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VIA E-FILING

February 24, 2021

Ms. Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E., Docket Room
Washington, D.C. 20426-001

RE: River Falls Hydroelectric Project, FERC Project No. 10489
Updated Study Report Meeting Summary

Dear Secretary Bose:

In accordance with 18 CFR § 5.15(f), the City of River Falls Municipal Utilities (RFMU or Licensee) filed with the Federal Energy Regulatory Commission (FERC or Commission) the Updated Study Report (USR) for the River Falls Hydroelectric Project (Project) (FERC P-10489) on January 29, 2021. Pursuant to 18 CFR § 5.15(c), RFMU held the USR Meeting on February 9, 2021 and is filing the FERC USR Meeting summary. The Licensee has not identified the need for any additional studies.

If there are any questions or comments regarding the USR Meeting summary, please contact Kevin Westhuis at (715) 426-3442, or by email at kwesthuis@rfcity.org.

Sincerely,

Kevin Westhuis
Utility Director
City of River Falls Municipal Utilities
222 Lewis Street
River Falls, WI 54022

Enclosures: Updated Study Report Meeting Agenda
Updated Study Report Meeting Summary
Updated Study Report Meeting Presentations

cc: Interested Parties Mailing List
Lesley Brotkowski, TRC

RIVER FALLS HYDROELECTRIC PROJECT, FERC No. 10489
INTERESTED PARTIES MAILING LIST

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River Falls Hydroelectric Project, FERC Project No. 10489
Updated Study Report Meeting Agenda

Date and Time: February 9, 2021, 9:00 AM – 4:00 PM CST

Meeting Location: Virtual Microsoft Teams Meeting

Purpose of the meeting:

- Review the contents of the Updated Study Report (USR). Each study update will include an opportunity for questions and comments. This meeting is an opportunity to discuss the study results prior to submittal of the Draft License Application.

Agenda

9:00 AM	**Meeting Overview** • Introductions – Kevin Westhuis, RFMU & Lesley Brotkowski, TRC • Meeting Purpose and FERC Process Update – RFMU, TRC, & FERC
9:30 AM	**Studies Conducted in 2020** • Hydraulic and Hydrologic Analysis – Pat Dowd, USACE • Water Quality – Ellen Faulkner, Ayres • Mussel Survey – Dan Kelner, USACE
11:00 AM	**Break**
11:15 AM	**Studies Conducted in 2020, Continued** • Lake George Shoreline Habitat Assessment – Josh McEnany, GSRC • Aquatic Invasive Species Survey – Marty Melchior & Sean Morrison, Inter-Fluve • Riverine Habitat Evaluation Below Powell Falls – Marty Melchior & Sean Morrison, Inter-Fluve
12:30 PM	**Lunch Break**
1:00 PM	**Studies Conducted in 2020, Continued** • Recreation Use Assessment – Ross Hackbarth, GSRC • Archaeology Survey – Rachel Klabacka, TRC • Sediment Study – Pete Haug, Ayres & Ben Lenz, TRC
2:30 PM	**Break**
2:45 PM	**Powell Falls Decommissioning Plan** – Pete Haug, Ayres
3:30 PM	**Next Steps and Meeting Conclusion**

CITY OF RIVER FALLS WISCONSIN
RIVER FALLS HYDROELECTRIC PROJECT (FERC NO. 10489)
UPDATED STUDY REPORT MEETING SUMMARY
Virtual Meeting
February 9, 2021

Date and Time: February 9, 2021, 9:00 AM – 4:00 PM (break for lunch 12:00 PM – 1:00 PM).

Meeting Location: Virtual Meeting via Microsoft Teams

Purpose of the meeting:
Review the contents of the Updated Study Report (USR). Each study update included an opportunity for questions and comments. This meeting provided an opportunity to discuss the study results and proposals, if any, to modify the study plan in light of the progress of the study plan and data collected.

Present via Virtual Microsoft Teams Meeting:
Brooks, Charlene (Kinnickinnic River Land Trust Executive Director);
Brotkowski, Lesley (TRC Senior Consultant);
Dowd, Patrick (U.S. Army Corps of Engineers (USACE));
Downing, Sean (City of River Falls Council Alderperson District 1);
Ettema, Nicholas (FERC Fish Biologist);
Faulkner, Ellen (Ayres Associates Senior Project Manager);
Foster Babcock, Judie (Kinnickinnic River Land Trust President);
Hackbarth, Ross (GSRC Natural Resource Specialist);
Haller, Macaulay (Wisconsin Department of Natural Resources (WDNR));
Haug, Peter (Ayres Associates Water Resources Engineer);
Helsel, Dan (WDNR);
Holsey, Shannon (Stockbridge Munsee Tribe of Mohican Indians Tribal President);
Howe, Tyler (Wisconsin Historical Society State Historic Preservation Officer (SHPO));
Johnson, Kent (Trout Unlimited (TU) Kiap TU Wish Chapter Member);
Kelner, Daniel (U.S. Army Corps of Engineers Fisheries Biologist/Malacologist);
Klabacka, Rachel (TRC Archaeologist)
LaRue, Patricia (River Falls Community Member);
Laatsch, Cheryl (WDNR FERC Coordinator);
Lenz, Ben (TRC Senior Environmental Scientist);
MacManus, Lisa (TRC Environmental Technician);
Makowski, Paul (FERC Engineer);
McEnany, Josh (Gulf South Research Corporation (GSRC) Senior Environmental Manager);
Melchior, Marty (Inter-Fluve Principal Ecologist and Fisheries Biologist);
Morrison, Sean (Inter-Fluve Staff Geomorphologist);
Nelson, Lanae (City of River Falls Municipal Utilities Administrative Assistant);
Oakley, Janet (FERC Advisory Attorney);
Peters, Dennis (GSRC Eastern Regional Operations Manager);
Peterson, Amy (City of River Falls Community Development Director);

Plunkett, Ben (City of River Falls Council Alderperson at Large);
Prosser, Michelle (USACE St. Paul District);
Santiago, Hector (Wild and Scenic Rivers Program U.S. National Park Service Midwest Regional Coordinator);
Shafer, Marion L. (National Park Service);
Shannon, Diana (FERC OEP-Division of Hydropower Administration and Compliance (DHAC));
Simpson, Scot (City of River Falls City Administrator);
Spafford, Mark (City of River Falls Municipal Utilities (RFMU) Utility Advisory Board Vice Chair);
Stewart, Scot (WDNR Trout Committee Chairman);
Summers, Jay (FERC Wildlife Biologist);
Swanson, Kevin (City of River Falls Municipal Utilities (RFMU) Utility Advisory Board Member);
Thum, Tim (RFMU Utility Advisory Board Member);
Tornes, Angela (U.S. National Park Service Midwest Hydropower Coordinator);
Utrup, Nick (U.S. Fish & Wildlife Service Twin Cities Field Office Hydropower Coordinator);
Warshaw, Kim (USACE St. Paul District);
Westhuis, Kevin (City of River Falls Municipal Utilities (RFMU) Utility Director);
Wiseman, Shana (FERC Coordinator)

Meeting Summary:

The River Falls Hydroelectric Project (FERC No. 10489) USR meeting was moderated by TRC Senior Consultant Lesley Brotkowski. A copy of the presentation slides presented during the meeting is available in Appendix A.

1. **Meeting Overview**
    a. Mr. Westhuis welcomed participants to the meeting.
    b. Introductions
        i. Ms. Brotkowski went over the agenda and stated that the meeting will be recorded.
        ii. The attendees should raise their hand or comment in the chat function of the virtual meeting to make a comment or ask questions.
        iii. The attendees sign in would be tracked virtually and any unknown meeting participants will be asked to identify themselves periodically.
    c. Meeting Purpose
        i. Ms. Brotkowski described the meeting purpose. The meeting is an opportunity to review and discuss the 2020 study results prior to the submittal of the Draft License Application .
        ii. Each study update will include an opportunity for questions and comments.
    d. FERC Process Update
        i. Ms. Brotkowski described the FERC relicensing process and schedule between the Second Study Season to the Public Notice of License Application filing.
            1. RFMU will file the USR meeting summary within 15 days of the USR Meeting.
            2. Draft License Application Due April 3, 2021
            3. Draft License Application Comments due July 2, 2021
            4. License Application filed by August 31, 2021
            5. Public Notice of License Application filing by September 14, 2021
        ii. USACE Planning Assistance to States (PAS) Program
            1. Ms. Brotkowski gave a brief overview of the PAS Program and described that RFMU used the PAS program to support some of the 2020 studies.

iii. 2020 Flood
    1. Ms. Brotkowski reviewed the June 28-29, 2020 flood and described damage to the Powell Falls Dam.
    2. On July 16, 2020 RFMU filed a flood damage report with FERC Division of Dam Safety and Inspection.
    3. On September 10, 2020 FERC requested a plan and schedule to address dam safety inspection and replacement.

iv. Lake Louise Drawdown
    1. On Sept 25, 2020 RFMU filed a Plan and Schedule for Lake Louise drawdown to conduct a dam safety inspection.
    2. On October 1, 2020 FERC Division of Hydropower Administration and Compliance (DHAC) Order approved the drawdown.
    3. On October 2, 2020 Drawdown was initiated.
    4. On December 22, 2020 RFMU filed Post-Flood Dam Safety Inspection and Repair Options letter for Powell Falls.

v. Powell Falls Action Options
    1. Ms. Brotkowski reviewed the Powell Falls Action Options considered and explained that Option 3 is the choice that was selected.
        a. Option 1: Repair the dam and refill Lake Louise
        b. Option 2: Keep Lake Louise drawn down as is
        c. Option 3: Keep Lake Louise drawn down, fix the gate and pull the turbine to enhance flow capacity
        d. Option 4: Keep Lake Louise drawn down and add flow capacity by opening a new passage route
        e. Option 5: Proceed with full dam removal (accelerated by two years from original schedule)

vi. Next Steps
    1. FERC Amendment Application
        a. Request Powell Falls be removed from the FERC license.
        b. Lake Louise will not be refilled, and the power generation will not resume.
        c. The gate will be fixed, and the turbine will be removed.
        d. The powerhouse and the appurtenant facilities will be decommissioned (excluding dam removal).
        e. Conduct dam removal under state jurisdiction.
    2. FERC License Application
        a. The Draft & Final License Applications will include Junction Falls only.
        b. Study results will still be used to inform the licensing process but results specific to Powell Falls will not be included.
    3. Updated Study Report (USR)
        a. All 2020 studies conducted in accordance with FERC's Study Plan Determination have been included in the USR filed with FERC and were discussed in the meeting.
    4. Comments or Questions:
        a. Shana Wiseman asked when RFMU will be applying and submitting the amendment application to FERC. Ms. Brotkowski stated that RFMU will aim to file the amendment application in March 2021, prior to the filing of the Draft License Application.
        b. Paul Makowski asked if the Supporting Design Report will be submitted with the Final License Application. Ms. Brotkowski

stated that a Supporting Design Report for Junction Falls will be submitted with the Final License Application.

2. **Study Overview**
    a. Ms. Brotkowski provided an overview of the studies performed in 2019 and 2020.
        1. Hydrologic & Hydraulic Evaluation (2020)
        2. Water Quality (2019 & 2020)
        3. Lake George Shoreline Habitat Assessment (2020)
        4. Aquatic Invasive Species Survey (2020)
        5. Mussel Survey (2020)
        6. Wetland, Riparian, and Terrestrial Resources Survey (2019)
        7. Riverine Habitat Evaluation below Powell Falls (2020)
        8. Recreation
            a. Recreation Facility Inventory (2019)
            b. Recreation Use Assessment (2020)
        9. Cultural Resources
            a. Architectural Resources Survey (2019)
            b. Archaeology Resources Survey (2020)
        10. Sediment Study (2020)
        11. Decommissioning Plan (2019 & 2020)
3. **Studies Conducted in 2020**
    a) <u>Hydrologic & Hydraulic Evaluation – Pat Dowd, USACE</u>
        i. Mr. Dowd gave a brief outline and reviewed objectives of the hydrologic and hydraulic (H&H) study:
            1. Estimate streamflow rates for several flood events (hydrologic).
            2. Estimate river levels during those events with and without Powell Falls Dam (hydraulic).
        ii. Mr. Dowd described the study and results of the Hydrologic Analysis:
            1. Used USGS regression equations and USGS gage data to conduct flood frequencies.
                a. Compared past data to current data results.
                b. Results: All studies have very similar flow value.
            2. Mr. Dowd described the study the Hydraulic Analysis:
                a. Compared 100-year flood to Powell Falls Flood.
                b. Reviewed the hydraulic model's geometry for opportunities for improvement.
            3. Results:
                a. There is an opportunity to improve the RAS model by updating model geometry, georeferencing the model and updating the model to run as unsteady flow.
        iii. Comments or Questions:
            1. Sean Morrison asked if a low flow analysis was conducted in the study. Mr. Dowd stated that the study did not include a low flow analysis but USACE has estimates of what low flows would look like. Kent Johnson typed the question, "Where are the cross-sections locations for the model?" Peter Haug responded, "Every dot on the bottom of the channel is a cross-section, so he has one about one every 500 feet or so." Mr. Dowd pulled up the PowerPoint slide showing a map of where the cross-sections are located. The cross sections extend from downstream of the Powell Falls Dam to upstream to the Highway 35 bridge. Mr. Johnson also asked if the flood model could be used to estimate profiles for more frequent run off events. (i.e. the model might be helpful to see what

water profiles would look like during flood events at higher frequencies). Mr. Dowd stated that the model is more accurate when there are lower flow rates. USACE did run a base flow scenario and have estimates for river levels for the June flood event and could provide those to Mr. Johnson. He also noted that the estimate was the same estimate that FEMA and SEH used in the past.

2. Dan Helsel asked if flood flows or surface water elevation will change downstream of where the dam was located as a result of removal. Mr. Dowd stated that the river geometry will likely stay the same so flooding would look the same before and after the removal of Powell Falls.

b) Water Quality – Ellen Faulkner, Ayres

i. Ms. Faulkner described the Water Quality Study conducted in 2019 and 2020. The study focused on 4 locations. Ms. Faulkner described how the dissolved oxygen (DO) and water temperature in the project area were recorded at 15-minute intervals between July 18, 2019 to October 2, 2020. A transect was added to Lake George in 2020 to collect DO and water temperature grab samples.

ii. Ms. Faulkner described the 2020 results:

a. Project inflows met state criteria for cold water fisheries. Exceptions were generally explainable by instrument disturbance.

b. From upstream to downstream in the study area, water temperature typically increased by 2 to 4 degrees Fahrenheit on a given day. Recorded DO concentrations generally decreased from upstream to downstream.

c. The rate of decrease was variable. In Lake George, the DO concentration dropped below 5mg/L on several occasions and in the first (pre-flood) half of the 2020 season.

d. After the June 2020 flood, Lake George showed higher overall DO concentrations with less variability than prior to the flood.

e. Points of the transect southeast of the primary flow path in Lake George showed increased temperatures and higher amplitude DO cycles but little vertical stratification. Field personnel reported detectable current at all Lake George transect points.

f. DO concentrations in or downstream of the dams' impoundments dropped below 5mg/L during some periods in both years, more frequently in 2019 than 2020.

g. The 2020 record below Junction Falls lacked data corresponding to a low-DO period (May-June 12) in Lake George. Temperatures and DO concentrations not meeting state standards occurred more frequently below Powell Falls than below Junction Falls.

iii. Comments or Questions:

a. Mark Spafford asked if there were any DO temperature measurements taken ¼ mile below Powell Falls. Ms. Faulkner stated that there was no sampling in that area for this study. In the season that Ayres was there, they did not see any critical conditions in that area.

b. Nick Ettema requested spreadsheets with the DO and temperature data form Ayres. Ms. Faulkner stated that she would make those available to him.

c. Nick Ettema noted that unit locations downstream of Junction Falls appeared different from 2019 and 2020. He noted DO swings and wanted clarification as to what caused those swings. Ms. Faulkner stated that the data sonde kept getting displaced, so it was moved further from the shore and placed near the center of the river.
d. Nick Ettema also asked about the fate of the data from readings downstream of Powell Falls following the drawdown. Pete Haug stated that the one data sonde that was downstream of Powell Falls was buried in sediment is no longer functioning. One month after Lake Louise draw-down, there are readings from one data sonde that was not lost.
e. Kent Johnson shared that since 1992, Trout Unlimited has had 5 continuous monitoring stations and offered to share data to help fill in gaps.

c) <u>Mussel Survey – Dan Kelner, USACE</u>
   i. Mr. Kelner stated that the survey was conducted in summer of 2020. Mr. Kelner stated that the objective of the study was to obtain baseline information of mussels in Kinnickinnic River and selected stations downstream in the St. Croix prior to removal of the Powell Falls dam.
   ii. Mr. Kelner described the survey results:
      a. 12 sites were searched (2 in the Kinnickinnic River and 10 in the St. Croix).
      b. No live or dead mussels were found in the lower Kinnickinnic River and there are no concerns with impacts of mussels in the Kinnickinnic River.
      c. In the lower St. Croix River, 19 live species were found including Higgins Eye. Mussel populations are stable compared to the 2001 survey.
      d. Mr. Kelner anticipates minimal to no impacts to the mussel community in the St. Croix River following dam removal. Mr. Kelner suggested that RFMU conduct another mussel survey in 10-20 years post dam removal.
   iii. Comments or Questions:
      a. Peter Haug asked if there would be any turbidity impacts to mussels. Mr. Kelner stated that turbidity and sedimentation will have minor impacts to mussels.

d) <u>Lake George Shoreline Habitat Assessment</u> – Josh McEnany, GSRC
   i. Mr. McEnany stated that the Shoreline Habitat Assessment was conducted July 28-29, 2020 and described the methods used to conduct the study.
   ii. Mr. McEnany described the 2020 results:
      a. Loop 1: Habitat Assessment
         i. Described the Riparian Buffer Zone Assessment Percent Cover
         ii. Described the lake, structures around lake and runoff concerns in the riparian buffer zone.
         iii. There were not many human structures in Loop 1 and there were minimal runoff concerns within the riparian area.
         iv. Bank Zone:

i. Vertical Retaining Wall: 335 ft, Rip Rap: 615 ft, Bank erosion: 90ft

v. Littoral Zone: total of 9 human structures

vi. Aquatic plants/Exposed Lakebed

ii. Emergent and floating plants were observed at approximately 25% of parcels assessed. No submerged aquatic plants were recorded as part of the study and no areas of exposed lakebed were observed during the assessment.

b. Loop 2: Mapping Coarse Woody Debris

i. Woody debris consisted of logs/tree limbs observed on the eastern and southern side of Lake George. There was a total of 34 pieces observed with the majority of pieces being located on the southern side of Lake George.

c. Loop 3: Photo-Documentation of Shoreline

i. Photos taken at approximately 50 feet from shoreline within the project area and are included in the report.

iii. Discussion: There were three portions assessed in the project area: South of Junction Falls Dam, Lake George and the Upper Kinnickinnic River.

1. South of Junction Falls Dam
   a. Shoreline changes rapidly from exposed bedrock waterfalls that have been modified by the installation of the dam, adjoining retaining wall, and powerhouse to a short "river reach" that leads to south Lake Louise to the south.
2. Lake George
   a. Modifications within the current bank zone of Lake George were minimal. Rip rap has been placed as stabilization in some areas. Due to the shallow nature of most areas of Lake George, the littoral zone is similar in character to much of the open water zone. Floating and/or emergent vegetation are found in small stretches around the shoreline.
3. Upper Kinnickinnic River
   a. Data collected during the survey did not contribute substantially to the conclusion that a short-term drawdown was necessary within the next re-licensing period to remove sediment.

iv. Conclusions: GSRC did not recommend a drawdown or sediment removal at this time to manage aquatic plants. If needed, it was recommended sediment removal occur in the future concurrently with dam removal.

v. Comments or Questions: None

e) <u>Aquatic Invasive Species Survey</u> – Sean Morrison, Inter-Fluve

i. Mr. Morrison stated that the Aquatic Invasive Species Survey was conducted July 6 - 7, 2020.

ii. The goal of the survey was to review aquatic invasive species in Lake Louise and Lake George.

iii. Methodology: followed Haxwell et al. (2010)

1. Rake cast into lake and retrieved
2. Plant species identified
3. "Rake Fullness" quantified

iv. Results:

a. There were 291 samples collected with 197 containing aquatic vegetation.

b. Curly leaf pondweed was the only aquatic invasive species identified and was present in both lakes but was absent in riverine sections of the impoundment.

v. Comments or Questions: None

f) Riverine Habitat Evaluation below Powell Falls – Sean Morrison, Inter-Fluve

i. Mr. Morrison stated that the survey was conducted after the June 2020 flood and took place September 21-24, 2020.

ii. The goal of the evaluation was to look at habitat conditions downstream of the Powell Falls and assess the mesohabitat features of:
   a. Pools, riffles, runs
   b. Large wood
   c. Sediment characteristics, floodplain deposits
   d. Channel geometry

iii. Inter-Fluve used an Apple iPad with Bad Elf GPS receiver to map location features. Visual estimates were taken throughout and channel geometry and pebble counts were surveyed in select subreaches.

iv. Methods: Over 10 miles of stream were evaluated, with 5 representative subreaches surveyed (numbered from upstream to downstream):
   1. Reach 1:
      a. Pool-riffle with naturally confined floodplain
      b. Overbank deposition common
      c. Low habitat diversity
   2. Reach 2:
      a. Pool-riffle with naturally confined floodplain
      b. Low habitat diversity
   3. Reach 3:
      a. Pool-riffle with naturally confined floodplain
      b. Low habitat diversity
      c. Overbank deposition common
   4. Reach 4:
      a. Bedrock commonly exposed at outside of meander bends
      b. Pool-riffle with naturally confined floodplain
      c. Low habitat diversity
      d. Overbank deposition common
   5. Reach 5:
      a. Upstream- pool riffle with naturally confined floodplain
      b. Abundant large wood
      c. Recent avulsion of channel deposited as a result of 2020 flood

v. Additional Observations:
   a. Buried soil horizons were common and typically associated with tributary gullies.
   b. There was massive overbank sedimentation following the June 2020 flood.
   c. Reed canary grass was common in riparian areas.

vi. Discussion:
   a. Channel is relatively stable, but lacks habitat complexity
   b. Pool depth was typically limited
   c. Overbank sedimentation was widespread as a result of recent flood
   d. Main aquatic habitat feature was coarse substrate

vii. Conclusions:
   a. Aquatic habitat diversity is low throughout the study area.

b. Abundance of trout is likely from good water quality, stream size, food abundance, and coarse substrate.
c. Unregulated release of sediment is a concern since it may lead to the burial of coarse substrate.
d. Terrestrial habitat is limited by reed canary grass.

viii. Comments or Questions: None

g) Recreation Use Assessment – Ross Hackbarth, GSRC

i. Mr. Hackbarth stated that the Recreation Use Assessment was conducted from June to Labor Day weekend 2020.

ii. Mr. Hackbarth described the study objectives and results associated with the survey.

a. Objectives
   i. Document scope of recreation opportunities and amenities and condition of these amenities.
   ii. Assess recreation use rates for various recreation activities.
   iii. Gauge the public opinion on recreation opportunities in the Project Area.
   iv. Predict future recreation use rates and provide management recommendations if applicable.

b. Recreation survey areas
   i. White Kinnickinnic Pathway (Lake George): Popular for paved pathway activities, most accessible
   ii. Glen Park Trails (Junction Falls Dam/Lake Louise): Popular as an area of exploration
   iii. Powell Falls Kayak Launch (Lower Kinnickinnic River): Kayaking and canoeing

c. Methodology
   i. Document the survey area amenities and conditions
   ii. Recreation use one hour-spot counts at each Survey Area (2 per day for each survey area, 6 total per day)
   iii. Recreation User Opinion Surveys

d. The survey study was conducted in one-hour spot counts of each area and the recreation user survey opinions. The top recreation activities were:
   i. Walking/Running
   ii. Canoeing/Kayaking
   iii. Biking

iii. Discussion:

a. Mr. Hackbarth stated that the average respondent visited 76.1 times per year. Most out of town visitors came for kayaking at the Powell Falls. The overall aesthetic rating for the project area was rated 4.05 out of 5. Mr. Hackbarth stated that there is a relatively high growth rate for future recreation use.

iv. Comments or Questions:

a. Kent Johnson stated that 2020 was an unusual year for outdoor activity and recreation due to COVID-19. He asked about thoughts on possible data bias and projections of future recreational use. Mr. Hackbarth recommended comparing data from previous recreation use assessments to this assessment to see if the per hour recreation use averages are significantly higher and if they are, it might be a reason to note this report as being biased due to the conditions for the year.

b. Mr. Johnson also asked what implications the river restoration will create in terms of projecting what will happen in the stretch through Lake Louise. Mr. Hackbarth stated the restoration of Lake Louise will not impact use in that area.
c. Angela Tornes asked if there was a need for signage. Mr. Hackbarth stated that the signage is good but there is a concern with a resident understanding the private verses personal use of the driveway and path access for kayakers. Some first-time visitors are a little confused in this area with how to get to the launch site.
d. In response to concerns with the public and private use of the driveway and path to the kayak launch, City of River Falls City Administrator Scot Simpson stated the resident adjacent to the kayak launch has been invited and involved in the planning process. He clarified that the access area is public, not private.
e. Kent. Johnson commented: The study provided a lot of great recreational information for the corridor planning.

h) Archaeological Survey- Rachel Klabacka-Williams, TRC
   i. Ms. Klabacka-Williams described the purpose and resources used for the Archeological Survey.
   ii. There was a review of the National Historic Preservation Act (NHPA) and Section 106.
   iii. The fieldwork survey consisted of a shoreline review and shovel testing of Junction Falls and Powell Falls.
   iv. Conclusion and Recommendations
      a. Junction Falls
         i. Visual inspection of the shoreline did not encounter any areas of erosion, the shoreline appears to be well vegetated and stable.
         ii. Shovel testing did not encounter any subsurface archaeological artifacts or deposits.
         iii. No additional archaeological work is recommended until that stipulated by the Historic Resources Management Plan (HRMP).
      b. Powell Falls
         i. Visual inspection of the shoreline did not encounter any areas of erosion, the shoreline appeared to be well vegetated and stable.
         ii. Shovel testing did not encounter any subsurface archaeological artifacts or deposits.
         iii. No additional archaeological work is recommended for the Project.
   v. Results: There were no documented prehistoric or historic sites within the project boundary.
   vi. Comments or Questions:
      a. Tyler Howe stated that SHPO did not have any concerns about cultural resources. He requested updated photographs of architectural structures. Ms. Brotkowski stated that she will provide Mr. Howe with photos from the 2019 Architectural Survey.

i) Sediment Study – Peter Haug, Ayres and Ben Lenz, TRC

i. Mr. Haug stated that FERC requested the Sediment Study to address two objectives. Mr. Haug stated that he will be addressing Objective 1 and Ben Lenz will be addressing Objective 2.

ii. Objective 1 of the study was to determine the amount of sediment that could be released downstream of Powell Falls Dam to average releases and determine the level of ecological risk to the downstream geomorphology and aquatic resources. Mr. Haug stated that a geomorphologist separated the lower Kinnickinnic River into 4 distinct reaches (numbered from downstream to upstream).

iii. The expected impacts from the dam removal include:
   a. Reach 1: temporary disposition on flood banks
   b. Reach 2: temporary pool filling but steep reach should flush pools faster than other reaches
   c. Reach 3: permanent disposition on overbank during floods and temporary filling of pools during low flow periods
   d. Reach 4: Most changes of any reach, especially within 1000 feet of dam, including temporary filling of pools and possibly permanent changes
   e. St. Croix: The 2020 flood and dam removal will have similar impacts to the St. Croix River. Permanent impacts are expected to include expansion of the delta bar and thicker channel dunes.

iv. Comments or Questions:
   a. Kent Johnson asked for clarification of the word "sediment," asking if estimates of downstream sediment transport are strictly bed sediment transport or if they include suspended sediments as well. Mr. Haug stated that in the upper reach there will be some silt transported, but both go into sediment transport. The biggest issue with the pool and riffle system will be the bed load transport and not the silt. Sean Morrison asked how long it will take for the sediment to move to the gorge area. Mr. Haug said the 2020 flood still has sand in the system to move in the channel and will likely take a few years to move to the gorge area.
   b. Angela Tornes asked if there might be impacts to the St. Croix mussel species? Mr. Haug responded that there would be minimal impacts to the mussels in the St. Croix River and cited the results of Mr. Kelner's mussel survey.
   c. Kent Johnson typed the comment: "Only a good sediment transport model could make some predictions of bed sediment load transport downstream (and how quickly that happens). Agreed that follow-up habitat assessment after dam removal will be a critical piece of information. Sustained, high levels of suspended sediment (turbidity), such as those that may occur during drawdown and/or dam removal, can also pose a direct risk to fish."

v. Ben Lenz, TRC presented Objective 2 of the Sediment Study.

vi. Objective 2 of the study was to assess potential effects on geomorphology and aquatic resources based on the predicted level of ecological risk.

vii. The expected impacts from dam removal include:
   1. Water quality impacts: There was an increase in phosphorous and suspended solids during the Lake Louise drawdown. Baseline conditions returned soon after the drawdown event.

