNOW	O	T	C	N	86	172.0	36.60	520	0.91	3.0
43-001	COMMON CARP	O	T	M	G	28	56.0	11.91	34000	59.47	607.1
77-008	GREEN SUNFISH	I	T	C	S	23	46.0	9.79	420	0.73	9.1
43-028	SPOTTAIL SHINER	I	P	M	N	17	34.0	7.23	200	0.35	5.8
77-004	SMALLMOUTH BASS	C	M	C	F	9	18.0	3.83	860	1.50	47.7
40-016	WHITE SUCKER	O	T	S	W	8	16.0	3.40	5700	9.97	356.2
77-002	BLACK CRAPPIE	I		C	S	8	16.0	3.40	1500	2.62	93.7
77-003	ROCK BASS	C		C	S	8	16.0	3.40	1560	2.73	97.5
77-006	LARGEMOUTH BASS	C		C	F	7	14.0	2.98	1040	1.82	74.2
47-004	YELLOW BULLHEAD	I	T	C		6	12.0	2.55	2500	4.37	208.3
80-014	JOHNNY DARTER	I		C	D	5	10.0	2.13	10	0.02	1.0
43-004	HORNYHEAD CHUB	I	I	N	N	4	8.0	1.70	220	0.38	27.5
77-009	BLUEGILL SUNFISH	I	P	C	S	4	8.0	1.70	1120	1.96	140.0
87-001	ROUND GOBY				E	4	8.0	1.70	40	0.07	5.0
43-003	GOLDEN SHINER	I	T	M	N	3	6.0	1.28	20	0.03	3.3
77-015	GREEN SF X BLUEGILL SF					3	6.0	1.28	260	0.45	43.3
54-002	BLACKSTRIPE TOPMINNOW	I		M		2	4.0	0.85	6	0.01	1.5
80-003	YELLOW PERCH			M		2	4.0	0.85	20	0.03	5.0
20-003	GIZZARD SHAD	O		M		1	2.0	0.43	60	0.10	30.0
37-003	NORTHERN PIKE	P		M	F	1	2.0	0.43	2000	3.50	1000.0
40-018	SPOTTED SUCKER	I		S	R	1	2.0	0.43	2000	3.50	1000.0
47-002	CHANNEL CATFISH			C	F	1	2.0	0.43	3000	5.25	1500.0
47-013	TADPOLE MADTOM	I		C		1	2.0	0.43	6	0.01	3.0
77-013	PUMPKINSEED SUNFISH	I	P	C	S	1	2.0	0.43	10	0.02	5.0
80-005	BLACKSIDE DARTER	I		S	D	1	2.0	0.43	20	0.03	10.0
80-011	LOGPERCH	I	M	S	D	1	2.0	0.43	80	0.14	40.0

No Species: 25 **Nat. Species:** 23 **Hybrids:** 1 **Total Counted:** 235 **Total Rel. Wt. :** 57172

IBI: 30.0 **MIwb:** 6.8

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

Site ID: River: 95-995 Mill Creek RM: 1.71 Date: 07/18/2020

Time Fished: 1489 Distance: 0.200 Drainge (sq mi): 62.2 Depth: 0

Location: ust. Mill Creek WWTP Lat: 42.42099 Long: -87.95684

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
43-032	SPOTFIN SHINER	I		M	N	83	124.5	22.02	402	2.90	3.2
77-009	BLUEGILL SUNFISH	I	P	C	S	77	115.5	20.42	3765	27.12	32.5
43-043	BLUNTNOSE MINNOW	O	T	C	N	39	58.5	10.34	261	1.88	4.4
77-008	GREEN SUNFISH	I	T	C	S	38	57.0	10.08	618	4.45	10.8
77-010	ORANGESPOTTED SUNFISH	I		C	S	32	48.0	8.49	310	2.24	6.4
77-006	LARGEMOUTH BASS	C		C	F	30	45.0	7.96	1741	12.54	38.7
77-013	PUMPKINSEED SUNFISH	I	P	C	S	14	21.0	3.71	585	4.21	27.8
20-003	GIZZARD SHAD	O		M		8	12.0	2.12	303	2.18	25.2
47-002	CHANNEL CATFISH			C	F	8	12.0	2.12	1275	9.18	106.2
47-008	STONECAT MADTOM	I	I	C		7	10.5	1.86	225	1.62	21.4
70-001	BROOK SILVERSIDE	I	M	M		7	10.5	1.86	10	0.08	1.0
43-003	GOLDEN SHINER	I	T	M	N	6	9.0	1.59	52	0.38	5.8
77-007	WARMOUTH SUNFISH	C		C	S	5	7.5	1.33	150	1.08	20.0
54-002	BLACKSTRIPE TOPMINNOW	I		M		4	6.0	1.06	6	0.04	1.0
80-014	JOHNNY DARTER	I		C	D	4	6.0	1.06	6	0.04	1.0
47-004	YELLOW BULLHEAD	I	T	C		2	3.0	0.53	450	3.24	150.0
68-001	PIRATE PERCH	I		C		2	3.0	0.53	30	0.22	10.0
77-002	BLACK CRAPPIE	I		C	S	2	3.0	0.53	75	0.54	25.0
80-005	BLACKSIDE DARTER	I		S	D	2	3.0	0.53	6	0.04	2.0
15-001	BOWFIN	P		C		1	1.5	0.27	450	3.24	300.0
40-016	WHITE SUCKER	O	T	S	W	1	1.5	0.27	1500	10.80	1000.0
43-001	COMMON CARP	O	T	M	G	1	1.5	0.27	1500	10.80	1000.0
43-034	SAND SHINER	I	M	M	N	1	1.5	0.27	1	0.01	1.0
43-117	CARMINE SHINER	I	I	S	N	1	1.5	0.27	3	0.02	2.0
47-006	BLACK BULLHEAD	I	P	C		1	1.5	0.27	150	1.08	100.0
47-013	TADPOLE MADTOM	I		C		1	1.5	0.27	7	0.05	5.0

No Species: 26 **Nat. Species:** 25 **Hybrids:** 0 **Total Counted:** 377 **Total Rel. Wt. :** 13884

IBI: 40.0 **MIwb:** 8.9

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

Site ID: River: 95-995 Mill Creek RM: 1.71 Date: 09/02/2020

Time Fished: 1783 Distance: 0.200 Drainge (sq mi): 62.2 Depth: 0

Location: ust. Mill Creek WWTP Lat: 42.42099 Long: -87.95684

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
43-043	BLUNTNOSE MINNOW	O	T	C	N	732	1098.0	37.10	2175	7.51	1.9
43-032	SPOTFIN SHINER	I		M	N	315	472.5	15.97	1110	3.83	2.3
77-009	BLUEGILL SUNFISH	I	P	C	S	315	472.5	15.97	11355	39.23	24.0
77-006	LARGEMOUTH BASS	C		C	F	141	211.5	7.15	1950	6.74	9.2
54-002	BLACKSTRIPE TOPMINNOW	I		M		90	135.0	4.56	150	0.52	1.1
77-008	GREEN SUNFISH	I	T	C	S	70	105.0	3.55	1950	6.74	18.5
20-003	GIZZARD SHAD	O		M		63	94.5	3.19	1095	3.78	11.5
43-003	GOLDEN SHINER	I	T	M	N	45	67.5	2.28	750	2.59	11.1
47-002	CHANNEL CATFISH			C	F	43	64.5	2.18	3427	11.84	53.1
77-010	ORANGESPOTTED SUNFISH	I		C	S	37	55.5	1.88	540	1.87	9.7
47-008	STONECAT MADTOM	I	I	C		28	42.0	1.42	195	0.67	4.6
77-013	PUMPKINSEED SUNFISH	I	P	C	S	28	42.0	1.42	1245	4.30	29.6
70-001	BROOK SILVERSIDE	I	M	M		24	36.0	1.22	60	0.21	1.6
80-005	BLACKSIDE DARTER	I		S	D	12	18.0	0.61	75	0.26	4.1
43-004	HORNYHEAD CHUB	I	I	N	N	5	7.5	0.25	75	0.26	10.0
77-007	WARMOUTH SUNFISH	C		C	S	5	7.5	0.25	420	1.45	56.0
47-004	YELLOW BULLHEAD	I	T	C		4	6.0	0.20	300	1.04	50.0
77-015	GREEN SF X BLUEGILL SF					4	6.0	0.20	465	1.61	77.5
40-016	WHITE SUCKER	O	T	S	W	3	4.5	0.15	472	1.63	105.0
15-001	BOWFIN	P		C		1	1.5	0.05	600	2.07	400.0
37-003	NORTHERN PIKE	P		M	F	1	1.5	0.05	150	0.52	100.0
43-001	COMMON CARP	O	T	M	G	1	1.5	0.05	120	0.41	80.0
43-002	GOLDFISH	O	T	M	G	1	1.5	0.05	135	0.47	90.0
43-028	SPOTTAIL SHINER	I	P	M	N	1	1.5	0.05	15	0.05	10.0
43-042	FATHEAD MINNOW	O	T	C	N	1	1.5	0.05	7	0.03	5.0
77-002	BLACK CRAPPIE	I		C	S	1	1.5	0.05	45	0.16	30.0
80-003	YELLOW PERCH			M		1	1.5	0.05	60	0.21	40.0
80-014	JOHNNY DARTER	I		C	D	1	1.5	0.05	3	0.01	2.0

No Species: 27 **Nat. Species:** 25 **Hybrids:** 1 **Total Counted:** 1973 **Total Rel. Wt. :** 28945

IBI: 36.0 **MIwb:** 9.2

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

Site ID: River: 95-996 North Mill Creek RM: 11.30 Date: 07/18/2020

Time Fished: 1033 Distance: 0.150 Drainge (sq mi): 19.2 Depth: 0

Location: ust. Edwards Rd. Lat: 42.48082 Long: -88.01196

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
77-008	GREEN SUNFISH	I	T	C	S	17	34.0	36.17	340	18.95	10.0
80-003	YELLOW PERCH			M		7	14.0	14.89	200	11.15	14.2
77-006	LARGEMOUTH BASS	C		C	F	6	12.0	12.77	206	11.48	17.1
77-009	BLUEGILL SUNFISH	I	P	C	S	5	10.0	10.64	200	11.15	20.0
80-014	JOHNNY DARTER	I		C	D	4	8.0	8.51	8	0.45	1.0
40-016	WHITE SUCKER	O	T	S	W	3	6.0	6.38	500	27.87	83.3
47-004	YELLOW BULLHEAD	I	T	C		3	6.0	6.38	320	17.84	53.3
34-001	CENTRAL MUDMINNOW	I	T	C		2	4.0	4.26	20	1.11	5.0

No Species: 8 **Nat. Species:** 8 **Hybrids:** 0 **Total Counted:** 47 **Total Rel. Wt. :** 1794

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

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

Site ID: River: 95-996 North Mill Creek RM: 11.30 Date: 09/22/2020

Time Fished: 971 Distance: 0.150 Drainge (sq mi): 19.2 Depth: 0

Location: ust. Edwards Rd. Lat: 42.48082 Long: -88.01196

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
77-006	LARGEMOUTH BASS	C		C	F	10	20.0	28.57	140	19.44	7.0
77-008	GREEN SUNFISH	I	T	C	S	9	18.0	25.71	220	30.56	12.2
80-014	JOHNNY DARTER	I		C	D	8	16.0	22.86	40	5.56	2.5
34-001	CENTRAL MUDMINNOW	I	T	C		4	8.0	11.43	60	8.33	7.5
43-013	CREEK CHUB	G	T	N	N	3	6.0	8.57	40	5.56	6.6
47-004	YELLOW BULLHEAD	I	T	C		1	2.0	2.86	220	30.56	110.0

No Species: 6 **Nat. Species:** 6 **Hybrids:** 0 **Total Counted:** 35 **Total Rel. Wt. :** 720

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

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

Site ID: River: 95-996 North Mill Creek RM: 1.10 Date: 07/18/2020

Time Fished: 1166 Distance: 0.150 Drainge (sq mi): 31.9 Depth: 0

Location: dst. Millburn Rd. Lat: 42.42340 Long: -87.99709

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
77-008	GREEN SUNFISH	I	T	C	S	30	60.0	27.78	800	8.43	13.3
80-003	YELLOW PERCH			M		24	48.0	22.22	912	9.61	19.0
77-009	BLUEGILL SUNFISH	I	P	C	S	13	26.0	12.04	500	5.27	19.2
43-032	SPOTFIN SHINER	I		M	N	10	20.0	9.26	22	0.23	1.1
43-043	BLUNTNOSE MINNOW	O	T	C	N	8	16.0	7.41	16	0.17	1.0
77-006	LARGEMOUTH BASS	C		C	F	8	16.0	7.41	16	0.17	1.0
34-001	CENTRAL MUDMINNOW	I	T	C		5	10.0	4.63	10	0.11	1.0
40-016	WHITE SUCKER	O	T	S	W	4	8.0	3.70	2700	28.46	337.5
43-001	COMMON CARP	O	T	M	G	2	4.0	1.85	3500	36.89	875.0
47-004	YELLOW BULLHEAD	I	T	C		2	4.0	1.85	1000	10.54	250.0
43-013	CREEK CHUB	G	T	N	N	1	2.0	0.93	10	0.11	5.0
54-002	BLACKSTRIPE TOPMINNOW	I		M		1	2.0	0.93	2	0.02	1.0

No Species: 12 **Nat. Species:** 11 **Hybrids:** 0 **Total Counted:** 108 **Total Rel. Wt. :** 9488

IBI: 34.0 **MIwb:** 6.2

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

Site ID: River: 95-996 North Mill Creek RM: 1.10 Date: 09/22/2020

Time Fished: 1312 Distance: 0.150 Drainge (sq mi): 31.9 Depth: 0

Location: dst. Millburn Rd. Lat: 42.42340 Long: -87.99709

Species Code:	Species Name:	Feed Guild	Toler-ance	Breed Guild	IBI Group	No. Fish	Rel. No.	% by No.	Rel. Wt.	% by Wt.	Av. Wt.
80-003	YELLOW PERCH			M		26	52.0	23.21	260	10.44	5.0
77-008	GREEN SUNFISH	I	T	C	S	23	46.0	20.54	330	13.25	7.1
43-032	SPOTFIN SHINER	I		M	N	16	32.0	14.29	80	3.21	2.5
77-009	BLUEGILL SUNFISH	I	P	C	S	16	32.0	14.29	440	17.67	13.7
77-006	LARGEMOUTH BASS	C		C	F	12	24.0	10.71	180	7.23	7.5
43-043	BLUNTNOSE MINNOW	O	T	C	N	7	14.0	6.25	60	2.41	4.2
80-014	JOHNNY DARTER	I		C	D	6	12.0	5.36	40	1.61	3.3
54-002	BLACKSTRIPE TOPMINNOW	I		M		3	6.0	2.68	20	0.80	3.3
40-016	WHITE SUCKER	O	T	S	W	2	4.0	1.79	880	35.34	220.0
47-004	YELLOW BULLHEAD	I	T	C		1	2.0	0.89	200	8.03	100.0

No Species: 10 **Nat. Species:** 10 **Hybrids:** 0 **Total Counted:** 112 **Total Rel. Wt. :** 2490

IBI: 32.0 **MIwb:** 6.4

APPENDIX B

Upper Des Plaines 2020 Macroinvertebrate Assemblage Data

B-1: Macroinvertebrate IBI (mIBI) Metrics & Scores
B-2: Macroinvertebrate Taxa by Site and Sample

Appendix Table B-1. Illinois Macroinvertebrate IBI metrics and values from the upper Des Plaines River study area in 2020.

River Mile	Site ID	Sample Date	Drainage Area (sq mi)	Sub-samp	Number of				MBI	Percent:		MIBI
					Total Taxa	Coleoptera Taxa	Mayfly Taxa	Intolerant Taxa		Percent Scrapers	Percent EPT	
Des Plaines River (95-656)												
Year: 2020												
109.30	G-08	10/07/2020	122.80		22(48.0)	2(40.0)	1(9.8)	2(22.2)	7.4(59.0)	0.8(2.7)	2.8(3.7)	26.5
106.60	13-5	10/07/2020	137.29		23(50.0)	1(20.0)	1(9.8)	1(11.1)	8.3(44.3)	5.1(17.2)	5.1(6.9)	22.8
102.90	G-25	10/07/2020	144.80		29(63.0)	1(20.0)	4(39.2)	3(33.3)	6.6(72.1)	2.2(7.5)	11.5(15.5)	35.8
99.30	13-19	10/07/2020	213.17		24(52.0)	2(40.0)	2(19.6)	2(22.2)	8.7(37.7)	3.3(11.3)	3.9(5.3)	26.9
98.70	13-3	10/08/2020	220.29		28(61.0)	2(40.0)	2(19.6)	2(22.2)	7.4(59.0)	9.5(32.0)	6.7(9.0)	34.7
96.82	13-2	10/08/2020	225.36		32(70.0)	2(40.0)	3(29.4)	2(22.2)	5.2(95.1)	6.6(22.4)	6.6(9.0)	41.2
90.60	13-16	10/08/2020	253.75		29(63.0)	3(60.0)	4(39.2)	4(44.4)	5.1(96.7)	6.4(21.7)	48.6(65.7)	55.8
87.10	16-6	10/06/2020	261.38		31(67.0)	3(60.0)	6(58.8)	6(66.7)	6.3(77.1)	9.9(33.6)	19.6(26.5)	55.7
84.60	16-7	10/06/2020	266.48		27(59.0)	2(40.0)	4(39.2)	1(11.1)	5.5(90.2)	2.9(9.6)	38.0(51.3)	42.9
83.60	16-5	10/06/2020	268.07		27(59.0)	3(60.0)	3(29.4)	5(55.6)	5.6(88.5)	0.8(2.6)	27.5(37.1)	47.5
82.90	16-8	10/06/2020	268.90		28(61.0)	2(40.0)	3(29.4)	2(22.2)	5.8(85.3)	1.0(3.3)	10.3(13.9)	36.4
80.00	16-4	10/06/2020	273.21		30(65.0)	1(20.0)	6(58.8)	4(44.4)	5.1(96.7)	8.1(27.4)	67.3(90.9)	57.6
76.70	16-3	10/06/2020	314.68		32(70.0)	3(60.0)	6(58.8)	4(44.4)	5.3(93.4)	5.8(19.7)	40.8(55.1)	57.4
75.40	R5W07648-9	10/06/2020	315.80		23(50.0)	2(40.0)	5(49.0)	1(11.1)	5.1(96.7)	13.5(45.6)	58.9(79.5)	53.2
71.70	16-1	07/20/2020	358.68		24(52.0)	2(40.0)	3(29.4)	4(44.4)	4.9(100)	0.3(1.1)	9.2(12.5)	39.9
Mill Creek (95-995)												
Year: 2020												
1.71	11-2	10/07/2020	62.25		32(70.0)	3(60.0)	3(29.4)	4(44.4)	5.2(95.1)	5.9(19.9)	40.4(54.6)	53.3
North Mill Creek (95-996)												
Year: 2020												
1.10	10-1	10/07/2020	31.97		33(72.0)	3(60.0)	3(29.4)	5(55.6)	6.6(72.1)	19.1(64.6)	27.4(37.1)	55.8

Appendix Table B-2. Macroinvertebrate taxa collected at all upper DesPlaines River sites in 2020.

