DuPage River/Salt Creek

Special Conditions Report

March 25, 2022

Phosphorus and Leaf Litter Removal

Klein Creek (West Branch)

Southern East Branch Stream Enhancement

DuPage River Salt Creek Workgroup

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Introduction and Participation DuPage/Salt Creek Special Conditions Report, March 25, 2022.

This report fulfills certain reporting requirements contained in DuPage River Salt Creek Workgroup's (DRSCW) and Lower DuPage River Watershed Coalition's (LDRWC) NPDES permits. These requirements are provided in the DRSCW Special Conditions (Attachment 1) and the LDRWC Special Conditions. (Attachment 2 – Note: As the LDRWC Special Conditions differ between permit holders, the Special Conditions for Bolingbrook STP#3 is included in the Attachment as a representation of the Workgroup's Special Conditions Language.)

The Special Conditions are in the NPDES permits identified in Table 1 and Table 2. Listed permittees are required to ensure the completion of projects and activities set out in the Special Conditions, while a few other permittees are required to participate only in identified watershed level studies and the chloride reduction program. Table 1 identifies the status of funding for these activities by each permittee in the DRSCW; and Table 2 identifies the status of funding for these activities by each permittee in the LDRWC.

All listed permittees participate in the DRSCW and/or LDRWC and are working with other watershed members of the DRSCW and LDRWC to determine the most cost-effective means to remove dissolved oxygen (DO) and offensive condition impairments in the DRSCW watersheds.

The specific reporting requirements addressed herein include annual reporting on the progress of the projects listed in the Special Conditions, and certain baseline condition reporting for the Chloride Reduction Program. Map 1 and 2 show the locations of the physical projects to be realized under the special conditions.

Special Conditions Permit Holder Forum

In Spring/Summer 2021, four (4) Special Conditions Permit Holder Forums for DRSCW and LDRWC Permit Holders were held. Special Conditions Permit Holders were encouraged to attend at least one of the forums. The objective of the meeting was to provide an update on the Nutrient Implantation Plan (NIP) and discuss future permit negotiations.

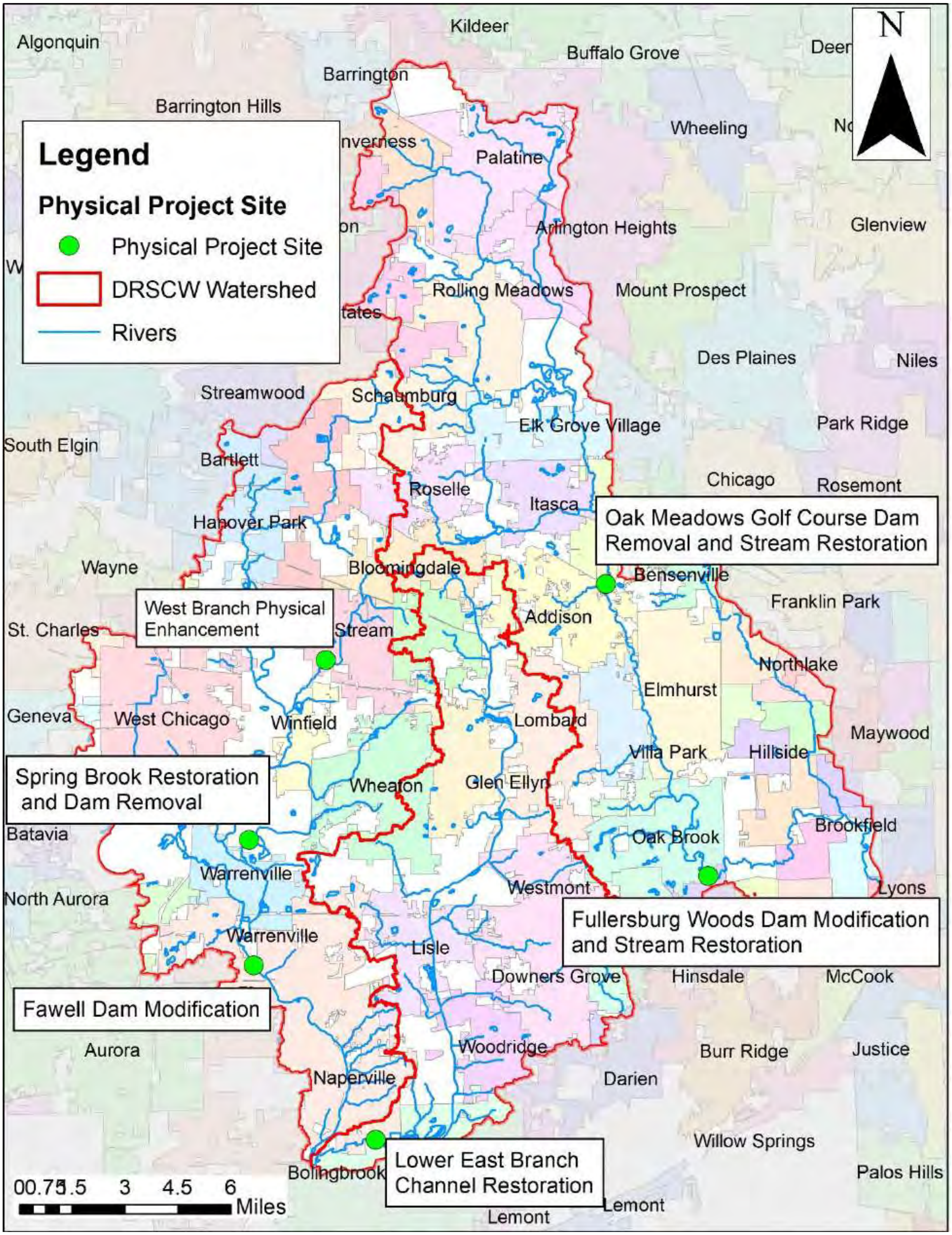
Table 1. *Participation in the DRSCW Special Conditions permit 2021-2022*

POTW Owner/ Facility Name	NPDES No.	Membership Dues Paid 2021-22	Assessment Paid for Paragraph 2 Table Project Funding*	Assessment Paid for Chloride Reduction/NIP/QUAL 2k/Trading Program
Addison North STP	IL0033812	YES	YES	YES
Addison South - AJ LaRocca	IL0027367	YES	YES	YES
Bartlett WWTP	IL0027618	YES	YES	YES
Bloomingdale-Reeves WRF	IL0021130	YES	YES	YES
Bolingbrook STP#1	IL0032689	YES	YES	YES
Bolingbrook STP#2	IL0032735	YES	YES	YES
Carol Stream WRC	IL0026352	YES	YES	YES
Downers Grove SD	IL0028380	YES	YES	YES
DuPage County Woodridge	IL0031844	YES	YES	YES
Elmhurst WWTP	IL0028746	YES	YES	YES
Glenbard WW Authority STP	IL0021547	YES	YES	YES
Glendale Heights STP	IL0028967	YES	YES	YES
Hanover Park STP#1	IL0034479	YES	YES	YES
Metropolitan Water Reclamation District of Greater Chicago (MWRDGC) – Egan WRP	IL0036340	YES	YES	YES
MWRDGC – Hanover Park WRP	IL0036137	YES	YES	YES
Roselle-Devlin STP	IL0030813	YES	YES	YES
Roselle-J Botterman WWTF	IL0048721	YES	YES	YES
Salt Creek SD	IL0030953	YES	YES	YES
West Chicago Regional WWTF	IL0023469	YES	YES	YES
Wheaton SD	IL0031739	YES	YES	YES
Wood Dale North STP	IL0020061	YES	YES	YES
Wood Dale South STP	IL0034274	YES	YES	YES
Bensenville South STP	IL0021849	YES	N/A	YES
Itasca STP	IL0079073	YES	N/A	YES

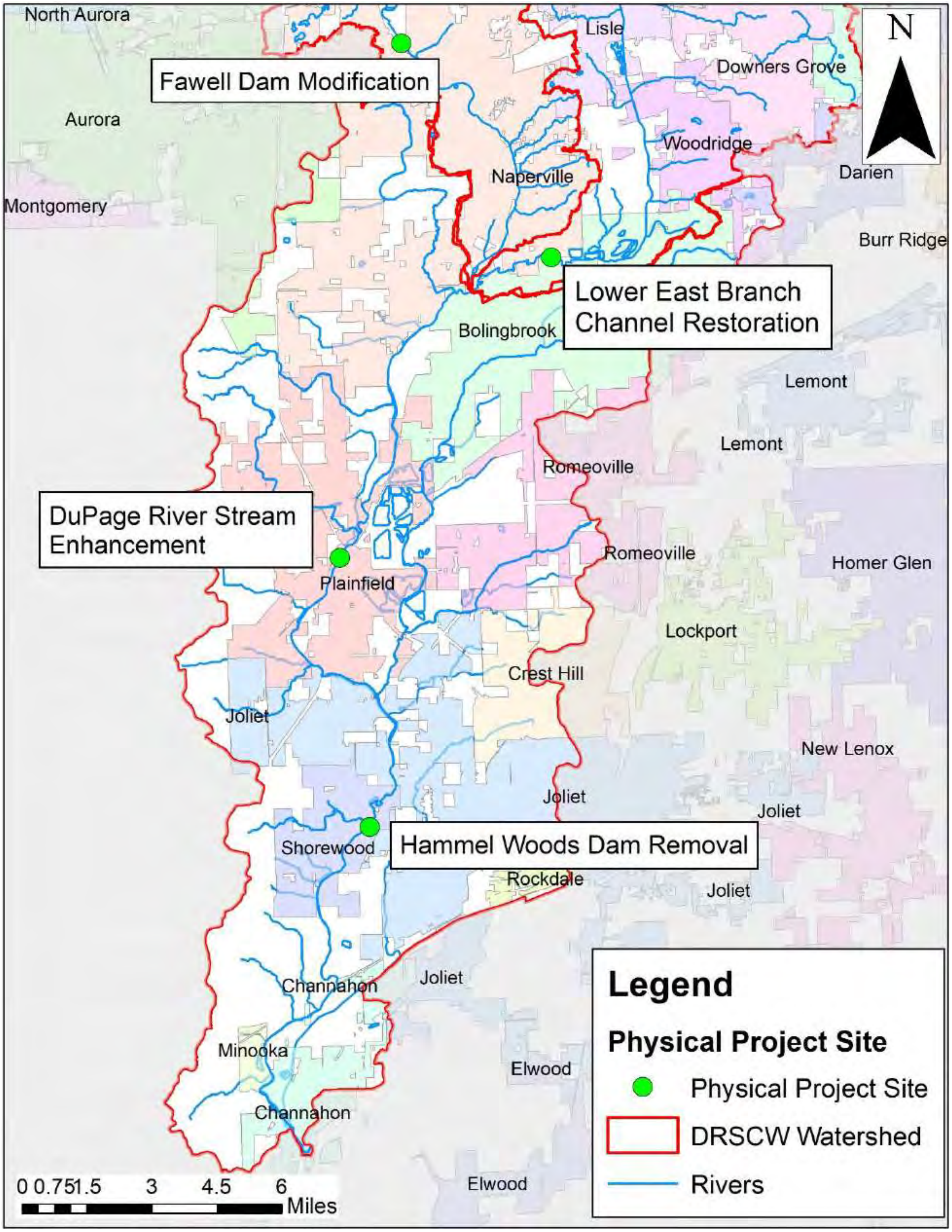
Table 2. *Participation in the LDRWC Special Conditions Permit 2021-2022*

POTW Owner/ Facility Name	NPDES No.	Membership Dues Paid 2021-2022	Assessment Paid for Paragraph 2 Table Project Funding*	Assessment Paid for Chloride Reduction/NIP/QUAL 2k/Trading Program
Naperville Springbrook WRC	IL0034061	YES	YES	YES
Bolingbrook STP#3	IL0069744	YES	YES	YES
Plainfield STP	IL0074373	YES	N/A	YES
Joliet Aux Sable Plant	IL0076414	YES	N/A	YES
Crest Hill West STP	IL0021121	YES	N/A	YES
Minooka STP	IL0055913	YES	N/A	YES

*N/A means that the agency does not have that condition in its permit.



Map 1. *Map of DRSCW Physical Projects set out in the Special Conditions*



Map 2. *Map of LDRWC Physical Projects set out in the Special Conditions*

Chapter 1 Physical Projects

The Special Conditions Paragraph 2 identifies stream restoration and dam modification projects that must be completed by the DRSCW and/or LDRWC. The current DRSCW Five-Year Financial Plan and the LDRWC Three-Year Financial Plan identifies project expenses and funds allocated for each of the physical projects. Map 1 shows the DRSCW physical projects covered in this section; and Map 2 shows the LDRWC physical projects covered in this section.

1.1 Oak Meadows Golf Course Dam Removal and Stream Restoration

- Special Conditions Completion Date – December 31, 2016 (dam removal), December 31, 2017 (stream restoration)
- Project Status – Dam removal and stream restoration are complete. The post-project monitoring phase was completed in 2019. Future monitoring of the project area will be completed in conjunction with the bioassessment program. Bioassessment sampling was competed in the Summer of 2021. Salt Creek's next bioassessment is scheduled for the Summer of 2025.

Post project survey results: mean QHEI increased from 57.25 to 69.3 in 2017 to 70 in 2018, 71.25 in 2019, and 74.83 in 2021. Mean mIBI increased from 23.6 (based on 2013 data) to 33.2 in 2017, to 34.9 in 2018, 40.85 in 2019, and 38.8 in 2021.

1.1.1 Site Description

The 2016 Annual Report provided a site description.

1.1.2 Design Characteristics

The 2016 Annual Report described the Project's design characteristics.

1.1.3 Permitting Requirements

The 2016 Annual Report includes details on the Project's permitting requirements.

1.1.4 Project Implementation

The 2017 Annual Report details the project implementation.

1.1.5 Project Impact Evaluation

The DRSCW and Midwest Biodiversity Institute (MBI) developed a monitoring plan to assess the restoration work conducted by the Forest Preserve District of DuPage County (FPDDC) and DRSCW contractors at the Preserve at Oak Meadows restoration project site. Biological and habitat data from the previous watershed surveys conducted by MBI in Salt Creek prior to 2016 were used as the pre-restoration condition baseline (SC34 and SC35). Post-restoration biological and habitat sampling added two new sites (SC35A and SC35B) beginning in late

August 2017 and continuing in 2018, 2019 and 2021 to assess project effectiveness. The post-restoration assessment included four biological monitoring sites with a fifth site located upstream at Lionwood Park (SC40) serving as an upstream control site that is typical of Salt Creek water quality and habitat and as representative of pre-restoration water quality conditions. Table 3 is a summary of pre- and post- project biological and habitat data collected at the Preserve at Oak Meadows in 2014, 2017, 2018, 2019, and 2021. A map of sampling locations is included in Map 3. Tables 4 and 5 include the color codes to IBI and habitat scores.

Habitat scores at the Oak Meadows project site were mostly fair during the pre-construction surveys (2007-2014) at SC34; and SC35 (SC35A and SC35B were not yet established) (Figure 1). Silt or muck substrates, fair to poor development, and a stream channel recovering from channelization were among the 6-8 modified attributes consistently recorded at each site through 2014. The stream banks were lined with A-jacks and steel sheet piling and the riparian corridor was narrow and segregated from Salt Creek. The resulting poor instream habitat lacked root wads and root mats, coarse substrates, and riffles such that only 3-5 good attributes were recorded. The pre-restoration Oak Meadows project area had elevated ratios of modified good habitat attributes at each site which included at least one high and multiple moderate influence modified habitat attributes in 2007-14.

The project was designed to improve QHEI scores on Salt Creek at the Preserve at Oak Meadows. Post-restoration QHEI scores were higher at all four sites in the restoration area, while remaining fair at the upstream control site (SC40) (Table 3 & Figure 1). Post project all four sites within the Preserve at Oak Meadows offer cobble/gravel riffles, deep runs, root wads, boulders and, other than SC35A, good to excellent channel morphology. Fine sediments are no longer the predominant substrates at any of the sites, the constructed riffles have low embeddedness, and the channel has recovered from historic modifications. Post-restoration surveys recorded no high influence modified attributes, fewer moderate influence modified attributes, an increased number of good habitat attributes, and lower modified good habitat ratios each of which is a distinct indication of improved habitat for aquatic life.

The project was also designed to increase the diversity and abundance of macroinvertebrate populations associated with the enhanced habitat features. Post-project macroinvertebrate Index of Biological Integrity (mIBI) scores are the highest ever recorded in the Oak Meadows project area and a signal of incremental improvement (Table 3 & Figure 2). Three (3) of the sites (SC34, SC35A, and SC34B) within the project limits are currently meeting the Illinois goals for aquatic life use attainment for macroinvertebrates (mIBI of ≥41.8). The fourth site (SC35) has increased its mIBI scores by 14.7 points from 15.5 in 2014 to 30.3 in 2021.

The expectations for improvements in fish are presently tempered by comparison to macroinvertebrates given that their ingress to this reach is eliminated by downstream barriers (the Fullersburg Woods and possibly the Old Oak Brook Dams) which was further documented in 2021 (Table 3 & Figure 3). The historically limited fish assemblage in Salt Creek plus remaining downstream barriers have blunted the potential improvements in the post-restoration fish assemblage for this project which is why the focus for the interim is on macroinvertebrate assemblage attributes.

Table 3. *Pre- and Post-Project Biological and Habitat Data collected at the Preserve at Oak Meadows in 2014, 2017, 2018, 2019, and 2021 (see table 4 & 5 for keys)*

Site ID	River Mile	Drainage Area (sq. mi.)	Fish IBI	MIwb	mIBI	QHEI	Attain-ment Status
Salt Creek 2021							
SC40	24.5	73.68	18	5.65	32.6	52.5	Non-Poor
SC34	23.5	74.51	15.5	6.55	42.4	77.0	Non-Poor
SC35	23	74.76	18	7.35	30.2	77.5	Non-Poor
SC35B	22.8	74.96	13.5	7.20	40.2^{ns}	72.0	Non-Poor
SC35A	22.7	75.11	14.5	6.20	42.4	72.8	Non-Poor
SC23	22.5	81.7	16.5	7.00	34.2	46.0	Non-Poor
Salt Creek 2019							
SC40	24.5	73.68	18	7.5	34.6	54.5	Non-Poor
SC34	23.5	74.51	16	8.1	43.8	71.5	Non-Poor
SC35	23	74.76	17	7.6	32.9	74	Non-Poor
SC35B	22.8	74.96	19	8.2	40.2^{ns}	72	Non-Poor
SC35A	22.7	75.11	15	6.9	46.5	67.5	Non-Poor
Salt Creek 2018							
SC40	24.5	73.68	17	8	34.4	58	Non-Poor
SC34	23.5	74.51	14	7.2	38.5^{ns}	71.5	Non-Poor
SC35	23	74.76	17	6.9	28.9	71.5	Non-Poor
SC35B	22.8	74.96	17	7.2	33.8	71.5	Non-Poor
SC35A	22.7	75.11	17	6.7	38.4^{ns}	65.5	Non-Poor
Salt Creek 2017							
SC40	24.5	73.68	14	7.1	32	64.5	Non-Poor
SC34	23.5	74.51	15	6.3	36	67	Non-Poor
SC35	23	74.76	14	5.9	29.7	69.5	Non-Poor
SC35B	22.8	74.96	13	6.7	33.1	71.5	Non-Poor
SC35A	22.7	75.11	-	-	33.9	-	Non-Fair
Salt Creek 2014							
SC34	23.5	74.51	16	5.2	20.2*	54	Non-Poor
SC35	23	74.76	13	5.3	15.5	60.5	Non-Poor
SC35A	22.7	75.11	-	-	12.1*	-	Non-Fair

Table 4. Color Key to IBI Scores.

Legend: Biological Indicators	
Green	Good
Yellow	Fair
Red	Poor
*	Significant departure from biocriterion
NS	Nonsignificant departure from biocriterion

Table 5. Color Code to QHEI Scores

Legend: QHEI	
(blue)	Excellent
(green)	Good
(yellow)	Fair
(orange)	Poor
(red)	Very Poor

Figure 1. Pre- and Post-Project QHEI Scores at the Preserve at Oak Meadows in 2013, 2014, 2016, 2017, 2018, 2019, and 2021

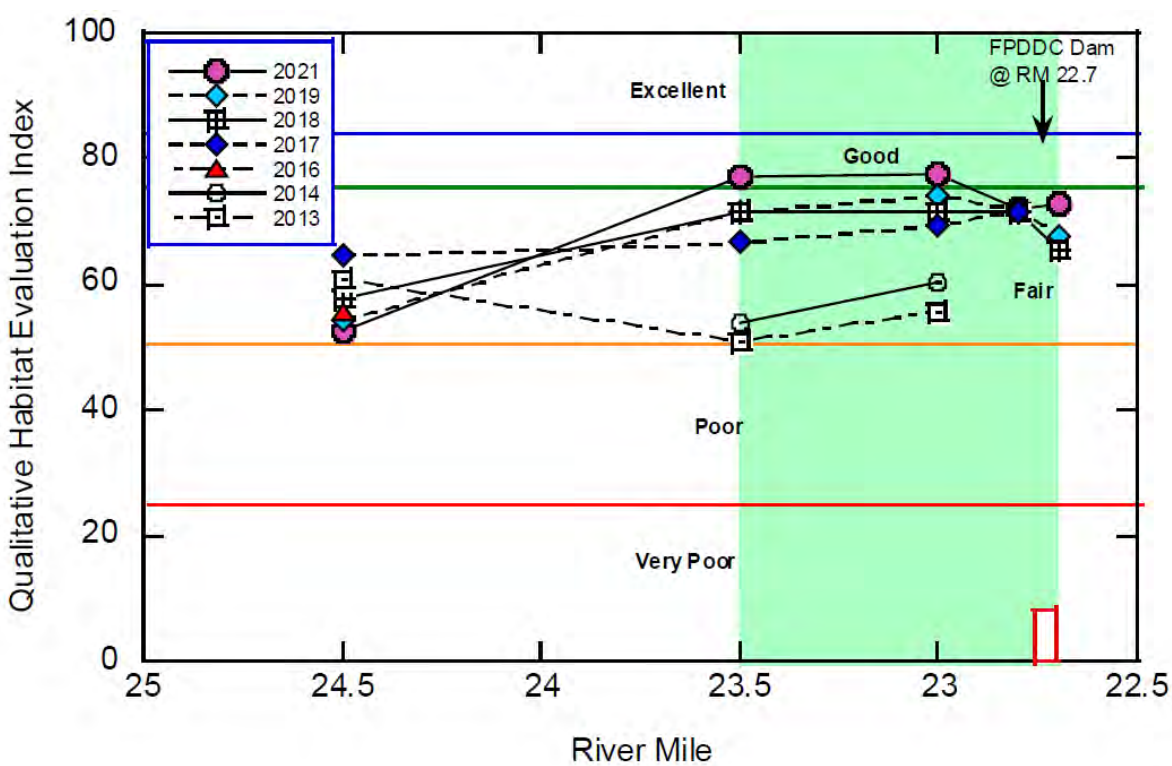


Figure 2. *Pre- and Post-Project mIBI Scores at the Preserve at Oak Meadows in 2013, 2014, 2016, 2017, 2018, 2019, and 2021*

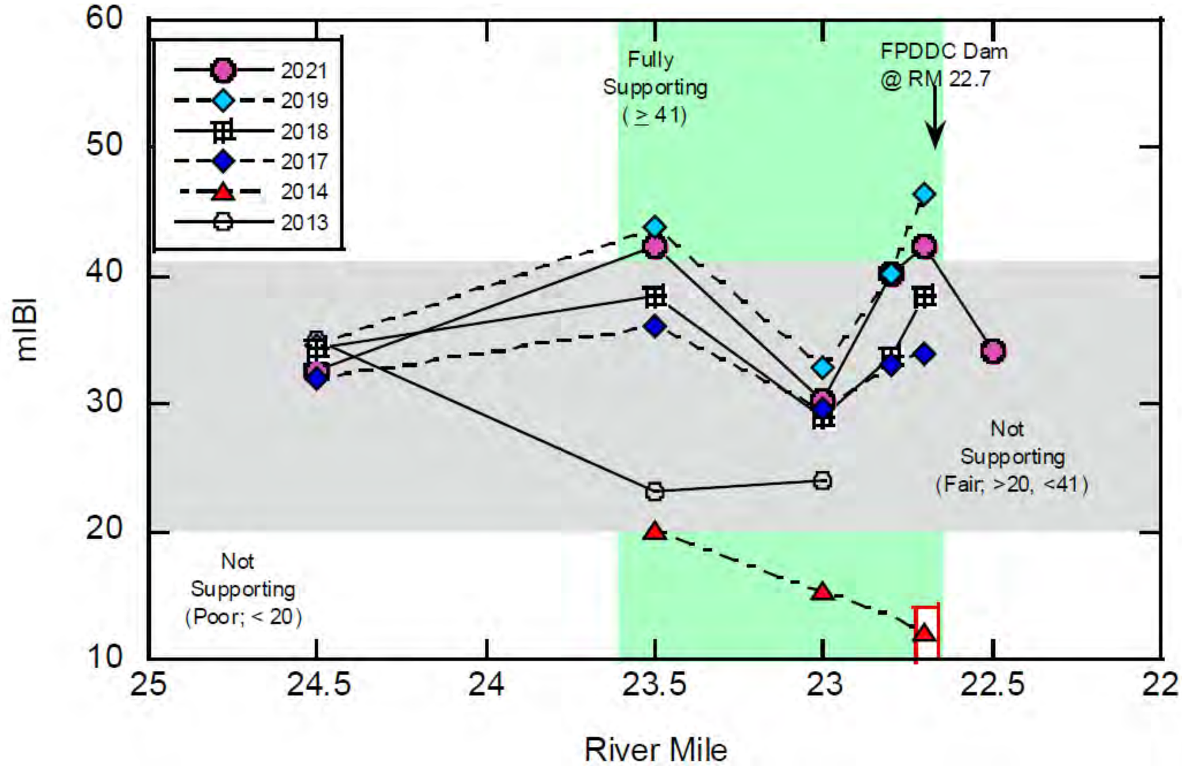
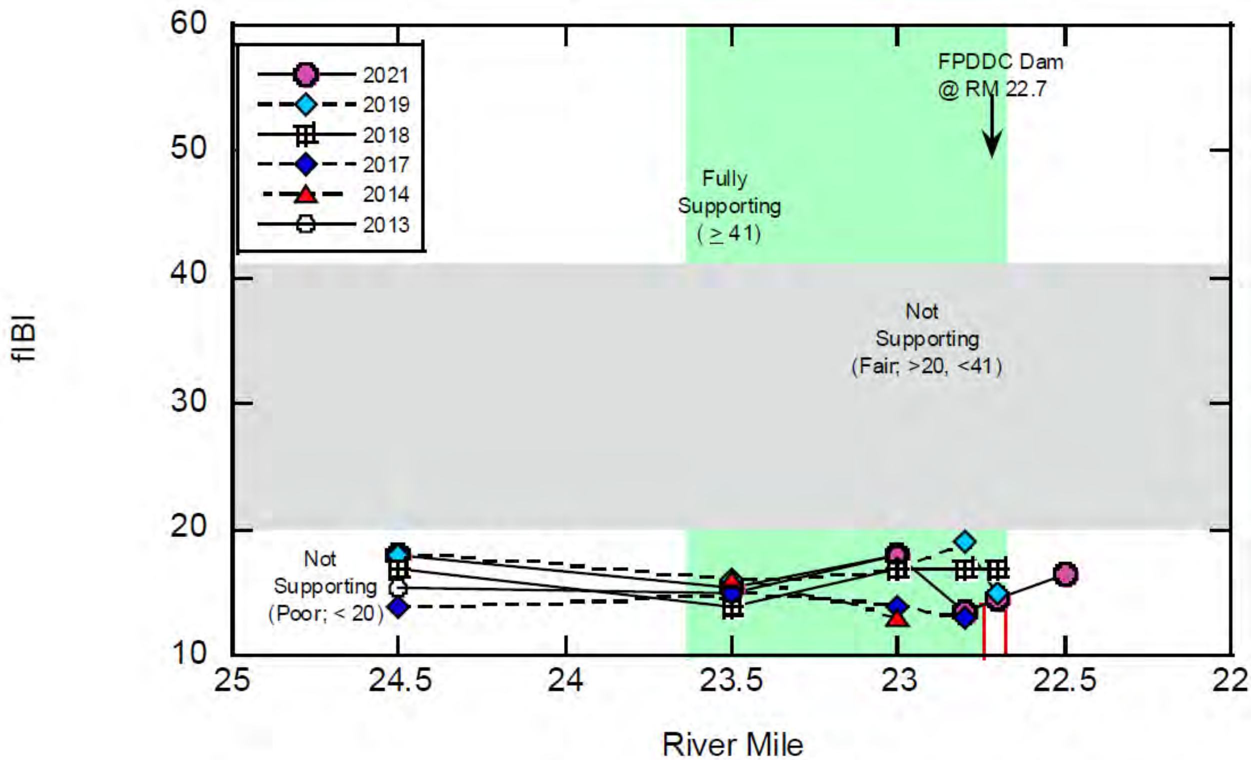


Figure 3. *Pre- and Post-Project fIBI Scores at the Preserve at Oak Meadows in 2013, 2014, 2016, 2017, 2018, 2019, and 2021*



Map 3. *Pre- and Post-Project Monitoring Sites at the Preserve at Oak Meadows*

1.2 Fawell Dam Modification

- Special Conditions Listed Completion Date – December 2022
- Status – In design and permitting phase

The objective of the project is to create fish passage through the Fawell dam.

1.2.1. Site Description

The 2017 Annual Report provided a site description.

1.2.2. Design Characteristics

The 2020 and 2021 Annual Report provided a detailed review of design characteristics of the Fawell Dam Modification.

1.2.3. Permitting Requirements

The below listed permits are required for the Fawell Dam Modification. Status as of March 1 2022 is included.

- U.S. Army Corps of Engineers Nationwide Permit
  - Application submittal pending
  - Illinois Historic Preservation Agency Section 106 Clearance –We do not anticipate needing this permit
  - U.S. Fish & Wildlife Service (US FWS) Section 7 Consultation – Completed US FWS self-documenting Section 7 Consultation in Summer 2021
- Illinois Department of Natural Resources (IDNR)
  - EcoCat Request – Signoff received (Submitted in 2021, expires in 2023)
  - Major Modification of Existing Dam Permit – Based on past discussions with IDNR and the revised design, this permit may be combined with the Floodway Construction Permit and thus will be submitted jointly.
  - Floodway Construction Permit
    - Expected to be delegated to DuPage County Stormwater
    - Application submittal pending
- DuPage County Stormwater Management Certification and Building Permit
  - Application submittal pending

1.2.4. Design Progress Report

The DRSCW is negotiating a memorandum of understanding (MOU) with DuPage County Stormwater Management (DCSWM) and the Forest Preserve District of DuPage County (FPDDC) for post project management at the site. DCSWM is the owner of the dam and the land it sits on. The FPDDC owns the property surrounding the dam parcel, including the area under the downstream riprap. The MOU will cover:

- Permitting and placement of the structure.
- Maintenance of the structure (debris management and inspection of joins and anchors).
- Placement of winter debris screen.
- Maintenance of instream elevation of the downstream riffle
- Operation of the hinged section where the ladder exits the upstream end of the culvert to allow the ladder to be moved aside if the gate needs to be closed.

The objective is to have the MOU signed by the end of March 2022.

The DRSCW also received comments on the design from DCSWM. Comments including questions on the materials used to construct the ladder, trash bollards, and sign of the baffles. Replies to these questions have been supplied to the County.

During 2021-2022 the design went under further refinement by the designer. This included:

- The replacement of the single length of ladder with two shorter ladders, one for the culvert and another for the splash pad lip.
- The cross profile dimensions for these ladders has been changed to 2ft wide by 3ft tall.
- Updated proposals on trash deflectors and ladder placement options

The objective is to have the final design accepted by all parties by the end of April 2022.

Several obstacles remain for the project. As the dam is a flood control structure DCSWM is understandably cautious about any proposed modification, and it may ultimately withhold permission to proceed. In addition, current events have dramatically increased the predicted costs and decreased the availability of materials.

It is difficult to see how the project can be further scaled back. If an agreement cannot be reached with DCSWM another project on the West Branch DuPage River will be proposed by the end of the year.

1.2.5. Project Impact Evaluation

Post project, both fIBI and fish taxa will be sampled upstream of the site and compared to historical data. The upstream and downstream sites were sampled in 2020 as part of the DRSCW's rolling basin assessment.

There are several possibilities for additional direct instream monitoring for fish movement through the system which are being evaluated based on the final design.

1.3 Spring Brook Restoration and Dam Removal (Spring Brook Phase 2)

- Special Conditions Listed Completion Date – December 2019
- Status – Construction is complete. Post-project monitoring is on-going. Year 1 of post-project monitoring was completed in 2021. Year 2 and Year 3 of post-project monitoring are scheduled for 2022 and 2023, respectively.

The project is being managed by the Forest Preserve District of DuPage County (FPDDC); construction, permitting, and long-term monitoring is being funded by the FPDDC, the Illinois State Toll Highway Authority (ISTHA), and the DRSCW.

Post project survey results: After one (1) year of post-project monitoring, Spring Brook Phase 2 has met its post-project targets for QHEI and fIBI both within the project footprint and at sites monitored as part of the post-project impact evaluation.

1.3.1. Site Description

The 2020 Annual Report provided a site description.

1.3.2. Design Characteristics

The 2020 Annual Report provided the Project's design characteristics.

1.3.3. Permitting Requirements

The 2020 Annual Report includes details on the Project's permitting requirements.

1.3.4. Project Implementation

The 2020 Annual Report details the project implementation.

1.3.5 Project Impact Evaluation

The DRSCW, MBI, and the FPDDC developed a monitoring plan to assess the restoration work conducted by the FPDDC, ISTHA, and DRSCW contractors at the Spring Brook Phase 2. Pre-and post-project monitoring includes five (5) sites. Three (3) of the sites (WB10, WB10C, and WB10D) are located with the project footprint with the remaining two (2) sites (10A and 10B) being located downstream of the project. The downstream sites serve as control sites that share the same water quality as the upstream (restored) sites. It should also be noted that the location of WB10 has moved between the pre- and post-project sampling. As part of the project, a new stream channel was constructed north of the existing channel for the portion of Spring Brook situated downstream of the former location of the Arrow Road dam and the former channel was converted to wetlands. Prior to 2020, WB10 was located on the original channel. As such, as part of the post-project monitoring, WB10 was relocated to the new constructed channel immediately upstream of the pedestrian bridge. Table 6 is a summary of pre- and post- project biological and habitat data collected at Spring Brook Phase 2 in 2018 and

2021. Figure 4-6 depict the pre- and post-project QHEI (Figure 4); mIBI scores (Figure 5); and fIBI scores (Figure 6). A map of sampling locations is included in Map 4.

