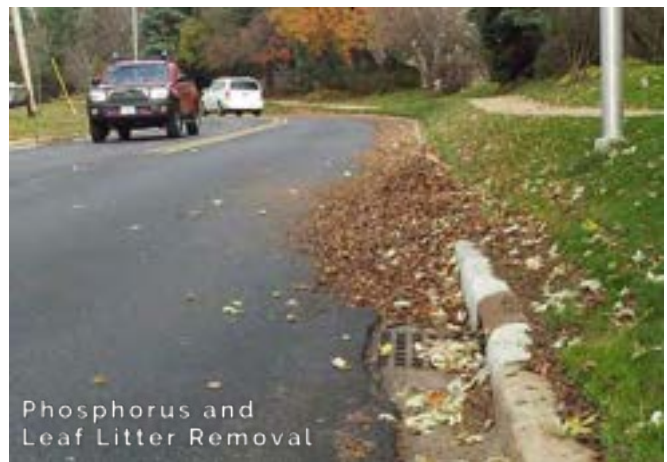


DuPage/Salt Creek Special Conditions Report

March 31, 2021



*Photo courtesy of DuPage County Forest Preserve District



DuPage River Salt Creek Workgroup

TABLE OF CONTENTS

INTRODUCTION AND PARTICIPATION DUPAGE/SALT CREEK SPECIAL CONDITIONS REPORT MARCH 31, 2021..... I

CHAPTER 1 PHYSICAL PROJECTS..... 1-1

1.1 Oak Meadows Dam Removal and Stream Restoration	1-1
1.1.1. Site Description	1-1
1.1.2. Design Characteristics	1-1
1.1.3. Project Implementation	1-1
1.1.4. Project Impact Evaluation	1-1
1.2 Fawell Dam Modification.....	1-1
1.2.1. Site Description	1-3
1.2.2. Design Characteristics	1-3
1.2.3. Permitting Requirements	1-3
1.2.4. Design Progress Report	1-4
1.2.5. Project Impact Evaluation	1-4
1.3 Spring Brook Restoration and Dam Removal (Spring Brook Phase 2)	1-5
1.3.1. Site Description	1-5
1.3.2. Design Characteristics	1-5
1.3.3. Permitting Requirements	1-7
1.3.4. Project Implementation	1-7
1.3.5. Project Impact Evaluation	1-11
1.4 Fullersburg Woods Dam Modification Concept Plan Development	1-11
1.5 Fullersburg Woods Dam Modification and Stream Restoration	1-11
1.5.1. Site Description	1-11
1.5.2. Research and Public Outreach	1-11
1.5.3. Design Progress Report	1-16
1.5.3.1. Phase 1: Development of the Concept Master Plan for Salt Creek at Fullersburg Woods	1-16
1.5.3.2. Phase 2: Concept Master Plan for Salt Creek at Fullersburg Woods Final Design and Preparation of Contract Bid Documents	1-18
1.5.4. Project Impact Evaluation	1-20
1.6 Southern West Branch Physical Improvement.....	1-20
1.7 Southern East Branch Stream Enhancement	1-25
1.7.1. Site Description	1-25
1.7.2. Design Progress Report	1-25

1.7.3. Project Impact Evaluation	1-25
1.8 Hammel Woods Dam Modification	1-26
1.8.1. Site Description	1-26
1.8.2. Design Characteristics	1-26
1.8.3. Permitting Requirements	1-26
1.8.4. Design Progress Report	1-27
1.8.5. Project Impact Evaluation	1-27
1.9 Hammel Woods Dam to 119th Street in Plainfield Stream Enhancement	1-27
1.9.1. Site Description	1-27

CHAPTER 2 CHLORIDE REDUCTION PROGRAM 2-1

2.1 Technical Workshops.....	2-1
2.2 Tracking BMP Adoption	2-4
2.2.1. Chloride Questionnaire	2-4
2.2.2. Ambient Impact Monitoring.....	2-5
2.3 Continuous Chloride Monitoring.....	2-6

CHAPTER 3 NUTRIENT IMPLEMENTATION PLAN..... 3-1

3.1 IPS Model /Project Identification Study	3-1
3.1.1. Background on the IPS Model and 2019-2020 Project Work.....	3-1
3.1.2. Next Steps in IPS Modeling.....	3-6
3.2 QUAL2Kw Updates for East Branch and Salt Creek	3-6
3.2.1. Data Collection	3-6
3.2.1.1. Continuous Dissolved Oxygen (DO) Sonde Network	3-6
3.2.1.2. Expanded Dissolved Oxygen Monitoring Program	3-7
3.2.2. QUAL2Kw Modeling	3-7
3.3 NPS Phosphorus Feasibility Analysis	3-19
3.3.1. Consultant Roundtable.....	3-19
3.3.2. Evaluation of Leaf Removal as a Means to Reduce Nutrient Concentrations and Loads in Urban Stormwater	3-19
3.3.3. Leaf Litter, Street Sweeping, and Stormwater Sewer Inlet Survey / NPS Phosphorus Management	3-19
3.4 Development of a Basin Wide Nutrient Trading Program	3-21
3.5 NIP Related Items.....	3-24
3.5.1. Chlorophyll a Sampling.....	3-24

ATTACHMENTS

- Attachment 1. DRSCW Special Condition
- Attachment 2. LDRWC Special Condition
- Attachment 3. Relocating Fish to a new Spring Brook
- Attachment 4. Executive Summary – Concept Master Plan For Salt Creek at Fullersburg Woods
- Attachment 5. Rheophilic Taxa Analysis - Pre-Project Sampling at Fullersburg Woods
- Attachment 6. Segmentation Memorandums for the QUAL2Kw models
- Attachment 7. Draft Leaf Litter, Street Sweeping, and Storm Sewer Inlet Maintenance Survey

LIST of TABLES

Table 1. Participation in the DRSCW Special Condition permit 2020-2021.	ii
Table 2. Participation in the LDRWC Special Condition Permit 2020-2021.	iii
Table 3. Target QHEI, mIBI, and fIBI scores generated for Spring Brook from the 2018 sampling.....	1-5
Table 4. Three-pronged approach to educating stakeholders for the Concept Master Plan for Salt Creek at Fullersburg Woods.....	1-13
Table 5. Master Plan for Salt Creek at Fullersburg Woods Public Comment Form and Results.....	1-15
Table 6. fIBI, mIBI, and QHEI baseline data collected in 2019 and 2020 for the Fullersburg Woods Dam Modification.....	1-21
Table 7. Color Key to IBI scores depicted in Table 6.	1-21
Table 8. Color Key to QHEI Scores in Table 6.	1-21
Table 9. Strongly Correlated Stressors with the highest FIT score (>0.32).	3-5
Table 10. Schedule for Expanded DO Monitoring.	3-7
Table 11. Sites Monitored as Part of the Expanded DO Monitoring Program.....	3-8
Table 12. Parameters Included in Expanded DO Monitoring Program.....	3-8
Table 13. Data Utilized in the Development of the QUAL2Kw Models for the DuPage River and Salt Creek Watersheds.....	3-9
Table 14. East Branch DuPage River Key Model Calibration Locations.	3-10
Table 15. Salt Creek Key Model Calibration Locations.	3-11
Table 16. Output from the Canopy ROW spatial file showing the percentage of total ROW area that has canopy area.	3-21

LIST OF FIGURES

Figure 1. Fish Index of Biotic Integrity scores in Salt Creek at the Fullersburg Dam survey area for the years of 2019 and 2020.	1-22
Figure 2. Modified Index of Well-Being (MIwb) scores in Salt Creek at the Fullersburg Dam survey area for the years of 2019 and 2020.....	1-22
Figure 3. Macroinvertebrate Index of Biotic Integrity scores in Salt Creek at the Fullersburg Dam survey area for the years of 2019 and 2020.	1-23
Figure 4. Qualitative Habitat Evaluation Index (QHEI) scores in Salt Creek at the Fullersburg Dam survey area for the years of 2019 and 2020.	1-23
Figure 5. fIBI data collected on the main stem of the East Branch DuPage River (2007, 2011, 2019, and 2019).	1-26
Figure 6. Calculated annual chloride concentrations - winter months (2007-2020) for Salt Creek at Wolf Road....	2-7
Figure 7. Calculated annual chloride concentrations - winter months (2008-2020) for Salt Creek at Busse Woods Main Dam.....	2-7
Figure 8. Calculated annual calculated chloride concentrations - winter months (2008-2020) for East Branch at Hobson Road.....	2-8

Figure 9. Calculated annual chloride concentrations - winter months (2007-2020) for East Branch at Army Trail Road.....	2-8
Figure 10. Calculated annual chloride concentrations - winter months (2018-2020) for West Branch at Bailey Road.	2-9
Figure 11. Calculated annual chloride concentrations - winter months (2007-2019) for West Branch at Arlington Road.....	2-9
Figure 12. Step-by-Step IPS Threshold Development and Stressor Identification Process.	3-4
Figure 13. East Branch DuPage River Simulated and Observed Streamflow (cms) at Reach 17 (USGS 05540250).3-12	
Figure 14. East Branch DuPage River Simulated and Observed Water Temperature (°C) at Reach 10 (EB30).....	3-12
Figure 15. East Branch DuPage River Simulated and Observed Nitrogen Species (µg/L) at Reach 10 (EB30).....	3-13
Figure 16. East Branch DuPage River Simulated and Observed Total Phosphorus (µg/L) at Reach 10 (EB30).....	3-13
Figure 17. East Branch DuPage River Simulated and Observed Dissolved Oxygen (mg/L) at Reach 10 (EB30).....	3-14
Figure 18. Salt Creek Simulated and Observed Streamflow (cms) at Reach 16 (USGS 05531500).....	3-15
Figure 19. Salt Creek Simulated and Observed Water Temperature (°C) at Reach 16 (SCWR).	3-15
Figure 20. Salt Creek Simulated and Observed Nitrogen Species (µg/L) at Reach 12(SCGD).	3-16
Figure 21. Salt Creek Simulated and Observed Total Phosphorus (µg/L) at Reach 12 (SCGD).	3-16
Figure 22. Salt Creek Simulated and Observed Dissolved Oxygen (mg/L) at Reach 12 (SCGD).	3-17

LIST OF MAPs

Map 1. Map of DRSCW physical projects set out in the Special Condition.	iv
Map 2. Map of the LDRWC physical projects set out in the Special Condition.....	v
Map 3. Construction reaches of Spring Brook No.1 Creek & Wetland Restoration – Phase 2.	1-6
Map 4. Pre-project Monitoring Locations for the Fullersburg Woods Dam Modification Project.	1-24
Map 5. Spatial distribution and providence of data utilized in the 2020 IPS Update.....	3-2

LIST OF PLATES

Plate 1. Sections of the ladder being prepped for placement at the Eel River site.	1-2
Plate 2. The view south (downstream) from the dam showing the backwater affect created by the accumulated riprap. The high crest on the riprap is the result of material movement caused by the high flows through the culvert system (directly beneath the viewer’s position).....	1-4
Plate 3. Planted in 2019, banks of Reach A were taking root in July 2020.	1-8
Plate 4. Excavation of a new Spring Brook channel in Reach B, a former impoundment created by a dam, continued in July 2020.	1-8
Plate 5. Flow of Spring Brook No. 1 was diverted into a new channel on August 27, 2020.	1-9
Plate 6. Without water flow in the former channel, Forest Preserve staff collected and inventoried isolated fish to translocate into the new channel.	1-9
Plate 7. Trail base was laid outside the floodplain for a newly routed regional trail in October 2020.	1-10
Plate 8. Aerial image showing the completed project in October 2020.	1-10
Plate 9. Demonstrations of equipment calibration at DRSCW Chloride Management Workshops.	2-1
Plate 10. Deicing Workshops Registration Form, 2020.....	2-2
Plate 11. Welcome & Introduction to Parking Lots & Sidewalks Presentation, 2020.....	2-3
Plate 12. Links from webinar presentation and chat, 2020.....	2-3
Plate 13. Winter Technical Briefs, 2020.....	2-4
Plate 14. Outreach Poster/Handout on winter safety, 2020.	2-5
Plate 15. Example of the GIS output of the merged and clipped canopy and ROW layers.	3-20

Introduction and Participation DuPage/Salt Creek Special Conditions Report March 31, 2021.

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 as 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 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 Condition Permit Holder Forum

In Fall 2020, three (3) Special Conditions Permit Holder Forums for DRSCW and LDRWC Permit Holders were held via Zoom. Special Condition 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 Condition permit 2020-2021.

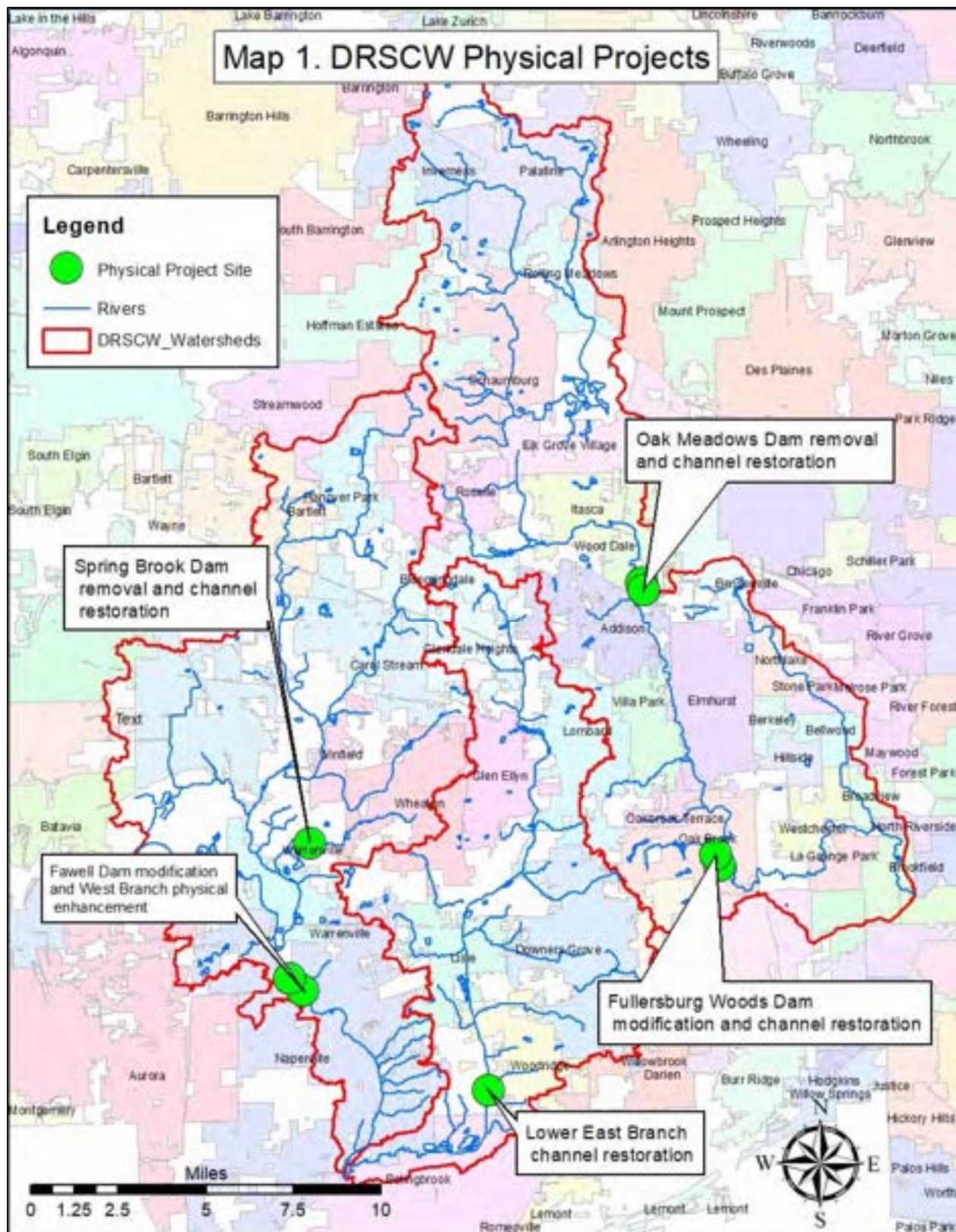
POTW Owner/ Facility Name	NPDES No.	Membership Dues Paid 2020-21	Assessment Paid for Paragraph 2 Table Project Funding*	Assessment Paid for Chloride Reduction/NIP/QUAL 2k/Trading Program
Addison North STP	IL0033812	YES	YES	YES
Addison South - AJ LaRocca	IL0027367	YES	YES	YES
Bartlett WWTP	IL0027618	YES	YES	YES
Bloomington-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

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

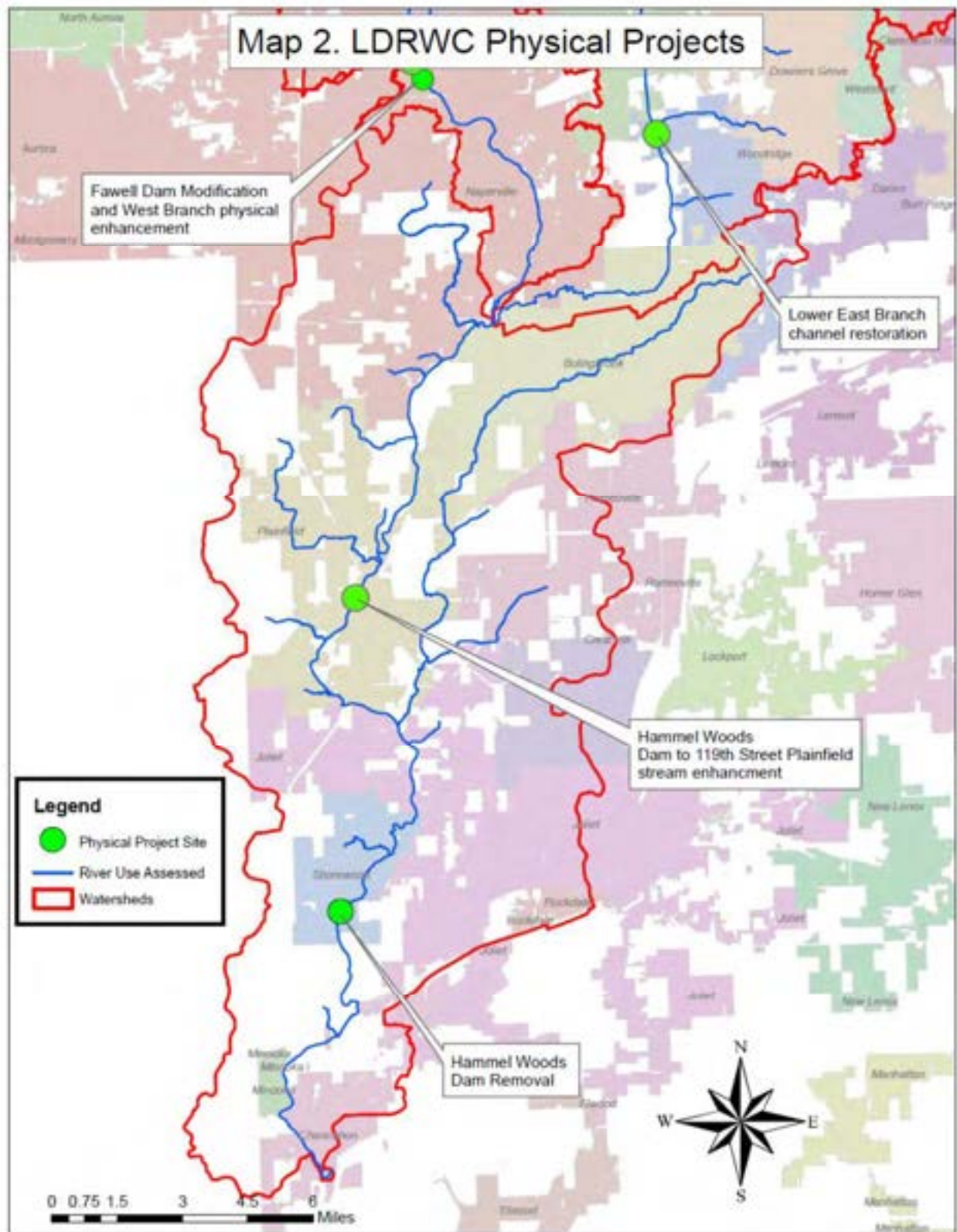
Table 2. *Participation in the LDRWC Special Condition Permit 2020-2021.*

POTW Owner/ Facility Name	NPDES No.	Membership Dues Paid 2020-2021	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 their permit.