Taxa Code	Taxa Name	OH Toler-ance	IL Toler-ance	Abund-ance	Percent	Samples Collected (N = 18)
03600	*Oligochaeta*	T	10	670	12.06	18
16700	*Tricorythodes sp*	MI	5	493	8.87	13
97601	*Corbicula fluminea*	F	4	485	8.73	13
06800	*Gammarus sp*	F	3	410	7.38	17
11130	*Baetis intercalaris*	F	4	403	7.25	14
83300	*Glyptotendipes (G.) sp*	MT	10	324	5.83	11
52200	*Cheumatopsyche sp*	F	6	254	4.57	16
69400	*Stenelmis sp*	F	7	197	3.55	17
18100	*Anthopotamus sp*	MI	4	123	2.21	9
06201	*Hyalella azteca*	F	4	120	2.16	9
82730	*Chironomus (C.) decorus group*	T	11	118	2.12	6
80420	*Cricotopus (C.) bicinctus*	T	8	107	1.93	13
01801	*Turbellaria*	F	6	102	1.84	11
85625	*Rheotanytarsus sp*	F	6	99	1.78	13
98200	*Pisidium sp*	MT	5	98	1.76	13
84520	*Polypedilum (Tripodura) halterale grou*	MT	6	93	1.67	15
78655	*Procladius (Holotanypus) sp*	MT	8	86	1.55	6
77750	*Hayesomyia senata or Thienemannimy*	F	5	76	1.37	14
22001	*Coenagrionidae*	T	5.5	74	1.33	6
68700	*Dubiraphia sp*	F	5	73	1.31	10
83040	*Dicrotendipes neomodestus*	F	6	67	1.21	10
84470	*Polypedilum (P.) illinoense*	T	6	65	1.17	9
85800	*Tanytarsus sp*	F	7	56	1.01	10
85265	*Cladotanytarsus vanderwulpi group sp*	MI	7	55	0.99	4
98600	*Sphaerium sp*	F	5	51	0.92	8
84450	*Polypedilum (Uresipedilum) flavum*	F	6	46	0.83	11
82820	*Cryptochironomus sp*	F	8	38	0.68	12
13400	*Stenacron sp*	F	4	37	0.67	10
84469	*Polypedilum (P.) illinoense group*		6	37	0.67	7
52400	*Hydropsyche sp or Ceratopsyche sp*		0	33	0.59	1
83158	*Endochironomus nigricans*	MT	6	32	0.58	5
22300	*Argia sp*	F	5	27	0.49	12
05800	*Caecidotea sp*	T	6	26	0.47	3
93900	*Elimia sp*	MI	6	26	0.47	2
17200	*Caenis sp*	F	6	24	0.43	4
68708	*Dubiraphia vittata group*	F	5	21	0.38	4
68901	*Macronychus glabratus*	F	2	21	0.38	6
84540	*Polypedilum (Tripodura) scalaenum gro*	F	6	21	0.38	9
68201	*Scirtidae*	F	7	20	0.36	3
82710	*Chironomus (C.) sp*	MT	11	20	0.36	5
13570	*Maccaffertium terminatum*	MI	4	19	0.34	5

Appendix Table B-2. Macroinvertebrate taxa collected at all upper DesPlaines River sites in 2020.

Taxa Code	Taxa Name	OH Toler-ance	IL Toler-ance	Abund-ance	Percent	Samples Collected (N = 18)
79020	*Tanypus neopunctipennis*	T	8	19	0.34	3
59407	*Nectopsyche candida*	MI	3	18	0.32	7
95100	*Physella sp*	T	9	17	0.31	5
52570	*Hydropsyche simulans*	MI	5	15	0.27	3
83110	*Einfeldia natchitocheae*		0	15	0.27	1
93200	*Hydrobiidae*	F	6	15	0.27	6
82141	*Thienemanniella xena*	F	2	14	0.25	7
82822	*Cryptochironomus eminentia*	F	0	14	0.25	5
11200	*Callibaetis sp*	MT	4	13	0.23	3
18700	*Hexagenia sp*	F	6	13	0.23	1
80410	*Cricotopus (C.) sp*	F	8	13	0.23	6
08250	*Orconectes (Procericambarus) rusticus*	F	5	12	0.22	4
81632	*Parakiefferiella n.sp 2*	F	5	11	0.2	1
77355	*Clinotanypus pinguis*	MT	6	10	0.18	5
81631	*Parakiefferiella n.sp 1*	F	5	10	0.18	3
59500	*Oecetis sp*	F	5	9	0.16	6
68707	*Dubiraphia quadrinotata*	F	5	9	0.16	1
84612	*Saetheria tylus*	F	4	8	0.14	4
80370	*Corynoneura lobata*	F	2	7	0.13	6
80510	*Cricotopus (Isocladius) sylvestris group*	T	8	7	0.13	3
83820	*Microtendipes "caelum" (sensu Simpso*	MI	6	7	0.13	4
85821	*Tanytarsus glabrescens group sp 7*	F	7	7	0.13	6
77120	*Ablabesmyia mallochi*	F	6	6	0.11	6
80440	*Cricotopus (C.) trifascia*	F	6	6	0.11	1
81231	*Nanocladius (N.) crassicornus or N. (N.)*	F	3	6	0.11	2
81825	*Rheocricotopus (Psilocricotopus) robac*	F	6	6	0.11	2
85840	*Tanytarsus sepp*	F	7	6	0.11	4
86100	*Chrysops sp*	F	7	6	0.11	1
11120	*Baetis flavistriga*	F	4	5	0.09	2
74100	*Simulium sp*	F	6	5	0.09	3
82885	*Cryptotendipes pseudotener*	F	6	5	0.09	3
84790	*Tribelos fuscicorne*	F	5	5	0.09	5
59570	*Oecetis nocturna*	F	5	4	0.07	4
96900	*Ferrissia sp*	F	7	4	0.07	1
03000	*Ectoprocta*	F	99.9	3	0.05	3
51206	*Cyrnellus fraternus*	F	5	3	0.05	2
69200	*Optioservus sp*	MI	4	3	0.05	2
80470	*Cricotopus (C.) or Orthocladius (O.) sp*		6	3	0.05	2
81460	*Orthocladius (O.) sp*	F	4	3	0.05	2
84000	*Parachironomus sp*	MT	8	3	0.05	1
84700	*Stenochironomus sp*	F	3	3	0.05	3

Appendix Table B-2. Macroinvertebrate taxa collected at all upper DesPlaines River sites in 2020.

Taxa Code	Taxa Name	OH Toler-ance	IL Toler-ance	Abund-ance	Percent	Samples Collected (N = 18)
85230	*Cladotanytarsus mancus group*	F	7	3	0.05	2
85500	*Paratanytarsus sp*	F	6	3	0.05	1
01900	*Nemertea*	F	99.9	2	0.04	2
11620	*Paracloeodes minutus*	MI	5	2	0.04	2
52500	*Hydropsyche sp*		5	2	0.04	2
53501	*Hydroptilidae*	F	3.5	2	0.04	2
59550	*Oecetis inconspicua complex sp A (sens*	F	5	2	0.04	2
71910	*Tipula abdominalis*	F	0	2	0.04	1
78200	*Larsia sp*	MT	6	2	0.04	1
94400	*Fossaria sp*	MT	7	2	0.04	1
03121	*Paludicella articulata*	MI	0	1	0.02	1
08310	*Procambarus (Ortmannicus) acutus acu*	T	5	1	0.02	1
08451	*Palaemonetes kadiakensis*	F	4	1	0.02	1
13550	*Maccaffertium mexicanum integrum*	MI	0	1	0.02	1
18501	*Ephemeridae*		5	1	0.02	1
23909	*Boyeria vinosa*	F	3	1	0.02	1
53400	*Protoptila sp*	I	1	1	0.02	1
53800	*Hydroptila sp*	F	2	1	0.02	1
58505	*Helicopsyche borealis*	MI	2	1	0.02	1
71300	*Limonia sp*	F	3	1	0.02	1
71900	*Tipula sp*	F	4	1	0.02	1
77110	*Ablabesmyia annulata*	F	6	1	0.02	1
77130	*Ablabesmyia rhamphe group*	MT	6	1	0.02	1
78140	*Labrundinia pilosella*	F	4	1	0.02	1
78600	*Pentaneura inconspicua*	F	3	1	0.02	1
78650	*Procladius sp*	MT	8	1	0.02	1
78750	*Rheopelopia paramaculipennis*	MI	3	1	0.02	1
80740	*Eukiefferiella claripennis group*	MT	4	1	0.02	1
81240	*Nanocladius (N.) distinctus*	MT	3	1	0.02	1
81250	*Nanocladius (N.) minimus*	F	3	1	0.02	1
81712	*Psectrocladius (P.) psilopterus group*	MT	0	1	0.02	1
82130	*Thienemanniella similis*	MI	2	1	0.02	1
82824	*Cryptochironomus ponderosus*	F	0	1	0.02	1
83000	*Dicrotendipes sp*	F	6	1	0.02	1
83002	*Dicrotendipes modestus*	MT	6	1	0.02	1
83050	*Dicrotendipes lucifer*	MT	6	1	0.02	1
83051	*Dicrotendipes simpsoni*	T	6	1	0.02	1
83410	*Harnischia curtilamellata*	F	6	1	0.02	1
83840	*Microtendipes pedellus group*	F	6	1	0.02	1
84040	*Parachironomus frequens*	F	8	1	0.02	1
84280	*Phaenopsectra sp or Tribelos sp*	F	4	1	0.02	1

Appendix Table B-2. Macroinvertebrate taxa collected at all upper DesPlaines River sites in 2020.

Taxa Code	Taxa Name	OH Toler-ance	IL Toler-ance	Abund-ance	Percent	Samples Collected (N = 18)
84750	*Stictochironomus sp*	F	5	1	0.02	1
84800	*Tribelos jucundum*	MT	5	1	0.02	1
85400	*Micropsectra sp*	MT	4	1	0.02	1
85711	*Stempellinella leptocelloides*	MI	0	1	0.02	1
86200	*Tabanus sp*	F	7	1	0.02	1
89501	*Ephydridae*	F	8	1	0.02	1
99001	*Unionidae*		1.5	1	0.02	1
	Total Taxa = 130					

Appendix Table B-3. Macroinvertebrate taxa collected in small tribs of the lower Des Plaines River study area during 2019.

Site: dst. Russell Rd

Site ID: **13-6**

Subsample:

RM: 109.30

Collection Date 10/07/2020 River Code 95-656 River: DesPlaines River

Taxa Code	Taxa	Taxa Grp	Tol.	Qt./Ql.
01801	Turbellaria		6.0	1
03600	Oligochaeta		10.0	121
06201	Hyalella azteca		4.0	40
06800	Gammarus sp		3.0	11
17200	Caenis sp	MA	6.0	5
18501	Ephemeridae		5.0	1
22001	Coenagrionidae		5.5	8
59500	Oecetis sp	CA	5.0	2
68700	Dubiraphia sp	CO	5.0	19
69400	Stenelmis sp	CO	7.0	1
77355	Clinotanypus pinguis		6.0	3
78200	Larsia sp		6.0	2
78655	Procladius (Holotanypus) sp		8.0	8
79020	Tanypus neopunctipennis		8.0	4
80370	Corynoneura lobata		2.0	1
82820	Cryptochironomus sp		8.0	1
83110	Einfeldia natchitocheae		0.0	15
83158	Endochironomus nigricans		6.0	6
83300	Glyptotendipes (G.) sp		10.0	1
84520	Polypedilum (Tripodura) halterale group		6.0	1
85800	Tanytarsus sp		7.0	1
93200	Hydrobiidae		6.0	1
98200	Pisidium sp		5.0	1

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.

No. Quantitative Taxa: 23 Total Taxa: 23

Number of Organisms: 254 mIBI: 26.49

Appendix Table B-3. Macroinvertebrate taxa collected in small tribs of the lower Des Plaines River study area during 2019.

Site: dst. Rosecrans Rd.

Site ID: **13-5**

Subsample:

RM: 106.60

Collection Date 10/07/2020 River Code 95-656 River: DesPlaines River

Taxa Code	Taxa	Taxa Grp	Tol.	Qt./Ql.
03600	Oligochaeta		10.0	117
06800	Gammarus sp		3.0	1
18700	Hexagenia sp	MA	6.0	13
59500	Oecetis sp	CA	5.0	1
68700	Dubiraphia sp	CO	5.0	19
71900	Tipula sp		4.0	1
77110	Ablabesmyia annulata		6.0	1
77355	Clinotanypus pinguis		6.0	3
78655	Procladius (Holotanypus) sp		8.0	65
79020	Tanypus neopunctipennis		8.0	14
80420	Cricotopus (C.) bicinctus		8.0	1
82730	Chironomus (C.) decorus group		11.0	1
82820	Cryptochironomus sp		8.0	3
83050	Dicrotendipes lucifer		6.0	1
83158	Endochironomus nigricans		6.0	2
83300	Glyptotendipes (G.) sp		10.0	2
83840	Microtendipes pedellus group		6.0	1
84470	Polypedilum (P.) illinoense		6.0	6
85800	Tanytarsus sp		7.0	1
89501	Ephydridae		8.0	1
95100	Physella sp		9.0	10
96900	Ferrissia sp		7.0	4
97601	Corbicula fluminea		4.0	7

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.

No. Quantitative Taxa: 23 Total Taxa: 23

Number of Organisms: 275 mIBI: 22.75

Appendix Table B-3. Macroinvertebrate taxa collected in small tribs of the lower Des Plaines River study area during 2019.

Site: Dst. Wadsworth Rd.

Site ID: **13-4**

Subsample:

RM: 102.90

Collection Date 10/07/2020 River Code 95-656 River: DesPlaines River

Taxa Code	Taxa	Taxa Grp	Tol.	Qt./Ql.
03600	Oligochaeta		10.0	64
05800	Caecidotea sp		6.0	2
06201	Hyalella azteca		4.0	64
06800	Gammarus sp		3.0	9
08451	Palaemonetes kadiakensis		4.0	1
11130	Baetis intercalaris	MA	4.0	1
11200	Callibaetis sp	MA	4.0	10
13400	Stenacron sp	MA	4.0	3
17200	Caenis sp	MA	6.0	16
22001	Coenagrionidae		5.5	51
22300	Argia sp		5.0	1
52200	Cheumatopsyche sp	CA	6.0	5
53800	Hydroptila sp	CA	2.0	1
69400	Stenelmis sp	CO	7.0	1
74100	Simulium sp		6.0	1
77355	Clinotanypus pinguis		6.0	2
78655	Procladius (Holotanypus) sp		8.0	10
80510	Cricotopus (Isocladius) sylvestris group		8.0	5
81231	Nanocladius (N.) crassicornus or N. (N.) "rectinervis"		3.0	1
82730	Chironomus (C.) decorus group		11.0	2
82820	Cryptochironomus sp		8.0	2
83002	Dicrotendipes modestus		6.0	1
83158	Endochironomus nigricans		6.0	22
83300	Glyptotendipes (G.) sp		10.0	29
84470	Polypedilum (P.) illinoense		6.0	3
85500	Paratanytarsus sp		6.0	3
85625	Rheotanytarsus sp		6.0	1
95100	Physella sp		9.0	2
98200	Pisidium sp		5.0	1

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.

No. Quantitative Taxa: 29 Total Taxa: 29

Number of Organisms: 314 mIBI: 35.81

Appendix Table B-3. Macroinvertebrate taxa collected in small tribs of the lower Des Plaines River study area during 2019.

Site: ust. Wetland Riffle

Site ID: **13-19**

Subsample:

RM: 99.30

Collection Date 10/07/2020 River Code 95-656 River: DesPlaines River

Taxa Code	Taxa	Taxa Grp	Tol.	Qt./Ql.
01801	Turbellaria		6.0	6
03600	Oligochaeta		10.0	54
06201	Hyalella azteca		4.0	5
06800	Gammarus sp		3.0	13
08310	Procambarus (Ortmannicus) acutus acutus		5.0	1
16700	Tricorythodes sp	MA	5.0	3
17200	Caenis sp	MA	6.0	2
22300	Argia sp		5.0	2
51206	Cyrnellus fraternus	CA	5.0	1
52200	Cheumatopsyche sp	CA	6.0	7
59570	Oecetis nocturna	CA	5.0	1
68707	Dubiraphia quadrinotata	CO	5.0	9
69400	Stenelmis sp	CO	7.0	12
80420	Cricotopus (C.) bicinctus		8.0	11
81240	Nanocladius (N.) distinctus		3.0	1
82822	Cryptochironomus eminentia		0.0	6
83040	Dicrotendipes neomodestus		6.0	6
83051	Dicrotendipes simpsoni		6.0	1
83300	Glyptotendipes (G.) sp		10.0	204
83410	Harnischia curtilamellata		6.0	1
84469	Polypedilum (P.) illinoense group		6.0	3
84520	Polypedilum (Tripodura) halterale group		6.0	3
85230	Cladotanytarsus mancus group		7.0	1
85625	Rheotanytarsus sp		6.0	3
85821	Tanytarsus glabrescens group sp 7		7.0	1
98200	Pisidium sp		5.0	1
98600	Sphaerium sp		5.0	2

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.

No. Quantitative Taxa: 27 Total Taxa: 27

Number of Organisms: 360 mIBI: 26.86

Appendix Table B-3. Macroinvertebrate taxa collected in small tribs of the lower Des Plaines River study area during 2019.

Site: ust. Skokie Hwy

Site ID: **13-3**

Subsample:

RM: 98.70

Collection Date 10/08/2020 River Code 95-656 River: DesPlaines River

Taxa Code	Taxa	Taxa Grp	Tol.	Qt./Ql.
03600	Oligochaeta		10.0	83
06201	Hyalella azteca		4.0	3
06800	Gammarus sp		3.0	37
11130	Baetis intercalaris	MA	4.0	4
13400	Stenacron sp	MA	4.0	7
22300	Argia sp		5.0	4
51206	Cyrnellus fraternus	CA	5.0	2
52200	Cheumatopsyche sp	CA	6.0	4
59550	Oecetis inconspicua complex sp A (sensu Floyd, 1995)	CA	5.0	1
59570	Oecetis nocturna	CA	5.0	1
68700	Dubiraphia sp	CO	5.0	12
69400	Stenelmis sp	CO	7.0	19
77120	Ablabesmyia mallochi		6.0	1
77355	Clinotanypus pinguis		6.0	1
77750	Hayesomyia senata or Thienemannimyia norena		5.0	5
78140	Labrundinia pilosella		4.0	1
80420	Cricotopus (C.) bicinctus		8.0	8
80470	Cricotopus (C.) or Orthocladius (O.) sp		6.0	2
82141	Thienemanniella xena		2.0	1
82820	Cryptochironomus sp		8.0	10
83000	Dicrotendipes sp		6.0	1
83158	Endochironomus nigricans		6.0	1
83300	Glyptotendipes (G.) sp		10.0	55
84280	Phaenopsectra sp or Tribelos sp		4.0	1
84470	Polypedilum (P.) illinoense		6.0	2
84520	Polypedilum (Tripodura) halterale group		6.0	2
84540	Polypedilum (Tripodura) scalaenum group		6.0	1
85625	Rheotanytarsus sp		6.0	1
85800	Tanytarsus sp		7.0	2
97601	Corbicula fluminea		4.0	12
98200	Pisidium sp		5.0	1

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.