Table 6. *Pre- and Post-Project Biological and Habitat Data collected at Spring Brook Phase 2 in 2018 and 2021*

Site ID	River Mile	Drainage Area (sq mi.)	fIBI	MIwb	mIBI	QHEI	Attain-ment Status
Spring Brook 2021							
WB10D	1.51	6	30*	4.5	33.2*	78.5	Non-Fair
WB10C	1.12	6.3	24*	5.5	23.3*	48	Non-Fair
WB10	0.71	6.8	22*	4.8	33.1*	81	Non-Fair
WB10B	0.3	6.9	27*	5	44.6	64	Non-Fair
WB10A	0.1	7	27*	6.6	52.3	68	Partial
Spring Brook 2018							
WB10D	1.51	6	28*	4.5	29.5*	54	Non-Fair
WB10C	1.12	6.3	18*	3.4	29.1*	34	Non-Poor
WB10	0.71	6.8	25*	7.9	42.8	69.5	Partial
WB10B	0.3	6.9	11*	5.8	51.6	51.6	Non-Poor
WB10A	0.1	7	15*	6.6	56	56	Non-Poor

See Tables 4 and 5 for the color key to IBI and QHEI scores.

Figure 4. *Pre- and Post-Project QHEI Scores at Spring Brook Phase 2 in 2018 and 2021*

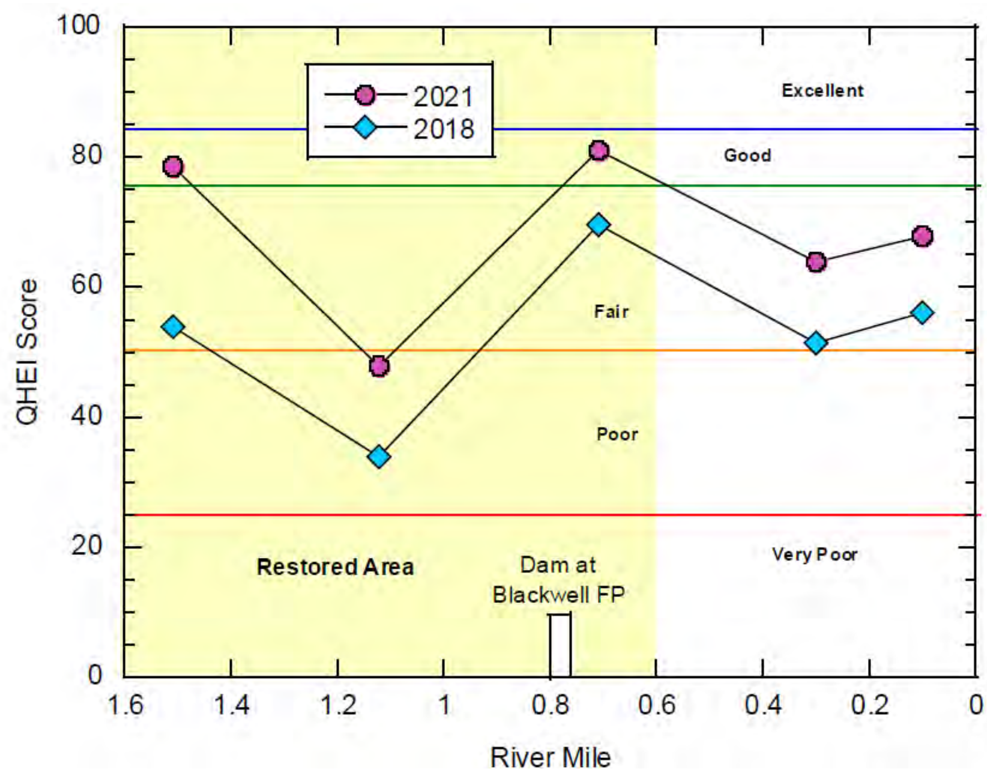


Figure 5. Pre- and Post-Project mIBI Scores at Spring Brook Phase 2 in 2018 and 2021

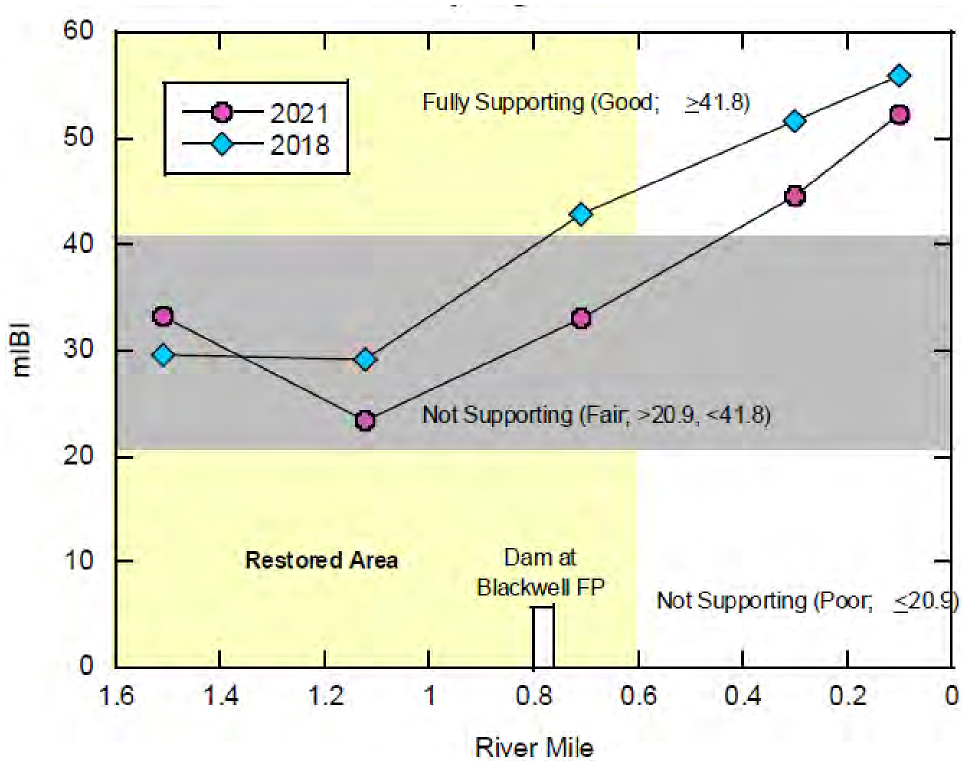
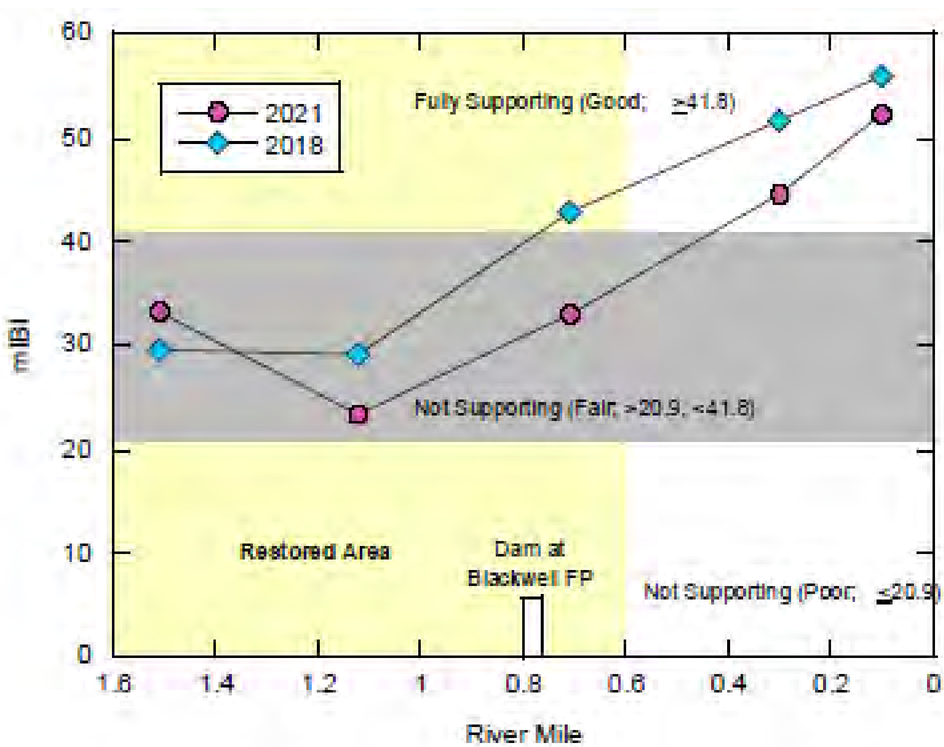


Figure 6. Pre- and Post-Project fIBI Scores at Spring Brook Phase 2 in 2018 and 2021



Map 4. *Pre-and Post-Project Monitoring Sites at Spring Brook Phase 2*

Using pre-project monitoring data collected in 2018, target QHEI, mIBI, and fIBI post-project scores for both the project footprint and all five (5) monitoring sites were developed. The target criteria and 2021 post-project scores are included in Table 7.

Table 7. *Target QHEI, mIBI and fIBI Scores Generated from 2018 Sampling and Average QHEI, mIBI, and fIBI Scores from the 2021 Post-Project Monitoring at Springbrook Phase 2*

Parameter	Post-Project Targets		2021 Post-Project Data (average)	
	All Monitoring Sites (5 sites)	Footprint proper sites (3 sites RM 0.75 -1.42)	All Monitoring Sites (5 sites)	Footprint proper sites (3 sites RM 0.75 -1.42)
QHEI	>54.8	> 52.5	67.9	69.2
mIBI	> 50.1	> 42.8	37.3	29.9
fIBI	> 19.4	> 17	26	25.3

After one (1) year of post-project monitoring, Spring Brook Phase 2 has met its post-project targets for QHEI and fIBI both within the project footprint and at sites monitored as part of the post-project impact evaluation. Data also shows that two (2) new species of fish, Stonecat Madtom and Rock Bass, were observed for the first time within the project limits. Post-project mIBI targets have not been met but it is expected that mIBI scores will continue to increase in Years 2 and 3 of post-project monitoring.

1.4 Fullersburg Woods Dam Modification Concept Plan Development

- Special Conditions Listed Completion Date – December 2016
- Status – Complete (December 2016)

The DRSCW submitted the Fullersburg Woods Dam Modification Concept Plan to the IEPA on December 2016. The 2017 Annual Report included details on the findings of the Fullersburg Woods Dam Modification Concept Plan.

1.5 Fullersburg Woods Dam Modification and Stream Restoration

- Special Conditions Listed Completion Date – December 2021/December 2022
- Status – Outreach and Education Campaign is ongoing (started 2017). Master Planning process was completed in 2020. Final Design/Permitting/Preparation of Contract Bid Documents Construction is in progress and is scheduled for completion in mid-2022. Construction is expected to begin in late 2022.

The Fullersburg Woods Dam Modification and Stream Restoration Project is located on the Salt Creek within the Fullersburg Woods Forest Preserve, Village of Oak Brook, DuPage County, Illinois. The Project's objectives are to raise QHEI above its current average of 47.45, raise fIBI at the sites upstream of the dam above its current average score of 14.0, raise mIBI above its current average score of 25.5 for approximately 1.25 river miles and to improve dissolved oxygen (DO) in the impoundment, as compared to the 2007-2018 data set. The DRSCW will be collaborating with FPDDC and DuPage County Stormwater Management (DCSWM) on this project. DRSCW has budgeted $4,975,000 for this project.

1.5.1. Site Description

The 2018 Annual Report provide details on the Project's site description.

1.5.2. Research and Public Outreach

The 2021 Annual Report provided details on the Research and Public Outreach activities conducted between 2016 and 2021. All reports and materials developed as part of the research and public outreach phase of the Fullersburg Woods Dam Modification and Stream Restoration Project can be found at RestoreSaltCreek.org.

1.5.3 Design Characteristics

The 2020 Annual Report provided the Project's design characteristics.

1.5.4 Permitting Requirements

The permits listed below are required for the Fullersburg Dam Removal and Stream Restoration Project. Status as of March 1 2022 is included.

- U.S. Army Corps of Engineers Nationwide Permits 53, 58, and 27 (LRC-2021-977)
  - Application submittal pending
  - Illinois Historic Preservation Agency Section 106 Clearance – Pending
  - U.S. Fish & Wildlife Service Section 7 Consultation – Submitted to IPAC system
- Illinois Department of Natural Resources
  - EcoCat Request – Signoff received
  - Floodway Construction Permit
    - Expected to be delegated to DuPage County Stormwater
    - Application submittal pending
- Illinois Environmental Protection Agency
  - NPDES Permit for Construction (ILR10)
    - Notice of Intent submittal pending
- Kane DuPage Soil and Water Conservation
  - Soil erosion and sediment control (SESC) review submittal is pending
- DuPage County Stormwater Management Certification and Building Permit
  - Application submittal pending
- DuPage County Highway Access Permit
  - Application submittal pending
- Village of Oak Brook Roadway Access Permit
  - Application submittal pending

1.5.5 Design Progress Report

1.5.5.1. *Phase 1: Development of the Concept Master Plan for Salt Creek at Fullersburg Woods*

The 2021 Annual Report describes all work conducted as part of the development of a Concept Master Plan for Salt Creek at Fullersburg Woods. The Concept Master Plan was completed in September 2021 and can be found at http://restoresaltcreek.org/wp-content/uploads/2020/09/concept-master-plan_09.17.20-final.pdf

1.5.5.2. *Phase 2: Concept Master Plan for Salt Creek at Fullersburg Woods Final Design and Preparation of Contract Bid Documents*

In early January 2021, the DRSCW entered into a contract with Hey and Associates, Inc. for the final design engineering and preparation of contract bid documents for the Concept Master Plan for Salt Creek at Fullersburg Woods. Work in 2021-2022 focused on final design and preparation of permit applications and construction bid documents.

The Master Plan for Salt Creek at Fullersburg Woods will replace the concrete dam on Salt Creek at Graue Mill, constructed in 1933, with a rock riffle structure that will create a safe passage for paddlers and allow fish to travel for 17 miles upstream of the dam for the first time in for nearly 90 years. There will be no alteration to the historic millhouse, where an electric motor has been used for its milling operations for several years. The project will include modifications to the millrace and the public access structures around it to enhance the visitor experience and address the lower water level resulting from the dam removal. Also included in the project is the placement of seven (7) riffles and pools from the former location of the dam upstream to Willow Island. See Attachment 3A for the overall Project Concept Design Plan.

The Master Plan is designed to:

- Improve water quality and avoid additional regulations by the U.S. Environmental Protection Agency (USEPA) or the Illinois Environmental Protection Agency (IEPA)
- Increase fish diversity in Salt Creek by 30% in the 17 miles upstream of the dam
- Maintain an attractive water feature on Salt Creek at the Graue Mill site
- Preserve operation of the historic Graue Mill wheel and gristmill
- Provide canoe launches and fishing stations and other improvements at Fullersburg Woods
- Have no impact on flooding upstream or downstream of Fullersburg Woods

Impacts to wetlands/waters were avoided and minimized to the maximum extent practicable given the dam removal and stream enhancement nature of the project. Access routes avoided wetlands wherever possible. Impacts within the stream are the minimum needed to remove the dam and construct the riffles and pools. It also seems prudent to reduce the bank angle where they are near vertical due to erosion. However, the project will necessitate the unavoidable impact of 1.19 acres of Waters of the U. S. to construct in-stream riffles and pools, reduce bank slopes, and provide other enhancements to improve habitat and water quality. This includes cut and fill within the stream channel to create geomorphically-based riffle-run-pool sequences in the former impoundment area of Salt Creek. The project will also require temporary impacts to 0.89-acres of wetlands for access to the stream channel. See Attachment 3B for the impact exhibit.

The project is considered self-mitigating. There are no negative permanent impacts to wetlands or waters. Temporary impacts for access are offset by the enhancement of approximately 1.5 miles of stream channel, 19.61 acres of riparian wetland, and enhancement of an additional 14.08 of nonwetland riparian habitat. In addition, approximately 10.97 acres of open water in the dam pool will become vegetated wetland once the dam is removed and plantings completed. See Attachment 3C for the enhancement exhibit.

The project will require authorization under Section 404 of the Clean Water Act from the US Army Corps of Engineers (ACOE) for the proposed impacts to 2.19-acres of jurisdictional wetland/Waters of the U. S. This includes a Nationwide Permit 53 for low-head dam removal, Nationwide Permit 58 for the water intake for the raceway pumps, and a Nationwide Permit 27 for the aquatic and riparian habitat restoration work. The project will comply with all conditions of the Nationwide Permit program. The permit application is expected to be submitted to the ACOE in March 2022.

The project will also require authorization from DuPage County under their Flood Plain and Stormwater Ordinance and Building Permit programs. A permit application is expected to be submitted to DuPage County in March 2022.

The Metropolitan Water Reclamation District of Greater Chicago (MWRDGC) will lead the bid and award of the contract and provide construction oversight of the project. It is expected that the project will go to bid in April 2022 with construction to start in Fall of 2022.

1.5.6 Project Impact Evaluation

Pre-project monitoring for the Fullersburg Woods Dam Modification project was completed in 2019, 2020, and 2021. Pre-project biological and habitat data was collected at SC53 which is a site that is included in previous watershed surveys conducted as party of the bioassessment program by MBI in Salt Creek in 2007, 2010, 2013, and 2016. In order to collect additional data within the proposed project reach, three (3) additional sampling sites (SC53a, SC56B, and SC56C) were established as part of the pre-project monitoring. The pre-project assessment also includes two (2) sites located upstream of the project reach (SC56 and SC56a) and one (1) site (SC52) downstream of the project reach. The upstream and downstream sites serve as control sites and are representative of typical of Salt Creek water quality and habitat.

Table 8 includes the results of the pre-project 2019, 2020, and 2021 surveys collected by the DRSCW. Figure 7-9 depict the pre-project QHEI (Figure 7); mIBI scores (Figure 8); and fIBI scores (Figure 9). It is also important to note that fish sampling found 24 species, including 21 native species, downstream of the dam but only 9 species, including 7 native species, upstream of the dam. These results underline the need for fish passage through the Fullersburg Woods dam. Map 5 depicts the pre-project monitoring sites at the Fullersburg Woods Dam Removal and Stream Restoration Project.

Table 8. *Pre-Project Biological and Habitat Data Collected at the Fullersburg Woods Dam Removal and Stream Restoration Project in 2019, 2020, and 2021*

Site ID	River Mile	Drainage Area (sq. mi.)	fIBI	MIwb	mIBI	QHEI	Attain-ment Status
Salt Creek 2021							
SC56	12.5	109.8	14*	5.5	30.1	56.0	Non-Poor
SC56A	12.2	109.8	16*	5.7	36.7	62.0	Non-Poor
SC56B	11.7	113.6	12*	6.0	-	50.0	Non-Poor
SC56C	11.3	113.6	13*	5.5	28.1	50.3	Non-Poor
SC53	11.0	114.0	16*	7.0	28.7	46.0	Non-Poor
SC53A	10.8	114.0	13*	6.5	19.7	43.5	Non-Poor
SC52	10.5	114.0	28	8.2	45.0	82.8	Partial
Salt Creek 2020							
SC56	12.5	109.8	12*	5.5	30.1	49.0	Non-Poor
SC56A	12.2	109.8	15*	8.0	26.2	58.0	Non-Poor
SC56B	11.7	113.6	16*	5.0	-	61.0	Non-Poor
SC56C	11.3	113.6	16*	6.8	29.5	55.0	Non-Poor
SC53	11.0	114.0	14*	7.2	24.7	49.5	Non-Poor
SC53A	10.8	114.0	12*	7.4	22.7	44.0	Non-Poor
SC52	10.5	114.0	28	8.8	31.1	85.5	Non-Fair
S alt Creek 2019							
SC56	12.5	109.8	17*	5.6	14.6*	44.5	Non-Poor
SC56A	12.2	109.8	15*	6.5	27.6	42.5	Non-Poor
SC56B	11.7	113.6	16*	5.8	-	53.5	Non-Poor
SC56C	11.3	113.6	15*	6.8	28.5	57.0	Non-Poor
SC53	11.0	114.0	14*	7.0	20.3*	54.5	Non-Poor
SC53A	10.8	114.0	13*	6.7	13.2*	49.5	Non-Poor
SC52	10.5	114.0	30	9.1	47.4	72.0	Partial

See Tables 4 and 5 for the color key to IBI and QHEI scores.

Figure 7. *Pre-Project QHEI Scores at the Fullersburg Woods Dam Removal and Stream Restoration Project in 2019, 2020, and 2021*

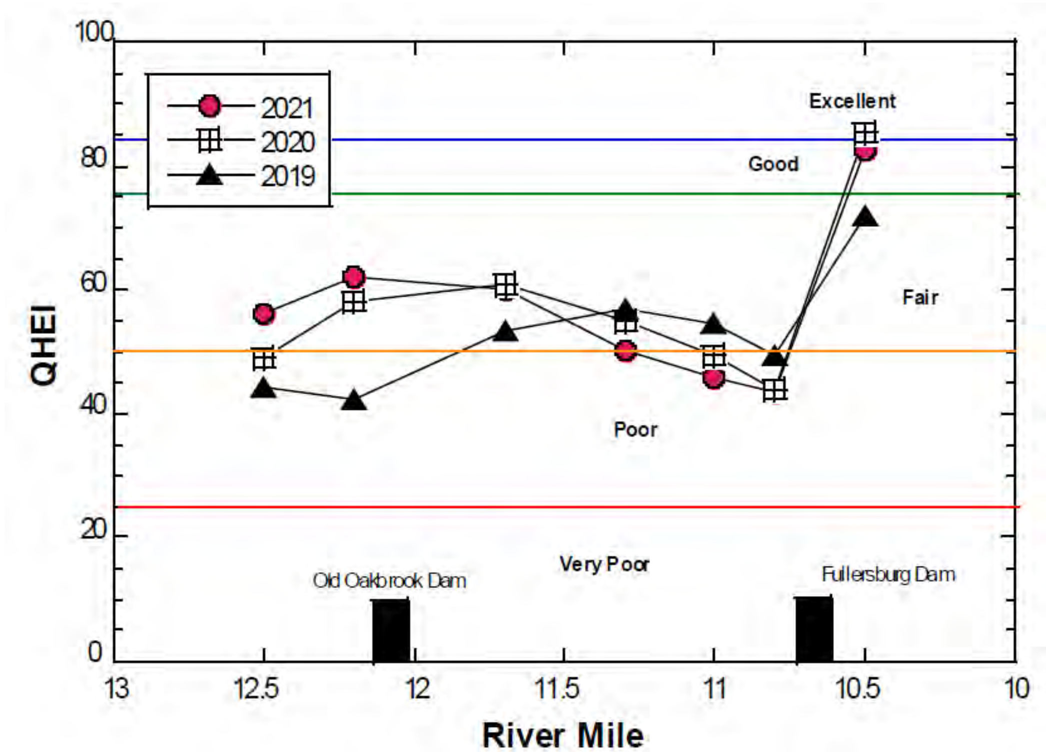


Figure 8. *Pre-Project mIBI Scores at the Fullersburg Woods Dam Removal and Stream Restoration Project in 2019, 2020, and 2021*

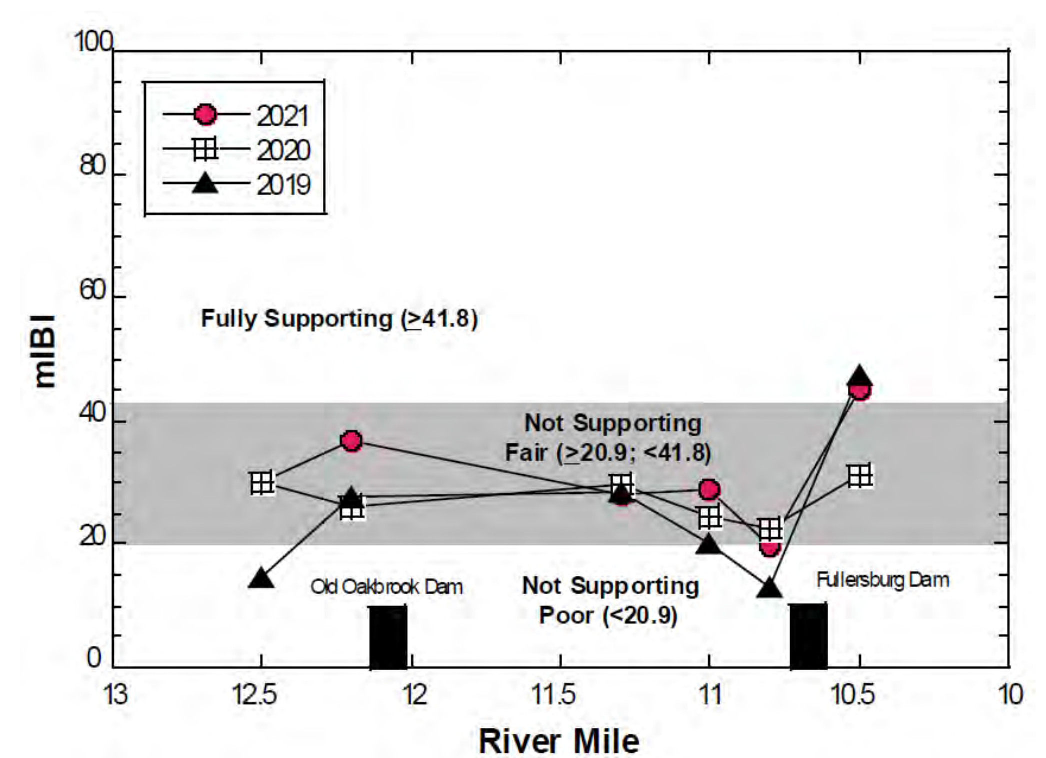
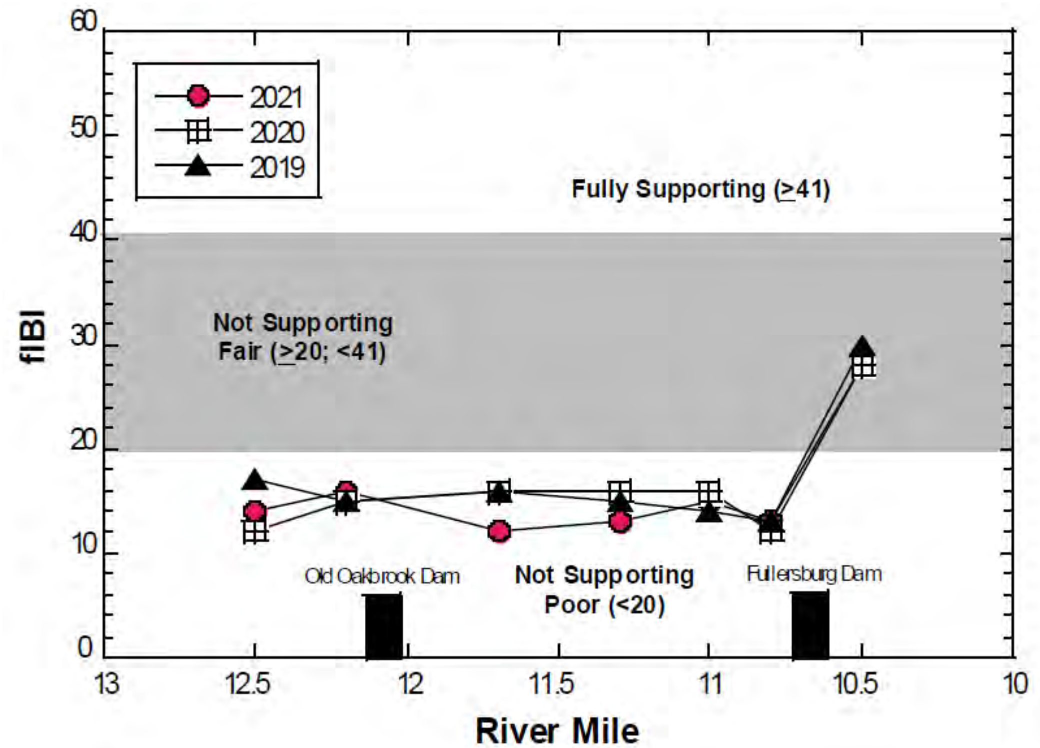


Figure 9. *Pre-Project fIBI Scores at the Fullersburg Woods Dam Removal and Stream Restoration Project in 2019, 2020, and 2021*



***Map 5**. Pre-Project Monitoring Sites at the Fullersburg Woods Dam Removal and Stream Restoration Project*

1.6 West Branch Physical Enhancement – Klein Creek Streambank Stabilization Project

- Special Conditions Listed Completion Date – December 2022
- Status — Final Design/Preparation of Bid Documents is in progress and is scheduled for completion in March 2022 with construction expected to begin in June 2022.

The DRSCW has entered in a Memorandum of Understanding (MOU) with the Village of Carol Stream to fund the river resource improvement elements of the Klein Creek Section I Stream Bank Stabilization. Klein Creek is a tributary to the West Branch of the DuPage River. The objectives of the Project are to raise QHEI above its current score of 41.25 and to raise fIBI and mIBI scores in Klein Creek. The DRSCW budgeted $1,249,623 for the Project.

1.6.1. Site Description

The Klein Creek Section 1 Stream Bank Stabilization project is located entirely within the municipal boundary of the Village of Carol Stream, DuPage County, Illinois on either Village-owned property or within Village easements. It is approximately half of a larger project that will stabilize Klein Creek from just north of North Avenue (IL Route 64) at Kuhn Road to Thunderbird Trail. The Klein Creek Section 1 Stream Bank Stabilization project will reconstruct the 1,500 feet of the creek from Kuhn Road to just downstream of the Carol Stream's wastewater treatment plant's outfall. The remaining 1,900 feet upstream to Thunderbird Trail is being funded by an IEPA 319(h) grant (Agreement No. 3192009) whose funding cannot be used to meet the conditions of an NPDES permit.

1.6.2. Design Characteristics

The Klein Creek Section 1 Stream Bank Stabilization project will re-meander the channel and increase its length by approximately 200 feet. A new stream bed will be constructed with a bioengineered cobble/gravel/sand mix. The longitudinal slope is too flat for riffle structures, but two rock substrate areas will be added to provide riffle-type benefits. Stream banks will be stabilized with a vegetated rock toe or rootwads embedded at outside bends, as well as several rock vanes (aka stream barbs) at strategic locations. The top of bank will be lowered adjacent to newly created wetlands totaling approximately 1.4 acres.

1.6.3. Permitting Requirements

The following permits are required with their status updated as of February 4, 2022:

- U.S. Army Corps of Engineers Regional Permit
  - Application Submitted on 01/27/22
  - Illinois Historic Preservation Agency Section 106 Clearance – Pending
  - U.S. Fish & Wildlife Service Section 7 Consultation – Pending
- Illinois Department of Natural Resources Floodway Construction Permit
  - Delegated to DuPage County Stormwater on 12/03/21

    - Application Submitted to DuPage County on 11/09/21
    - Comments Received on 01/18/22 – Resubmittal Pending
- Stormwater Management Certification (DuPage County Ordinance)
    - Village of Carol Stream is a Full Waiver Community.

1.6.4. Design Progress Report

The construction plans and specifications are currently being reviewed by the Village of Carol Stream for constructability and quality assurance. The retaining wall design is being finalized now that its location has been set. Responses to the comments from DuPage County on the floodway permit application will be re-submitted by the end of February. The Invitation for Bids is tentatively set for mid-March 2022 for award at the May 2, 2022 Village Board meeting.

1.6.5. Project Impact Evaluation

The DRSCW, Village of Carol Stream, and MBI developed a monitoring plan to assess the pre-project conditions at the Klein Creek Section 1 Stream Bank Stabilization Project. Biological and habitat data were collected in 2021 at two (2) sites within the proposed project limits: WB19B and WB19C. Sites WB19, 19A, and 19B were collected upstream of the proposed project limits and are located within the limits of a second project being designed and constructed by Carol Stream. Site WB16 is located outside the project limits of both the Klein Creek Section 1 Stream Bank Stabilization Project and Carol Stream's other project and was also sampled to serve as downstream control site that is typical of Klein Creek water quality. Table 9 includes the results of the pre-project 2021 survey collected by the DRSCW. Figure 10-12 depicts the pre-project QHEI scores (Figure 10); mIBI scores (Figure 11), and fIBI scores (Figure 12). Map 6 depicts the locations of the samples collected by the DRSCW.

Table 9. Pre-Project Biological and Habitat Data Collected at the Klein Creek Section 1 Stream Bank Stabilization Project in 2021

Site ID	River Mile	Drainage Area (sq mi.)	fIBI	MIwb	mIBI	QHEI	Attain-ment Status
Klein Creek 2021							
WB19	3.60	5.30	16	3.9	20.8	36.8	Non-Poor
WB19A	2.97	8.36	14	4.6	21.0	43.0	Non-Poor
WB19B	2.57	8.59	17	4.4	14.2	41.5	Non-Poor
WB19C	2.44	8.64	14	4.0	24.3	41.0	Non-Poor
WB16	1.00	10.43	19	5.5	33.0	76.0	Non-Poor

See Tables 4 and 5 for the color key to IBI and QHEI scores.