Map 1. Map of DRSCW physical projects set out in the Special Condition.



Map 2. Map of the LDRWC physical projects set out in the Special Condition.

Chapter 1 Physical Projects

The Special Condition 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 Five-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 Dam Removal and Stream Restoration

- Special Condition 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. Salt Creek's next bioassessment is scheduled for the Summer of 2021.

Summary of Results – Post project survey results: mean QHEI increased from 57.25 to 69.3 in 2017 to 70 in 2018 and 71.25 in 2019. Mean mIBI increased from 23.6 (based on 2013 data) to 33.2 in 2017, to 34.9 in 2018, and to 40.85 in 2019. Additionally, 13 of the 21-high value rheophilic taxa identified at the site were only identified post-project.

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. Project Implementation

The 2017 Annual Report detailed the project implementation.

1.1.4. Project Impact Evaluation

The 2019 Annual Report detailed the post-project monitoring phase of the project. Future monitoring of the project area will be completed in conjunction with the bioassessment program and will be completed in 2021.

1.2 Fawell Dam Modification

- Special Condition Listed Completion Date – December 2018, Extended to December 2021. Based on feedback from DuPage County (dam's owner) and the fish ladder

manufacturer DRSCW will advise IEPA if more time is necessary. This should be known by June 2021.

- Status – In design and permitting phase.

The objective of the project is to allow fish passage through the Fawell dam. To accomplish this, the original design approach focused on modifying the dam's primary spillway, which consists of three box culverts. In June 2018, the Dam's owner (DuPage County Division of Storm Water Management (DC SWM)) revealed that due to recent repairs to the dam structure they could no longer support direct structural modifications of the culvert system. The dam is a flood control structure operated by DuPage County Stormwater Management and must be fully functional as such post project

In response the project team, including the dam's owner, DC SWM, reviewed alternative approaches to establishing fish passage at the dam which did not involve any proposed structural modifications.

After a review of options, a proposal involving a modular fish ladder system designed by BK Riverfish, LLC from Massachusetts was proposed (Plate 1). During 2020 the project team evaluated the possibility of installing the system directly into one of the Fawell Dam's culverts. This approach has a number of advantages; no structural change to the culverts, no change to gate operations, and minimization of any post project changes in upstream and downstream water elevations.

A review team made up of DC SWM, FPDDC, IDNR and DRSCW met with the designer between 3/03/2020 and 3/04/2020 including a hands-on visit to the site.

Plate 1. Sections of the ladder being prepped for placement at the Eel River site.



In August 2020 a proposal was sent to DC SWM for review. Proposal included details on the installation's footings, modification of the boulder field at the tail race of the splash pad, hinged section to allow gate operations and upstream debris bollards. Additionally, initial modelling details on impacts on post project water elevations were also supplied. Permits from IDNR-OWR, USACE, and DuPage County need to be obtained by the project. Depending on the permitting process and manufacturing lead time, the goal would be to install the system in late 2021.

1.2.1. Site Description

The 2017 Annual Report provided a site description.

1.2.2. Design Characteristics

The 2020 Annual Report provided a detailed review of design characteristics including a review of the species passed by the system on the Eel River in comparison with the species of the Lower West Branch DuPage River.

The proposal sent to DC SWM includes (from downstream end):

- Dropping the crest of the downstream riprap armoring to eliminate the backwater (see Plate 2). The riprap material has been moved into its current configuration over time by traction created during high flows. The new configuration may need to be fixed in place post project.
- Extending the ladder down through the elevated lip at the downstream end of the splash pad to create a flow of attraction.
- 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.
- A number of instream bollards to protect the upstream end of the ladder from debris.

1.2.3. Permitting Requirements

The project will require:

- Stormwater management certification demonstrating compliance with the DuPage County Countywide Stormwater Ordinance. It is anticipated that a separate Floodway Construction permit will not be required by IDNR-OWR but will be reviewed as part of the County permitting process.
- Compliance with DuPage County and US Army Corps of Engineers (USACE) requirements associated with wetlands, Waters of the U.S., buffers, and sediment and erosion control. It is assumed that the proposed improvements qualify for USACE Regional Permit (RP) 5, Wetland and Stream Restoration and Enhancement, which also typically requires submittal of a Stormwater Pollution Prevention Plan (SWPPP) to Kane-DuPage Soil & Water Conservation District as part of the permitting process.

Although it is anticipated that the existing gate operations and structural components of the dam will not be modified, a Major Modification of Existing Dam Permit from the Illinois Department of Natural Resources – Office of Water Resources (IDNR-OWR) may be required.

***Plate 2.** The view south (downstream) from the dam showing the backwater affect created by the accumulated riprap. The high crest on the riprap is the result of material movement caused by the high flows through the culvert system (directly beneath the viewer’s position).*



1.2.4. Design Progress Report

The proposal was sent to DuPage County (DC SWM) in August 2020 for review.

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 DRSWC’s rolling basin assessment.

There are several possibilities for additional instream monitoring for fish movement through the system which are being evaluated based on updated proposal.

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

- Special Condition Listed Completion Date – December 2019
- Status – Construction is complete. Delays during construction were caused by the unusually wet weather encountered in 2019, by the highly mobile sediments encountered in Reach C and additional protocols created by pandemic procedures.

Objective – Based on the pre-project monitoring results the objective was refined. Both the pre-project results and post project objectives are shown in Table 3.

Table 3. Target QHEI, mIBI, and fIBI scores generated for Spring Brook from the 2018 sampling.

Parameter	All Monitoring Sites (5 sites)	Footprint proper sites (3 sites RM 0.75 -1.42)
QHEI	>54.8	> 52.5
MIBI	> 50.1	> 42.8
FIBI	> 19.4	> 17

The project was managed by the Forest Preserve District of DuPage County (FPDDC). The construction, permitting, and long-term monitoring was funded by the FPDDC, the Illinois Tollway and the DRSCW.

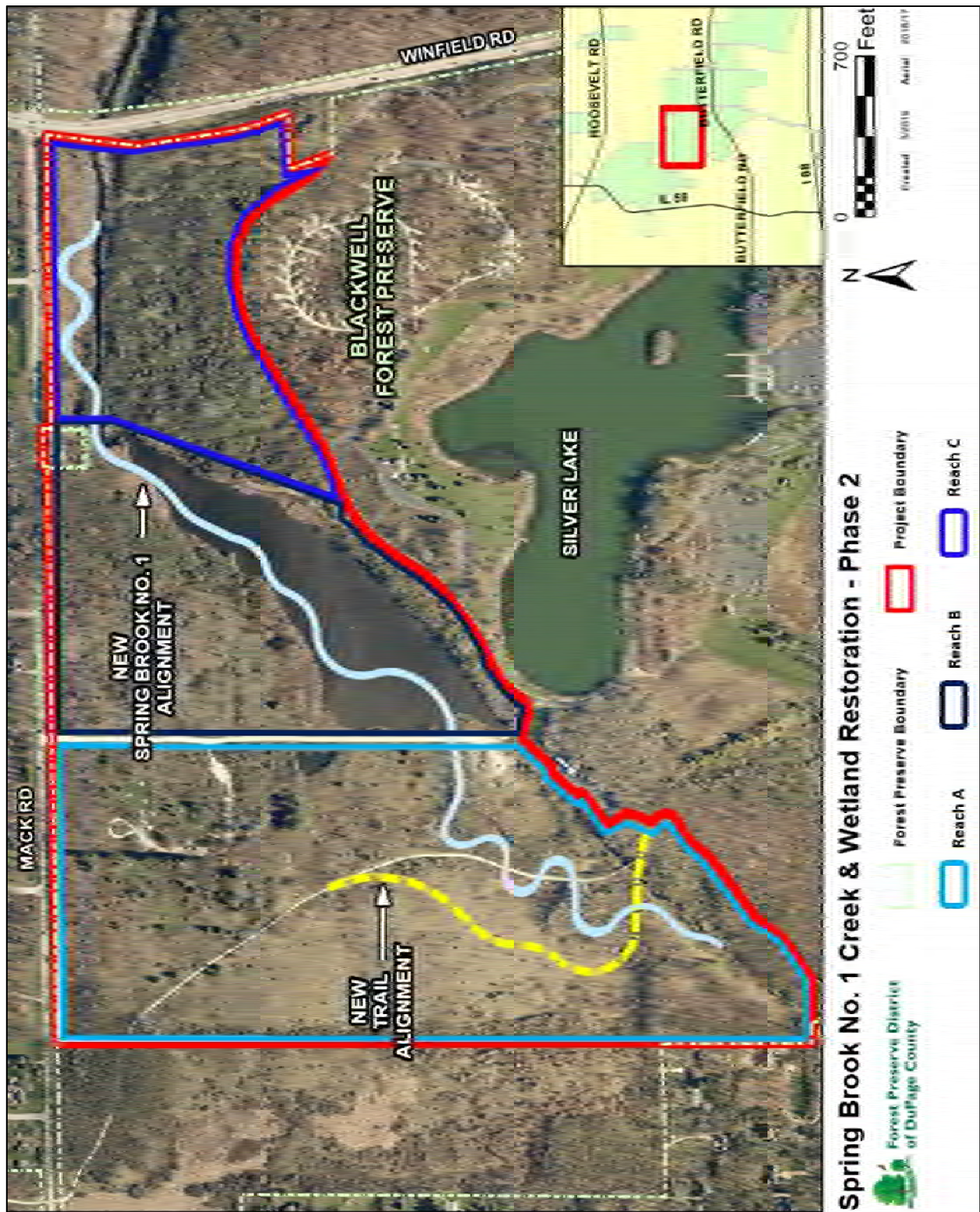
1.3.1. Site Description

The Phase 2 Project is located in unincorporated DuPage County in Blackwell Forest Preserve (Map 3). The project footprint limits are entirely on FPDDC property. The project runs along Spring Brook #1. The downstream limit is approximately 400' downstream of the existing unnamed pedestrian bridge, which runs south from Mack Road and east of Williams Road. The upstream limit is Winfield Road. The project is immediately downstream of the Spring Brook #1 Stream and Wetland Restoration Project (Phase 1) constructed in 2015.

The 2018 Annual Report provided details on the Project's design in the section entitled "Design Progress Report".

1.3.2. Design Characteristics

The 2017 Annual Report provided details on the Project's design characteristics in sections titled Existing Conditions and Proposed Conditions.



Map 3. Construction reaches of Spring Brook No.1 Creek & Wetland Restoration – Phase 2.

1.3.3. Permitting Requirements

All necessary project permits have been issued and received. The 2018 Annual Report provided details on the permits and their issuing agencies required for the project.

1.3.4. Project Implementation

As previously reported, by the end of February 2020 crews completed construction of the new channel in Reach C, the reach furthest upstream and closest to the intersection of Mack and Winfield Roads. Expecting spring rains, construction paused in anticipation of favorable, drier, summer weather. Map 3 denotes the location of each Reach of the project.

In May 2020, crews seeded and planted tens of thousands of plugs along the banks and in the floodplain of Reach A and Reach C. Nearly daily irrigation was necessary to ensure survival and establishment during the late spring and early summer.

Stream construction resumed in the first week of July 2020. As expected, crews discovered, soft, silty, sediment in Reach B (site of the former impoundment), often at depths over 15'. To create a stable channel, crews excavated wide cross-sections, replaced soft material with stable clay, and armored the new stream banks with cobble. Construction of Reach B lasted six weeks; and with all three reaches complete, flow of Spring Brook was diverted into the newly constructed channel on August 27, 2020.

In the days following the diversion, Forest Preserve District staff conducted fish surveys in the now-isolated reaches of the former channel. Over 1,100 individual fish representing 22 species were collected and translocated into the new stream. A detailed summary can be found in Attachment 3 as well as on the FPDDC website at <https://www.dupageforest.org/blog/spring-brook-fish>.

Following construction of the stream channel, finishing touches were completed on both bridges and the regional trail. After 1.5 years of trail closure, the new regional trail situated outside of the floodplain was reopened to pedestrians on November 2, 2020.

With cold winter temperatures and snow cover, conditions were good in January and February 2021 to selectively remove non-desirable vegetation in the uplands surrounding the riparian corridor.

Now that construction is complete, 2021 marks the first of 5 years of the required maintenance, monitoring, and reporting period. Plates 3 to 8 document work conducted in 2019-2020 on Springbrook Phase 2.

Plate 3. *Planted in 2019, banks of Reach A were taking root in July 2020.*



Plate 4. *Excavation of a new Spring Brook channel in Reach B, a former impoundment created by a dam, continued in July 2020.*



Plate 5. *Flow of Spring Brook No. 1 was diverted into a new channel on August 27, 2020.*



Plate 6. *Without water flow in the former channel, Forest Preserve staff collected and inventoried isolated fish to translocate into the new channel.*



Plate 7. Trail base was laid outside the floodplain for a newly routed regional trail in October 2020.



Plate 8. Aerial image showing the completed project in October 2020.



1.3.5. Project Impact Evaluation

Pre-project monitoring was included in the 2018 Annual Report. No monitoring was conducted in 2019 and 2020 due to on-going construction. Post-project monitoring will begin in 2021.

1.4 Fullersburg Woods Dam Modification Concept Plan Development

- Special Condition 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 Condition Listed Completion Date – December 2021
- Status – Outreach and Education Campaign is ongoing (started 2017). Master Planning process was completed in 2020. Final Design/Construction is in progress and is scheduled for completion in 2022-2023.

The project is on the Salt Creek mainstem; its objectives are to raise QHEI above its current score of 39.5, raise fIBI at the sites upstream of the dam above its current score of 19.0, raise mIBI above its current score of 17 for approximately 1.5 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 (DC SWM) on this project. DRSCW has budgeted \$4,975,000 for this project.

1.5.1. Site Description

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

1.5.2. Research and Public Outreach

The plan to modification of the Fullersburg Woods (Graue Mill) dam encountered significant public opposition. The concept plan prepared in 2016 included a framework for reaching out to stakeholders, listening to their concerns and soliciting feedback so that the final design proposal could incorporate features based on their input. In 2018, the DRSCW replaced its original outreach coordinator with Aileron Communications and updated the research and public outreach work plan. Below includes each task and work completed in 2020.

Phase 1: Public Opinion Research

The 2019 Annual Report included details on Phase 1 of the Public Opinion Research.

Phase 2: Communications and Outreach

As the DRSCW moved forward with the preparation of a Master Plan for Salt Creek at Fullersburg Woods (see Section 1.5.3 for more details) that included modifying the Graue Mill Dam, the DRSCW signed a contract with Aileron Communications to continue providing services during this phase of the project. Work included communications and outreach efforts that would take place before the master plan was shared with the public, as well as communications strategy and support for public outreach on the master plan. These steps were designed to align support for the DRSCW's goals, increase the public's trust in the workgroup and help the public understand the importance of dam modification projects.

Please find below summaries of each task associated with the Communications and Outreach tasks for the Master Plan for Salt Creek at Fullersburg Woods completed in 2020. Details on the 2020 activities can be found in the Master Plan for Salt Creek at Fullersburg Woods, Public Outreach and Engagement Report, dated September 2020. http://restoresaltcreek.org/wp-content/uploads/2020/09/masterplan_publiccommentreport_09142020final.pdf

Task 1: Press Announcements and New Stories

Aileron worked with the DRSCW to create materials to improve the public understanding of the broader context of watershed restoration efforts and the benefits of dam modification. This effort also helped us build relationships between DRSCW and local media before the Master Plan for Salt Creek at Fullersburg Woods was presented to the public.

The first article was published by the Daily Herald on March 22, 2020. It was focused on the water and habitat improvement recorded following dam removal and restoration of the Oak Meadows dam site (See Section 1.1 of the 2020 report for additional information on the project at the Preserve at Oak Meadows).

On April 7, 2020, a virtual press conference was held to discuss dam removals in Illinois. Presentations on ongoing/future dam removal/modification work were given by representatives from Illinois Department of Natural Resources, DRSCW, Kane County, Fox River Study Group, Friends of the Chicago River and Chicago Park District. The following newspapers/news outlets attended the press conference: Chicago Sun Times, Daily Herald, Patch, Aurora Beacon News, NW Herald, Independent News, Kane County Chronicle, WBEZ, and Journal Topics. Additionally, the recording of the press conference was made available to additional newspaper and news outlets via email. The following news articles resulted from the Virtual Press Conference:

State Funding Steps Up Fox River Dam Removal Projects. Kane County Chronicle. April 7, 2020.
<https://www.kcchronicle.com/2020/04/07/state-funding-steps-up-fox-river-dam-removal-projects/aphr45r/>

Chicago rivers: A discussion on dam removals on the Des Plaines, Fox, DuPage and Chicago rivers. Chicago Sun Times. April 11, 2020.
<https://chicago.suntimes.com/2020/4/11/21217411/chicago-rivers-discussion-dam-removals-des-plaines-fox-dupage-chicago-rivers>

Planning Underway for Carpentersville Dam Removal on Fox River in 2020. Chicago Tribune. April 14, 2020.
<https://www.chicagotribune.com/suburbs/elgin-courier-news/ct-ecm-carpentersville-dam-fox-river-st-0415-20200414-ykg4xfur3be4fhwowowpf3sk44-story.html>

Village Considers Dam Removal. Aurora Beacon News. June 9, 2020
https://digitaledition.aurorabeaconnews.chicagotribune.com/infinity/article_share.aspx?guid=de724e15-d230-4697-88e4-0e5b57400d72&fbclid=IwAR3KnBb52e4c-8HsD6E17CyGVH6XbbhaxZxl7XLwpp-3wJI4J8MhL5kARMU

Task 2: Public Open Houses

DRSCW hosted two public open houses and held a 30-day public comment period to solicit input and comment on the draft Concept Master Plan for Salt Creek at Fullersburg Woods (see Section 1.5.3 for more details).

Advertising Tactics for the Master Plan for Salt Creek at Fullersburg Woods

The DRSCW and Aileron used a three-pronged approach in educating stakeholders and soliciting input on the Concept Master Plan for Salt Creek at Fullersburg including awareness, education, and engagement activities (Table 4).

Table 4. *Three-pronged approach to educating stakeholders for the Concept Master Plan for Salt Creek at Fullersburg Woods.*

Awareness	Education	Engagement
Public Notice	RestoreSaltCreek.org	Virtual Open Houses
News Coverage	Background Videos	Stakeholder Follow-Up
Newsletter	Fact Sheets	Public Comment Form
Social Media	Stakeholder Meetings	
Email Campaigns		

Details on these can be found in the Master Plan for Salt Creek at Fullersburg Woods, Public Outreach and Engagement Report, dated September 2020. http://restoresaltcreek.org/wp-content/uploads/2020/09/masterplan_publiccommentreport_09142020final.pdf

Public Open Houses

The DRSCW hosted two virtual open house events to allow the public to learn more about the project and ask questions of DRSCW staff. While public health restrictions made large in-person meetings impossible, the virtual open houses were well attended and gave members of the public an opportunity to learn about the project and ask questions in a live format, as well as watch recordings of the events after the fact.