No. Quantitative Taxa: 31 Total Taxa: 31

Number of Organisms: 285 mIBI: 34.69

Appendix Table B-3. Macroinvertebrate taxa collected in small tribs of the lower Des Plaines River study area during 2019.

Site: dst. McClure Ave.

Site ID: **13-2**

Subsample:

RM: 96.82

Collection Date 10/08/2020 River Code 95-656 River: DesPlaines River

Taxa Code	Taxa	Taxa Grp	Tol.	Qt./Ql.
01801	Turbellaria		6.0	5
03000	Ectoprocta		99.9	1
03600	Oligochaeta		10.0	44
05800	Caecidotea sp		6.0	8
06201	Hyalella azteca		4.0	4
06800	Gammarus sp		3.0	150
08250	Orconectes (Procericambarus) rusticus		5.0	1
11130	Baetis intercalaris	MA	4.0	7
13400	Stenacron sp	MA	4.0	6
16700	Tricorythodes sp	MA	5.0	1
22001	Coenagrionidae		5.5	5
22300	Argia sp		5.0	2
52200	Cheumatopsyche sp	CA	6.0	7
52570	Hydropsyche simulans	CA	5.0	1
68700	Dubiraphia sp	CO	5.0	1
69400	Stenelmis sp	CO	7.0	13
77750	Hayesomyia senata or Thienemannimyia norena		5.0	2
80370	Corynoneura lobata		2.0	1
80420	Cricotopus (C.) bicinctus		8.0	11
81460	Orthocladius (O.) sp		4.0	1
82710	Chironomus (C.) sp		11.0	4
82820	Cryptochironomus sp		8.0	1
83040	Dicrotendipes neomodestus		6.0	1
83300	Glyptotendipes (G.) sp		10.0	8
84469	Polypedilum (P.) illinoense group		6.0	14
84520	Polypedilum (Tripodura) halterale group		6.0	2
84540	Polypedilum (Tripodura) scalaenum group		6.0	1
84790	Tribelos fuscicorne		5.0	1
84800	Tribelos jucundum		5.0	1
85400	Micropsectra sp		4.0	1
85625	Rheotanytarsus sp		6.0	9
85821	Tanytarsus glabrescens group sp 7		7.0	1
93200	Hydrobiidae		6.0	2
95100	Physella sp		9.0	1
97601	Corbicula fluminea		4.0	13
98200	Pisidium sp		5.0	1
98600	Sphaerium sp		5.0	1

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.

No. Quantitative Taxa: 37 Total Taxa: 37

Number of Organisms: 333 mIBI: 41.15

Appendix Table B-3. Macroinvertebrate taxa collected in small tribs of the lower Des Plaines River study area during 2019.

Site: dst. Buckley Rd.

Site ID: **13-16**

Subsample:

RM: 90.60

Collection Date 10/08/2020 River Code 95-656 River: DesPlaines River

Taxa Code	Taxa	Taxa Grp	Tol.	Qt./Ql.
03600	Oligochaeta		10.0	29
06800	Gammarus sp		3.0	38
11130	Baetis intercalaris	MA	4.0	102
13570	Maccaffertium terminatum	MA	4.0	2
16700	Tricorythodes sp	MA	5.0	35
18100	Anthopotamus sp	MA	4.0	19
22001	Coenagrionidae		5.5	2
52200	Cheumatopsyche sp	CA	6.0	14
52500	Hydropsyche sp	CA	5.0	1
58505	Helicopsyche borealis	CA	2.0	1
68708	Dubiraphia vittata group	CO	5.0	6
69200	Optioservus sp	CO	4.0	2
69400	Stenelmis sp	CO	7.0	17
77120	Ablabesmyia mallochi		6.0	1
77750	Hayesomyia senata or Thienemannimyia norena		5.0	9
80370	Corynoneura lobata		2.0	1
80410	Cricotopus (C.) sp		8.0	2
80420	Cricotopus (C.) bicinctus		8.0	10
80740	Eukiefferiella claripennis group		4.0	1
82130	Thienemanniella similis		2.0	1
82141	Thienemanniella xena		2.0	1
82710	Chironomus (C.) sp		11.0	7
82822	Cryptochironomus eminentia		0.0	3
82885	Cryptotendipes pseudotener		6.0	1
83040	Dicrotendipes neomodestus		6.0	3
83820	Microtendipes "caelum" (sensu Simpson & Bode, 1980)		6.0	1
84450	Polypedilum (Uresipedilum) flavum		6.0	2
84469	Polypedilum (P.) illinoense group		6.0	10
85625	Rheotanytarsus sp		6.0	7
93200	Hydrobiidae		6.0	1
97601	Corbicula fluminea		4.0	28
98200	Pisidium sp		5.0	1

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.

No. Quantitative Taxa: 32 Total Taxa: 32

Number of Organisms: 358 mIBI: 55.82

Appendix Table B-3. Macroinvertebrate taxa collected in small tribs of the lower Des Plaines River study area during 2019.

Site: dst. Rockland Rd.

Site ID: **16-6**

Subsample:

RM: 87.10

Collection Date 10/06/2020 River Code 95-656 River: DesPlaines River

Taxa Code	Taxa	Taxa Grp	Tol.	Qt./Ql.
03600	Oligochaeta		10.0	15
06800	Gammarus sp		3.0	24
11130	Baetis intercalaris	MA	4.0	1
11620	Paracloeodes minutus	MA	5.0	1
13400	Stenacron sp	MA	4.0	2
13570	Maccaffertium terminatum	MA	4.0	3
16700	Tricorythodes sp	MA	5.0	22
18100	Anthopotamus sp	MA	4.0	22
22300	Argia sp		5.0	1
52200	Cheumatopsyche sp	CA	6.0	7
59407	Nectopsyche candida	CA	3.0	5
59550	Oecetis inconspicua complex sp A (sensu Floyd, 1995)	CA	5.0	1
59570	Oecetis nocturna	CA	5.0	1
68700	Dubiraphia sp	CO	5.0	6
68901	Macronychus glabratus	CO	2.0	4
69400	Stenelmis sp	CO	7.0	23
77750	Hayesomyia senata or Thienemannimyia norena		5.0	7
78655	Procladius (Holotanypus) sp		8.0	1
80370	Corynoneura lobata		2.0	1
80410	Cricotopus (C.) sp		8.0	3
80420	Cricotopus (C.) bicinctus		8.0	13
82141	Thienemanniella xena		2.0	1
82730	Chironomus (C.) decorus group		11.0	58
82820	Cryptochironomus sp		8.0	3
83040	Dicrotendipes neomodestus		6.0	10
84450	Polypedilum (Uresipedilum) flavum		6.0	3
84470	Polypedilum (P.) illinoense		6.0	2
84520	Polypedilum (Tripodura) halterale group		6.0	9
84700	Stenochironomus sp		3.0	1
84790	Tribelos fuscicorne		5.0	1
85265	Cladotanytarsus vanderwulpi group sp 5		7.0	1
85800	Tanytarsus sp		7.0	8
85821	Tanytarsus glabrescens group sp 7		7.0	1
85840	Tanytarsus sepp		7.0	1
93200	Hydrobiidae		6.0	5
97601	Corbicula fluminea		4.0	61
98200	Pisidium sp		5.0	3
98600	Sphaerium sp		5.0	1

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.

No. Quantitative Taxa: 38 Total Taxa: 38

Number of Organisms: 332 mIBI: 55.65

Appendix Table B-3. Macroinvertebrate taxa collected in small tribs of the lower Des Plaines River study area during 2019.

Site: ust. Dam site

Site ID: **16-7**

Subsample:

RM: 84.60

Collection Date 10/06/2020 River Code 95-656 River: DesPlaines River

Taxa Code	Taxa	Taxa Grp	Tol.	Qt./Ql.
01801	Turbellaria		6.0	37
03600	Oligochaeta		10.0	7
05800	Caecidotea sp		6.0	16
06800	Gammarus sp		3.0	10
11120	Baetis flavistriga	MA	4.0	2
11130	Baetis intercalaris	MA	4.0	26
13400	Stenacron sp	MA	4.0	1
16700	Tricorythodes sp	MA	5.0	82
18100	Anthopotamus sp	MA	4.0	4
52200	Cheumatopsyche sp	CA	6.0	3
52500	Hydropsyche sp	CA	5.0	1
53501	Hydroptilidae	CA	3.5	1
68708	Dubiraphia vittata group	CO	5.0	2
69400	Stenelmis sp	CO	7.0	7
74100	Simulium sp		6.0	2
77750	Hayesomyia senata or Thienemannimyia norena		5.0	1
80410	Cricotopus (C.) sp		8.0	2
80420	Cricotopus (C.) bicinctus		8.0	3
80440	Cricotopus (C.) trifascia		6.0	6
80510	Cricotopus (Isocladius) sylvestris group		8.0	1
81712	Psectrocladius (P.) psilopterus group		0.0	1
82730	Chironomus (C.) decorus group		11.0	3
82820	Cryptochironomus sp		8.0	2
83040	Dicrotendipes neomodestus		6.0	1
84450	Polypedilum (Uresipedilum) flavum		6.0	6
84470	Polypedilum (P.) illinoense		6.0	15
84520	Polypedilum (Tripodura) halterale group		6.0	5
85265	Cladotanytarsus vanderwulpi group sp 5		7.0	1
85625	Rheotanytarsus sp		6.0	15
85800	Tanytarsus sp		7.0	2
85821	Tanytarsus glabrescens group sp 7		7.0	1
93200	Hydrobiidae		6.0	1
97601	Corbicula fluminea		4.0	12
98200	Pisidium sp		5.0	24
98600	Sphaerium sp		5.0	13

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.

No. Quantitative Taxa: 35 Total Taxa: 35

Number of Organisms: 316 mIBI: 42.92

Appendix Table B-3. Macroinvertebrate taxa collected in small tribs of the lower Des Plaines River study area during 2019.

Site: dst. Townline Rd.

Site ID: **16-5**

Subsample:

RM: 83.60

Collection Date 10/06/2020 River Code 95-656 River: DesPlaines River

Taxa Code	Taxa	Taxa Grp	Tol.	Qt./Ql.
03121	Paludicella articulata		0.0	1
03600	Oligochaeta		10.0	20
06800	Gammarus sp		3.0	17
11130	Baetis intercalaris	MA	4.0	57
16700	Tricorythodes sp	MA	5.0	6
18100	Anthopotamus sp	MA	4.0	4
22300	Argia sp		5.0	3
52200	Cheumatopsyche sp	CA	6.0	4
59407	Nectopsyche candida	CA	3.0	1
68201	Scirtidae		7.0	1
68708	Dubiraphia vittata group	CO	5.0	3
68901	Macronychus glabratus	CO	2.0	5
69400	Stenelmis sp	CO	7.0	1
77750	Hayesomyia senata or Thienemannimyia norena		5.0	8
80410	Cricotopus (C.) sp		8.0	1
80420	Cricotopus (C.) bicinctus		8.0	26
81631	Parakiefferiella n.sp 1		5.0	6
82141	Thienemanniella xena		2.0	5
82710	Chironomus (C.) sp		11.0	7
82820	Cryptochironomus sp		8.0	2
83040	Dicrotendipes neomodestus		6.0	10
84450	Polypedilum (Uresipedilum) flavum		6.0	4
84469	Polypedilum (P.) illinoense group		6.0	5
84520	Polypedilum (Tripodura) halterale group		6.0	3
84540	Polypedilum (Tripodura) scalaenum group		6.0	5
84612	Saetheria tylus		4.0	2
84700	Stenochironomus sp		3.0	1
85625	Rheotanytarsus sp		6.0	24
85800	Tanytarsus sp		7.0	6
85821	Tanytarsus glabrescens group sp 7		7.0	1
86200	Tabanus sp		7.0	1
97601	Corbicula fluminea		4.0	22

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.

No. Quantitative Taxa: 32 Total Taxa: 32

Number of Organisms: 262 mIBI: 47.46

Appendix Table B-3. Macroinvertebrate taxa collected in small tribs of the lower Des Plaines River study area during 2019.

Site: ust. Dam site

Site ID: 16-8

Subsample:

RM: 82.90

Collection Date 10/06/2020 River Code 95-656 River: DesPlaines River

Taxa Code	Taxa	Taxa Grp	Tol.	Qt./Ql.
01801	Turbellaria		6.0	3
01900	Nemertea		99.9	1
03600	Oligochaeta		10.0	11
06201	Hyalella azteca		4.0	1
06800	Gammarus sp		3.0	10
11130	Baetis intercalaris	MA	4.0	5
16700	Tricorythodes sp	MA	5.0	9
18100	Anthopotamus sp	MA	4.0	1
52200	Cheumatopsyche sp	CA	6.0	6
59407	Nectopsyche candida	CA	3.0	7
59500	Oecetis sp	CA	5.0	3
68700	Dubiraphia sp	CO	5.0	2
69400	Stenelmis sp	CO	7.0	3
77120	Ablabesmyia mallochi		6.0	1
77750	Hayesomyia senata or Thienemannimyia norena		5.0	10
78655	Procladius (Holotanypus) sp		8.0	1
79020	Tanypus neopunctipennis		8.0	1
80410	Cricotopus (C.) sp		8.0	4
80420	Cricotopus (C.) bicinctus		8.0	8
82730	Chironomus (C.) decorus group		11.0	30
82820	Cryptochironomus sp		8.0	6
83040	Dicrotendipes neomodestus		6.0	3
84450	Polypedilum (Uresipedilum) flavum		6.0	1
84470	Polypedilum (P.) illinoense		6.0	6
84520	Polypedilum (Tripodura) halterale group		6.0	16
84540	Polypedilum (Tripodura) scalaenum group		6.0	1
84612	Saetheria tylus		4.0	2
84790	Tribelos fuscicorne		5.0	1
85230	Cladotanytarsus mancus group		7.0	2
85265	Cladotanytarsus vanderwulpi group sp 5		7.0	2
85625	Rheotanytarsus sp		6.0	5
85800	Tanytarsus sp		7.0	21
85840	Tanytarsus sepp		7.0	1
97601	Corbicula fluminea		4.0	117
98200	Pisidium sp		5.0	2

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.

No. Quantitative Taxa: 35 Total Taxa: 35

Number of Organisms: 303 mIBI: 36.44

Appendix Table B-3. Macroinvertebrate taxa collected in small tribs of the lower Des Plaines River study area during 2019.

Site: dst. Halfday Rd.

Site ID: **16-4**

Subsample:

RM: 80.00

Collection Date 10/06/2020 River Code 95-656 River: DesPlaines River

Taxa Code	Taxa	Taxa Grp	Tol.	Qt./Ql.
01801	Turbellaria		6.0	6
01900	Nemertea		99.9	1
03600	Oligochaeta		10.0	7
06201	Hyalella azteca		4.0	1
06800	Gammarus sp		3.0	13
11130	Baetis intercalaris	MA	4.0	88
11200	Callibaetis sp	MA	4.0	2
13400	Stenacron sp	MA	4.0	3
13570	Maccaffertium terminatum	MA	4.0	7
16700	Tricorythodes sp	MA	5.0	83
18100	Anthopotamus sp	MA	4.0	2
22001	Coenagrionidae		5.5	1
22300	Argia sp		5.0	2
52200	Cheumatopsyche sp	CA	6.0	36
53501	Hydroptilidae	CA	3.5	1
59407	Nectopsyche candida	CA	3.0	1
59500	Oecetis sp	CA	5.0	1
69400	Stenelmis sp	CO	7.0	17
77120	Ablabesmyia mallochi		6.0	1
77750	Hayesomyia senata or Thienemannimyia norena		5.0	7
80370	Corynoneura lobata		2.0	2
80410	Cricotopus (C.) sp		8.0	1
80420	Cricotopus (C.) bicinctus		8.0	10
82141	Thienemanniella xena		2.0	2
82822	Cryptochironomus eminentia		0.0	1
83040	Dicrotendipes neomodestus		6.0	4
83820	Microtendipes "caelum" (sensu Simpson & Bode, 1980)		6.0	1
84450	Polypedilum (Uresipedilum) flavum		6.0	4
84469	Polypedilum (P.) illinoense group		6.0	1
84520	Polypedilum (Tripodura) halterale group		6.0	11
84540	Polypedilum (Tripodura) scalaenum group		6.0	4
84612	Saetheria tylus		4.0	1
85625	Rheotanytarsus sp		6.0	6
97601	Corbicula fluminea		4.0	4
98600	Sphaerium sp		5.0	2

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.

No. Quantitative Taxa: 35 Total Taxa: 35

Number of Organisms: 334 mIBI: 57.61

Appendix Table B-3. Macroinvertebrate taxa collected in small tribs of the lower Des Plaines River study area during 2019.

Site: dst. Deerfield Rd.

Site ID: **16-3**

Subsample:

RM: 76.70

Collection Date 10/06/2020 River Code 95-656 River: DesPlaines River

Taxa Code	Taxa	Taxa Grp	Tol.	Qt./Ql.
01801	Turbellaria		6.0	1
03600	Oligochaeta		10.0	7
06800	Gammarus sp		3.0	26
08250	Orconectes (Procericambarus) rusticus		5.0	2
11130	Baetis intercalaris	MA	4.0	3
11200	Callibaetis sp	MA	4.0	1
13400	Stenacron sp	MA	4.0	2
13550	Maccaffertium mexicanum integrum		0.0	1
13570	Maccaffertium terminatum	MA	4.0	2
16700	Tricorythodes sp	MA	5.0	54
18100	Anthopotamus sp	MA	4.0	67
22300	Argia sp		5.0	2
52200	Cheumatopsyche sp	CA	6.0	2
59407	Nectopsyche candida	CA	3.0	2
68201	Scirtidae		7.0	1
68700	Dubiraphia sp	CO	5.0	2
68901	Macronychus glabratus	CO	2.0	2
69400	Stenelmis sp	CO	7.0	12
77750	Hayesomyia senata or Thienemannimyia norena		5.0	6
78650	Procladius sp		8.0	1
81631	Parakiefferiella n.sp 1		5.0	2
82730	Chironomus (C.) decorus group		11.0	24
82824	Cryptochironomus ponderosus		0.0	1
82885	Cryptotendipes pseudotener		6.0	1
83040	Dicrotendipes neomodestus		6.0	27
83300	Glyptotendipes (G.) sp		10.0	3
84450	Polypedilum (Uresipedilum) flavum		6.0	2
84470	Polypedilum (P.) illinoense		6.0	2
84520	Polypedilum (Tripodura) halterale group		6.0	7
84540	Polypedilum (Tripodura) scalaenum group		6.0	4
84700	Stenochironomus sp		3.0	1
84790	Tribelos fuscicorne		5.0	1
85625	Rheotanytarsus sp		6.0	1
85800	Tanytarsus sp		7.0	10
85821	Tanytarsus glabrescens group sp 7		7.0	2
93900	Elimia sp		6.0	2
97601	Corbicula fluminea		4.0	40

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.