***Figure 10**. Pre-Project QHEI Scores at the Klein Creek Section 1 Stream Bank Stabilization Project for 2021.*

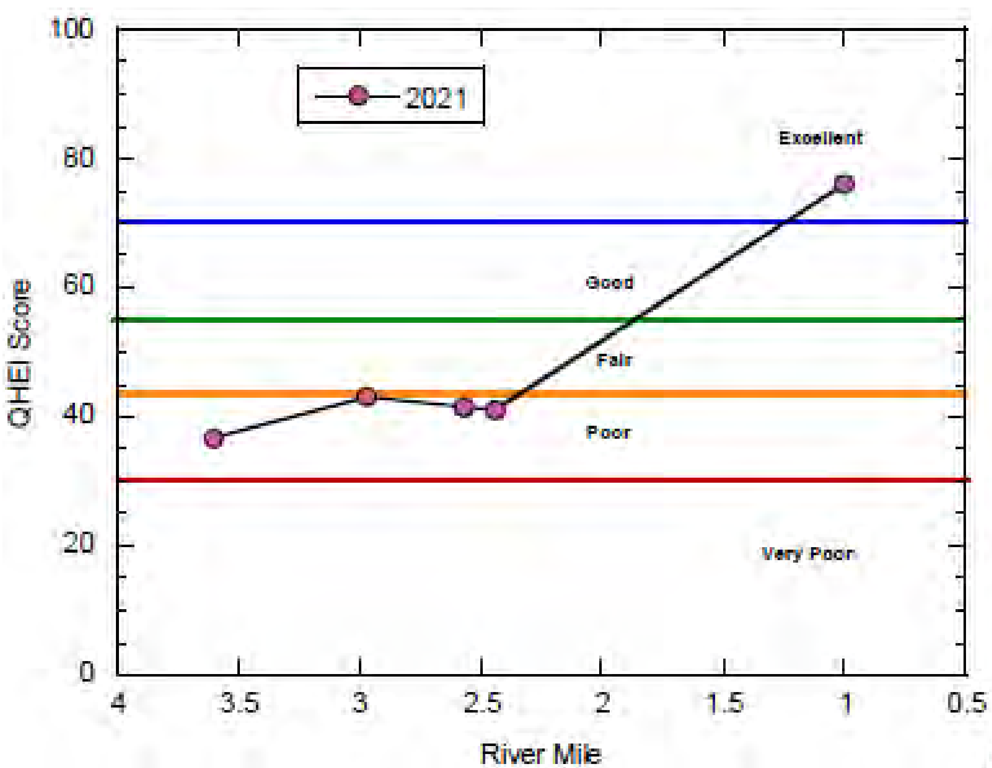


Figure 11. Pre-Project mIBI Scores at the Klein Creek Section 1 Stream Bank Stabilization Project in 2021

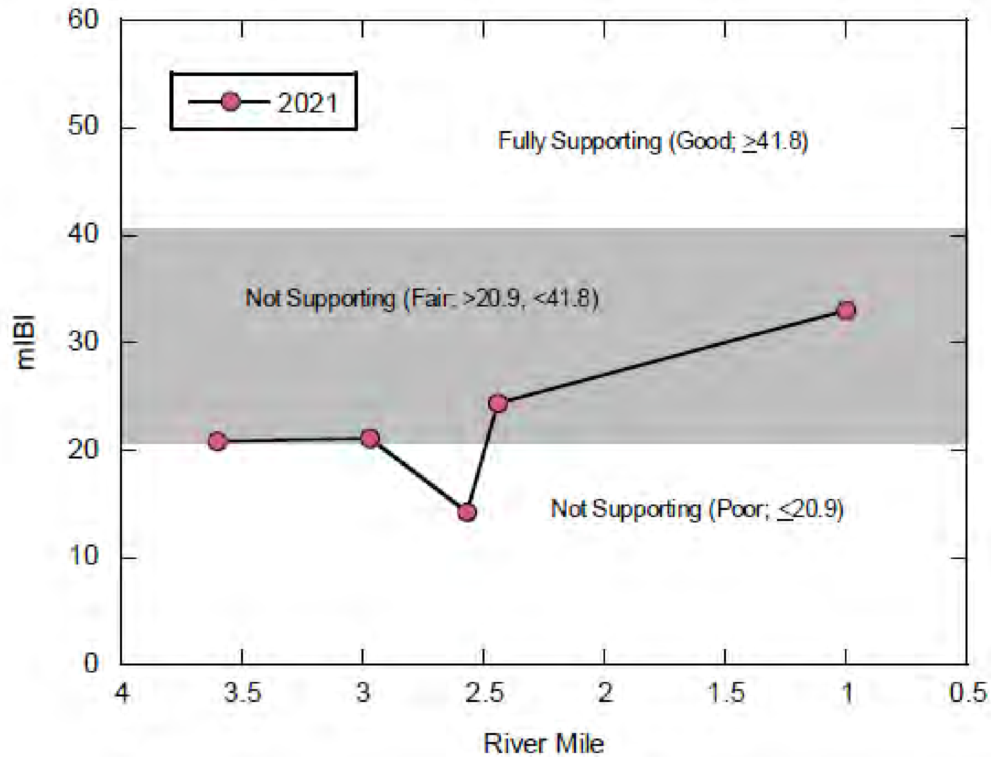
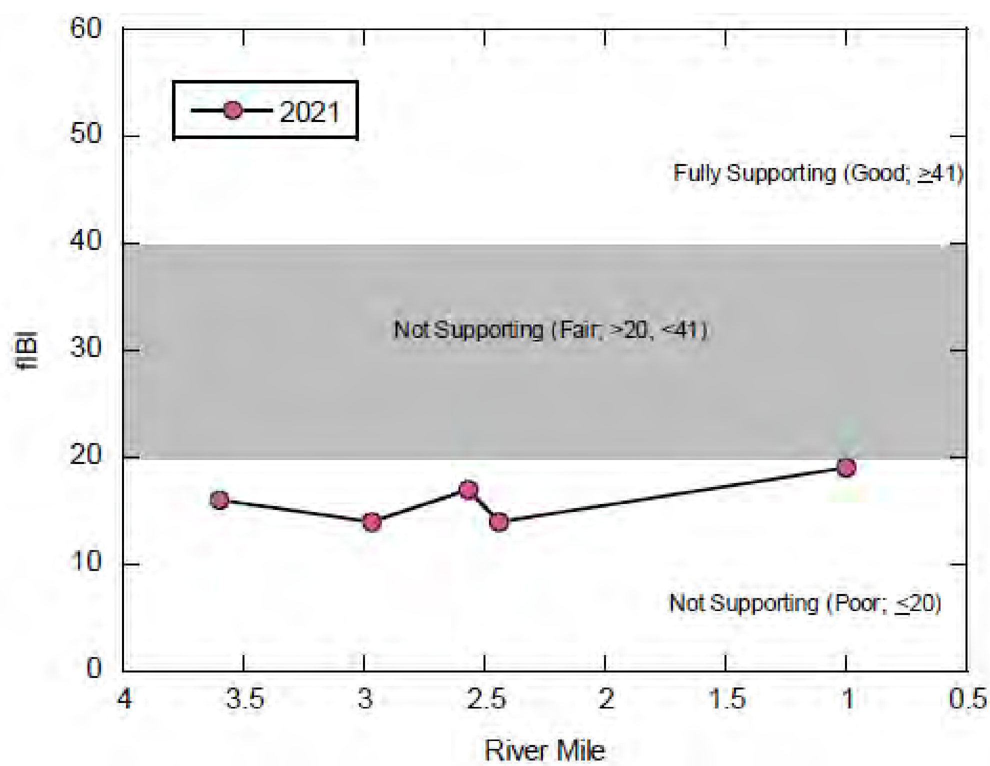


Figure 12. Pre-project fIBI Scores at the Klein Creek Section 1 Stream Bank Stabilization Project in 2021



Map 6. *Pre-Project Monitoring Sites at the Klein Creek Section 1 Stream Bank Stabilization Project*

1.7 Southern East Branch Stream Enhancement

- Special Conditions Listed Completion Date – December 2023
- Status – Final Design/Construction is in progress and is scheduled for completion in 2022-2023.

The Southern East Branch Stream Enhancement Project is located on the East Branch DuPage River between Royce Road and Weber Road in the Villages of Bolingbrook and Naperville, Will County, Illinois. The Project's objectives are to raise QHEI above its current score of 65, raise fIBI above its current score of 29.0, and raise mIBI above its current score of 38 throughout the length of the project. The DRSCW will be collaborating with the Forest Preserve District of Will County (FPDWC), the Villages of Bolingbrook and Naperville, and the Bolingbrook and Naperville Park Districts for this project (referred to collectively as the partners). The DRSCW has budgeted $2,500,000 for this project.

1.7.1. Site Description

The Southern East Branch Stream Enhancement Project is located on the East Branch DuPage in the Villages of Bolingbrook and Naperville, Will County, Illinois. The upstream limit of the project is Royce Road. The downstream limit is Weber Road. The majority of the project corridor is in public ownership including the Village of Bolingbrook, the FPDWC, Bolingbrook Park District, and Naperville Park District. Private landowners within the corridor include Vulcan Materials (leasing property from Elmhurst Quarry and Stone) and Independent Baptist Church. A ComEd easement is also present through the central portion of the project limits.

The project area is a low-gradient (0.04%) section of the East Branch DuPage River. The project area's geology is dominated by the advance and retreat of the glaciers responsible for forming the Great Lakes during the Wisconsin Glaciation.

The modern East Branch DuPage River lies within an alluvial valley incised through a series of glacial end moraines. In many areas, the river has been channelized and limestone quarries encroach on the channel. In less impacted areas, the valley is less confined and broader. Effluent from wastewater treatment plants contributes to baseflow, and watershed urbanization leads to flashy flows following rain events. The river has a low gradient, steep banks, and exhibits a relatively stable planform. Urbanization and climate change have contributed to channel widening. The floodplain and near bank vegetation communities are dominated by reed canary grass and spotted smartweed.

1.7.2. Design Characteristics

The DRSCW has contracted with the team of Inter-Fluve and AECOM to lead the design and preparation of contract bid documents for the Southern East Branch Stream Enhancement Project. The primary goals of the Project are to increase fish biodiversity and improve physical habitat in the East Branch DuPage River. These goals will be met by implementing naturalized stream restoration practices such as re-meandering, engineered large wood structures, and aquatic and riparian habitat enhancements that will help restore geomorphic processes and create habitat complexity.

The Project will support continued and enhanced recreational enjoyment of the East Branch DuPage River corridor and will be designed to minimize impacts to surrounding infrastructure and private property.

Specific project objectives were identified by the partners during a conceptual design charrette on November 9, 2021. They are:

- Improve fish and macroinvertebrate population size and diversity
- Improve instream, riparian, and floodplain habitat to fair/good quality standards, as measured by QHEI and IBI scores
- Improve floodplain and riparian vegetation quality, reduce invasive species presence, and restore wetlands
- Increase recreational value within the river corridor
- Reduce bank erosion and provide widespread bank stability
- Provide a regional example of a healthy stream and riparian area

The partners also communicated that the project should be permittable, should limit maintenance to practical levels, and be constructible within identified budgets.

Based on the identified project objectives, Inter-Fluve developed the following design criteria:

- Increase the amount of in-stream cover and habitat complexity using large wood and
- boulder elements
- Restore naturalized river processes to channelized portions of river through targeted remeandering of the river
- Improve the quality and increase the abundance of pool habitat and riffles
- Re-establish diverse assemblages of native plants in riparian and floodplain areas for
- regionally appropriate vegetative communities
- Increase the number of access points for paddlers.

1.7.3. Permitting Requirements

Permit coordination for the Project has not yet started. At a minimum, it is anticipated coordination with the following agencies will be required:

- US Army Corps of Engineers (US ACOE)
- United States Fish and Wildlife Service
- Illinois Department of Natural Resources (IDNR)
- Illinois Environmental Protection Agency (IEPA)
- Will County Stormwater Commission

- Will-Cook Soil and Water Conservation District

1.7.4. Design Progress Report

Inter-Fluve has prepared the "Lower East Branch River Stream Restoration Project, DuPage & Will Counties, IL Conceptual Design Report" (Lower East Branch Concept Design Report) (Attachment 4). The Lower East Branch Concept Design Report includes the East Branch DuPage River from Hobson Road in Woodridge, Illinois (DuPage County) downstream to Weber Road in Naperville, Illinois (Will County) and has divided the East Branch DuPage River into four (4) reaches:

- Reach 1 – Hobson Road to Royce Road (Reach 1 is outside the limits of the Lower East Branch Stream Enhancement Project and was included in the Lower East Branch Concept Design Report for planning purposes only).
- Reach 2 and 3 – Royce Road to Whalon Lake
- Reach 4 – Whalon Lake to Weber Road

The Lower East Branch Concept Design Report (Attachment 4) includes a detailed summary of the Project Area including landscape context, hydrology, historical conditions, topographic/bathymetry survey, and geomorphic assessment.
The preliminary designs for Reaches 1 through 4 included in the Lower East Branch Concept Design Report are intended to provide an overview of potential restoration work that could be implemented to meet the objectives set forth by the project partners and described in Section 1.7.2. As stated above, Reach 1 (Hobson Road to Royce Road) designs will not be advanced to final design in the near-term. The concepts prepared for Reaches 2, 3, and 4 have been developed to meet the project's objectives and design criteria with the understanding that the work advanced to final design may be a subset of the work depicted in the conceptual design drawings. Two alternatives have been developed for Reach 3: one including a generous application of large wood to maximize ecological enhancement and another with reduced wood inclusion to fit a reduced budget. Cost estimates were also prepared.

A summary of the design elements proposed for Reaches 2-3 is included below. Details on the design elements, cost estimates, and illustrations of the concept plans are included as part of the Lower East Branch Concept Design Plan in (Attachment 4).

<u>Channel Construction</u>

Re-meandering in Reach 3 is intended to restore more natural river processes to what is currently a channelized, entrenched reach. The proposed planform in Reach 3 is intended to maintain critical hydraulic connections to Whalon Lake, provide sediment transport continuity and geomorphic stability, and maximize habitat improvements in the reach.

Large Wood

Large wood structures (LWS) have been included in the conceptual designs throughout the project area within the river channel, on banks, and on floodplain surfaces. Four (4) main applications of LWS are included throughout the project area: Large Wood Crib Structures, Bank LWS, Apex of Mid-channel LWS, and Floodplain/Wetland LWS.

Habitat Features

Constructed habitat features directly provide specific habitat types for specific species. Terrestrial features may include bird and bat nesting boxes or perching areas, snake hibernacula and herptile habitats, or turtle nesting areas and basking logs. Specifically, a heron and/or egret rookery is included in the conceptual designs.

Plantings

The vegetation communities included in the project's design will be appropriately matched to the site's hydrologic, climatic, and soil conditions, and be designed to provide maximum habitat benefits over the long term.

Next steps for the Project include refinement of the conceptual designs for Reaches 2-4 to meet the existing Project budget. The Project will them move into final design, permitting, and the preparation of contract bid documents. It is expected construction will begin in 2023.

1.7.5. Project Impact Evaluation

The DRSCW and MBI developed a monitoring plan to assess the pre- project conditions at the Southern East Branch Stream Enhancement Project. Pre-project biological and habitat data was collected at six (6) sites (EB33, EB43, EB35, EB34, EB39, and EB38) that have been included in previous watershed surveys conducted as part of the bioassessment program in 2008, 2011, 2014, and 2019. In 2019, one (1) additional site (EB47) was added to the bioassessment sites so that additional biological and habitat data could be collected from within the project corridor for a total of eight (8) pre-project sampling sites. Furthermore in 2021, three (3) additional pre-project sites (EB44, EB45, and EB46) were added for a total of eleven (11) pre-project sampling sites. EB40 is a bioassessment site that is located downstream of the proposed project limits and was sampled in 2014, 2019, and 2021 to serve as a control site. Table 10 includes the results of the pre-project 2014, 2019, and 2021 surveys collected by the DRSCW. Figure 13-15 depict the pre-project QHEI (Figure 13); mIBI scores (Figure 14); and fIBI scores (Figure 15). Map 7 depicts the pre-project monitoring sites at the Southern East Branch Stream Enhancement Project.

Table 10. *Pre-Project Biological and Habitat Data Collected at the East Branch Stream Enhancement Project in 2014, 2019, and 2021*

Site ID	River Mile	Drainage Area (sq. mi.)	fIBI	MIwb	mIBI	QHEI	Attain-ment Status
East Branch DuPage River - 2021							
EB40	7.60	63.0	26*	7.3	37.6*	68.8	Non-Fair
EB33	7.00	64.0	24*	5.5	47.1	72.0	Partial
EB43	6.60	64.0	30*	6.8	45.9	76.5	Partial
EB47	6.35	71.7	24*	7.6	41.7*	59.0	Partial
EB35	6.00	72.4	22*	7.2	39.8*	57.0	Non-Fair
EB46	5.67	73.3	32*	7.3	36.6*	64.3	Non-Fair
EB45	5.40	73.5	28*	5.8	36.1*	70.0	Non-Fair
EB34	5.00	78.0	28*	7.8	28.1*	72.5	Non-Fair
EB39	4.00	78.0	30*	7.3	39.7*	57.0	Non-Fair
EB44	3.66	79.0	30*	7.9	36.5*	58.5	Non-Fair
EB38	3.00	81.0	34*	7.5	49.2	75.5	Partial
East Branch DuPage River - 2019							
EB40	7.60	63.0	<u>18</u>*	3.9	27.9*	62.5	Non-Poor
EB33	7.00	64.0	23*	6.6	31.2*	69.0	Non-Fair
EB43	6.60	64.0	24*	5.6	-	72.0	Non-Fair
EB43A	6.30	71.7	21*	4.7	-	64.0	Non-Fair
EB35	6.00	72.4	26*	8.7	40.4*	52.8	Non-Fair
EB34	5.00	78.0	23*	9	40.4*	67.3	Non-Fair
EB39	4.00	78.0	23*	7.5	42.0	50.5	Non-Fair
EB38	3.00	81.0	30*	8.7	40.8*	77.0	Non-Fair
East Branch DuPage River - 2014							
EB40	7.60	63.0	29*	5.19	31.6*	62.0	Non-Fair
EB33	7.00	64.0	36*	7.31	21.9*	66.0	Non-Fair
EB43	6.60	64.0	34*	6.93	33.0*	61.5	Non-Fair
EB35	6.00	72.4	25*	6.44	34.9*	50.0	Non-Fair
EB34	5.00	78.0	25*	7.32	36.0*	65.0	Non-Fair
EB39	4.00	78.0	28*	6.36	32.2*	58.8	Non-Fair
EB38	3.00	81.0	32*	7.56	31.5*	68.0	Non-Fair

See Tables 4 and 5 for the color key to IBI and QHEI scores.

Figure 13. Pre-project QHEI Scores at the Southern East Branch Stream Enhancement Project in 2014, 2019 and 2021

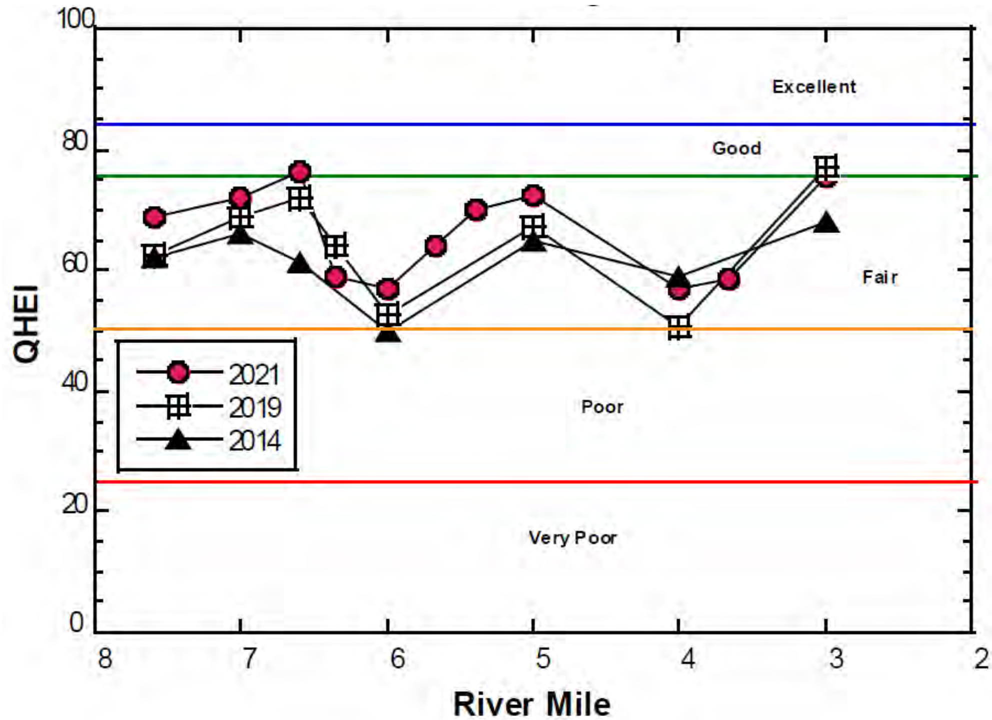


Figure 14. Pre-project mIBI Scores at the Southern East Branch Stream Enhancement Project in 2014, 2019, and 2021

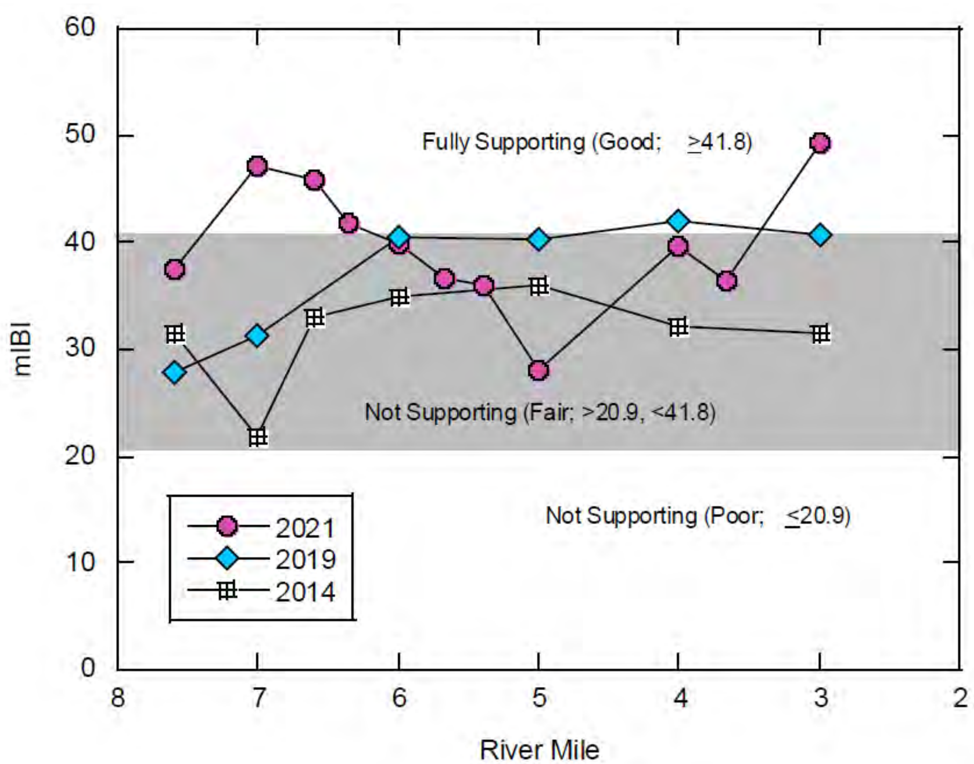
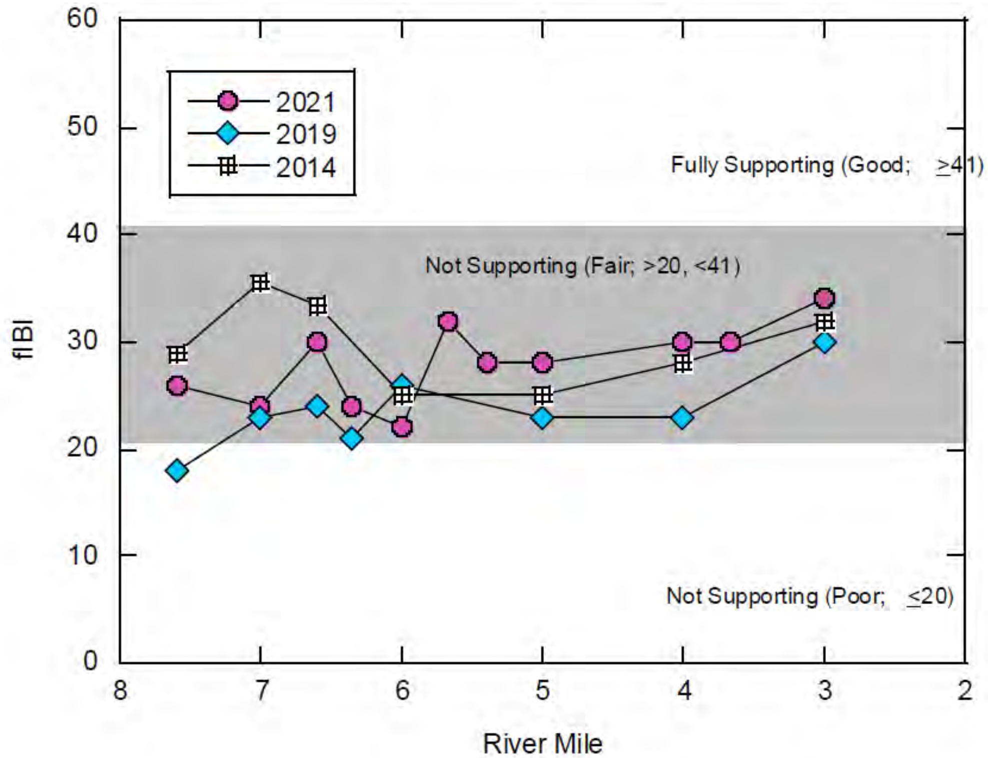


***Figure 15**. Pre-project fIBI Scores at the Southern East Branch Stream Enhancement Project in 2014, 2019, and 2021*



***Map 7.** Pre-Project Monitoring Sites at the Southern East Branch Stream Enhancement Project*

1.8 Hammel Woods Dam Modification

- Special Conditions Listed Completion Date – December 2023
- Status – Complete. The Hammel Woods dam was removed in Summer 2021 and the Project is complete. Post-project monitoring is on-going. Year 1 of post-project monitoring was completed in 2021. Year 2 and Year 3 of post-project monitoring are scheduled for 2022 and 2023, respectively.

The Hammel Woods dam was located on the Lower DuPage River within the Hammel Woods Forest Preserve, Shorewood, Will County, Illinois. The objective of the Project was to increase fIBI at sites located upstream of the dam. Fish sampling conducted both upstream and downstream of the dam in 2012-2018 indicated that the Hammel Wood dam blocked eight species including Central Mudminnow, Grass Pickerel, Mimic Shiner, Yellow Bass, Northern Sunfish, Slenderhead Darter, Pumpkinseed Sunfish, and Log Perch, from accessing the DuPage River watershed upstream of the dam. The LDRWC collaborated with the Forest Preserve District of DuPage County on the Hammel Woods Dam Modification Project. The LDRWC spent $611,270.76 on the project design and construction and has $15,000 budgeted for post-project monitoring.

1.8.1. Site Description

The 2017 Annual Report provided a site description.

1.8.2. Design Characteristics

The 2017 Annual Report provided the Project's design characteristics.

1.8.3. Permitting Requirements

The 2020 Annual Report includes details on the Project's permitting requirements.

1.8.4. Project Implementation

The Forest Preserve District of Will County oversaw construction related to the dam removal and restoration. A coffer dam system was used to dewater half of the dam at a time so that deconstruction of the structure could be completed in the dry. Installation of the coffer dam was started in late July 2021. Photo documentation of the structure was completed for the Historic American Engineering Report and dismantling of the dam was started on August 3, 2021. The dam structure was taken down to the bed level with the base left in place to provide grade control. The coffer dam was re-erected on the west side of the river to complete the removal process and placement of boulders array and toe stone. The project was completed by the end of August 2021.

The Forest Preserve District of Will County created two videos about the project that are posted on their YouTube Channel: https://www.youtube.com/watch?v=fInru25itgw&t=412s and https://www.youtube.com/watch?v=9ELAFKVxpEw Combined, the two videos have had almost 3,000 views. This was a great way to share information with the public about this project.

Plate 1. *Installation of Coffer Dam Structure (Photo Credit: FPDWC)*

Plate 2. *Dewatered East Side of River Before Removal of Structure (Photo Credit: FPDWC)*

Plate 3. *Removal of Hammel Woods Dam Structure*

Plate 4. *Free-flowing DuPage River, Looking Upstream; Toe Rock and Boulder Array along West Side*

1.8.5. Project Impact Evaluation

The LDRWC and Midwest Biodiversity Institute (MBI) developed a monitoring plan to assess the removal of the Hammel Woods dam. Fish and habitat pre- and post-project monitoring were completed at four (4) sites in 2019 and 2021. Three (3) of the sites (LD07, LD36, and LD36A) are located upstream of the Hammel Woods dam location with LD36 and LD36A located within the former impoundment behind the dam. An additional site (LD06) located downstream of the dam was also monitored as part of the pre- and post-project monitoring. Historical biological (fish and macroinvertebrates) and habitat data is also available for LD06 and LD07 as these sites are included in the bioassessment program and were sampled in 2012, 2015, and 2018. The downstream site (LD07) serves as a control site that is typical of Lower DuPage River water quality and habitat and as representative of pre-restoration water quality conditions. Table 11 is a summary of pre- and post- project biological and habitat data collected at the Hammel Woods Dam Removal Project in 2012, 2015, 2018, 2019, and 2021. Figure 16-18 depict the pre-project QHEI (Figure 16); mIBI scores (Figure 17); and fIBI scores (Figure 18) for the Hammel Woods Dam Removal Project in 2015, 2018, 2019, and 2021. A map of sampling locations is included in Map 8.

Post project QHEI increased upstream of the former dam, from an average of 75.7 to an average 88.0 and all sites of upstream of the former dam location are now considered to have excellent habitat. Average fIBI scores upstream of the former dam location remained stable at 38, however, one (1) of the upstream sites (LD36) located in the dam's former impoundment is now meeting its designated aquatic life use for fish (fIBI ≥41). Monitoring will resume in 2022.

Table 11. *Pre- and Post-Project Biological and Habitat Data collected at the Hammel Woods Dam Removal Project in 2012, 2015, 2018, 2019, and 2021*

Site ID	River Mile	Drainage Area (sq mi.)	fIBI	MIwb	mIBI	QHEI	Attain-ment Status
DuPage River 2021							
LD07	11.4	321.0	37	9.05	47.6	88.8	Partial
LD36A	11.25	323.0	36*	8.70	-	84.8	Partial
LD36	10.93	323.0	41	9.60	-	90.3	Full*
LD06	9.6	323.2	41	8.55	46.7	80	Full
DuPage River 2019							
LD07	11.4	321.0	37	9.20	46.2	75.75	Partial
LD36A	11.25	323.0	39	8.90	-	76	Non*
LD36	10.93	323.0	38	8.60	-	75.5	Non*
LD06	9.6	323.2	40	9.10	47.5	74.5	Partial
DuPage River 2018							
LD07	11.4	321.0	39.5	8.70	54.8	78	Partial
LD36A	11.25	323.0	-	-	-	-	-
LD36	10.93	323.0	-	-	-	-	-
LD06	9.6	323.2	43.5	9.10	64.9	73.5	Full
DuPage River 2015							
LD07	11.4	321.0	36*	6.95	44.6	74	Partial
LD36A	11.25	323.0	-	-	-	-	-
LD36	10.93	323.0	-	-	-	-	-
LD06	9.6	323.2	39.5	8.85	47.3	83.5	Partial
DuPage River 2012							
LD07	11.4	321.0	32.5*	7.65	46.7	75	Partial
LD36A	11.25	323.0	-	-	-	-	-
LD36	10.93	323.0	-	-	-	-	-
LD06	9.6	323.2	40.5	8.25	54.2	76	Partial

See Tables 4 and 5 for the color key to IBI and QHEI scores.