2. Downstream aquatic habitat for species of concern: Riffle features were maintained and pool depth decreased by fine sediment deposition immediately downstream of Powell Falls following the drawdown.
3. Downstream aquatic species for life stages:
    a. Fish eggs: downstream of Powell Falls, flexibility during early part of spawn season
    b. Mussels: absent
    c. Invertebrates: downstream of Powell Falls, productivity occurred earlier in the season,
4. Riparian vegetation: Deposition of fine sediment out of channel benefits riparian vegetation
5. Aquatic species migration: No blockages were reported after the June 2020 flood or October 2020 drawdown.
6. Restoration of riverine habitat in reservoir area: Primary benefit of dam removal
7. Restoration of riverine habitat dynamic processes:
    a. Physical habitat features include bars, islands, large wood features and side channel activation. Large pieces of wood provide important habitat. Removal of dam will transport large wood downstream and will benefit fish habitats.
8. Ice jams considerations: No evidence of ice jams in the Powell Falls region.
9. Recreational use impacts: Boat launch downstream of Powell Falls has a reduced depth following the drawdown. Finer sediment will increase and decrease depth of that area as water events occur throughout time.

viii. Ecological Risk-Benefit Comprehensive Summary: The removal of the Powell Falls dam will likely result in low long-term risks and high long-term benefits for water quality, sedimentation, riverine conditions, instream habitats, ice jams and recreation.

ix. Comments or Questions:
    a. Kent Johnson was concerned that the study underrepresented productivity and potential impacts of dam removal on invertebrates. Lesley Brotkowski clarified the term "short-term" in the summary table is defined as being one year or less, which is why invertebrates were ranked as having a "medium" short term risk opposed to "high."
    b. Nicholas Ettema asked if the channel bar noted in the presentation formed after the drawdown or result from the flood? Mr. Haug responded that the channel bar was likely formed from the drawdown.

j) <u>Decommissioning Plan – Peter Haug, Ayres</u>

i. Mr. Haug stated that the objective of this study was to provide a general overview of the Powell Falls decommissioning and schedule.

ii. Mr. Haug discussed dam removal case studies in Wisconsin and Minnesota and lessons learned from the case studies. It was determined that the largest contributors to dam removal risk are:
    a. Sediment release during construction (vegetate lakebed early)
    b. Floods impacting dam removal safety (Post-tensioned sections in Powell Falls need to come out completely in stages)
    c. Excessive dewatering costs (Draw down impoundment and keep it down)

iii. Mr. Haug went over expected costs associated with the Powell Falls dam removal.
iv. Mr. Haug discussed the expected permit conditions
    a. Worksite safety signage/fencing
    b. Controlled rate of drawdown
    c. Construction equipment cleaning
    d. Sediment barriers in-stream and on land throughout construction
    e. Reservoir restoration is two parts, quick rooting cover crops and long-term establishment of natives
    f. 5-year monitoring period for bank erosion
v. Mr. Haug discussed Ayres' Recommendations
    a. 2+ growing seasons to establish vegetation prior to removing the dam
    b. Mitigate sediment as reasonably practicable but understand that some sediment release can be accommodated by downstream river
    c. Sediment removal is cheapest in traps created by turbidity barriers
    d. Expect a large flood to occur during construction
vi. Sediment Management: Annual average of sediment release at the dam is estimated to be 10,000 tons per year (suspended and bedload). The maximum expected release from removal of the Powell Falls Dam is 33,000 to 90,000 tons.
vii. 2021 Activities expected
    a. Manually seed lakebed and then aerially seed lakebed
    b. Permit applications for sediment management and FERC license amendment request
    c. Construct access route to tailrace
    d. Sediment management in tailrace
    e. Naturally dewater lakebed sediments (up to a year process)
viii. 2022 Activities expected
    a. Monitor lakebed vegetation growth and invasive species
    b. Monitor and armor sanitary sewer infrastructure as necessary
    c. Sediment management in tailrace
    d. Naturally dewater lakebed sediments (up to a year process)
    e. Finalize dam removal drawings for anticipated Wisconsin DNR submission
    f. Finalize lakebed restoration plan
ix. 2023-2024 Activities expected
    a. Apply for grants, finalize funding arrangements
    b. Bid construction project after all permits are in hand
    c. Build causeway from disposal site to dam
    d. Remove west end of spillway to allow causeway to come through dam
    e. Sediment management in tailrace
    f. Remove top of powerhouse
x. 2024-2026 Activities expected
    a. Implement lakebed restoration
    b. Remove rest of spillway
    c. Remove sluice gate structure
    d. Stabilize powerhouse foundation for future reuse
    e. Remove causeways and access roads
    f. Remove sediment management system
    g. Monitor bank erosion and invasive species
xi. 2026-2030 Activities expected

a. Monitor bank erosion and invasive species

xii. Mr. Haug described the estimated schedule for the Decommissioning Plan
   a. FERC Amendment Application to remove Powell Falls from the FERC license (March 2021)
   b. Lakebed seeding (1) (March 2021)
   c. Permit applications to Wisconsin DNR and USACE (March 2021)
   d. FERC authorization received to improve flow management and temporary abutment protection (June 2021)
   e. Lakebed seeding (2) (June 2021)
   f. Monitoring of infrastructure (2021-2026 with rip rap placed prior to the start of river diversion)
   g. Sediment management (Summer 2021)
   h. FERC amendment decision (April 2022)
   i. Sediment management evaluation (Annually until dam removal is complete)
   j. Final design of dam removal (Fall 2022)
   k. Final restoration plan (December 2022)
   l. Dam removal permit applications submitted (December 2022)
   m. Contractor mobilization (June 1, 2023)
   n. Dam removal completed (December 31, 2026)
   o. Restoration monitoring, management, and implementation (June 1-2023 to December 31, 2028)

xiii. Comments or Questions:
   a. Shana Wiseman clarified that the City will submit a license amendment to FERC (DHAC) to propose to remove Powell Falls development from the FERC license. The August license application will only be to relicense the upper Junction Falls development.
   b. Dan Helsel asked Shana if the FERC Environmental Assessment (EA) is likely to include or not include the dam removal component of the project? Shana Wiseman stated that the license application will only address the relicensing of Junction Falls. The EA will not include information on Powell Falls, but will be addressed to provide an overview or existing project facilitates.
   c. Cheryl Laatsch commented, "Please note what the public notice/comment period may be for the Amendment to remove the dam from the FERC license." Diana Shannon from DHAC responded that there will be an opportunity to comment under the state process.
   d. Shana Wiseman stated that there is a comment period for the USR. Comments are due by March 31st.

4. **Overview of Next Steps**
   a. Ms. Brotkowski thanked the presenters and reviewed the next steps in the FERC process. Ms. Brotkowski stated that the USR meeting summary will be filed with FERC by February 24, 2021 Ms. Brotkowski stated that the amendment application to remove Powell Falls from the FERC license will be submitted in March 2021 and the Draft License Application is due to FERC by April 3, 2021. The Draft License Application comments are due by July 2, 2021. The Final License Application will be filed with FERC by August 31, 2021. The Public Notice of License Application will be submitted on September 14, 2021.
   b. Ms. Brotkowski asked if there were any final questions or comments.

i. Kent Johnson asked if the final study reports will be posted on an easy-to-find location on the City of River Falls website. Mr. Westhuis stated that he will post the studies online.
ii. Mr. Johnson asked how long it will take FERC to act on the amendment application for Powell Falls. Ms. Shannon said she could not comment on how long it will take.

c. Ms. Brotkowski and Mr. Westhuis thanked everyone for their time and participation.

Updated Study Report Meeting Presentations

River Falls Hydroelectric Project (FERC P-10489)

Updated Study Report Meeting

February 9, 2021

Agenda

9:00 AM **Meeting Overview**

- Introductions – Kevin Westhuis, RFMU & Lesley Brotkowski, TRC
- Meeting Purpose and FERC Process Update – RFMU, TRC, & FERC

9:30 AM **Studies Conducted in 2020**

- Hydraulic and Hydrologic Analysis – Pat Dowd, USACE
- Water Quality – Ellen Faulkner, Ayres
- Mussel Survey – Dan Kelner, USACE

11:00 AM **Break**

11:15 AM **Studies Conducted in 2020, Continued**

- Lake George Shoreline Habitat Assessment – Josh McEnany, GSRC

Agenda

11:15 AM	**Studies Conducted in 2020, Continued** • Aquatic Invasive Species Survey- Marty Melchior & Sean Morrison, Inter-Fluve • Riverine Habitat Evaluation Below Powell Falls – Marty Melchior & Sean Morrison, Inter-Fluve
12:30 PM	**Lunch Break**
1:00 PM	**Studies conducted in 2020, Continued** • Recreation Use Assessment – Ross Hackbarth, GSRC • Archaeology Survey – Rachel Klabacka-Williams, TRC • Sediment Study – Pete Haug, Ayres & Ben Lenz, TRC
2:30 PM	**Break**
2:45 PM	**Powell Falls Decommissioning Plan** – Pete Haug, Ayres
3:30 PM	**Next Steps and Meeting Conclusion**

Introductions

- Welcome
- Virtual meeting housekeeping
  - Meeting will be recorded
  - Raise hand or use meeting chat functions to make a comment or ask questions
  - Sign-in: unknown meeting participants will be asked to identify themselves periodically

Meeting Purpose

- Review the contents of the Updated Study Report
- Provide an opportunity to discuss the 2020 study results prior to the submittal of the Draft License Application
- Each study update will include an opportunity for questions and comments

Project Boundary

FERC Process Update

Responsible Party	Pre-Filing Milestone	Date*
Licensee	Second Study Season	2020
Licensee	Updated Study Report due	1/30/2021
All stakeholders	Updated Study Report Meeting	2/9/2021
Licensee	Updated Study Report Meeting Summary	2/24/2021
Licensee	Draft License Application Due	4/3/2021
Stakeholders	Draft Comments Due	7/2/2021
Licensee	License Application filed	8/31/2021
Licensee	Public Notice of License Application filing	9/14/2021

*Dates based on FERC Revised Process Plan and Schedule issued on 7/10/2019

FERC Process Update

- **USACE Planning Assistance to States (PAS) Program**
  - USACE cost-share program assists with preparation of comprehensive plans for water and related land resources
  - 50/50 cost share, with $210,000 provided by USACE
  - PAS Program used to support 2020 studies

FERC Process Update - 2020 Flood

- June 28-29, 2020: 7-8” of rainfall in parts of the Kinnickinnic Watershed
- Damage to the Powell Falls dam
- July 16, 2020: RFMU filed a flood damage report with FERC Division of Dam Safety and Inspection (D2SI)
- September 10, 2020: FERC D2SI requested a plan and schedule to address dam safety inspection and replacement of gages

2020 Flood

Junction Falls

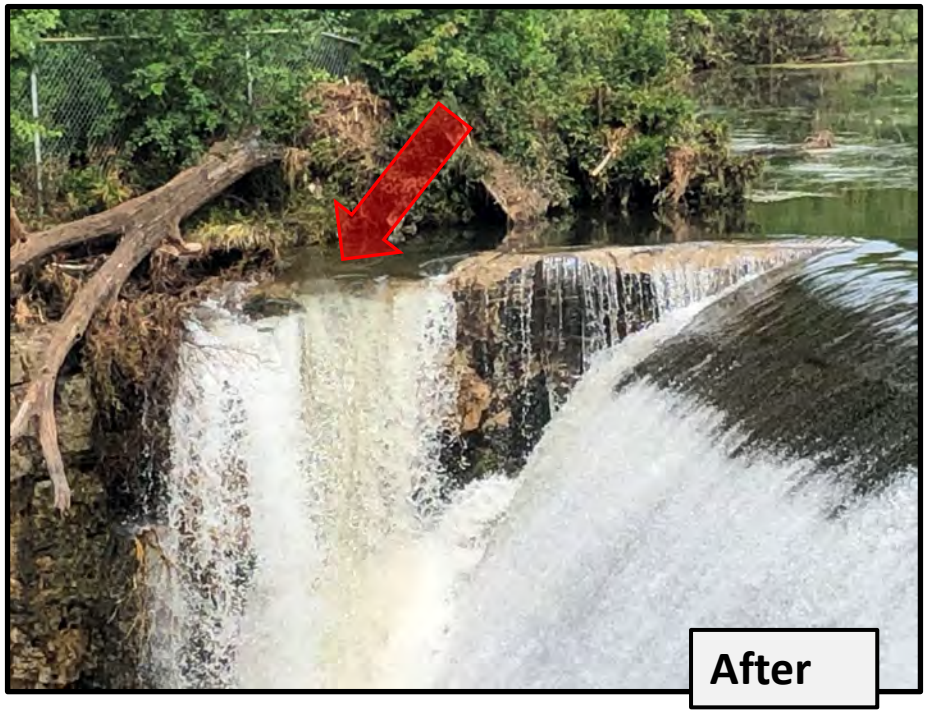
- Headworks at Powell Falls were underwater on June 29, 2020
- At the height of the flood, water was 7 feet above the crest of the dam

Powell Falls

*Pictures taken on 6/29/2020

Powell Falls Before and After

- Damage to right wing wall



Lake Louise Drawdown

- September 25, 2021: RFMU filed Plan and Schedule for Lake Louise drawdown to conduct dam safety inspection
- October 1, 2020: FERC Division of Hydropower Administration and Compliance (DHAC) Order approved drawdown and temporary variance from run-of-river operation, required refill plan by April 2021 and return to normal by June 2021
- October 2, 2020:
  - FERC D2SI concurred with inspection plan, asked for future action options
  - Drawdown initiated
- December 22, 2020: RFMU filed Post-Flood Dam Safety Inspection and Repair Options letter for Powell Falls

Powell Falls Action Options

- **Option 1**: Repair the dam and refill Lake Louise
- **Option 2**: Keep Lake Louise drawn down as is
- **Option 3**: Keep Lake Louise drawn down, fix the gate and pull the turbine to enhance flow capacity
- **Option 4**: Keep Lake Louise drawn down and add flow capacity by opening a new passage route
- **Option 5**: Proceed with full dam removal (accelerated by two years from original schedule)

Powell Falls Action Options

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Next Steps

FERC Amendment Application - FERC DHAC

- Remove Powell Falls from FERC license
- Lake Louise will not be refilled, power generation will not resume
- Fix gate and remove turbine
- Decommission powerhouse and appurtenant facilities (excluding dam removal)

Conduct dam removal under state jurisdiction

- Apply to Wisconsin DNR Municipal Dam Removal Grant Program

Next Steps

FERC License Application – FERC Licensing

- Draft & Final License Applications will include Junction Falls only
- Study results will still be used to inform the licensing process, but results specific to Powell Falls and dam removal will not be included

Updated Study Report (USR)

- All 2020 studies conducted in accordance with the FERC Study Plan Determination have been included in the USR filed with FERC and will be discussed today

Studies Conducted 2019 & 2020

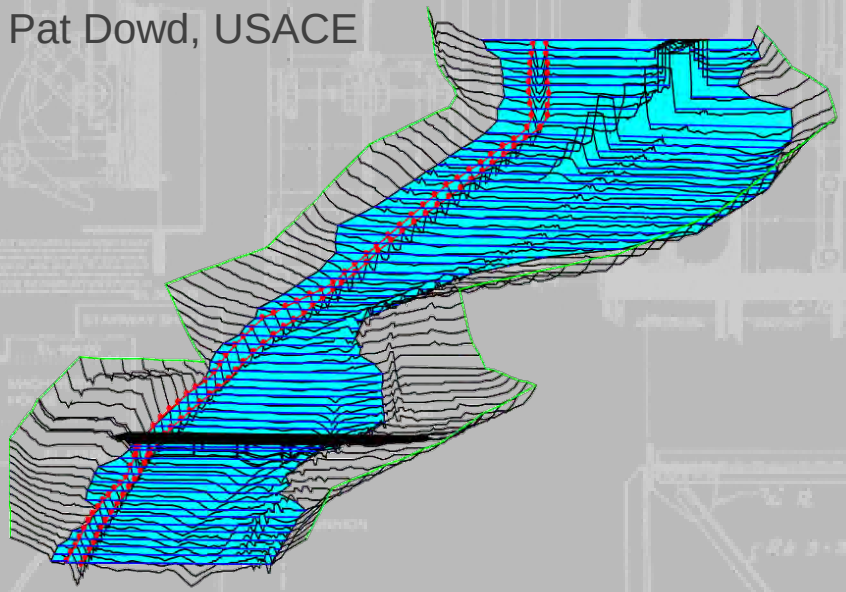
Study	2019	2020
Hydrologic & Hydraulic Evaluation		✓
Water Quality	✓	✓
Lake George Shoreline Habitat Assessment		✓
Aquatic Invasive Species Survey		✓
Mussel Survey		✓
Wetland, Riparian, and Terrestrial Resources Survey	✓	
Riverine Habitat Evaluation below Powell Falls		✓
Recreation - Recreation Facility Inventory - Recreation Use Assessment	✓	 ✓
Cultural Resources - Architectural Resources Survey - Archaeology Resources Survey	✓	 ✓
Sediment Study		✓
Decommissioning Plan	✓	✓

Hydraulic & Hydrologic Analysis

Pat Dowd, USACE

HYDRAULIC & HYDROLOGIC ANALYSIS

Pat Dowd, USACE



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PRESENTATION OUTLINE

- Study Objectives and Scope of Work
- Previous Studies
- Hydrologic Analysis
- Hydraulic Analysis
- Results and Discussion

STUDY OBJECTIVES

- Estimate streamflow rates for several flood events (hydrologic)
- Estimate river levels during those events with and without Powell Falls Dam (hydraulic)

SCOPE OF HYDROLOGIC ANALYSIS

- The Revised Study Plan:
  - Use USGS gage data and *Bulletin 17C*
  - Use FEMA's hydrologic model (HEC-HMS) and NOAA's *Atlas 14*
  - Use the USGS's flood frequency regression equations for Wisconsin

SCOPE OF HYDROLOGIC ANALYSIS

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SCOPE OF HYDRAULIC ANALYSIS

- Revised Study Plan:
  - Update SEH's hydraulic model (HEC-RAS)
  - Review the hydraulic model's geometry for opportunities for improvement
  - Conduct a topographic and bathymetric survey and add data to model

SCOPE OF HYDRAULIC ANALYSIS

- Revised Study Plan:
  - Update SEH's hydraulic model (HEC-RAS)
  - Review the hydraulic model's geometry for opportunities for improvement
  - ~~Conduct a topographic and bathymetric survey and add data to model~~

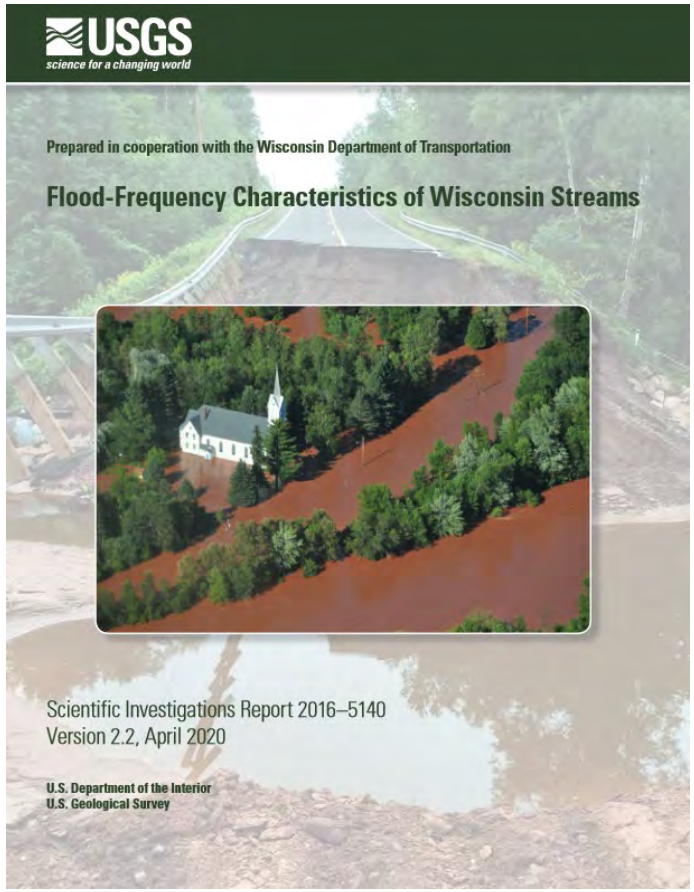
SCOPE OF HYDRAULIC ANALYSIS

- Swanson's (professor at UWRF) Kinnickinnic Watershed Study (1976)
- FEMA's Flood Insurance Study (FIS) 2002 (published in 2011)
- Inter-Fluve's Sediment Assessment (2016)
- SEH's Hydraulic & Hydrologic Analysis (2017)

Hydrologic Analysis

USGS REGRESSION EQUATIONS

USGS
science for a changing world



USGS REGRESSION EQUATIONS

USGS REGRESSION EQUATIONS

USGS REGRESSION EQUATIONS

Streamflow Dependent on 3 Variables:

- Watershed Area
- Soil Infiltration Rate
- Percent Forest Cover

USGS REGRESSION EQUATIONS

USGS science for a changing world

Watershed Area

MRLC

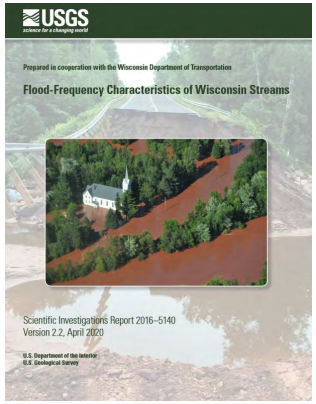
Land Use (Forest Cover) Data

USDA

Soil Infiltration Rate Data

ArcGIS Pro

Geospatial Analysis



USGS Regression Equations

Estimated Flow Values

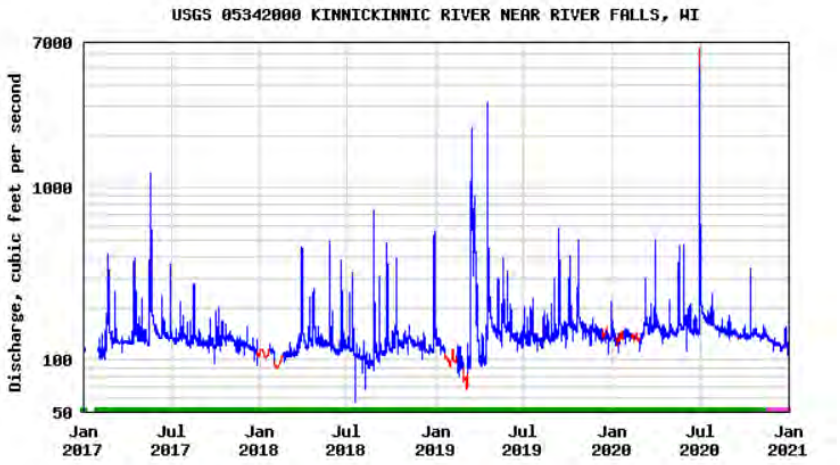
USGS REGRESSION EQUATIONS

Best-fit equation						SEP, in percent
Area 5, 26 streamflow-gaging stations						
Q_{50p}	=	183	$A^{0.701}$	$K_{sat}^{-0.540}$	$F^{-0.422}$	47.5
Q_{20p}	=	521	$A^{0.707}$	$K_{sat}^{-0.701}$	$F^{-0.403}$	45.4
Q_{10p}	=	951	$A^{0.709}$	$K_{sat}^{-0.796}$	$F^{-0.383}$	45.1
Q_{4p}	=	1,870	$A^{0.709}$	$K_{sat}^{-0.906}$	$F^{-0.358}$	46.0
Q_{2p}	=	2,950	$A^{0.710}$	$K_{sat}^{-0.982}$	$F^{-0.340}$	47.7
Q_{1p}	=	4,530	$A^{0.709}$	$K_{sat}^{-1.05}$	$F^{-0.316}$	48.5
$Q_{0.5p}$	=	6,750	$A^{0.709}$	$K_{sat}^{-1.12}$	$F^{-0.302}$	50.1
$Q_{0.2p}$	=	11,100	$A^{0.708}$	$K_{sat}^{-1.21}$	$F^{-0.277}$	51.1

HEC-RAS Model Cross-Section/Location	50% AEP Discharge (cfs)	10% AEP Discharge (cfs)	1% AEP Discharge (cfs)
RS-71222	2,700	6,600	13,800
RS-66059	2,800	7,000	14,600
RS-53219	2,800	7,000	14,500
USGS Gage 05342000	3,000	7,500	15,600