The virtual open houses took place on July 7 at 7:00 PM and on July 9 at 11:00 AM and each event lasted approximately 110 minutes. 78 people attended the July 7th open house and 71 people attended the July 9th event. Recordings of the webinars were viewed approximately 120 times during the public comment period.

The open houses consisted of a presentation by Stephen McCracken of the DRSCW followed by a question and answer session. DRSCW staff answered more than 80 questions from the public during the two open house events.

The recordings of the Open House events are available at RestoreSaltCreek.org.

30-Day Public Comment Period

The public comment period for the Master Plan for Salt Creek at Fullersburg Woods was open from July 7 through August 7, 2020. Comments were collected via an online form that was available to anyone. The comment form requested that participants watch the open house recordings and background videos if they had not attended one of the virtual open houses. Commenters were required to provide their name and address.

As described in the public outreach section of this report, the DRSCW invited the public to provide comment and worked to build public awareness of the opportunity for comment. During the comment period, the Workgroup published a second public notice in the Daily Herald, held additional meetings with stakeholders, and used email and social media outreach to make sure the public was aware of the opportunity to comment.

Table 5 includes a summary of the Public Comment form and results. A total of 172 comments were received via the public comment process. 96 of those who commented shared “additional thoughts” on the Master Plan. 91% of the public comments were supportive of the Master Plan

and 86% indicated strong support. 9% of the comments were opposed to the plan with 8% strongly opposed. Responses were largely consistent across the various questions, positive responses ranged from 87-92% across the survey questions and negative responses ranged from 8-13%. While a number of comments did express strong opposition to the project, the public comments overall were strongly in support of the Master Plan.

Table 5. Master Plan for Salt Creek at Fullersburg Woods Public Comment Form and Results.

Question	Summary of Results
1. Did you watch the open house webinar about the Master Plan for Salt Creek at Fullersburg Woods?	Yes: 73.68% No: 26.32%
2. Did you watch the background information webinars about the Master Plan for Salt Creek at Fullersburg Woods?	Yes: 76.16% No: 23.84%
3. Have you visited Fullersburg Woods in the last year?	Yes: 67.44% No: 32.56%
4. What's your primary reason for visiting Fullersburg Woods?	Recreation: 56.77% Watch Animals: 5.81% Scenery: 24.52% Visit Historic Sites: 9.68% Learn about Nature: 3.23%
5. Do you understand the benefits of the Master Plan?	Yes: 92.44% No: 7.56%
6. Have your questions about the Master Plan been adequately answered?	Yes: 88.89% No: 9.94% Unsure: 1.17%
7. Do you understand the legal requirements to improve water quality in Salt Creek?	Yes: 92.99% No: 4.09% Unsure: 2.92%
8. Do you think the Master Plan would improve opportunities for recreation?	Yes: 90.70% No: 9.30%
9. Do you think the Master Plan would improve habitat for fish, plants and animals?	Yes: 91.81% No: 8.19%
10. Do you think the Master Plan would improve scenery in the area?	Yes: 90.59% No: 9.41%
11. Do you think the Master Plan would preserve the historic character of the site?	Yes: 90.00% No: 10.00%
12. Do you think the Master Plan would improve opportunities for the public to learn about nature?	Yes: 90.12% No: 9.88%
13. Do you think the Master Plan would improve public safety?	Yes: 87.20% No: 12.80%
14. Do you think the Master Plan would improve water quality in Salt Creek?	Yes: 92.44% No: 7.56%
15. Do you think the Master Plan is a good use of financial resources?	Yes: 90.70% No: 9.30%
16. Do you support the Master Plan for Salt Creek at Fullersburg Woods?	Yes: 90.64% No: 9.36%
17. How would you rate your support for the Master Plan?	Support: 90.70% Oppose: 9.30%

Details including all submitted comments and attendance sheets for the Public Open Houses can be found in the Master Plan for Salt Creek at Fullersburg Woods, Public Outreach and Engagement Report, dated September 2020. http://restoresaltcreek.org/wp-content/uploads/2020/09/masterplan_publiccommentreport_09142020final.pdf

1.5.3. Design Progress Report

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

In June 2019, the DRSCW entered into a contract with AECOM Technical Services (AECOM) for the development of a Master Plan for Salt Creek at Fullersburg Woods. The scope of work for the Master Plan at Salt Creek at Fullersburg Woods and the work conducted to date is discussed below.

Task 1: Topographic and Bathymetric Survey

The topographic field survey and DOR measurements were completed in late July/early August 2019 and discussed in detail in the 2019 Annual Report.

Task 2: Wetlands/Waters of the United State (WOTUS) Assessment

The WOTUS assessment was completed in 2019 and discussed in detail in the 2019 Annual Report. In 2020, jurisdictional determination was issued by the United States Army Corps of Engineers. Additionally, DuPage County confirmed the wetland boundaries of wetlands under the County's jurisdiction.

Task 3: Sediment Sampling Analysis

Preliminary Sediment sampling analysis was completed in 2019 and discussed in detail in the 2019 Annual Report.

Task 4: Alternatives Analysis and Cost Estimates

The Alternatives Analysis was completed in 2019 and discussed in detail in the 2019 Annual Report.

Task 5: Coordination and Alternative Selection Meetings

Work in this task included five (5) meetings between AECOM and the DRSCW. These meetings include a Project Kickoff (July 2019, two progress meetings to discuss the alternatives analysis (January 24, 2020 and February 4, 2020), a meeting to select the preferred alternative (March 11, 2020), and a meeting to present the Final Master Plan (May 2020).

Task 6: Pre-Application Meetings

Due to the Covid-19 quarantine and restrictions on in-person meetings, this Task was moved to Phase 2 - Concept Master Plan for Salt Creek at Fullersburg Woods Final Design Engineering and Preparation of Contract Bid Documents (see Section 1.5.3.2 for more details).

Task 7: Master Plan for Salt Creek at Fullersburg Woods

The Concept Master Plan for Salt Creek at Fullersburg Woods was completed in September 2020. As detailed in the Master Plan, this project goes beyond dam removal, it is a full stream corridor restoration project. The Master Plan will improve water quality and increase recreation and education opportunities on Salt Creek while being efficient with taxpayer money relative to other options. The Master Plan addresses this series of objectives by putting focus on the following:

- Water Quality Improvements -- The Concept Master Plan relies on the benefits of healthy, naturally free-flowing rivers to improve water quality in Salt Creek beyond what could be achieved through additional public spending on wastewater treatment. In addition to improvements at the Graue Mill dam site, over a mile of river upstream of the dam will be restored by creating wetlands, planting native vegetation, enhancing in-stream habitat and more. These enhancements will be designed to improve the aquatic habitat of Salt Creek and promote healthy populations of fish, macroinvertebrates, birds, and reptiles.
- Recreation and Education Opportunities -- The project benefits go beyond ecology. The Concept Master Plan for Salt Creek at Fullersburg Woods includes education and recreational elements to complement the water quality improvements. Proposed amenities include canoe/kayak launches, fishing stations that provide access to the creek and educational signs. Content for the educational signs will focus on the benefits of dam removal and stream restoration as well as honoring the history of the site and its milling operations.
- Responsible Public Investment -- The Concept Master Plan will allow upstream communities to forgo hugely expensive upgrades at their wastewater treatment plants recommended by the 2005 DO TMDL, by implementing the second phase of the alternative DO plan for Salt Creek. Analysis shows that improvements to water and stream resource quality due to the dam removal are more effective and cheaper than plant upgrades. Plant upgrades have been estimated at \$213 million in capital costs and \$7 million a year in increased operating costs. Such upgrades will marginally improve

water quality but cannot restore the river's fish biodiversity or the habitat upstream of the dam.

Renderings of all aspects of the project including the rock/riffle structure that will replace the dam, stream restorations practices, and recreation and education amenities are included in the Concept Master Plan (see Attachment 4 – Executive Summary).

The Concept Master Plan for Salt Creek also includes:

- A summary and findings of Tasks 1-5;
- Renderings prepared as part of Task 4 and additional renderings of the preferred alternatives as well as the stream corridor;
- A summary of all permits that will be required by the project;
- Estimate for engineering fees to complete the Final Engineering Design and Permit; and
- Construction cost opinion

The Concept Master Plan for Salt Creek at Fullersburg Woods can be found at http://restoresaltcreek.org/wp-content/uploads/2020/09/concept-master-plan_09.17.20-final.pdf

Task 8: Needs Analysis

This task was completed and is included in the Concept Master Plan for Salt Creek Fullersburg Woods (see Task 7 for more details).

On October 6, 2020, board members of the Forest Preserve District of DuPage County, which owns the Fullersburg Woods dam and Forest Preserve, voted to enter into a lease agreement with the DRSCW. The lease agreement grants the DRSCW permission to implement all aspects of the Concept Master Plan for Salt Creek at Fullersburg Woods including the removal of the dam.

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

In early January 2020, 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. The scope of work included in this contract is discussed below. Preliminary work on the contract which began in early 2021 will continue through 2022.

Task 1 –Hydraulic and hydrologic modeling

Task 1 includes the development of a hydrology/hydraulic model(s) necessary for design, permitting, and construction. Modeling will ensure that the design of the dam removal and 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 2 – Final Design Engineering

Task 2 includes the final design engineering of all project components, including but not limited to, the removal of the Fullersburg Woods dam and its replacement with a rock/riffle feature; stream restoration practices; and recreation amenities as included in the Concept Master Plan for Salt Creek at Fullersburg Woods. This Task also includes the final design of the Graue Mill's raceway that will include a method to maintain water level and flow (disconnected from Salt Creek) in the raceway and provisions to power the mill's waterwheel. The Dam structure investigation will also be included as part of this Task.

Task 3– Characterization of on-site sediment

Task 3 focuses on the development of a soil characterization plan and the collection of sediment samples. Once the existing conditions are determined, Hey and Associates will develop a sediment management plan and dredge and disposal plan as required to obtain all permits to construct the project.

Task 4 – Rehabilitation of Floodwall

The Nature Education Center at Fullersburg Woods has significant basement flooding due to leakage of the existing floodwall. As part of this task, Hey and Associates will inspect the existing sheet pile floodwall and develop appropriate solutions to eliminate leaking and extend the lifespan of the floodwall. Cost estimates will also be developed for each solution. The preferred solution will be incorporated into the final design of the project.

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
- Department of Interior National Park Service
- Illinois Department of Natural Resources (IDNR)-Office of Water Resources (OWR)
- IDNR – Cultural Resources Program

- Illinois State Historic Preservation Office (SHPO)
- DuPage County Stormwater Management
- Kane-DuPage Soil and Water Conservation District
- Forest Preserve District of DuPage County
- Illinois Environmental Protection Agency (IEPA)
- Village of Oak Brook

Task 5 also includes the completion of Historic American Engineering Record (HAER) Documentation of the Graue Mill, Fullersburg Woods dam, and surrounding area.

Task 6 –Preparation of Cost Estimate and Contract Bid Documents

Task 6 includes the preparation of contract bid documents and cost estimates per the specifications of the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC). 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, the DRSCW and project stakeholders. These meetings will include: project kick off meeting, two (2) stream restoration and recreational amenities design alternatives selection meeting, and design review meetings at 50%, 75% and 100% of completion.

1.5.4. Project Impact Evaluation

Pre-project monitoring for the Fullersburg Woods Dam Modification project was completed in 2019 and 2020. Map 4 depicts the locations of the samples collected by the DRSCW. Table 6 includes the results of the pre-project 2019 and 2020 survey collected by the DRSCW. Figure 1-4 depict the pre-project FBI scores (Figure 1); MIwb scores (Figure 2); mIBI scores (Figure 3), and QHEI scores (Figure 4). It is also important to note that fish sampling found 24 species, including 21 native species, downstream of the dam but only 9 species with 7 native species upstream of the dam. These results highlight the need for fish passage through the Fullersburg Woods dam. Attachment 5 includes the rheophilic taxa analysis for the 2019 and 2020 pre-project monitoring at Fullersburg Woods.

1.6 Southern West Branch Physical Improvement

- Special Condition Listed Completion Date – December 2022
- Status – Concepts are being developed along with the Fawell Dam Modification Plan.

The DRSCW budgeted \$1,465,071 for the period 2019 to 2021.

Table 6. *fIBI, mIBI, and QHEI baseline data collected in 2019 and 2020 for the Fullersburg Woods Dam Modification.*

Site ID		River Mile	Drainage Area (sq mi.)	Fish IBI	MIwb	mIBI	QHEI	Attainment Status
Salt Creek 2020								
SC56		12.5	109.7	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	113.7	16	6.8	29.5	55.0	Non-Poor
SC53		11.0	114.0	16	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
Salt Creek 2019								
SC56		12.5	109.7	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	113.7	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

Table 7. *Color Key to IBI scores depicted in Table 6.*

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

Table 8. *Color Key to QHEI Scores in Table 6.*

Legend: QHEI	
Blue	Excellent
Green	Good
Yellow	Fair
Orange	Poor
Red	Very Poor

Figure 1. Fish Index of Biotic Integrity scores in Salt Creek at the Fullersburg Dam survey area for the years of 2019 and 2020.

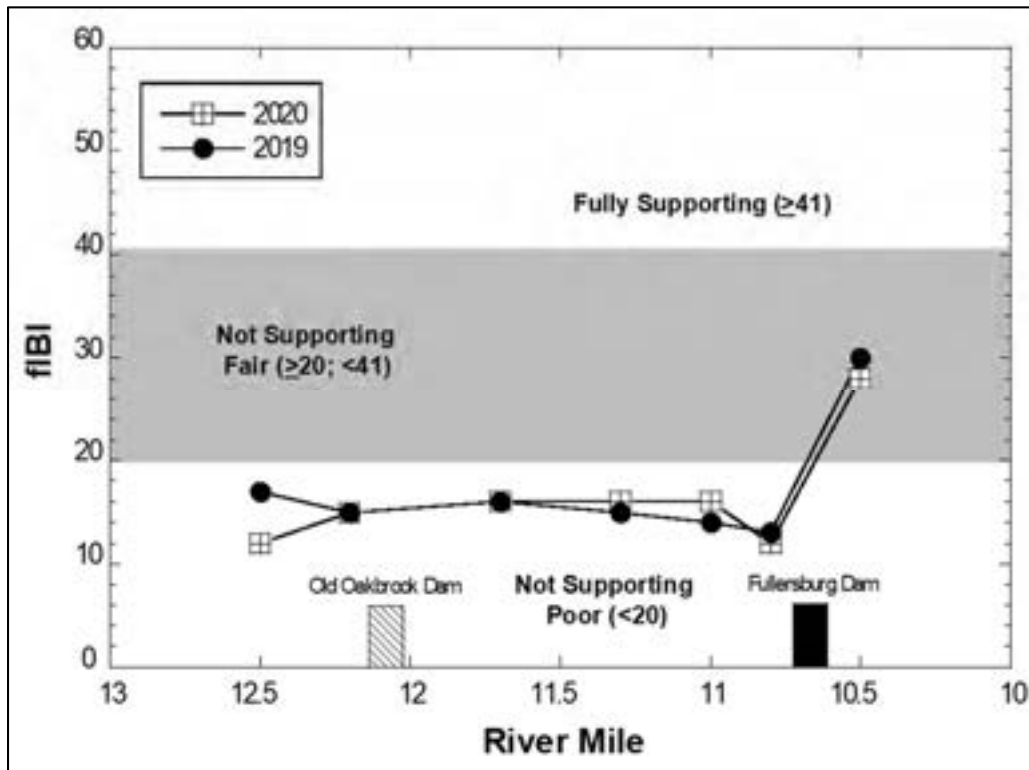


Figure 2. Modified Index of Well-Being (MIwb) scores in Salt Creek at the Fullersburg Dam survey area for the years of 2019 and 2020.

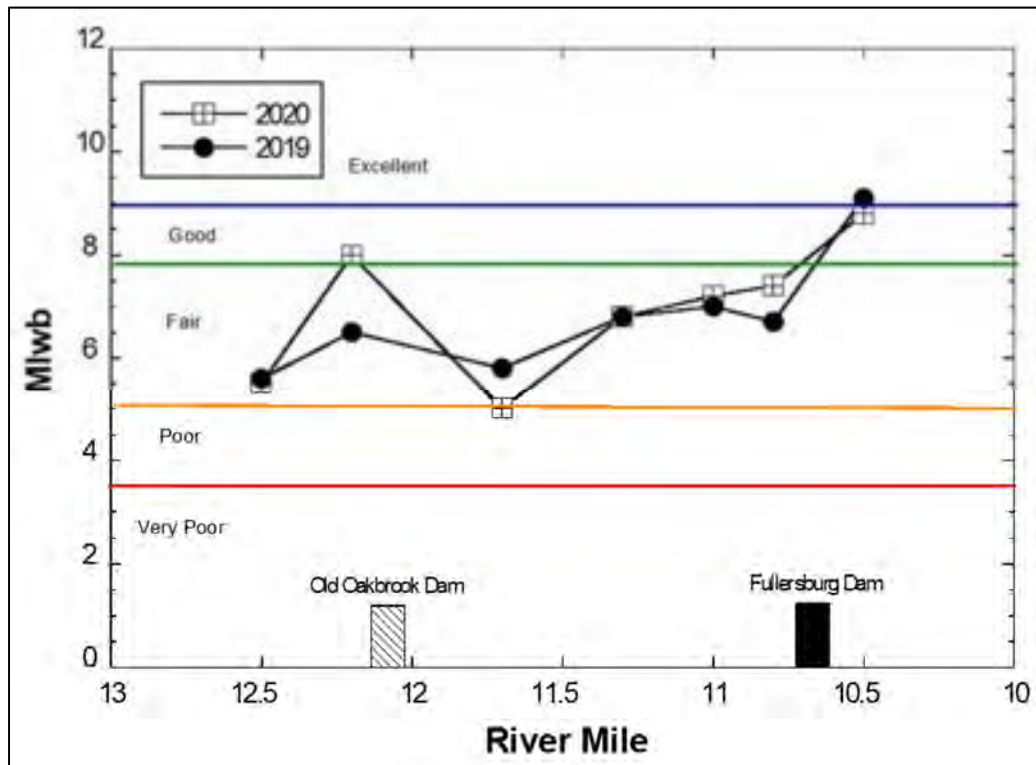


Figure 3. Macroinvertebrate Index of Biotic Integrity scores in Salt Creek at the Fullersburg Dam survey area for the years of 2019 and 2020.