Figure 16. Pre- and Post-Project QHEI Scores at the Hammel Woods Dam Removal Project in 2015, 2018, 2019, and 2021

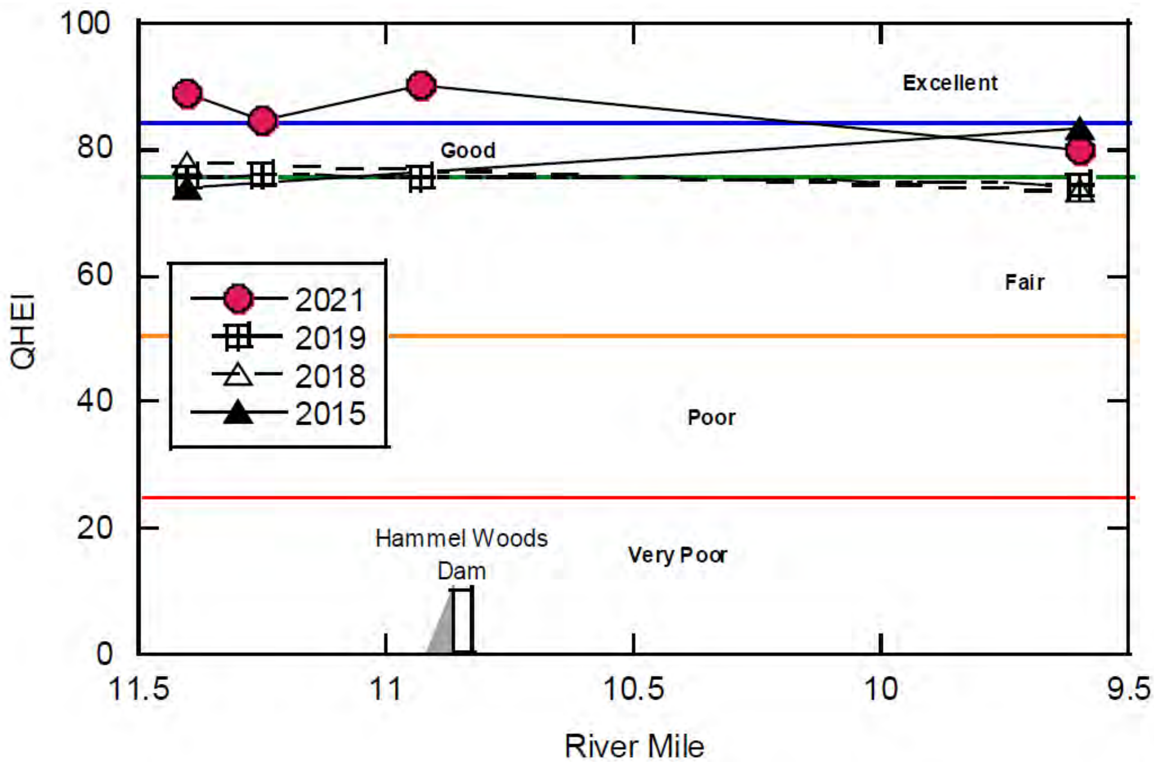


Figure 17. Pre- and Post-Project mIBI Scores at the Hammel Woods Dam Removal Project in 2015, 2018, 2019, and 2021

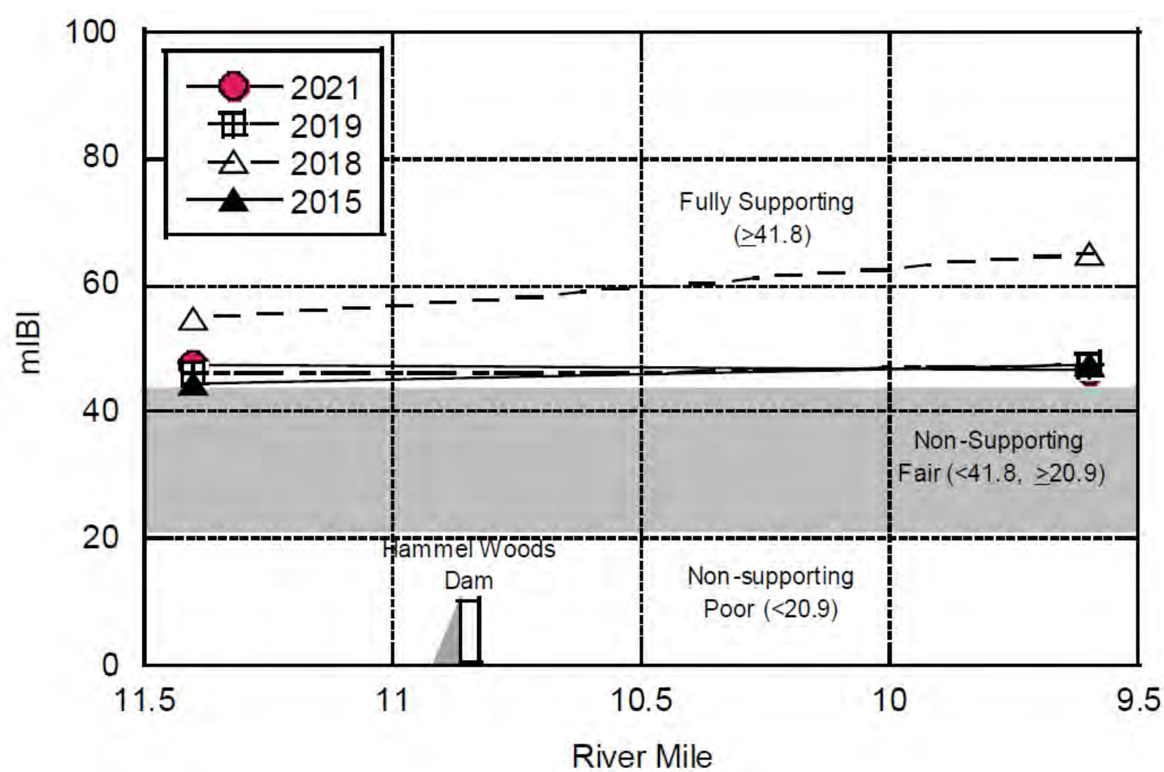
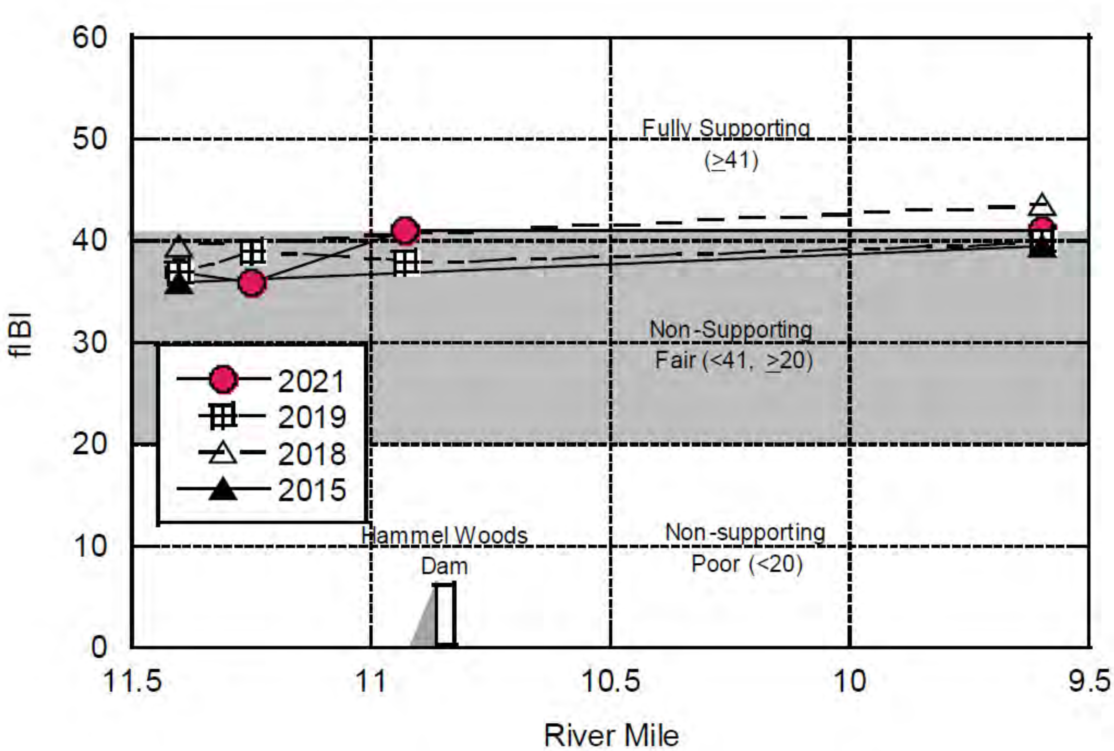


Figure 18. *Pre- and Post-Project fIBI Scores at the Hammel Woods Dam Removal Project in 2015, 2018, 2019, and 2021*



Map 8. *Pre- and Post-Project Monitoring Sites at the Hammel Woods Dam Removal Project*

1.9 DuPage River Stream Enhancement

- Special Conditions Listed Completion Date – December 2023
- Status – Final Design and Preparation of Contract Bid Documents is on-going. Construction is expected to begin in Winter 2023.

The Lower DuPage River Stream Restoration Project is located on the mainstem of the DuPage River between Route 126 and Renwick Road, Village of Plainfield, Will County, Illinois. The objectives of the Project are to raise QHEI, fIBI and mIBI scores in Lower DuPage River. The LDRWC budgeted $2,740,000.00 for the Project.

1.9.1. Site Description

The Lower DuPage River Stream Restoration Project is located on the mainstem of the DuPage River between Lockport Street and Renwick Road, Village of Plainfield, Will County, Illinois. This segment is listed at partial support of aquatic life, with a current fish IBI of 34.5. The IPS Model identifies QHEI channel characteristics and dissolved oxygen (min/max/swing) along with nutrient issues as causes of impairment. The objectives of the Project are to raise QHEI above its current score, that ranges from 73.5 at the downstream end of the project to 64.5 at the upstream end, and to raise fIBI and mIBI scores in Lower DuPage River. Flow through this section is very uniform and lacks well developed riffle sequences. There is moderate streambank erosion and widening of the stream that has resulted in disconnection from its floodplain. The wide, even flow supports extensive macrophyte beds that likely influence dissolved oxygen fluctuations. These conditions are representative of this center section of the Lower DuPage River. This site was selected particularly because of the access to public land adjacent to the river, providing space to incorporate riparian wetlands in addition to instream habitat restoration and shoreline stabilization. Project partners will include both the Village of Plainfield and the Plainfield Township Park District. The LDWRC budgeted $2,740,000.00 for the Project.

1.9.2. Design Characteristics

Preliminary concept plans for the Project have not yet been developed.

1.9.3. Permitting Requirements

Permit coordination for the Project has not yet started. At a minimum, it is anticipated coordination with the following agencies will be required:

- US Army Corps of Engineers (US ACOE)
- United States Fish and Wildlife Service
- Illinois Department of Natural Resources (IDNR)
- Illinois Environmental Protection Agency (IEPA)
- Will County Stormwater Commission
- Will-Cook Soil and Water Conservation District

1.9.4. Design Progress Report

In late 2021, the LDWRC initiated a qualifications-based selection process to select a consultant to assist with the final design and preparation of contract bid documents for the Lower DuPage River Stream Restoration Project. In mid-January 2022, the LDRWC entered into a contract with Hey and Associates, Inc. for the final design engineering and preparation of contract bid documents for the Lower DuPage River Stream Restoration Project. The scope of work included in this contract is discussed below. Preliminary work on the contract began in early 2022.

Task 1 – Site Survey

Task 1 includes a site survey of the proposed project area.

Task 2- Wetlands/Waters of the United States Assessment

Task 2 includes a site survey of the delineation wetlands and Waters of the United States and Will County jurisdictional wetlands. The preparation of a wetland/water boundary confirmation and jurisdictional determination is also included in this task.

Task 3 –Final Design Engineering

Task 3 includes the final design engineering of all project components, including but not limited to stream restoration practices and amenities as included in the Village of Plainfield's Riverfront Master Plan.

Task 4 – Hydraulic and Hydrologic Modeling

Task 4 includes the development of a hydrology/hydraulic model(s) necessary for design, permitting, and construction. Modeling will ensure that the design of the in-stream features meet the enhancement goals of the project, are sustainable for the long-term, and do not negatively impact downstream or upstream properties.

Task 5 – Procure Local, State, and Federal Permits for the Master Plan

Task 5 includes the preparation of all permit applications needed to procure all local, state and federal permits. At a minimum, it is anticipated coordination with the following agencies will be required:

- US Army Corps of Engineers (US ACOE)
- United States Fish and Wildlife Service
- Illinois Department of Natural Resources (IDNR)
- Illinois Environmental Protection Agency (IEPA)
- Will County Stormwater Commission
- Will-Cook Soil and Water Conservation District

Task 6 –Preparation of Cost Estimate and Contract Bid Documents

Task 6 includes the preparation of contract bid documents and cost estimates. Hey and Associates, Inc. will also provide Bid Assistance by addressing contractor questions during the public bid process.

Task 7 – Coordination Meetings

Task 7 includes six (6) meetings with Hey and Associates, Inc, LDRWC, and project stakeholders. These meetings will include: project kick off meeting, two (2) stream restoration design alternatives selection meeting, and design review meetings at 50%, 75% and 100% of completion.

1.9.5. Project Impact Evaluation

Bioassessment sites above and below this segment were sampled in 2018 and 2021 and will continue to be sampled as part of the long-term Bioassessment Program. Additional sampling will be conducted in 2022 within, above and below the project area to further document pre-project conditions as well as provide additional information to support design of project. Post project monitoring will be completed in 2024 and again in 2025 as part of the new bioassessment.

Chapter 2 Chloride Reduction Program

The Special Conditions Paragraph 3 requires NPDES holder participation in a watershed Chloride Reduction Program either directly or through the DRSCW and/or LDRWC. This section summarizes the DRSCW and LDRWC Chloride Reduction Program activities in 2021-2022.

2.1 Technical Workshops

In 2007, the DRSCW held its first deicing workshop to highlight new deicing methods, NPDES water quality goals, and best management practices in order to reduce chlorides and costs. In the following years, the DRSCW offered an additional workshop that targeted contractors responsible for snow and ice management of parking lots and sidewalks. Since 2007 the DRSCW has executed workshops every year targeting personnel responsible for 1) public roads and 2) parking lots and sidewalks. The programs have provided training and resources for numerous attendees at various agencies (Plate 5).

Plate 5. *Demonstrations of Equipment Calibration at DRSCW Chloride Management Workshops*

In 2020, due to precautions necessitated by the Coronavirus pandemic, the annual deicing workshops were held as webinars for the first time. Registration was made available to agencies in McHenry, Lake and Cooke counties as their usual deicing workshops were not being held (Plate 6).

In 2021 the decision was made to hold the deicing workshops as webinars again due to the reservations about gathering in larger numbers as well as the noted increase in attendance in the prior year. The workgroup staff for the DRSCW, LDRWC, Lower Des Plains Watershed Group (LDWG) collaborated with staff from Lake County DOT and Health Dept. to coordinate the workshops.

Registration was made available to agencies over a wide area of northeastern Illinois resulting in staff attending from DuPage, Will, Kane, Kendall, Lake, McHenry, Cook, Boone, Lee, and Winnebago counties.

Public Roads Deicing Workshops were held on September 30, October 5, and October 12, 2021. Fortin Consulting, Inc. from Minnesota was engaged to present the material. A registration fee was required per agency in order to view the webinar. The links were sharable so the webinars could be viewed individually or in groups. A survey was provided at the end of each webinar to those who had signed in asking for the number of attendees from each agency and for an evaluation of the webinar. The survey results indicated that a minimum of 743 persons attended the three Public Roads webinars. Certificates of attendance were provided to those who requested them. A link to the *Minnesota Snow and Ice Control: Field Book for Snowplow Operators* was provided to each registrant.

Plate 6. *Deicing Workshops Registration Form, 2021*

The Parking Lots and Sidewalks Deicing Workshop webinars were held on September 28 and October 7, 2021 with Fortin Consulting, Inc. presenting. The survey results indicated that there was a minimum of 196 persons who viewed the webinars. Certificates of attendance were provided to those who requested them. The surveys provided an opportunity to provide an evaluation on the webinars (Plate 7). A link was sent to each registrant for the *Minnesota Pollution Control Agency Winter Parking Lot & Sidewalk Maintenance Manual*.

Plate 7. *Feedback from the Public Roads Deicing Workshop Webinar Chat on October 12, 2021*

Michael Orr to everyone: 12:00 PM Thank you. Very informative. I am now more consciousness of my salt use. I am interested in a certificate.

Michael Brouillard to everyone: 12:04 PM Thank you, and Great job to all the speakers!!

Kueker to everyone: 12:01 PM I am interested in a certification as well. I learned alot!

In order to provide more targeted training, four additional workshops were held. DuPage County DOT hosted an in-person Calibration Workshop on Nov. 19, 2021. The demonstration was on a Force Am truck outfitted with a spreader system with digital controls and an open loop system. Calibration was shown for dry rock salt, wetted salt and liquids. Fourteen persons from eight agencies attended. The three other technical workshops which were presented virtually focused on more detailed information than presented in the general deicing workshops. The topics were More about Brine Making (13 agencies attended), Snow and Ice Removal Plans and Communication (14 agencies attended), and Using Organics (11 agencies attended). The recordings of the virtual technical workshops are posted on www.saltsmart.org.

Additionally, during this reporting period, the LDRWC shared seasonal outreach materials for members to use in residential outreach efforts (Plate 8). The materials were made available through their website www.dupagerivers.org/winter and through the Salt Smart Collaborative website at www.saltsmart.org. The LDRWC is one of the lead collaborators for SaltSmart.org. Materials included blog posts, newsletter articles, supporting social media graphics, posters/handouts, plastic cups for spreading salt correctly and a bookmark with information for residents. A winter checklist was also included to assist communities in tracking the use of outreach materials for MS4 reporting. Both websites also advertise the winter deicing workshops.

Plate 8. *Outreach Poster/Handout on Winter Safety, 2021*

2.2 Tracking BMP Adoption

2.2.1. Chloride Questionnaire

The DRSCW has attempted to track adoption of sensible salting BMPs in the program area since 2007. Monitoring ambient chloride concentrations has proven an imperfect metric for tracking efficiency trends in winter salt use. Tracking target BMP adoption in the program area provides opportunities to evaluate the impacts of the chloride management workshops, identify material for future workshops, and form suppositions about salt use per unit of service expended inside the program area relative to 2006 levels.

In 2007, 2010, 2012, 2014, 2016, and 2018 the DRSCW distributed a questionnaire to approximately 80 municipal highway operations and public works agencies to obtain information about deicing practices throughout the program area. Findings of the 2018 questionnaire were include in the 2018 Annual Report. A new questionnaire was due to be distributed in 2021 but was withheld as agencies were already involved in completing the leaf litter questionnaire (See Chapter 3 Section 3.3.3 for more details on the leaf litter questionnaire). The questionnaire is being prepared for release at the end of March 2022 and the results will be supplied in the 2022 Annual Report.

2.2.2. Ambient Impact Monitoring

DRSCW's Chloride Education and Reduction Program is performing an analysis to demonstrate any observable reduction in chloride loading within the water quality data collected since the beginning of program efforts. For over a decade, the program has been implementing a number of chloride reduction efforts, including:

- Annual Educational workshops (for public roads and parking lots/sidewalks)
- Equipment calibration training
- Product and chemical alternative summaries
- Equipment and salt application advancements
- Salt usage, storage and deicing best management practices
- Example salt use policies and management plans

The goal of the analysis is to observe the impact, if any, of the chloride education program on chloride loadings generated from DRSCW water quality data collected from 2009 to present. While the winter concentration data graphed in section 2.2 suggests a long-term downward trend in winter concentrations, this analysis is an attempt to produce a more comprehensive appraisal of long term trends in chlorides in area waterways.

The analysis is challenging. There are number of factors that dictate the magnitude of chloride impact on water quality data. Principally variability in winter weather accounted for variation in temperatures (air and pavement), types of precipitation (rain, snow and ice), the number of storms, types of storms and inconsistencies in the definition of municipal salt application events across the DRSCW's watershed areas. The analysis needed to account for this inherent variability to as great a degree as possible. To help accomplish this the DRSCW purchased 10 years of weather data (snow and ice precipitation data for numerous locations and max and minimum air temperature data) from Weather Command / Murray and Trettel, Inc. The analysis steps for each site where winter monitoring is conducted (see Section 2.3) include:

- Calculation of estimated chloride concentration from winter conductivity data
- Calculation of a warm weather regression value from summer concentration data and summer conductivity measures
- Calculation of estimated chloride summer concentrations
- Creation of loading data (in pound per day) from the estimated concentration data using USGS flow data

- Identification of ice events from the weather command data and “replacement” of such events with loadings observed under snow events with the same accumulation
- Graphing of loading and concentration data for each site

This analysis has been completed and phase one results have been produced. Preparation of the final report is on-going and is expected to be completed by mid-2022.

2.3 Continuous Chloride Monitoring

When chlorides are present in elevated concentrations in rivers, they harm aquatic invertebrates, fish, and aquatic and terrestrial plants. High chloride concentrations also corrode structures like bridges, increasing maintenance costs; and chlorides are very difficult to remove from water through treatment. In the DRSCW and LDRWC watersheds, the main source of chlorides in the rivers is from winter deicing applications. In an effort to understand and reduce chloride levels in the watershed, year-round conductivity monitoring is carried out.

Ambient monitoring of conductivity is carried out at six (6) locations in the DRSCW program area (5 sites monitored by the DRSCW and 12 sites monitored by MWRD), and one (1) site in the LDWRC program area (monitored by the LDRWC). DRSCW chloride sites are positioned upstream and downstream in their watersheds to capture total loadings within the watershed. The LDRWC site is located near the confluence of the Lower DuPage and the Des Plaines. Long term data collection allows the DRSCW and LDRWC to monitor changes in chloride concentrations over time. As the main driver of chloride in these watersheds is from deicing applications in the winter, the DRSCW and LDRWC are able to monitor the efficacy of outreach campaigns and projects aimed at reducing chloride in the waterways. Year round monitoring shows how chloride levels change throughout the year. Chloride concentrations spike in the winter months, and gradually decrease throughout the spring, summer and fall. The greatest challenge in chloride reduction is maintaining road safety.

The upstream Salt Creek chloride site (Busse Woods) is at the upstream most point of the Lower Salt Creek watershed. The site isn’t placed further upstream as there are no treatment plants in the Upper Salt Creek watershed. In 2021, MWRD did not conduct ambient winter conductivity monitoring at the Salt Creek at Busse Woods Main Dam (Upstream Salt Creek Site). As of Winter, 2022 DRSCW has taken over management of the site at Salt Creek Busse Woods Main Dam.

In the LDRWC watershed, conductivity data was only recently collected as of last year (Fall 2020 to Winter 2021) at Channahon. To date, a conductivity to chloride relationship has not been established. As such, raw conductivity data is presented in Figure 19. Additionally, surface icing on the Lower DuPage River prevented data collection for a substantial amount of the winter.

For the sites located within the DRSCW watersheds, conductivity concentrations are used to calculate chloride concentrations based on a linear relationship established by the DRSCW in 2007 and 2019. Calculated Annual chloride concentrations for the winter months from 2007-2021 for six (6) sites are depicted in Figures 20-25. Years are broken up by continuous winter season, e.g. the point labeled as “2021” is comprised of data from Fall 2020 to Spring 2021. The Daily Max represents the highest chloride daily value calculated from that year’s winter season. The Winter Average is the average of all measurements from the winter season. The Four-Day Average is the maximum value of the year’s four-day averages.

Figure 19. *Daily Conductivity Concentration - Winter Months (2020-2021) for the Lower DuPage River at Shorewood*

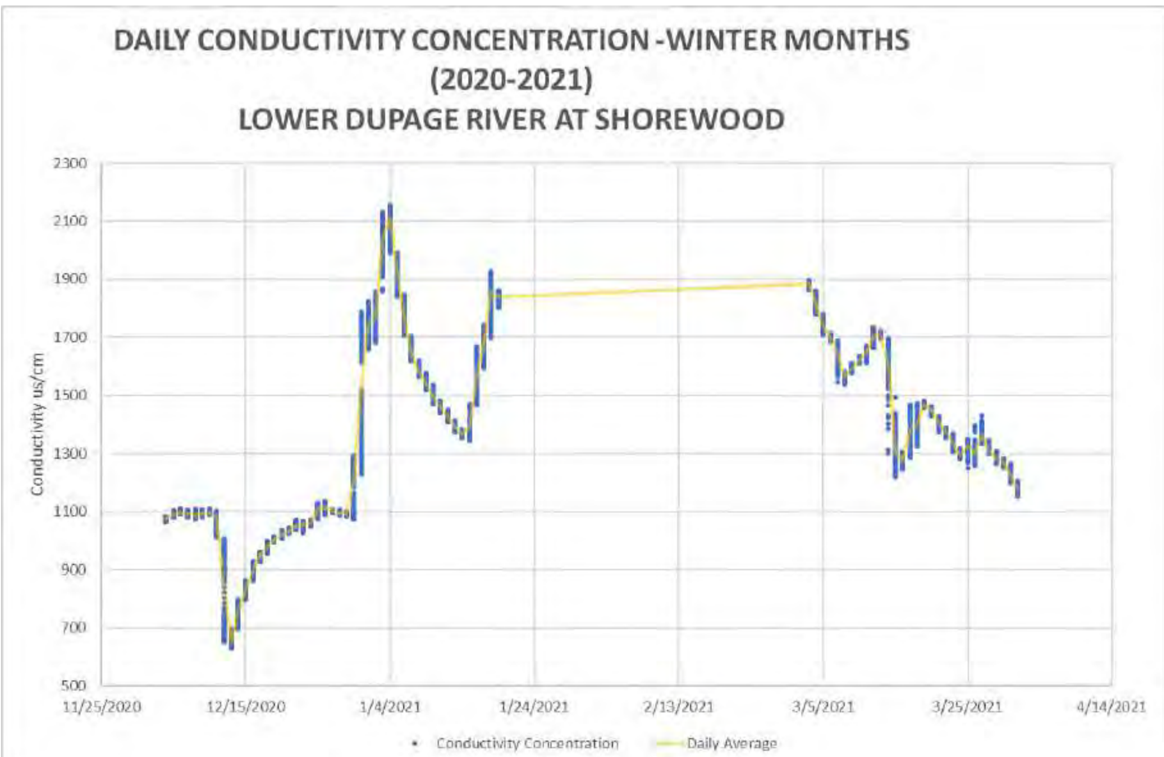


Figure 20. Calculated Concentrations - Winter Months (2007-2020) for Salt Creek at Busse Woods Main Dam. Data was not collected in 2021.

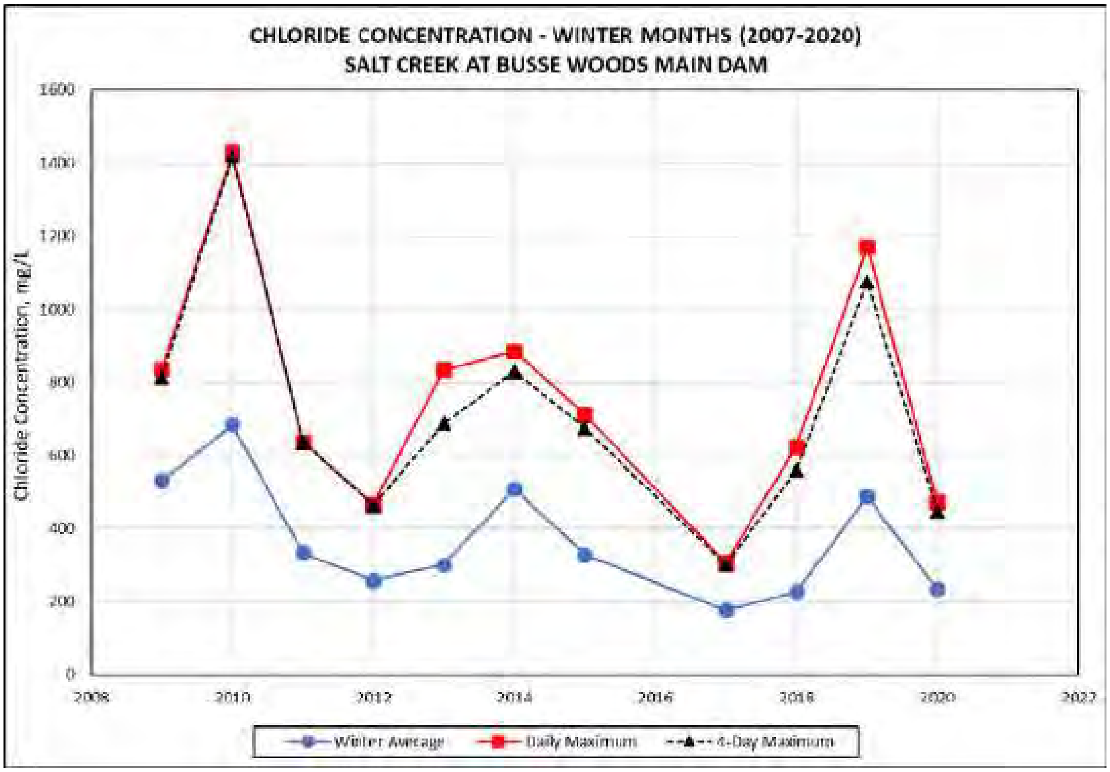


Figure 21. Calculated Chloride Concentrations - Winter Months (2007-2021) for Salt Creek at Wolf Road

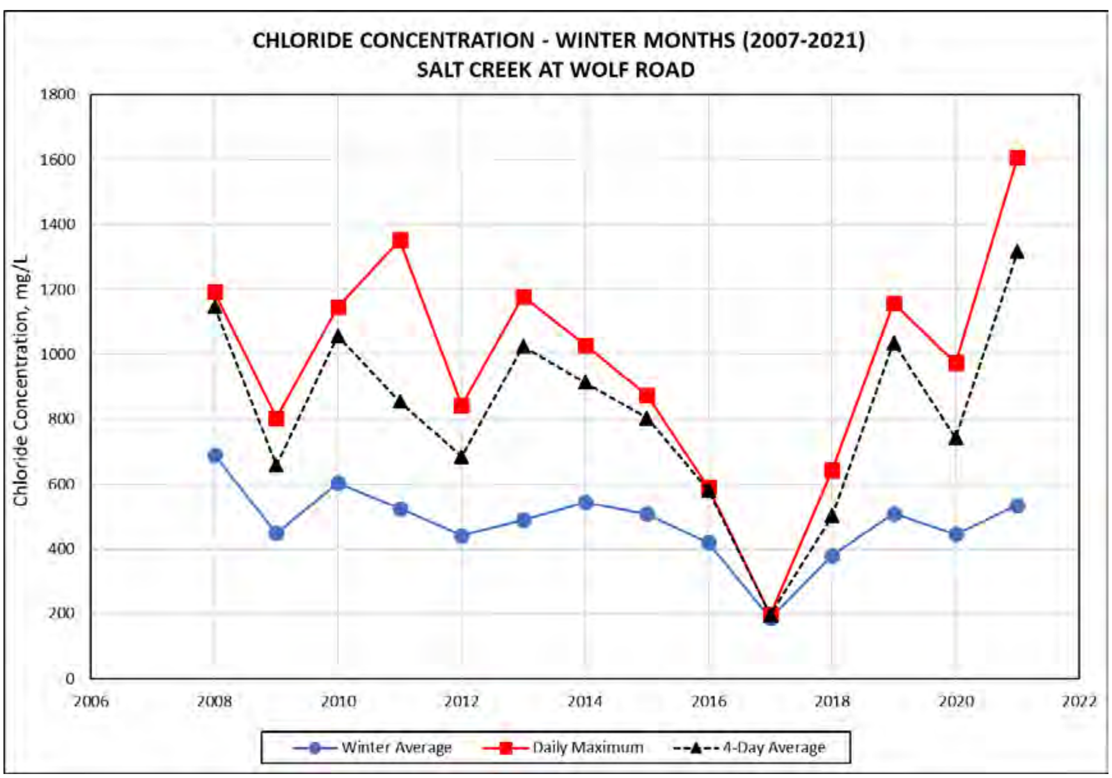


__Figure 22.__ Calculated Chloride Concentrations - Winter Months (2007-2021) for the East Branch DuPage River at Army Trail Road

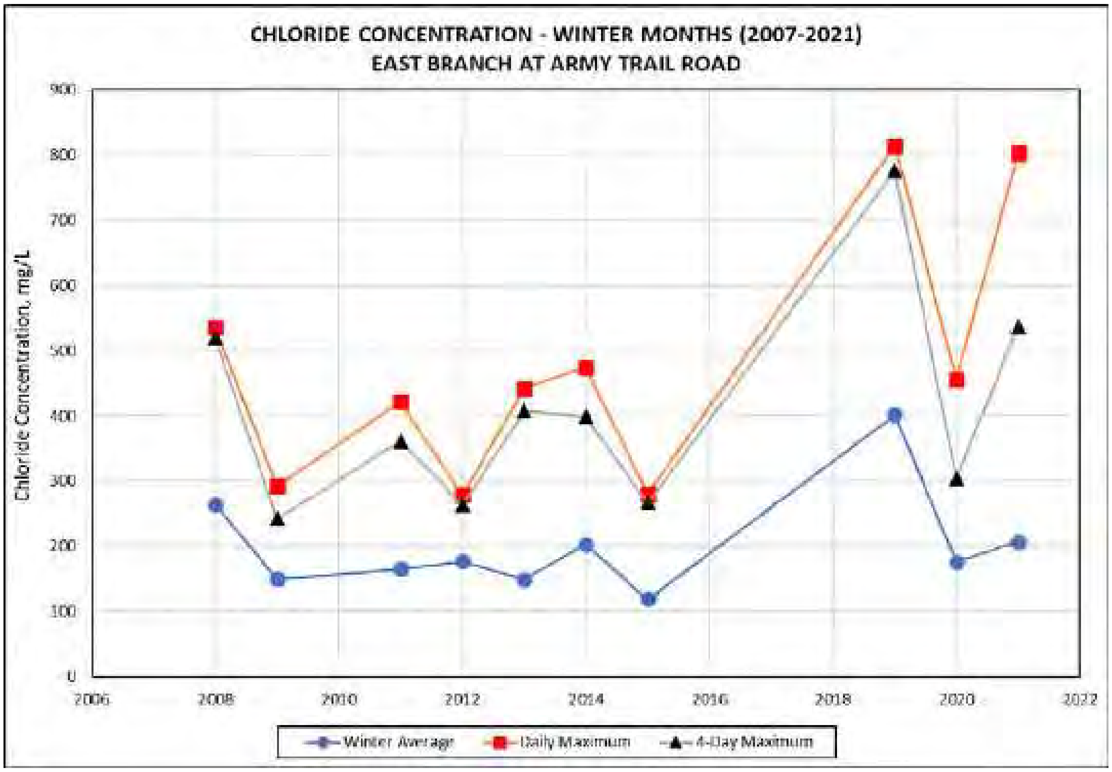


__Figure 23.__ Calculated Chloride Concentrations - Winter Months (2008-2021) for the East Branch DuPage River at Hobson Road

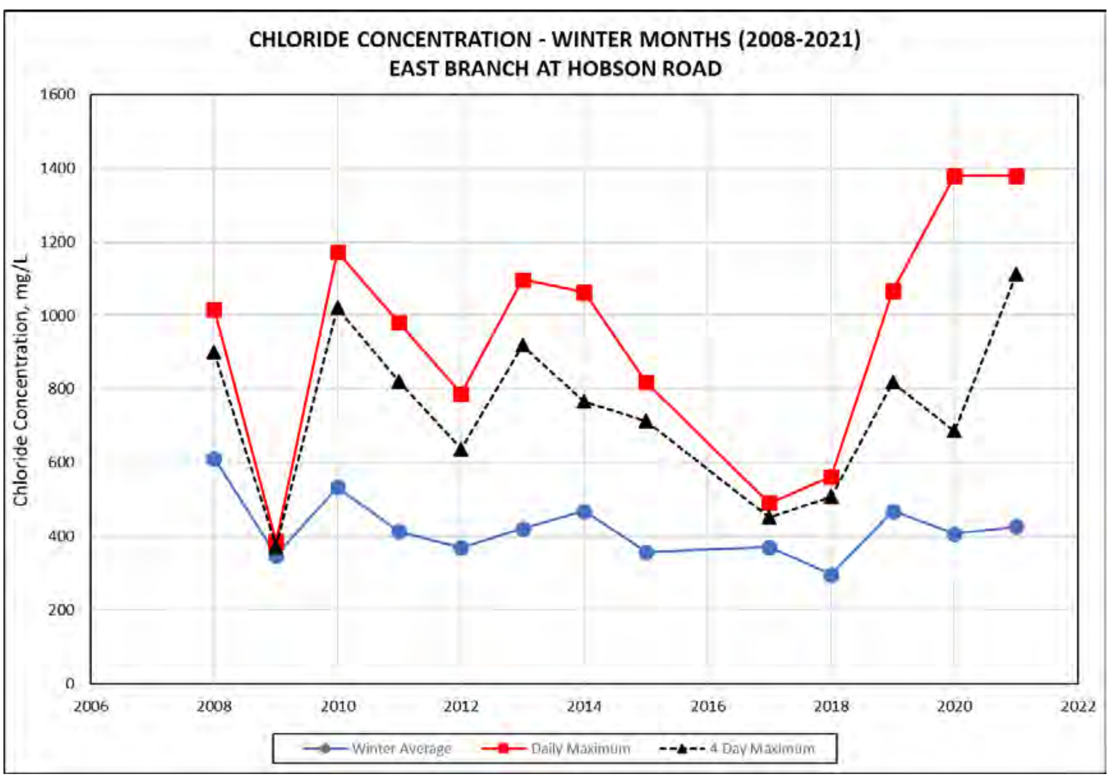


Figure 24. Calculated Chloride Concentrations - Winter Months (2007-2021) for the West Branch DuPage River at Arlington Drive