USGS GAGE DATA

1917-1921 and
2002 - Present



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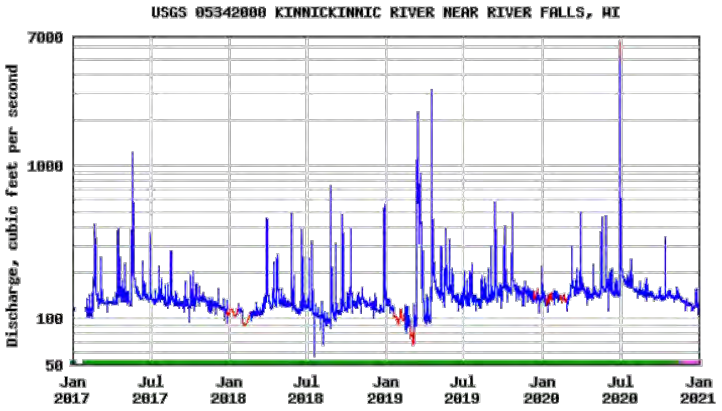
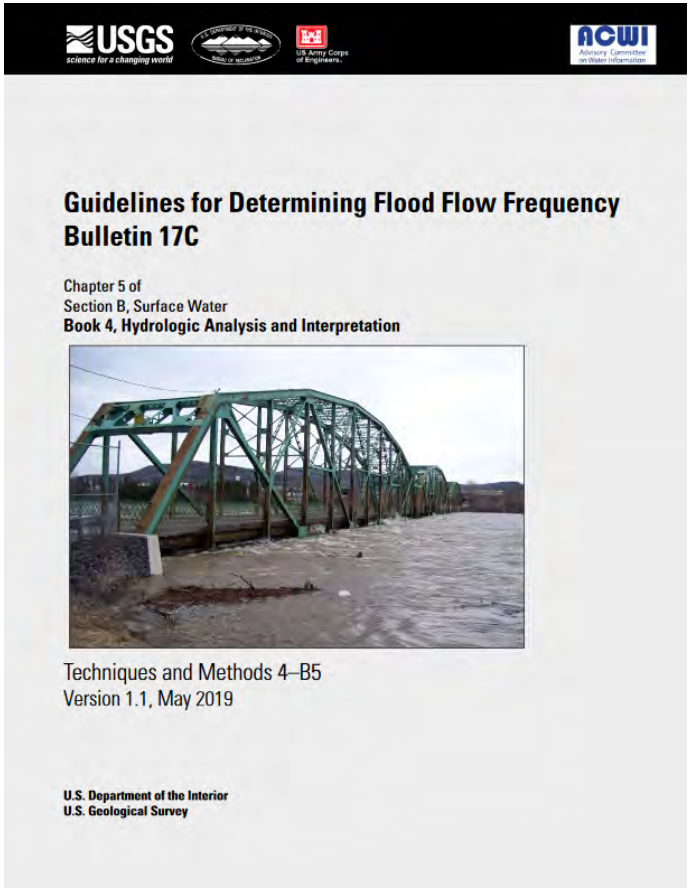
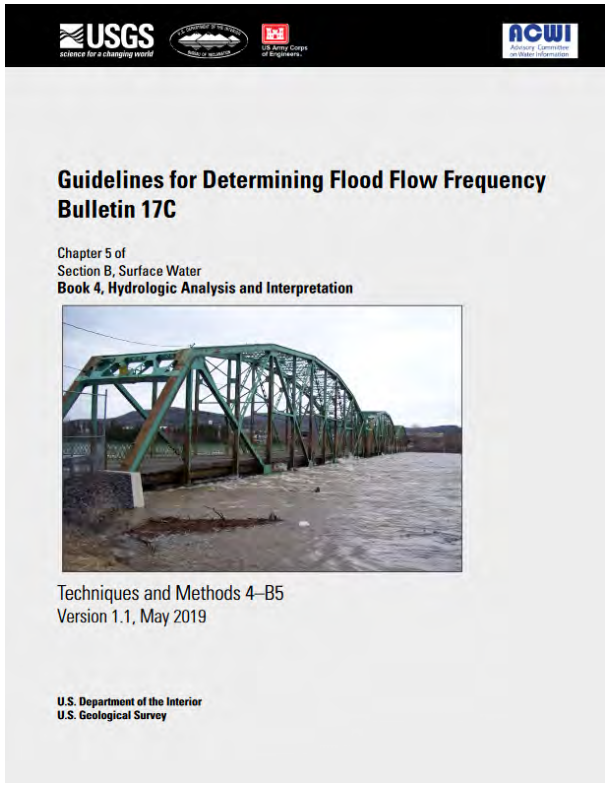
HISTORICAL FLOODS

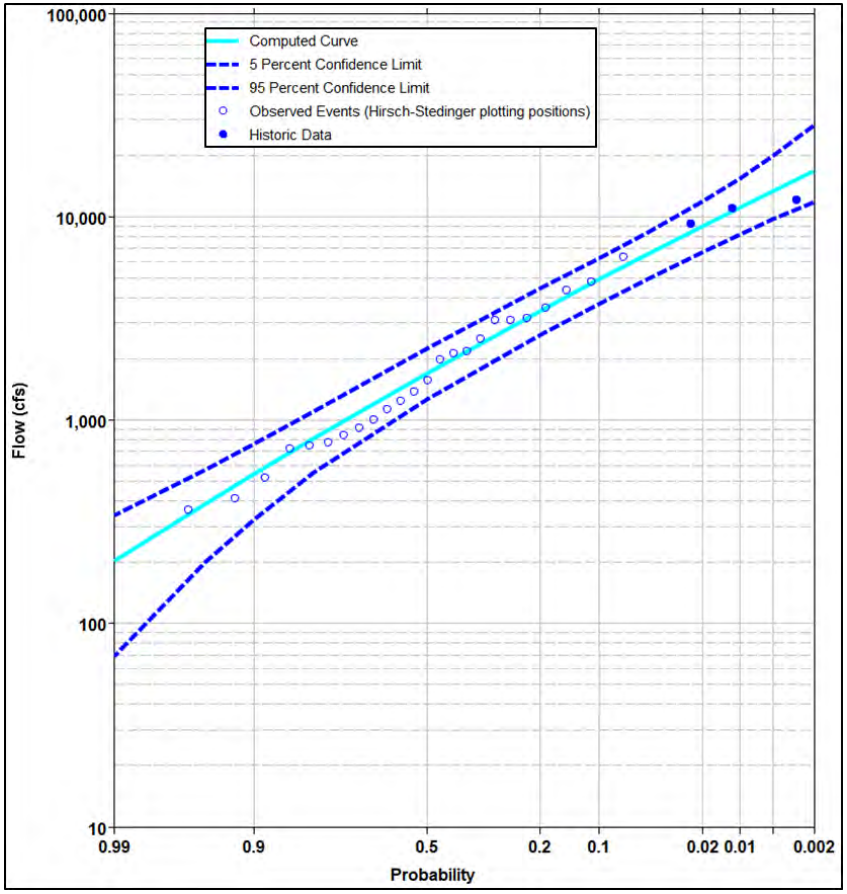
BULLETIN 17C ANALYSIS





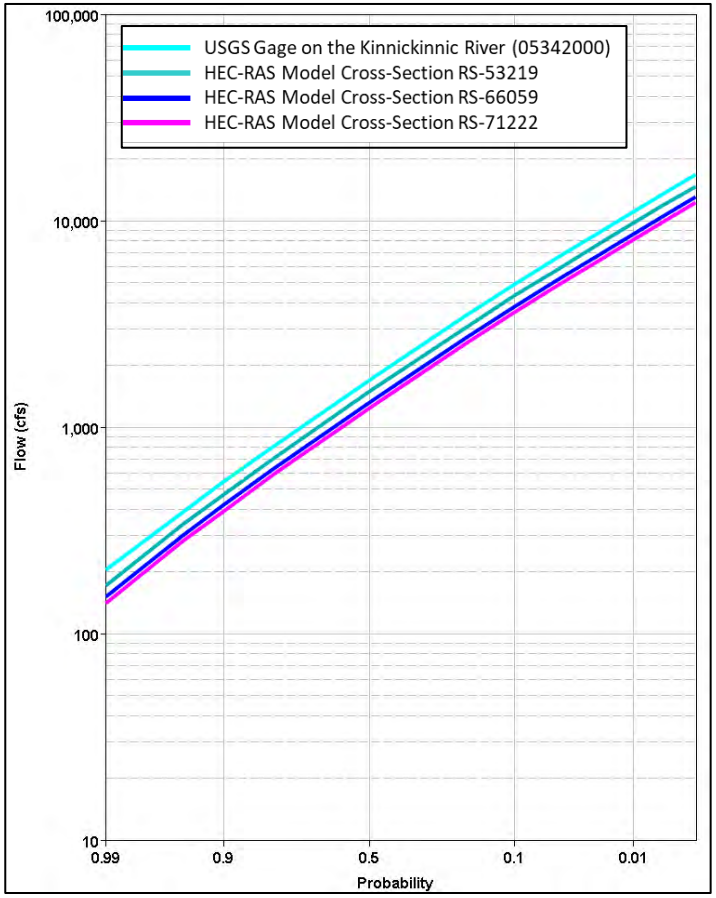
BULLETIN 17C ANALYSIS





BULLETIN 17C ANALYSIS

	Discharge Estimates (cfs)			
Exceedance Probability	Cross-Section RS-71222	Cross-Section RS-66059	Cross-Section RS-53219	USGS Gage 05342000
0.002 (0.2%)	12,200	13,000	14,600	16,690
0.01 (1%)	8,110	8,630	9,740	11,070
0.02 (2%)	6,590	7,020	7,920	9,000
0.1 (10%)	3,590	3,830	4,320	4,910

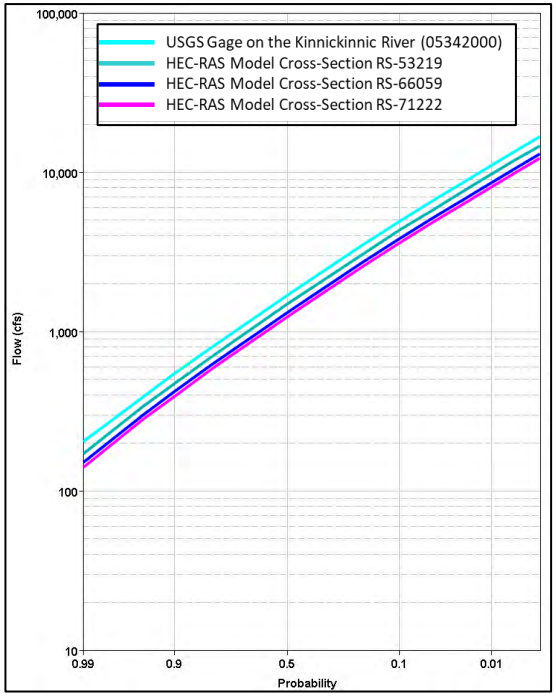


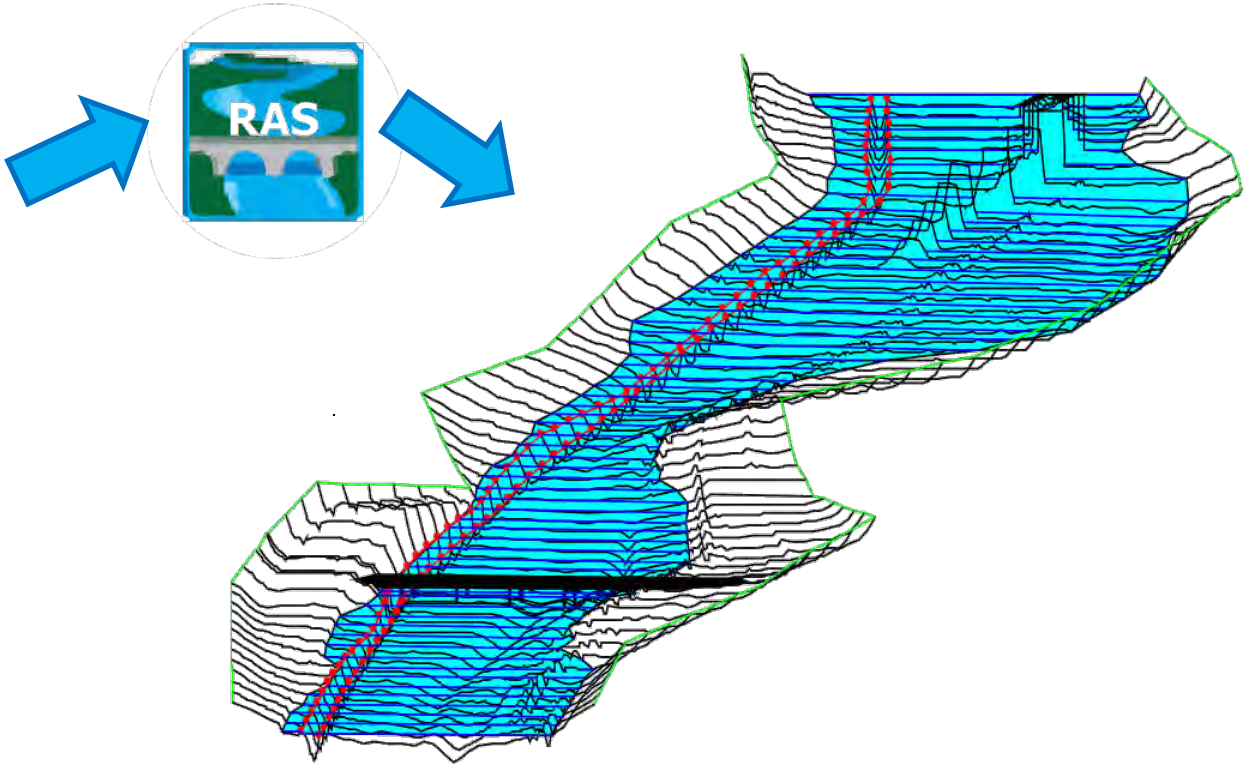
COMPARISON TO PAST HYDROLOGIC ANALYSES

	Discharge Estimates for Cross-Section RS-66059 (Upstream of Junction Falls) (cfs)		
Exceedance Probability (%)	1976 Study	2011 FIS Study	This Study
0.2	9,900	13,000	13,000
1	8,600	8,700	8,630
2	7,200	7,050	7,020
10	4,200	3,350	3,830