No. Quantitative Taxa: 37 Total Taxa: 37

Number of Organisms: 326 mIBI: 57.36

Appendix Table B-3. Macroinvertebrate taxa collected in small tribs of the lower Des Plaines River study area during 2019.

Site: dst. Lake Cook Rd.

Site ID: **16-2**

Subsample:

RM: 75.40

Collection Date 10/06/2020 River Code 95-656 River: DesPlaines River

Taxa Code	Taxa	Taxa Grp	Tol.	Qt./Ql.
01801	Turbellaria		6.0	24
03600	Oligochaeta		10.0	1
06201	Hyalella azteca		4.0	1
06800	Gammarus sp		3.0	19
11130	Baetis intercalaris	MA	4.0	22
13400	Stenacron sp	MA	4.0	1
13570	Maccaffertium terminatum	MA	4.0	5
16700	Tricorythodes sp	MA	5.0	164
18100	Anthopotamus sp	MA	4.0	3
22300	Argia sp		5.0	1
52200	Cheumatopsyche sp	CA	6.0	1
68700	Dubiraphia sp	CO	5.0	2
69400	Stenelmis sp	CO	7.0	15
77750	Hayesomyia senata or Thienemannimyia norena		5.0	3
80420	Cricotopus (C.) bicinctus		8.0	1
83300	Glyptotendipes (G.) sp		10.0	1
83820	Microtendipes "caelum" (sensu Simpson & Bode, 1980)		6.0	1
84450	Polypedilum (Uresipedilum) flavum		6.0	1
84470	Polypedilum (P.) illinoense		6.0	1
84520	Polypedilum (Tripodura) halterale group		6.0	3
84540	Polypedilum (Tripodura) scalaenum group		6.0	1
85625	Rheotanytarsus sp		6.0	1
85800	Tanytarsus sp		7.0	1
93900	Elimia sp		6.0	24
97601	Corbicula fluminea		4.0	11
98200	Pisidium sp		5.0	19
98600	Sphaerium sp		5.0	6

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.

No. Quantitative Taxa: 27 Total Taxa: 27

Number of Organisms: 333 mIBI: 53.15

Appendix Table B-3. Macroinvertebrate taxa collected in small tribs of the lower Des Plaines River study area during 2019.

Site: ust. Palatine Rd.

Site ID: **16-1**

Subsample:

RM: 71.70

Collection Date 07/20/2020 River Code 95-656 River: DesPlaines River

Taxa Code	Taxa	Taxa Grp	Tol.	Qt./Ql.
01801	Turbellaria		6.0	6
03600	Oligochaeta		10.0	3
06800	Gammarus sp		3.0	6
11620	Paracloeodes minutus	MA	5.0	1
16700	Tricorythodes sp	MA	5.0	22
18100	Anthopotamus sp	MA	4.0	1
22300	Argia sp		5.0	1
52200	Cheumatopsyche sp	CA	6.0	2
59407	Nectopsyche candida	CA	3.0	1
59500	Oecetis sp	CA	5.0	1
68901	Macronychus glabratus	CO	2.0	1
69400	Stenelmis sp	CO	7.0	1
77750	Hayesomyia senata or Thienemannimyia norena		5.0	3
82820	Cryptochironomus sp		8.0	5
82822	Cryptochironomus eminentia		0.0	3
83300	Glyptotendipes (G.) sp		10.0	1
84450	Polypedilum (Uresipedilum) flavum		6.0	11
84469	Polypedilum (P.) illinoense group		6.0	2
84520	Polypedilum (Tripodura) halterale group		6.0	7
84612	Saetheria tylus		4.0	3
84790	Tribelos fuscicorne		5.0	1
85265	Cladotanytarsus vanderwulpi group sp 5		7.0	51
85625	Rheotanytarsus sp		6.0	3
97601	Corbicula fluminea		4.0	146
98200	Pisidium sp		5.0	21
99001	Unionidae		1.5	1

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.

No. Quantitative Taxa: 26 Total Taxa: 26

Number of Organisms: 304 mIBI: 39.92

Appendix Table B-3. Macroinvertebrate taxa collected in small tribs of the lower Des Plaines River study area during 2019.

Site: ust. Mill Creek WWTP

Site ID: **11-2**

Subsample:

RM: 1.71

Collection Date 10/07/2020 River Code 95-995 River: Mill Creek

Taxa Code	Taxa	Taxa Grp	Tol.	Qt./Ql.
01801	Turbellaria		6.0	8
03000	Ectoprocta		99.9	1
03600	Oligochaeta		10.0	10
06201	Hyalella azteca		4.0	1
06800	Gammarus sp		3.0	8
08250	Orconectes (Procericambarus) rusticus		5.0	2
11130	Baetis intercalaris	MA	4.0	46
13400	Stenacron sp	MA	4.0	1
16700	Tricorythodes sp	MA	5.0	6
22001	Coenagrionidae		5.5	7
22300	Argia sp		5.0	1
52200	Cheumatopsyche sp	CA	6.0	69
52400	Hydropsyche sp or Ceratopsyche sp		0.0	33
52570	Hydropsyche simulans	CA	5.0	7
59500	Oecetis sp	CA	5.0	1
68708	Dubiraphia vittata group	CO	5.0	10
69200	Optioservus sp	CO	4.0	1
69400	Stenelmis sp	CO	7.0	15
71300	Limonia sp		3.0	1
77120	Ablabesmyia mallochi		6.0	1
77750	Hayesomyia senata or Thienemannimyia norena		5.0	1
78655	Procladius (Holotanypus) sp		8.0	1
80420	Cricotopus (C.) bicinctus		8.0	3
80470	Cricotopus (C.) or Orthocladius (O.) sp		6.0	1
81231	Nanocladius (N.) crassicornus or N. (N.) "rectinervis"		3.0	5
81250	Nanocladius (N.) minimus		3.0	1
82141	Thienemanniella xena		2.0	2
82710	Chironomus (C.) sp		11.0	1
82822	Cryptochironomus eminentia		0.0	1
83040	Dicrotendipes neomodestus		6.0	2
83300	Glyptotendipes (G.) sp		10.0	18
84450	Polypedilum (Uresipedilum) flavum		6.0	11
84520	Polypedilum (Tripodura) halterale group		6.0	18
85840	Tanytarsus sepp		7.0	1
95100	Physella sp		9.0	2
98200	Pisidium sp		5.0	1
98600	Sphaerium sp		5.0	25

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.

No. Quantitative Taxa: 37 Total Taxa: 37

Number of Organisms: 323 mIBI: 53.34

Appendix Table B-3. Macroinvertebrate taxa collected in small tribs of the lower Des Plaines River study area during 2019.

Site: ust. Edwards Rd.

Site ID: **10-7**

Subsample:

RM: 11.30

Collection Date 10/07/2020 River Code 95-996 River: North Mill Creek

Taxa Code	Taxa	Taxa Grp	Tol.	Qt./Ql.
01801	Turbellaria		6.0	3
03600	Oligochaeta		10.0	39
04664	Helobdella stagnalis		8.0	2
05800	Caecidotea sp		6.0	1
05900	Lirceus sp		4.0	32
06201	Hyalella azteca		4.0	1
06800	Gammarus sp		3.0	90
13400	Stenacron sp	MA	4.0	15
16700	Tricorythodes sp	MA	5.0	1
17200	Caenis sp	MA	6.0	1
21200	Calopteryx sp		4.0	3
52200	Cheumatopsyche sp	CA	6.0	11
52530	Hydropsyche depravata group	CA	5.0	1
59550	Oecetis inconspicua complex sp A (sensu Floyd, 1995)	CA	5.0	1
59570	Oecetis nocturna	CA	5.0	3
68700	Dubiraphia sp	CO	5.0	6
71700	Pilaria sp		0.0	3
72700	Anopheles sp		6.0	1
76001	Chironomidae		6.0	12
77120	Ablabesmyia mallochi		6.0	1
77355	Clinotanypus pinguis		6.0	8
78655	Procladius (Holotanypus) sp		8.0	16
82730	Chironomus (C.) decorus group		11.0	4
82820	Cryptochironomus sp		8.0	1
84155	Paralauterborniella nigrohalteralis		6.0	1
84470	Polypedilum (P.) illinoense		6.0	1
84520	Polypedilum (Tripodura) halterale group		6.0	13
85800	Tanytarsus sp		7.0	1
86100	Chrysops sp		7.0	1
95100	Physella sp		9.0	2
98200	Pisidium sp		5.0	4
98600	Sphaerium sp		5.0	14

Taxa Code	Taxa	Feed Grp	Tol.	Qt./Ql.

No. Quantitative Taxa: 32 Total Taxa: 32

Number of Organisms: 293 mIBI: 0.00

Appendix Table B-3. Macroinvertebrate taxa collected in small tribs of the lower Des Plaines River study area during 2019.

Site: dst. Milburn Rd.

Site ID: **10-1**

Subsample:

RM: 1.10

Collection Date 10/07/2020 River Code 95-996 River: North Mill Creek

Taxa Code	Taxa	Taxa Grp	Tol.	Qt./Ql.
03000	Ectoprocta		99.9	1
03600	Oligochaeta		10.0	71
08250	Orconectes (Procericambarus) rusticus		5.0	7
11120	Baetis flavistriga	MA	4.0	3
11130	Baetis intercalaris	MA	4.0	37
13400	Stenacron sp	MA	4.0	11
17200	Caenis sp	MA	6.0	1
22300	Argia sp		5.0	7
23909	Boyeria vinosa		3.0	1
52200	Cheumatopsyche sp	CA	6.0	22
53400	Protoptila sp	CA	1.0	1
59570	Oecetis nocturna	CA	5.0	1
68201	Scirtidae		7.0	18
68700	Dubiraphia sp	CO	5.0	3
68901	Macronychus glabratus	CO	2.0	4
69400	Stenelmis sp	CO	7.0	23
71910	Tipula abdominalis		0.0	2
74100	Simulium sp		6.0	2
77120	Ablabesmyia mallochi		6.0	1
77355	Clinotanypus pinguis		6.0	1
77750	Hayesomyia senata or Thienemannimyia norena		5.0	3
80370	Corynoneura lobata		2.0	1
80420	Cricotopus (C.) bicinctus		8.0	2
81460	Orthocladius (O.) sp		4.0	2
81631	Parakiefferiella n.sp 1		5.0	2
81632	Parakiefferiella n.sp 2		5.0	11
81825	Rheocricotopus (Psilocricotopus) robacki		6.0	5
82141	Thienemanniella xena		2.0	2
82710	Chironomus (C.) sp		11.0	1
82820	Cryptochironomus sp		8.0	1
82885	Cryptotendipes pseudotener		6.0	3
83820	Microtendipes "caelum" (sensu Simpson & Bode, 1980)		6.0	4
84469	Polypedilum (P.) illinoense group		6.0	2
84520	Polypedilum (Tripodura) halterale group		6.0	5
84540	Polypedilum (Tripodura) scalaenum group		6.0	2
84750	Stictochironomus sp		5.0	1
85711	Stempellinella leptocelloides		0.0	1
85800	Tanytarsus sp		7.0	4
85840	Tanytarsus sepp		7.0	3
86100	Chrysops sp		7.0	6

No. Quantitative Taxa: 40 Total Taxa: 40

Number of Organisms: 278 mIBI: 55.83

APPENDIX C

Upper Des Plaines 2020 Habitat Data

C-1: Upper Des Plaines 2020 QHEI Metrics & Scores
C-2: QHEI Field Sheets 2020

Appendix C-1. QHEI metric scores for sites in the Upper Desplaines River study area in 2020.

River Mile	QHEI	QHEI Metrics							Narrative
		Substrate	Cover	Channel	Riparian	Pool	Riffle	Gradient / Score	
95-656	*DesPlaines River*								
	Year: **2020**								
109.30	**53.00**	4.0	11.0	9.0	10.0	8.0	1.0	5.64 - (10)	Fair
106.60	**42.00**	0.0	11.0	5.5	8.5	7.0	0.0	5.15 - (10)	Poor
102.90	**47.00**	0.0	15.0	6.0	10.0	6.0	0.0	4.67 - (10)	Poor
99.72	**70.50**	13.0	14.0	14.0	10.0	9.0	2.5	2.63 - (8)	Fair
99.30	**47.00**	4.0	15.0	4.0	11.0	6.0	0.0	2.63 - (8)	Poor
98.70	**79.50**	14.0	16.0	15.0	10.0	10.0	4.5	4.26 - (10)	Good
96.82	**82.50**	16.0	17.0	14.0	9.5	11.0	5.0	4.03 - (10)	Good
94.20	**72.25**	14.0	15.0	14.0	8.2	9.0	4.0	3.61 - (8)	Fair
90.60	**68.50**	13.0	17.0	13.0	5.5	8.5	3.5	3.32 - (8)	Fair
87.10	**71.00**	16.0	15.0	12.0	7.5	9.0	3.5	2.70 - (8)	Fair
84.60	**79.50**	14.0	17.0	16.0	7.5	11.0	6.0	2.77 - (8)	Good
83.60	**72.00**	16.0	17.0	11.0	10.5	7.0	3.0	2.72 - (8)	Fair
82.90	**62.50**	12.0	14.0	11.0	9.0	8.0	0.5	2.63 - (8)	Fair
80.00	**68.50**	16.0	16.0	11.0	5.0	9.0	3.5	2.38 - (8)	Fair
76.70	**58.50**	10.0	15.0	9.0	9.5	7.0	0.0	2.23 - (8)	Fair
75.40	**57.50**	10.0	12.0	10.0	7.5	9.0	1.0	2.19 - (8)	Fair
71.70	**68.00**	16.0	15.0	12.0	10.0	7.0	0.0	2.13 - (8)	Fair
95-995	*Mill Creek*								
	Year: **2020**								
1.71	**75.50**	14.5	14.0	15.0	9.5	10.0	4.5	7.30 - (8)	Fair
95-996	*North Mill Creek*								
	Year: **2020**								
11.30	**42.50**	4.5	11.0	7.0	10.0	6.0	0.0	2.60 - (4)	Poor
1.10	**63.00**	12.0	15.0	12.0	9.5	6.0	2.5	5.24 - (6)	Fair

Qualitative Habitat Evaluation Index Field Sheet

Midwest Biodiversity Institute

QHEI Score: 63

River Code: 95-996 RM: 1.10 Stream: N. Mill Creek
Site Code: 10-1 Project Code: DRWW20 Location: Dst Millburn Rd
Date: 7-8-20 Scorer: PMD Latitude: 42.423400 Longitude: -87.997090

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

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

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

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

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

Substrate: 12 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]
1 OVERHANGING VEGETATION [1]
3 SHALLOWS (IN SLOW WATER) [1]
1 ROOTMATS [1]

TYPE: Score All That Occur
0 POOLS > 70 cm [2]
2 ROOTWADS [1]
1 BOULDERS [1]
1 OXBOWS, BACKWATERS [1]
0 AQUATIC MACROPHYTES [1]
3 LOGS OR WOODY DEBRIS [1]

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

Cover: 15 Max 20

COMMENTS:

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

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

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

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

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

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

Channel: 12 Max 20

COMMENTS:

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

River Right Looking Downstream

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

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

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

Riparian: 9.5 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: 2.5 Max 8

COMMENTS:

6.) GRADIENT (ft / mi): 5.24 DRAINAGE AREA (sq.mi.): 31.93 % POOL: % GLIDE: % RIFFLE: % RUN:

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

Manual based on gradient and drainage area.

Gradient: 6 Max 10

entered 1-14-21

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: ____

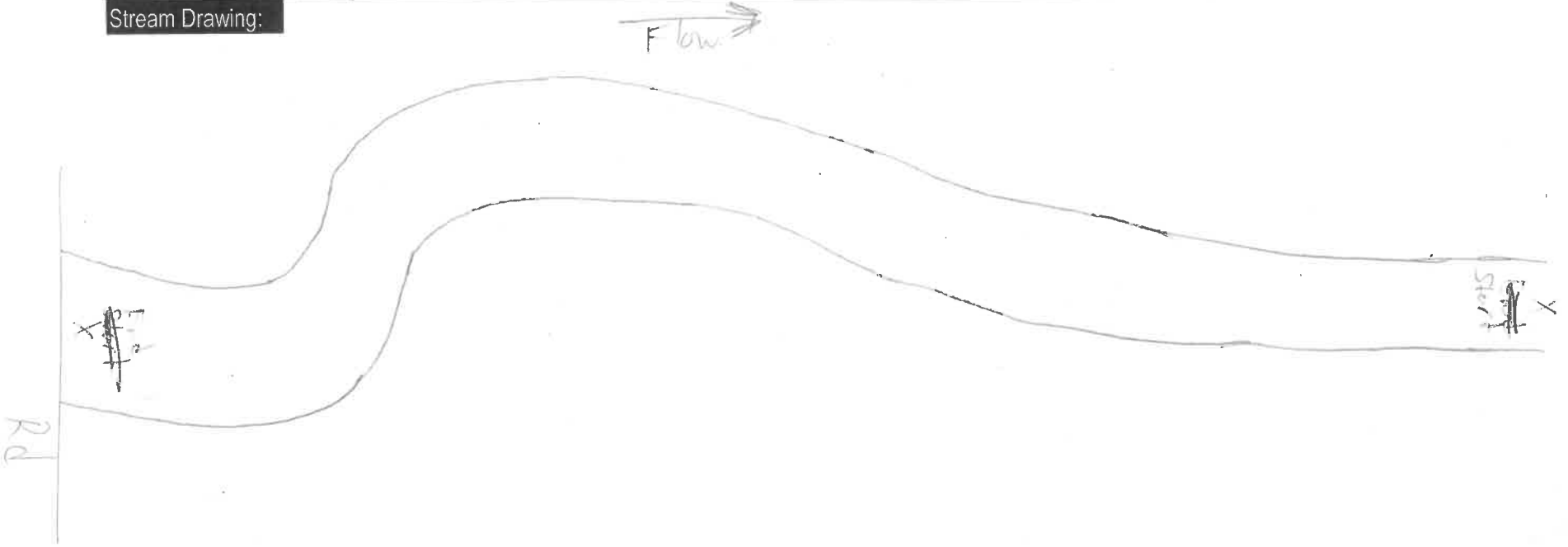
	Subjective Rating (1-10)	Aesthetic Rating (1-10)
	6	7

Gradient: ☐ -Low ☐ -Moderate ☐ -High

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

Qualitative Habitat Evaluation Index Field Sheet

Midwest Biodiversity Institute

QHEI Score: 42.5

River Code: 95-996 RM: 1.3 Stream: N Mill Creek
Site Code: 10-7 Project Code: DRWW20 Location: U/S Edwards Rd
Date: 7-15-20 Scorer: PMD Latitude: 42.980820 Longitude: -88.011960

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]			☐ ☐ -ARTIFICIAL [0]		
☐ ☒ -MUCK [2]			☐ ☐ -SILT [2]		

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

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

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

Substrate: 4.5 Max 20

COMMENTS:

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

(Structure): 0 UNDERCUT BANKS [1]; 1 OVERHANGING VEGETATION [1]; 3 SHALLOWS (IN SLOW WATER) [1]; 0 ROOTMATS [1]

TYPE: Score All That Occur: 0 POOLS > 70 cm [2]; 1 ROOTWADS [1]; 0 BOULDERS [1]; 0 OXBOWS, BACKWATERS [1]; 0 AQUATIC MACROPHYTES [1]; 3 LOGS OR WOODY DEBRIS [1]

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

Cover: 11 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; ☐ -IMPOUNDMENT; ☐ -RELOCATION; ☐ -ISLAND; ☐ -CANOPY REMOVAL; ☐ -LEVEED; ☐ -DREDGING; ☐ -BANK SHAPING; ☐ -ONE SIDE CHANNEL MODIFICATIONS

Channel: 7 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: 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: 6 Max 12

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

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

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

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

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

Riffle / Run: 0 Max 8

COMMENTS:

6.) GRADIENT (ft / mi): 2.6 DRAINAGE AREA (sq.mi.): 19.23 % POOL: % GLIDE: % RIFFLE: % RUN:

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

Manuel based on gradient and drainage area.