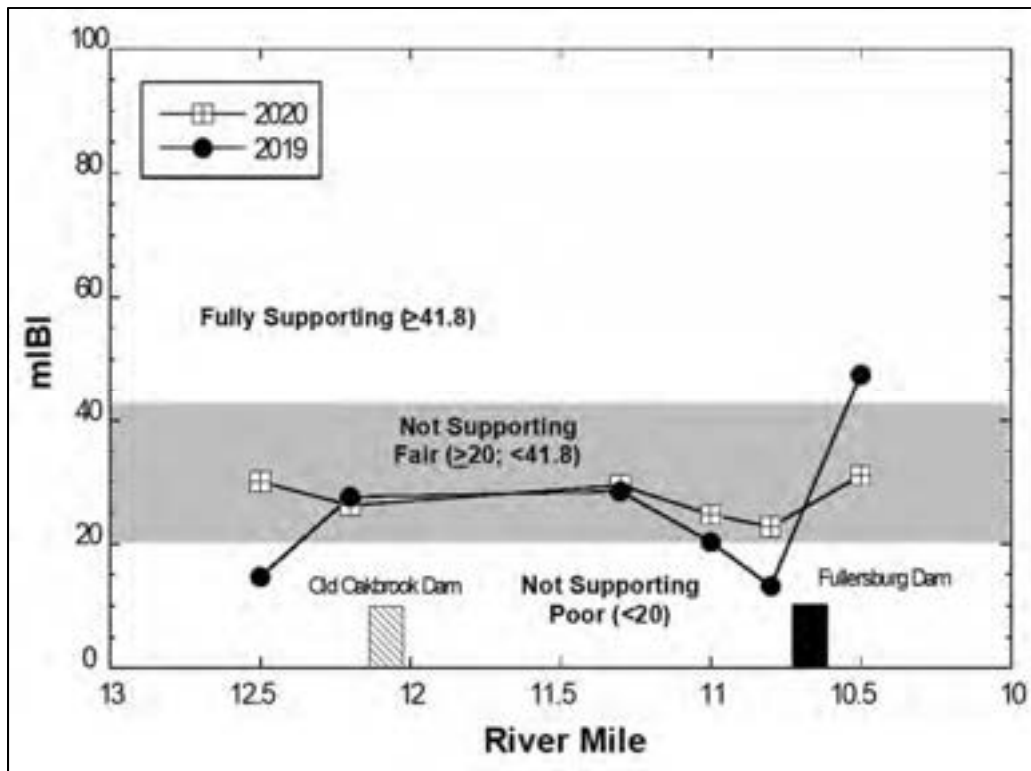
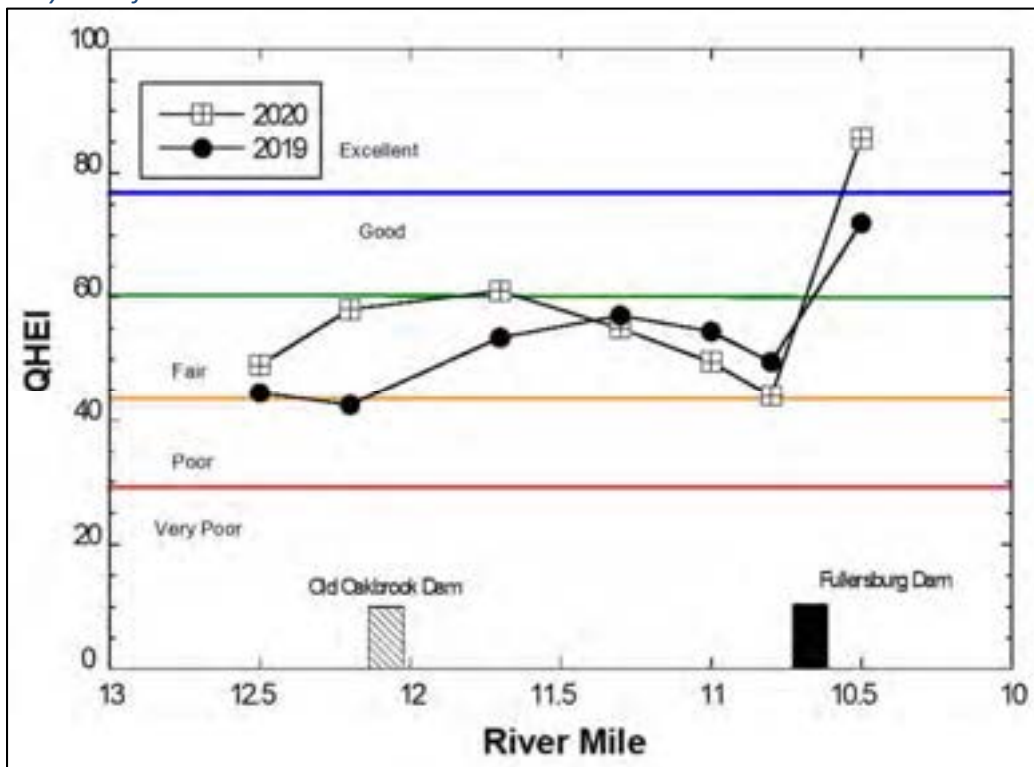
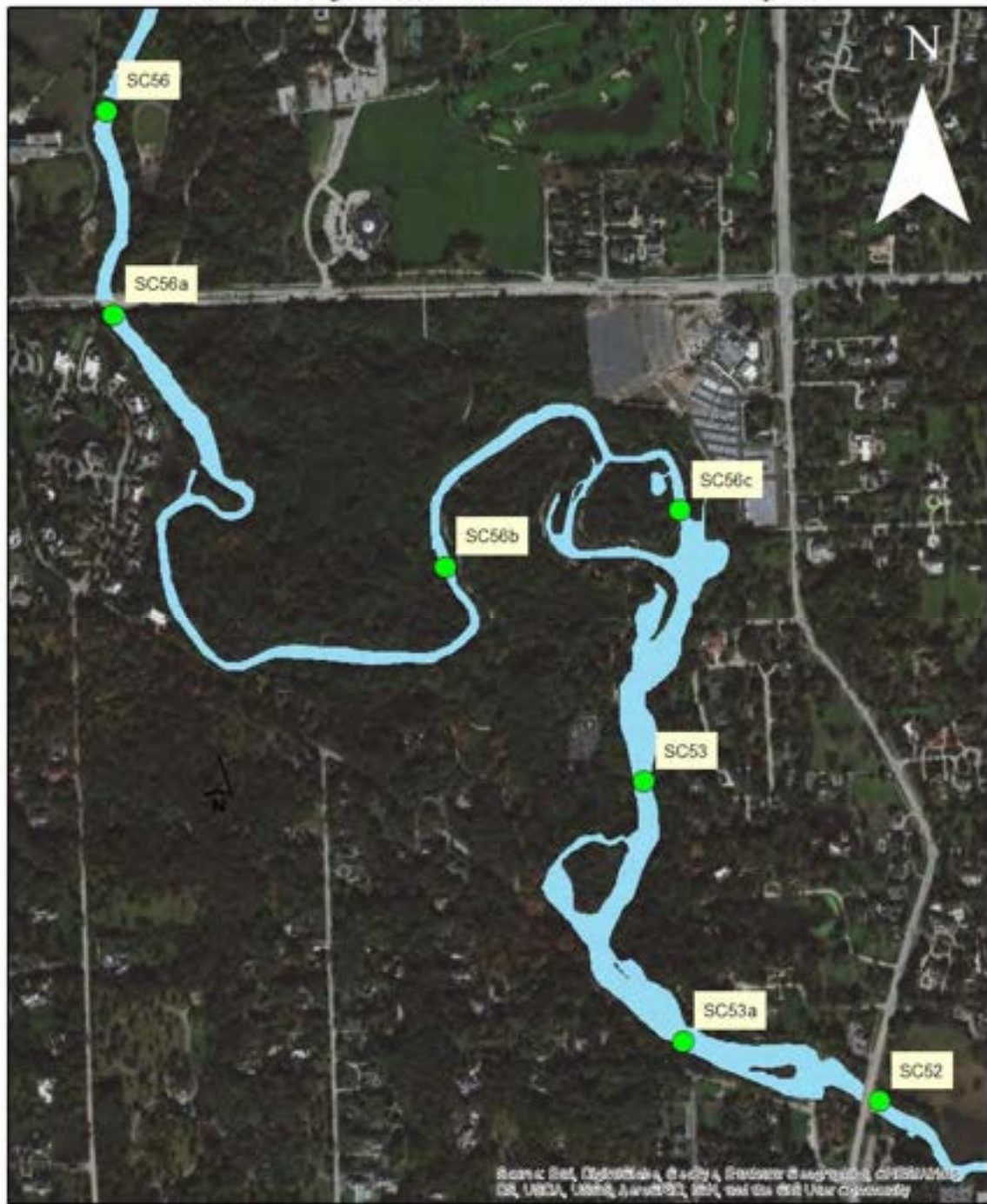


Figure 4. Qualitative Habitat Evaluation Index (QHEI) scores in Salt Creek at the Fullersburg Dam survey area for the years of 2019 and 2020.



Pre-Project Monitoring Sites, Fullersburg Woods Dam Modification Project



Legend

● Salt Creek Fullersburg Woods Sample Sites

Map 4. Pre-project Monitoring Locations for the Fullersburg Woods Dam Modification Project.

1.7 Southern East Branch Stream Enhancement

- Special Condition Listed Completion Date – December 2023
- Status – In planning

The DRSCW has budgeted \$2,500,000 for this project and anticipates expenditures in 2021-2023.

1.7.1. Site Description

The DRSCW is utilizing outputs from the Identification and Prioritization System Model (IPS), pre-project site assessment (2017), and fish monitoring (2019) to narrow down the location of the project where the best improvements to aquatic life can be made. It is expected that the project will be situated in the stream reach located downstream of the Green Valley Wastewater Treatment Plant and upstream of the western boundary of the Naperville Park District's DuPage River Park East.

The 2017 Report provided details on the pre-project site assessment fieldwork conducted for the Project. See Section 1.7.3 for details on the fish sampling conducted in 2019.

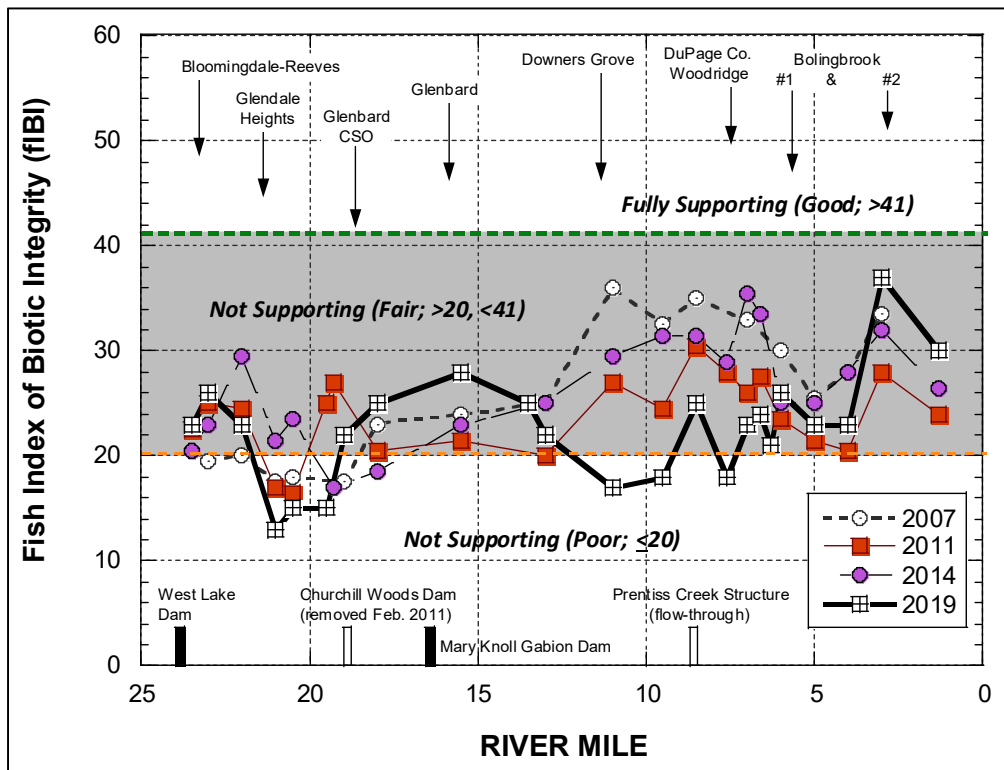
1.7.2. Design Progress Report

In order to identify and select a consultant for design engineering services and the preparation of contract bid documents for the Southern East Branch Stream Enhancement project, the DRSCW initiated a solicitation for statements of interests (SOIs) from interested firms in early 2021. Seven (7) consultant teams submitted SOIs. From the submitted SOIs, three (3) consultant teams were shortlisted and asked to prepare detailed project proposals. The DRSCW aims to select and enter into contract with a consultant team for this work by the end of April 2021.

1.7.3. Project Impact Evaluation

Figure 5 shows fIBI data collected on the main stem 2007, 2011, 2014 and 2019. The project site will be targeted on the area between river mile 2 and river mile 7. Additional higher resolution mapping is scheduled for 2021.

Figure 5. *fIBI* data collected on the main stem of the East Branch DuPage River (2007, 2011, 2019, and 2019).



1.8 Hammel Woods Dam Modification

- Special Condition Listed Completion Date – December 2023
- Status – Designs are completed and permits were submitted in November 2019. Landowner is in final discussions with permitting agencies.

The LDRWC budgeted \$600,000 for this project and anticipates expenditures in 2021-2022.

1.8.1. Site Description

The 2017 Annual Report provided a site description.

1.8.2. Design Characteristics

The 2017 Annual Report provided the design characteristics of the Project.

1.8.3. Permitting Requirements

The 2017 Annual Report provided details on the permitting requirements for the Project. Additional requirements for completing a Historic American Engineering Record was added in late 2020 which slowed the permitting process down. This study requires the drawdown of the water for high quality photographic documentation of the structure. Agreements are being

developed to allow the documentation to occur immediately before dam removal construction to minimize construction costs.

1.8.4. Design Progress Report

The Lower DuPage River Watershed Coalition approved a Memorandum of Understanding (MOU) with the Forest Preserve District of Will County (FPDWC) to fund the design and construction of this project. The FPDWC executed a contract with their consultant to complete the design and permitting phase of this project. The design consultant submitted permit applications in November 2019 to ACOE and IDNR. Bids for construction went out in August 2020 and a contract was awarded in November 2020. Construction will coincide with appropriate water level conditions for this project sometime in 2021.

1.8.5. Project Impact Evaluation

The LDRWC sampled bioassessment monitoring sites in 2012, 2015, and 2018 as part of the long-term Bioassessment Program. Sites sampled include above, below the dam, and within impoundment. In order to evaluate the success of the project, the LDRWC conducted additional pre-project sampling at two additional sites within the impoundment in 2019 and will include those sites in addition to the regular bioassessment sites for post-project monitoring.

1.9 Hammel Woods Dam to 119th Street in Plainfield Stream Enhancement

- Special Condition Listed Completion Date – December 2023
- Status – In planning

The LDRWC has budgeted \$2,740,000.00 for this project and anticipated expenditures will be made from 2021-2023.

1.9.1. Site Description

The LDRWC is utilizing outputs from the Identification and Prioritization System Model (IPS) to narrow down the location of the project where the best improvements to aquatic life can be made. Additionally, outputs from the new QUAL 2Kw model and QHEI data will be used to further define design criteria. This process should be completed in Spring 2021. It is anticipated that SOI and RFP for design and engineering work will immediately follow site selection.

Chapter 2 Chloride Reduction Program

The Special Condition 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 2020/2021.

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. The workshops were held in collaboration with APWA Chicago Metro Chapter. The following year, the DRSCW added a second workshop that targeted contractors responsible for snow and ice management of parking lots and sidewalks into an annual rotation. Since 2007 the DRSCW has executed two 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. Additionally, in 2014, the DRSCW held a third workshop in collaboration with Monroe Truck Equipment which focused solely on equipment calibration (Plate 9). Calibrating equipment is an immediate, low-cost BMP that can be implemented without capital upgrades.

Plate 9. Demonstrations of equipment calibration at DRSCW Chloride Management Workshops.



In the past several years, deicing workshops have been held separately by The Conservation Foundation in partnership with Kane County, the DuPage River Salt Creek Workgroup, and the Lower DuPage River Watershed Coalition in partnership with Lower Des Plaines Watershed Group.

During the reporting period April 1, 2020 to March 31, 2021, three chloride reduction workshops and four technical webinar briefs were held. Due to precautions necessitated by the Coronavirus pandemic, the workshops were held in a webinar format allowing the groups to collaborate and host the workshops jointly. Registration was also made available to agencies in McHenry, Lake and Cooks counties as their usual annual deicing workshops were not being held. Accordingly, the webinars were attended by staff in DuPage, Will, Kane, Kendall, Lake, McHenry and Cook counties.

Public Roads Deicing Workshops were held on October 1 and October 14, 2020 (Plate 10). Fortin Consulting, Inc. from Minnesota was engaged to present the material. A registration fee was required per agency in order view the webinar. The links were sharable so the webinars could be viewed individually or in groups. A poll was taken at the beginning of each webinar asking how many persons were in the room. The polling results indicated that there were 280 persons viewing the Oct. 1 webinar and 190 persons viewing the Oct. 14th webinar for a total of 470 attendees for the Public Roads webinars. Certificates of attendance were provided to those who requested them. Evaluation surveys were sent to the persons who logged in to the webinars. A link to the *Minnesota Snow and Ice Control: Field Book for Snowplow Operators* was provided to each registrant.

Plate 10. *Deicing Workshops Registration Form, 2020.*



On October 8, 2020 the Parking Lots and Sidewalks Deicing Workshop webinar was held with Fortin Consulting, Inc. presenting (Plate 11). The polling results indicated that there were 123 persons viewing the webinar. Certificates of attendance were provided to those who requested them. Evaluation surveys were sent to the persons who logged in to the webinars. A link to the *Minnesota Pollution Control Agency Winter Parking Lot & Sidewalk Maintenance Manual* was provided to each registrant.

Questions from participants were entered into the chat and answered by Fortin Consulting staff, Workgroup staff as well as others participating in the training. A summary of all links provided during the training as well as other links added to the chat were captured and provided to the participants after the webinar (Plate 12).

To complement the Winter Deicing Workshops, the Winter Technical Briefs – Mini-Webinar Series was presented to focus on specific issues (Plate 13). Topics in 2020 included: October 20 – Reducing Salt With Organics: The Boost & Reduce Method, October 27 – Sourcewell & Cooperative Purchasing, November 10 – Benefits of Segmented Blades, and November 17 – The Fine Art of Brine Making. Staff also worked with local partners to create a training video on how to calibrate a walk behind salt spreader. These webinars and training video are posted on www.saltsmart.org.

Plate 11. *Welcome & Introduction to Parking Lots & Sidewalks Presentation, 2020.*



Plate 12. *Links from webinar presentation and chat, 2020.*



Plate 13. *Winter Technical Briefs, 2020.*



Additionally, during this reporting period, the LDRWC shared seasonal outreach materials for members to use in residential outreach efforts (Plate 14). 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.

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 will be distributed in spring of 2021 and the results will be supplied in the 2021 Annual Report.

Plate 14. Outreach Poster/Handout on winter safety, 2020.



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 see if these efforts are resulting in a discernable impact on chloride loading within the instream water quality data collected by DRSCW from 2009 to present.

The analysis is challenging. There are many factors that affect the resulting water quality data, including variability in winter weather over the years (temperatures, precipitation, number of storms, types of storms), inconsistency in municipal salt application events across the DRSCW's

watershed areas, and inconsistency in the way events are defined and tracked by municipalities. The variability inherent in winter weather conditions, municipal application practices and record keeping does not allow the loading data to show the effect of reduction practices without accounting for it in some way. Additionally, the assumption that reductions in public or institutional use (the main recipients of training) will automatically translate into lowering of ambient chloride loading needs to be proven.

Our approach consists of using direct chloride sampling and analysis concentration data, along with adjusted specific conductivity concentration data collected by the DRSCW, and USGS flow data to calculate loading (in pound per day) of chloride for each DRSCW watershed over the past decade. This created loading data. The methodology then required that the loading data be adjusted or normalized to account for variabilities in winter weather and salt application events. The team examined several different weather datasets to try and overlay the loading data but none proved adequate. In early 2021, the DRSCW signed a contract with Weather Command / Murray and Trettel, Inc. for 10 years of detailed data.

The weather data is being analyzed by individual watershed and separately for summer and winter periods each year. The hope is that once adjusted for variabilities, the loading data will better show the effect of the program's salt use reduction training and best management practices implementation by municipalities on water quality.

As of the time of this report, the data has been organized by watershed and season, and water quality loadings have been calculated for the study period. Detailed weather and precipitation data is being reviewed to develop a method for accounting for the variability in temperatures and precipitation, municipal salt application events, and the way salt application events are defined and tracked. Adjustments will be performed using those methods, and the resulting loading trends will be presented in a future report. This analysis may provide an indication of the effectiveness of the Workgroup's chloride education and reduction efforts.