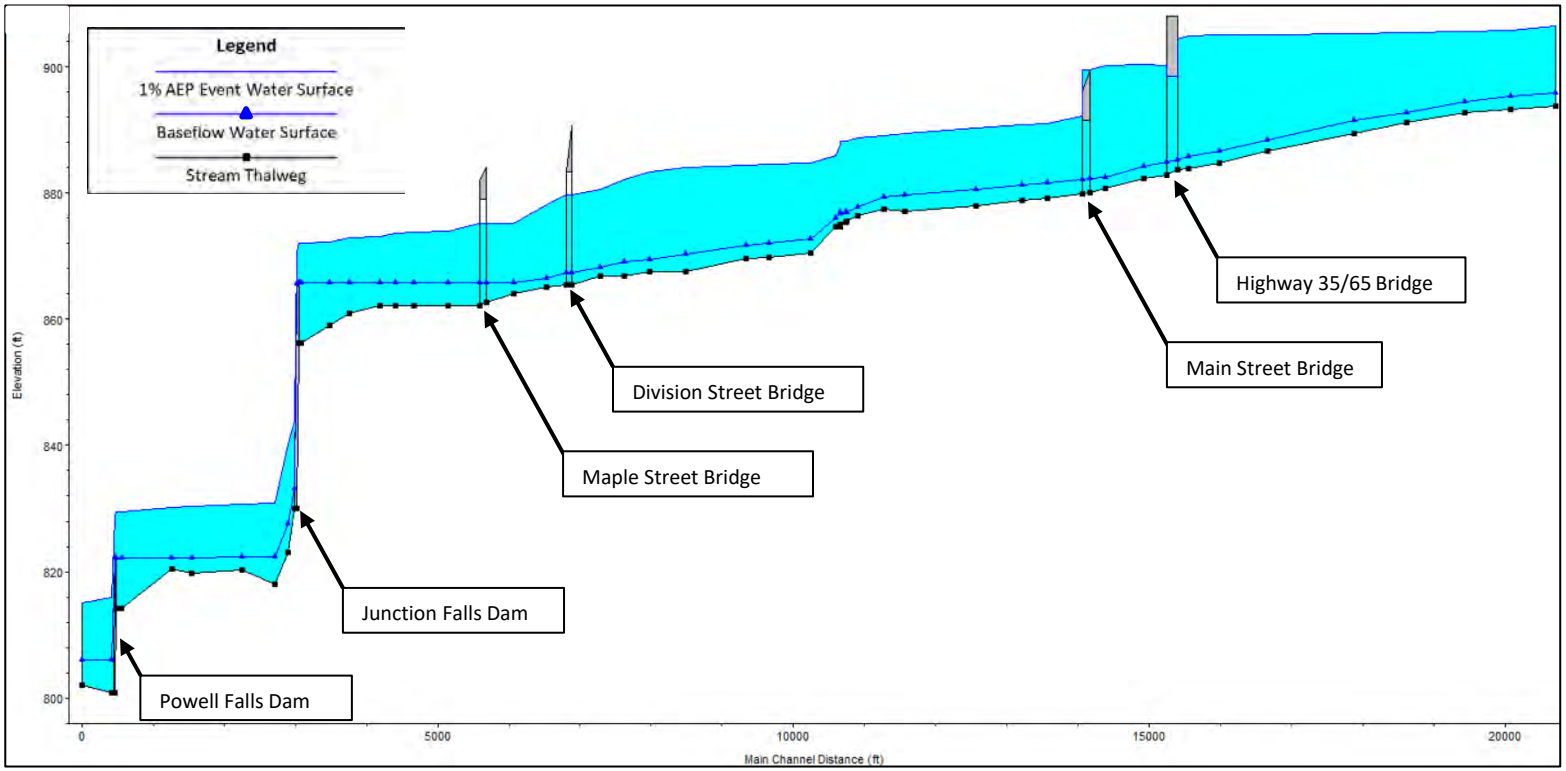
Hydraulic Analysis

HYDRAULIC ANALYSIS

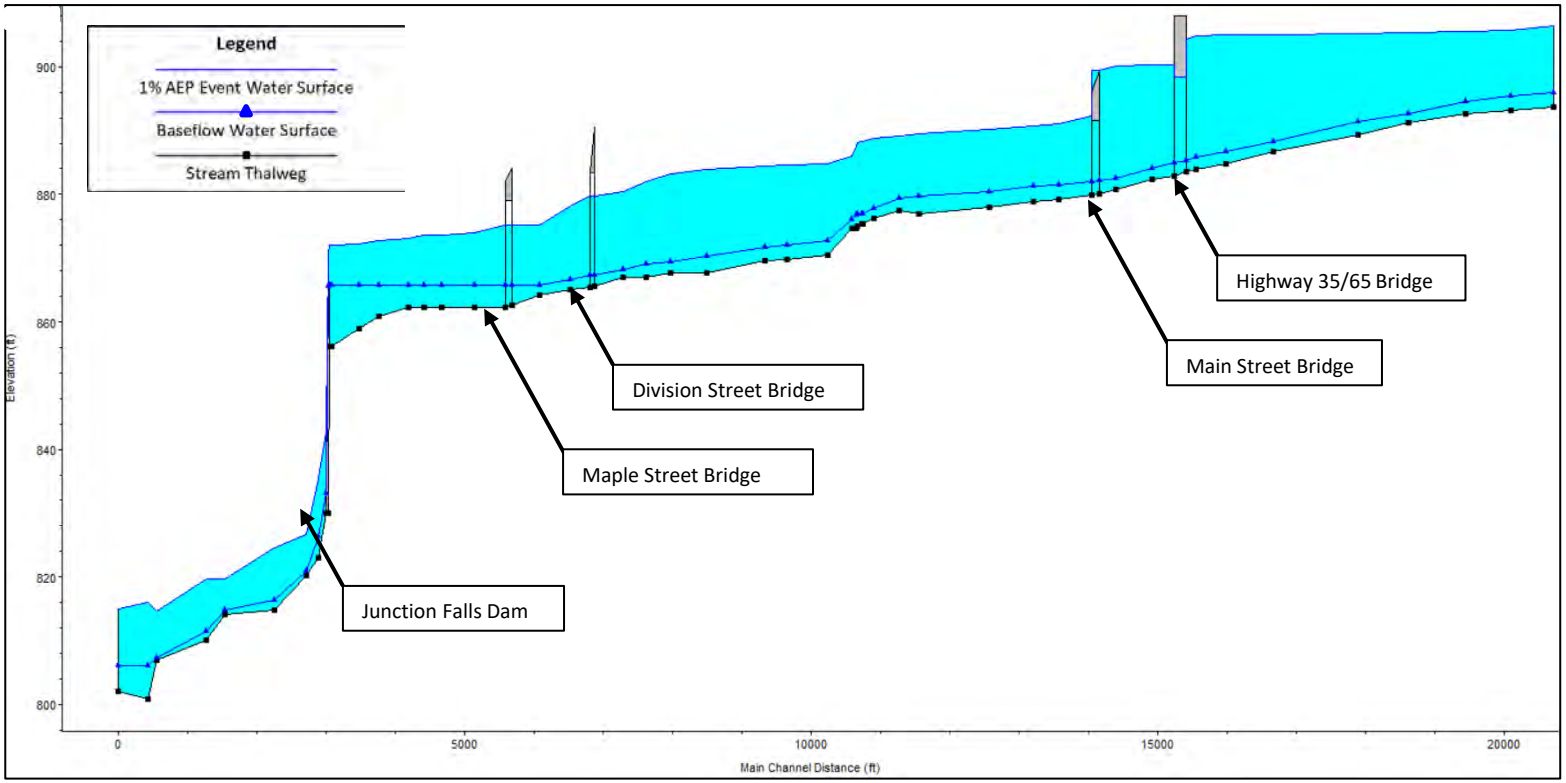




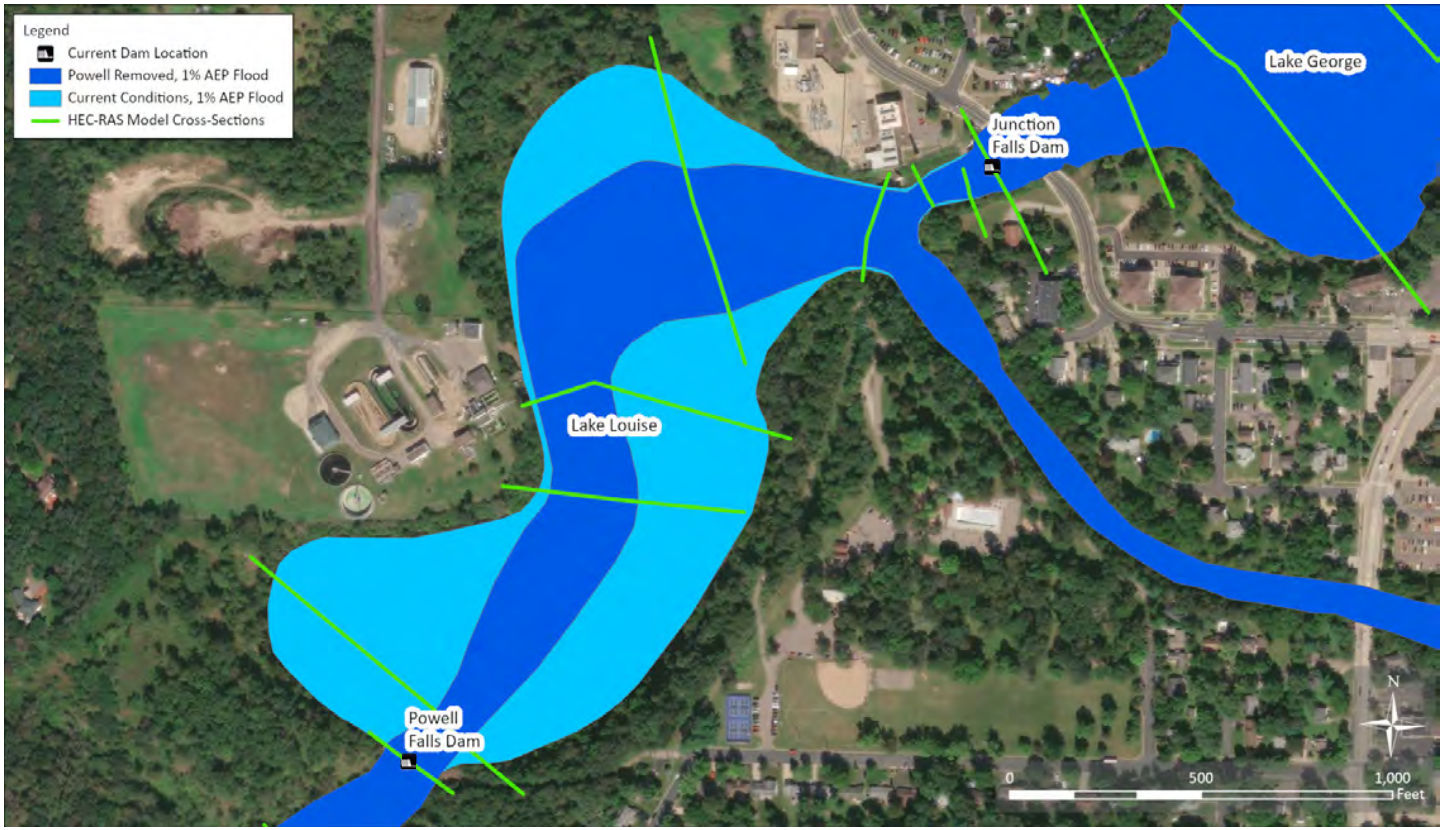
HYDRAULIC ANALYSIS



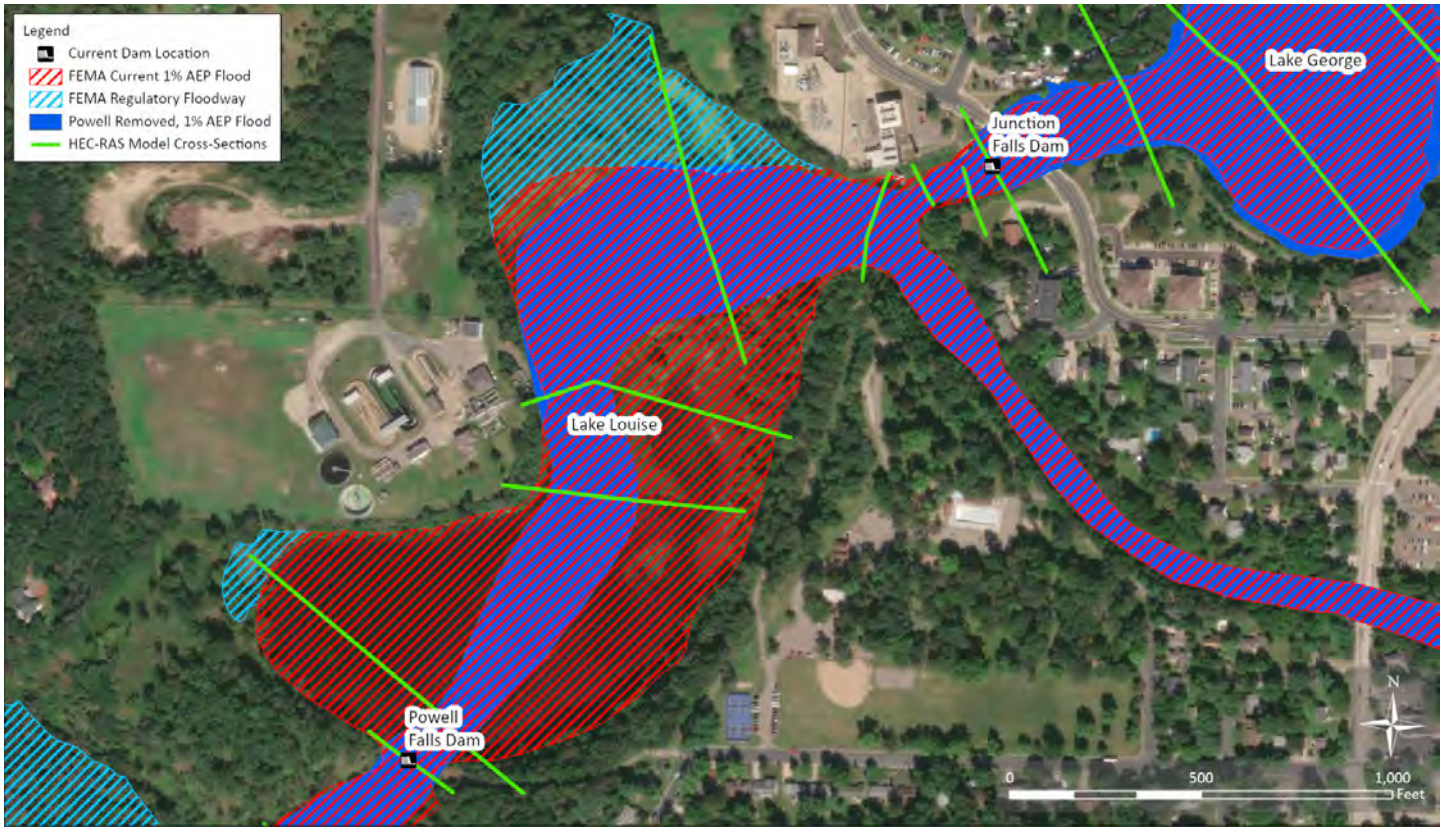
HYDRAULIC ANALYSIS



RESULTS

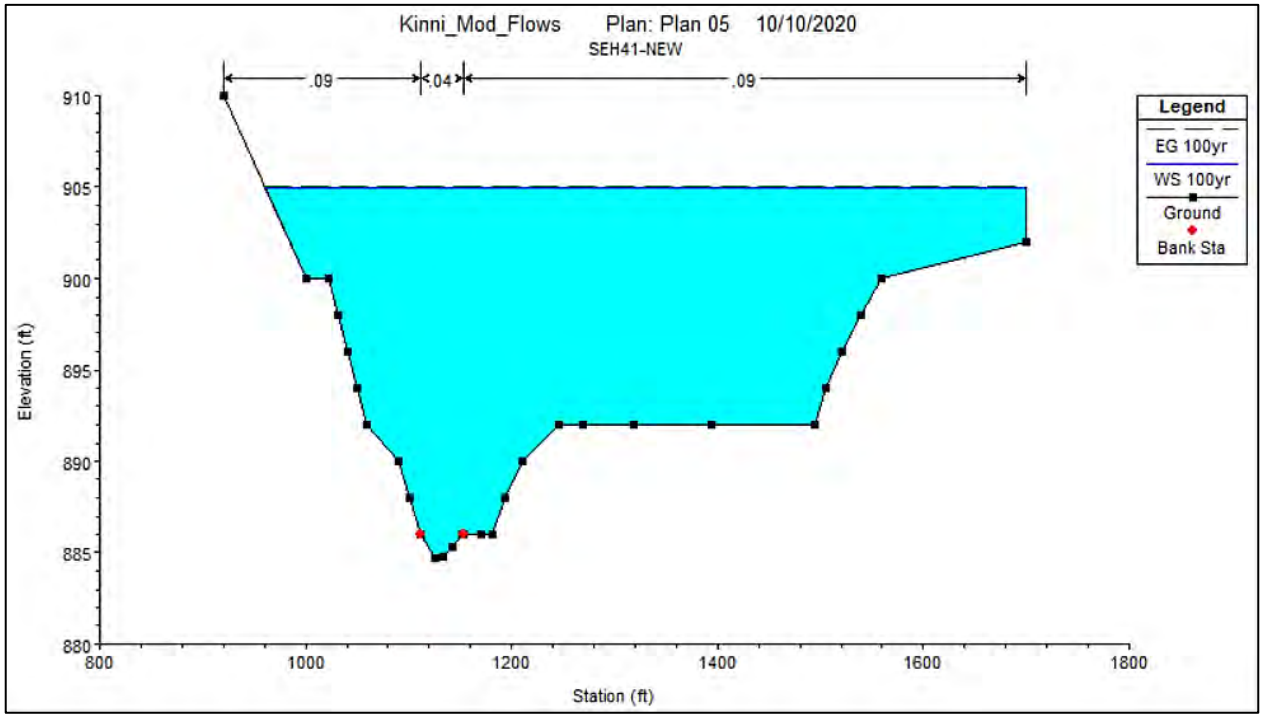

Legend
Current Dam Location
Powell Removed, 1% AEP Flood
Current Conditions, 1% AEP Flood
HEC-RAS Model Cross-Sections
Lake George
Junction
Falls Dam
Lake Louise
Powell
Falls Dam
N
0
500
1,000
Feet

RESULTS


Legend
Current Dam Location
FEMA Current 1% AEP Flood
FEMA Regulatory Floodway
Powell Removed, 1% AEP Flood
HEC-RAS Model Cross-Sections
Lake George
Junction Falls Dam
Lake Louise
Powell Falls Dam
N
0
500
1,000
Feet

OPPORTUNITIES FOR RAS MODEL IMPROVEMENT

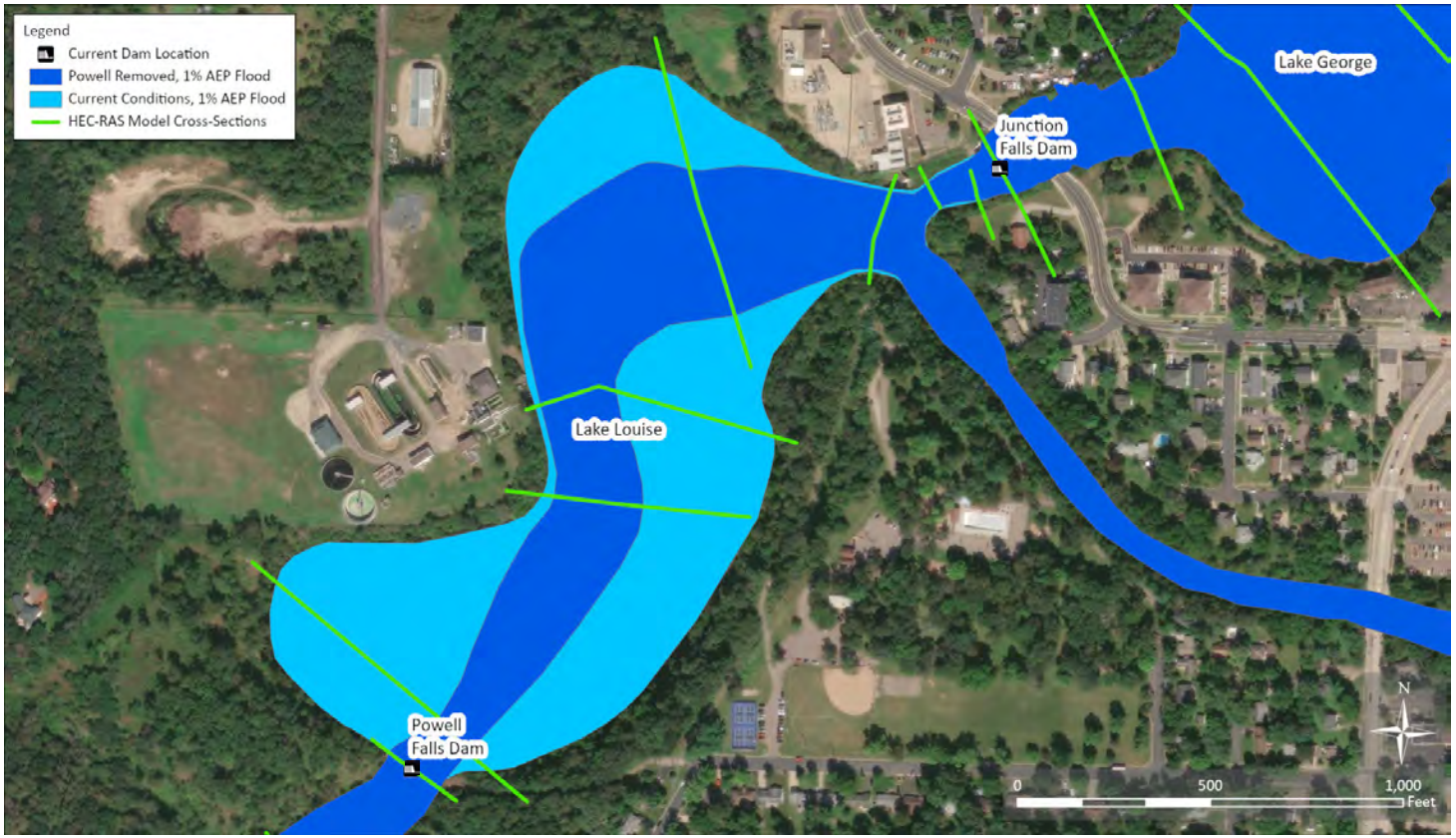
- Expanding Model Cross-Sections



OPPORTUNITIES FOR RAS MODEL IMPROVEMENT

- Updating Model Geometry (Bathymetry and Topography)
  - Bathymetric Surveys (What Channel Looks Like Under Water)
  - Topographic Surveys and LiDAR (What Channel Looks Like Above Water)
  - Sediment Surveys/Geomorphological Analysis (What Channel Will Look Like After Dam Removal)
- Georeferencing Model (Map Cross-Section to Path of River)
- Updating Model to Run as Unsteady Flow

QUESTIONS


Legend
Current Dam Location
Powell Removed, 1% AEP Flood
Current Conditions, 1% AEP Flood
HEC-RAS Model Cross-Sections
Lake George
Junction
Falls Dam
Lake Louise
Powell
Falls Dam
N
0
500
1,000
Feet

Water Quality Study

Ellen Faulkner, Ayres

Water Quality Study

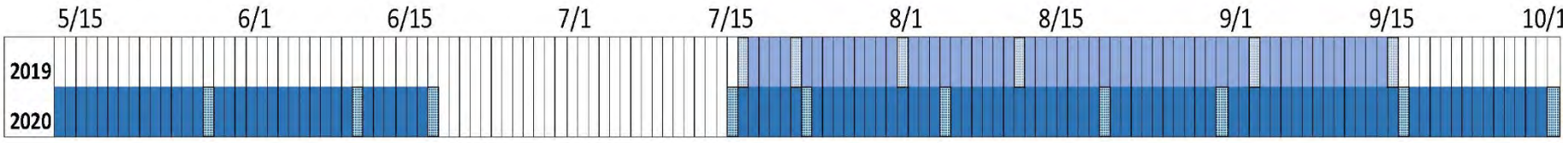
Ellen Faulkner, Ayres

- Dissolved oxygen and water temperature in the project area recorded at 15-minute intervals, summer 2019 and 2020
- Supporting observations including independent DO meter “grab samples,” air temperature, algae cover, streamflow

Water Quality Study

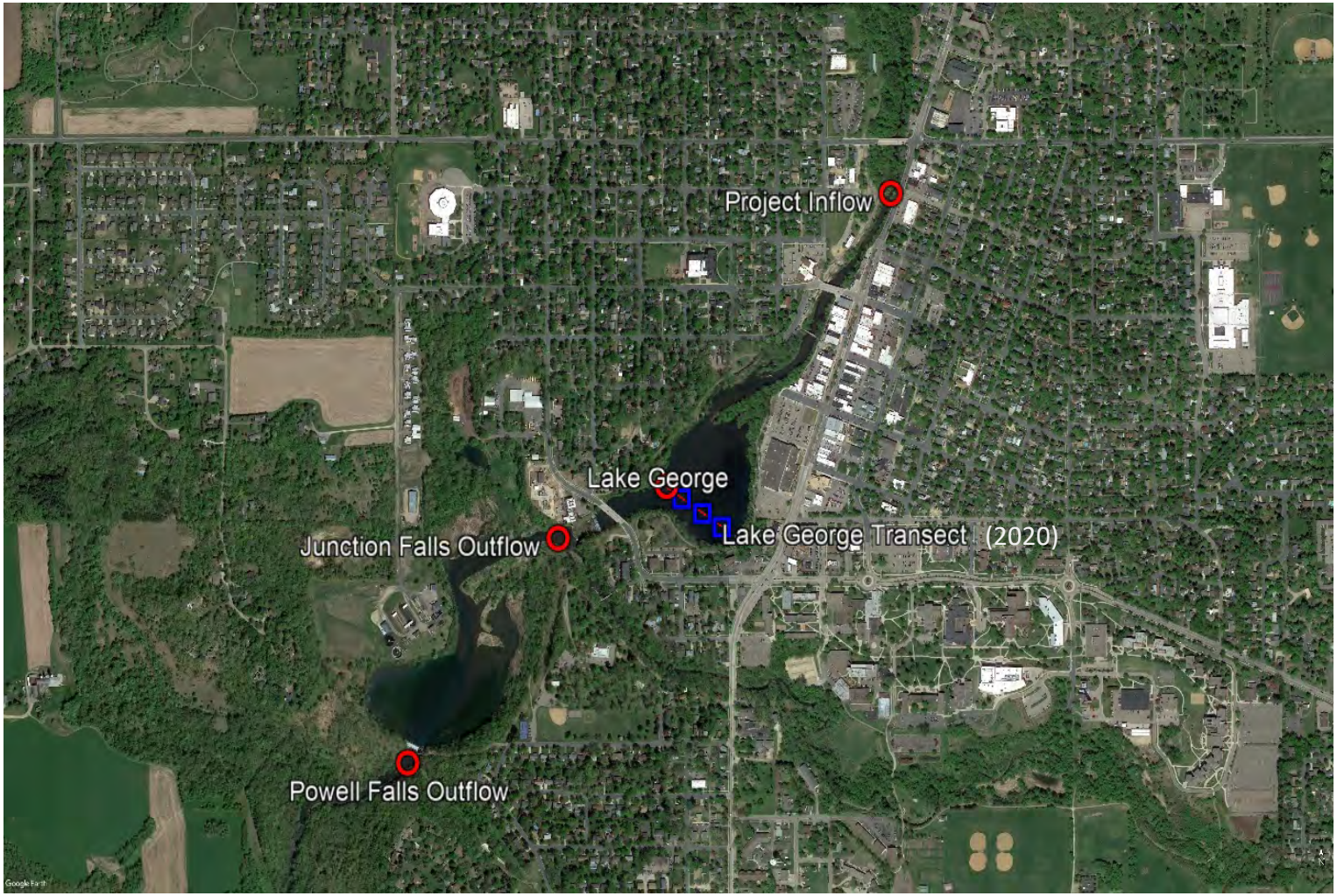
- 15-minute readings at 4 locations
  - July 18-September 17, 2019
  - May 15-June 19, 2020
  - *Flood June 29, 2020, lost all instruments*
  - July 17-Oct. 2, 2020

- Handheld meter readings/data downloads at 1-2 week intervals



Water Quality Study

DO Meter Locations



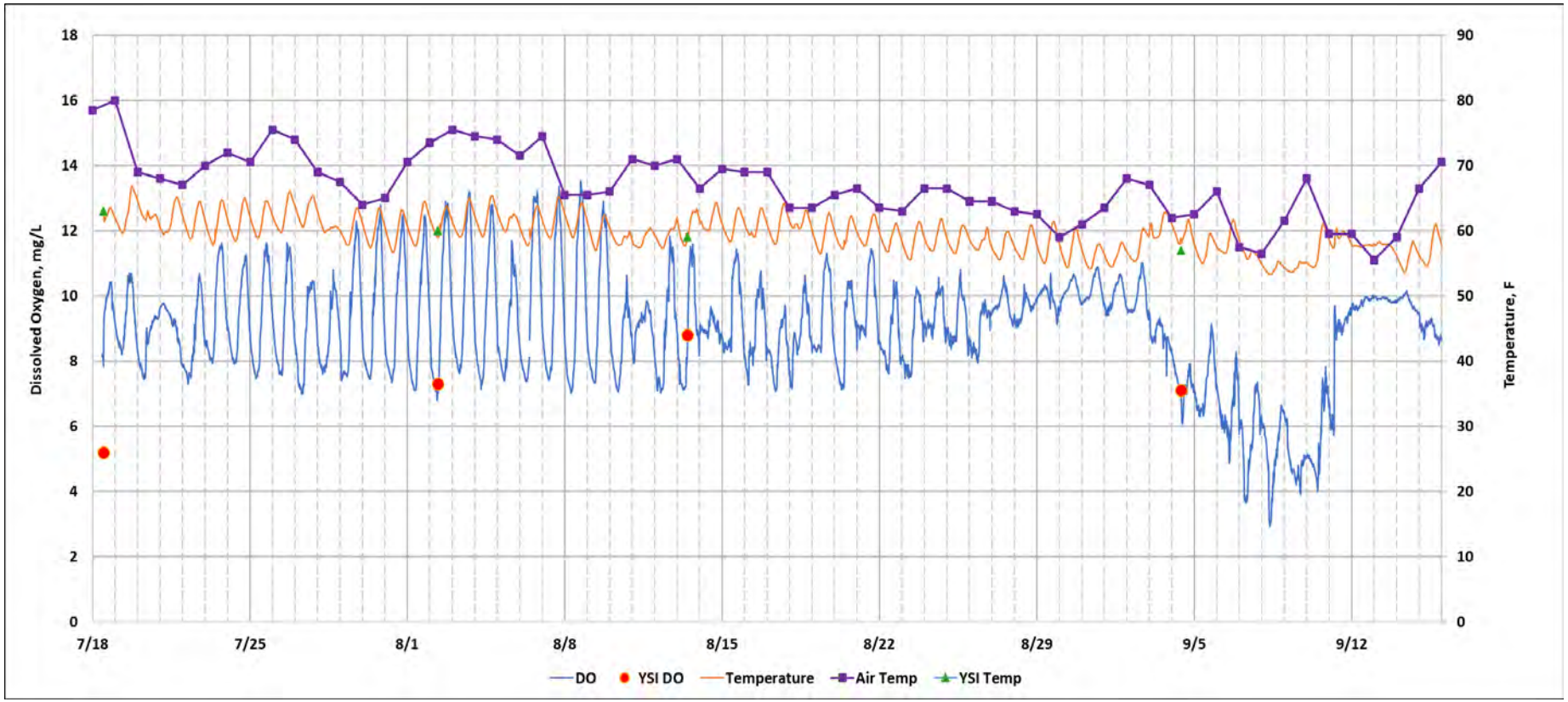
Water Quality Study

Continuous Instrumentation

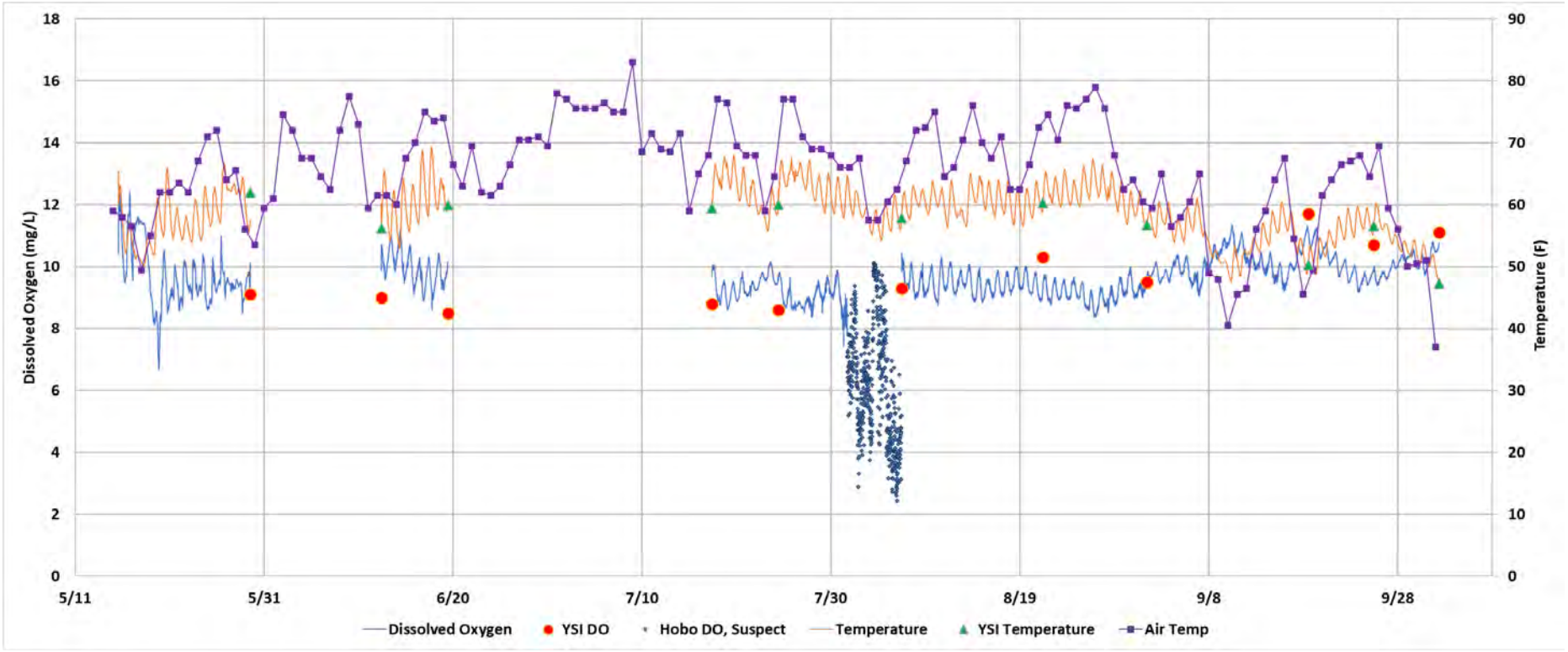
Junction Falls outflow site, 2019

- 4 HOBO U26-001 DO and temperature data loggers
- Sensors positioned mid-water column
- Meter check, sensor cleaning, data download at 1-2 week intervals
- Public interference issues early in 2019 season, throughout 2020

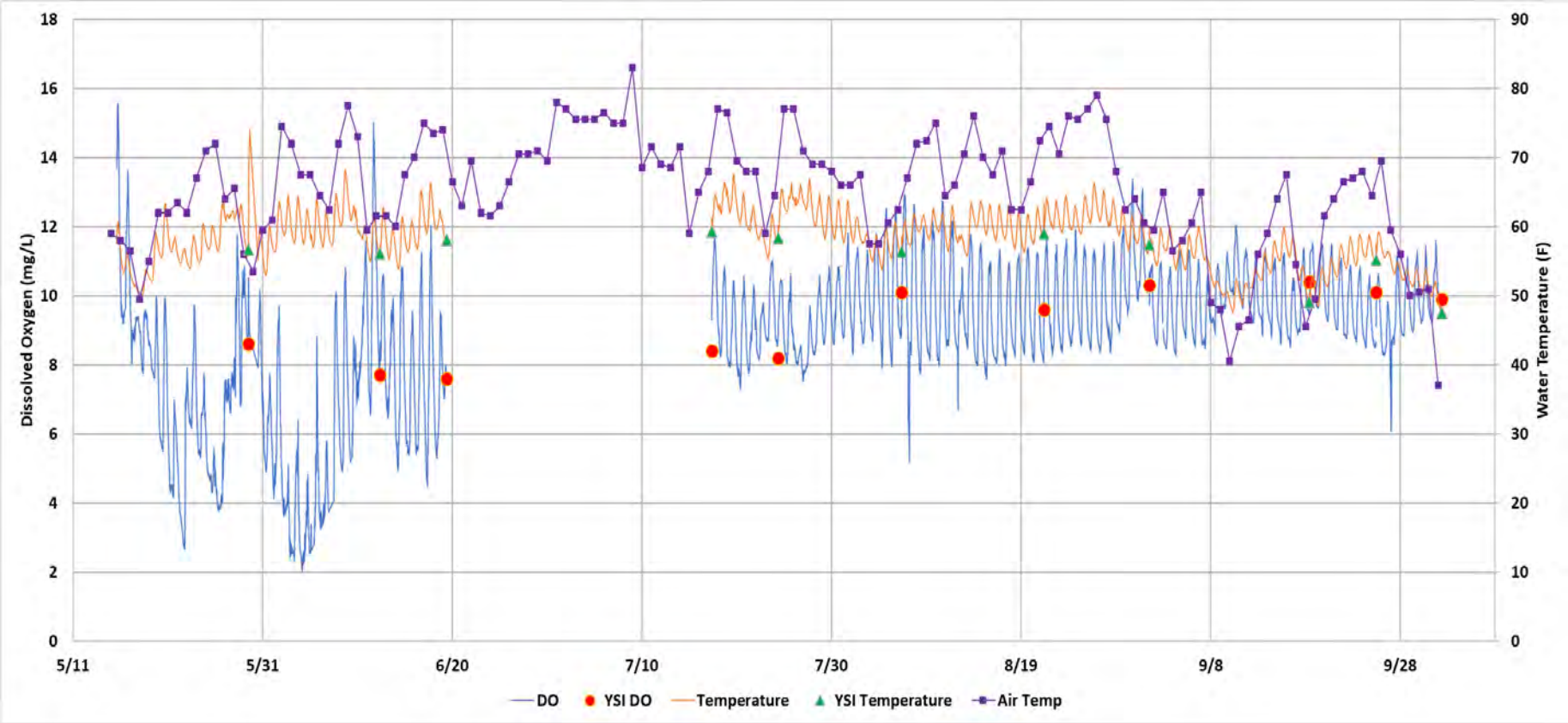
Water Quality Time Series – Junction Falls Outflow, 2019



Water Quality Time Series – Junction Falls Outflow, 2020



Water Quality Time Series – Lake George, 2020



Water Quality Study

Summary of Recorded Dissolved Oxygen Concentrations

Location	Year	Measured Dissolved Oxygen Range (mg/L) for Season	Percent of readings < 6.0 mg/L (trout stream standard)	Percent of readings < 5.0 mg/L (other water body standard)
Inflow	2019	7.0 – 13.0	0 %	0 %
	2020	1.4*(6.3) - 14.5	1.6	1.5
Lake George	2019	0.0 – 13.0	37 %	28 %
	2020	2.0 – 15.5	12%	8%
Junction Falls Outflow	2019	2.9 – 13.5	4 %	3 %
	2020	2.4*(6.7) – 12.4	3%*	2%*
Powell Falls Outflow	2019	0.7 – 12.2	29 %	18 %
	2020	0.0*(2.2) – 15.0	15%*	13%*

* *Instrument data suspect due to disturbance; lowest non-suspect value shown in ( )*