Gradient: 4 Max 10

entered 1-14-21

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

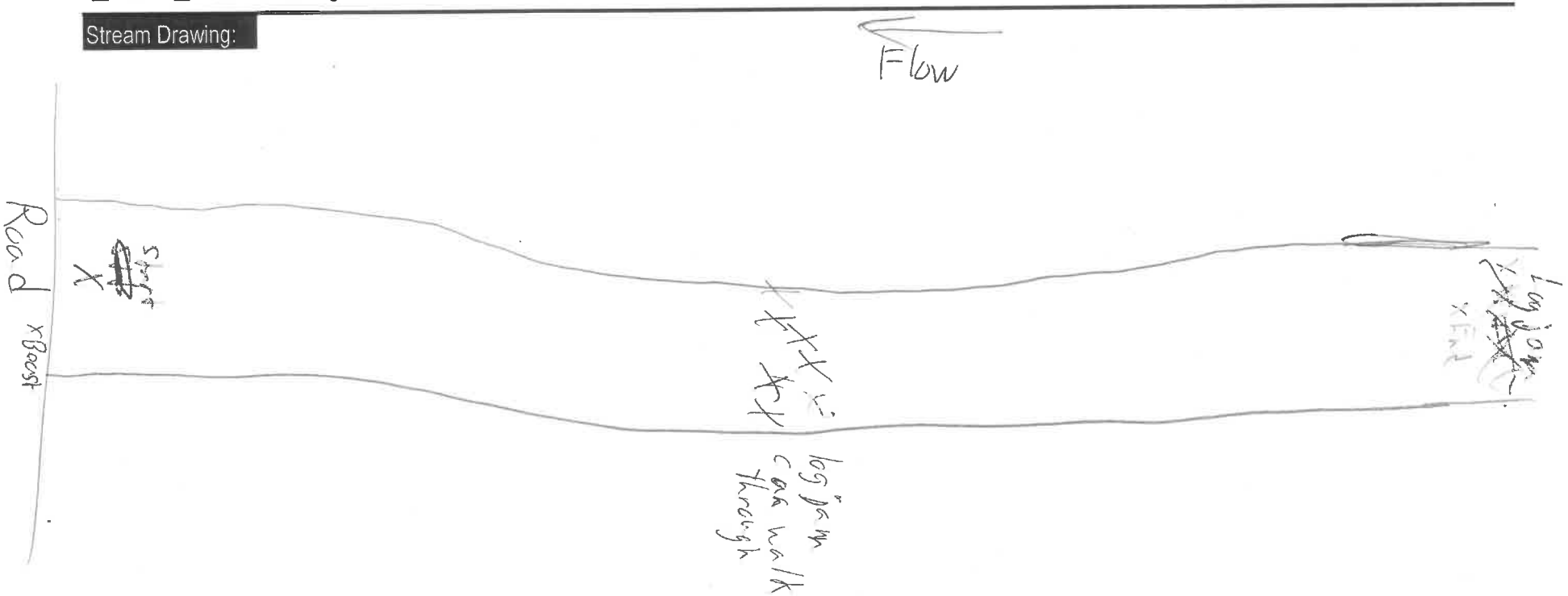
Aesthetic Rating (1-10): 5

Gradient: ☐ -Low ☐ -Moderate ☐ -High

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

Qualitative Habitat Evaluation Index Field Sheet

Midwest Biodiversity Institute

QHEI Score: 76.5

River Code: 95-995 RM: 1.71 Stream: Mill Creek
Site Code: 11-2 Project Code: DRWW20 Location: UST Mill Creek WWTP
Date: 7-18-20 Scorer: PMD Latitude: Longitude:

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

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

	POOL	RIFFLE
	X	X
	X	X
	X	X

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

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

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

Substrate: 14.5 Max 20

COMMENTS:

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

(Structure): 2 UNDERCUT BANKS [1]; 0 OVERHANGING VEGETATION [1]; 0 SHALLOWS (IN SLOW WATER) [1]; 2 ROOTMATS [1]

TYPE: Score All That Occur: 1 POOLS > 70 cm [2]; 1 ROOTWADS [1]; 2 BOULDERS [1]; 1 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; ☐ -IMPOUNDMENT; ☐ -RELOCATION; ☐ -ISLAND; ☐ -CANOPY REMOVAL; ☐ -LEVEED; ☐ -DREDGING; ☐ -BANK SHAPING; ☐ -ONE SIDE CHANNEL MODIFICATIONS

Channel: 15 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: 9.5 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: 4.5 Max 8

COMMENTS:

6.) GRADIENT (ft / mi): 7.3 DRAINAGE AREA (sq.mi.): 62.25 % POOL: % GLIDE: % RIFFLE: % RUN:

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

Manual based on gradient and drainage area.

Gradient: 8 Max 10

Entered 1-14-21

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

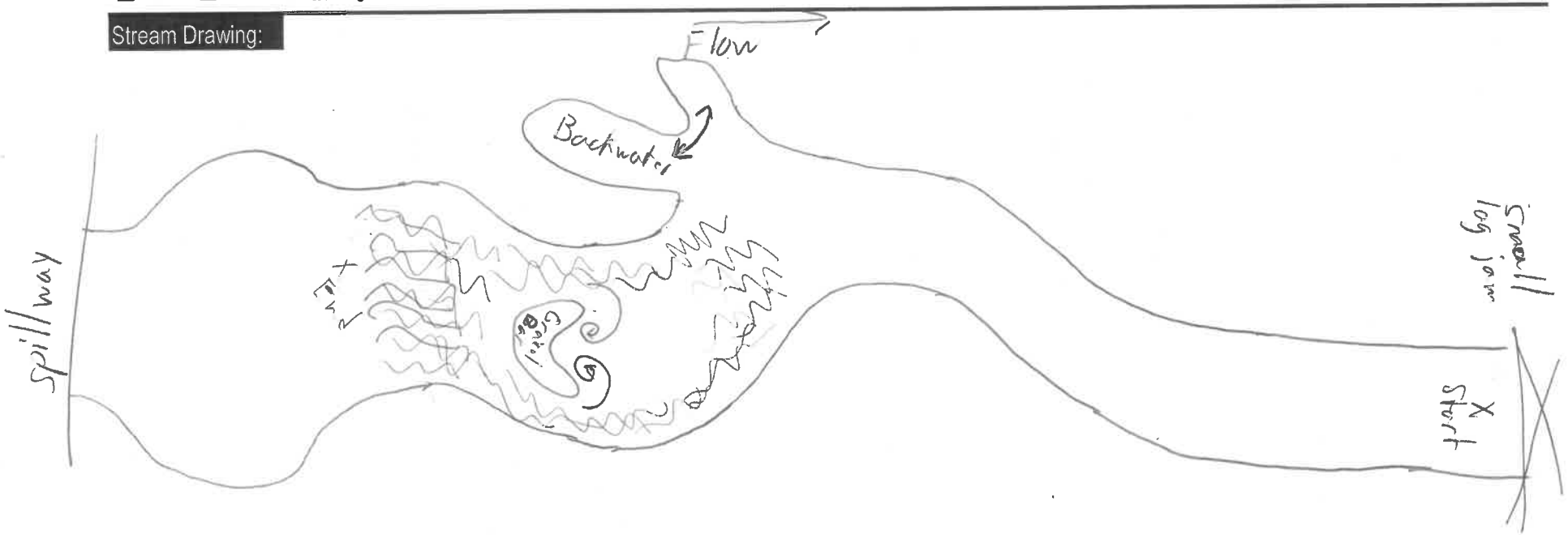
Aesthetic Rating (1-10): 7

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

Gradient: ☐ -Low ☐ -Moderate ☐ -High

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

Stream Drawing:



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

Qualitative Habitat Evaluation Index Field Sheet

Midwest Biodiversity Institute

QHEI Score: 72.25

River Code: 95-656 RM: 94.2 Stream: Des Plaines River
Site Code: 13-1 Project Code: DesWQN Location: Dst Belvidere Rd
Date: 8-13-2020 Scorer: MAS Latitude: 42.39355 Longitude: -87.94106

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: (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 Max 20

COMMENTS:

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

(Structure)
0 UNDERCUT BANKS [1]
0 OVERHANGING VEGETATION [1]
3 SHALLOWS (IN SLOW WATER) [1]
1 ROOTMATS [1]

TYPE: Score All That Occur
3 POOLS > 70 cm [2]
1 ROOTWADS [1]
0 BOULDERS [1]
3 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: 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]
☐ ☐ -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: 8.25 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: 4 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 Score from Table 2 of Users Manual based on gradient and drainage area.

Gradient: 8 Max 10

Entered 1-14-21

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

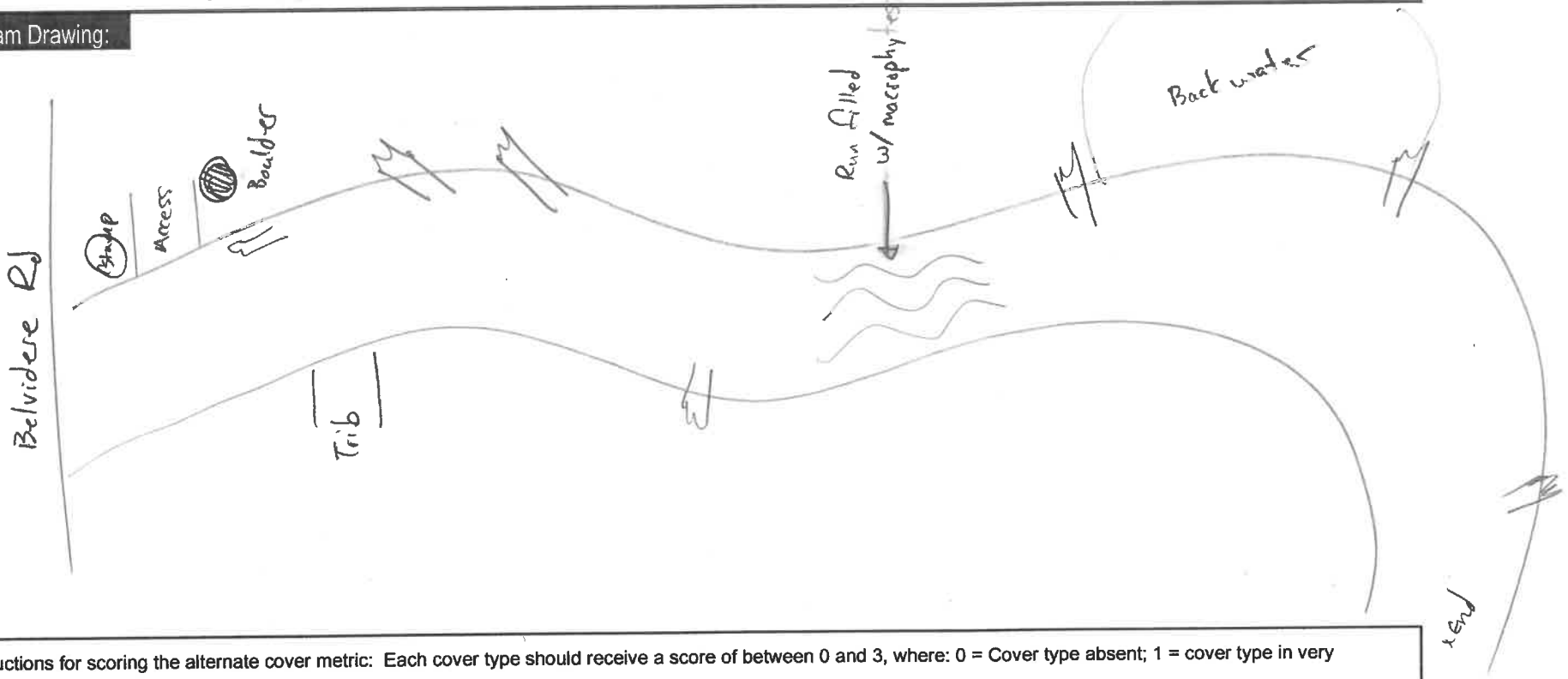
Aesthetic Rating (1-10): 6

	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
First Sampling Pass	P	500	Turbid	Up	10%

Gradient: ☐ -Low ☐ -Moderate ☐ -High

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

Stream Drawing:



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

Qualitative Habitat Evaluation Index Field Sheet

Midwest Biodiversity Institute

QHEI Score: 82.5

River Code: 95-656 RM: 96.82 Stream: Des Plaines River
Site Code: 13-2 Project Code: DRWW20 Location: dst. McClare Ave.
Date: 8-13-2020 Scorer: MAS Latitude: 42.36964 Longitude: -87.91836

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]		
☐ ☐ -HARDPAN [4]	X		☐ ☐ -ARTIFICIAL [0]		X
☐ ☐ -MUCK [2]			☐ ☐ -SILT [2]		

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

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

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

Substrate: 16 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]; 1 OVERHANGING VEGETATION [1]; 3 SHALLOWS (IN SLOW WATER) [1]; 2 ROOTMATS [1]

TYPE: Score All That Occur: 3 POOLS > 70 cm [2]; 2 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]

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

Riparian: 9.5 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: 11 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 Max 8

COMMENTS:

6.) GRADIENT (ft / mi): 4.037 DRAINAGE AREA (sq.mi.): 225.36 % 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: 10 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): 6

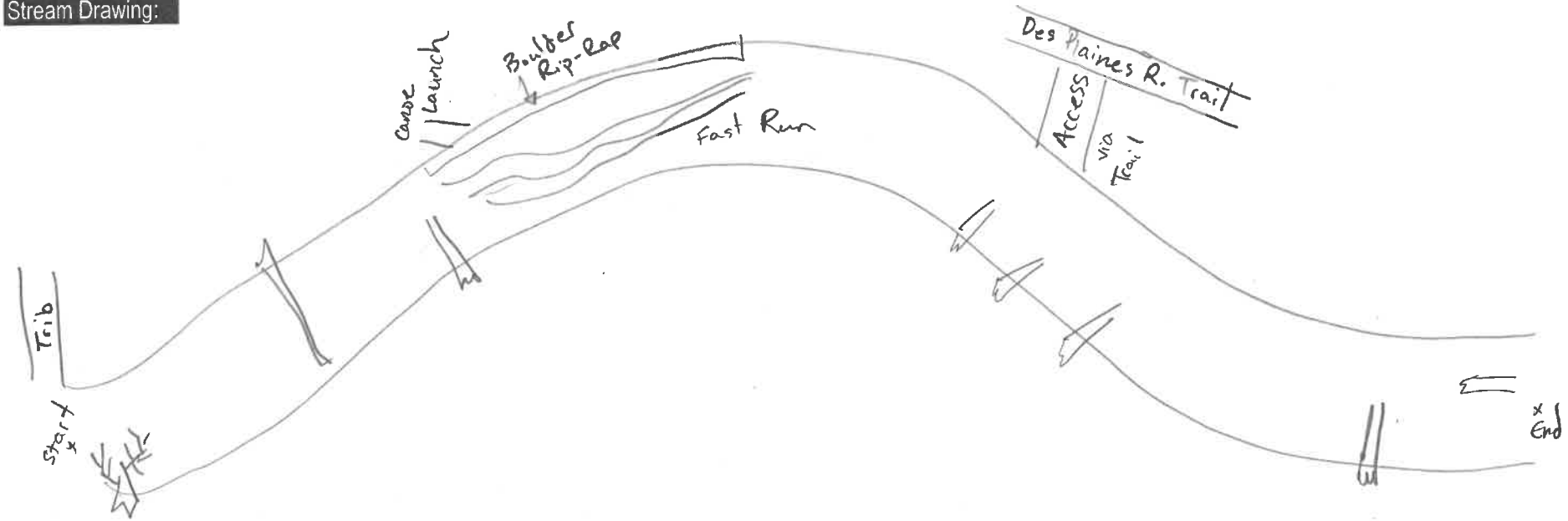
Aesthetic Rating (1-10): 6

Gradient: ☐ -Low ☐ -Moderate ☐ -High

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

Qualitative Habitat Evaluation Index Field Sheet

Midwest Biodiversity Institute

QHEI Score: 79.5

River Code: 95-656 RM: 98.7 Stream: Des Plaines River
Site Code: 13-3 Project Code: DRWW20 Location: ust. Skokie Hwy
Date: 8-9-2020 Scorer: MAS Latitude: 42.38319 Longitude: -87.91460

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]		

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

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

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

Substrate: 14 Max 20

COMMENTS:

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

(Structure): 0 UNDERCUT BANKS [1]; 1 OVERHANGING VEGETATION [1]; 1 SHALLOWS (IN SLOW WATER) [1]; 2 ROOTMATS [1]

TYPE: Score All That Occur: 3 POOLS > 70 cm [2]; 2 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: 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: 15 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: 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: 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: 4.5 Max 8

COMMENTS:

6.) GRADIENT (ft / mi): 4.261 DRAINAGE AREA (sq.mi.): 220.29 % 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: 10 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): 6

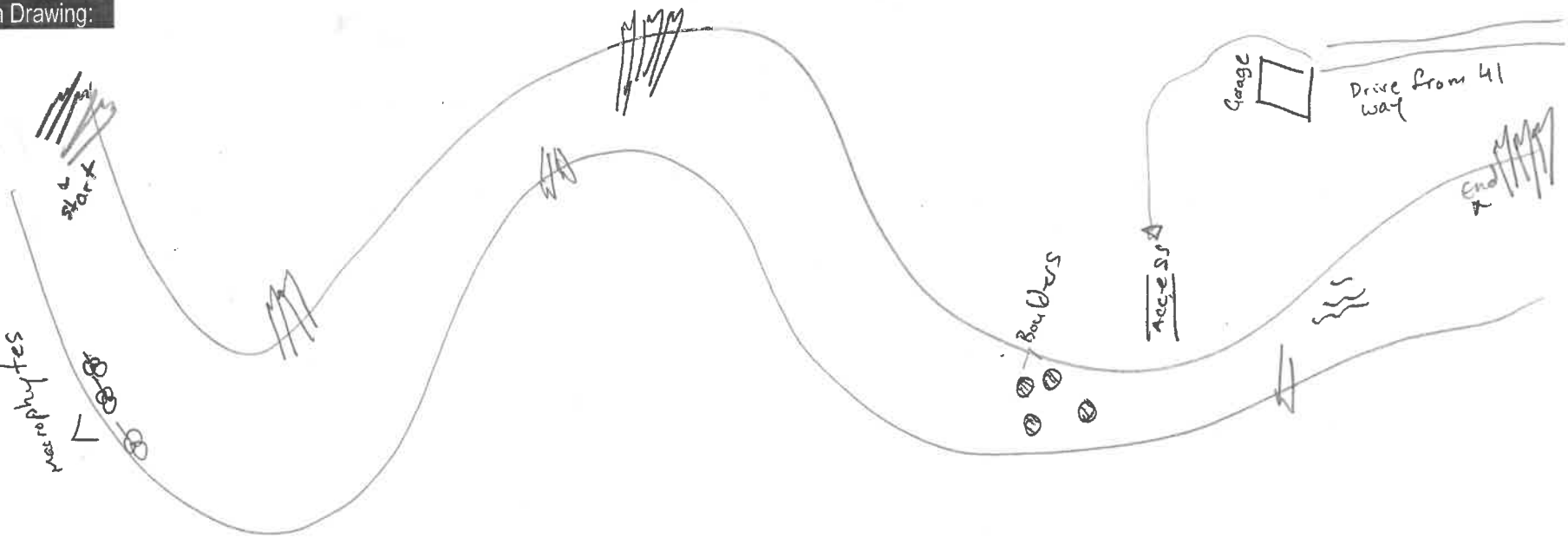
Aesthetic Rating (1-10): 7

Gradient: ☐ -Low ☐ -Moderate ☐ -High

	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
First Sampling Pass	?	500	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.