2.3 Continuous Chloride Monitoring

Ambient monitoring of winter conductivity was carried out at 6 locations in the program area in 2018-2019 (4 sites monitored by the DRSCW and 2 sites monitored by MWRD). Conductivity is used to calculate chloride concentrations based on a relationship established by the DRSCW in 2007 and 2019 (so the data is referred to as calculated). Calculated Annual chloride concentrations for the winter months from 2006-2019 for the 6 sites are depicted in Figure 6-11.

Figure 6. Calculated annual chloride concentrations - winter months (2007-2020) for Salt Creek at Wolf Road.

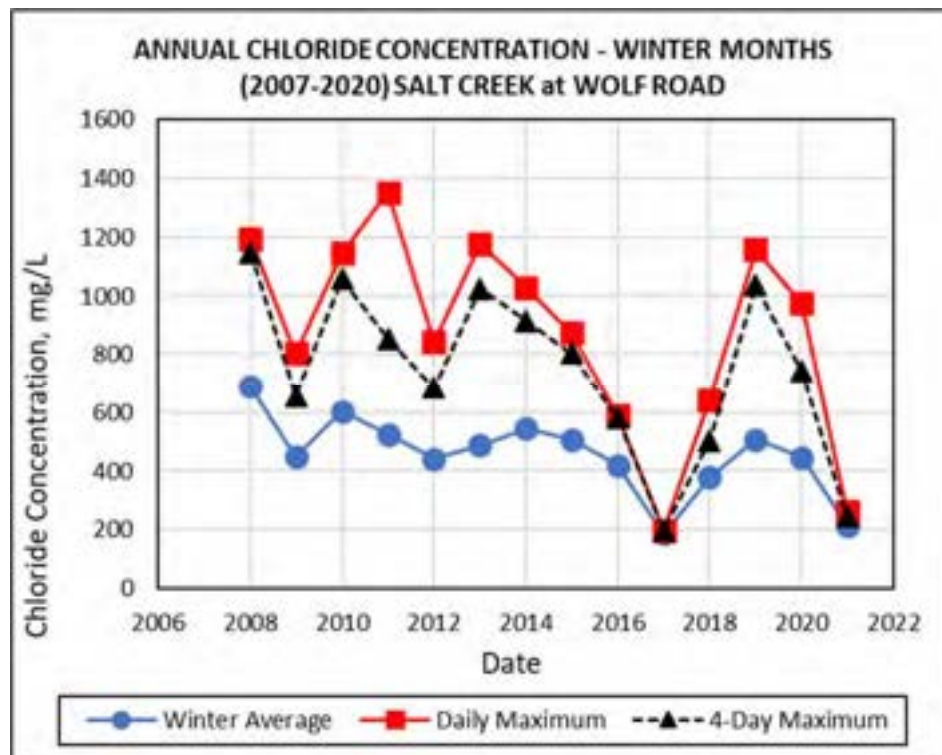


Figure 7. Calculated annual chloride concentrations - winter months (2008-2020) for Salt Creek at Busse Woods Main Dam.

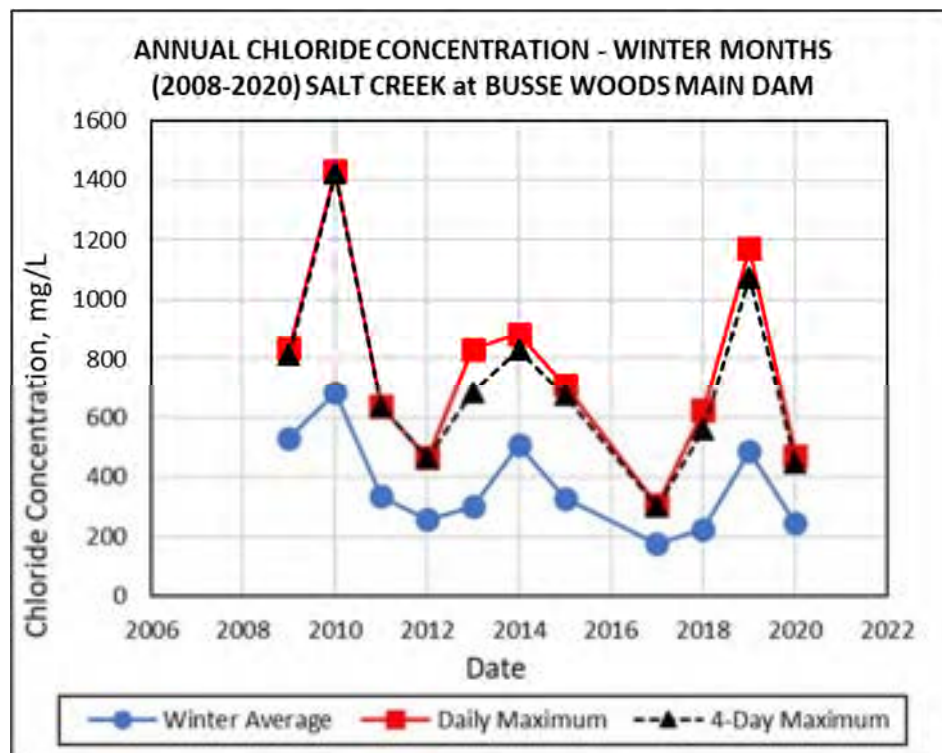


Figure 8. Calculated annual calculated chloride concentrations - winter months (2008-2020) for East Branch at Hobson Road.

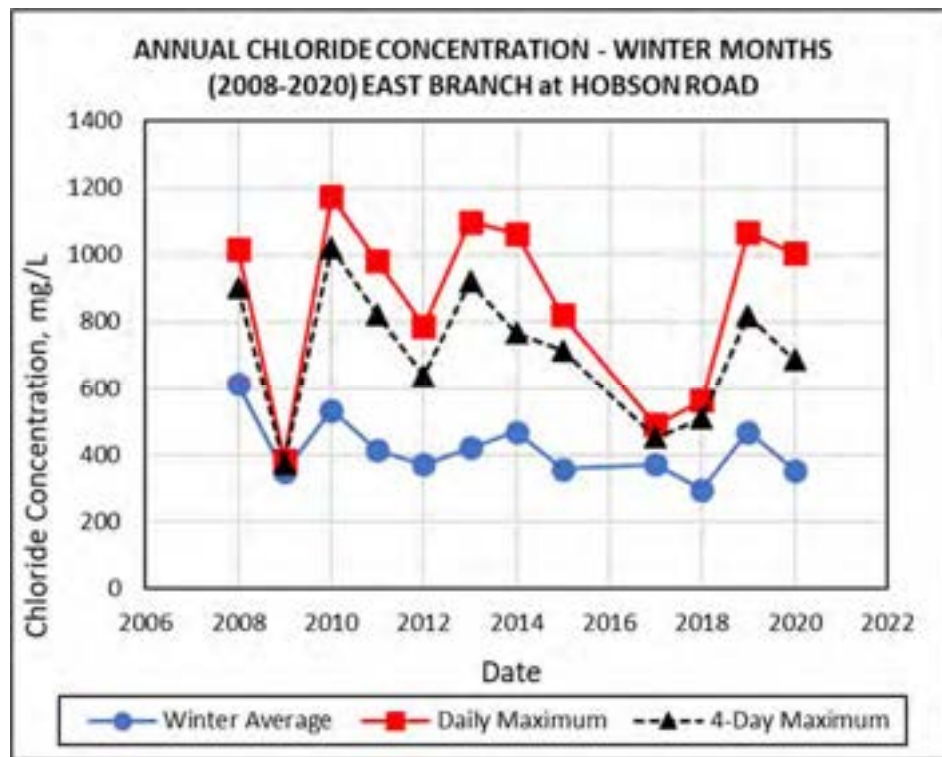


Figure 9. Calculated annual chloride concentrations - winter months (2007-2020) for East Branch at Army Trail Road.

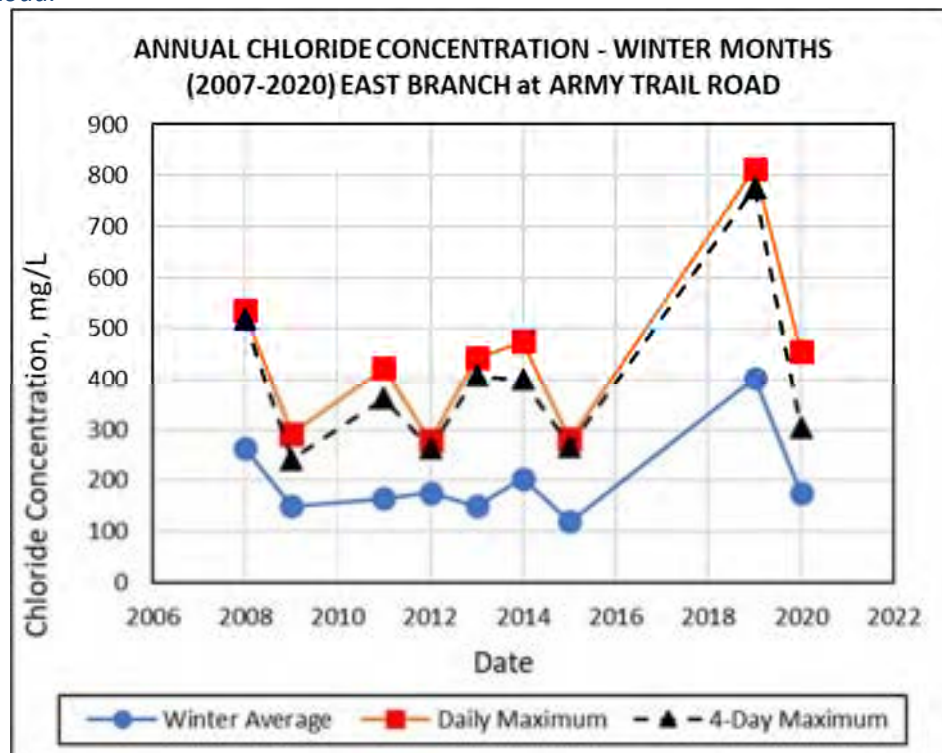


Figure 10. Calculated annual chloride concentrations - winter months (2018-2020) for West Branch at Bailey Road.

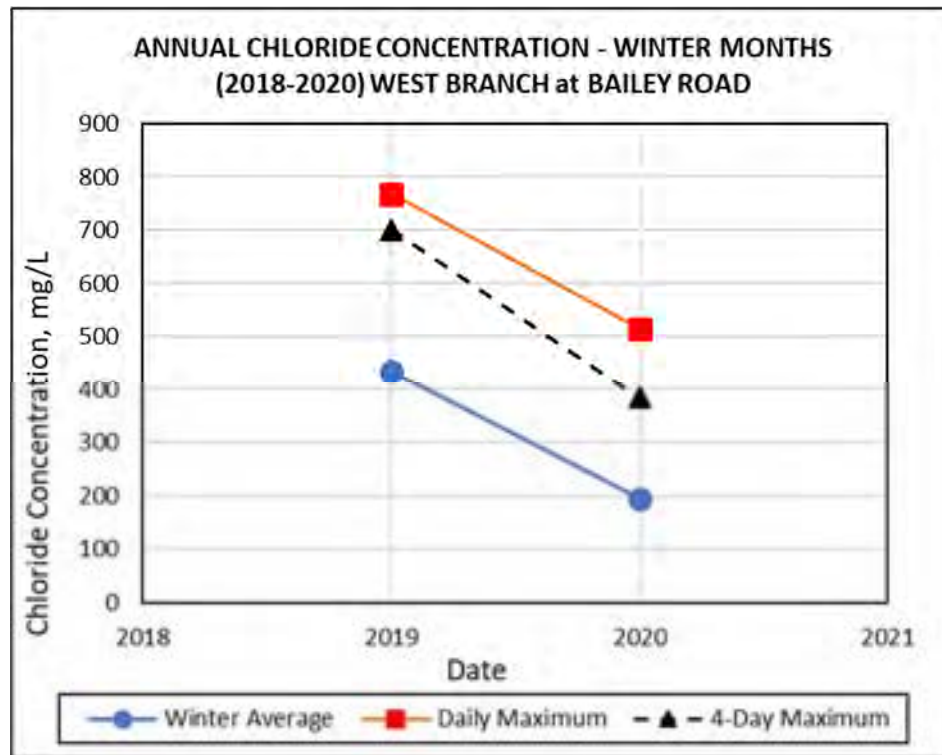
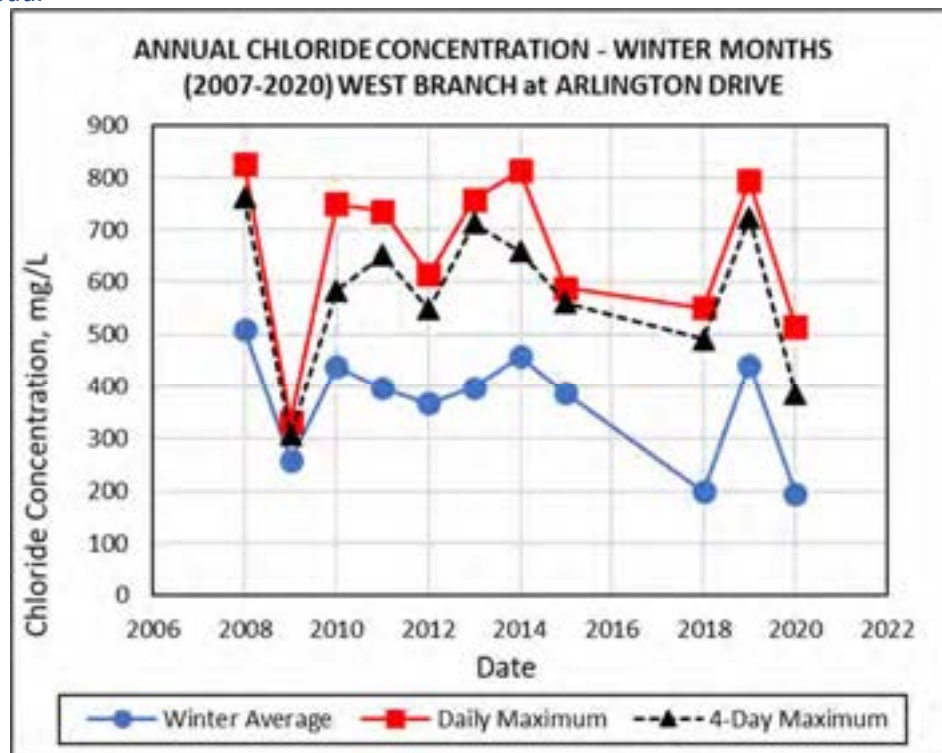


Figure 11. Calculated annual chloride concentrations - winter months (2007-2019) for West Branch at Arlington Road.



Chapter 3 Nutrient Implementation Plan

The Special Condition 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 Condition Paragraph 2 and Special Condition Paragraph 8.c. identify additional studies to be completed by the watershed workgroups. This section summarizes the DRSCW and LDRWC work in 2020/2021 on the studies.

3.1 IPS Model /Project Identification Study

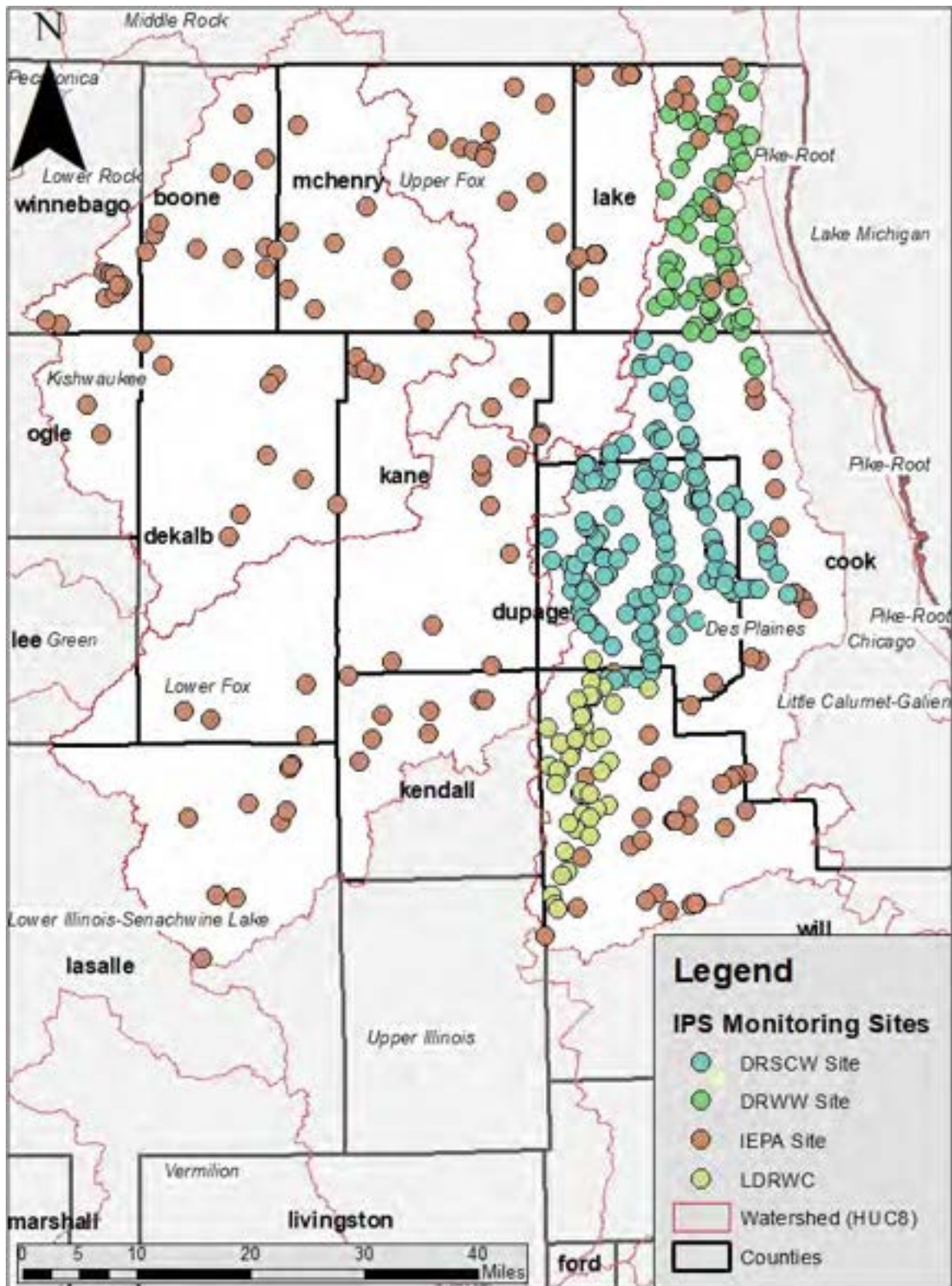
- Special Condition Listed Completion Date – Complete
- Status – Staff is still amending final report and database for release. The methodology, results, database, and a user manual all exist in draft final form and are under review. Due to the potential long-term impacts of some of the IPS model results DRSCW had requested to talk to IEPA about the results. Due to the pandemic this did not occur in 2020. It will be organized for 2021.

3.1.1. Background on the IPS Model and 2019-2020 Project Work

The project's objective is to update the DRSCW's Integrated Prioritization System model (IPS) and develop a new list of prioritized projects for both the DRSCW and LDRWC watersheds. The original IPS Model was developed by the DRSCW with its consultant (MBI) in 2010. The updated model used additional monitoring sites, several years of additional monitoring, updated methodology and updated prioritization methodology.

The IPS is a framework that merges high resolution monitoring data and assessment results with water quality management goals and objectives in order to guide decision-making at regional and local watershed scales. The model is designed to provide accurate quantitative indicators (biological response measures and chemical, habitat and land use stressor measures) and data-driven tools to Watershed groups to guide and inform their surface water restoration and protection efforts. Unlike traditional modelling efforts that tend to focus on very few parameters, the IPS examines many stressor variables including habitat and land use variables; and thus, it provides a comprehensive view and weighting, of the factors potentially limiting aquatic life.