Water Quality Study

Summary of Recorded Maximum 15-Minute Water Temperatures

Month	Acute Water Temperature Criteria for Cold Water Stream/Lake, °F		Maximum 15-minute Temperature, °F			
	Stream	Lake	Project Inflow	Lake George	Junction Falls Outflow	Powell Falls Outflow
July 2019	73	86	64	78	78	80
Aug. 2019	73	86	63	65	65	82
Sept. 2019	72	84	63	62	63	66
May 2020	72	81	65	65	67	73
June 2020	72	85	65	68	69	72
July 2020	73	86	66	68	68	69
Aug. 2020	73	86	65	66	68	70
Sept. 2020	72	84	59	60	61	62

Water Quality Study

Summary of Average Monthly Water Temperatures

Month	Ambient Water Temperature Criteria for Cold Water Stream/Lake, °F		Monthly Average Water Temperature, °F			
	Stream	Lake	Project Inflow	Lake George	Junction Falls Outflow	Powell Falls Outflow
July 2019	64	72	60	61	62	63
Aug. 2019	63	71	60	59	60	61
Sept. 2019	57	63	56	57	57	58
May 2020	56	55	57	57	58	59
June 2020	62	67	59	60	61	62
July 2020	64	72	61	62	63	63
Aug. 2020	63	71	59	60	61	62
Sept. 2020	57	63	54	54	55	55

Water Quality Study – Key Points

- **Project inflows met state criteria for cold water fisheries. Exceptions were generally explainable by instrument disturbance.**
- **From upstream to downstream in the study area, water temperature typically increased by 2° F to 4° F on a given day.**
- **Recorded DO concentrations generally decreased from upstream to downstream. The rate of decrease was variable.**
- **In Lake George, the DO concentration dropped below 5 mg/L on several occasions in 2019 and in the first (pre-flood) half of the 2020 season.**
- **After the June 2020 flood, Lake George showed higher overall DO concentrations with less variability than prior to the flood.**
- **Points on the transect southeast of the primary flow path in Lake George showed increased temperatures and higher-amplitude DO cycles but little vertical stratification. Field personnel reported detectable current at all Lake George transect points.**

Water Quality Study – Key Points, cont'd

- **DO concentrations in or downstream of the dams' impoundments dropped below 5 mg/L during some periods in both years, more frequently in 2019 than 2020. The 2020 record below Junction Falls lacked data corresponding to a low-DO period (May 31-June 12) in Lake George.**

- **Temperatures and DO concentrations not meeting state standards occurred more frequently below Powell Falls than below Junction Falls.**

- **Neither sampling season included exceptionally high temperatures or low streamflows.**

- **The June, 2020 flood noticeably affected impoundment sediments, vegetation, and bed morphology.**

- **Visually estimated algae cover in Lake George ranged from 0% to 50% and was highest in mid-summer 2019.**

Mussel Survey

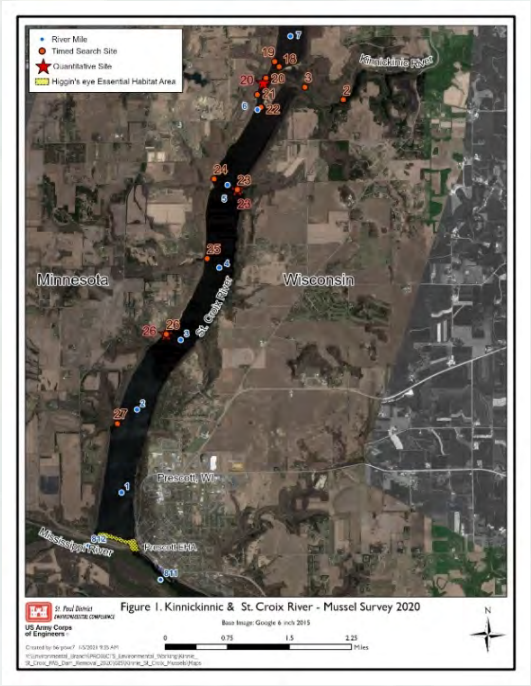
Dan Kelner, USACE

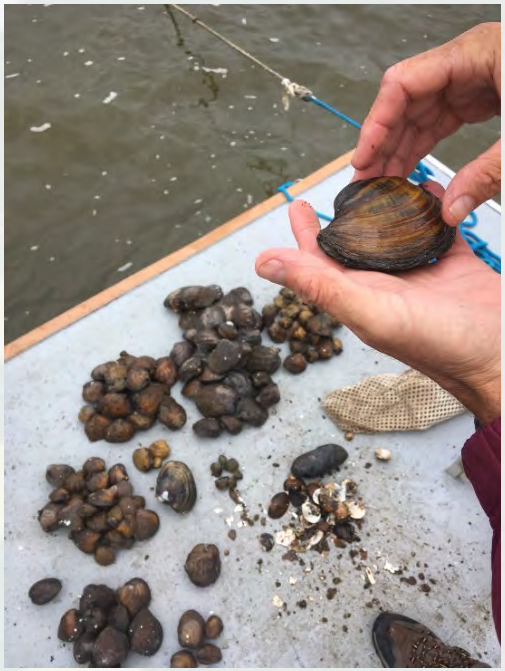
Mussel Survey

Lower Kinnickinnic and St. Croix Rivers

River Falls Hydroelectric Project
(FERC No. 10489)

Updated Study Report Meeting
9 February 2021





Dan Kelner
U.S. Army Corps of Engineers – St. Paul District

NATIONAL PARK SERVICE

US Army Corps of Engineers ®

Native Freshwater Mussels of the lower St. Croix River

39 Species

~1/2 State Listed T & E

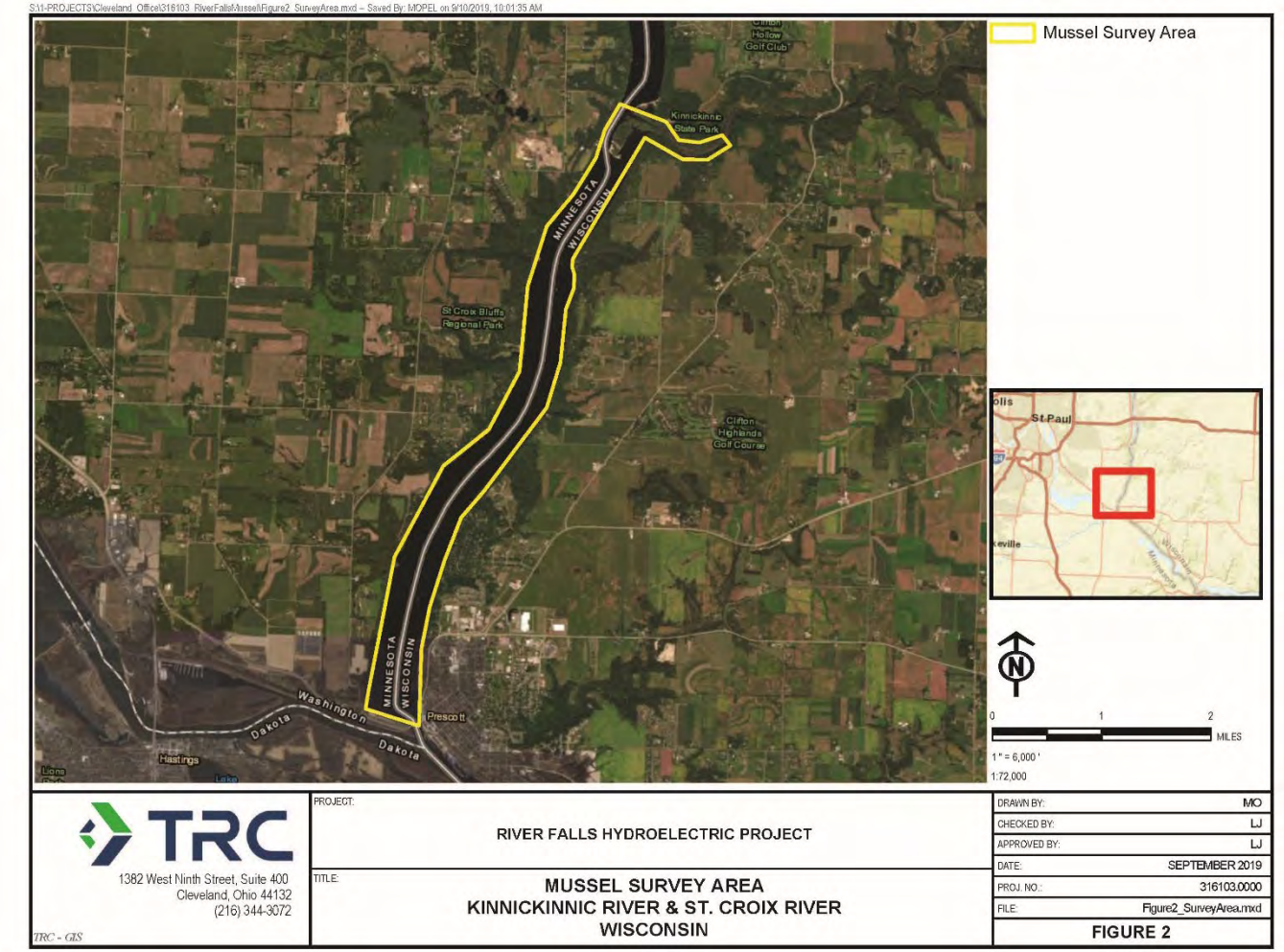
5 Federally Listed T & E

Objective

Baseline Information on Native Mussel Community

Presence, density, distribution, relative abundance including T&E species

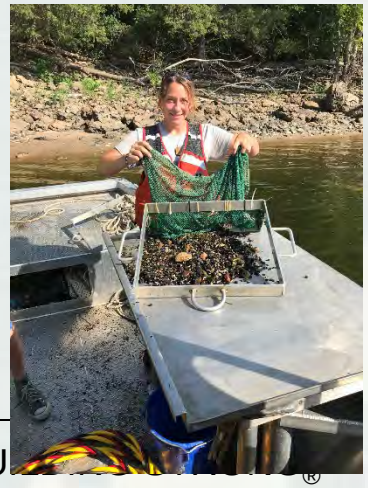
Document mussel habitat (location, depth, substrate)

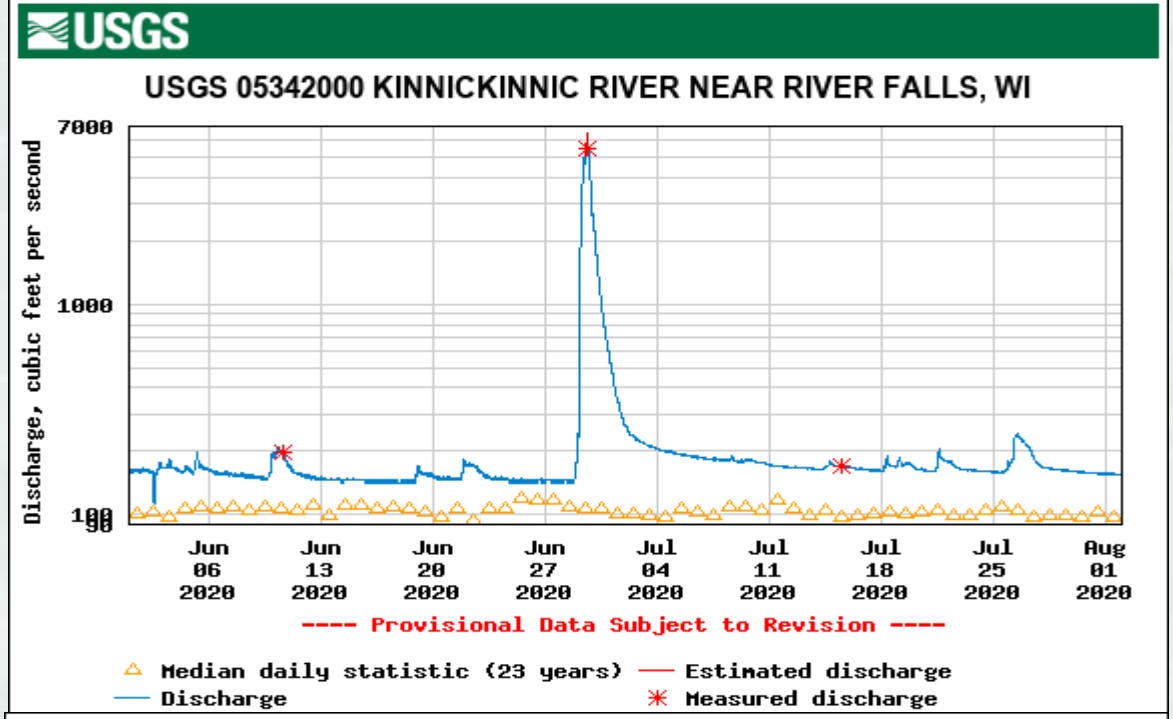


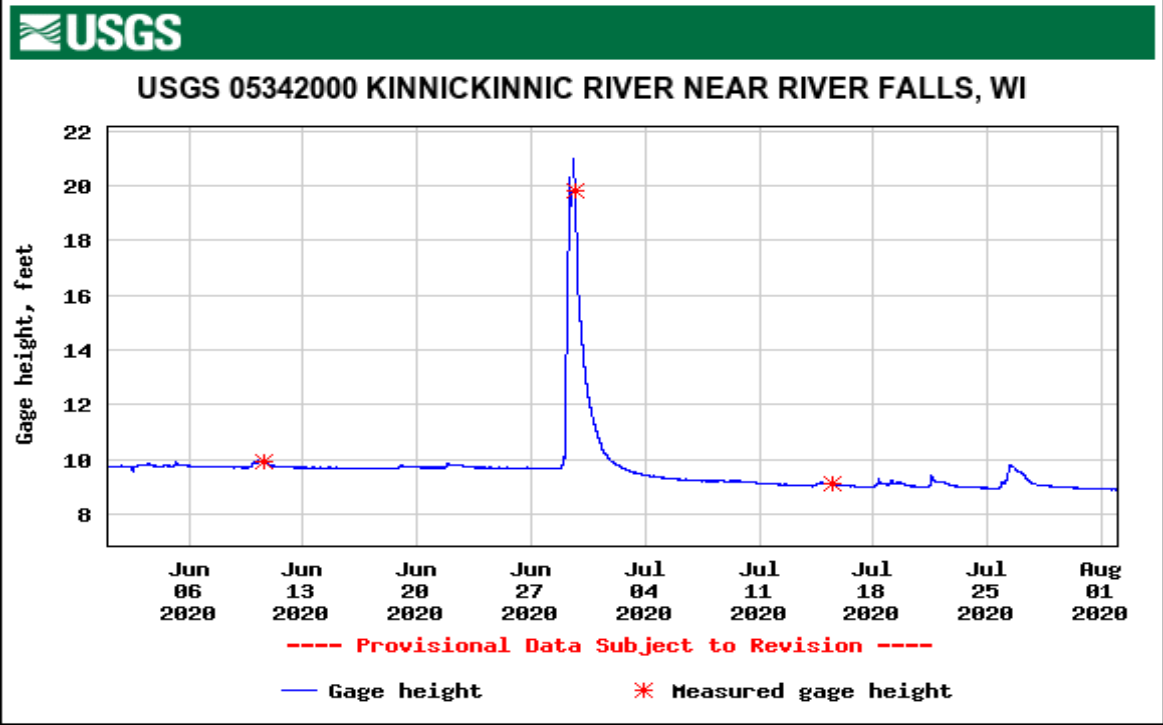
Methodology

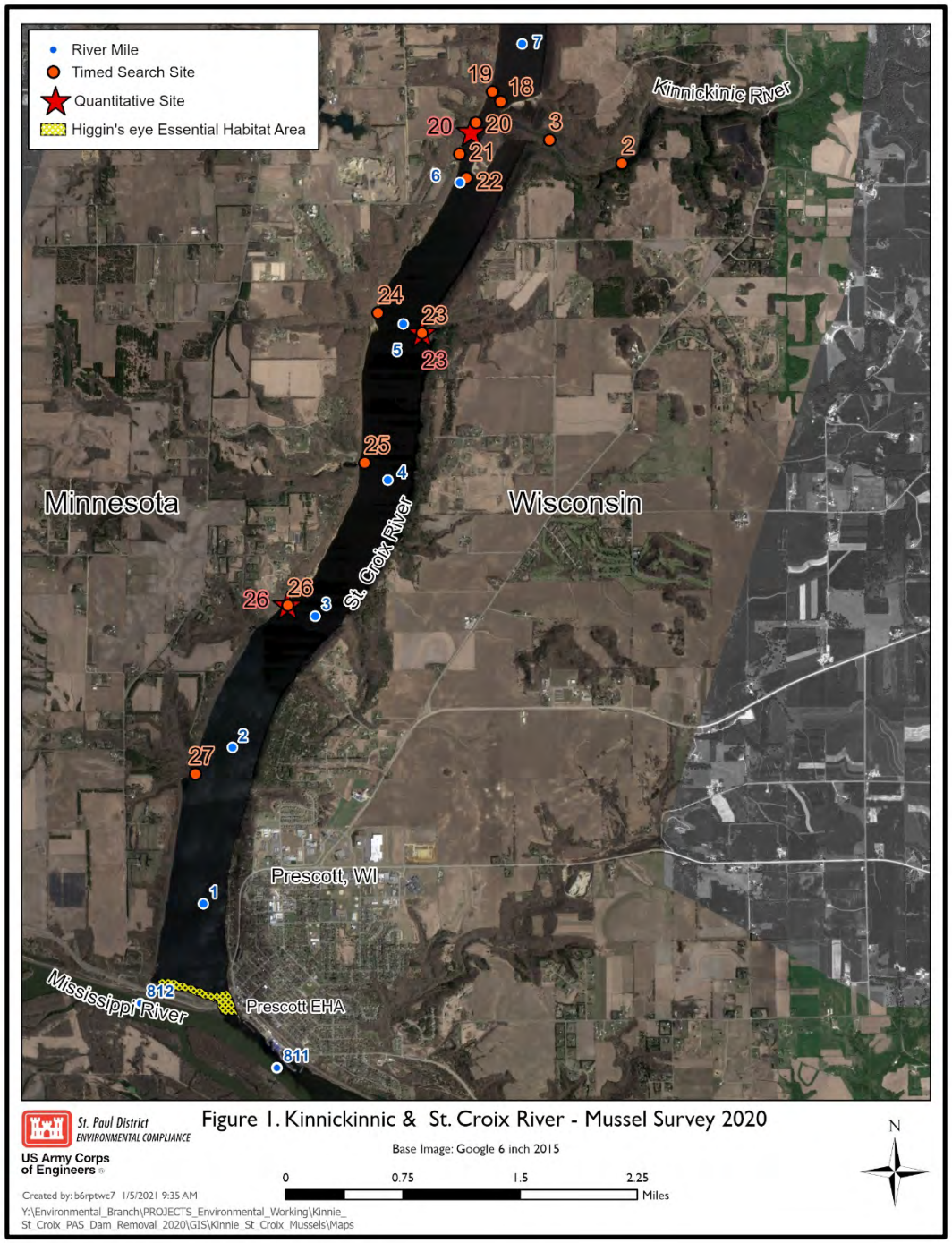
Reconnaissance, Timed Searches (qualitative), Quantitative

- WiDNR Guidelines for Sampling Mussels in Wadable Streams (2015)
- MnDNR Statewide Mussel Survey – Lower St. Croix River (2001)
- USACE Large River Mussel Monitoring Protocols (Kelner pers. Comm)




USGS
USGS 05342000 KINNICKINNIC RIVER NEAR RIVER FALLS, WI
Discharge, cubic feet per second
7000
1000
100
90
Jun 06 2020
Jun 13 2020
Jun 20 2020
Jun 27 2020
Jul 04 2020
Jul 11 2020
Jul 18 2020
Jul 25 2020
Aug 01 2020
---- Provisional Data Subject to Revision ----
Median daily statistic (23 years)
Estimated discharge
Discharge
Measured discharge

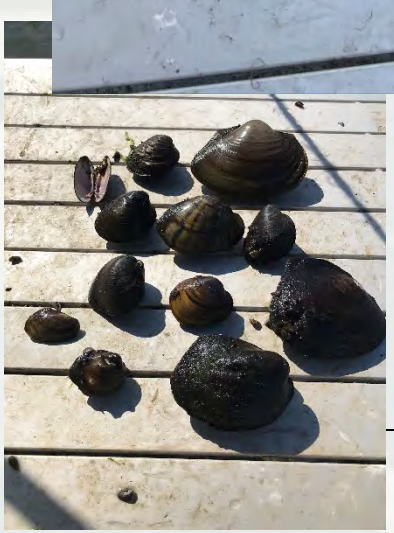

USGS
USGS 05342000 KINNICKINNIC RIVER NEAR RIVER FALLS, WI
Gage height, feet
22
20
18
16
14
12
10
8
Jun 06 2020
Jun 13 2020
Jun 20 2020
Jun 27 2020
Jul 04 2020
Jul 11 2020
Jul 18 2020
Jul 25 2020
Aug 01 2020
---- Provisional Data Subject to Revision ----
Gage height
Measured gage height


River Mile
Timed Search Site
Quantitative Site
Higgin's eye Essential Habitat Area
Kinnickinic River
St. Croix River
Minnesota
Wisconsin
Prescott, WI
Prescott EHA
Mississippi River
St. Paul District
ENVIRONMENTAL COMPLIANCE
US Army Corps of Engineers
Figure 1. Kinnickinnic & St. Croix River - Mussel Survey 2020
Base Image: Google 6 inch 2015
0 0.75 1.5 2.25
Miles
N
Created by: b6rptwc7 1/5/2021 9:35 AM
Y:\Environmental_Branch\PROJECTS_Environmental_Working\Kinnie_St_Croix_PAS_Dam_Removal_2020\GIS\Kinnie_St_Croix_Mussels\Maps

Mussel species from timed search qualitative and quantitative sampling in the lower St. Croix River, August 2020.

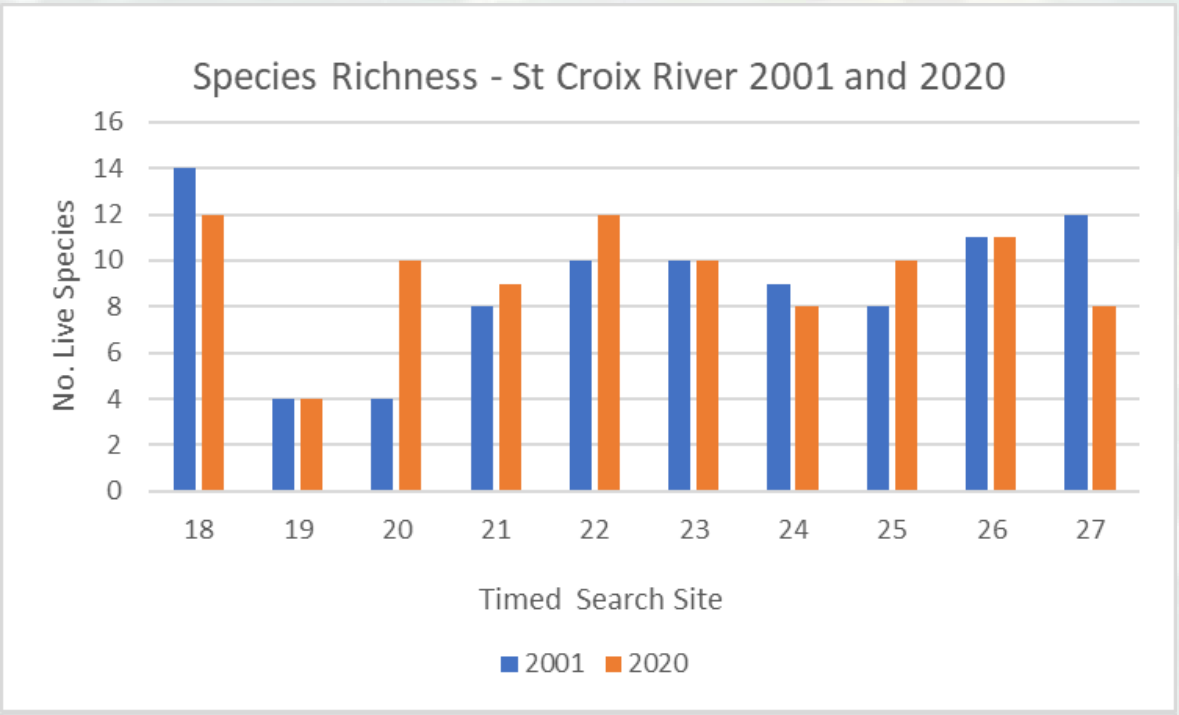
Species	Common Name	Status	Qualitative		Quantitative		Total	
			No. live	%	No. live	%	No. live	%
Amblemini								
Amblema plicata	**threeridge**		**923**	**55.0**	**105**	**55.0**	**1,028**	**55.0**
Anodontini								
Lasmigona complanata	white heelsplitter		3	0.2			3	0.2
Pyganodon grandis	giant floater		1	0.1	1	0.5	11	0.6
Lampsilini								
Actinonaias ligamentina	mucket	MnT	6	0.4	2	1.0	8	0.4
Lampsilis cardium	plain pocketbook		35	2.1	4	2.1	39	2.1
Lampsilis higginsi	**Higgins eye**	**FE,MnE,WiE**	**2**	**0.1**			**2**	**0.1**
Lampsilis siliquoidea	fatmucket		31	1.8	1	0.5	32	1.7
Leptodea fragilis	fragile papershell		7	0.4	1	0.5	8	0.4
Ligumia recta	black sandshell		2	0.1			2	0.1
Obliquaria reflexa	**threehorn wartyback**		**255**	**15.2**	**28**	**14.7**	**283**	**15.1**
Obovaria olivaria	hickorynut		1	0.1		0.0	1	0.1
Potamilus alatus	pink heelsplitter		14	0.8	5	2.6	19	1.0
Truncilla truncata	deertoe		3	0.2	D		3	0.2
Toxolasma parvum	lilliput		1	0.1	D		1	0.1
Pleurobemini								
Fusconaia flava	**Wabash pigtoe**		**273**	**16.3**	**19**	**9.9**	**292**	**15.6**
Pleurobema sintoxia	round pigtoe		38	2.3	4	2.1	42	2.2
Eurynia dilatata	spike	MnT	6	0.4	9	4.7	15	0.8
Quadrulini								
Quadrula quadrula	mapleleaf		6	0.4			6	0.3
Cyclonaias pustulosa	pimpleback		61	3.6	12	6.3	73	3.9
Total live			**1,677**		**191**		**1,868**	
Live species			**19**		**12**		**19**	
Total species			**19**		**14**		**19**	
No. sites			**12**		**3**		**12**	
N (No. 0.25 m2 per site)					40			
Effort (min/site)			60					