Qualitative Habitat Evaluation Index Field Sheet

Midwest Biodiversity Institute

QHEI Score: 47

River Code: 95-656 RM: 102.9 Stream: Des Plaines River
Site Code: 13-9 Project Code: DRWW20 Location: Dst. Wadsworth Rd
Date: 8-10-2020 Scorer: MAS Latitude: 42.42854 Longitude: -87.93017

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: (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: 0 Max 20

COMMENTS:

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

(Structure)
0 UNDERCUT BANKS [1]
0 OVERHANGING VEGETATION [1]
3 SHALLOWS (IN SLOW WATER) [1]
1 ROOTMATS [1]

TYPE: Score All That Occur
3 POOLS > 70 cm [2]
1 ROOTWADS [1]
0 BOULDERS [1]
2 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]
☐ ☐ -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: 6 Max 12

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

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

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

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

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

Riffle / Run: 0 Max 8

COMMENTS:

6.) GRADIENT (ft / mi): 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 Score from Table 2 of Users Manual based on gradient and drainage area.

Gradient: 10 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: _____

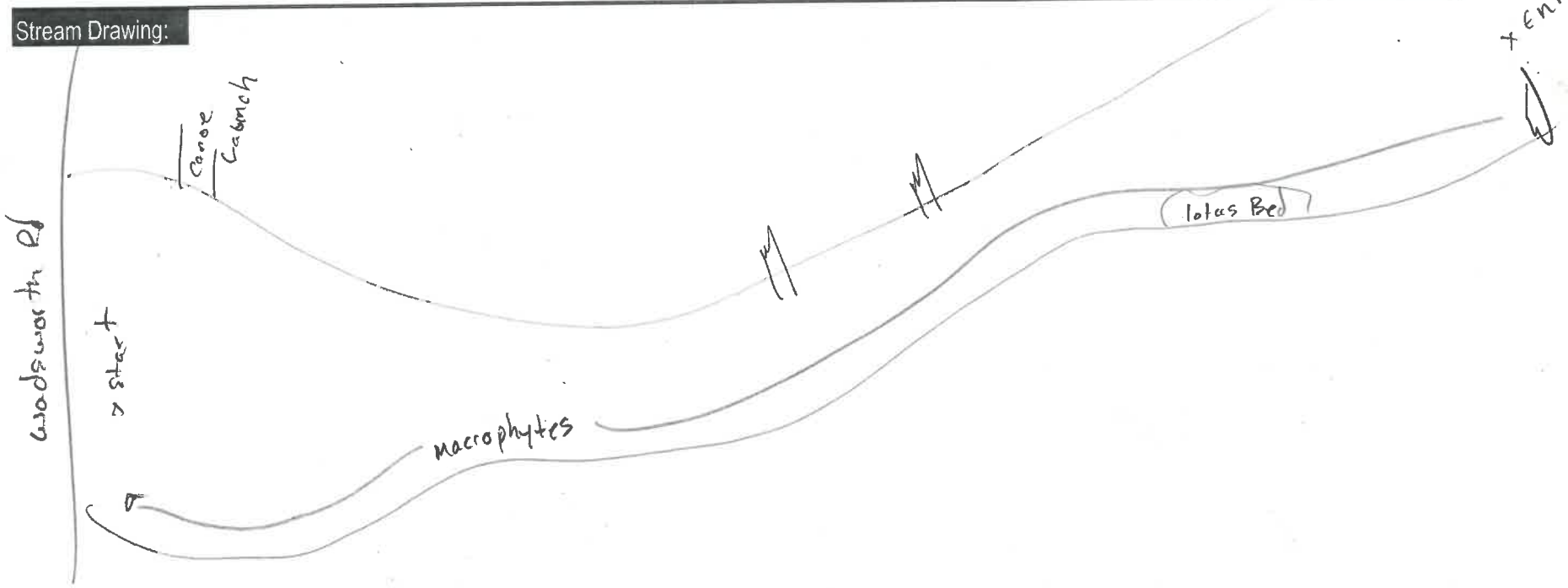
Subjective Rating (1-10)	Aesthetic Rating (1-10)
4	4

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

Gradient: ☐ -Low ☐ -Moderate ☐ -High

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: 42

River Code: 95-656 RM: 106.6 Stream: Des Plaines River
Site Code: 13-5 Project Code: DRWCJ21 Location: Dst Rosecrans Rd
Date: 8-10-2020 Scorer: MAS Latitude: 42.46483 Longitude: -87.94288

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: (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: 0 (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]
2 SHALLOWS (IN SLOW WATER) [1]
1 ROOTMATS [1]

TYPE: Score All That Occur
3 POOLS > 70 cm [2]
1 ROOTWADS [1]
0 BOULDERS [1]
6 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]

Cover: 11 (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: 5.5 (Max 20)

COMMENTS:

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

River Right Looking Downstream

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

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

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

Riparian: 8.5 (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: 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): 5.15 DRAINAGE AREA (sq.mi.): 137.29 % 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: 10 (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: _____

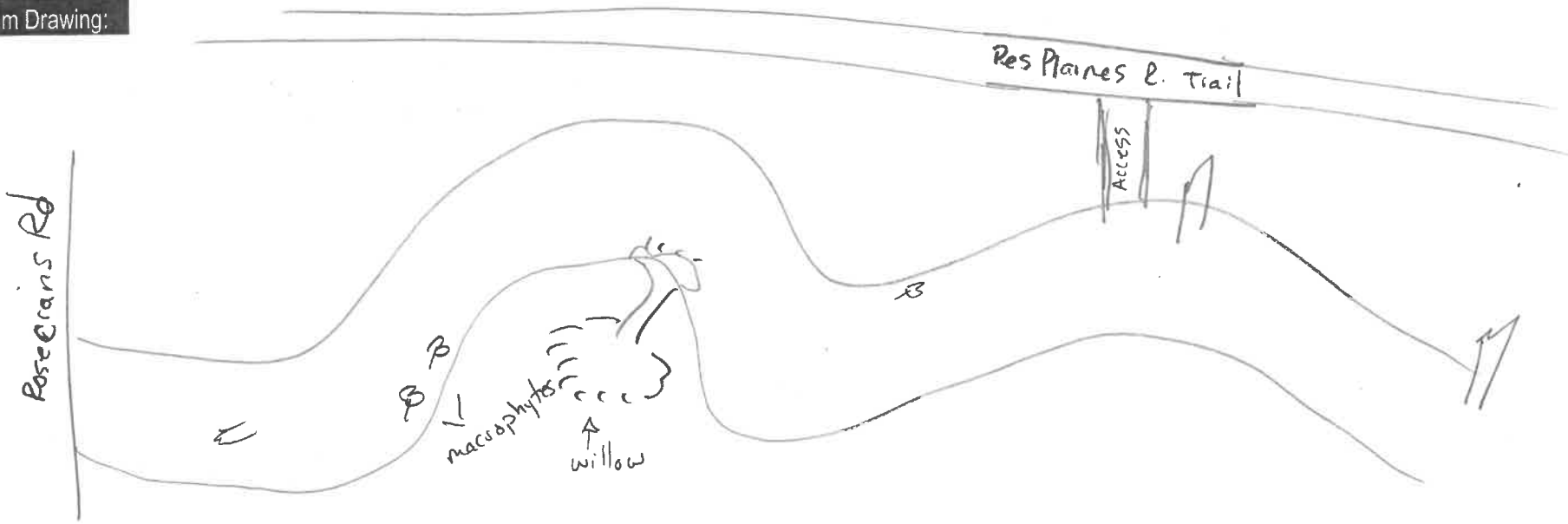
Subjective Rating (1-10)	Aesthetic Rating (1-10)
4	4

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

Gradient: ☑ -Low ☐ -Moderate ☐ -High

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: 63

Midwest Biodiversity Institute

River Code: 95-6556 RM: 109.3 Stream: Des Plaines River
Site Code: M3-L6 Project Code: DesRus20 Location: Dst Russell Rd
Date: 8-10-2020 Scorer: MAS Latitude: 42.48920 Longitude: -87.92570

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: (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: 4 (Max 20)

COMMENTS:

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

(Structure)
0 UNDERCUT BANKS [1]
0 OVERHANGING VEGETATION [1]
3 SHALLOWS (IN SLOW WATER) [1]
0 ROOTMATS [1]

TYPE: Score All That Occur
3 POOLS > 70 cm [2]
0 ROOTWADS [1]
0 BOULDERS [1]
1 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: 11 (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: 9 (Max 20)

COMMENTS:

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

River Right Looking Downstream

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

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

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

Riparian: 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: 1 (Max 8)

COMMENTS:

6.) GRADIENT (ft / mi): 5.64 DRAINAGE AREA (sq.mi.): 123.67 % 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: 10 (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: _____

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

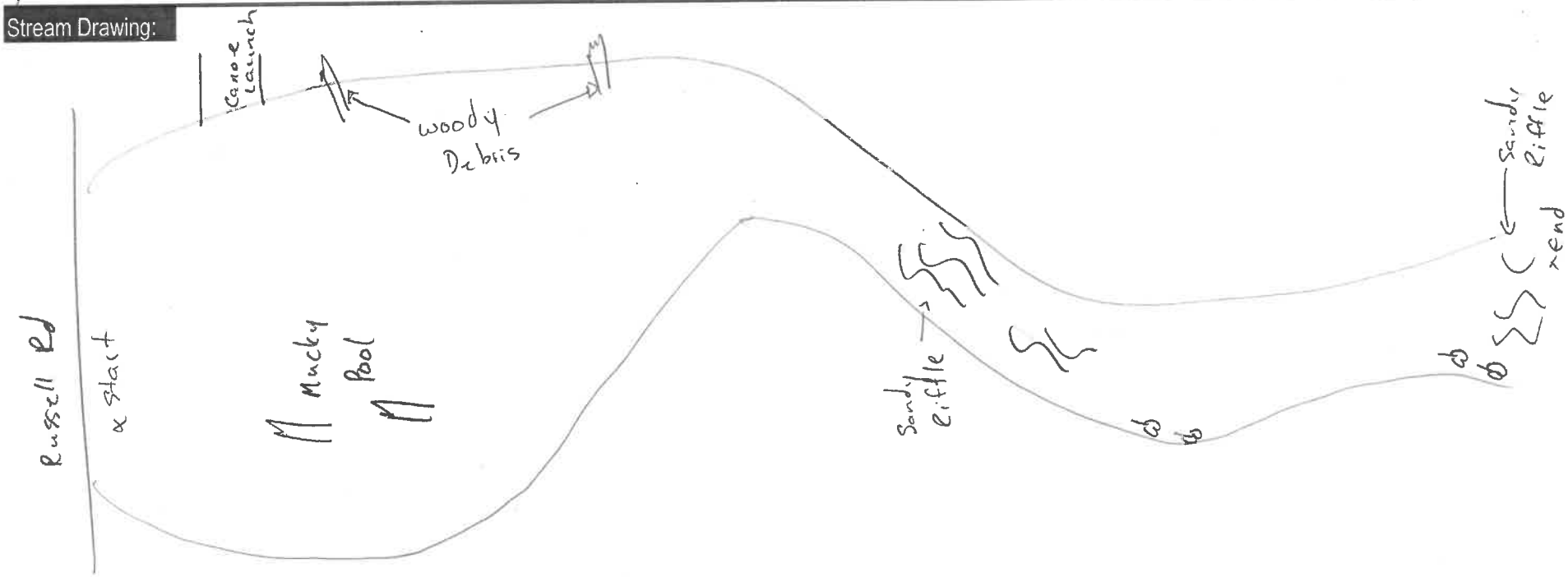
Subjective Rating (1-10): 4

Aesthetic Rating (1-10): 5

Gradient: ☒ -Low ☐ -Moderate ☐ -High

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: 68.5

Midwest Biodiversity Institute

River Code: 95-656 RM: 90.6 Stream: Des Plaines River
Site Code: 13-16 Project Code: 13-16 Location: Dst Buckley Rd
Date: 8-13-2020 Scorer: MHS Latitude: 42.30568 Longitude: -87.95461

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]		

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

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

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

Substrate: 13 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]
2 ROOTMATS [1]

TYPE: Score All That Occur
1 POOLS > 70 cm [2]
2 ROOTWADS [1]
1 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]

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]
☐	☐	-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: 8.5 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: 3.5 Max 8

COMMENTS:

6.) GRADIENT (ft / mi): 3.32 DRAINAGE AREA (sq.mi.): 253.75

% 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: _____

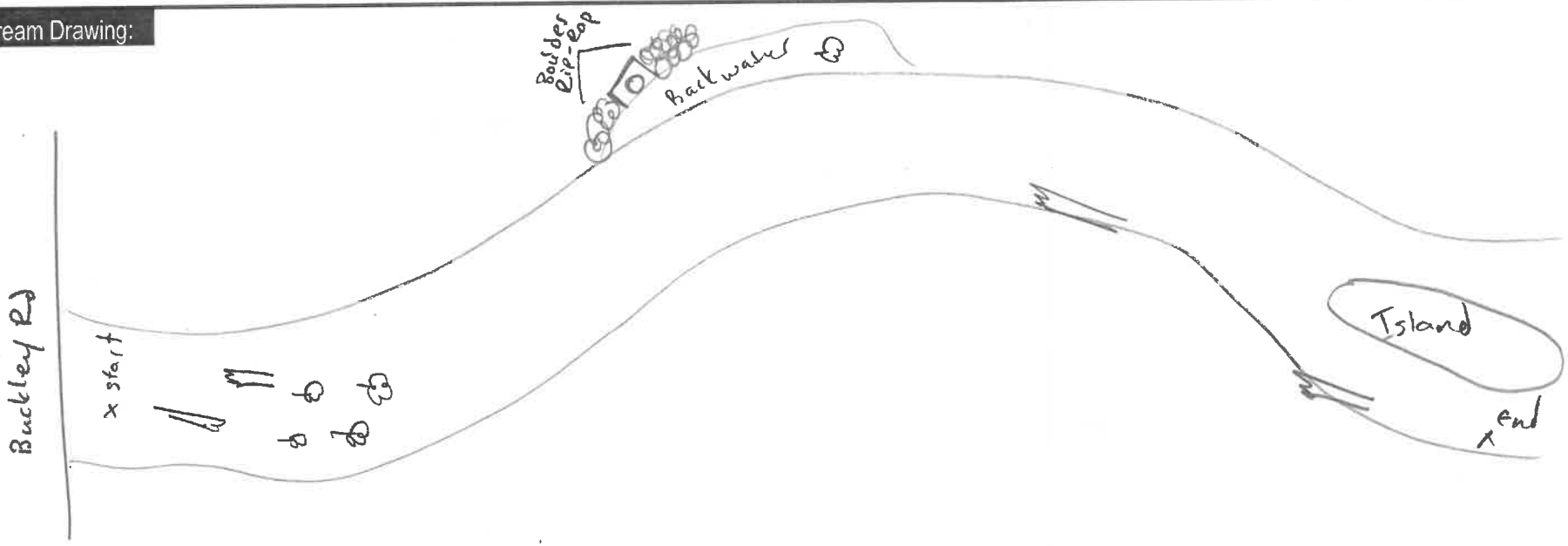
Subjective Rating (1-10)	Aesthetic Rating (1-10)
6	7

Gradient: ☐ -Low ☐ -Moderate ☐ -High

	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
First Sampling Pass	?	500	Turbid	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?