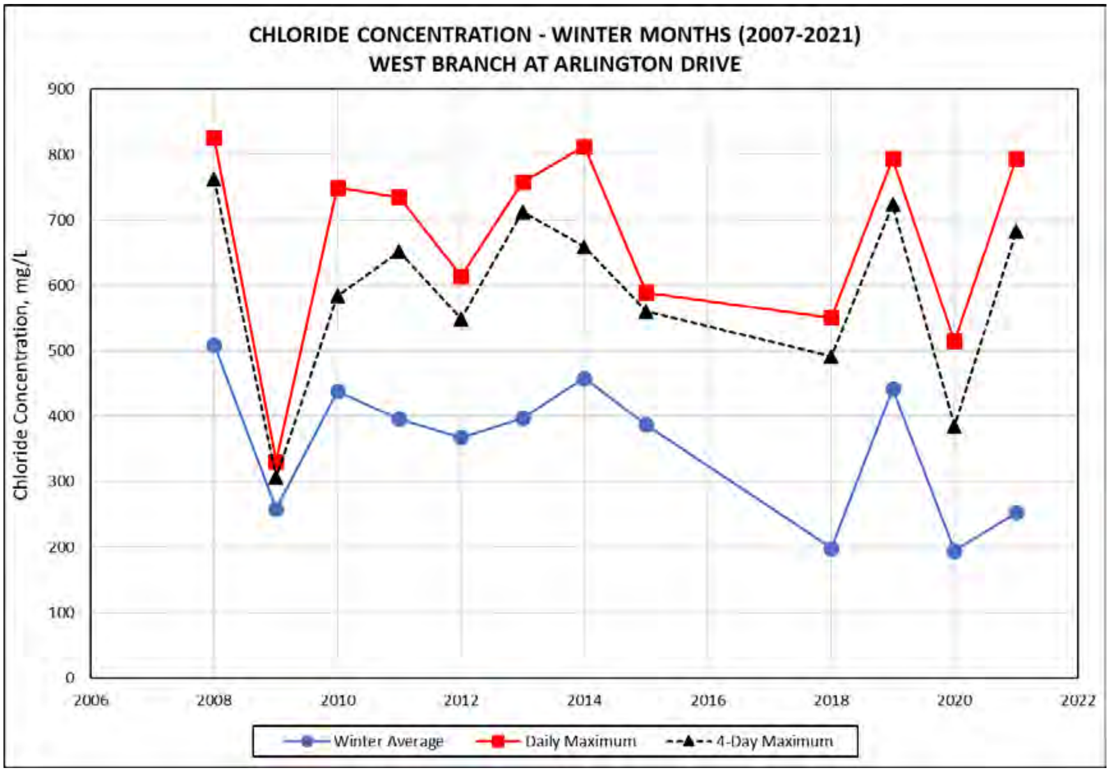
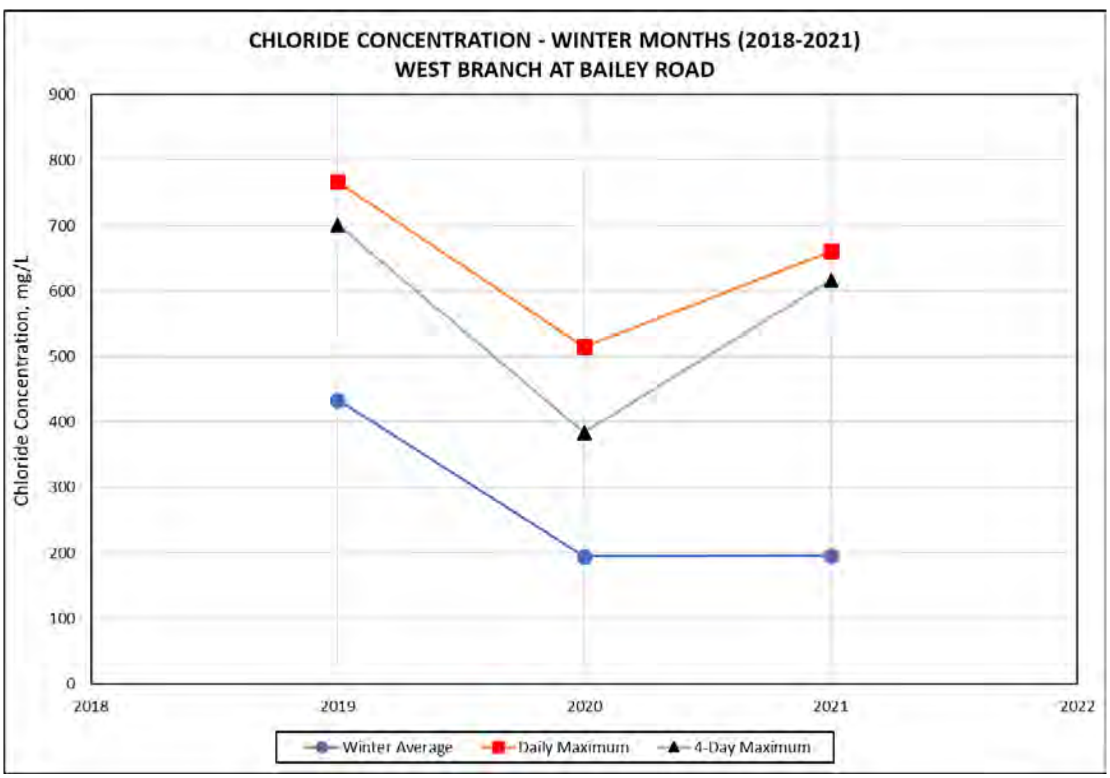


Figure 25. Calculated Chloride Concentrations - Winter Months (2018-2021) for the West Branch DuPage River at Bailey Road



Chapter 3 Nutrient Implementation Plan

The Special Conditions Paragraph 10 requires NPDES holders in the DRSCW and LDRWC to develop a Nutrient Implementation Plan (NIP) for the watershed that identifies phosphorus input reductions by point source discharges, non-point source discharges, and other measures necessary to remove DO and offensive condition impairments and meet the applicable dissolved oxygen criteria in 35 IL Adm. Code 302.206 and the narrative offensive aquatic algae criteria in 35 IL Adm. Code 302.203. Special Conditions Paragraph 2 and Special Conditions Paragraph 8.c. identify additional studies to be completed by the watershed workgroups. The following section summarizes the DRSCW and LDRWC work on the studies in 2021-2022.

3.1 IPS Model/Project Identification Study

- Special Conditions Listed Completion Date – Complete
- Status – Staff is still amending final report and database for release. The methodology, results, database, and a user manual all exist in draft final form and are under review. It is expected the final documentation will be completed in early 2022.

The IPS Model/Project Identification Study is a collaboration between the DRSCW, LDRWC, Des Plaines River Watershed Workgroup (DRWW), North Branch Watershed Workgroup (NBWW), Lower Des Plaines River Watershed Group (LDWG), and Midwest Biodiversity Institute (MBI).

3.1.1 Background on the IPS Model

The development of the IPS was completed in 2018. The 2019 and 2020 Annual Reports provide detailed descriptions on the IPS Model's inputs, set-up, and outputs.

3.1.2. Next Steps in IPS Modeling

The consortium of watershed workgroups is currently completing the following steps:

- Continue reviewing and testing the Power BI database and interface
- Review of nutrient outputs and thresholds with members and IEPA
- Finalize reviewing the results and editing the user manual and model narrative
- Incorporating final results into ongoing programs (NIP, physical projects, permit planning)
- Final review of the updated list of priority projects

The results of these efforts will be included in the Nutrient Implementation Plan due to the IEPA on December 31, 2023.

3.2 QUAL2Kw Updated for East Branch and Salt Creek

- Special Conditions Listed Completion Date – December 2023

- Status – On-going. All models have been calibrated and validated. Additionally, sensitivity analysis has been performed on all four (4) models. Model scenario runs are on-going.

The DRSCW budgeted $183,000 for this effort and anticipates expenditures in 2019-2022. Additionally, the LDRWC has budgeted $68,000 for this effort and anticipates expenditures in 2020-2022. Note: The Special Conditions Permit language only requires the update of the existing QUAL2K models for Salt Creek and the East Branch DuPage River. The DRSCW and LDRWC have decided to pursue similar models for the West Branch DuPage River and Lower DuPage River to assist with the development of the NIP.

3.2.1. Data Collection

3.2.1.1. *Continuous Dissolved Oxygen (DO) Sonde Network*

In 2021, the DRSCW gathered continuous DO data via water quality sondes at three (3) sites on Salt Creek, five (5) sites on the East Branch DuPage River, and five (5) sites on the West Branch DuPage River that will be utilized in the calibration and verification of the updated QUAL2Kw models. The Metropolitan Water Reclamation District of Greater Chicago (MWRDGC) also monitors two (2) additional locations on Salt Creek. Additionally, in 2020, the LDWRC maintained a sonde network of five (5) sondes on the Lower DuPage River. All sondes are deployed from May through October and collected DO, temperature, conductivity, and pH on an hourly basis.

Starting in October of 2021, the DRSCW and LDWRC will be extending the continuous DO monitoring to year round monitoring at all sites where the sonde is placed in a casing that is bridge-mounted. This includes two (2) sites on each of the four mainstem rivers: Salt Creek, East Branch DuPage River, West Branch DuPage River, and Lower DuPage River.

3.2.1.2. *Expanded Dissolved Oxygen Monitoring Program*

In 2019, the DRSCW and LDWRC began their expanded DO Monitoring Program as a means to collect additional data to support the calibration/validation of the QUAL2Kw models and to support the development of the NIP. This program is coordinated with the Bioassessment Program (see Table 12 for schedule). Sites sampled in the Salt Creek and Lower DuPage River watersheds in 2021 are included in Table 13. Sites in the other basins will be identified prior to the start of sampling for their designated year.

Table 12. *Schedule for Expanded DO Monitoring*

Basin	Year of Expanded DO Monitoring
East Branch DuPage River	2019
West Branch DuPage River	2020
Salt Creek	2021
Lower DuPage River	2021

The sampling period for the Expanded DO Monitoring Project is late June to the end of August in dry, low flow conditions (no rain for a minimum of 72 hours prior to sampling).

Sondes are deployed in the channel thalweg for a minimum of 72 hours, where they collect data on dissolved oxygen, temperature, pH, conductivity, turbidity, and chlorophyll a at 15-minute intervals.

Composite water quality samples and sestonic algae sampling were collected once during the sonde deployment using the sampling technique described in the IEPA Standard Operating Procedure for Stream Water Quality Sample Monitoring (DCN184). Samples were analyzed for the constituents listed in Table 14. One (1) benthic algae sample was collected at each site.

Table 13. *Sites Monitored as Part of the 2021 Expanded DO Monitoring Program.*

Site ID	Reasoning	Latitude	Longitude
LOWER DUPAGE RIVER WATERSHED			
Lower DuPage River			
LD14	Upstream of Naperville WWTP (upstream conditions)	41.7009756	-88.150800
LD25	Downstream from Naperville WWTP	41.6638788	-88.184710
LD11	Downstream from Bolingbrook #3 WWTP	41.6335642	-88.192800
LD10	Downstream from Plainfield WWTP	41.6105220	-88.207590
LD7	Downstream from Joliet WWTP	41.5452411	-88.182800
LD5	Downstream from Minooka WWTP	41.4376957	-88.236810
Rock Run			
LD4	Downstream of Crest Hill WWTP	41.5486859	-88.158640
Lily Cache Creek			
LD20	Upstream of Lily Cache Road (tributary)	41.6928045	-88.085500
SALT CREEK WATERSHED			
Salt Creek			
SC23	Downstream from Addison North WWTP	41.936938	-87.984234
SC29	Upstream of St Rt 171 (Upstream of confluence with Des Plaines River)	41.818297	-87.833708
SC35	Downstream from Wood Dale South WWTP	41.944091	-87.981079
SC37	Downstream of SCSC WWTP	41.885162	-87.959927
SC39	Downstream from Addison South WWTP	41.919985	-87.972745
SC40	Downstream from Wood Dale North WWTP	41.962745	-87.98439
SC41	Downstream from Itasca WWTP	41.970302	-87.988175
SC43	Downstream MWRDGC Egan WWTP	42.011973	-88.00092
SC44	Downstream of Busse Woods Dam (upstream conditions)	42.01602	-88.000508
SC46	Downstream of Roselle Devlin WWTP	41.966727	-88.077424
SC49	Upstream of Wolf Road	41.825756	-87.900036
SC51	Downstream Elmhurst WWTP	41.875767	-87.95799
Addison Creek			
SC24	Downstream of 3rd Street (Downstream of Bensenville WWTP)	41.946217	-87.926124
SC28	At Gardner Road (upstream of confluence with Salt Creek)	41.861162	-87.867743
Spring Brook			
SC16	Downstream from Roselle - JL Devlin WWTP	41.971781	-87.998034
SC21	Upstream of Roselle- JL Delvin WWTP (upstream conditions of Spring Brook)	41.97324	-88.079282

Table 14. Parameters Included in Expanded DO Monitoring Program.

Parameter	Abbreviation	Frequency
5 Day Biological Oxygen Demand	BOD5	Once per sampling period
5 Day Carbonaceous Biological Oxygen Demand	CBOD5	
Total Suspended Solids	TSS	
Volatile Suspended Solids	VSS	
Total Dissolved Solids	TDS	
Chloride	Chloride	
Conductivity	Cond.	
Total Organic Carbon	TOC	
Total Dissolved Carbon	TDC	
Ammonia	NH3	
Nitrite	NO2	
Nitrate	NO3	
Total Kjeldahl Nitrogen	TKN	
Total Phosphorus	TP	
Orthophosphate	Ortho-P	
Total Dissolved Phosphorus	TDP	
Chlorophyll A (sestonic)	Chl A	
Chlorophyll A (benthic)	Chl A (benthic)	Once Per Sampling Period

3.2.2. QUAL2Kw Modeling

In November 2019, the DRSCW and LDRWC entered into a contract with Tetra Tech to update the existing QUAL2K models for the East Branch DuPage River and Salt Creek and to prepare water quality models for the West Branch DuPage River and the Lower DuPage River. The water quality model selected for all four (4) watersheds was QUAL2Kw. The suite of QUAL models (most recently QUAL2K and QUAL2Kw) is a well-established modeling framework that is appropriate for steady-state (with diel variability) representation of critical condition DO and algal responses in flowing streams and run-of-river impoundments. The QUAL2Kw model improves upon the QUAL2K model in several ways, such as including hyporheic and surface transient storage zones and kinetics, variable options related to simulating sediment diagenesis, enhanced phytoplankton and bottom algae simulation and parameterization, options for a continuous dynamic modeling periods, and the built-in feature for automatic calibration using an algorithm for parameter optimization 1. However, unlike QUAL2K, QUAL2Kw does not allow for multiple headwaters or branching. Transitioning an existing steady state QUAL2K model into the dynamic continuous QUAL2Kw environment would allow for more accurate simulation of existing conditions throughout the DuPage River and Salt Creek watersheds.

Task 1: Review of Existing and Identification of Data Needs
Task 1 was completed for all four (4) watersheds in 2020. The 2020 Annual Report includes a summary of the findings of Task 1.

Task 2A: Model Re-Calibration/Re-Validation for Salt Creek and East Branch DuPage River
Task 2A was completed for the Salt Creek and East Branch DuPage River QUAL2Kw models in 2020. The 2020 Annual Report includes a summary of the calibration and validation of these two (2) models. The final QUAL2Kw Modeling Reports for both watersheds can be found at https://drscw.org/activities/project-identification-and-prioritization-system/.

Task 2B: Model Calibration/Validation for the West Branch DuPage River and Lower DuPage River
Task 2B was completed for the West Branch DuPage River and Lower DuPage River QUAL2Kw models in 2021. The final QUAL2Kw Modeling Reports for both watersheds can be found at https://drscw.org/activities/project-identification-and-prioritization-system/.

Task 3: Sensitivity Analysis
Task 3 was completed for the Salt Creek and East Branch DuPage River QUAL2Kw models in 2020 and the West Branch DuPage River and Lower DuPage River QUAL2Kw models in 2021. Details on the sensitivity analysis for each of the models can be found in the final QUAL2K Modeling Reports at https://drscw.org/activities/project-identification-and-prioritization-system/.

Task 4: Model Scenarios
Scenarios analysis is ongoing. Details on the scenario analysis as well as results will be included in the Nutrient Implementation Plan due to the IEPA on December 31, 2022.

3.3 NPS Phosphorus Feasibility Analysis

- Special Conditions Listed Completion Date – December 31, 2021
- Status – Complete. The NPS Phosphorus Reduction Feasibility Analysis Report was submitted to the IEPA on December 24, 2021.

3.3.1. Consultant Roundtable

Details on the 2018 Consultant Roundtable were included in the 2019 Annual Report.

3.3.2. Evaluation of Leaf Removal as a Means to Reduce Nutrient Concentrations and Loads in Urban Stormwater (USGS)

Details on the work conducted by William Selbig with the United States Geological Survey (USGS) and sponsored by the DRSCW were included in the 2019 Annual Report.

3.3.3. NPS Phosphorus Reduction Feasibility Analysis Report

The DRSCW and LDRWC evaluated the impact of area street sweeping and leaf litter management practices on non-point source loadings of total phosphorous (TP) pollution and developed recommendations on how those programs might be made more effective in regard to TP removal.

Leaf litter and street sweeping were selected for evaluation over structural best management practices (BMPs) for a number of reasons. These "source reduction" practices are ubiquitous in the watersheds as they are already included in municipal budgets and are understood by local public agencies. Structural BMPs, while required on most new and redevelopment projects per local and state regulations, are appearing only slowly in the already developed landscape of DuPage, Cook and Will Counties. Furthermore, source reduction practices do not compete for the limited space in the urban environment. Structural BMPs also require ongoing maintenance to continue to remove nutrients and can even switch from sinks to sources over time, perhaps most critically during the important spring rain period.

Source reduction practices also target TP in urban stormwater more precisely. Intensive monitoring of urban stormwater wash off from residential areas suggest that nearly 60% of the annual warm weather TP loading (59% of which was in the dissolved fraction) occurs in the fall and comes from leaf litter biomass. Research shows that leaf litter management can reduce TP loadings in fall stormwater runoff by over 60%.

To better understand and quantify current conditions in the targeted watersheds, the study developed a high resolution map of "effective canopy cover". This is the tree canopy that overhangs the road system and has been shown as being the major predictive factor of TP loading from impervious surfaces. To collect data for this study, a questionnaire was sent to communities, townships and agencies who operate a transportation network. There was a 58% reply rate to the questionnaire representing approximately 77% of the total study area. Data from the questionnaire was used to populate a modified version of the Minnesota Pollution Control Agency (MPCA) Street Sweeping Tool, calibrated to better reflect the TPS capture rates using a curb mile input. The model calculated that from the 77 % of the watershed coved by the questionnaire, street sweeping captured 6,870 and 12,021 lbs. TP/year at the 25th and 50th percentile respectively. The frequency of sweeping, timing of sweeping (spring and fall) and the nature of the road drainage system (curb and gutter or swale) all played roles in the magnitude of TP removal at individual agencies.

Although all questionnaire responders have a sweeping program and most vary sweeping frequency seasonally, there are opportunities to increase the efficiency of TP removal using source reduction practices. Most notably, a number of agencies do not increase the frequency of their sweepings in fall and spring. Areas with a high effective canopy cover may also benefit from increase sweeping frequency.

Any additional investments aimed at reducing loading from non-point sources would need to be weighed against the marginal costs of TP removal at Publicly Owned Treatment Plants. The findings and recommendations in this study report will be included in the Nutrient Implementation Plan (NIP) planned for December 2023.

The NPS Phosphorus Reduction Feasibility Analysis Report can be found at https://drscw.org/activities/project-identification-and-prioritization-system/.

3.4 Development of a Basin Wide Nutrient Trading Program

Special Condition 8.c. allows the DRSCW/LDRWC to develop and implement a trading program for the POTWs in the DuPage River and Salt Creek watersheds. The nutrient trading program will allow for the re-allocation of phosphorus loadings between two or more POTWs in the DuPage River and Salt Creek watersheds as long as the following two conditions are met:

- The trade allocated loadings will not exceed the anticipated loading from the uniform application of the applicable 1.0 mg/L monthly average effluent limitation among the POTW permits in the DRSCW watersheds; and
- The trade allocated loadings also remove DO and offensive condition impairments and meet the applicable dissolved oxygen criteria in 35 IL Adm. Code 302.206 and the narrative offensive aquatic algae criteria in 35 IL Adm. Code 302.203.

Special Condition 8.c. also allows for the implementation of the nutrient trading program within the 10-year permit cycle by allowing the IEPA to modify the NPDES permits if the nutrient trading program meets the criteria detailed above.

The previous Annual Reports have detailed all work conducted as part of the development of a basin-wide nutrient trading program. The 2020 Annual Report included proposed scope revisions necessary to continue the development of Stream Restoration TP Crediting Program. The proposed scope revisions and the need for continuing with the trading effort was discussed with the Special Conditions Permit holders in meetings held in late April/early May 2021. Special Conditions Permit Holders recommended suspending the trading analysis until a watershed-based effluent TP limit and implementation timeline is determined through the NIP process and facilities can determine their ability and/or need to be TP sellers or buyers. This information was presented to the Project Committee at their June 15, 2021 meeting for a final decision on whether or not to proceed with the recommended scope revisions. The Project Committee agreed with the Special Conditions Permit Holders and recommended suspending the trading analysis. As such, the development of a basin wide nutrient trading program for the DRSCW and LDRWC watersheds has been suspended indefinitely.

3.5 NIP Related Items

3.5.1 Chlorophyll a Sampling

The DRSCW bioassessment program began in 2007 with sampling in the West Branch DuPage River, East Branch DuPage River and Salt Creek watersheds. From 2006-2016, each watershed was sampled on a 3-year rotation beginning with the West Branch DuPage River watershed in 2006. Beginning in 2017, the watersheds will be sampled in a 4-year rotation to allow time for the report writing and program assessment. The LDRWC began in 2012 and is sampled every 3-years.

The DRSCW and LDRWC bioassessment program utilizes standardized biological, chemical, and physical monitoring and assessment techniques employed to meet three major objectives:

1) determine the extent to which biological assemblages are impaired (using IEPA guidelines)
2) determine the categorical stressors and sources that are associated with those impairments; and
3) add to the broader databases for the DuPage River and Salt Creek watersheds to track and understand changes through time in response to abatement actions or other influences

The data collected as part of the bioassessment is processed, evaluated, and synthesized as a biological and water quality assessment of aquatic life use status. The assessments are directly comparable to previously conducted bioassessments such that trends in status can be examined and causes and sources of impairment can be confirmed, amended, or removed. A final report is prepared following each bioassessment and contains a summary of major findings and recommendations for future monitoring, follow-up investigations, and any immediate actions that are needed to resolve readily diagnosed impairments. The bioassessment reports are posted on the DRSCW website at http://drscw.org/wp/bioassessment/. Data obtained from the bioassessments are a key source of data for all NIP projects discussed in Chapter 3.

In 2019, the DRSCW expanded its chemical monitoring to include sestonic chlorophyll a sampling beginning with the East Branch DuPage River in 2019. The West Branch DuPage River was sampled in 2020. Salt Creek and the Lower DuPage River watersheds were sampled in 2021. Sampling of sestonic chlorophyll a will continue to be included in all future bioassessment sampling efforts.

ATTACHMENT 1

DRSCW Special Condition

DuPage/Salt Creek Special Condition XX.

1. The Permittee shall participate in the DuPage River Salt Creek Workgroup (DRSCW). The Permittee shall work with other watershed members of the DRSCW to determine the most cost effective means to remove dissolved oxygen (DO) and offensive condition impairments in the DRSCW watersheds.

2. The Permittee shall ensure that the following projects and activities set out in the DRSCW Implementation Plan (April 16, 2015), are completed (either by the permittee or through the DRSCW) by the schedule dates set forth below; and that the short term objectives are achieved for each by the time frames identified below:

Project Name	**Completion Date**	**Short Term Objectives**	**Long Term Objectives**
Oak Meadows Golf Course dam removal	December 31, 2016	Improve DO	Improve fish passage
Oak Meadows Golf Course stream restoration	December 31. 2017	Improve aquatic habitat (QHEI), reduce inputs of nutrients and sediment	Raise miBi
Fawell Dam Modification	December 31, 2018	Modify dam to allow fish passage	Raise fiBi upstream
Spring Brook Restoration and dam removal	December 31, 2019	Improve aquatic habitat (QHEI), reduce inputs of nutrients and sediment	Raise miBi and fiBi
Fullersburg Woods dam modification concept plan development	December 31, 2016	Identify conceptual plan for dam modification and stream restoration	Build consensus among plan
Fullersburg Woods dam modification	December 31, 2021	Improve DO, improve aquatic habitat (QHEI)	Raise miBi and fiBi
Fullersburg Woods dam modification area stream restoration	December 31, 2022	Improve aquatic habitat (QHEI), reduce inputs of nutrients and sediment	Raise miBi and fiBi
Southern West Branch Physical Enhancement	December 31, 2022	Improve aquatic habitat (QHEI)	Raise miBi and fiBi
Southern East Branch Stream Enhancement	December 31, 2023	Improve aquatic habitat (QHEI), reduce inputs of nutrients and sediment	Raise miBi and fiBi

QUAL 2K East Branch and Salt Creek	December 31, 2023	Collect new baseline data and update model	Quantify improvements in watershed. Identify next round of projects for
NPS Phosphorus Feasibility Analysis	December 31, 2021	Assess NPS performance from reductions leaf litter and street sweeping	Reduce NPS contributions to lowest practical levels

3. The Permittee shall participate in implementation of a watershed Chloride Reduction Program, either directly or through the DRSCW. The program shall work to decrease DRSCW watershed public agency chloride application rates used for winter road safety, with the objective of decreasing watershed chloride loading. The Permittee shall submit an annual report on the annual implementation of the program identifying the practices deployed, chloride application rates, estimated reductions achieved, analyses of watershed chloride loads, precipitation, air temperature conditions and relative performance compared to a baseline condition. The report shall be provided to the Agency by March 31 of each year reflecting the Chloride Abatement Program performance for the preceding year (example: 2015-16 winter season report shall be submitted no later than March 31, 2017). The Permittee may work cooperatively with the DRSCW to prepare a single annual progress report that is common among DRSCW permittees.

4. The Permittee shall submit an annual progress report on the projects listed in the table of paragraph 2 above to the Agency by March 31 of each year. The report shall include project implementation progress. The Permittee may work cooperatively with the DRSCW to prepare a single annual progress report that is common among DRSCW permittees.

5. The Permittee shall develop a written Phosphorus Discharge Optimization Plan. In developing the plan, the Permittee shall evaluate a range of measures for reducing phosphorus discharges from the treatment plant, including possible source reduction measures, operational improvements, and minor low cost facility modifications that will optimize reductions in phosphorus discharges from the wastewater treatment facility. The permittee's evaluation shall include, but not necessarily be limited to, an evaluation of the following optimization measures:
    a. WWTF influent reduction measures.
        i. Evaluate the phosphorus reduction potential of users.
        ii. Determine which sources have the greatest opportunity for reducing phosphorus (e.g., industrial, commercial, institutional, municipal, and others).
            1. Determine whether known sources (e.g., restaurant and food preparation) can adopt phosphorus minimization and water conservation plans.
            2. Evaluate implementation of local limits on influent sources of excessive phosphorus.

b. WWTF effluent reduction measures.
   i. Reduce phosphorus discharges by optimizing existing treatment processes without causing non-compliance with permit effluent limitations or adversely impacting stream health.

      1. Adjust the solids retention time for biological phosphorus removal.
      2. Adjust aeration rates to reduce DO and promote biological phosphorus removal.
      3. Change aeration settings in plug flow basins by turning off air or mixers at the inlet side of the basin system.
      4. Minimize impact on recycle streams by improving aeration within holding tanks.
      5. Adjust flow through existing basins to enhance biological nutrient removal.
      6. Increase volatile fatty acids for biological phosphorus removal.

6. Within 24 months of the effective date of this permit, the Permittee shall finalize the written Phosphorus Discharge Optimization Evaluation Plan and submit it to IEPA. The plan shall include a schedule for implementing all of the evaluated optimization measures that can practically be implemented and include a report that explains the basis for rejecting any measure that was deemed impractical. The schedule for implementing all practical measures shall be no longer than 36 months after the effective date of this permit. The Permittee shall implement the measures set forth in the Phosphorus Discharge Optimization Plan in accordance with the schedule set forth in that Plan. The Permittee shall modify the Plan to address any comments that it receives from IEPA and shall implement the modified plan in accordance with the schedule therein.

   Annual progress reports on the optimization of the existing treatment facilities shall be submitted to the Agency by March 31 of each year beginning 24 months from the effective date of the permit.

7. The Permittee shall, within 24 months of the effective date of this permit, complete a feasibility study that evaluates the timeframe, and construction and O & M costs of reducing phosphorus levels in its discharge to a level consistently meeting a limit of 1 mg/L, 0.5 mg/L and 0.1 mg/L utilizing a range of treatment technologies including, but not necessarily limited to, biological phosphorus removal, chemical precipitation, or a combination of the two. The study shall evaluate the construction and O & M costs of the different treatment technologies for these limits on a monthly, seasonal, and annual average basis. For each technology and each phosphorus discharge level evaluated, the study shall also evaluate the amount by which the Permittee's typical household annual sewer rates would increase if the Permittee constructed and operated the specific type of technology to achieve the specific phosphorus discharge level. Within 24 months of the effective date of this Permit, the Permittee shall submit to the Agency and the DRSCW a written report summarizing the results of the study.

8. Total phosphorus in the effluent shall be limited as follows:

   a. If the Permittee will use chemical precipitation to achieve the limit, the effluent limitation shall be 1.0 mg/L on a monthly average basis, effective 10 years after the effective date of this permit unless the Agency approves and reissues or modifies the permit to include an alternate phosphorus reduction program pursuant to paragraph c or d below that is fully implemented within 10 years of the effective date of this permit.
   b. If the Permittee will primarily use biological phosphorus removal to achieve the limit, the effluent limitation shall be 1.0 mg/L monthly average to be effective 11 years after the effective date of this permit unless the Agency approves and reissues or modifies the permit to include an alternate phosphorus reduction program pursuant to paragraph c or d below that is fully implemented within 11 years of the effective date of this permit.
   c. The Agency may modify this permit if the DRSCW has developed and implemented a trading program for POTWs in the DRSCW watersheds, providing for reallocation of allowed phosphorus loadings between two or more POTWs in the DRSCW watersheds, that delivers the same results of overall watershed phosphorus point-source reduction and loading anticipated from the uniform application of the applicable 1.0 mg/L monthly average effluent limitation among the POTW permits in the DRSCW watersheds and removes DO and offensive condition impairments and meet the applicable dissolved oxygen criteria in 35 IL Adm. Code 302.206 and the narrative offensive aquatic algae criteria in 35 IL Adm. Code 302.203.
   d. The Agency may modify this permit if the DRSCW has demonstrated and implemented an alternate means of reducing watershed phosphorus loading to a comparable result within the timeframe of the schedule of this condition and removes DO and offensive condition impairments and meet the applicable dissolved oxygen criteria in 35 IL Adm. Code 302.206 and the narrative offensive aquatic algae criteria in 35 IL Adm. Code 302.203.

9. The Permittee shall monitor the wastewater effluent, consistent with the monitoring requirements on Page 2 of this permit, for total phosphorus, dissolved phosphorus, nitrate/nitrite, total Kjeldahl nitrogen (TKN), ammonia, total nitrogen (calculated), alkalinity and temperature at least once a month. The Permittee shall monitor the wastewater influent for total phosphorus and total nitrogen at least once a month. The results shall be submitted on NetDMRs to the Agency unless otherwise specified by the Agency.

10. The Permittee shall submit a Nutrient Implementation Plan (NIP) for the DRSCW watersheds that identifies phosphorus input reductions by point source discharges, non-point source discharges and other measures necessary to remove DO and offensive condition impairments and meet the applicable dissolved oxygen criteria in 35 IL Adm. Code 302.206 and the narrative offensive aquatic algae criteria in 35 IL Adm. Code 302.203. The NIP shall also include a schedule for implementation of the phosphorus input reductions and other measures. The Permittee may work cooperatively with the DRSCW to prepare a single NIP that is common among DRSCW permittees. The NIP shall be submitted to the Agency by December 31, 2023.

ATTACHMENT 2

LDRWC Special Conditions

Bolingbrook STP#3 Special Condition XX.

1. The Permittee shall participate in the DuPage River Salt Creek Workgroup (DRSCW) and the Lower DuPage River Watershed Coalition (LDRWC). The Permittee shall work with other watershed members of the DRSCW and LDRWC to determine the most cost effective means to remove dissolved oxygen (DO) and offensive condition impairments in the DuPage River Salt Creek watershed.

2. The Permittee shall ensure that the following projects and activities set out in the DRSCW and LDRWC Implementation Plan (April 16, 2015), are completed (either by the permittee or through the DRSCW/LDRWC) by the schedule dates set forth below; and that the short term objectives are achieved for each by the time frames identified below. This condition may be modified to include additional projects due to participation in the Lower DuPage River Watershed Coalition.