The updated IPS Model geographically covers the watersheds of Northeastern Illinois including the Upper Des Plaines River and tributaries (DuPage River, Salt Creek) in all or parts of DuPage,



Map 5. Spatial distribution and providence of data utilized in the 2020 IPS Update.

Cook, Will, and Lake Counties (Map 5). Data from outlying watersheds including the Kishwaukee River, Kankakee River, and the Fox River were used in order to expand the stressor and response gradients. Data from more than 650 IEPA/IDNR, DRSCW, LDRWC, and Des Plaines River Watershed Workgroup (DRWW) sites draining <350 sq. mi. were used in the analyses. This is a significant expansion over the original IPS 120 sites.

Paired data supplied by these organizations included the dependent variables of fish, macro-invertebrates, habitat, and water chemistry data. Additional stressor variables, notably land use data such as road density, canopy cover, land cover and land use types, were developed and added to the data set. Figure 12 gives a schema showing the step by step approach to reaching the IPS outputs. These steps were covered in detail in the 2019 & 2020 reports.

The IPS Model allows for the derivation of stressor thresholds for each of the explanatory variables. An additional major function of the IPS is to enhance the identification of causes and sources of impairment for rivers identified as impaired aquatic life uses. Given the large number of potential stressors that can affect aquatic life, particularly in urban settings, there is a practical necessity to narrow the stressors down to the most likely limiting factors. Here both FIT analyses and Random Forest regression and classification trees were used to assess the strength of the stressor relationships with the response of the aquatic biota and the most likely causes as a result. There is a need to reduce to the number of likely stressors prior to using these tools, thus the initial analyses using correlation and simple regression and classification trees by stressor category were used to achieve this reduction.

Three types of analyses were used to help identify important causal variables for the IPS

- 1) Correlation analyses and regression and classification tree analyses by stressor category using the entire data set to reduce variables and remove some highly correlated values;
- 2) Derivation of a goodness-of-fit (FIT) statistic to measure the strength of actual vs. predicted associations between parameters and sensitive species/taxa richness;
- 3) On a reduced set of parameters, random forest regression and classification analyses to help discriminate level of variable importance among the reduced set of variables.

The selection of the “strongest” correlates however, does not eliminate the usefulness of multiple stressors to better explain causality of impairments especially when designing management interventions. Categories such as land use and QHEI explain a large amount of the variation in aquatic life but the causal effects can be better understood and addressed by finer resolution understanding of the stressor (elements of QHEI and landscape cover). In

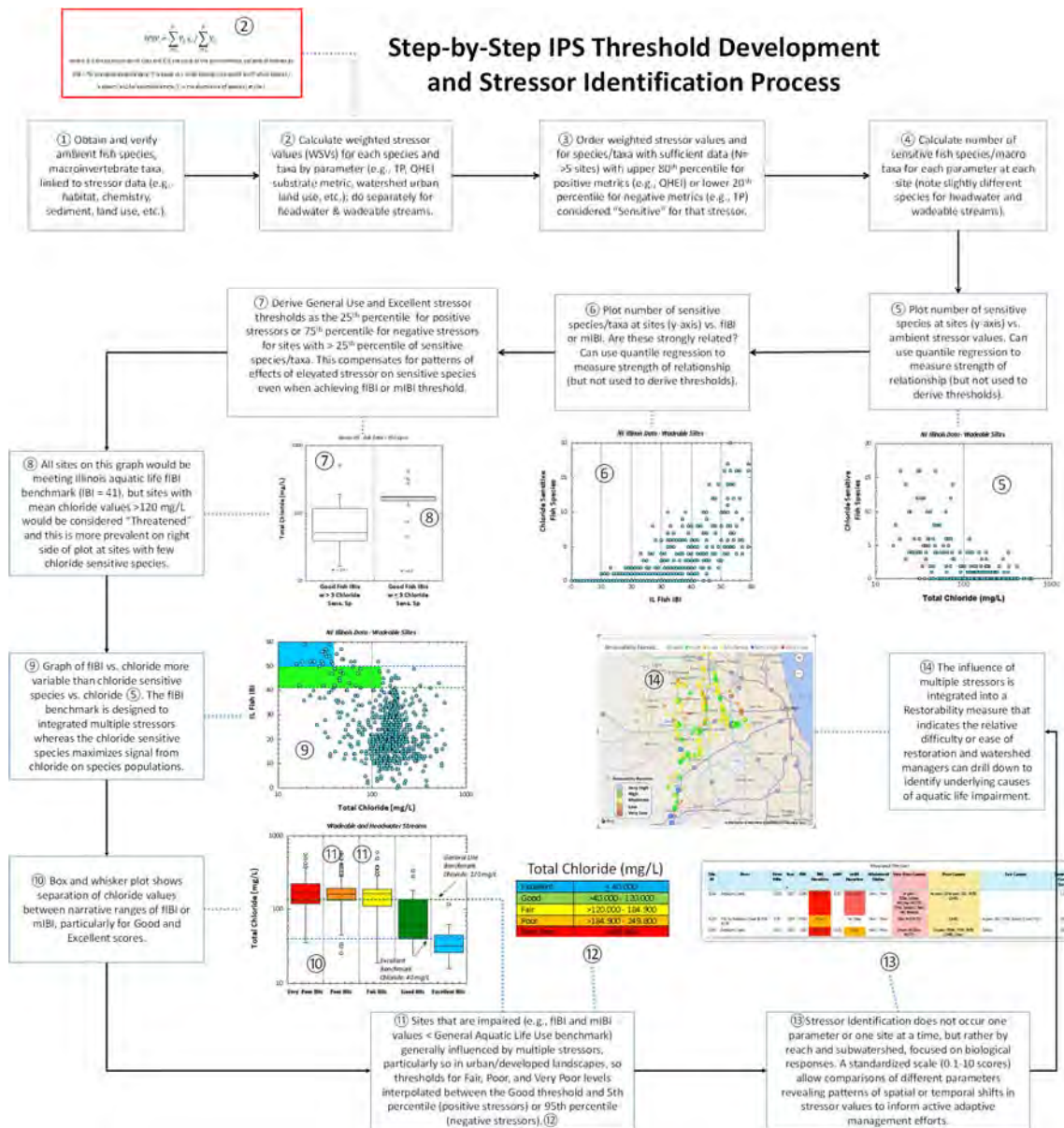


Figure 12. Step-by-Step IPS Threshold Development and Stressor Identification Process.

addition, broad scale statistical analyses provide insights into average or prevalent conditions, but this may obscure a site-specific scenario where a different variable is more influential.

Given the large number of environmental and stressor variables amassed in the IPS database, a three-step process was used to identify the best stressor variables for identifying the possible mechanisms causing aquatic life impairments. The process involved:

- A correlation matrix was derived to better reveal which variables are highly correlated.
- Of these, the stressors which were readily measured and that matched conceptual models and other evidence of causal impacts were selected.
- Classification and regression trees were then used to identify the strongest amongst these variables for derivation of FIT scores, random forest regression, and classification analysis.

Table 9. *Strongly Correlated Stressors with the highest FIT score (>0.32).*

Stressor	FIT Score
Impervious Land Use (500m)	0.01
QHEI Embeddedness Score	0.03
Urban Land Uses (WS)	0.03
QHEI Overall Score	0.04
QHEI Substrate Score	0.04
QHEI Good Attributes	0.04
Total Phosphorus	0.04
Impervious Land Use (30m)	0.04
Impervious Land Use (30m Clipped)	0.04
Conductivity	0.05
QHEI Channel Score	0.07
QHEI Silt Cover Score	0.07
Developed Land Use (WS)	0.07
Minimum Dissolved Oxygen	0.1
Total Dissolved Solids	0.1
Impervious Land Use (WS)	0.1
Hydro-QHEI Depth Score	0.11
QHEI Poor Habitat Attributes	0.12
Hydro-QHEI Overall Score	0.13

These results should provide the variables that will be the most useful in selecting effective restoration and protection approaches and setting readily measured goals for stressor reduction. Variables with stronger correlations carry more weight in the IPS Restorability scoring. The scores with the best FIT value are summarized in Table 9.

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.

3.2 QUAL2Kw Updates for East Branch and Salt Creek

- Special Condition Listed Completion Date – December 2023
- Status – On-going. The East Branch DuPage River and Salt Creek QUAL2Kw models were completed in 2020. The West Branch DuPage River and Lower DuPage River are scheduled for 2021. Model scenarios for all four (4) models will be also be completed in 2021.

The DRSCW budgeted \$183,000 for this effort and anticipates expenditures in 2019-2021. Additionally, the LDWRC has budgeted \$68,000 for this effort and anticipates expenditures in 2020-2021. Note: The Special Condition Permit language only requires the update of the existing QUAL2K models for Salt Creek and the East Branch DuPage River. The DRSCW and LDWRC 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 2020, 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 four (4) 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.

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 10 for schedule). Sites sampled in the West Branch DuPage River in 2020 are included in Table 11. Sites in the other basins will be identified prior to the start of sampling for their designated year.

Table 10. 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 and low flow conditions (no rain 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 will be 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 will be analyzed for the constituents listed in Table 12. One (1) benthic algae sample will be collected at each site.

3.2.2. QUAL2Kw Modeling

In November 2019, the DRSCW and LDWRC 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 through the DuPage River and Salt Creek watersheds.

Table 11. *Sites Monitored as Part of the Expanded DO Monitoring Program.*

Site Code	Site Name/Description	Latitude	Longitude
WB03	Upstream intersection of Joliet Street and Wilson Street	41.85663055	-88.2046
WB08	Knoch Knolls Park, Naperville	41.71213206	-88.14164968
WB11	Upstream of 2nd Bridge in WSD	41.84709267	-88.14121034
WB13	Adjacent to Liberty Street	41.86807845	-88.1569965
WB16	Upstream of Pedestrian Bridge in Klein Creek Farm	41.89616307	-88.1546693
WB19	Armstrong Park	41.91955794	-88.13045071
WB24	Downstream MWRDGC Hanover Park WWTP	41.99967181	-88.13621986
WB25	Upstream from Braintree Drive	42.0115085	-88.11083
WB26	Adjacent to Shaffner Rd.	41.84403109	-88.1467
WB27	Immediately downstream from County Farm Rd	41.9662973	-88.15337574
WB28	Immediately downstream from County Farm Rd	41.9653305	-88.167028
WB33	Immediately upstream from Great Western Trail	41.90528244	-88.17830798
WB34	Downstream from Garys Mill Rd	41.85798159	-88.19371109
WB35	Adjacent to Washington Street at Pioneer Park	41.75401377	-88.13389986
WB36	McDowell Grove; 1500 ft down trail from parking lot	41.79042673	-88.18267134
WB39	Immediately upstream from St. Charles Rd	41.91271345	-88.17972281

Table 12. *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

Task 1: Review of Existing and Identification of Data Needs

As part of Task 1, all available data was reviewed and considered for use in the development of the QUAL2Kw model for each watershed. Available data included flow, water quality, and sediment oxygen demand monitoring data, past DO improvement feasibility studies, wastewater discharge data, dams, and relevant hydraulic and watershed models. Data utilized to inform the development and calibration of the DuPage River and Salt Creek QUAL2Kw models is included in Table 13.

Table 13. *Data Utilized in the Development of the QUAL2Kw Models for the DuPage River and Salt Creek Watersheds.*

Component	Data Source	Approach
Boundary Inflows	United States Geological Society (USGS) sites	Spatially disaggregated USGS streamflow based on catchments delineated for each model segment.
Boundary Water Quality	DRSCW and LDRWC available water quality monitoring records (sondes and grab sites) for tributary sites and headwaters	Aggregated to develop spatially-varied hourly input time series for each model segment.
Hydraulics	DuPage County FEQ Models, HEC-RAS Models provided by the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC) and US Army Corps of Engineers (ACOE)	Channel geometry (e.g. bank slopes, bottom width) to be extruded from provided models; develop rating curves from steady-state QUAL2Kw runs, calibrated with USGS field measurements
Meteorology	North American Land Data Assimilation System (NLDAS-2); National Center for Environmental Prediction (NCEP) North American Regional Reanalysis (NARR)	Gridded NLDAS-2 data for air temperature, dew point temperature, wind speed, and solar radiation; NARR for cloud cover; shade based on aerial imagery and calibration tests.
NPDES Point Sources	Illinois Environmental Protection Agency (IEPA) monthly DMR data for facilities that discharge directly to mainstems	Developed hourly input series by facility/outfall, gap filled missing water quality records.
Sediment Oxygen Demand (SOD)	SOD Monitoring records	Applied and calibrated based on 2007 reconnaissance study records.

Additionally, as part of this Task, the mainstem extent of each of the four (4) study streams were divided into a series of longitudinal model segments. In QUAL2Kw, segments are represented as one-dimensional, vertically and laterally fully mixed segments. Each segment is represented with uniform hydraulic characteristics, boundary conditions (e.g., cloud cover), and parameterization for non-global model parameters (e.g., bottom algae coverage). Several

features, including the locations of dams (including flow-through structures) and associated impoundments, tributaries, point source discharges, water quality monitoring sites, and USGS flow gages, informed the development of the reach segmentation. The QUAL2Kw Model Segmentation Memorandums for each of the four (4) rivers is included in Attachment 6. Task 1 was completed in 2020.

Task 2A: Model Re-Calibration/Re-Validation for Salt Creek and East Branch DuPage Rivers

The QUAL2Kw model for the East Branch DuPage River and Salt Creek were calibrated to observed data for channel hydro-geometry, water temperature, DO, algae, nutrients, and CBOD. Although DO is the main response variable of interest, it is important that instream processes influencing DO are also representative of conditions in the river. Some key kinetics relevant to DO simulated in QUAL2Kw are SOD, reaeration at the air-water interface, temperature impacts on oxygen solubility, decay of oxygen-demanding substances (e.g., CBOD), oxygen demanding chemical transformations (e.g., nitrification), and benthic algae and free-floating phytoplankton photosynthesis and respiration.

Measurements are available for some hydraulic and water quality variables, such as chlorophyll-a concentrations for phytoplankton, at discrete locations along the river. For variables that lacked observations, the model was parameterized and calibrated based on values, rates, and concentrations in the literature (e.g., reaeration, CBOD decay rates, phytoplankton and benthic algae growth and death rates, kinetics associated with nutrients) and through interpretation of available evidence, such as use of the observed DO diel range to inform algal respiration parameterization.

East Branch DuPage River Results

The East Branch DuPage River model was developed to simulate calendar year 2019 and sites with the most expansive datasets from the 2019 sampling effort were selected as key calibration locations (Table 14).

Table 14. *East Branch DuPage River Key Model Calibration Locations.*

QUAL2Kw Reach Description	Model Reach	Monitoring Site ID
Churchill Lake	6	EBCB
Gabion Weir to Butterfield Road	10	EB30
I88 to Maple Avenue/Lisle Levee	13	EB31
Royce Road to Whalon Lake	16	EB34
East Branch DuPage River near confluence with West Branch	20	EB41

Available monitoring records were used to calibrate hydro-geometry, water temperature, nutrients, dissolved oxygen, and algae along the mainstem. Predicted water temperature closely matches continuous observations collected during warm weather at multiple sites. Simulated phytoplankton concentrations as chlorophyll-a are similar to observations, generally ranging between 1 to 15 µg/L. The model is biased high in terms of phytoplankton as chlorophyll a at Reach 13 (EB31); it, however, exhibits low bias at the other calibration locations. No benthic algae data were available for calibration; thus, benthic algae dynamics were adjusted based on dissolved oxygen patterns (i.e., diel ranges, in part due to algal photosynthesis and respiration). Dissolved oxygen is the primary endpoint of this study. Relative errors on daily mean and daily minimum DO are lowest at Reach 10, 13, and 30, indicating good model performance at these locations, which served as three of the five primary water quality calibration sites for the QUAL2Kw model. The model overestimates mean daily and daily minimum DO at Churchill Lake. This is in part due to differences in spatial scale because the monitoring reflects a point-in-space locations whereas QUAL2Kw provides predictions at the larger reach scale. Overall, the model calibration was successful, and the model is suitable for supporting future planning and management efforts, including simulation of dissolved oxygen improvement scenarios.

Figures 13 to 17 are representative calibration plots for the East Branch DuPage River model. All calibration plots will be included the final project report (scheduled for 2021).

Salt Creek Results

The Salt Creek model was developed to simulate calendar year 2016 and sites with the most expansive datasets from the 2016 sampling effort were selected as key calibration locations (Table 15).

Table 15. *Salt Creek Key Model Calibration Locations.*

Calibration Parameter	Model Reach	Site ID	Monitoring Site Description
Hydro-geometry	6	USGS05531300	Salt Creek near Elmhurst
	16	USGS05531500	Salt Creek at Western Springs
Water Temperature & DO	7	SCBR	Salt Creek at Butterfield Road
	12	SCFW	Salt Creek at Fullersburg Woods
	16	SCWR	Salt Creek at Wolf Road
Nutrients	3	SC23	Salt Creek at Eisenhower Expressway
	12	SC53	Salt Creek upstream of Graue Mill Dam
	14	SC52	Salt Creek downstream of Graue Mill Dam

Figure 13. East Branch DuPage River Simulated and Observed Streamflow (cms) at Reach 17 (USGS 05540250).

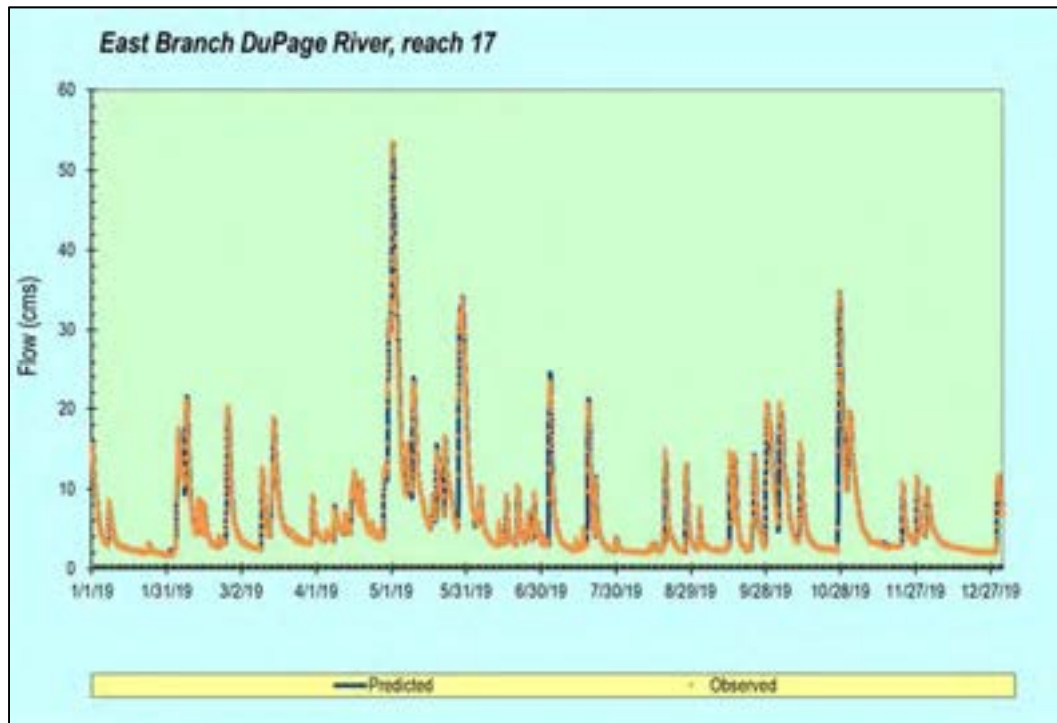


Figure 14. East Branch DuPage River Simulated and Observed Water Temperature (°C) at Reach 10 (EB30).