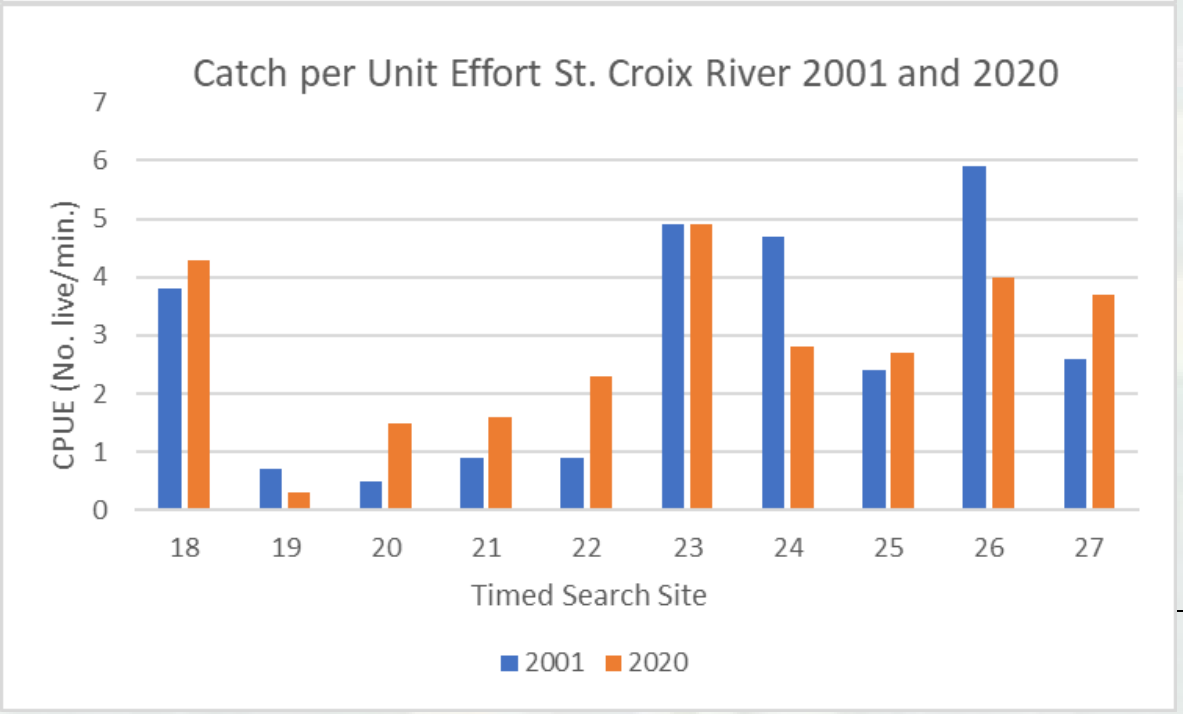
Species / site



Higgins eye

Zebra mussels





Timed Searches St. Croix River

BUILDING STRONG®

Quantitative Sampling – Sites 20, 23, 26

Figure 2. Quantitative Sample Site 20

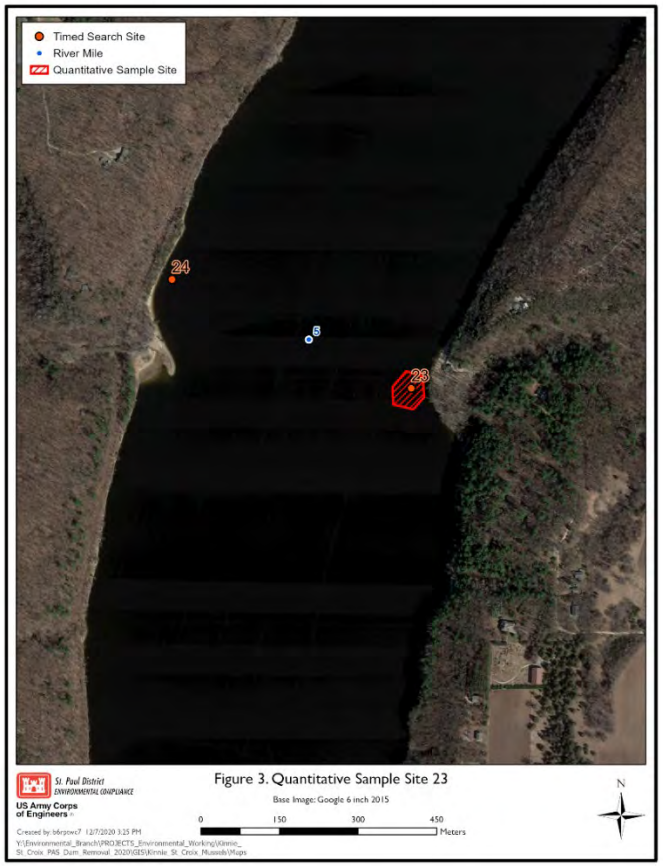


Figure 3. Quantitative Sample Site 23

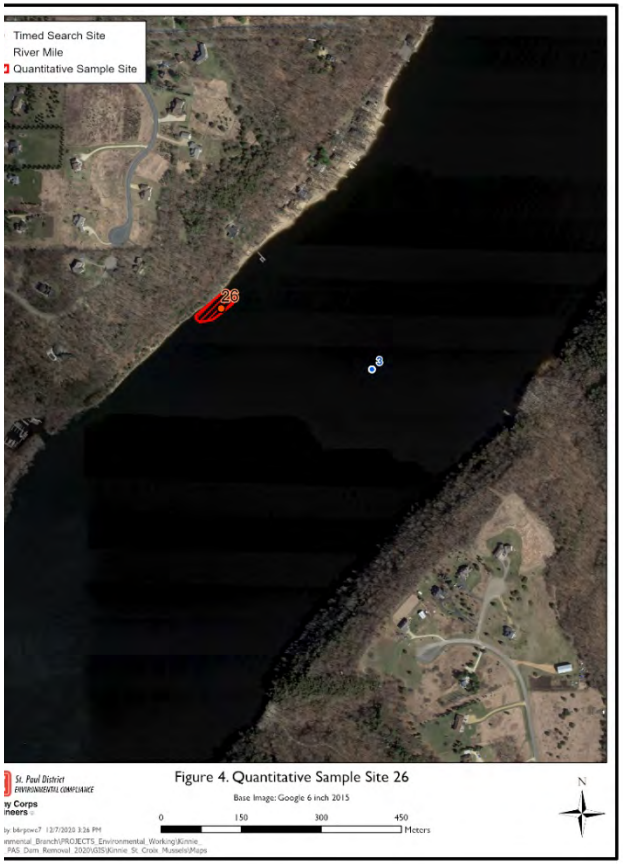
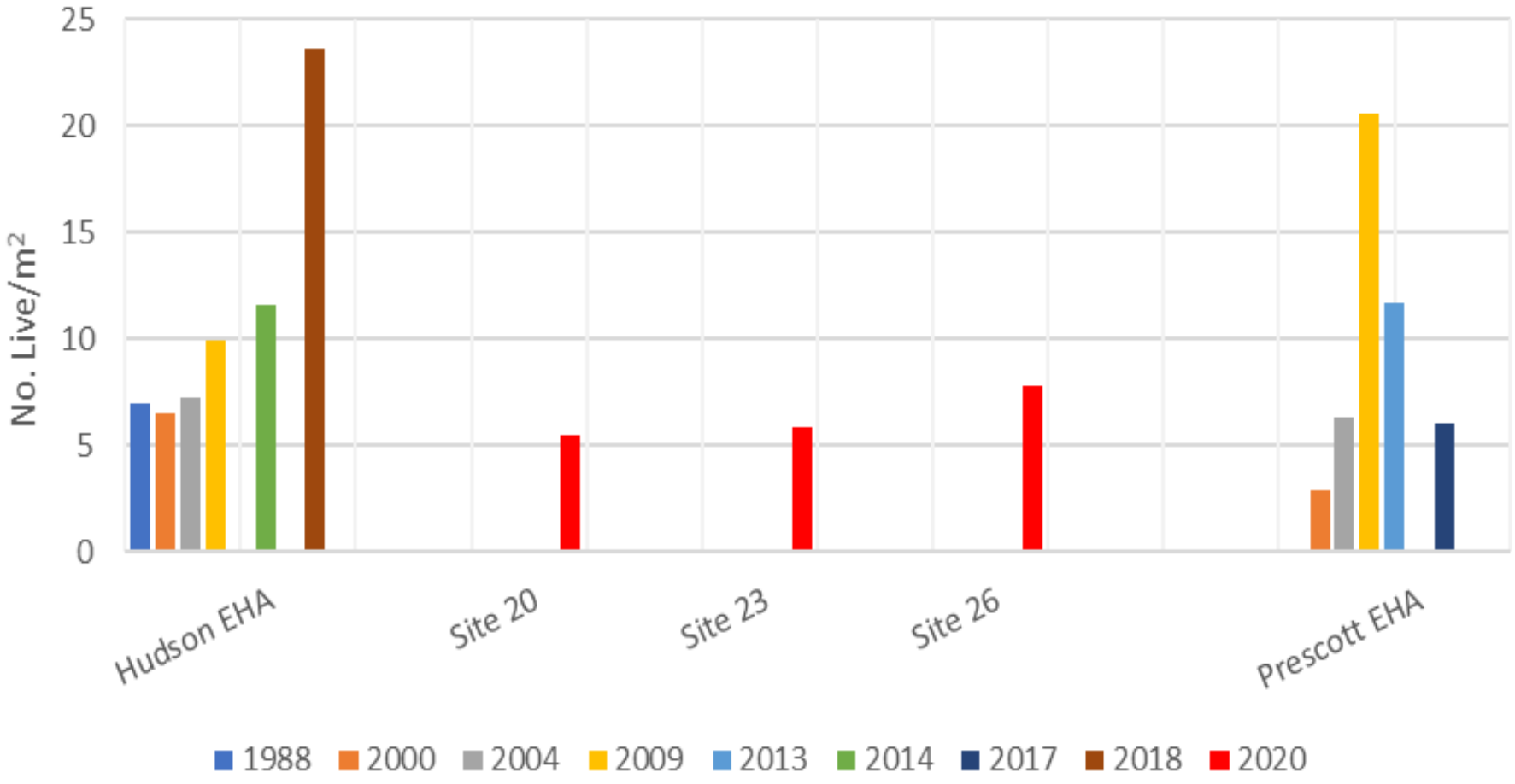


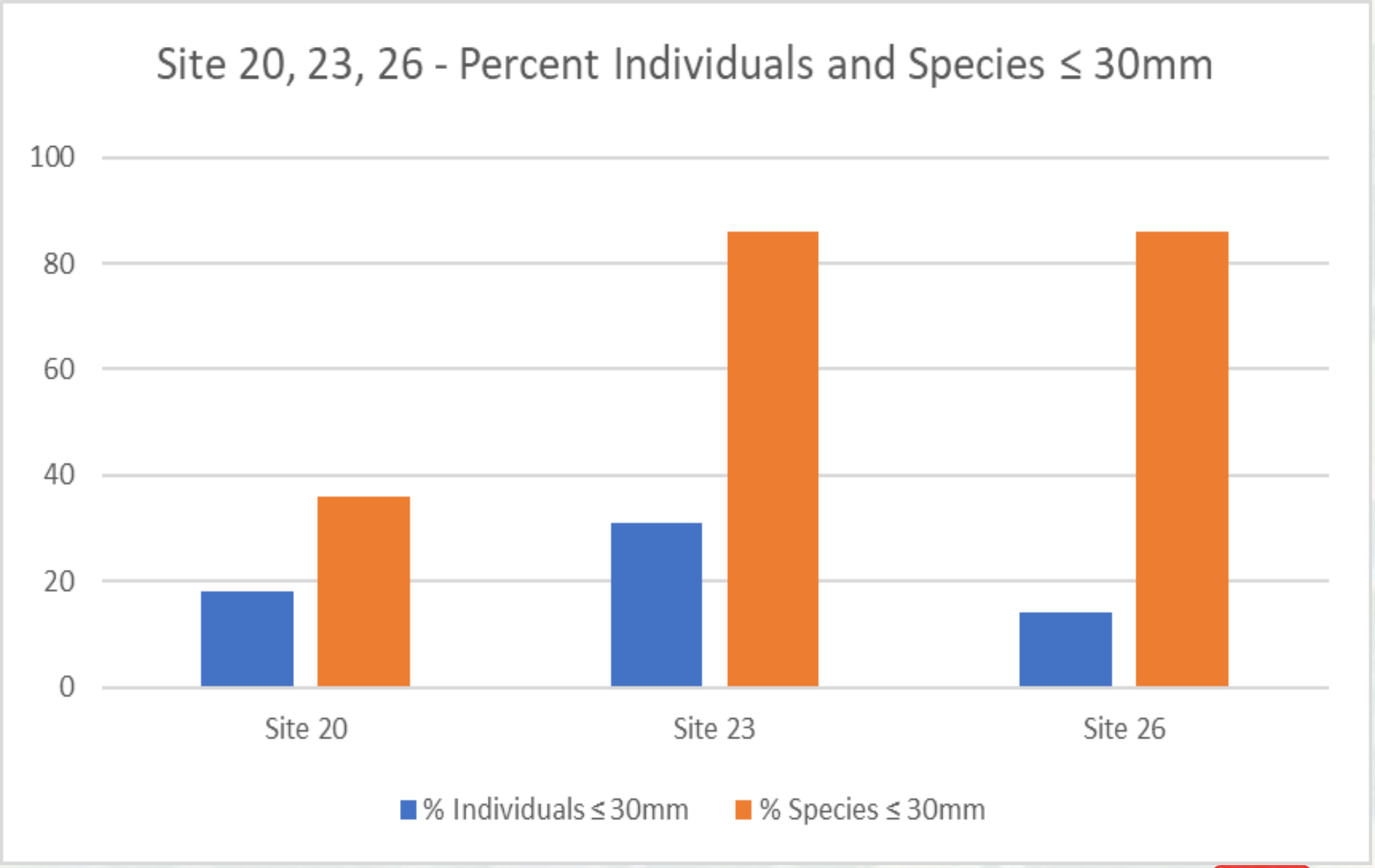
Figure 4. Quantitative Sample Site 26

11 Live Species
5.5 mussels / m²
No ZM infestation
Area = 3,692m² (0.9 acre)
3-12 ft depth
Consolidated Sand/gravel/cobble

7 Live Species
5.8 mussels / m²
59% natives w ZM, 1.6 ZM/native
Area = 3,306m² (0.8 acre)
3-15 ft depth
Consolidated sand/gravel

7 Live Species
7.8 mussels / m²
64% natives w ZM, 3.1 ZM/native
Area = 2,061m² (0.5 acre)
2-12 ft depth
Sand/empty ZM shells/flocc.


Native Mussel Density - St. Croix EHAs and This Study
No. Live/m2
25
20
15
10
5
0
Hudson EHA
Site 20
Site 23
Site 26
Prescott EHA
1988
2000
2004
2009
2013
2014
2017
2018
2020


Site 20, 23, 26 - Percent Individuals and Species ≤ 30mm
100
80
60
40
20
0
Site 20
Site 23
Site 26
% Individuals ≤ 30mm
% Species ≤ 30mm

Conclusion

Baseline data obtained pre dam removal

Lower Kinnickinnic

- Mussels absent - likely pre-flood as well.

Lower St. Croix

- 19 live species including Higgins eye (this study)
- Pockets of moderately densely populated areas (this study)
- Stable compared to 2001
  - Species richness and abundance
  - Minimally impacted by zebra mussels

Dam removal effects to mussels

- 2020 Flood observations
- Likely minimal impacts to native mussels including T&E
  - Repeat survey one time 10-20 years post dam removal?

Questions?

Lake George Shoreline Habitat Assessment

Josh McEnany, GSRC

LAKE GEORGE SHORELINE HABITAT ASSESSMENT
JOSH MCENANY, GSRC

Gulf South Research Corporation (GSRC) was contracted by the U.S. Army Corps of Engineers, St. Paul District, on behalf of the City of River Falls, Wisconsin to conduct a Shoreline Habitat Assessment (SHA) on a portion of the Kinnickinnic River south of Junction Falls Dam, the Lake George impoundment, and another portion of the river directly upstream from the impoundment.

The SHA was conducted on July 28 and 29, 2020. The SHA was implemented in accordance with the *Lake Shoreland & Shallows Habitat Monitoring Field Protocol* provided by the Wisconsin Department of Natural Resources.

Legend

- Lake Shoreline Within the Study Area
- 35-Foot Riparian Buffer
- Parcel Boundary

N

0 250 500 Feet

0 50 100 Meters

GSRC

December 2020

MATERIALS AND METHODOLOGY

Initial background research and aerial imagery review

- Preliminary mapping
  - Parcel mapping
    - 20 parcels with 7 landowners (City of River Falls, 14/20 parcels)

The protocol dictated the assessment of the lake use three habitat zones and recording that information on a datasheet as provided by the protocol.

- Littoral Zone: defined as the in-water area of the lake starting at the present water line and extending approximately 50 feet into the lake
- Bank Zone: the area between the top of the bank lip and the bank toe, which includes the ordinary high-water mark (OHWM)
- Riparian Buffer Zone: begins at the top edge of the bank zone and extends inland 35 feet.

Assessment Zones for Lake George SHA

DATASHEET FOR SHORELINE HABITAT ASSESSMENT

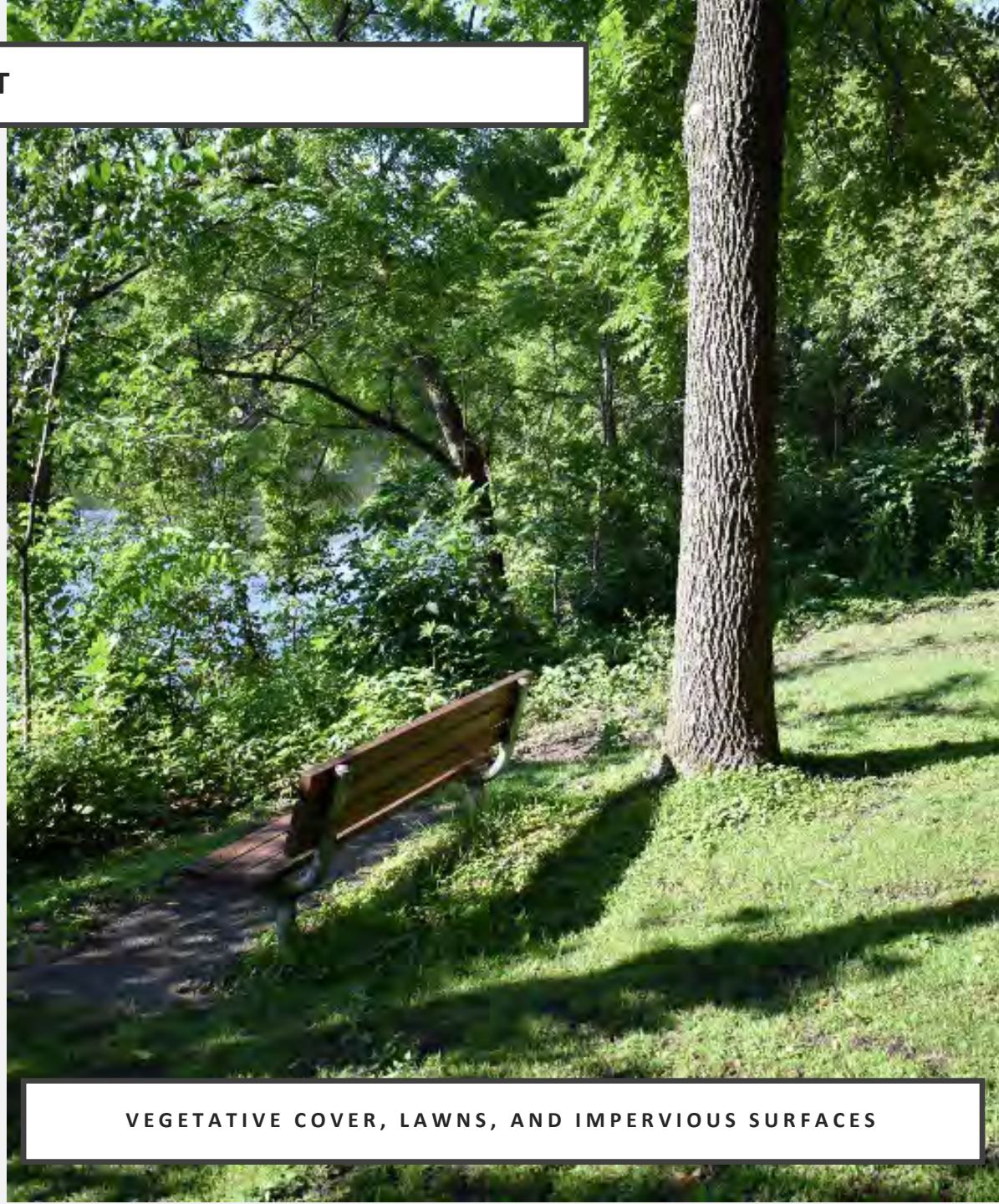
Date		Lake Name			WBIC		
Parcel ID				Observers			
RIPARIAN ZONE					**BANK ZONE**		Length (ft)
Percent Cover in Riparian			Percent		Vertical Sea Wall		
Canopy				(0-100)	Rip Rap		
Shrub		Herbaceous			Other Erosion Control Structures		
Shrub/Herbaceous					Artificial Beach		
Impervious Surface					Bank Erosion >1 ft face		
Manicured Lawn					Bank Erosion <1 ft face		
Agriculture							
Other (e.g., duff, soil, mulch)					**LITTORAL ZONE**		
Description:					**Human Structures**		Number
					Piers		
Human Structures in Riparian			Number		Boat Lifts		
Buildings					Boat Shelters		
Boats on Shore					Swim Rafts/Water Trampolines		
Fire Pits					Boathouses (Over Water)		
Other					Marinas		
Description:					Other		
					Description:		
Runoff Concerns		Present in	Present out				
in Riparian or Entire Parcel		Riparian	of Riparian		**Aquatic Plants**		Present
Point Source					Emergents		
Channelized Water Flow/Gully					Floating		
Stair/Trail/Road to Lake					Plant Removal		
Lawn/Soil Sloping to Lake							
Bare Soil					**If Applicable (Low Water Level):**		
Sand/Silt Deposits					**EXPOSED LAKE BED ZONE**		
Other					**Plants**		Present
Description:					Canopy		
					Shrubs		
					Herbaceous		
Notes:							
					Disturbed		
					Plants (Mowed or Removed)		
					Sediment (Tilled or Dug)		

LOOP 1: HABITAT ASSESSMENT

Biologists walked a literal loop (Loop 1) around the entire lake and river corridor within the Riparian Buffer Zone and upland areas. The Bank and Littoral Zones were assessed by making another loop with kayaks around entire lake and river corridor

Riparian Buffer Zone Assessment Percent Cover

- Canopy
- Shrub
- Herbaceous
- Impervious Surfaces
- Lawn
- Agriculture
- Other (exposed sand/soil)



VEGETATIVE COVER, LAWNS, AND IMPERVIOUS SURFACES

PARCEL LENGTH AND PERCENT COVER IN RIPARIAN ZONE

Parcel No.	Canopy	Shrub	Herb.	Impervious	Lawn	Agriculture	Other	Description (Other)	Total Disturbed	Length (ft)
276010120900	60	75	10	10	5	0	0		15	498.46
276010470100	100	40	60	0	0	0	0		0	279.05
276010600100	25	20	40	25	10	0	5	exposed sand/soil	40	272.75
276010600500	20	10	40	35	15	0	0		50	313.10
276010600800	20	15	30	25	20	0	10	exposed soil	55	280.88
276010970100	100	40	20	40	0	0	0		40	266.41
276010970400	20	20	20	60	0	0	0		60	44.63
276010970500	30	25	25	50	0	0	0		50	94.43
276011030500-NE	35	25	25	40	10	0	0		50	323.32
276011030500-C	60	30	20	5	10	0	35	exposed sand/soil	50	871.92
276011030500-SW	45	50	35	5	10	0	0		15	1,229.51
276011040100	30	25	15	5	55	0	0		60	156.56
276011040200	20	50	10	0	40	0	0		40	75.81
276011040400	15	85	10	5	0	0	0		5	1,145.23
276011110600	85	40	40	15	5	0	0		20	976.11
276011120700	80	45	45	0	10	0	0		10	413.33
276011260300	20	20	20	60	0	0	0		60	304.50
276011260600-NE	85	50	30	20	0	0	0		20	897.23
276011260600-C	100	70	20	0	0	0	10	exposed sand	10	1,184.71
276011260600-S	80	60	30	5	5	0	0		10	309.38
none[1]	0	0	0	100	0	0	0		100	54.91
none[1]	0	0	0	100	0	0	0		100	67.48
none[2]	80	40	40	20	0	0	0		20	406.64
none[1]	0	0	0	100	0	0	0		100	80.85
none[1]	0	0	0	100	0	0	0		100	68.83
AVERAGE	46.96	36.96	22.68	30.89	7.32	0.00	2.14	-	40.36	10,616.03 (2.01 miles)
WEIGHTED AVERAGE	58.72	47.32	26.86	15.59	5.84	0.00	4.38	-	25.81	-

[1] Road crossing (i.e., bridge).
[2] Section of land south of Parcel No. 276010970100 and north of Parcel No. 276011260300 in the northeast corner of the Project Area.