Project Name	**Completion Date**	**Short Term Objectives**	**Long Term Objectives**
Oak Meadows Golf Course dam removal	December 31, 2016	Improve DO	Improve fish passage
IPS Tool/Project Identification Study	December 31, 2017	Improve DO	Improve fish passage
Oak Meadows Golf Course stream restoration	December 31. 2017	Improve aquatic habitat (QHEI), reduce inputs of nutrients and sediment	Raise miBi
Fawell Dam Modification	December 31, 2018	Modify dam to allow fish passage	Raise fiBi upstream
Hammel Woods Dam removal	December 31, 2019	Improve DO, reduce nuisance algae	Raise miBi and fiBi
Spring Brook Restoration and dam removal	December 31, 2019	Improve aquatic habitat (QHEI), reduce inputs of nutrients and sediment	Raise miBi and fiBi
Fullersburg Woods dam modification concept plan development	December 31, 2016	Identify conceptual plan for dam modification and stream restoration	Build consensus among plan
Fullersburg Woods dam modification	December 31, 2021	Improve DO, improve aquatic habitat (QHEI)	Raise miBi and fiBi
Fullersburg Woods dam modification area stream restoration	December 31, 2022	Improve aquatic habitat (QHEI), reduce inputs of nutrients and sediment	Raise miBi and fiBi
Southern West Branch Physical Enhancement	December 31, 2022	Improve aquatic habitat (QHEI)	Raise miBi and fiBi

Southern East Branch Stream Enhancement	December 31, 2023	Improve aquatic habitat (QHEI), reduce inputs of nutrients and sediment	Raise miBi and fiBi
Hammel Woods Dam to 119th Street in Plainfield Stream Enhancement	December 31, 2023	Improve aquatic habitat (QHEI), reduce inputs of nutrients and sediment	Raise miBi and fiBi
QUAL 2K East Branch and Salt Creek	December 31, 2023	Collect new baseline data and update model	Quantify improvements in watershed. Identify next round of projects for
NPS Phosphorus Feasibility Analysis	December 31, 2021	Assess NPS performance from reductions leaf litter and street sweeping	Reduce NPS contributions to lowest practical levels

3. The Permittee shall participate in implementation of a watershed Chloride Reduction Program, either directly or through the DRSCW/LDRWC. The program shall work to decrease DRSCW/LDRWC watershed public agency chloride application rates used for winter road safety, with the objective of decreasing watershed chloride loading. The Permittee shall submit an annual report on the annual implementation of the program identifying the practices deployed, chloride application rates, estimated reductions achieved, analyses of watershed chloride loads, precipitation, air temperature conditions and relative performance compared to a baseline condition. The report shall be provided to the Agency by March 31 of each year reflecting the Chloride Abatement Program performance for the preceding year (example: 2015-16 winter season report shall be submitted no later than March 31, 2017). The Permittee may work cooperatively with the DRSCW/LDRWC to prepare a single annual progress report that is common among DRSCW/LDRWC permittees.

4. The Permittee shall submit an annual progress report on the projects listed in the table of paragraph 2 above to the Agency by March 31 of each year. The report shall include project implementation progress. The Permittee may work cooperatively with the DRSCW/LDRWC to prepare a single annual progress report that is common among DRSCW/LDRWC permittees.

5. The Permittee shall develop a written Phosphorus Discharge Optimization Plan. In developing the plan, the Permittee shall evaluate a range of measures for reducing phosphorus discharges from the treatment plant, including possible source reduction measures, operational improvements, and minor low cost facility modifications that will optimize reductions in phosphorus discharges from the wastewater treatment facility. The permittee's evaluation shall

include, but not necessarily be limited to, an evaluation of the following optimization measures:

a. WWTF influent reduction measures.
   i. Evaluate the phosphorus reduction potential of users.
   ii. Determine which sources have the greatest opportunity for reducing phosphorus (e.g., industrial, commercial, institutional, municipal, and others).
      1. Determine whether known sources (e.g., restaurant and food preparation) can adopt phosphorus minimization and water conservation plans.
      2. Evaluate implementation of local limits on influent sources of excessive phosphorus.
b. WWTF effluent reduction measures.
   i. Reduce phosphorus discharges by optimizing existing treatment processes without causing non-compliance with permit effluent limitations or adversely impacting stream health.
      1. Adjust the solids retention time for biological phosphorus removal.
      2. Adjust aeration rates to reduce DO and promote biological phosphorus removal.
      3. Change aeration settings in plug flow basins by turning off air or mixers at the inlet side of the basin system.
      4. Minimize impact on recycle streams by improving aeration within holding tanks.
      5. Adjust flow through existing basins to enhance biological nutrient removal.
      6. Increase volatile fatty acids for biological phosphorus removal.

6. Within 24 months of the effective date of this permit, the Permittee shall finalize the written Phosphorus Discharge Optimization Evaluation Plan and submit it to IEPA. The plan shall include a schedule for implementing all of the evaluated optimization measures that can practically be implemented and include a report that explains the basis for rejecting any measure that was deemed impractical. The schedule for implementing all practical measures shall be no longer than 36 months after the effective date of this permit. The Permittee shall implement the measures set forth in the Phosphorus Discharge Optimization Plan in accordance with the schedule set forth in that Plan. The Permittee shall modify the Plan to address any comments that it receives from IEPA and shall implement the modified plan in accordance with the schedule therein.

   Annual progress reports on the optimization of the existing treatment facilities shall be submitted to the Agency by March 31 of each year beginning 24 months from the effective date of the permit.

7. The Permittee shall, within 24 months of the effective date of this permit, complete a feasibility study that evaluates the timeframe, and construction and O & M costs of reducing phosphorus levels in its discharge to a level consistently meeting a limit of 1 mg/L, 0.5 mg/L and 0.1 mg/L utilizing a range of treatment technologies including, but not necessarily limited to, biological phosphorus removal, chemical precipitation, or a combination of the two. The study shall evaluate the construction and O & M costs of the different treatment technologies for these limits on a

monthly, seasonal, and annual average basis. For each technology and each phosphorus discharge level evaluated, the study shall also evaluate the amount by which the Permittee's typical household annual sewer rates would increase if the Permittee constructed and operated the specific type of technology to achieve the specific phosphorus discharge level. Within 24 months of the effective date of this Permit, the Permittee shall submit to the Agency and the DRSCW/LDRWC a written report summarizing the results of the study.

8. Total phosphorus in the effluent shall be limited as follows:

    a. If the Permittee will use chemical precipitation to achieve the limit, the effluent limitation shall be 1.0 mg/L on a monthly average basis, effective 10 years after the effective date of this permit unless the Agency approves and reissues or modifies the permit to include an alternate phosphorus reduction program pursuant to paragraph c or d below that is fully implemented within 10 years of the effective date of this permit.
    b. If the Permittee will primarily use biological phosphorus removal to achieve the limit, the effluent limitation shall be 1.0 mg/L monthly average to be effective 11 years after the effective date of this permit unless the Agency approves and reissues or modifies the permit to include an alternate phosphorus reduction program pursuant to paragraph c or d below that is fully implemented within 11 years of the effective date of this permit.
    c. The Agency may modify this permit if the DRSCW has developed and implemented a trading program for POTWs in the DRSCW/LDRWC watersheds, providing for reallocation of allowed phosphorus loadings between two or more POTWs in the DRSCW/LDRWC watersheds, that delivers the same results of overall watershed phosphorus point-source reduction and loading anticipated from the uniform application of the applicable 1.0 mg/L monthly average effluent limitation among the POTW permits in the DRSCW watersheds and removes DO and offensive condition impairments and meet the applicable dissolved oxygen criteria in 35 IL Adm. Code 302.206 and the narrative offensive aquatic algae criteria in 35 IL Adm. Code 302.203.
    d. The Agency may modify this permit if the DRSCW/LDRWC has demonstrated and implemented an alternate means of reducing watershed phosphorus loading to a comparable result within the timeframe of the schedule of this condition and removes DO and offensive condition impairments and meet the applicable dissolved oxygen criteria in 35 IL Adm. Code 302.206 and the narrative offensive aquatic algae criteria in 35 IL Adm. Code 302.203.

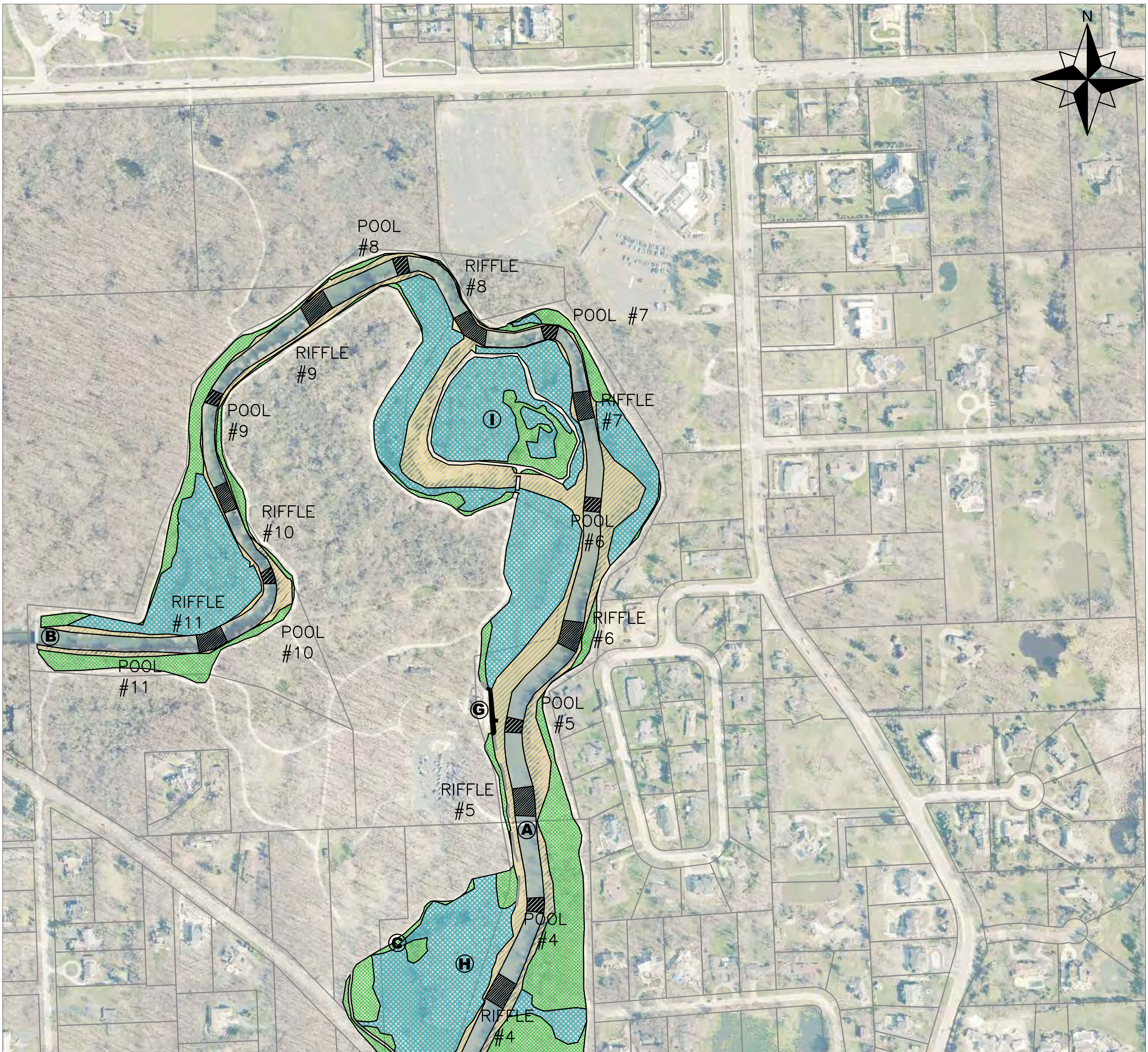
9. The Permittee shall monitor the wastewater effluent, consistent with the monitoring requirements on Page 2 of this permit, for total phosphorus, dissolved phosphorus, nitrate/nitrite, total Kjeldahl nitrogen (TKN), ammonia, total nitrogen (calculated), alkalinity and temperature at least once a month. The Permittee shall monitor the wastewater influent for total phosphorus and total nitrogen at least once a month. The results shall be submitted on NetDMRs to the Agency unless otherwise specified by the Agency.

10. The Permittee shall submit a Nutrient Implementation Plan (NIP) for the DRSCW watersheds that identifies phosphorus input reductions by point source discharges, non-point source discharges and other measures necessary to remove DO and offensive condition impairments and meet the applicable dissolved oxygen criteria in 35 IL Adm. Code 302.206 and the narrative offensive aquatic algae criteria in 35 IL Adm. Code 302.203. The NIP shall also include a schedule for implementation of the phosphorus input reductions and other measures. The Permittee may work cooperatively with the DRSCW to prepare a single NIP that is common among DRSCW and LDRWC permittees. The NIP shall be submitted to the Agency by December 31, 2023.

ATTACHMENT 3

Fullersburg Woods Dam Modification

and Stream Restoration Design Plans



Salt Creek at Fullersburg Woods

Overall Project Concept Design Plan

PROJECT NO.	20-0349	ISSUE DATE	03/10/2022	EXHIBIT NO.	#

LEGEND

- A. Flat Bridge
- B. Rainbow Bridge
- C. Sycamore Island Bridge Removal
- D. Fullersburg Dam Removal
- E. Dam Bypass Structure Removal
- F. Graue Mill Visitor Improvements
- G. Fullersburg Woods Nature Education Center and Flood Wall Improvements
- H. Sycamore Island
- I. Willow Island

- Riparian Wetland Conversion
- Wetland Selective Clearing and Enhancement
- Floodplain Forest Selective Clearing and Enhancement

No.	Revision/Issue	Date

Hey and Associates, Inc.
Engineering, Ecology and Landscape Architecture
26575 West Commerce Drive, Suite 601
Volo, Illinois 60073
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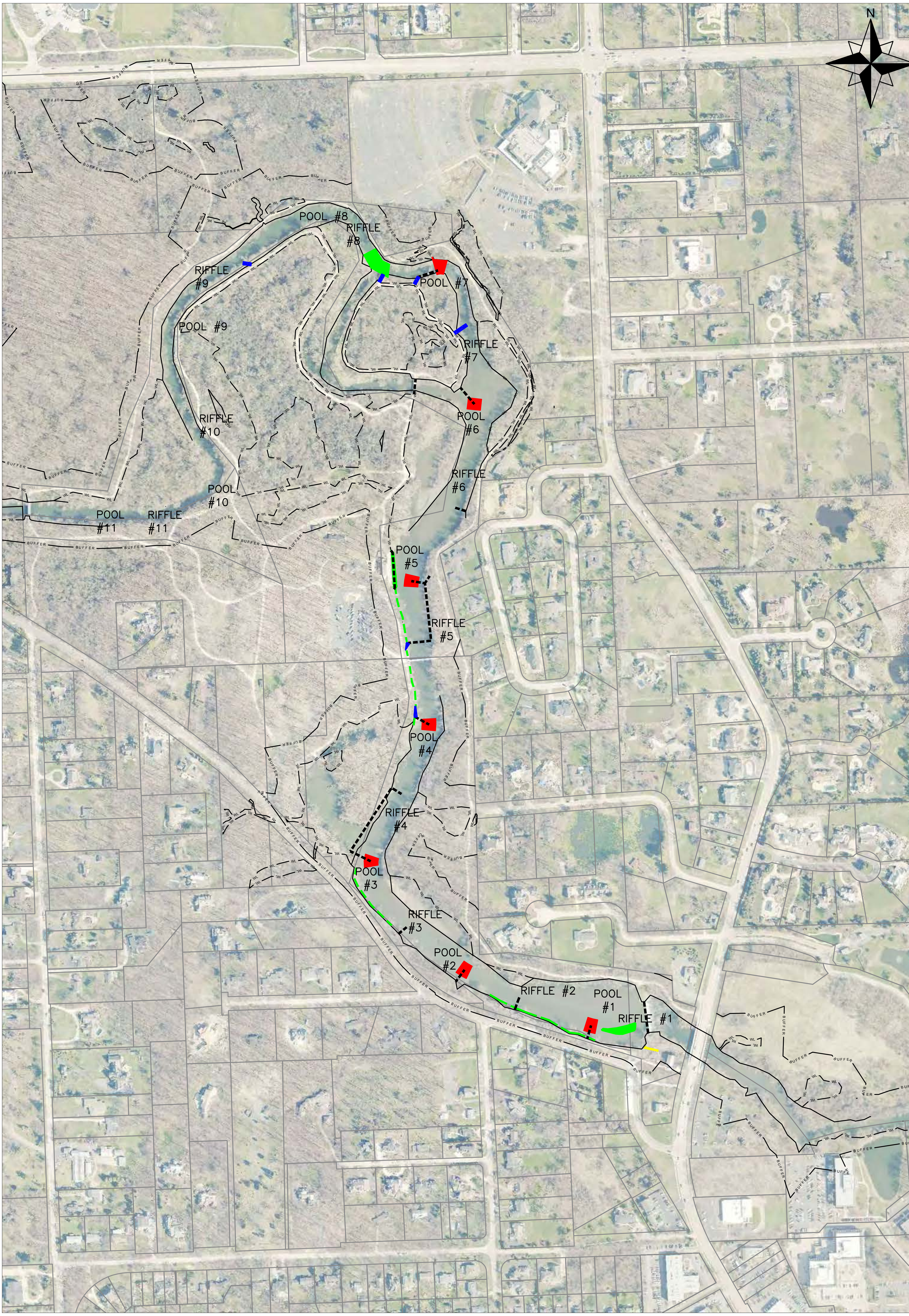
Volo@Heyassoc.com

Professional Design Firm
License No. 184.002429

File: P:\20000\20-0349 DRSCW-Salt Creek at Fullersburg Woods\05 CAD\Impact\Overall Graphic.dwg Plot Date: March 11, 2022 Plotted by: Ethan Appelgren

Attachment 3B



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Salt Creek at Fullersburg Woods

Impact Exhibit

PROJECT NO.	20-0349	ISSUE DATE	03/10/2022	EXHIBIT NO.	#

LEGEND

- Cut
- Fill
- Raceway Fill
- Temporary Stone Ramp
- Temp. Construction Matting/Bridge
- Bank Restoration
- Wall Protection Fill

No.	Revision/Issue	Date

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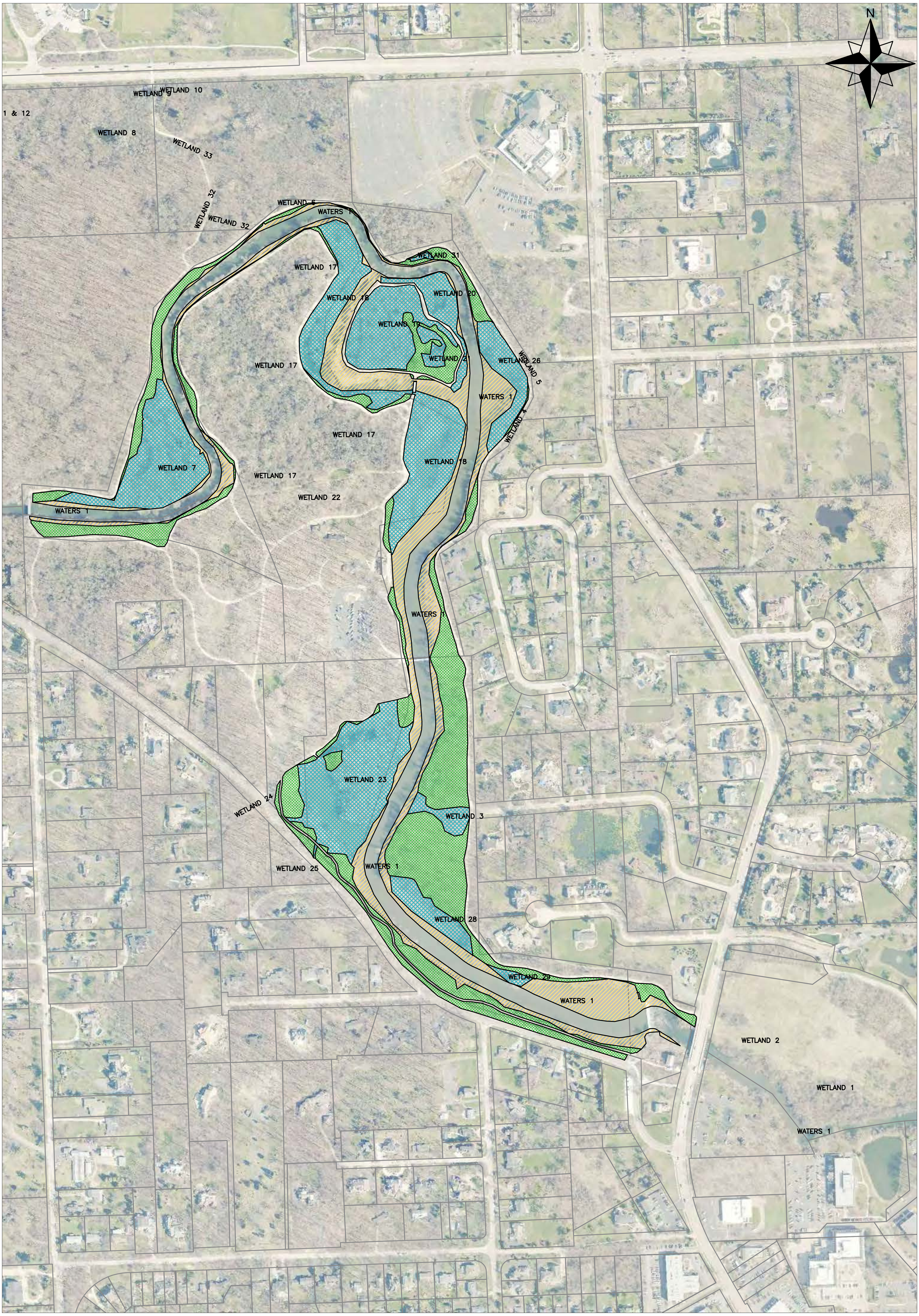

Salt Creek at Fullersburg Woods

Enhancement Plan

PROJECT NO.	20-0349	ISSUE DATE	03/10/2022	EXHIBIT NO.	#

LEGEND

- Riparian Wetland Conversion
- Wetland Selective Clearing and Enhancement
- Floodplain Forest Selective Clearing and Enhancement

No.	Revision/Issue	Date

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File: P:\20000\20-0349 DRSCW-Salt Creek at Fullersburg Woods\05 CAD\Impact\Enhancement Exhibit.dwg Plot Date: March 11, 2022 Plotted by: Ethan Appelgren

ATTACHMENT 4

Southern East Branch DuPage River Stream

Enhancement Conceptual Design Report

Lower East Branch DuPage River Stream Restoration Project, DuPage & Will Counties, IL Conceptual Design Report

SUBMITTED TO

DuPage River Salt Creek Workgroup
10 S 404 Knoch Knolls Road
Naperville, Illinois 60565

January 20, 2022

inter·fluve

Table of Contents

1. Executive Summary

This report documents Inter-Fluve's site investigation, field data collection efforts, conceptual designs, and options assessment for the restoration of the lower East Branch DuPage River (the Project) in DuPage County and Will County, Illinois. The primary goals of the Project are to increase fish biodiversity and improve physical habitat in the East Branch DuPage River. These goals will be met by implementing naturalized stream restoration practices such as re-meandering, engineered large wood structures, and aquatic and riparian habitat enhancements that will help restore geomorphic processes and create habitat complexity.

The project area is an approximately 7.2-mile, low-gradient (0.04%) section of the East Branch DuPage River, including its riparian corridor, that extends from Hobson Road in Woodridge, Illinois (DuPage County) downstream to Weber Road (also referred to as Washington Street) in Naperville, Illinois (Will County). The project area's geology is dominated by the advance and retreat of the glaciers responsible for forming the Great Lakes during the Wisconsin Glaciation.

The modern East Branch DuPage River lies within an alluvial valley incised through a series of glacial end moraines. The river through the project area has been channelized over an approximately 5.2-mile stretch (i.e., 72% of the project area). Currently, industrial land uses, limestone quarries, and development encroach on the straightened channel over an approximately 2-mile reach (i.e, 28% of the project area). The valley is less confined and broader in historically less impacted reaches and where land has been preserved as park space, presently totaling approximately 5.2 miles (i.e., total of 72% of the project area). Effluent from wastewater treatment plants contributes to baseflow, and watershed urbanization leads to flashy flows following rain events. The river has a low gradient, steep banks, and exhibits a relatively stable planform. Urbanization and climate change have contributed to channel widening. The floodplain and near bank vegetation communities are dominated by reed canary grass and spotted smartweed.

Inter-Fluve divided the study area into four reaches and developed recommendations for ecological enhancement of each. Design elements can be grouped into four categories: channel construction (i.e., re-meandering), in-stream and floodplain large wood structures, in-stream habitat treatments, and revegetation. Conceptual designs incorporating these elements were tailored to the opportunities and constraints in each reach. Implementation of the recommendations would result in an improvement of channel conditions based on QHEI scoring. The greatest improvements and categorical changes (e.g., Fair to Good overall condition) would be realized in reaches where meanders can be re-introduced to areas that were previously channelized. Construction cost opinions have been provided for each reach.

2. Introduction

This report documents Inter-Fluve's site investigation, field data collection efforts, conceptual designs, and options assessment for the restoration of the lower East Branch DuPage River (the Project) in DuPage County and Will County, Illinois.

2.1 PROJECT PARTNERS

The Project benefits from the support of the following project partners:

- DuPage River Salt Creek Workgroup (DRSCW);
- Forest Preserve District of Will County;
- Naperville Park District;
- Bolingbrook Park District;
- City of Naperville; and
- Village of Bolingbrook.

The Project will also involve a variety of stakeholders, including Vulcan Materials Company, Commonwealth Edison Company (ComEd), and Independent Baptist Church.

2.2 PROJECT GOALS AND DESIGN CRITERIA

The primary goals of the Project are to increase fish biodiversity and improve physical habitat in the East Branch DuPage River. These goals will be met by implementing naturalized stream restoration practices such as re-meandering, engineered large wood structures, and aquatic and riparian habitat enhancements that will help restore geomorphic processes and create habitat complexity.

The Project will support continued and enhanced recreational enjoyment of the East Branch DuPage River corridor and will be designed to minimize impacts to surrounding infrastructure and private property.

Specific project objectives were identified by the project partners during a conceptual design charrette on November 9, 2021. They are:

- Improve fish and macroinvertebrate population size and diversity;
- Improve instream, riparian, and floodplain habitat to fair/good quality standards, as measured by QHEI and IBI scores;
- Improve floodplain and riparian vegetation quality, reduce invasive species presence, and restore wetlands;
- Increase recreational value within the river corridor;
- Reduce bank erosion and provide widespread bank stability; and
- Provide a regional example of a healthy stream and riparian area.

The partners also communicated that the project should be permittable, should limit maintenance to practical levels, and be constructable within identified budgets.

Based on the identified project objectives, Inter-Fluve developed the following design criteria:

- Increase the amount of in-stream cover and habitat complexity using large wood and boulder elements;
- Restore naturalized river processes to channelized portions of river through targeted re-meandering of the river;
- Improve the quality and increase the abundance of pool habitat and riffles;
- Re-establish diverse assemblages of native plants in riparian and floodplain areas for regionally appropriate vegetative communities; and
- Increase the number of access points for paddlers.

3. Data Collection and Review

3.1 PROJECT AREA

The project area is an approximately 7.2-mile, low-gradient (0.04%) section of the East Branch DuPage River, including its riparian corridor, that extends from Hobson Road in Woodridge, Illinois (DuPage County) downstream to Weber Road (also referred to as Washington Street) in Naperville, Illinois (Will County) (Figure 1). Site survey was collected in the reach between Royce Road and Weber Road (see Section 4). Conceptual designs have been prepared for the entire project area, although engineering design will only take place in the area between Royce Road and Weber Road, which lies entirely within Will County. The land available for active construction and staging includes the channel bed and banks and publicly owned parcels. Any project activities on privately owned parcels will be subject to agreements between landowners and the project partners.

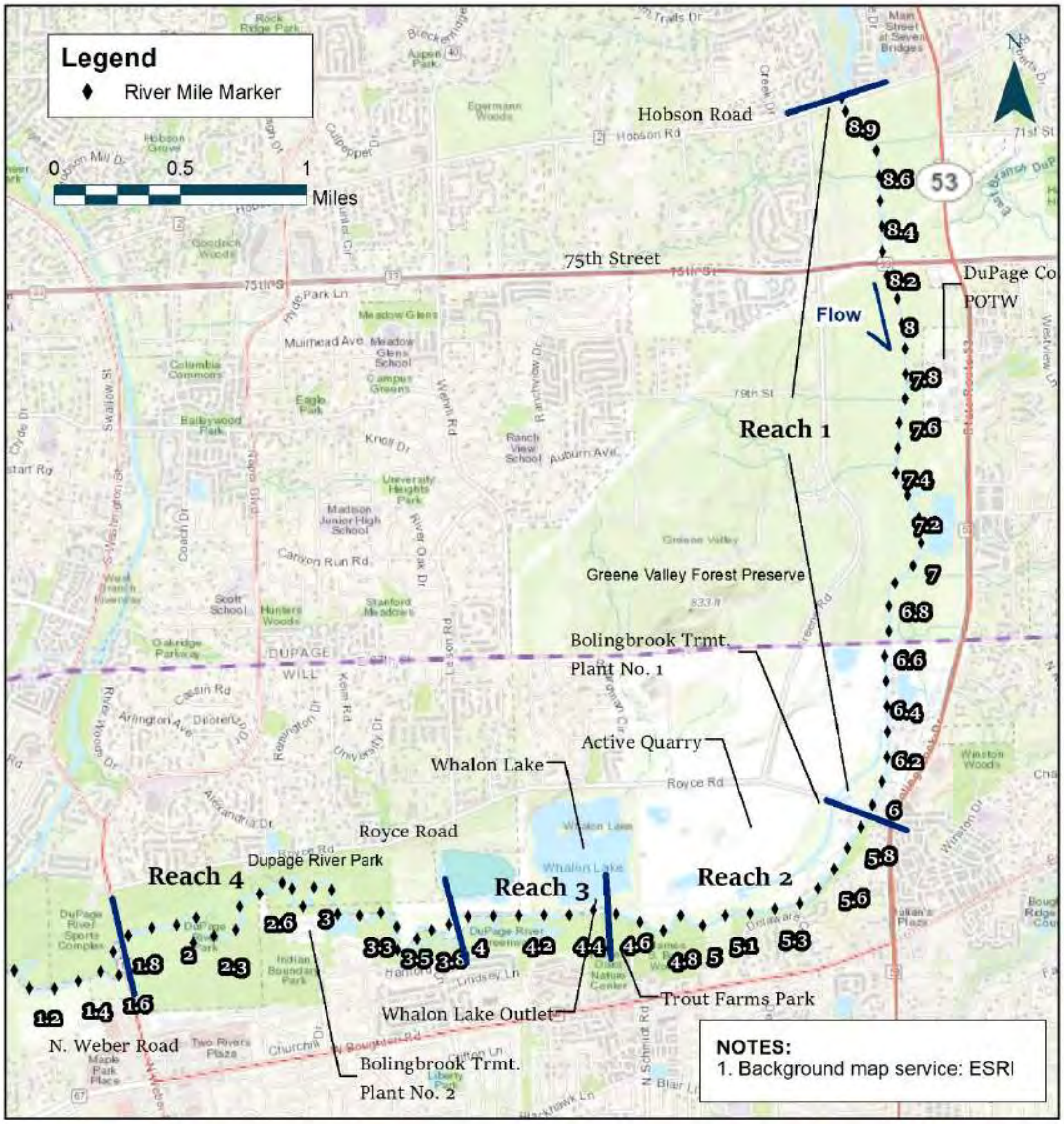

Figure 1. Project area location. River mile markers begin with 0.0 at the confluence of the East Branch with the West Branch.

3.2 LANDSCAPE CONTEXT

The project area's geology is dominated by the advance and retreat of the glaciers responsible for forming the Great Lakes during the Wisconsin Glaciation. Near the end of this period, advances and retreats of the Lake Michigan lobe left a series of terminal moraines throughout the majority of the East Branch DuPage River Watershed (Figure 2). Together, these moraines are part of the West Chicago and Valparaiso morainal systems. The river and its tributaries formed valleys within low-lying portions of the moraines, draining to the western edge of the morainal complex.

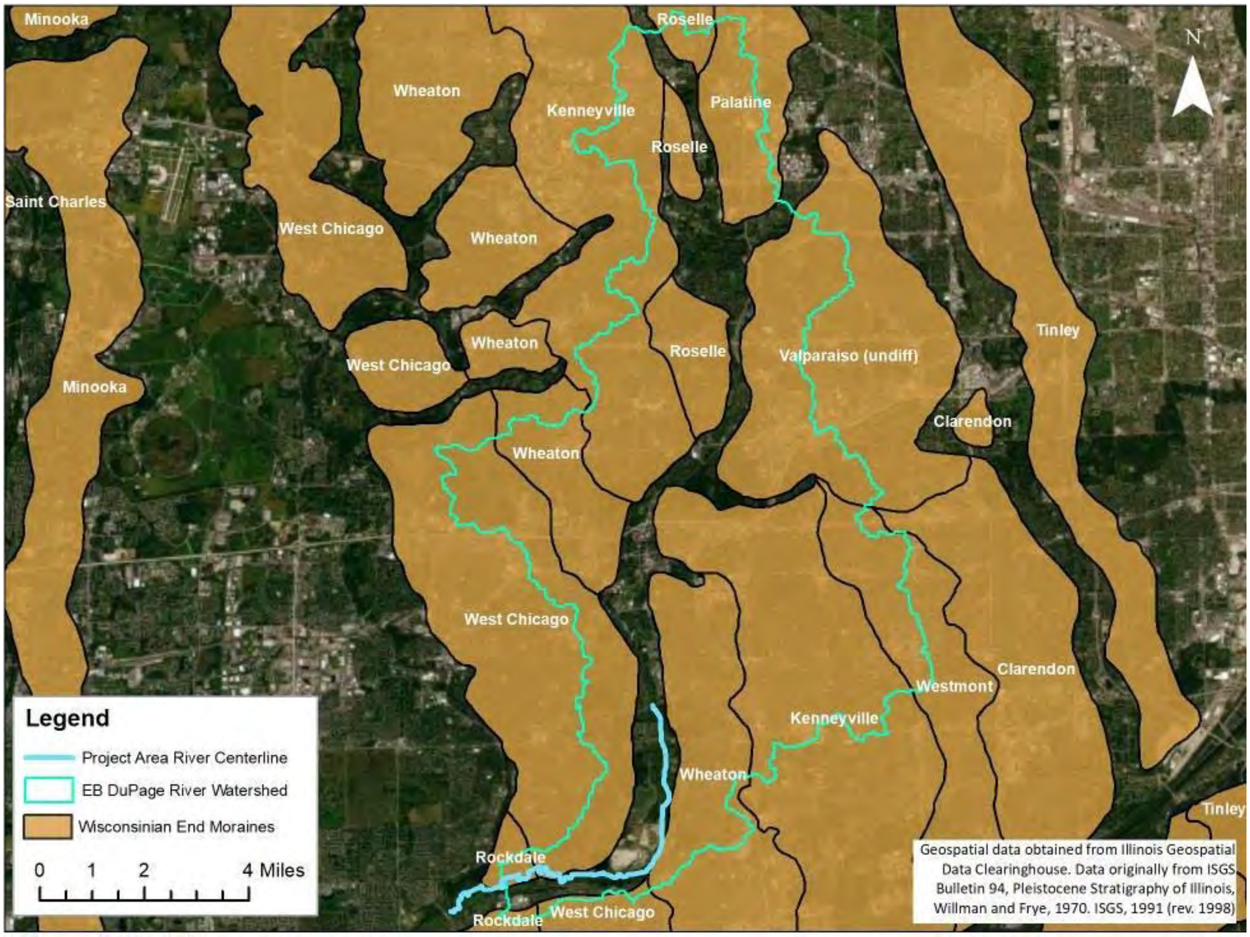

Figure 2. Map of end moraines within the East Branch DuPage River watershed. Glacial ice movement in the area was primarily to the northeast as glaciers receded.