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: 47

River Code: 95-656 RM: 99.3 Stream: Des Plaines River
Site Code: 13-18 Project Code: DEWW20 Location: Ust Wetland Riffle
Date: 8-15-2020 Scorer: MAS Latitude: 42.40099 Longitude: -87.92827

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]		

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

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

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

Substrate: 4 / Max 20

COMMENTS:

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

(Structure): 0 UNDERCUT BANKS [1]; 1 OVERHANGING VEGETATION [1]; 0 SHALLOWS (IN SLOW WATER) [1]; 2 ROOTMATS [1]

TYPE: Score All That Occur: 3 POOLS > 70 cm [2]; 2 ROOTWADS [1]; 0 BOULDERS [1]; 3 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: 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: 4 / Max 20

COMMENTS:

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

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

Riparian: 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: 6 / Max 12

COMMENTS:

CHECK ONE OR CHECK 2 AND ADVERAGE

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

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

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

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

Riffle / Run: 0 / Max 8

COMMENTS:

6.) GRADIENT (ft / mi): 2.63 DRAINAGE AREA (sq.mi.): 212.87 % POOL: % GLIDE: % RIFFLE: % RUN:

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

Gradient: 8 / Max 10

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

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

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

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

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

Other: _____

Subjective Rating (1-10): 5

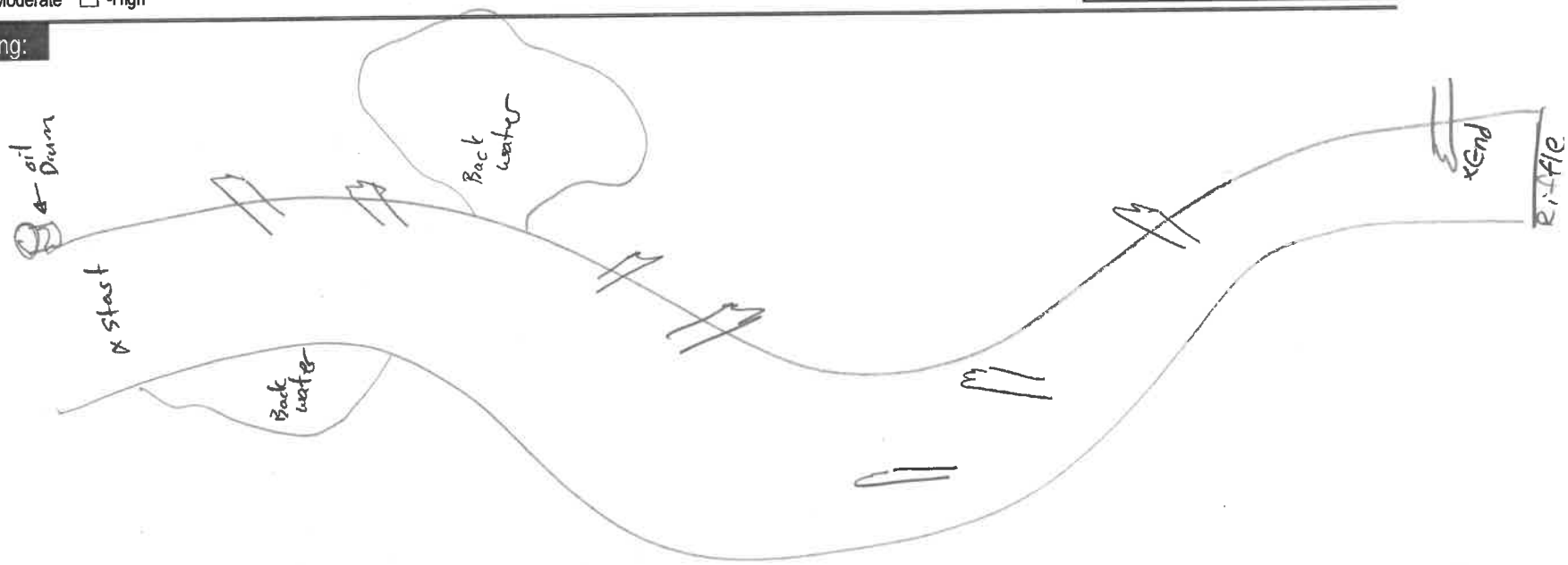
Aesthetic Rating (1-10): 5

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

Gradient: ☐ -Low ☐ -Moderate ☐ -High

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

Stream Drawing:



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

Qualitative Habitat Evaluation Index Field Sheet

Midwest Biodiversity Institute

QHEI Score: 70.5

River Code: 95-656 RM: 99.72 Stream: Des Plaines R
Site Code: 13-19 Project Code: DPWW20 Location: DST WRI Riffle
Date: 10-1-2020 Scorer: MAS Latitude: 42.39607 Longitude: -87.92368

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

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

	POOL	RIFFLE
	K	A
	D	A
	X	

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

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

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

Substrate: 13 (Max 20)

COMMENTS:

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

(Structure)
0 UNDERCUT BANKS [1]
0 OVERHANGING VEGETATION [1]
3 SHALLOWS (IN SLOW WATER) [1]
2 ROOTMATS [1]

TYPE: Score All That Occur
2 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: 14 (Max 20)

COMMENTS:

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

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

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

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

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

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

Channel: 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]
☐ ☐ -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: 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: 2.5 (Max 8)

COMMENTS:

6.) GRADIENT (ft / mi): 2.63 DRAINAGE AREA (sq.mi.): 213.17 % POOL: % GLIDE: % RIFFLE: % RUN:

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

Gradient: 8 (Max 10)

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

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

If Not, Explain: _____

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

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

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

Other: _____

Subjective Rating (1-10): 5

Aesthetic Rating (1-10): 5

	Gear:	Distance:	Water Clarity:	Water Stage:	Canopy- % open:
First Sampling Pass	P	450	Turbid	Normal	100

Gradient: ☐ -Low ☐ -Moderate ☐ -High

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: 68

River Code: 95-656 RM: 71.7 Stream: Des Plaines River
Site Code: 16-1 Project Code: DesWeb Location: Us Palatine Rd
Date: 8-19-2020 Scorer: MAS Latitude: 42.11409 Longitude: -87.88931

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] ☐ -3 or Less [0]
(High Quality Only, Score 5 or >)

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

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

Substrate: 16 Max 20

COMMENTS:

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

(Structure)
0 UNDERCUT BANKS [1]
6 OVERHANGING VEGETATION [1]
3 SHALLOWS (IN SLOW WATER) [1]
1 ROOTMATS [1]

TYPE: Score All That Occur
2 POOLS > 70 cm [2]
ROOTWADS [1]
1 BOULDERS [1]
1 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: 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]
STABILITY: ☐ -HIGH [3] ☒ -MODERATE [2] ☐ -LOW [1]
MODIFICATIONS / OTHER: ☐ -SNAGGING ☒ -RELOCATION ☐ -CANOPY REMOVAL ☐ -DREDGING ☐ -ONE SIDE CHANNEL MODIFICATIONS ☐ -IMPOUNDMENT ☐ -ISLAND ☐ -LEVEED ☐ -BANK SHAPING

Channel: 17 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: 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: 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): 2.133 DRAINAGE AREA (sq.mi.): 358.68 % POOL: % GLIDE: % RIFFLE: % RUN:

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

Gradient: 8 Max 10

*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: _____

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

Subjective Rating (1-10): 5

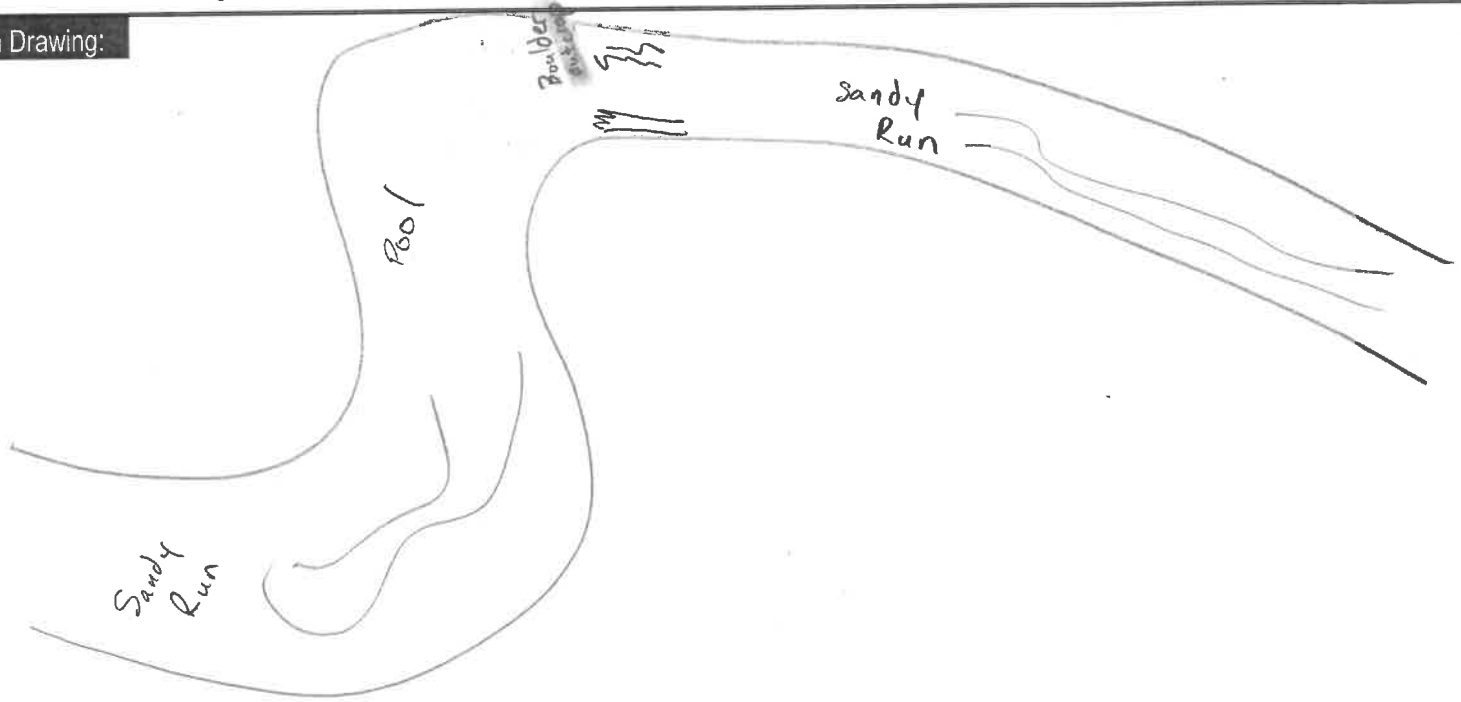
Aesthetic Rating (1-10): 6

Gradient:

☐ -Low ☐ -Moderate ☐ -High

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: 57.5

River Code: 95-656 RM: 75.4 Stream: Des Plaines River
Site Code: 16-2 Project Code: DRWW20 Location: Dst Lake Cook Rd
Date: 9-9-2020 Scorer: MAS Latitude: 42.15285 Longitude: -87.91016

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

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

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

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

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

Substrate: 10 / Max 20

COMMENTS:

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

(Structure)	TYPE: Score All That Occur	
0 UNDERCUT BANKS [1]	2 POOLS > 70 cm [2]	0 OXBOWS, BACKWATERS [1]
0 OVERHANGING VEGETATION [1]	0 ROOTWADS [1]	1 AQUATIC MACROPHYTES [1]
3 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: 17 / Max 20

COMMENTS:

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

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

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

Riparian: 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: 1 / 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) _____ If Not, Explain: _____

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

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

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

Other: _____

Subjective Rating (1-10): 5

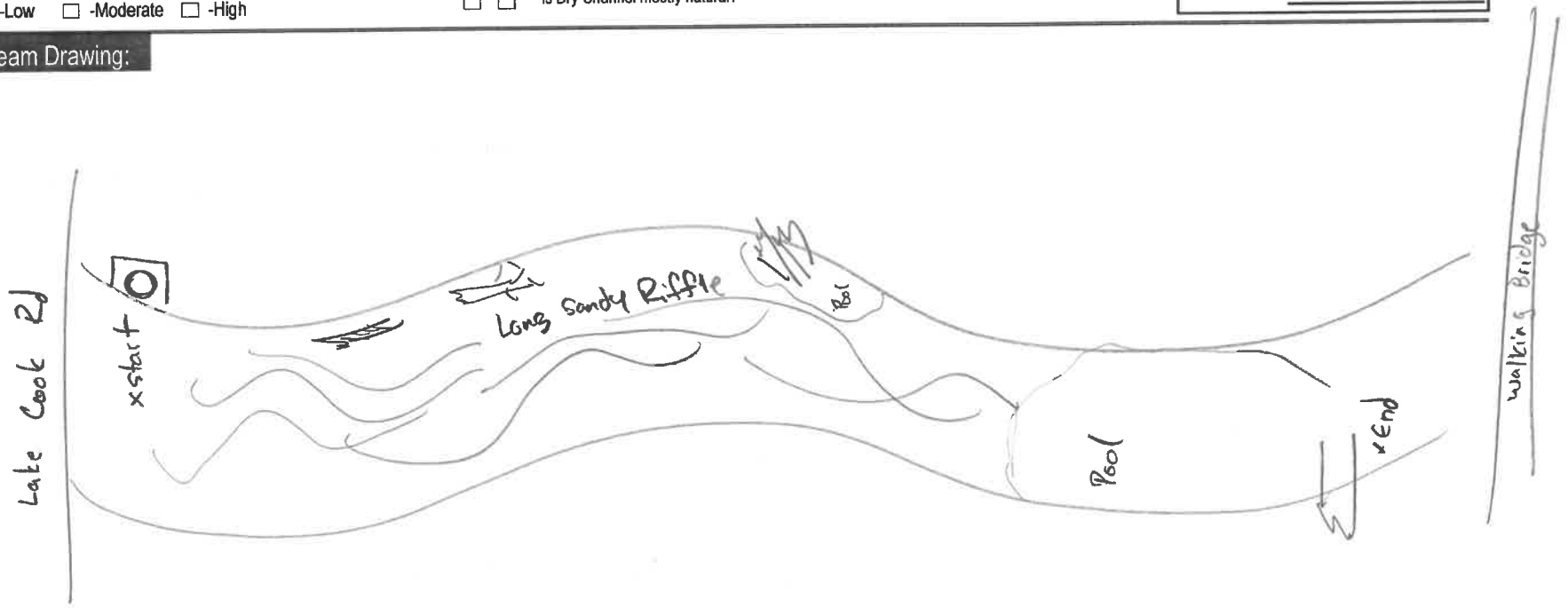
Aesthetic Rating (1-10): 5

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

Gradient: ☐ -Low ☐ -Moderate ☐ -High

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: 68.5

River Code: 95-6056 RM: 76.7 Stream: Des Plaines River
Site Code: 16-3 Project Code: DRW20 Location: Dst Deer Field Rd
Date: 8-9-2020 Scorer: MAS Latitude: 42.16738 Longitude: -87.91360

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]		

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

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

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

Substrate: 10 / Max 20

COMMENTS:

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

(Structure): 0 UNDERCUT BANKS [1]; 1 OVERHANGING VEGETATION [1]; 3 SHALLOWS (IN SLOW WATER) [1]; 1 ROOTMATS [1]

TYPE: Score All That Occur: 3 POOLS > 70 cm [2]; 1 ROOTWADS [1]; 0 BOULDERS [1]; 0 OXBOWS, BACKWATERS [1]; 1 AQUATIC MACROPHYTES [1]; 3 LOGS OR WOODY DEBRIS [1]

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

Cover: 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]

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

Riparian: 9.5 / 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: 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): 2.235 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: _____

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

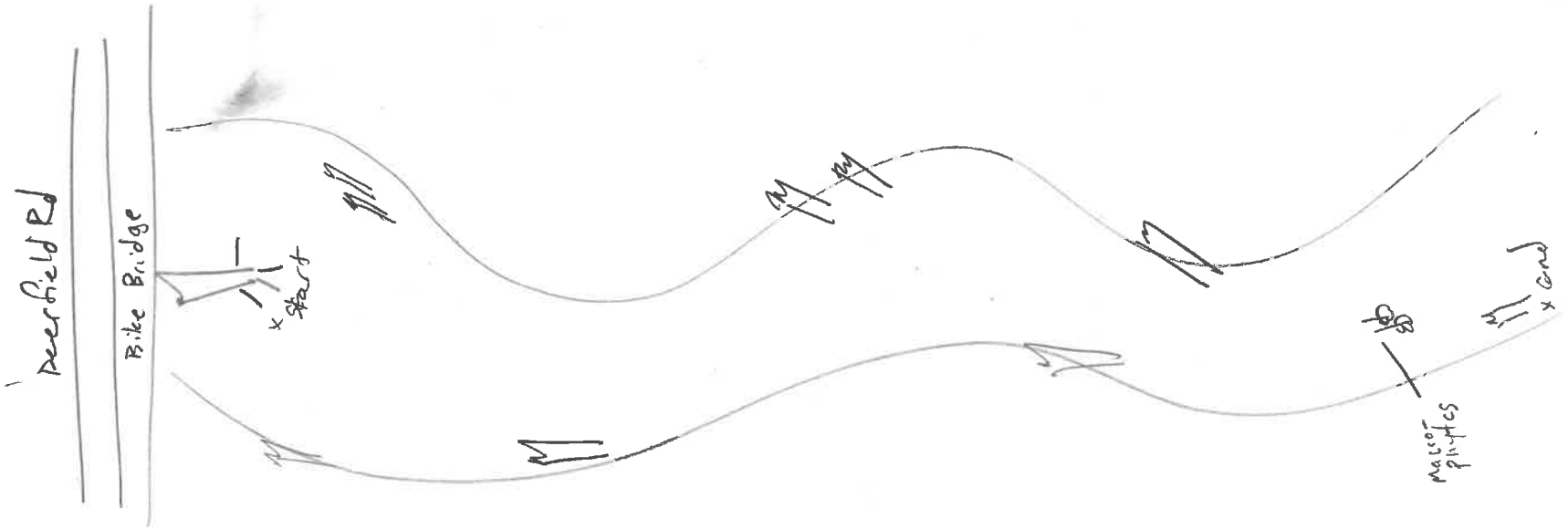
Subjective Rating (1-10): 5

Aesthetic Rating (1-10): 5

Gradient: ☐ -Low ☐ -Moderate ☐ -High

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

Stream Drawing:



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

Qualitative Habitat Evaluation Index Field Sheet

Midwest Biodiversity Institute

QHEI Score: 48.5

River Code: 95-656 RM: 80.0 Stream: Des Plaines River
Site Code: 16-4 Project Code: DRW22 Location: Dsf Half Day Rd
Date: 8-17-2020 Scorer: MAS Latitude: 42.20013 Longitude: -87.91841

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]		

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

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

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

Substrate: 16 Max 20

COMMENTS:

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

(Structure): 0 UNDERCUT BANKS [1]; 0 OVERHANGING VEGETATION [1]; 3 SHALLOWS (IN SLOW WATER) [1]; 1 ROOTMATS [1]

TYPE: Score All That Occur: 3 POOLS > 70 cm [2]; 1 ROOTWADS [1]; 1 BOULDERS [1]; 1 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]

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: 11 Max 20

COMMENTS:

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

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

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

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

Riparian: 5 Max 10

COMMENTS:

5.) POOL / GLIDE AND RIFFLE / RUN QUALITY

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

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

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

Pool / Current: 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: 2.5 Max 8

COMMENTS:

Gradient: 8 Max 10

6.) GRADIENT (ft / mi): 2.387 DRAINAGE AREA (sq.mi.): 273.21 % 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.