HUMAN STRUCTURES IN RIPARIAN BUFFER ZONE

Parcel No.	Buildings	Boats on Shore	Fire Pits	Other	Description (Other)
276010120900	0	0	0	0	
276010470100	0	0	0	0	
276010600100	0	0	0	2	bench, light pole
276010600500	0	0	0	2	light poles
276010600800	0	0	0	1	bridge abutment
276010970100	1	0	0	1	adjacent road
276010970400	1	0	0	0	
276010970500	1	0	0	0	
276011030500-C	0	0	0	1	paved trail
276011030500-NE	0	0	0	3	bike rack, benches, trash cans
276011030500-SW	0	0	0	2	fishing pier, boat ramp
276011040100	0	0	0	2	benches
276011040200	0	0	0	0	
276011040400	1	0	0	1	dam-related infrastructure
276011110600	0	0	0	0	
276011120700	0	0	0	0	
276011260300	1	0	0	0	
276011260600-C	0	0	0	0	
276011260600-NE	0	0	0	0	
276011260600-S	0	0	0	1	paved trail
Totals (20 parcels)	5	0	0	16	-

BOAT RAMP ON WEST SIDE OF LAKE GEORGE

RUNOFF CONCERNS IN THE RIPARIAN BUFFER ZONE

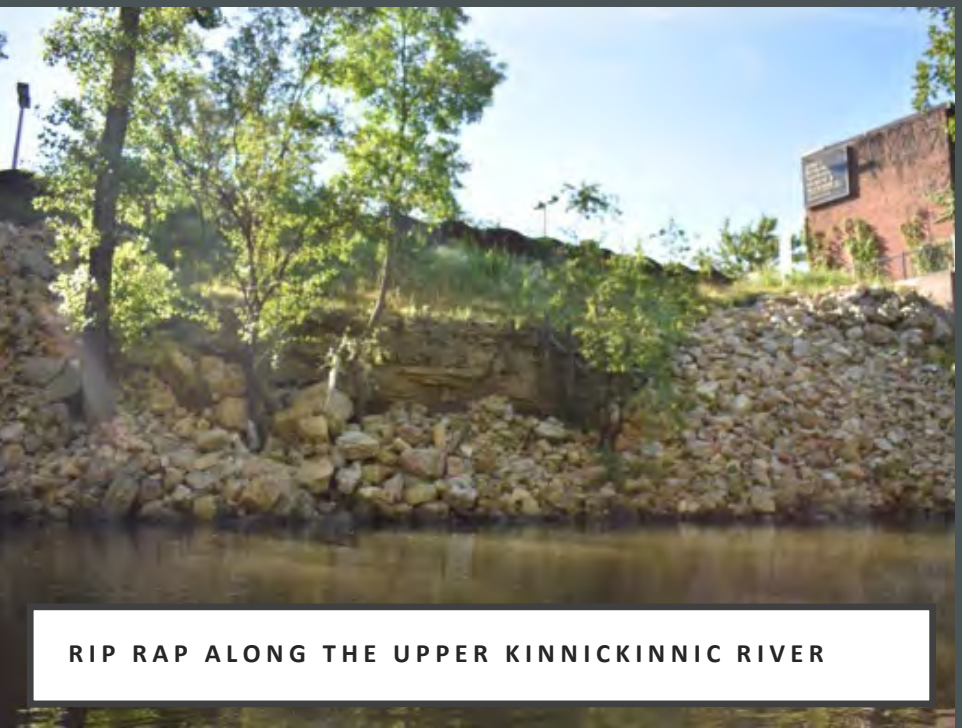
Parcel No.	Point Source		Channelized Water/Gully[1]	Stair, Trail, Road		Lawn, Soil Sloping		Bare Soil[1]	Sand/ Silt[1]	Other Runoff[1]
	Riparian	Upland		Riparian	Upland	Riparian	Upland			
276010120900	0	1	1	0	0	1	0	0	0	0
276010470100	0	0	1	1	0	0	0	1	1	0
276010600100	1	0	1	1	1	1	1	1	1	0
276010600500	0	0	0	0	0	1	0	0	1	0
276010600800	1	0	0	1	0	1	0	0	0	0
276010970100	1	0	0	0	0	1	0	0	0	0
276010970400	0	0	0	0	0	1	0	0	0	0
276010970500	0	0	0	0	0	1	0	0	0	0
276011030500-SW	0	0	0	1	0	1	0	1	0	0
276011030500-C	0	0	0	1	0	1	0	1	1	0
276011030500-NE	1	0	0	1	0	1	0	1	0	0
276011040100	0	0	0	1	0	1	0	0	0	0
276011040200	1	0	0	0	0	1	0	0	0	0
276011040400	0	0	0	0	0	0	0	1	1	0
276011110600	1	0	0	1	0	1	0	1	0	0
276011120700	0	0	0	1	0	1	0	0	0	0
276011260300	0	0	0	0	0	1	0	0	0	0
276011260600-NE	1	0	0	0	0	1	0	0	0	0
276011260600-C	0	0	0	0	0	1	0	0	0	0
276011260600-S	1	0	0	0	0	1	0	0	0	0
Totals (20 parcels)	8	1	3	9	1	18	1	7	5	0

TYPICAL POINT SOURCE

BANK ZONE

The portion of shoreline between the upper bank lip and lower bank toe that typically contains the OHWM.

Vertical Retaining Wall: 355 feet
Rip Rap: 615 feet
Bank Erosion (>1 ft): 90 feet



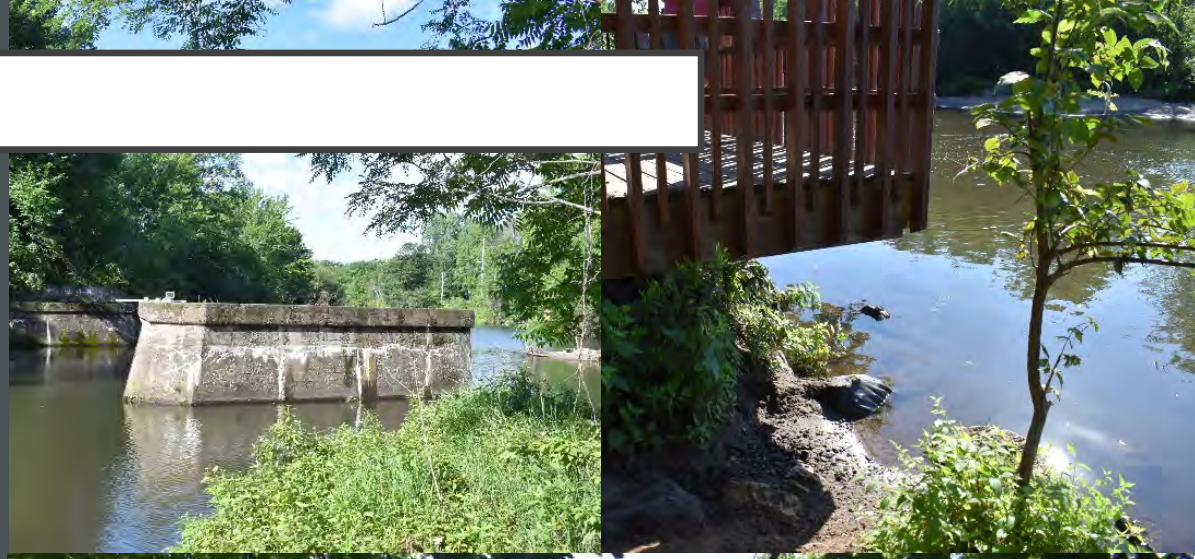
RIP RAP ALONG THE UPPER KINNICKINNIC RIVER

RETAINING WALL ALONG UPPER KINNICKINNIC RIVER

LITTORAL ZONE

Human Structures in Littoral Zone:

- A total of nine human structures
- 2 old bridge abutments
- 1 pedestrian bridge
- 1 fishing pier
- 1 boat ramp (kayak or canoe take out area)
- Junction Falls Dam
- West Maple Street Bridge
- Winter Street Bridge



AQUATIC PLANTS / EXPOSED LAKEBED

- Emergent and floating aquatic plants were observed in approximately 25 percent of the parcels assessed. It should be noted that submerged aquatic plants were not recorded as part of this study.
- Typically found along the edges of Lake George or the slower, wider section of the Kinnickinnic River upstream from Lake George
- No areas of exposed lakebed were observed during the assessment

LOOP 2: MAPPING COARSE WOODY DEBRIS

Woody debris was mapped and recorded by using a kayak from within the water.

Woody debris consisted of logs/tree limbs greater than 4 inches in diameter and at least 5 feet in length.

Two variables were recorded during the mapping of woody debris:

- Connectivity to shore (present/not present)
- Branching (no branches, some branches, and full canopy

LOOP 3: PHOTO-DOCUMENTATION OF SHORELINE

GSRC made a third loop, photo-documenting the entire shoreline within the project area.

- Approximately 50 feet from the shoreline looking back at the shoreline.
- GPS coordinates were taken at the location of each photograph for future reference.

DISCUSSION

Three distinct portions of the Project Area:

- South of Junction Falls Dam
- Lake George
- Upper Kinnickinnic River

South of Junction Falls Dam

Shoreline changes rapidly from exposed bedrock waterfalls that have been modified by the installation of the dam, adjoining retaining wall, and powerhouse to a short “river reach” that leads to Lake Louise to the south

VIEW OF NORTHWEST PORTION OF LAKE GEORGE SHORELINE

VIEW OF SOUTHEAST PORTION OF LAKE GEORGE SHORELINE

Lake George

Lake George is the second distinct portion of the Project Area and the focal point of the SHA study. The original channel of the Kinnickinnic River flowed near the existing northwest shoreline.

Modifications within the current bank zone of Lake George are minimal. Rip rap has been placed as stabilization in some areas. Due to the shallow nature of most areas of Lake George, the littoral zone (i.e., nearshore zone) is similar in character to much of the open water zone. Floating and/or emergent vegetation are found in small stretches around the shoreline.

In accordance with RFMU's 2019 Revised Study Plan for the River Falls Hydroelectric Project (FERC P-10489), the feasibility of a short-term drawdown of water within the impoundment in order to consolidate sediment and stimulate plant growth was considered during the shoreline assessment. Data collected during this survey did not contribute substantially to the conclusion that a short-term drawdown was necessary within the next re-licensing period to remove sediment.

It would be most efficient to perform a drawdown and sediment removal concurrently with dam removal, if dam removal is being considered after the next license term. To warrant a drawdown prior to future dam removal, Lake George would have to be at risk of completely filling with sediment. In order to determine whether the lake is at risk of complete sedimentation, necessary considerations include the current sediment level and the rate of sedimentation. This information could then be used to project when the lake would completely fill with sediment. A planned drawdown and associated sediment removal would be recommended prior to the estimated date calculated for when complete sedimentation of the lake would occur.

Aquatic Invasive Species Survey

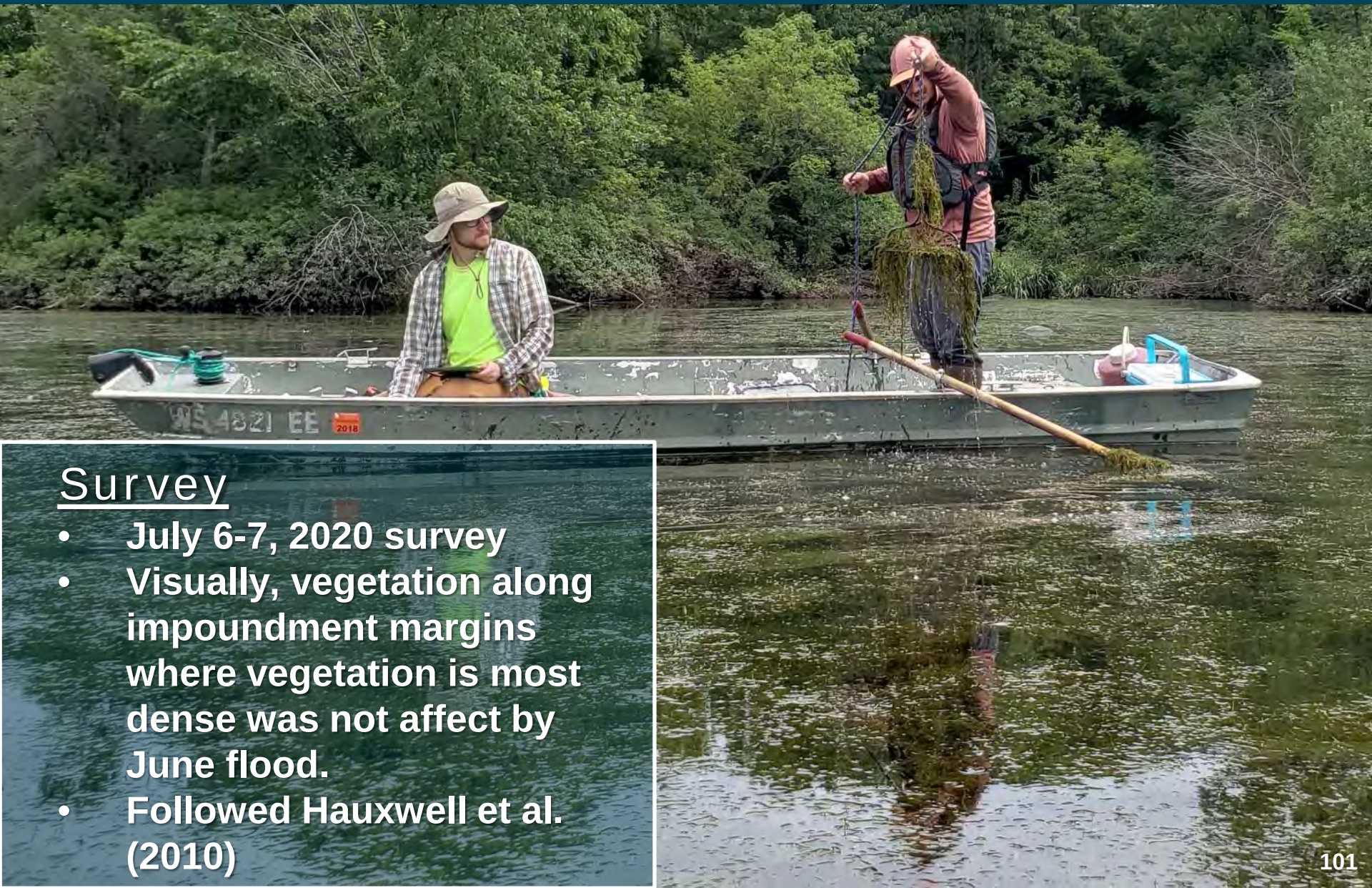
Marty Melchior & Sean Morrison, Inter-Fluve

Aquatic Invasive Species Survey

Goals

- **Survey aquatic invasive species (AIS) in Lake Louise and Lake George**

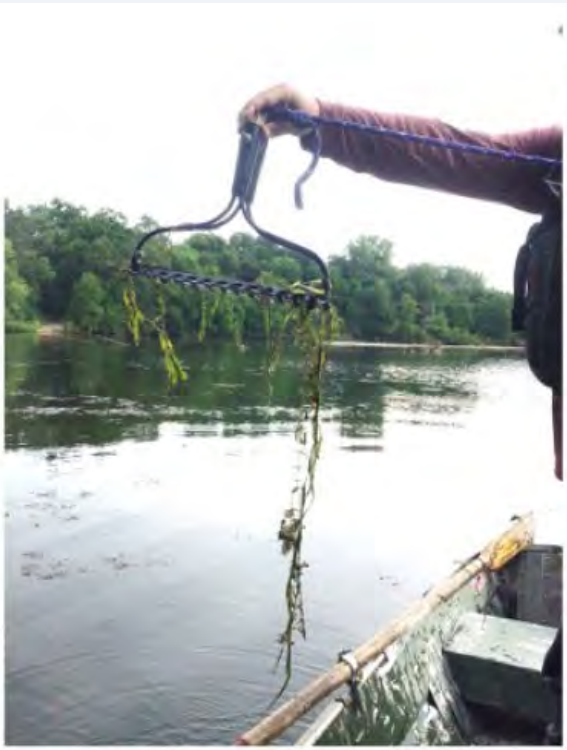
Aquatic Invasive Species Survey



Survey

- July 6-7, 2020 survey
- Visually, vegetation along impoundment margins where vegetation is most dense was not affect by June flood.
- Followed Hauxwell et al. (2010)

Aquatic Invasive Species Survey



Rake Fullness 1, typically

Rake Fullness 2, typically

Rake Fullness 3, typically

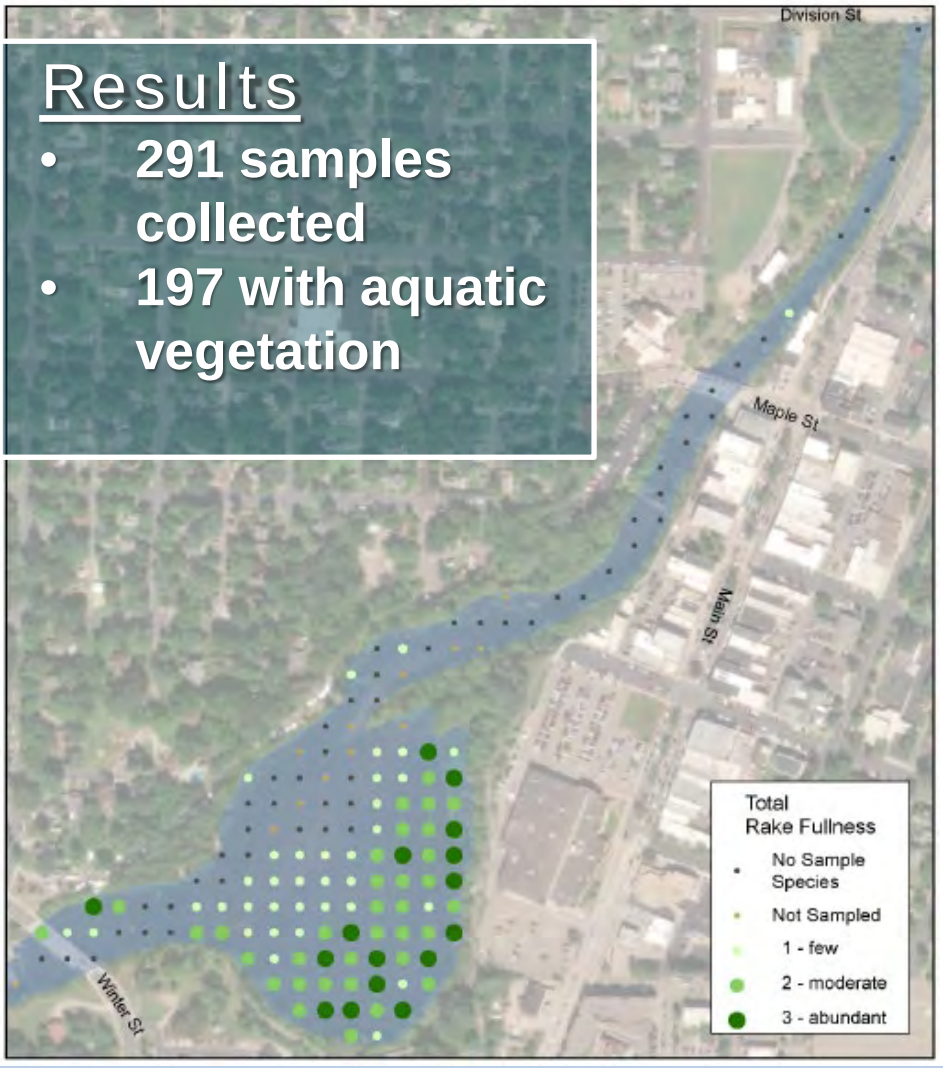
Methods

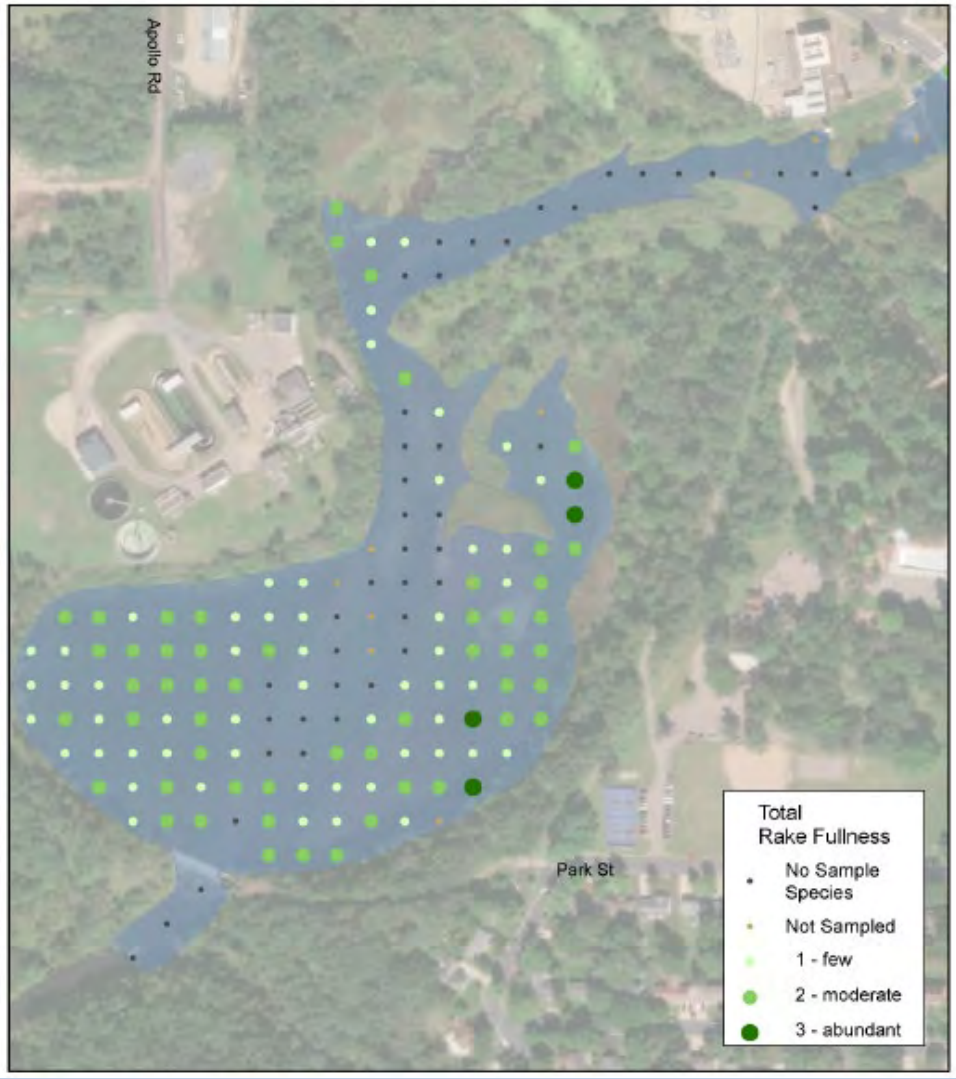
- **Rake cast into lake and retrieved**
- **Plant species identified**
- **“Rake fullness” quantified**

Aquatic Invasive Species Survey

Results

- 291 samples collected
- 197 with aquatic vegetation

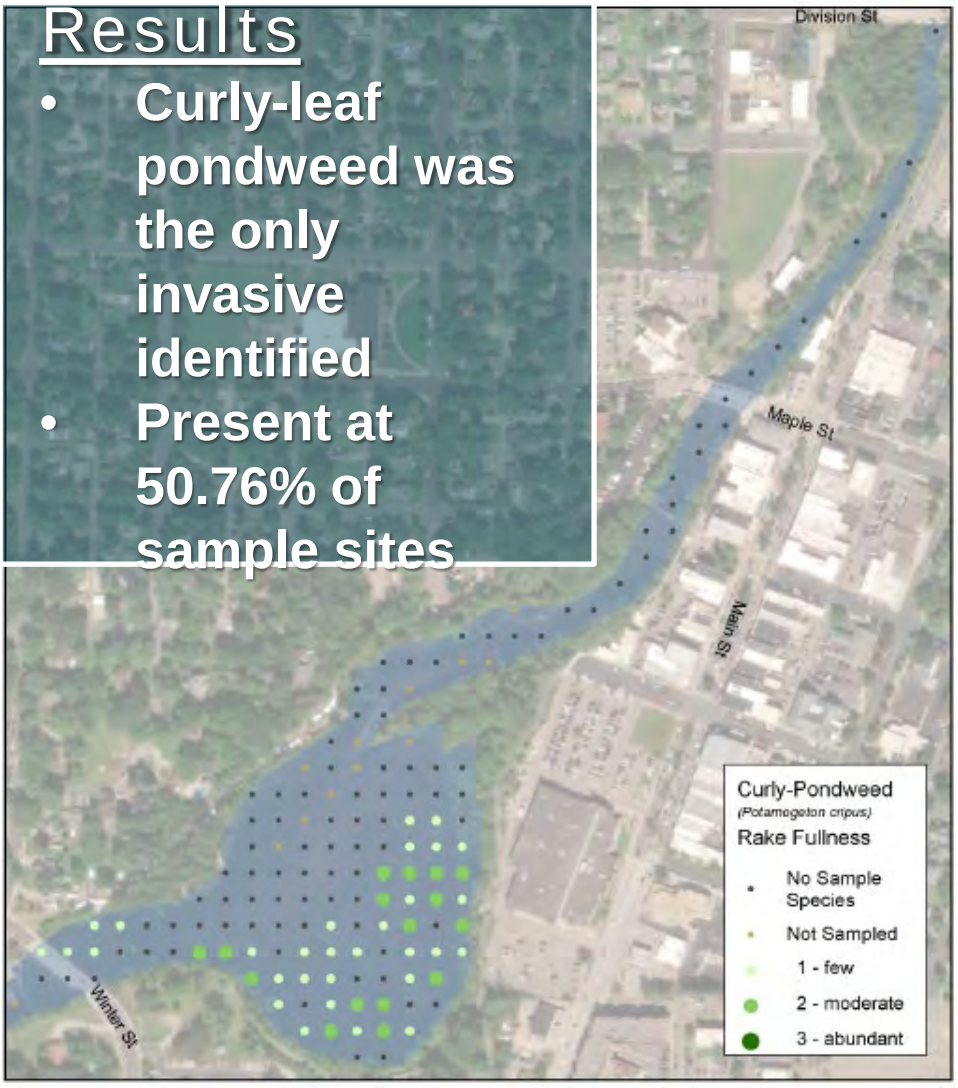




Aquatic Invasive Species Survey

Results

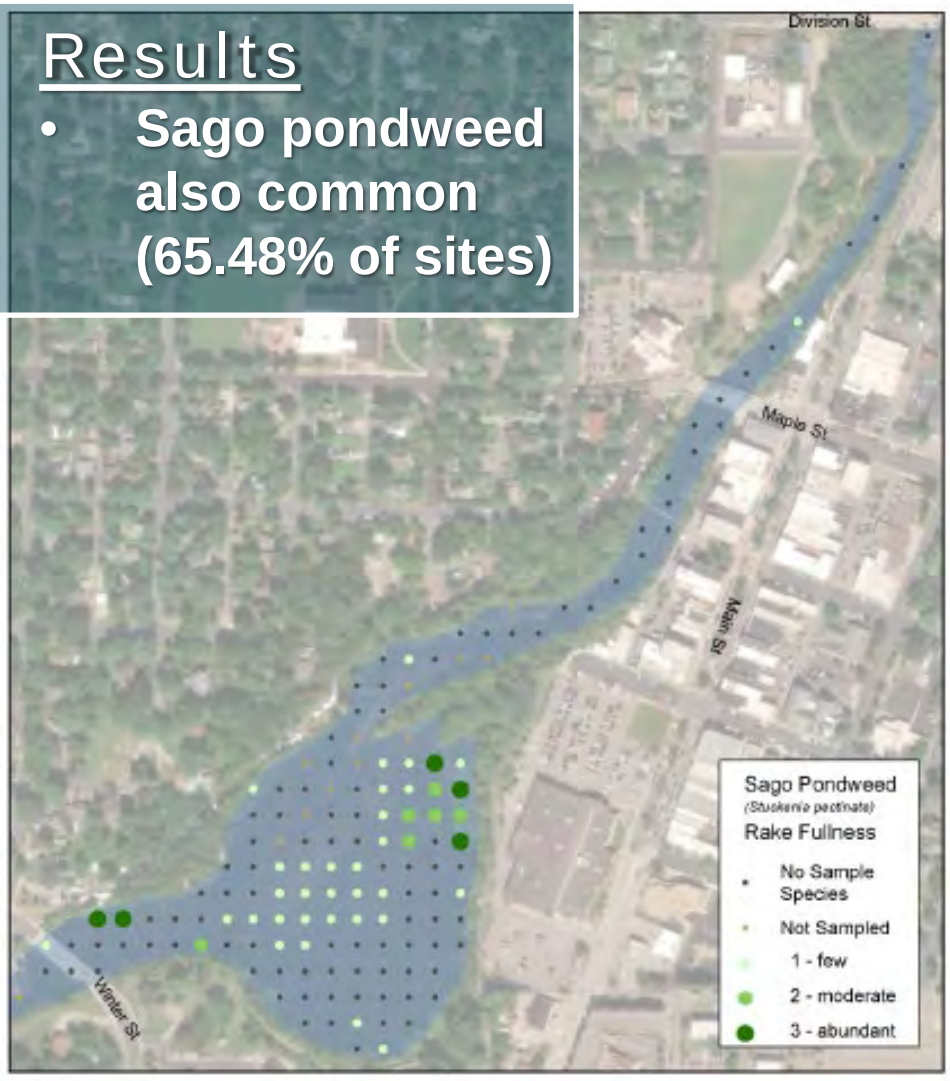
- Curly-leaf pondweed was the only invasive identified
- Present at 50.76% of sample sites