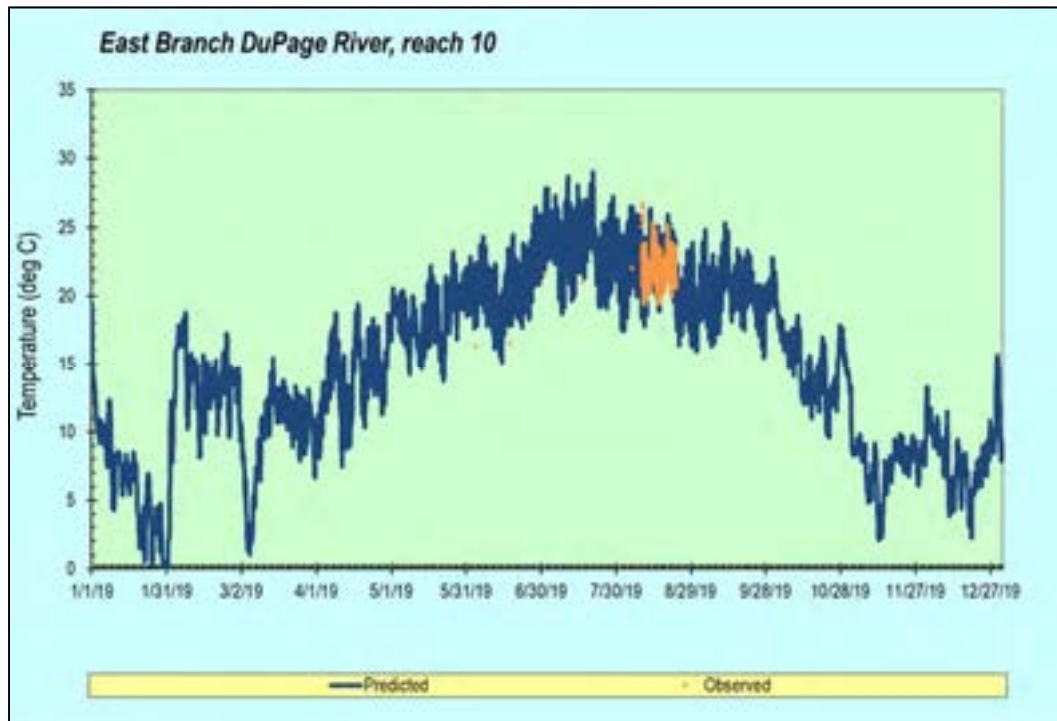


Figure 15. East Branch DuPage River Simulated and Observed Nitrogen Species ($\mu\text{g/L}$) at Reach 10 (EB30).

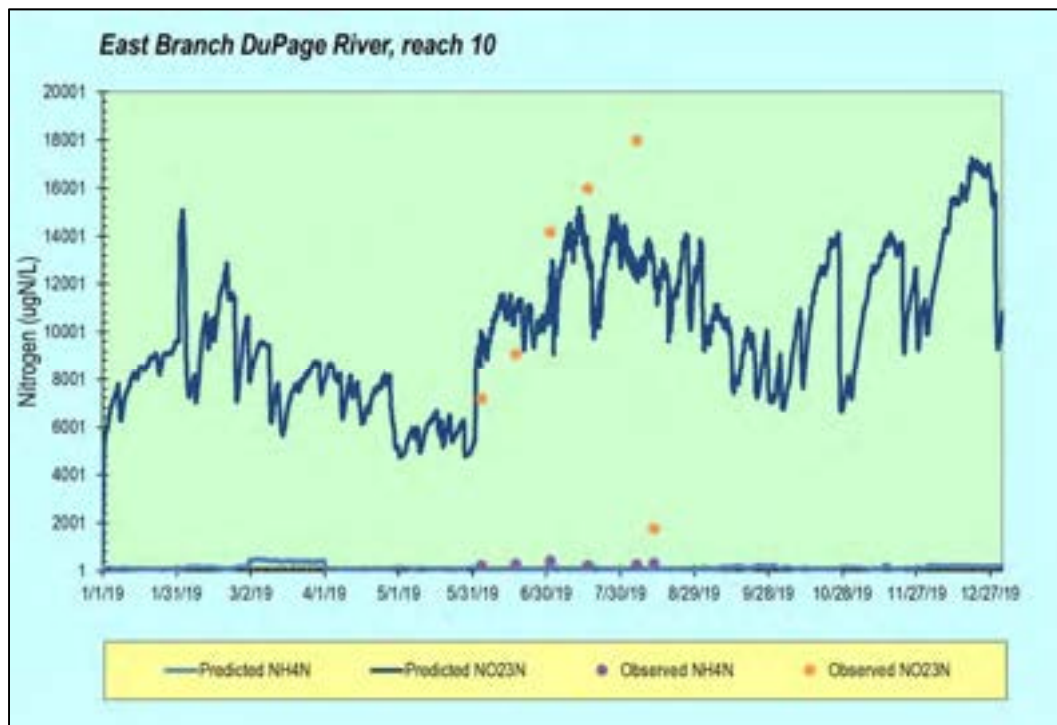


Figure 16. East Branch DuPage River Simulated and Observed Total Phosphorus ($\mu\text{g/L}$) at Reach 10 (EB30).

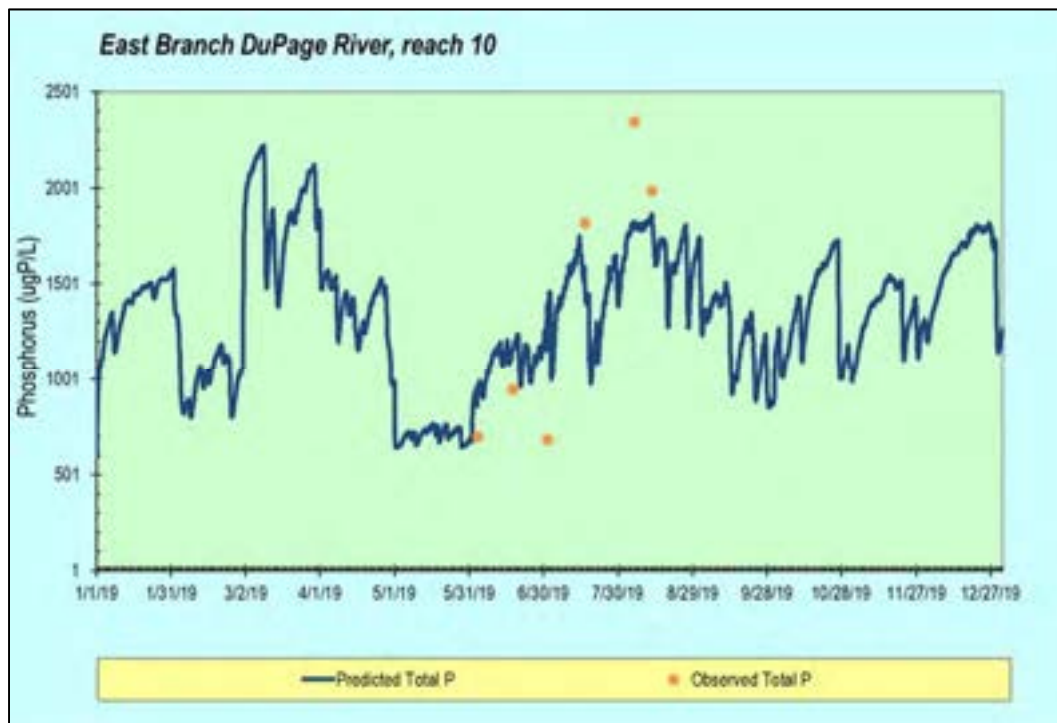
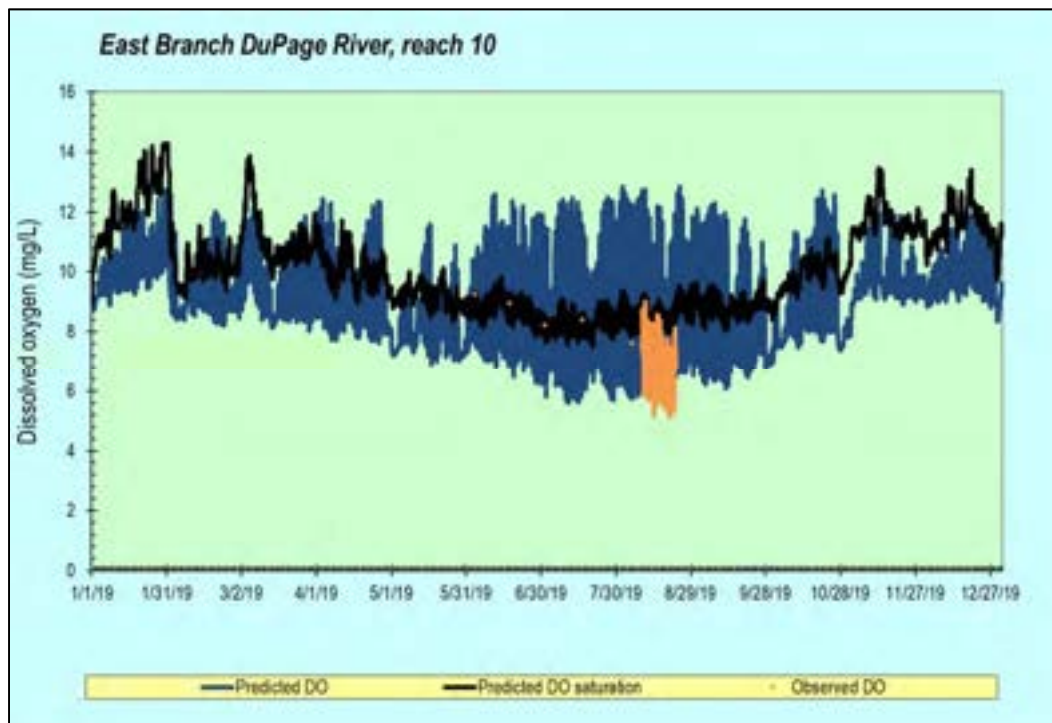


Figure 17. East Branch DuPage River Simulated and Observed Dissolved Oxygen (mg/L) at Reach 10 (EB30).



The QUAL2Kw model for Salt Creek was developed to simulate calendar year 2016. Available monitoring records were used to calibrate hydro-geometry, water temperature, nutrients, and dissolved oxygen along the mainstem. Predicted water temperature closely matches continuous observations at the majority of sites. The model predicts nitrogen species reasonably well, although it is biased high near the outlet of Busse Woods dam. The model is biased low in terms of total phosphorus; however, there is no phosphorus speciation data to help diagnose this uncertainty. No benthic algae and only limited non-growing-season chlorophyll a data was available for calibration; thus, biological kinetics were adjusted based largely on observed dissolved oxygen patterns (i.e., diel ranges, in part due to photosynthesis and respiration). Dissolved oxygen is the primary endpoint of this study. Relative errors on daily mean and daily minimum DO are lowest at Reach 7, 12, and 16, indicating good model performance at these locations. Overall, the model calibration was successful, and the model is suitable for supporting future planning and management efforts, including simulation of dissolved oxygen improvement scenarios.

Figures 18 to 22 are representative calibration plots for the Salt Creek model. All calibration plots will be included the final project report (scheduled for 2021).

Figure 18. Salt Creek Simulated and Observed Streamflow (cms) at Reach 16 (USGS 05531500).

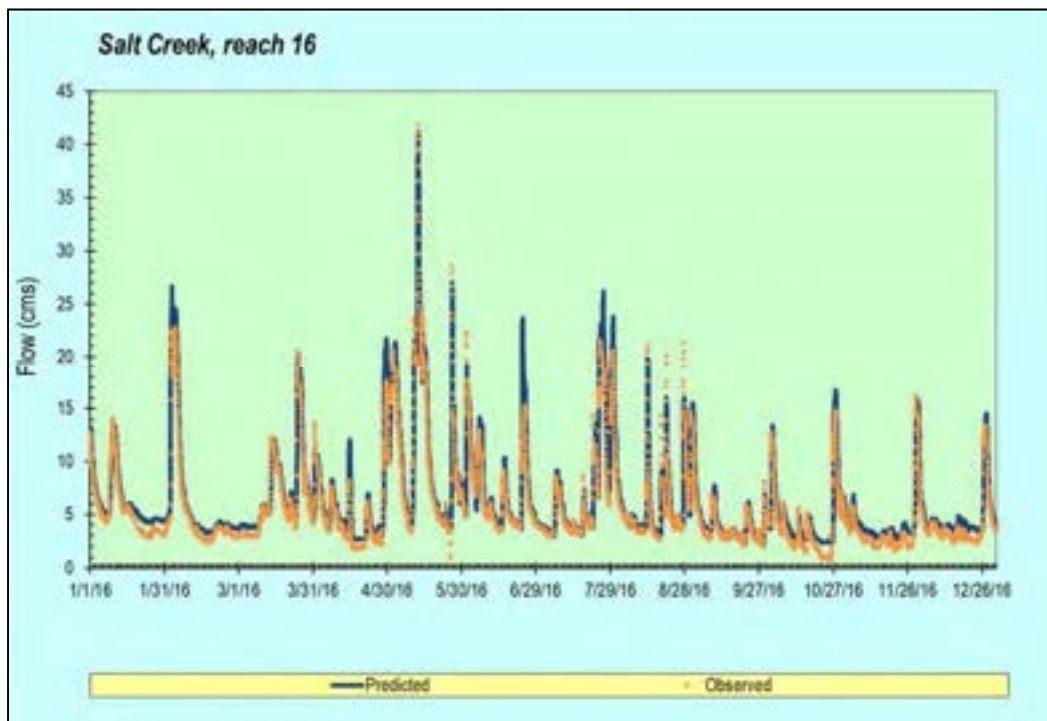


Figure 19. Salt Creek Simulated and Observed Water Temperature ($^{\circ}\text{C}$) at Reach 16 (SCWR).

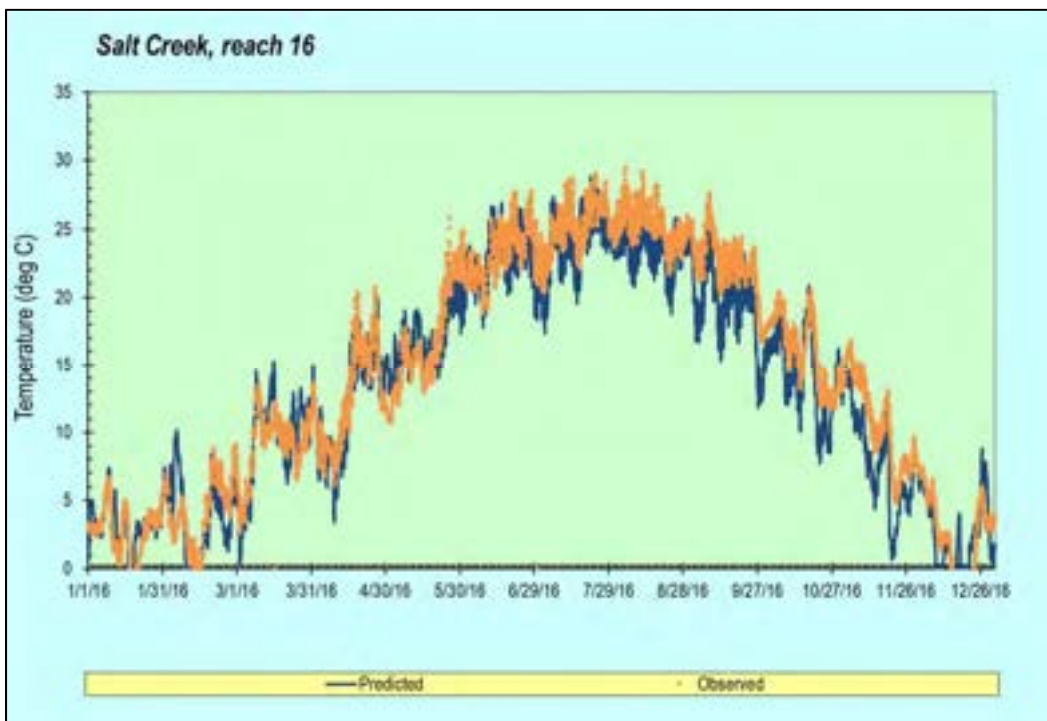


Figure 20. Salt Creek Simulated and Observed Nitrogen Species ($\mu\text{g/L}$) at Reach 12(SCGD).

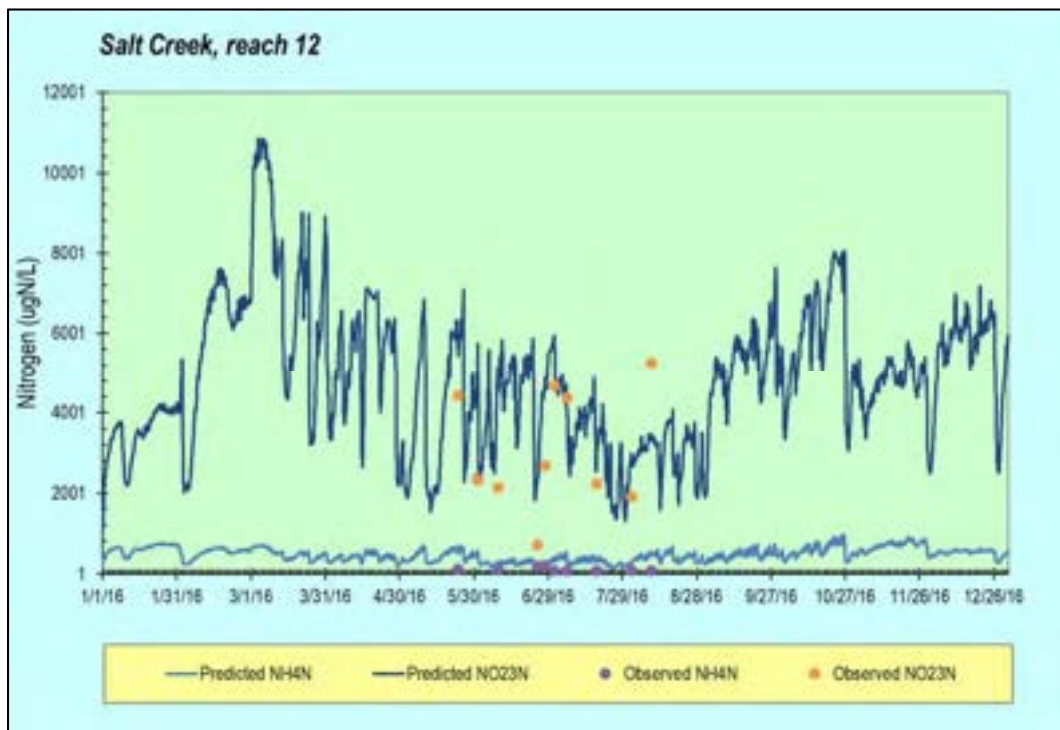


Figure 21. Salt Creek Simulated and Observed Total Phosphorus ($\mu\text{g/L}$) at Reach 12 (SCGD).