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

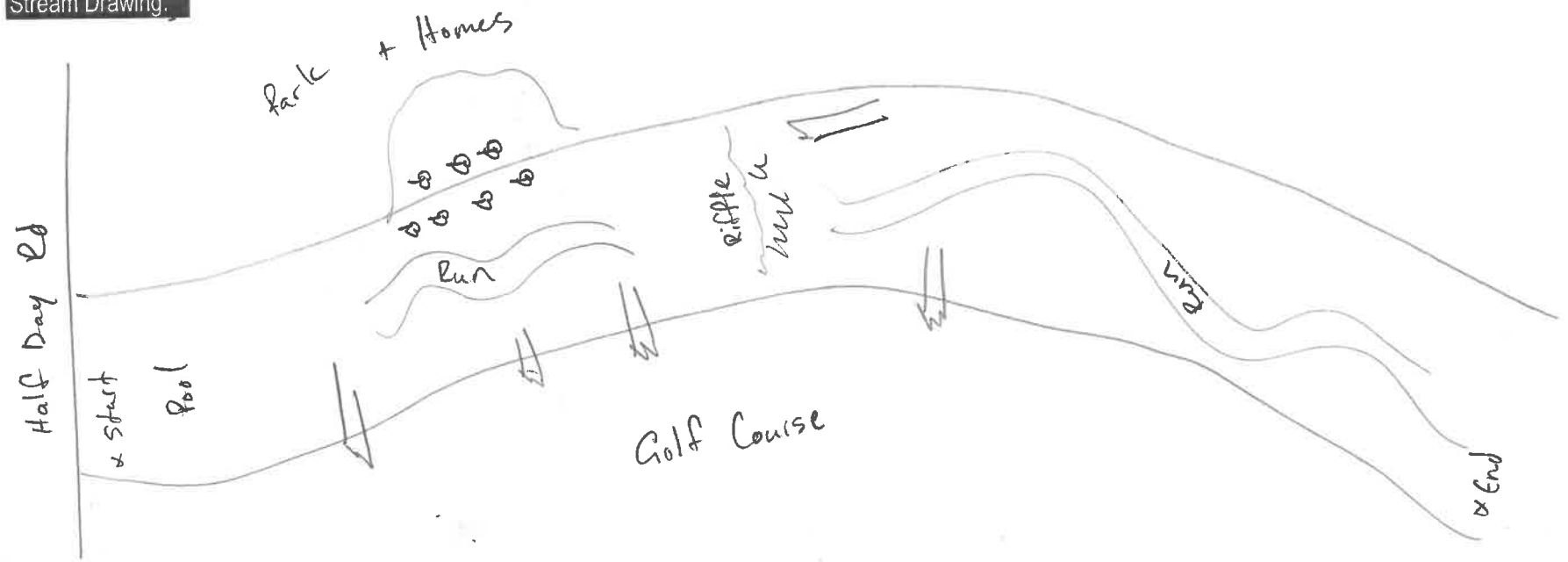
Aesthetic Rating (1-10): 6

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

Gradient: ☐ -Low ☒ -Moderate ☐ -High

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

Stream Drawing:



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

Qualitative Habitat Evaluation Index Field Sheet

Midwest Biodiversity Institute

QHEI Score: 72

River Code: 95-656 RM: 83.6 Stream: Des Plaines River
Site Code: 16-S Project Code: DesRiv20 Location: Dst Townline Rd
Date: 8-12-2020 Scorer: MAS Latitude: 42.240226 Longitude: -87.93919

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: 16 Max 20

COMMENTS:

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

(Structure)
0 UNDERCUT BANKS [1]
1 OVERHANGING VEGETATION [1]
3 SHALLOWS (IN SLOW WATER) [1]
1 ROOTMATS [1]

TYPE: Score All That Occur
3 POOLS > 70 cm [2]
1 ROOTWADS [1]
2 BOULDERS [1]
2 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: 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 (Per Bank)
L ☑ R ☑ -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) (Most Predominant Per Bank)
L ☑ R ☑ -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 (Per Bank)
L ☑ R ☑ -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: 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: 3 Max 8

COMMENTS:

6.) GRADIENT (ft / mi): 2.72 DRAINAGE AREA (sq.mi.): 268.07 % 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: _____

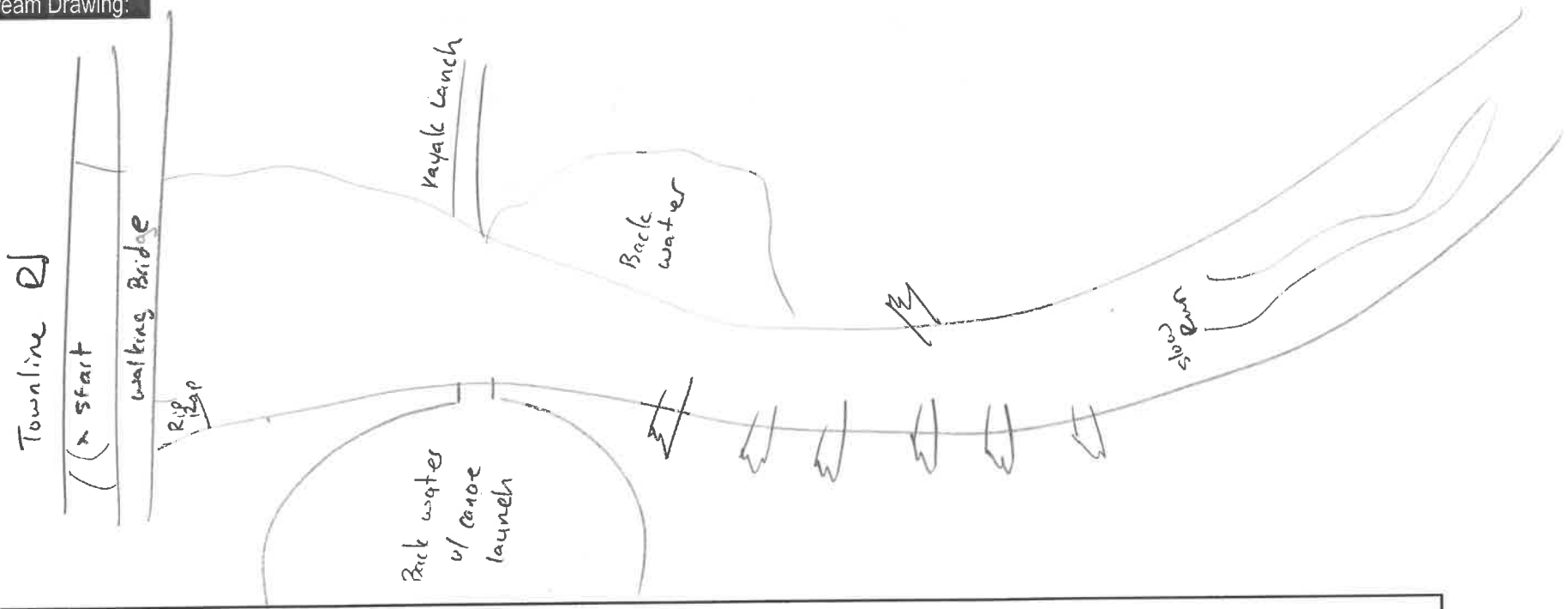
Subjective Rating (1-10)	Aesthetic Rating (1-10)
6	6

Gradient: ☐ -Low ☐ -Moderate ☐ -High

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

Stream Drawing:



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

Qualitative Habitat Evaluation Index Field Sheet

Midwest Biodiversity Institute

QHEI Score: 71

River Code: 95-656 RM: 87.1 Stream: Des Plaines River
Site Code: 16-6 Project Code: DRiv20 Location: Dst Rockland Rd
Date: 8-15-2020 Scorer: MAS Latitude: 42.27647 Longitude: -87.93922

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]		X
☐ ☐ -MUCK [2]	X		☐ ☐ -SILT [2]	X	

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

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

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

Substrate: 16 Max 20

COMMENTS:

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

(Structure)
0 UNDERCUT BANKS [1]
0 OVERHANGING VEGETATION [1]
3 SHALLOWS (IN SLOW WATER) [1]
1 ROOTMATS [1]

TYPE: Score All That Occur
3 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: 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: 17 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: 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: 3.5 Max 8

COMMENTS:

6.) GRADIENT (ft / mi): 2.7 DRAINAGE AREA (sq.mi.): 261.41 % 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: _____

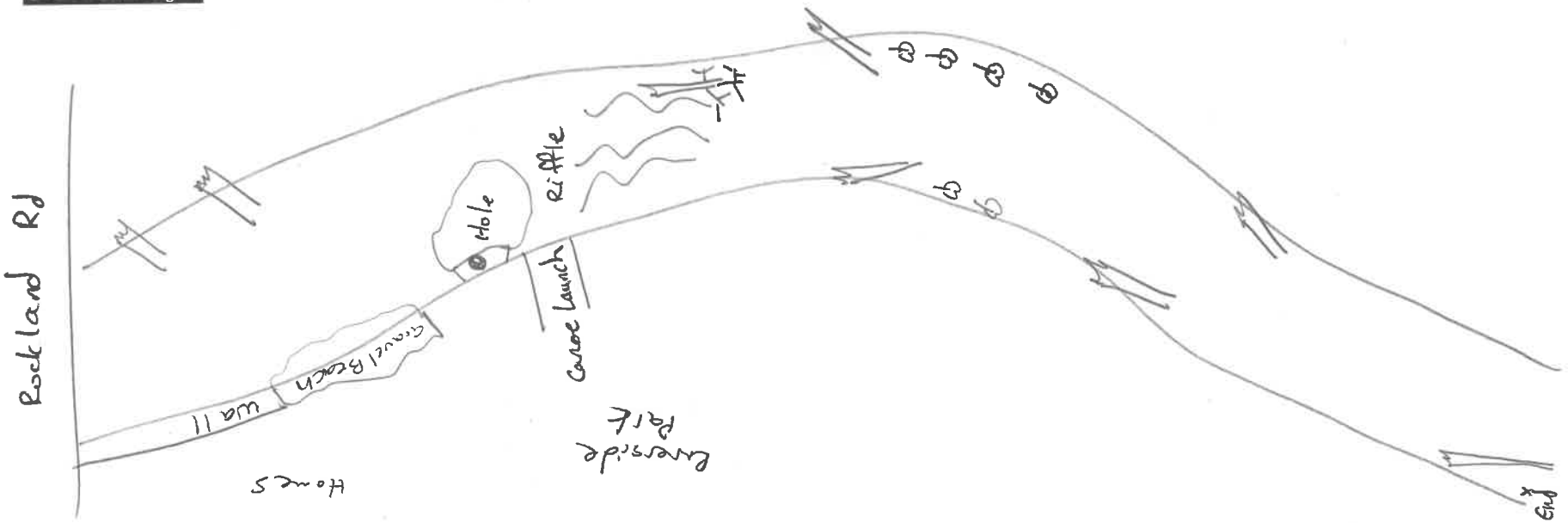
	Subjective Rating (1-10)	Aesthetic Rating (1-10)
	6	7

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

Gradient: ☐ -Low ☐ -Moderate ☐ -High

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: 79.5

River Code: 95-656 RM: 84.6 Stream: Des Plaines River
Site Code: 16-7 Project Code: DRww20 Location: ust. dam site
Date: 8-12-2020 Scorer: MAS Latitude: 42.250584 Longitude: -87.93958

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]	X	
☐ ☑ -GRAVEL [7]	X	X
☑ ☐ -SAND [6]	X	
☐ ☐ -BEDROCK [5]		
☐ ☐ -DETRITUS [3]	X	
☐ ☐ -ARTIFICIAL [0]		
☐ ☐ -SILT [2]	X	X

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

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

Cover: 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: 16 / 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: 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: 11 / 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: 6 / Max 8

COMMENTS:

6.) GRADIENT (ft / mi): 2.771 DRAINAGE AREA (sq.mi.): 266.48 % 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: _____

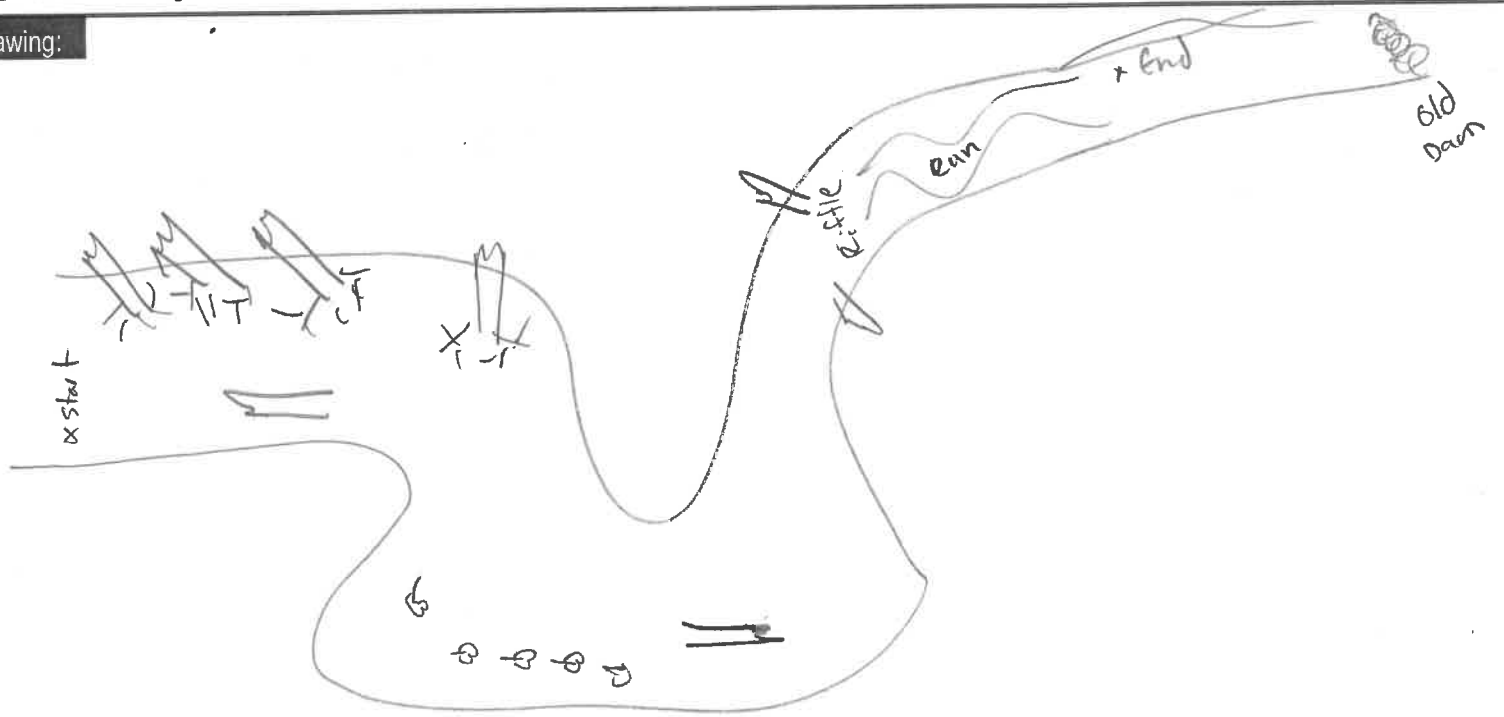
Subjective Rating (1-10)	Aesthetic Rating (1-10)
7	7

Gradient: ☐ -Low ☐ -Moderate ☐ -High

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

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: 62.5

River Code: 95-656 RM: 42.9 Stream: Des Plaines River
Site Code: 16-8 Project Code: DRWW20 Location: ust. dam
Date: 8-12-2020 Scorer: MAS Latitude: 42.23113 Longitude: -87.93430

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]		

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

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

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

Substrate: 12 Max 20

COMMENTS:

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

(Structure)
0 UNDERCUT BANKS [1]
1 OVERHANGING VEGETATION [1]
3 SHALLOWS (IN SLOW WATER) [1]
0 ROOTMATS [1]

TYPE: Score All That Occur
3 POOLS > 70 cm [2]
1 ROOTWADS [1]
0 BOULDERS [1]
0 OXBOWS, BACKWATERS [1]
1 AQUATIC MACROPHYTES [1]
3 LOGS OR WOODY DEBRIS [1]

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

Cover: 14 Max 20

COMMENTS:

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

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

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

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

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

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

Channel: 11 Max 20

COMMENTS:

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

River Right Looking Downstream

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

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

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

Riparian: 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: 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: 0.5 Max 8

COMMENTS:

6.) GRADIENT (ft / mi): 2.635 DRAINAGE AREA (sq.mi.): 268.9 % 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: _____

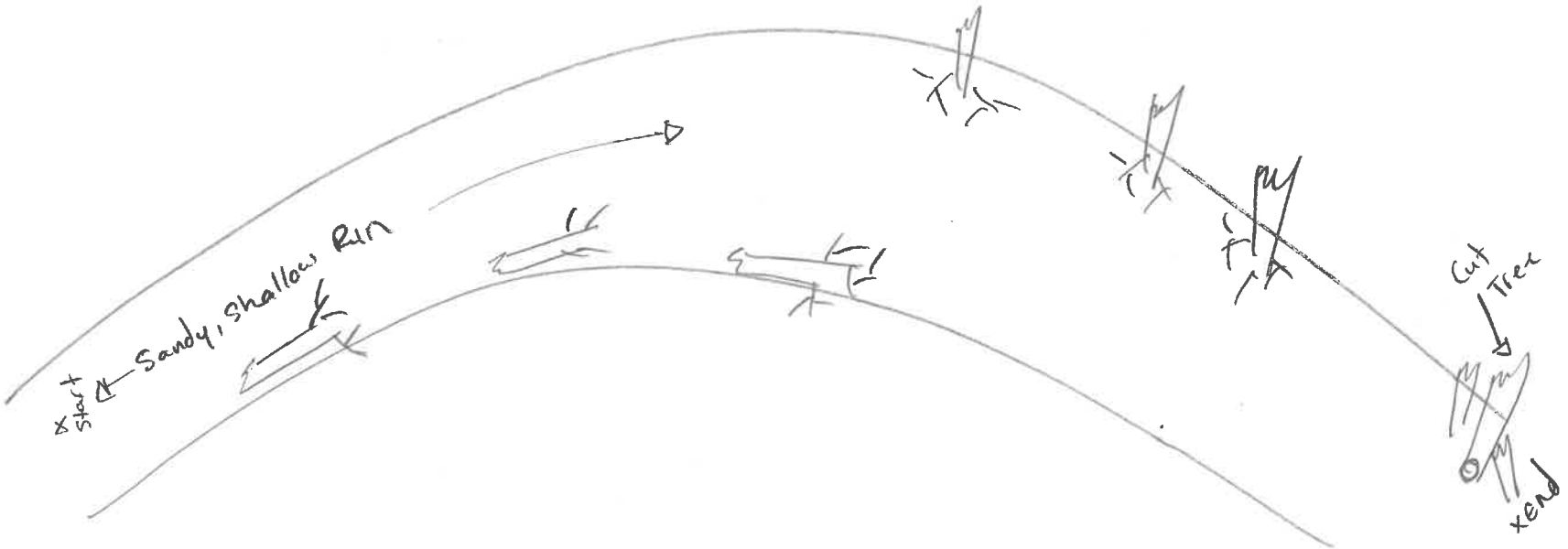
Subjective Rating (1-10)	Aesthetic Rating (1-10)
5	6

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

Gradient: ☐ -Low ☐ -Moderate ☐ -High

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		