The present-day East Branch DuPage River valley surficial geology is composed of Cahokia alluvium, a stratified formation of sand, silt, and clay less than five feet thick in much of the project area (Caron, 2017). The Henry Formation, a primarily sandy glacial outwash unit, is present along the valley margins, including in the areas surrounding the quarries north and west of the channel. Upland areas surrounding the valley are composed of the Wadsworth Formation, a thick till deposit associated with the West Chicago and Valparaiso terminal moraine systems (Figure 3).

Bedrock underlying the project area is composed of gently sloped Silurian dolomite and limestone Within the river valley, the depth to bedrock is generally less than 50 feet. Groundwater table elevations within the relatively shallow glacial deposits range from 650 to 625 feet in the project area. The regional slope of the groundwater potentiometric surface is to the east, although localized municipal and industrial groundwater pumping create a high-relief potentiometric surface within the watershed (Sasman et al., 1981).

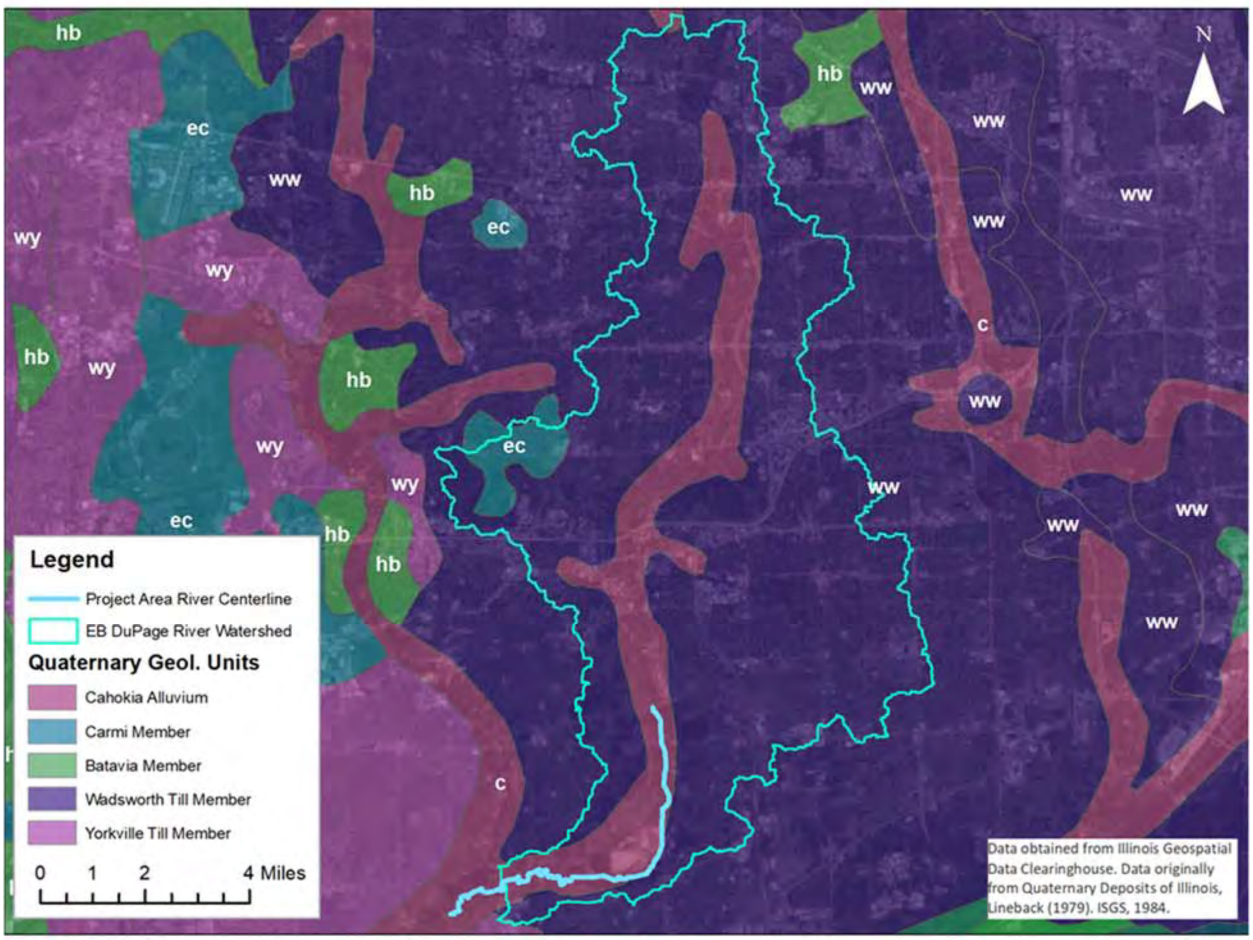

Figure 3. Map of generalized quaternary geology of the East Branch DuPage River Watershed

3.3 HYDROLOGY

Flow data for the East Branch DuPage River is available from the USGS gaging station located at the Royce Road bridge (USGS 05540250), which is located at the upstream end of the reaches which will be advanced to final design. The gage has a period of record dating from 1989 to the present day. We computed flood flow quantiles from annual peak flows using the USACE software package HEC-SSP Version 2.2 and USGS Bulletin 17C methodology. Peak flood discharge estimates are provided in Table 1.

Table 1. Peak flood estimates at USGS gage 05540250, located at Royce Road within the project area. The period of considered for analysis is 1989-2020.

Annual Exceedance Probability (%)	Average Recurrence Interval (years)	Estimated Peak Discharge at Royce Road Gage (cfs)
0.2	500	8,232
0.5	200	6,549
1	100	5,454
2	50	4,494
5	20	3,401
10	10	2,686
20	5	2,048
50	2	1,274
80	1.25	836
90	1.11	686
95	1.05	588
99	1.01	452

Inter-Fluve's analysis of annual peak flow data indicates the largest peak flow on record is 5,070 cfs, which occurred in 2013. The lowest recorded annual peak flow is 497 cfs, which occurred in 1989. Our analysis shows an increasing trend of peak flows at Royce Road since 1989, and the average annual rate of increase of annual peak flow between 1989 and 2020 is approximately 29 cfs per year. Urbanization and climate change both play a role in increasing peak flows (Aboelnour et al., 2020), and urbanization contributes to "flashy" flood hydrology in which flow peaks arrive more quickly, are greater in magnitude, and are shorter in duration than pre-urbanization conditions.

Analysis of daily mean flow records of the Royce Road gage indicates the East Branch DuPage River benefits from consistent baseflow exceeding 40 cfs, which is in part due to effluent from upstream wastewater treatment plants. The median flow in the river is 80 cfs. Flow is typically greatest in the spring and early summer and decreases in the fall and winter months.

Flood discharge estimates are also available for the East Branch DuPage River from the most recent Will County FEMA Flood Insurance Study (FIS; FEMA, 2019). FEMA peak discharge estimates for the East Branch DuPage River were made using the Illinois State Water Survey State Standard Method and regional equations and are shown in Table 2 (FEMA, 2019).

Table 2. FEMA FIS peak flood discharge estimates for the East Branch DuPage River at Royce Road

Annual Exceedance Probability (%)	Average Recurrence Interval (years)	FIS Estimated Peak Flow at Royce Road (cfs)
0.2	500	4,350
1	100	3,250
2	50	2,800
10	10	1,870

FEMA FIS mapping indicates the project area lies within the regulatory floodway. As such, the project is regulated by floodplain ordinances which stipulate that proposed activities do not result in an increase to the 1% flood elevation in any location.

3.4 HISTORICAL CONDITIONS

Inter-Fluve used historical images and maps of the project area to identify past locations and dimensions of the channel, floodplain characteristics, infrastructure, and land use. Prior to development of the watershed and floodplain, the river had a meandering single thread or multiple thread channel with a frequently inundated wetland floodplain.

Historical aerial photographs are available from the Will County and DuPage County GIS webpages, and we accessed historical topographic maps from the USGS Topoview database (USGS, 2021). USGS topographic maps show period of rapid channelization of the river. In 1923, the first year for which detailed mapping of the river is available, the reach upstream of Royce Road featured a meandering planform with an attendant floodplain wetland (USGS, 2021). The reach between Royce Road and the present-day Whalon Lake contained several more meanders not currently present along the river. By 1939, the first year for which aerial photographs are available, the reach upstream and downstream of Royce Road had been channelized to the present-day location of Trout Farm Park (Will County GIS, 2021). The meander bend downstream of Trout Farm Park was subsequently channelized between 1939 and 1954 (USGS, 2021).

The timing of channelization of the East Branch DuPage River corresponds to increasingly industrial and agricultural land uses within the river valley. In areas upstream of Royce Road, wetlands were mapped in 1923 (Figure 4); but by 1939, when the river is channelized, agricultural fields were present along much of the river. Quarries are first present on the 1954 topographic map along the west bank of the river, corresponding with channelization of meander bends downstream of Royce Road evident in aerial photos from 1947 (USGS, 2021; Will County, 2021).

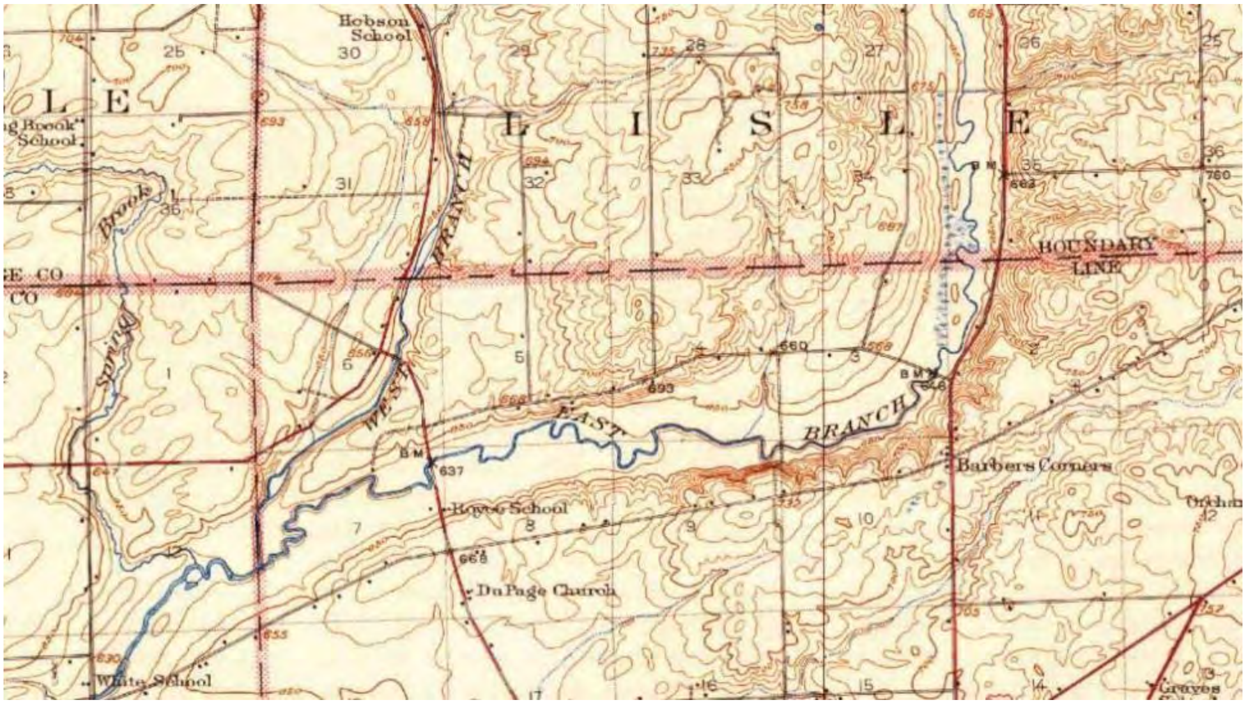

Figure 4. Excerpt from the 1923 USGS topographic map showing a relatively unaltered meandering river planform. The Royce Road crossing is shown just to the north of the Barbers Corners intersection.

To better discern changes to the planform and geometry of the channel, we digitized historical bank lines from the 1939 and 1970 aerial photo sets. Bank lines were manually digitized from georeferenced photos based on apparent waterline and vegetative indicators. In areas where indicators were unclear, we did not digitize bank lines. Uncertainties in the accuracy of digitization of historical geomorphic indicators exist as a result of photo resolution, georeferencing procedures, digitization scale, and physical variability of the indicators. In recognition of the myriad uncertainties, we offer a qualitative overview of channel change within the project area rather than a quantitative analysis.

The project area is remarkable for its relative lack of natural planform change between 1939 and 2020, even in reaches that had not been channelized. While the planform was relatively stable, the channel cross section appears to widen over the same time period. These trends are illustrated by a small area of the project reach shown in Figure 5. This area of channel, near the present-day DuPage River Trail parking lot, has widened appreciably since 1939. In 1939, the channel at riffle sections was approximately 50-55 feet wide. In 1970, riffle sections in this area were approximately 60-70 feet wide, and in 2020, they were approximately 80-90 feet wide. This progressive widening occurred without substantial migration of the channel’s meander planform.

Based on our understanding of the watershed, the observed trends of channel widening and planform stability are likely caused by two main factors. First, urbanization and climate change have resulted in increased peak flows, which in turn have resulted in an increase in channel capacity. Second, bank materials are primarily composed of fine-grained silt and clay, with relatively small fractions of coarse material. When banks do erode, the channel lacks the stream power necessary to transport the coarser gravels and cobbles, which settle at the bank toe, and finer materials are carried as suspended load far downstream. Thus, neither fraction forms the bars and bedforms that typically contribute to meander migration in other systems.

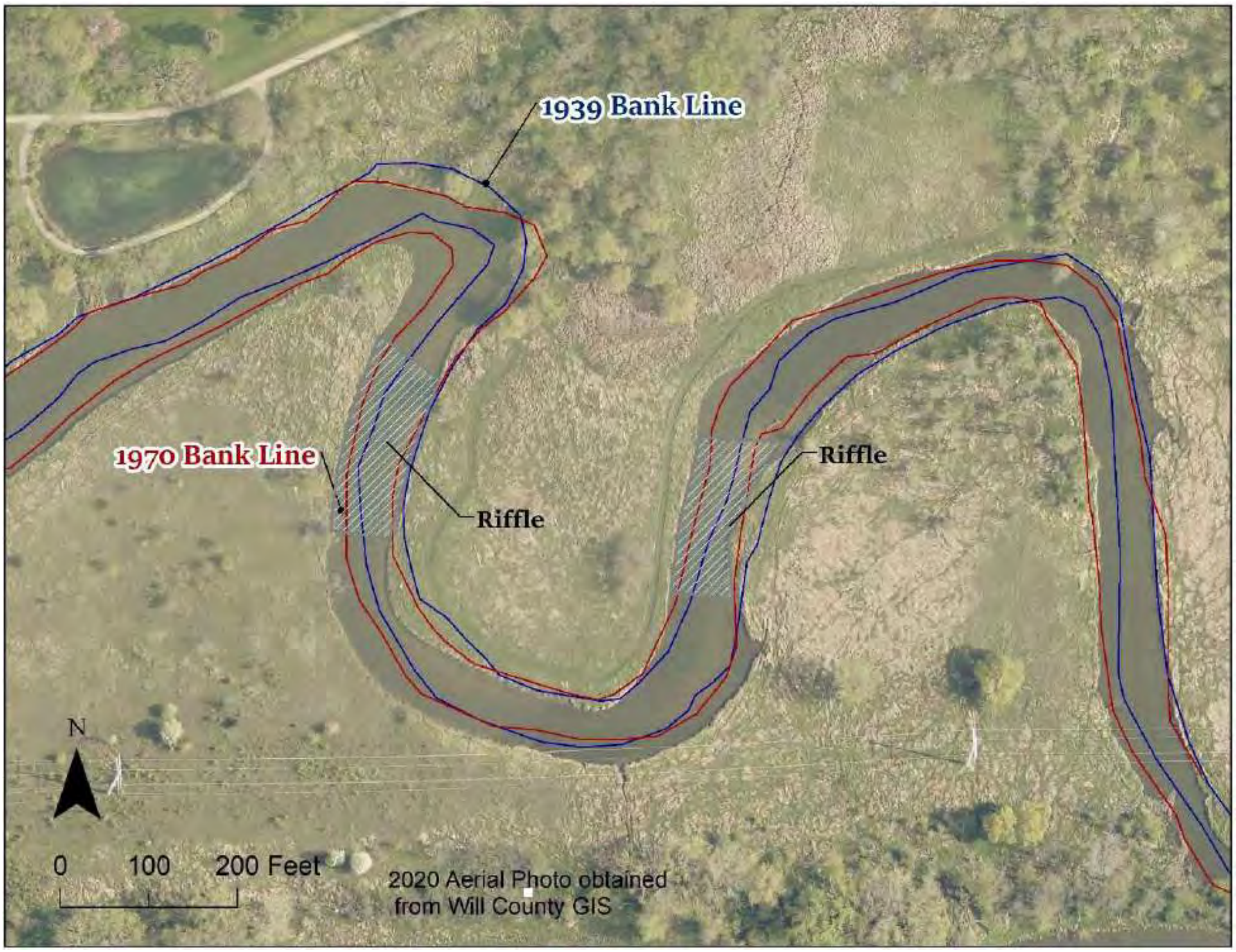

Figure 5. Image of the East Branch DuPage River overlain with historical bank lines digitized from 1939 and 1970 aerial photos. Map location is adjacent to the DuPage River Trail parking area on Royce Road (river mile 2.7 to 3.2). Approximate locations of riffles are shown.

3.5 TOPOGRAPHY/ BATHYMETRY SURVEY

The Inter-Fluve team collected topographic and bathymetric survey in the reach between Royce Road and Weber Road in September 2021. Flow was relatively uniform during the period of survey and approximated baseflow conditions. A HyDrone (Seafloor Systems, Inc.) equipped with a Hydrolite-TM single beam echosounder synced with RTK-GPS was used to obtain bathymetric survey of the channel in areas free of aquatic vegetation and with depths of at least one foot (Figure 6). Follow-up manual RTK-GPS surveys obtained bathymetric data in locations too shallow or otherwise inaccessible to the HyDrone. Topographic survey captured bank features, ground elevations within 50 feet of the channel, relevant utilities, trees, and infrastructure relevant to the project design.

Figure 6. Image of the HyDrone equipped with single-beam sonar and RTK-GPS equipment in operation upstream of Trout Farm Park

3.6 GEOMORPHIC ASSESSMENT

As described above, the East Branch DuPage River lies within an alluvial valley incised through a series of glacial end moraines. The river through the project area has been channelized over an approximately 5.2-mile stretch (i.e., 72% of the project area). Currently, industrial land uses, limestone quarries, and development encroach on the straightened channel over an approximately 2-mile reach (i.e, 28% of the project area). The valley is less confined and broader in historically less impacted reaches and where land has been preserved as park space, presently totaling approximately 5.2 miles (i.e., total of 72% of the project area). Effluent from wastewater treatment plants contributes to baseflow, and watershed urbanization leads to flashy flows following rain events. The river has a low gradient and steep banks. The floodplain and near bank vegetation communities are dominated by reed canary grass and spotted smartweed.

Inter-Fluve geomorphologists completed a reconnaissance geomorphic investigation of the project area between Hobson Road and Weber Road. Referenced river miles (RM) are approximate and correspond to those shown in Figure 1 and the accompanying concept design plans. For clarity, the project area is divided into the following four reaches:

- Reach 1: Hobson Road to Royce Road, in which the channel is entirely channelized;
- Reaches 2 and 3: Royce Road to a point approximately 1,900 feet downstream of the Whalon Lake outfall. This portion of the stream is predominantly channelized; and
- Reach 4: The downstream end of Reach 3 to Weber Road, in which the river has largely retained its historic meanders.

3.6.1 Reach 1: Hobson Road to Royce Road

In Reach 1, the East Branch DuPage River is channelized and flows through the Greene Valley Forest Preserve for approximately 2.3 miles (RM 8.9 to 6.6). Within the Forest Preserve, the river is bordered by wide floodplains, though these areas do not appear to be inundated frequently. For approximately 3,500 feet upstream of Royce Road, the river is bordered by industrial areas, including a large quarry owned by Elmhurst-Chicago Stone Company and leased to Vulcan Materials Company on river right. Several small tributaries and ditches, most of which were dry during field visits, enter the river in the reach. Flow enters from a pipe and ditch associated with Dupage County's Woodridge-Greene Valley Wastewater Facility (RM 7.7) on State Highway 53 downstream of 75th Street, and from a hydraulically connected pond downstream (south) of the wastewater facility (RM 7). During the field visit, substantial flow discharged from the quarry outfall approximately 4,500 feet upstream of Royce Road (RM 6.5) (Figure 7). Quarry discharge was cold (approximately 55° F), discharged through a marl (calcium carbonate) coated channel, and had a milky appearance, suggesting a suspended silt or clay load.

Between Hobson Road and the wastewater facility (RM 8.9 to 7.7), the channel banks are approximately 6 to 8 feet tall, with 2-4 feet of that height due to the presence of spoil berms left over from channel construction or clearing. Banks are predominantly vegetated with either shrubs or grasses. Banks vegetated with shrubs typically feature undercut banks with exposed gravel and cobble (D50 = 2 to 4 inches; Figure 8) at the toe. Areas with grassed banks are dominated by reed canary grass (*Phalaris arundinacea*) on the upper portions, spotted smartweed (*Persicaria maculosa*) on the lower banks, and generally are not undercut. Large woody debris is common along the stream banks throughout the reach.

Water depths during the field visit varied from approximately 3 inches over riffles to greater than 3 feet through runs and pools. Substrate material in the reach includes sand, gravel, and invasive clam shells, with some coarser material evident at riffles. Riffles are present at approximately 2,000-foot intervals between Hobson Road and the quarry outfall, downstream of which the channel bed displays undulating run-pool bedforms and generally deeper flow depths.

Figure 7. View of the Vulcan Materials quarry outfall upstream of Royce Road. Photo taken September 28, 2021.

Downstream of the wastewater facility at RM 7.7, channel widths range from 45 to 55 feet, and the banks are approximately 4 feet high, due to the absence of spoil berms. Relict meanders are present on the left (east) bank floodplain of the river upstream of the quarry outfall. One relict meander is particularly distinct on aerial photographs (RM 6.6), and it was discovered in the field that its banks, the channel bed, and associated riparian vegetation including mature cottonwood trees have been preserved.

Figure 8. Banks in Reach 1 are typically vegetated with trees and shrubs, undercut, and feature exposed gravel and cobble at the toe. Coarse toe material falls out of the upper banks, but the river lacks the energy to transport this material regularly.

3.6.2 Reaches 2 and 3: Royce Road to Whalon Lake

Reach 2 consists of the channelized portion of the East Branch Dupage River downstream of Royce Road, and extends for approximately 1.4 miles (RM 5.8 to 4.6). In this reach, the river is bounded by the DuPage River Trail and residential subdivisions on the left bank, and the Bolingbrook Sewage Treatment Plant No. 1 and the Vulcan Materials quarry on the right bank.

Reach 3 consists of approximately 0.5 miles of channelized river downstream of Trout Farm Park (RM 4.6 to 3.7). Downstream of Trout Farm Park, the left (south) bank is adjacent to a wide floodplain vegetated with box elder and reed canary grass. Several stormwater outfalls and small CMP culverts are present along the banks, though all were dry during the field visit. Whalon Lake discharges in two locations in Reach 3. The upstream, cascading outfall intermittently discharged during field visits (RM 4.5; Figure 9). The downstream outfall consists of culverts that outlet at river level and were not actively flowing during our field investigations (RM 4.3). Two inlets to floodplain channels are present on the left bank downstream of the

Whalon Lake culverts. The channels convey water through a wetland complex south of the main channel and re-enter the main channel around RM 3.7 at the downstream limit of Reach 3.

Figure 9. View of the upstream, cascading Whalon Lake outfall. The height of the hydraulic drop is approximately 8 feet.

Throughout Reaches 2 and 3, the right bank features a constructed berm 8 to 20 feet above the baseflow water surface that is vegetated with trees and shrubs. The left bank is generally lower through the reaches and ranges from 4 to 6 feet in height. The left bank is predominantly vegetated with reed canary grass and spotted smartweed, with pockets dominated by trees and shrubs. Banks are most commonly near vertical, although select areas feature lower, more mildly sloping vegetated depositional features within the bankfull channel. Throughout the reaches, a thick, resistant clay layer is exposed intermittently along the right bank toe.

Large woody debris is less common in Reaches 2 and 3 than in Reach 1, though several large log jams were observed, including at the mouths of the inlets to the floodplain channels. Where present, large woody debris can force split flow, control upstream water surface elevations, and force local aggradation and scour (Figure 10).

Figure 10. Example in Reach 2 of large woody debris forcing split flow and varied bedforms across the channel section

Water depths during the field visit range from approximately 3 inches at riffles to over 5 feet through runs and pools. Several areas where the river appears wider than average feature plane-bed conditions and shallow flow. Bed sediments in these areas consist of sand, gravel, and invasive clam shells. Riffles are present throughout the reach, specifically where large woody material constricts flow and in locations of stormwater outfalls. Elsewhere in the reach, bed sediments are comprised of silts, sand, and fine to medium gravel. Downstream of Trout Farm Park to the end of Reach 3, flow depths are deeper and fewer riffles are present than upstream areas.

3.6.3 Reach 4: Downstream End of Reach 3 to Weber Road

Reach 4 is a meandering portion of the river that has experienced the least amount of anthropogenic alteration. The river lies within a broad floodplain nearly exclusively vegetated with reed canary grass and bordered by suburban development and parkland. The downstream half of the reach flows through the DuPage River Park, and walking trails bound both sides of the river's valley. A pond on the left (south) side of the river (RM 3.2) has a hydraulic connection to the river, and several small pipes are present along the banks of the river. One of the outfalls carries discharge from the Bolingbrook Sewage Treatment Plant No. 2.

Banks in Reach 4 are approximately 6 feet high, near-vertical, and almost exclusively vegetated with reed canary grass and spotted smartweed. Riprap is present in some locations along the outside of river bends. The clay layer observed at the bank toe in upstream reaches is present along both banks over large stretches near the waterline.

The channel in Reach 4 is characterized by riffle-pool sequences, although the nature of the riffles and pool depths are variable over the course of the reach. In the upstream portion of the reach, pools at the outside of several meander bends are shallow; whereas in areas downstream, pool depths exceed 4 feet. Riffles in the reach have shallow flow depths at baseflow, and bed material consists of sand, gravel, and clam shells. One distinct riffle approximately 2,000 feet upstream of Weber Road (RM 3.1) is composed of coarser gravels, cobbles, and boulders. Although the origin of the coarse material is unknown, it is likely lag material derived from glacial deposits that form the banks of the river in some locations. Aquatic vegetation is common in shallower areas of the reach. Several fish spawning redds were present in shallow areas with sand and gravel substrates (Figure 11).

The floodplain throughout Reach 4 is wide, unconstrained, and predominantly vegetated with reed canary grass and scattered dead box elder and black ash trees. An important exception is the right (north) bank floodplain approximately 3,000 feet upstream of Weber Road, (RM 2.9) where a pocket of mature silver maple (*Acer saccharinum*) trees occupies a forested wetland. The floodplain in this area is 6 to 12 inches higher than surrounding areas. Large European black alder (*Alnus glutinosa*) trees, a non-native species, are growing in several locations along the bank with exposed roots in direct contact with the water line.

Figure 11. Fish spawning redd observed in Reach 3 during the field visit

4. Conceptual Design

The conceptual designs prepared by Inter-Fluve are shown on the accompanying plan set. The designs for Reaches 1 through 4 are intended to provide an overview of potential restoration work that could be implemented to meet the objectives set forth by the project partners. We understand Reach 1 (Hobson Road to Royce Road) designs will not be advanced to final design in the near-term. The concepts prepared for Reaches 2, 3, and 4 have been developed to meet the project's objectives and design criteria with the understanding that the work advanced to final design may be a subset of the work depicted in the conceptual design drawings. Two alternatives have been developed for Reach 3: one including a generous application of large wood to maximize ecological enhancement and another with reduced wood inclusion to fit a reduced budget. Costs are provided for each alternative.

4.1 DESIGN ELEMENTS

The design elements included in the conceptual designs can generally be broken down into four groupings: channel construction (including re-meandering), in-stream and floodplain large wood structures, in-stream habitat treatments, and revegetation. The following sections briefly describe the intent, significance, and relationships of the proposed work.

4.1.1 Channel Construction

Earthwork using heavy machinery to construct a re-meandered river and wetland areas is an intensive option to re-establish river processes in heavily impacted reaches. Meander restoration is limited to areas where adequate space is available.

Reach 1: In Reach 1 (Hobson Road to Royce Road), the proposed planform of the river follows the historical alignment of the river observed in the 1923 USGS topographic map of the area (USGS, 1923). The river cross section would be designed as a low-gradient, single-thread, unconfined wetland river with an accessible floodplain that is inundated every 1 to 1.5 years. The existing channel would be filled with earthwork spoils, roughened, and stabilized with large wood then planted with shrubs and trees to minimize the risk of avulsion. The river has relatively low energy during floods, and additional stabilization of the banks would not be necessary except at bridge crossings or near other sensitive infrastructure.

Reach 3: Re-meandering in Reach 3 is intended to restore more natural river processes to what is currently a channelized, entrenched reach. The proposed planform in Reach 3 is intended to maintain critical hydraulic connections to Whalon Lake, provide sediment transport continuity and geomorphic stability, and maximize habitat improvements in the reach. Where allowable channel movement is limited by infrastructure constraints, such as at the upstream end of the reach, an armored bank consisting of a stone toe and bioengineered materials would be constructed. Existing floodplain channels are utilized within the planform design to reduce the amount of excavation, and new side channels are included to add habitat complexity. Wetland restoration are shown in presently low-lying areas of the floodplain. The design would allow for proposed channels to be constructed off-line in order to let bank and riparian vegetation establish for one growing season before hydraulically connecting the channel. The construction approach will be finalized in the next design phase.

4.1.2 Large Wood

We propose a number of large wood structures (LWS) throughout the project area within the river channel, on banks, and on floodplain surfaces. The design life of wood structures is dependent on the rot resistance of the wood used, and also the degree to which the wood is exposed to the air. Fully submerged wood can last indefinitely, but floodplain roughness elements, exposed to wet and dry cycles, will have a design life of 10 to 15 years. Such floodplain elements serve their function of providing short term avulsion and erosion protection, and those functions are then replaced by native vegetation. Because of the river’s consistent baseflow, the proposed in-stream habitat and bank stabilization large wood treatments will be partially inundated. For such structures as the large wood cribs described below, the lower portion of the structure will last indefinitely, while the upper parts above base flow will slowly degrade and be replaced by woody plant root systems. Each large wood structure has a specific function and construction requirements, which are briefly discussed here.

Rootwads, log piles, and logs for LWS may be sourced from within the grading limits of the project and from nearby road construction or development projects. The potential for salvage and the extent of wood import will be investigated more fully in the next design phase.

A number of options are available for ballasting and securing LWS. The most common ballasting methods are log piles driven into the ground and boulders attached to the structures (which may be buried). Connections between logs, or logs and boulders may consist of threaded rod, cables, chain, or other materials.

We propose four main applications of large wood throughout the project area:

- *Large Wood Crib Structures*: These robust structures are constructed where banks must be immobile over the long-term to provide complexity at the channel margins. Logs are crossed over one another in layers, and the structures are filled with slash, and gravel or cobble (Figure 12). Banks can be constructed on top of the structures using bioengineering methods and are seeded and planted. These would be used primarily in sections where the new river crosses the existing channel to be filled.
- *Bank Large Wood Structures (LWS):* These are large wood structures constructed into stream banks to provide aquatic and riparian habitat (Figure 13). Rootwads can be used to encourage scour and maintain pools and to provide cover for fish. Bank LWS can be arranged to produce patterns of local deposition and scour that mimic natural processes observed throughout the project area. Bank LWS also can be used to define and maintain channel inlets or outlets, and to provide hydraulic roughness within the channel.
- *Apex or Mid-channel LWS:* These structures are placed mid-channel to encourage flow splits and bedform complexity and to protect bars (Figure 14). Several examples of naturally-occurring apex jams exist in the project area. Low-profile mid-channel LWS would be located at proposed new flow splits and in plane-bed riffle areas where existing bedform complexity and habitat value is low.
- *Floodplain/Wetland LWS:* These structures placed in wetland and floodplain areas serve several purposes. Where existing channels would be filled as a part of re-meander work, they would provide hydraulic roughness, mimicking that of a floodplain forest and preventing avulsion. Structures elsewhere on the floodplain and in wetlands would mimic naturally occurring downed wood and provide habitat to a number of aquatic, amphibious, and terrestrial species (Figure 15).

Figure 12. Large wood crib structures, Sheboygan River, Wisconsin. During (left) and two years after construction (right).

Figure 13. Bank large wood structure, Cowlitz River, Washington. Five years after construction.

Figure 14. Example of an apex bar jam

Figure 15. Floodplain wetlands with large wood, Eel River, Massachusetts. Three years after construction.