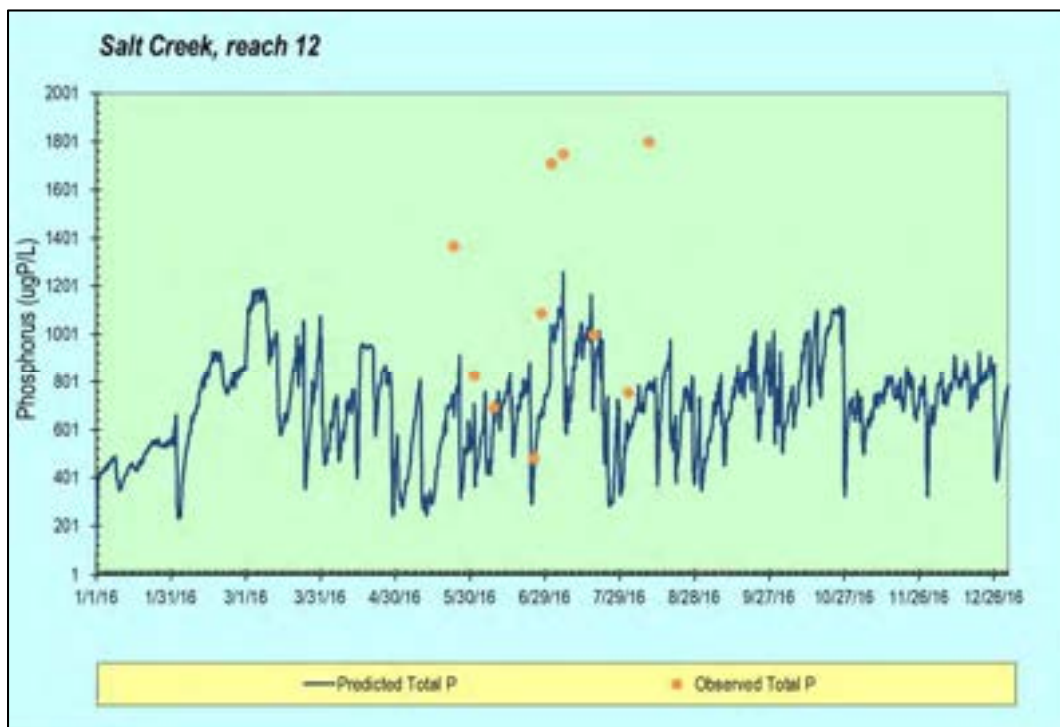
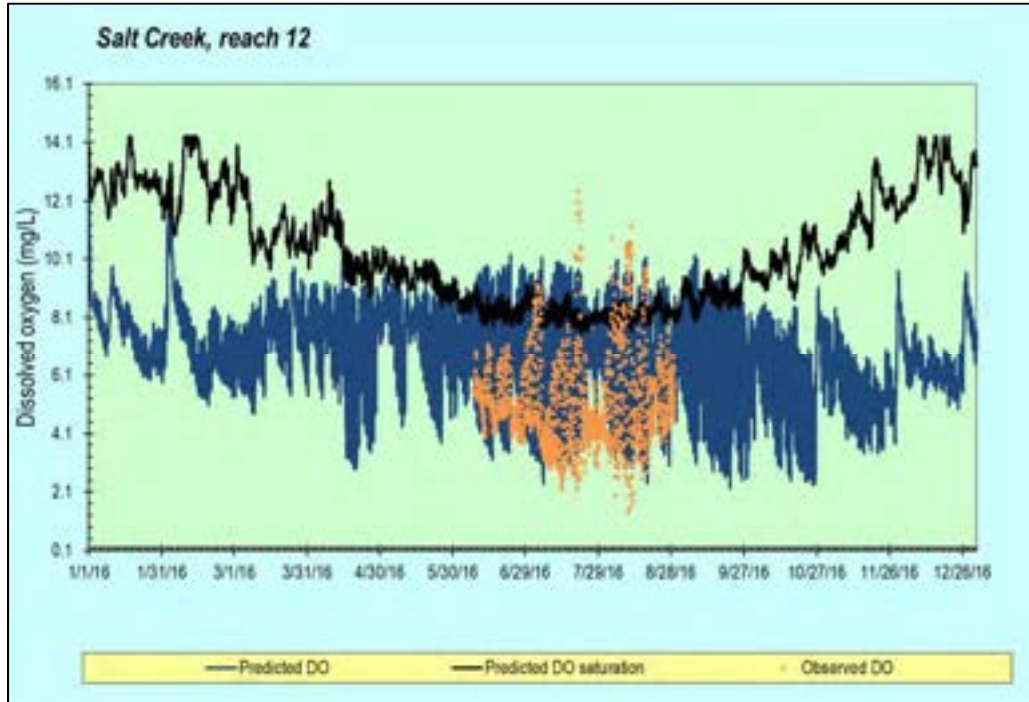


Figure 22. Salt Creek Simulated and Observed Dissolved Oxygen (mg/L) at Reach 12 (SCGD).



Task 2B: Model Development, Calibration, and Validation for West Branch DuPage River and Lower DuPage River

Task 2B will be conducted for the West Branch DuPage River and Lower DuPage River watersheds in 2021.

Task 3: Sensitivity Analysis

East Branch DuPage River

The calibrated QUAL2Kw model for East Branch DuPage River was used to examine the sensitivity of DO levels to various stressors or altered conditions. Sensitivity was evaluated as the simulated change in minimum DO concentration between March – July at the downstream end of the East Branch DuPage River above the confluence with West Branch DuPage River. This metric was selected because it is consistent with Illinois water quality standards, which specify that DO is to be above 5.0 mg/L at any time during these months.

Multiple factors influence minimum DO, including the temperature that alters oxygen solubility in the water column as well as algal respiration, SOD, and other biogeochemical processes. Based on the QUAL2Kw model sensitivity analyses for the East Branch DuPage River, an increase in DO levels in boundary waters (i.e., headwater, tributary, and diffuse inflows) was predicted to have the greatest impact on raising the instream minimum DO concentration

relative to the other parameters tested. Minimum DO was also relatively sensitive to changes in SOD, algae presence, and stream shading. Minimum DO was less sensitive to changes in nutrients and air temperature. It is important to note, however, that nutrients may be above saturation to support algal growth in the river, thus, the response to nutrient reductions may be minimal until a critical threshold that hinders algal growth is achieved (i.e., the relationship is not linear as implied by a leverage analysis), particularly for bioavailable inorganic forms of nutrients. Additionally, long-term changes in nutrient fluxes to the stream may have synergistic impacts on the stream which cannot be captured, such as changes to long-term average SOD due to changes in sediment accumulation of organic matter.

Salt Creek

Similar to the East Branch DuPage River model, the calibrated Salt Creek QUAL2Kw was used to examine the sensitivity of DO levels to various stressors or altered conditions. Based on the Salt Creek QUAL2Kw model sensitivity analyses, an increase in flow in boundary waters (i.e., headwater, tributary, and diffuse inflows) was predicted to have the greatest impact on raising the instream minimum DO concentration relative to the other parameters tested. This is expected as increasing and decreasing flows has an additive impact of increasing loads of associated water chemistry parameters. Minimum DO was also relatively sensitive to changes in algae presence and SOD. Minimum DO was less sensitive to changes in nutrients, air temperature, and shading. It is important to note, however, that nutrients may be above saturation to support algal growth in the river, thus, the response to nutrient reductions may be minimal until a critical threshold that hinders algal growth is achieved (i.e., the relationship is not linear as implied by a leverage analysis), particularly for bioavailable inorganic forms of nutrients. Additionally, long-term changes in nutrient fluxes to the stream may have synergistic impacts on the stream which cannot be captured, such as changes to long-term average SOD due to changes in sediment accumulation of organic matter. In general, however, the model was more sensitive to changes in nitrogen than phosphorus, perhaps due to model performance being biased low relative to total phosphorus concentrations.

West Branch DuPage River and Lower DuPage River

Sensitivity Analysis for the Lower DuPage River, and West Branch DuPage River models will be conducted in early 2021.

Task 4: Model Scenarios

The Scope of Work for Task 4 was detailed in the 2019 Annual Report. Task 4 will be completed for all four (4) watersheds in 2021.

3.3 NPS Phosphorus Feasibility Analysis

- Special Cond Special Condition Listed Completion Date – December 2021
- Status – In planning

The DRSCW and LDRWC budgeted \$183,610 for this effort and anticipates the majority of the expenditures in 2020-2021.

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

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

3.3.3. Leaf Litter, Street Sweeping, and Stormwater Sewer Inlet Survey / NPS Phosphorus Management

In an effort to calculate the probable distribution of leaf litter mass on roads the DRSCW developed a spatial file showing the current distribution of tree canopy overhanging roadways. Canopy coverage for the project area was generated using the tree canopy class of the high-resolution land cover data set for the Chicago region Spatial Analysis Laboratory (SAL) of the University of Vermont. The data set covers a total of 10 counties: Cook County, DuPage County, Kane County, Kendall County, Lake County (IL), McHenry County, Will County, Lake County (IN), LaPorte County and Porter County, providing complete coverage of the project area. The high-resolution dataset was created using imagery, LiDAR, and ancillary vector data sets to populate an object-based image analysis system supported by tens of thousands of manual corrections. Road data was created from county level Right Of Way (ROW) data. ROW data, originally collected for the IPS project (see Chapter 3.1), was supplied by Cook and DuPage County and was verified against recent imagery. ROW data for Will County was generated using aerial imagery. The ROW files were then merged and used to clip the canopy layer (see Plate 15). The final GIS file (developed pro bono by V3 Companies) contains data on the tree canopy overlying the ROW within the whole of the program area. Using the GIS file, the significant percentage of canopy by total roadway area, by watershed area and by management agency can be calculated in Cook, DuPage, and Will Counties. This provides the basis for a relative weighting of how much phosphorous from leaf litter could potentially make its way into receiving streams. Table 16 is an output from the final GIS file and lists percent of the ROW that has canopy cover by watershed.

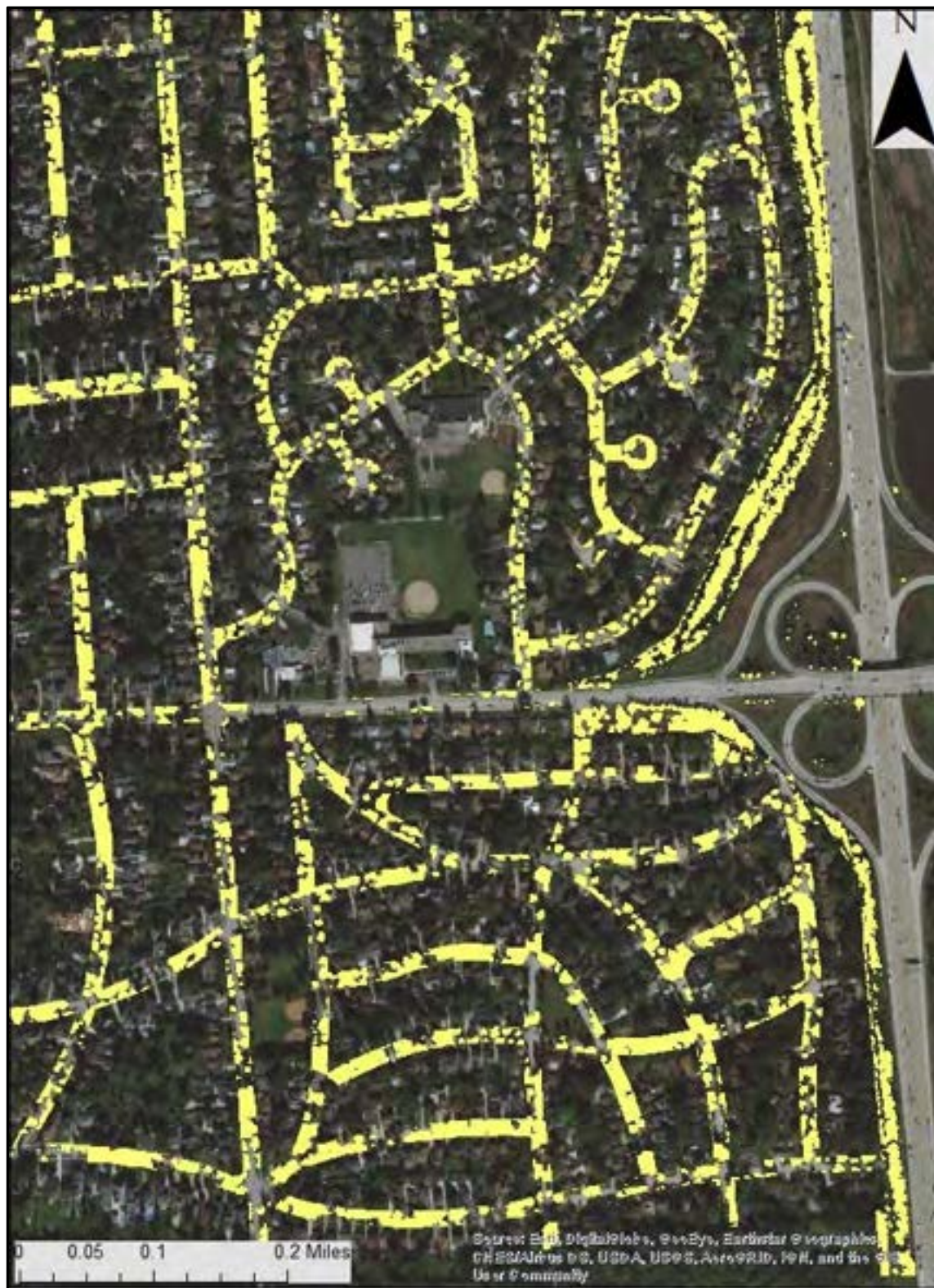


Plate 15. Example of the GIS output of the merged and clipped canopy and ROW layers.

Table 16. Output from the Canopy ROW spatial file showing the percentage of total ROW area that has canopy area.

HUC 12 Watershed	Percent ROW with Canopy Cover
Addison Creek	24.7
Du Page River	13.3
East Branch Du Page River	26.9
Headwaters East Branch Du Page River	24.6
Lily Cache Creek	12.5
Lower Salt Creek	33.1
Lower West Branch Du Page River	20.1
Middle Du Page River	8.8
Middle Salt Creek	19.8
Middle West Branch Du Page River	18.3
Rock Run-Illinois and Michigan Canal	14.0
Spring Brook-Du Page River	10.4
Upper Salt Creek	26.5
Upper West Branch Du Page River	24.4

A second part of the study is reviewing the current level of practice and management of leaf litter. A survey has been created to collect information on the current practices involving leaf litter collection within the project area. This survey was developed from a similar leaf litter collection survey that was distributed in Wisconsin, as well as a street sweeping questionnaire distributed by DCSM. The draft survey is hosted by the website JotForm which provides tools to make the form, a link to distribute it, and a secondary location to store results. In addition to the survey, the DRSCW and LDRWC hopes to receive copies of relevant leaf collection, street sweeping, and catch basin contracts to better understand how they operate. A draft of the survey is attached in the Attachment 7.

The survey is scheduled to be issued in April 2021.

3.4 Development of a Basin Wide Nutrient Trading Program

Special Condition 8.c. allows the DRSCW/LDWRC 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.

Estimated date of completion for the basin wide nutrient trading program is FY 2021-2022.

Brief descriptions are described below of the project's original scope of work, the work completed between April 1, 2020 and March 31, 2021 by Task, and recommended modifications to the project's scope to reflect shifting priorities.

Task 1: Project Kick-off and Schedule Analysis

This task was completed in 2017 and discussed in the 2017 Annual Report.

Task 2. Develop POTW Data Collection Checklist

This task was completed in 2017 and discussed in the 2017 Annual Report.

Task 3: Analyze and Define Eligibility Criteria

Eligibility criteria determine when, where, and what point and nonpoint sources are allowed to trade through the nutrient trading framework. This task will focus on analyzing and defining eligibility criteria for participating in trading, specifically baselines, geographic trading boundaries, and habitat project eligibility. In 2019-2020, work on eligibility criteria shifted away from point-to-point source trading among WWTPs due to ongoing discussions related to nutrient criteria and permit limits. Instead, this task has focused on the discussions and analysis related to stream restoration credits and equivalency factors, initiated under Task 5 in 2018.

Task 4: Analyze POTW Data and Fill Data Gaps

This task is complete and is discussed in the 2019 Annual Report.

Task 5: Develop/Analyze POTW Nutrient Reduction Costs

As discussed in the 2019 Annual Report, this Task remains on hold due to ongoing discussions about nutrient criteria and permit limits.

Task 6: Evaluate PS-NPS and Stream Restoration Trading

As part of the DRSCW and LDRWC's efforts to meet negotiated permit requirements and provide an opportunity to achieve future permitting relief, the watershed workgroups are examining the potential for offsetting nutrient reductions by incentivizing stream restoration projects implemented by the POTWs. These include projects identified by the Identification and Prioritization System (IPS) Model (Section 3.1) that go above and beyond those currently listed in the Special Conditions Paragraph 2 of NPDES permits. The 2018 Annual Report described the preliminary analysis and conceptual approaches to stream restoration crediting efforts, programs, and methodologies used in other watersheds captured by the project team in a technical memorandum. In 2019, work focused on developing a potential approach and analysis questions for developing a stream restoration crediting equivalency factor that could use DRSCW's IPS Model.

In late Summer 2020, Midwest Biodiversity Institute (MBI) completed their work on the DRSCW's IPS Model. The final version of the IPS Model was then shared with the Trading Consultant Team for a comprehensive review of its feasibility in assisting with the developing stream restoration credits. Following their initial review, two meetings (November 20, 2020 and December 10, 2020) were held between DRSCW staff, MBI, and the Trading Consultant Team to further discuss the IPS model and its applicability to stream restoration crediting.

Following these discussions, in January 2021, the Trading Consultant Team recommended a revised set of tasks needed to complete the development of the stream restoration benefits quantification approach.

Task 6A: Analyze Existing Stream Restoration TP Crediting Methodologies

Under this Task, the Trading Consultant Team will conduct an analysis of the newly updated Chesapeake Bay stream restoration protocols, WEF Stream Restoration as a BMP: Crediting Guidance, and select others to identify phosphorus crediting methodologies that are applicable for use by DRSCW for stream restoration benefits quantification. The Trading Consultant Team will create an applicability memorandum for the methodologies associated with each of the stream restoration practices. The Trading Consultant Team will also conduct a rough estimate of expected credits from an existing stream restoration project using the unmodified credit methodology to determine a general quantification of phosphorus reduction benefit associated with this approach. This will allow DRSCW to determine if modification of the existing credit methodology to quantify phosphorus reduction benefits would be a beneficial future effort for DRSCW stream restoration projects.

Task 6B: Research and Develop an Innovative Stream Restoration Benefits Quantification Approach Based On In-Stream Habitat (e.g., QHEI) and/or Other Important Stream Quality Indicators

Under this Task, the Trading Consultant Team will take a step-by-step approach to research and develop an innovative empirical statistical modeling approach to stream restoration benefits quantification. Each activity under this task will add to the base of knowledge about the feasibility of this approach. The Trading Consultant Team will ensure each completed activity summarizes the potential barriers and challenges of this approach and how these barriers and challenges will both inform and impact outcomes. The activities included in Task 6B are:

- Review existing DRSCW data sets and analyses, identify new data and additional analyses that may be needed.
- Develop statistical analysis options.
- Conduct literature review.
- Select and develop statistical analysis model.

Task 6C: Develop Stream Restoration Project Benefits Quantification Approach Document

Under Task 6C, the Trading Consultant Team will draft the stream restoration benefits quantification approach document that outlines the rationale and the process for the quantification approaches from Tasks 6A and 6B.

Task 6D: Input Meeting Support

The stakeholder meeting under this task will focus on presenting the draft document from Task 6C to the DRSCW Project Committee, DRSCW Executive Board, as well as other key stakeholders including IEPA and environmental advocacy groups (EAGs), to obtain feedback on the approach.

The proposed scope revisions detailed in Tasks 6A to 6D cost an additional \$80,000-120,000 above the current contract the DRSCW has signed with the Trading Team. As such, at the time of this report, the DRSCW is still reviewing the proposed scope changes and additional fees. The DRSCW will hold a meeting with its Special Condition Permit holders in April 2021 to discuss how to proceed with Task 6.

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 2009-2016, 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 LDWRC began in 2012 and is sampled every 3-years.

The DRSCW and LDWRC 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 containing 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 is prepared following each bioassessment. 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 are scheduled for 2021.