4.1.3 Habitat Features

Constructed habitat features directly provide specific habitat types for specific species. Terrestrial features may include bird and bat nesting boxes or perching areas, snake hibernacula and herptile habitats, or turtle nesting areas and basking logs. These habitat features can be a la carte options and included as site conditions and project budget allow.

A specific habitat feature included in the conceptual design is a heron and/or egret rookery. These features consist of whole standing snags harvested and anchored in isolated island features between side channels. The intent is to recreate critical nesting habitat for these birds, which is typically found on islands where egg predation is minimized. Over decades, trees planted nearby the rookeries as a part of the project would be large enough to support nesting habitat and replace the constructed perches.

Within the river channel, boulders placed on existing sand/gravel riffles would provide the complexity and flow diversity sought by many species of fish. Boulders would maintain local scour and could be arranged in groupings at specific elevations to produce desired local hydraulic conditions.

4.1.4 Plantings

A crucial element of any restoration project is the revegetation plan. The vegetation communities installed must be appropriately matched to the site's hydrologic, climatic, and soil conditions, and be designed to provide maximum habitat benefits over the long term.

Much of the project area is floodplain dominated by reed canary grass in relatively higher areas and spotted smartweed nearer the water line. In sparse areas generally about 1 foot higher than the surrounding land surface, floodplain forests composed of silver maple and cottonwood are present, and provide shade, woody debris, and canopy cover in the floodplain. Where possible and as costs allow, we propose to plant native genotypes of cottonwood, silver maple, and black willow on floodplain and in riparian areas. These trees would provide a source of large wood recruitment to the river, compete against reed canary grass and buckthorn, and provide habitat within the floodplain. Native seed and shrubs would be planted in the areas between trees.

Lower-lying areas within the floodplain would be planted to recreate shrub-carr or wet meadow wetland communities. Although species selection would occur at final design, shrub-carr areas would likely consist of willows, dogwoods, and appropriate berry-producing shrubs to provide forage for birds. Diverse and pollinator-friendly grasses and forbs would be selected to support insect communities within the project area.

Invasive species control will critical to the success of revegetation efforts. The extent and nature of planted areas should be designed such that planted species are not out-competed by reed canary grass, phragmites, or hybridized cattail after the end of the project's vegetation management period. Species selection and long-term management will be carefully considered during final design.

5. Options Assessment

5.1 HABITAT ENHANCEMENT

Inter-Fluve evaluated the proposed conceptual designs with the Qualitative Habitat Evaluation Index (QHEI) at the reach scale to estimate the habitat benefits that would be provided. Table 3 summarizes our estimate of sub-group and total QHEI scores for each project reach under existing and proposed conditions. The "narrative change" category is based the narrative classification for each subgroup per grouping information provided by DSRCW.

As shown in Table 3, "intensive" work consisting of channel re-meandering, large wood installation, and diverse riparian vegetation planting would substantially increase the Instream Cover and Channel Morphology sub-group scores, in addition to the overall QHEI scores. In Reaches 1 and 3, the overall habitat condition would change from Poor/Fair to Good/Excellent. These improvements are designed to be self-sustaining over time given the climate, hydrology, and geomorphic processes of the river, and would result in reach-scale changes.

"Extensive" habitat improvement work such as boulder and large wood placement is predicted to have a lesser influence on the habitat quality within channelized and naturally meandering sections of river. In these segments (Reaches 2 and 4), modest improvements of 6 to 8 points would be realized to instream cover. Very minor improvements to bedforms and channel morphology would be expected. These treatments would create or add complexity to small areas (e.g., maintaining a pool) but would not address impacts to broader river processes or improve overall QHEI categorization.

Table 3. Comparison of QHEI sub-group scores and relative change between existing conditions and those proposed in the concept designs

Reach 1 (RM 8.9 to RM 6.6)				
QHEI Sub-Group	**Existing**	**Proposed**	**Score Change**	**Narrative Change**
Substrate	14	14	0	Fair/No Change
Instream Cover	9	16	7	Poor to Good
Channel Morphology	7	18	11	Poor to Excellent
Riparian Zone	10	10	0	Excellent/No Change
Pool/Glide	9	11	2	Fair to Fair/Good
Riffle/Run	3.5	5.5	2	Poor to Fair/Good
Gradient	6	6	0	Poor/No Change
TOTAL	**58.5**	**80.5**	**22**	**Fair to Good**

Reach 2 (RM 5.8 to RM 4.6)				
QHEI Sub-Group	**Existing**	**Proposed**	**Score Change**	**Narrative Change**
Substrate	16	16	0	Good/No Change
Instream Cover	10	16	6	Fair to Good
Channel Morphology	7	7	0	Poor/No Change
Riparian Zone	5	5	0	Fair/No Change
Pool/Glide	10	10	0	Good/No Change
Riffle/Run	5	6	1	Fair to Good
Gradient	4	4	0	Poor/No Change
TOTAL	**57**	**64**	**7**	**Fair/No Change**

Reach 3 (RM 4.6 to RM 3.7)				
QHEI Sub-Group	**Existing**	**Proposed**	**Score Change**	**Narrative Change**
Substrate	12	14	2	Fair/No Change
Instream Cover	7	20	13	Poor to Excellent
Channel Morphology	6	18	12	Poor to Excellent
Riparian Zone	8.5	10	1.5	Excellent/No Change
Pool/Glide	8	11	3	Fair to Good
Riffle/Run	2	5	3	Poor to Fair
Gradient	4	4	0	Poor/No Change
TOTAL	**47.5**	**82**	**34.5**	**Poor to Good**

Reach 4 (RM 3.7 to RM 1.8)				
QHEI Sub-Group	**Existing**	**Proposed**	**Score Change**	**Narrative Change**
Substrate	16	16	0	Good/No Change
Instream Cover	7	15	8	Poor to Good
Channel Morphology	15	16	1	Good/No Change
Riparian Zone	10	10	0	Excellent/No Change
Pool/Glide	10	10	0	Fair/No Change
Riffle/Run	4	4	0	Fair/No Change
Gradient	4	4	0	Poor/No Change
TOTAL	**66**	**75**	**9**	**Fair to Fair/Good**

5.2 ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COSTS

An engineer's opinion of probable construction cost (EOPCC) for each reach is provided in Appendix A. We estimated lump sum and unit costs based on review of construction costs for similar items in past projects and applicable reference cost data. The actual implemented cost may vary from these estimates as a result of market factors, detailed design development, or other factors.

We recognize that the total estimated cost of the work for Reaches 2, 3, and 4, which are being advanced to final design, would exceed DRSCW's current construction budget of approximately $3.5M. Based on feedback from stakeholders, we have developed a second alternative for Reach 3 to accommodate this current budget restriction. Both alternatives are included in the accompanying plan set and the cost estimates in Appendix A.

It is important to note that the design concepts are intended to be a menu to aid selection of the scope for final design and to assist future project planning. This project would be an excellent candidate for a phased construction approach, and the attached EOPCCs can be modified to fit this approach as needed. Large wood, floodplain vegetation, and in-stream work extents can be tailored to meet budget needs similar to what has been done for Reach 3. Additionally, mobilization, erosion control, and other incidental project costs would be reduced if work in separate reaches was consolidated under a single construction contract.

We made several assumptions during the development of construction cost estimates. Key assumptions include:

- Excavated material from channel re-meandering will be reused on site, and no off-site disposal will be required;
- Utilities relocations will be not be required; and
- Working in the wet will be allowed.

Design, permitting, and construction observation costs are not included in the EOPCCs. We applied a contingency of 30% to account for uncertainty associated with bidding and the construction process, uncertainty or future changes in unit costs, and scope or design changes that may arise during the design process or as a result of permit conditions. All costs are reported in 2022 US dollars.

6. References

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Appendix A – Cost Estimates

East Branch DuPage River
Concept-Level Cost Estimate
Reach 1: Hobson Road to Royce Road
January 2022

Item #	Item	Unit	Quantity	Unit Cost	Sub total	Notes
1	**PRELIMINARIES**					
1.1	MOBILIZATION, SITE ACCESS, AND STAGING	LUMP	1	$ 680,000	$ 680,000	Assumes 10% of total construction cost, rounded to the nearest thousand. Includes insurance, bonds, mobilization, onsite facilities, site access, demobilization, as-builts, etc.
1.2	EROSION, SEDIMENT, AND POLLUTION CONTROL	LUMP	1	$ 204,000	$ 204,000	Assumes 3% of total construction cost
				SUBTOTAL	**$ 884,000**	
2	**CHANNEL CONSTRUCTION**					
2.1	CONTROL OF WATER	LUMP	1	$ 300,000	$ 300,000	
2.2	CLEARING	ACRE	7	$ 8,000	$ 56,000	Assumes approx. 25% of proposed channel area requires clearing. Includes stockpiling wood and slash for reuse.
2.3	CHANNEL EXCAVATION AND FILL	CY	200,000	$ 18	$ 3,600,000	Includes rough grade, hauling, stockpiling, filling existing channel, and fine grading. Assumes topsoil salvage/respread.
2.4	GROUNDWATER GALLERY GRAVEL/SAND MIXTURE	CY	1,000	$ 70	$ 70,000	Assumes mix of sand and gravel with spec'd hyd. conductivity
				SUBTOTAL	**$ 4,026,000**	
3	**LARGE WOOD & HABITAT FEATURES**					
3.1	LARGE WOOD CRIB STRUCTURE	LF	1,500	$ 660	$ 990,000	Includes wood procurement, storage, handling, and installation. Includes all connections. Includes bank construction.
3.2	APEX LARGE WOOD STRUCTURES	EACH	2	$ 5,500	$ 11,000	Includes wood procurement, storage, handling, and installation. Includes all connections and pile installation.
3.3	BANK LARGE WOOD STRUCTURES	EACH	75	$ 4,650	$ 348,750	Includes wood procurement, storage, handling, and installation. Includes all connections and pile installation.
3.4	FLOODPLAIN LARGE WOOD STRUCTURES	EACH	95	$ 3,700	$ 351,500	Includes wood procurement, storage, handling, and installation. Includes all connections and pile installation.
3.5	HABITAT BOULDERS	EACH	115	$ 300	$ 34,500	
3.5	MISC. HABITAT FEATURES	LUMP	1	$ 50,000	$ 50,000	Allowance for misc. features such as turtle nesting areas, bird houses, microtopography, etc.
				SUBTOTAL	**$ 1,785,750**	
4	**REVEGETATION**					
4.1	RIPARIAN/FLOODPLAIN ZONE REVEGETATION	ACRE	45	$ 14,500	$ 652,500	Includes site prep, planting and seeding, deer/rodent protection, and 3-yr maintenance
4.2	WETLAND ZONE REVEGETATION	ACRE	5	$ 14,000	$ 70,000	Includes site prep, planting and seeding, deer/rodent protection, and 3-yr maintenance
				SUBTOTAL	**$ 722,500**	
5	**RECREATION**					
5.1	NEW CANOE LAUNCH	EACH	1	$ 10,000	$ 10,000	
5.2	RELOCATED PEDESTRIAN TRAIL	LUMP	1	$ 100,000	$ 100,000	Relocated portion of path is approximately 1,160 ft long.
5.3	NEW PEDESTRIAN BRIDGE	LUMP	1	$ 150,000	$ 150,000	
				SUBTOTAL	**$ 260,000**	

Rounded Subtotal	**$ 7,678,300**
30% Contingency	**$ 2,303,500**
Construction Total	**$ 9,981,800**
AACE Class 4 Cost Range (-20% to +40%)	
Construction Total (Min)	**$ 7,985,500**
Construction Total (Max)	**$ 13,974,600**

East Branch DuPage River
Concept-Level Cost Estimate
Reach 2: Royce Road to Trout Farm Park
January 2022

Item #	Item	Unit	Quantity	Unit Cost	Sub total	Notes
1	MOBILIZATION, SITE ACCESS, AND STAGING	LUMP	1	$ 30,000	$ 30,000	Includes insurance, bonds, mobilization, onsite facilities, site access, demobilization, as-builts, etc.
2	EROSION, SEDIMENT, AND POLLUTION CONTROL	LUMP	1	$ 5,000	$ 5,000	
3	CONTROL OF WATER	LUMP	1	$ 5,000	$ 5,000	
4	MID CHANNEL LARGE WOOD STRUCTURES	EACH	2	$ 5,600	$ 11,200	Includes wood procurement, storage, handling, and installation. Includes all connections and pile installation.
5	BANK LARGE WOOD STRUCTURES	EACH	4	$ 5,400	$ 21,600	Includes wood procurement, storage, handling, excavation, and installation. Includes all connections and pile installation.
6	HABITAT BOULDERS	EACH	30	$ 300	$ 9,000	
7	RIPARIAN/FLOODPLAIN ZONE REVEGETATION	ACRE	1.5	$ 14,500	$ 21,750	Includes site prep, planting and seeding, deer/rodent protection, and 3-yr maintenance
8	RECONSTRUCT CANOE LAUNCH	EACH	1	$ 10,000	$ 10,000	

Rounded Subtotal	**$ 113,600**
30% Contingency	**$ 34,100**
Construction Total	**$ 147,700**
AACE Class 4 Cost Range (-20% to +40%)	
Construction Total (Min)	**$ 118,200**
Construction Total (Max)	**$ 206,800**

East Branch DuPage River
Concept-Level Cost Estimate
Reach 3: Trout Farm Park to Whalon Lake - Alternative 1
January 2022

Item #	Item	Unit	Quantity	Unit Cost	Sub total	Notes
1	**PRELIMINARIES**					
1.1	MOBILIZATION, SITE ACCESS AND STAGING	LUMP	1	$ 366,000	$ 366,000	Assumes 10% of total construction cost, rounded to the nearest thousand. Includes insurance, bonds, mobilization, onsite faciliities, site access, demobilization, as-builts, etc.
1.2	EROSION, SEDIMENT, AND POLLUTION CONTROL	LUMP	1	$ 110,000	$ 110,000	Assumes 3% of total construction cost
				SUBTOTAL	**$ 476,000**	
2	**CHANNEL CONSTRUCTION**					
2.1	CONTROL OF WATER	LUMP	1	$ 200,000	$ 200,000	
2.2	CLEARING	ACRE	2	$ 8,000	$ 16,000	Assumes approx. 25% of proposed channel area requires clearing.
2.3	CHANNEL EXCAVATION AND FILL	CY	75,000	$ 18	$ 1,350,000	Includes rough grade, hauling, stockpiling, filling existing channel, and fine grading. Assumes topsoil salvage/respread.
2.4	BIOENGINEERED BANK	LF	900	$ 200	$ 180,000	
2.5	GROUNDWATER GALLERY GRAVEL/SAND MIXTURE	CY	2,600	$ 70	$ 182,000	Assumes mix of sand and gravel with spec'd hyd. conductivity
				SUBTOTAL	**$ 1,928,000**	
3	**LARGE WOOD & HABITAT FEATURES**					
3.1	LARGE WOOD CRIB STRUCTURE	LF	1,250	$ 660	$ 825,000	Includes wood procurement, storage, handling, and installation. Includes all connections. Includes bank construction.
3.2	APEX LARGE WOOD STRUCTURES	EACH	1	$ 5,600	$ 5,600	Includes wood procurement, storage, handling, and installation. Includes all connections and pile installation.
3.3	BANK LARGE WOOD STRUCTURES	EACH	40	$ 4,650	$ 186,000	Includes wood procurement, storage, handling, and installation. Includes all connections and pile installation.
3.4	FLOODPLAIN LARGE WOOD STRUCTURES	EACH	30	$ 3,700	$ 111,000	Includes wood procurement, storage, handling, and installation. Includes all connections and pile installation.
3.5	WHOLE TREES - HERON/OSPREY ROOKERY	EACH	17	$ 4,000	$ 68,000	Includes wood procutrement, storage, handling, connections, and installation.
3.6	MISC. HABITAT FEATURES	LUMP	1	$ 50,000	$ 50,000	Allowance for misc. features such as turtle nesting areas, bird houses, microtopography, etc.
				SUBTOTAL	**$ 1,195,600**	
4	**REVEGETATION**					
4.1	RIPARIAN/FLOODPLAIN ZONE REVEGETATION	ACRE	27	$ 14,500	$ 391,500	Includes site prep, planting and seeding, deer/rodent protection, and 3-yr maintenance
4.2	WETLAND ZONE REVEGETATION	ACRE	10	$ 14,000	$ 140,000	Includes site prep, planting and seeding, deer/rodent protection, and 3-yr maintenance
				SUBTOTAL	**$ 531,500**	

Rounded Subtotal	**$ 4,131,100**
30% Contingency	**$ 1,239,400**
Construction Total	**$ 5,370,500**
AACE Class 4 Cost Range (-20% to +40%)	
Construction Total (Min)	**$ 4,296,400**
Construction Total (Max)	**$ 7,518,700**

East Branch DuPage River
Concept-Level Cost Estimate
Reach 3: Trout Farm Park to Whalon Lake - Alternative 2
January 2022

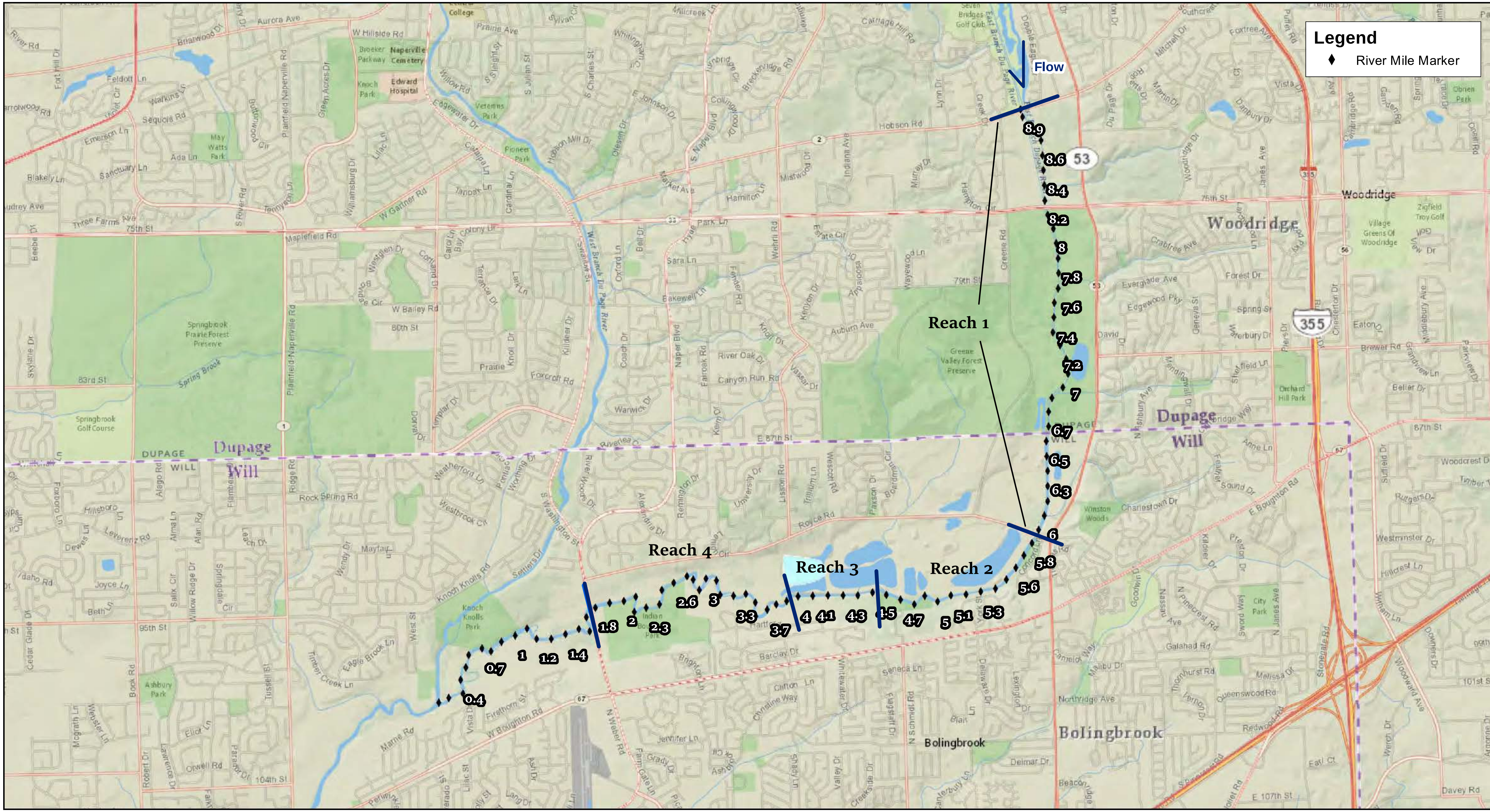
Item #	Item	Unit	Quantity	Unit Cost	Sub total	Notes
1	**PRELIMINARIES**					
1.1	MOBILIZATION, SITE ACCESS AND STAGING	LUMP	1	$ 311,000	$ 311,000	Assumes 10% of total construction cost, rounded to the nearest thousand. Includes insurance, bonds, mobilization, onsite facilitities, site access, demobilization, as-builts, etc.
1.2	EROSION, SEDIMENT, AND POLLUTION CONTROL	LUMP	1	$ 94,000	$ 94,000	Assumes 3% of total construction cost
				SUBTOTAL	**$ 405,000**	
2	**CHANNEL CONSTRUCTION**					
2.1	CONTROL OF WATER	LUMP	1	$ 100,000	$ 100,000	Assumes entirely offline construction and min. 1 growing season of veg. establishment along proposed channel prior to routing flow. Limited cofferdam construciton and local dewatering required. Includes turbidity curtain and BMPs.
2.2	CLEARING	ACRE	2	$ 8,000	$ 16,000	Assumes approx. 25% of proposed channel area requires clearing.
2.3	CHANNEL EXCAVATION AND FILL	CY	75,000	$ 18	$ 1,350,000	Includes rough grade, hauling, stockpiling, filling existing channel, and fine grading. Assumes topsoil salvage/respread.
2.4	BIOENGINEERED BANK	LF	1,500	$ 200	$ 300,000	Assumes combination of stone toe and FES Lifts
2.5	GROUNDWATER GALLERY GRAVEL/SAND MIXTURE	CY	2,600	$ 70	$ 182,000	Assumes mix of sand and gravel with spec'd hyd. conductivity
				SUBTOTAL	**$ 1,948,000**	
3	**LARGE WOOD & HABITAT FEATURES**					
3.1	LARGE WOOD CRIB STRUCTURE	LF	600	$ 660	$ 396,000	Includes wood procurement, storage, handling, and installation. Includes all connections. Includes bank construction.
3.2	APEX & MID CHANNEL LARGE WOOD STRUCTURES	EACH	2	$ 5,600	$ 11,200	Includes wood procurement, storage, handling, and installation. Includes all connections and pile installation.
3.3	BANK LARGE WOOD STRUCTURES	EACH	20	$ 4,650	$ 93,000	Includes wood procurement, storage, handling, and installation. Includes all connections and pile installation.
3.4	FLOODPLAIN LARGE WOOD STRUCTURES	EACH	25	$ 3,700	$ 92,500	Includes wood procurement, storage, handling, and installation. Includes all connections and pile installation.
3.5	WHOLE TREES - HERON/OSPREY ROOKERY	EACH	5	$ 4,000	$ 20,000	Includes wood procutrement, storage, handling, connections, and installation.
3.6	MISC. HABITAT FEATURES	LUMP	1	$ 50,000	$ 50,000	Allowance for misc. features such as turtle nesting areas, bird houses, microtopography, etc.
				SUBTOTAL	**$ 662,700**	
4	**REVEGETATION**					
4.1	TEMPORARY SEEDING	LUMP	1	$ 10,000	$ 10,000	Seeding for temporary stockpiles, access roads, etc. Stockpile seeding is while channel is off line.
4.1	RIPARIAN/FLOODPLAIN ZONE REVEGETATION	ACRE	23	$ 14,500	$ 333,500	Includes site prep, planting and seeding, deer/rodent protection, and 3-yr maintenance
4.2	WETLAND ZONE REVEGETATION	ACRE	11	$ 14,000	$ 154,000	Includes site prep, planting and seeding, deer/rodent protection, and 3-yr maintenance
				SUBTOTAL	**$ 497,500**	

Rounded Subtotal	**$ 3,513,200**
30% Contingency	**$ 1,054,000**
Construction Total	**$ 4,567,200**
AACE Class 4 Cost Range (-20% to +40%)	
Construction Total (Min)	**$ 3,653,800**
Construction Total (Max)	**$ 6,394,100**

East Branch DuPage River
Concept-Level Cost Estimate
Reach 4: Whalon Lake to Washington Street
January 2022

Item #	Item	Unit	Quantity	Unit Cost	Sub total	Notes
1	MOBILIZATION, SITE ACCESS AND STAGING	LUMP	1	$ 100,000	$ 100,000	Assumes 15% of total construction cost, rounded to the nearest thousand. Includes insurance, bonds, mobilization, onsite faciliities, site access, demobilization, as-builts, etc.
2	EROSION, SEDIMENT, AND POLLUTION CONTROL	LUMP	1	$ 21,000	$ 21,000	Assumes 3% of total construction cost
3	CONTROL OF WATER	LUMP	1	$ 10,000	$ 10,000	
4	LARGE WOOD CRIB STRUCTURE	LF	450	$ 660	$ 297,000	Includes wood procurement, storage, handling, and installation. Includes all connections. Includes bank construction.
5	BANK LARGE WOOD STRUCTURES	EACH	8	$ 5,400	$ 43,200	Includes wood procurement, storage, handling, and installation. Includes all connections and pile installation.
6	HABITAT BOULDERS	EACH	45	$ 300	$ 13,500	
7	RIPARIAN/FLOODPLAIN ZONE REVEGETATION	ACRE	10	$ 14,500	$ 145,000	Includes site prep, planting and seeding, deer/rodent protection, and 3-yr maintenance
8	WETLAND ZONE REVEGETATION	ACRE	11	$ 14,000	$ 154,000	Includes site prep, planting and seeding, deer/rodent protection, and 3-yr maintenance
9	POND GRADE CONTROL	LUMP	1	$ 3,000	$ 3,000	Assumes rock grade control structure to base flow elevation
10	NEW CANOE LAUNCH	EACH	1	$ 10,000	$ 10,000	

Rounded Subtotal	**$ 796,700**
30% Contingency	**$ 239,100**
Construction Total	**$ 1,035,800**
AACE Class 4 Cost Range (-20% to +40%)	
Construction Total (Min)	**$ 828,700**
Construction Total (Max)	**$ 1,450,200**



DuPage River Salt Creek Workgroup

inter-fluve

N

Miles
0 0.5 1

NOTES:
1. Background map service: ESRI
2. River Mile stationing relative to the confluence of East Branch DuPage River and West Branch DuPage River.

East Branch Dupage River
DuPage Co. & Will Co., Illinois
Overview Map
Concept Design

DuPage River Salt Creek Workgroup

inter·fluve

N

Feet
0 250 500

NOTES:
1. See Inter-Fluve concept design report for descriptions of design features.
2. Aerial image, parcel, and road data from DuPage County GIS
3. River Mile stationing relative to the confluence of East Branch DuPage River and West Branch DuPage River.

East Branch Dupage River

DuPage Co., Illinois

Reach 1: Hobson Road to Royce Road

Concept Design

DuPage River Salt Creek Workgroup

inter·fluve

NOTES:
1. See Inter-Fluve concept design report for descriptions of design features.
2. Aerial image, parcel, and road data from DuPage County GIS
3. River Mile stationing relative to the confluence of East Branch DuPage River and West Branch DuPage River.

East Branch Dupage River
DuPage Co., Illinois
Reach 1: Hobson Road to Royce Road
Concept Design

DuPage River Salt Creek Workgroup

inter-fluve

N

Feet
0 250 500

NOTES:
1. See Inter-Fluve concept design report for descriptions of design features.
2. Aerial image, parcel, and road data from Will County GIS
3. River Mile stationing relative to the confluence of East Branch DuPage River and West Branch DuPage River.

East Branch Dupage River
Will Co., Illinois
Reach 2: Royce Road to Trout Farm Park
Concept Design

DuPage River Salt Creek Workgroup

inter·fluve

N

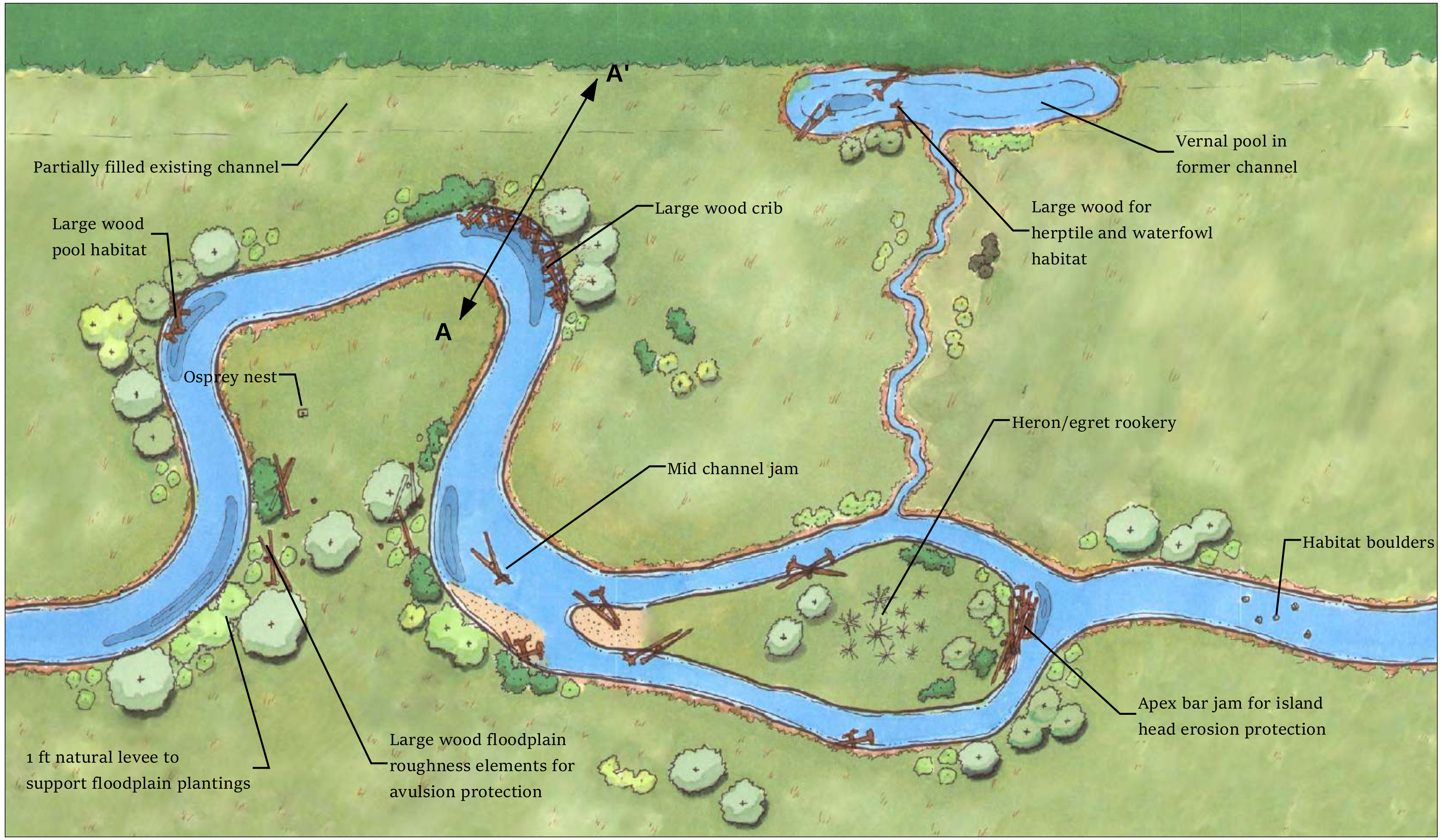
Feet
0 200 400

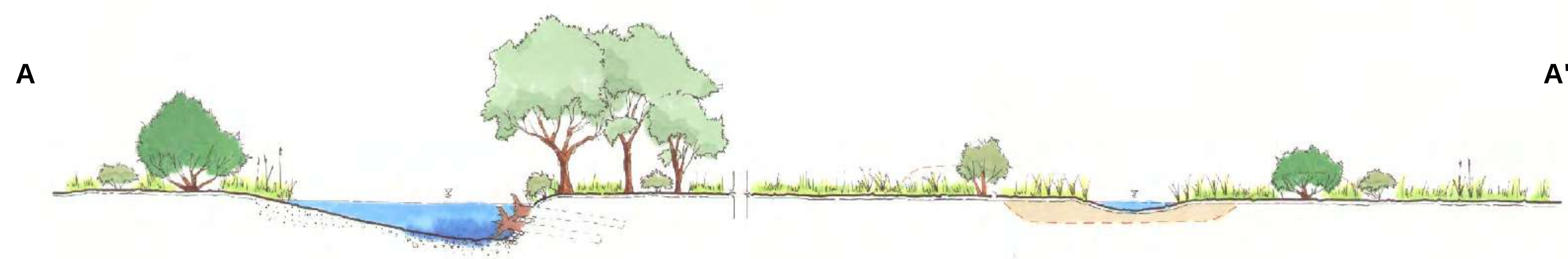
NOTES:
1. See Inter-Fluve concept design report for descriptions of design features.
2. Aerial image, parcel, and road data from Will County GIS
3. River Mile stationing relative to the confluence of East Branch DuPage River and West Branch DuPage River.

East Branch Dupage River
Will Co., Illinois
Reach 3: Trout Farm Park to Whalon Lake
Concept Design - Alternative 1

NOTES:
1. See Inter-Fluve concept design report for descriptions of design features.
2. Aerial image, parcel, and road data from Will County GIS
3. River Mile stationing relative to the confluence of East Branch DuPage River and West Branch DuPage River.

East Branch Dupage River
Will Co., Illinois
Reach 3: Trout Farm Park to Whalon Lake
Concept Design - Alternative 2





DuPage River Salt Creek Workgroup

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East Branch Dupage River
DuPage Co. & Will Co., Illinois
Reach 3
Illustrative Concept Design

DuPage River Salt Creek Workgroup

inter·fluve

NOTES:
1. See Inter-Fluve concept design report for descriptions of design features.
2. Aerial image, parcel, and road data from Will County GIS
3. River Mile stationing relative to the confluence of East Branch DuPage River and West Branch DuPage River.

East Branch Dupage River
Will Co., Illinois
Reach 4: Whalon Lake to Weber Road
Concept Design