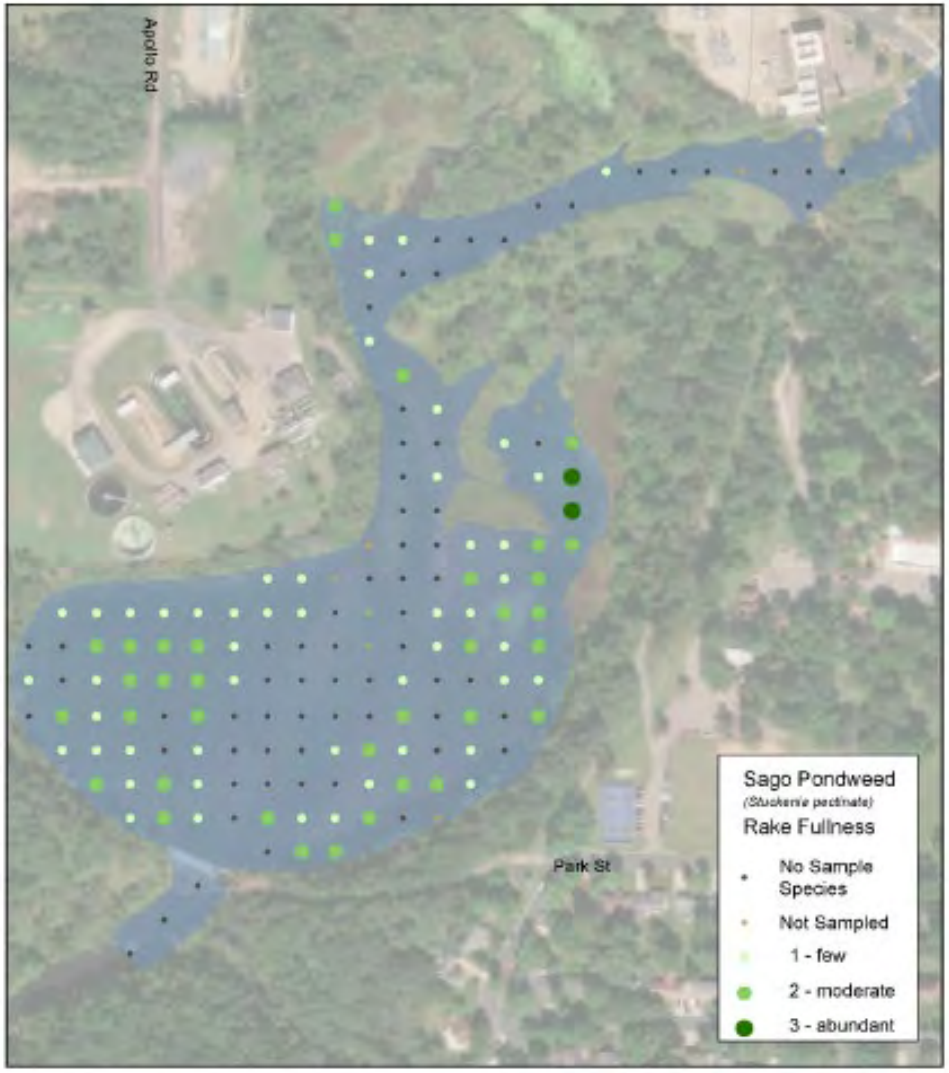


Aquatic Invasive Species Survey

Results

- Sago pondweed also common (65.48% of sites)

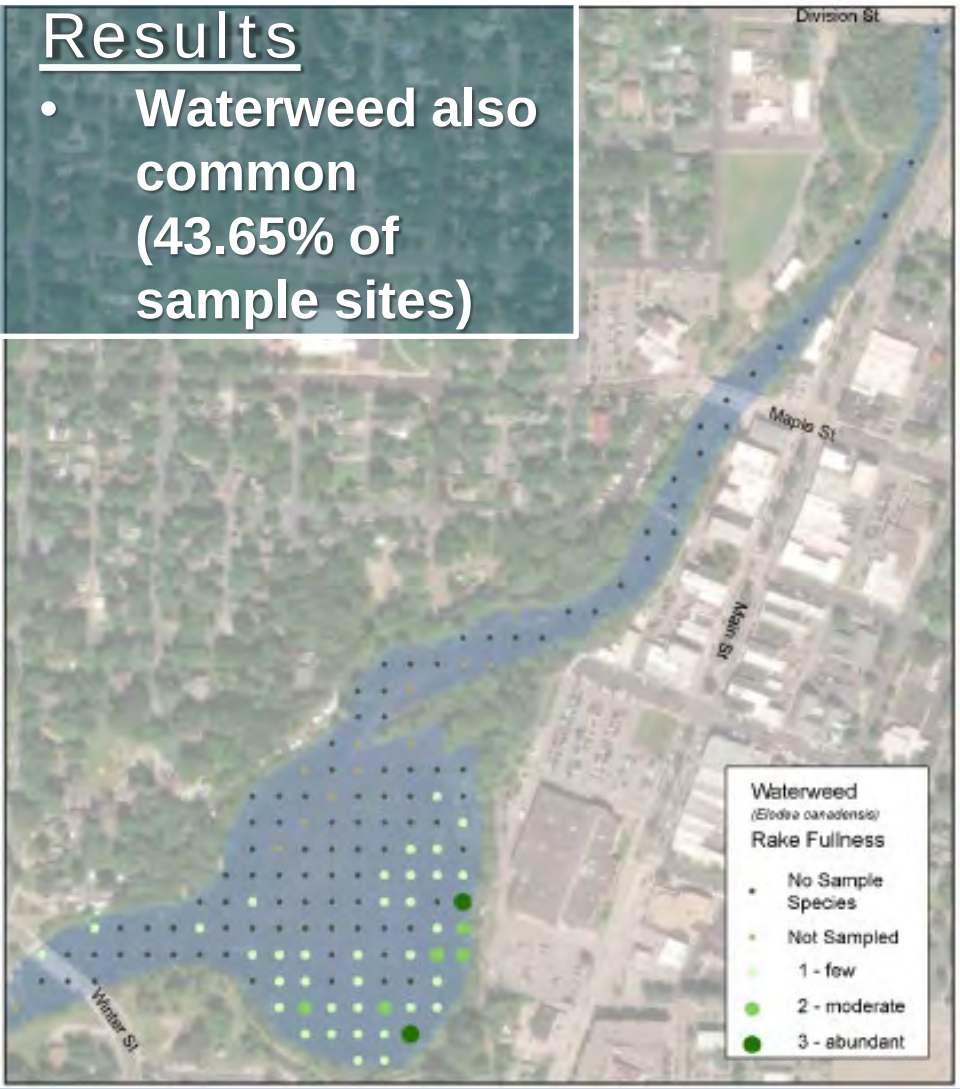




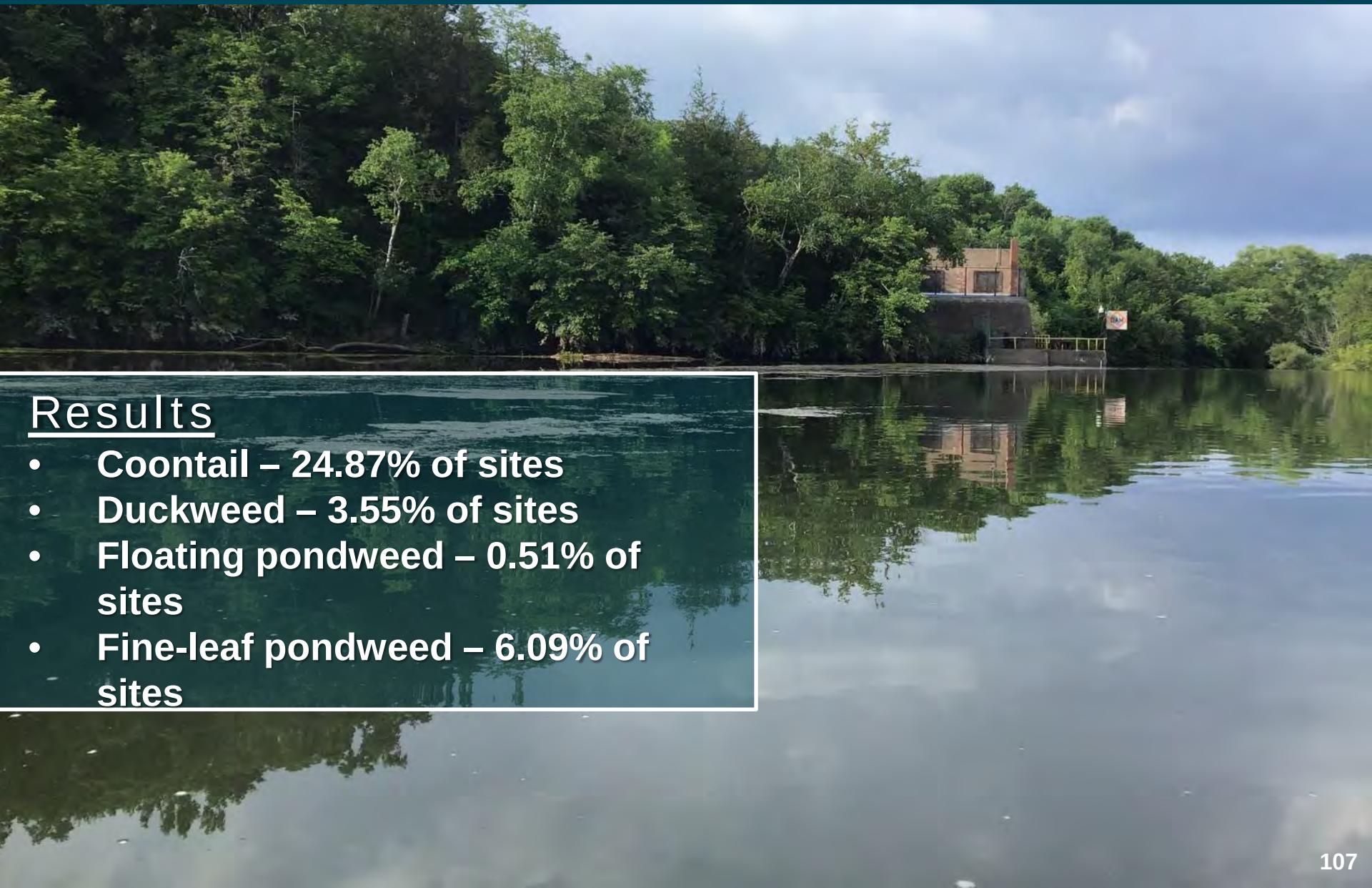
Aquatic Invasive Species Survey

Results

- Waterweed also common (43.65% of sample sites)



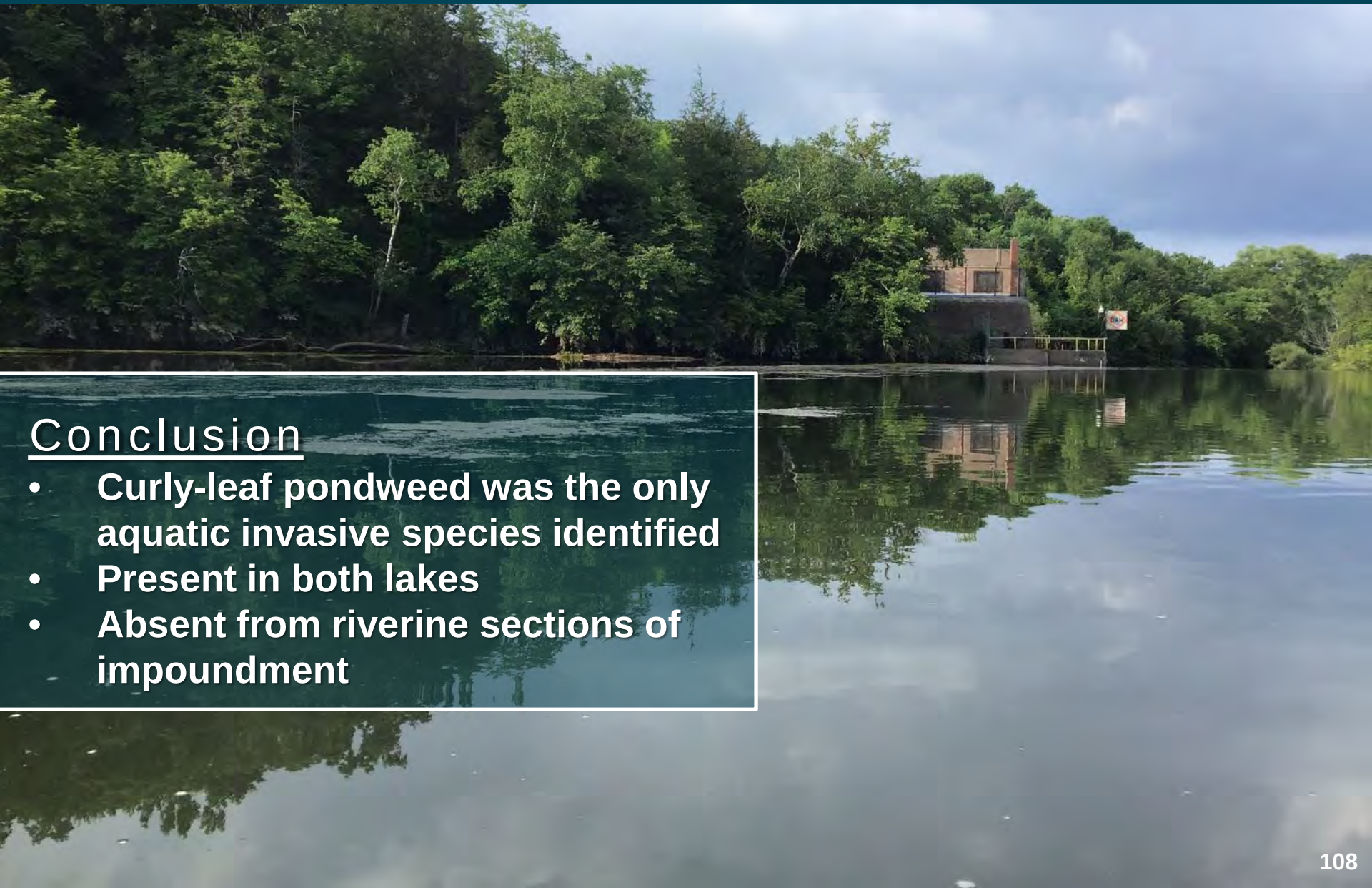
Aquatic Invasive Species Survey



Results

- **Coontail – 24.87% of sites**
- **Duckweed – 3.55% of sites**
- **Floating pondweed – 0.51% of sites**
- **Fine-leaf pondweed – 6.09% of sites**

Aquatic Invasive Species Survey



Conclusion

- **Curly-leaf pondweed was the only aquatic invasive species identified**
- **Present in both lakes**
- **Absent from riverine sections of impoundment**

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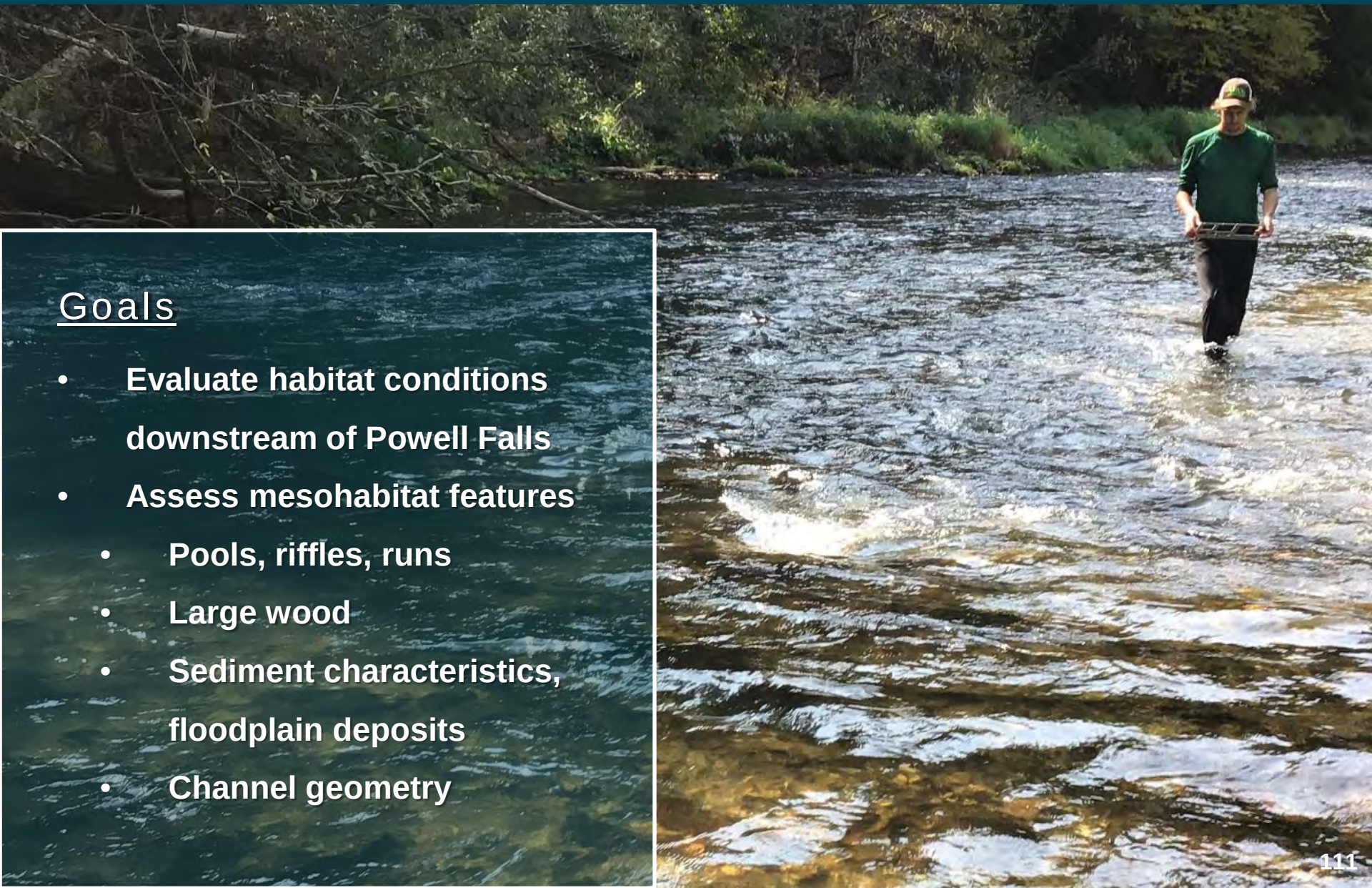
Riverine Habitat Evaluation Below Powell Falls

Marty Melchior & Sean Morrison, Inter-Fluve

Riverine Habitat Evaluation Below Powell Falls



Goals

- Evaluate habitat conditions downstream of Powell Falls
- Assess mesohabitat features
  - Pools, riffles, runs
  - Large wood
  - Sediment characteristics, floodplain deposits
  - Channel geometry

Riverine Habitat Evaluation Below Powell Falls

Background

- **Riparian ecosystem**
  - ***Resident animals***
  - ***Travel corridors***
  - ***Pollinator habitat***

- **GREATER BIODIVERSITY STEMS FROM GREATER HABITAT DIVERSITY**

Riverine Habitat Evaluation Below Powell Falls

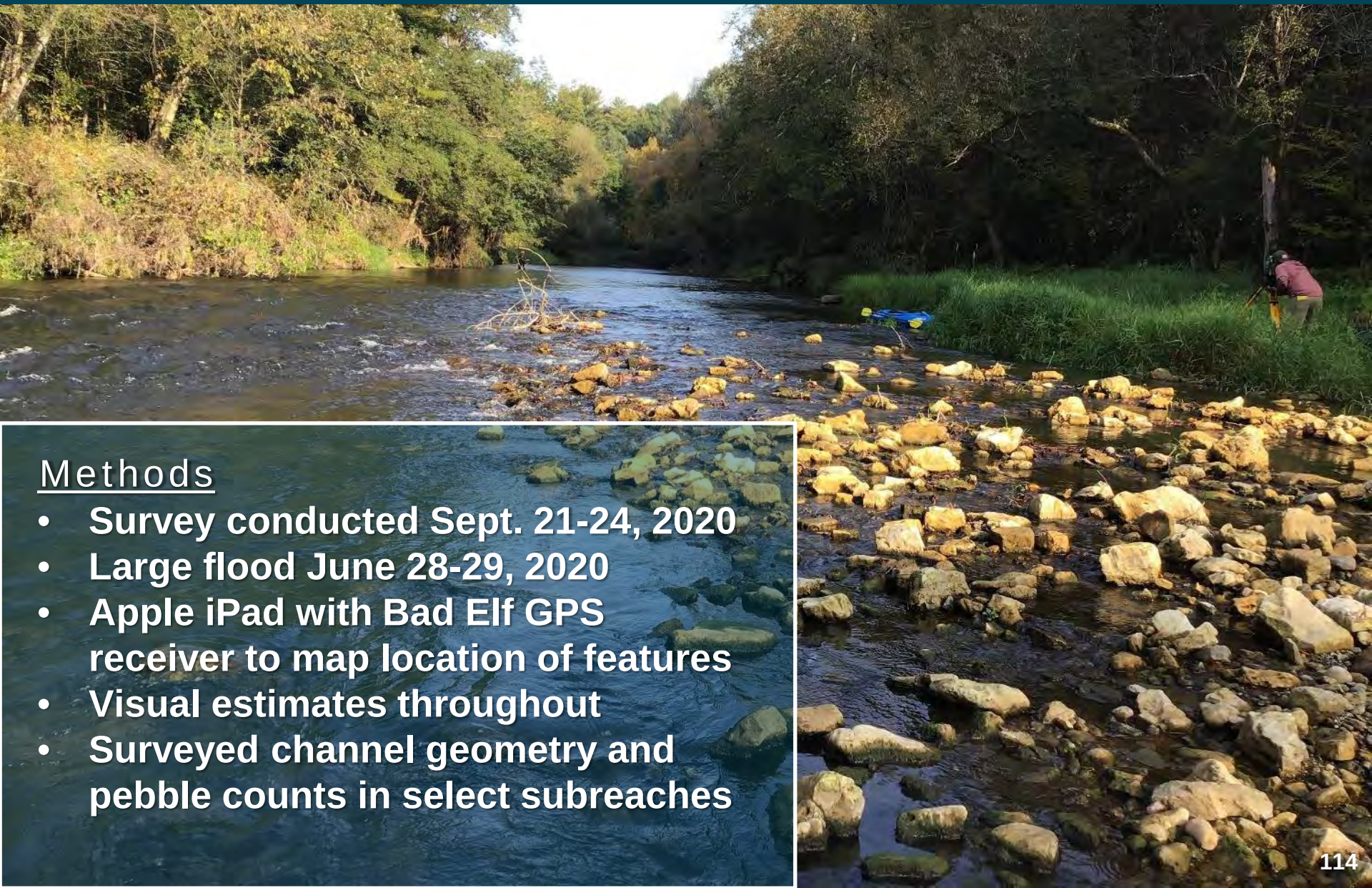
Background

- Class I trout stream
- Trout habitat needs
  - Food (benthic invertebrates, small fish)
  - Instream diversity (deep pools, boulders, large wood)
  - Gravel substrate

LEGEND

Trout Streams		
Class I	Interstate Highway	Other Streams
Class II	US Highway	Open Water
Class III	State Highway	Municipality
	County Road	
	Local Road	

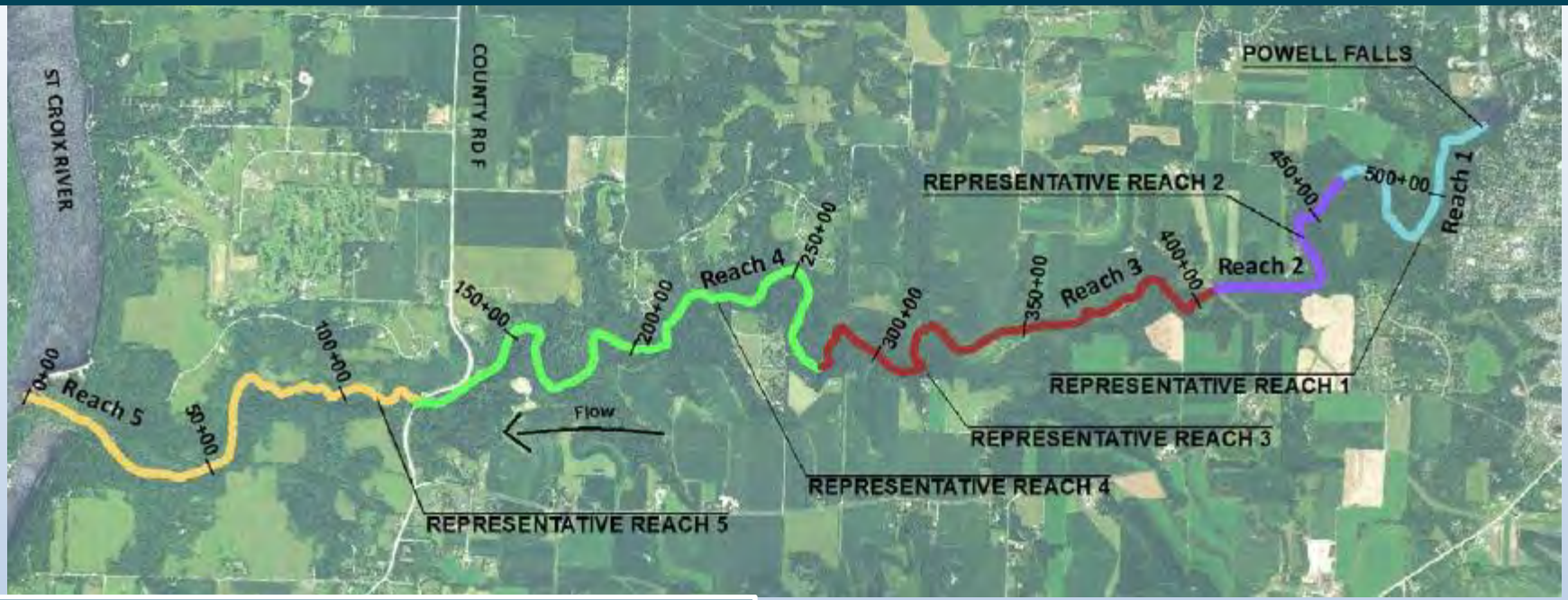
Riverine Habitat Evaluation Below Powell Falls



Methods

- Survey conducted Sept. 21-24, 2020
- Large flood June 28-29, 2020
- Apple iPad with Bad Elf GPS receiver to map location of features
- Visual estimates throughout
- Surveyed channel geometry and pebble counts in select subreaches

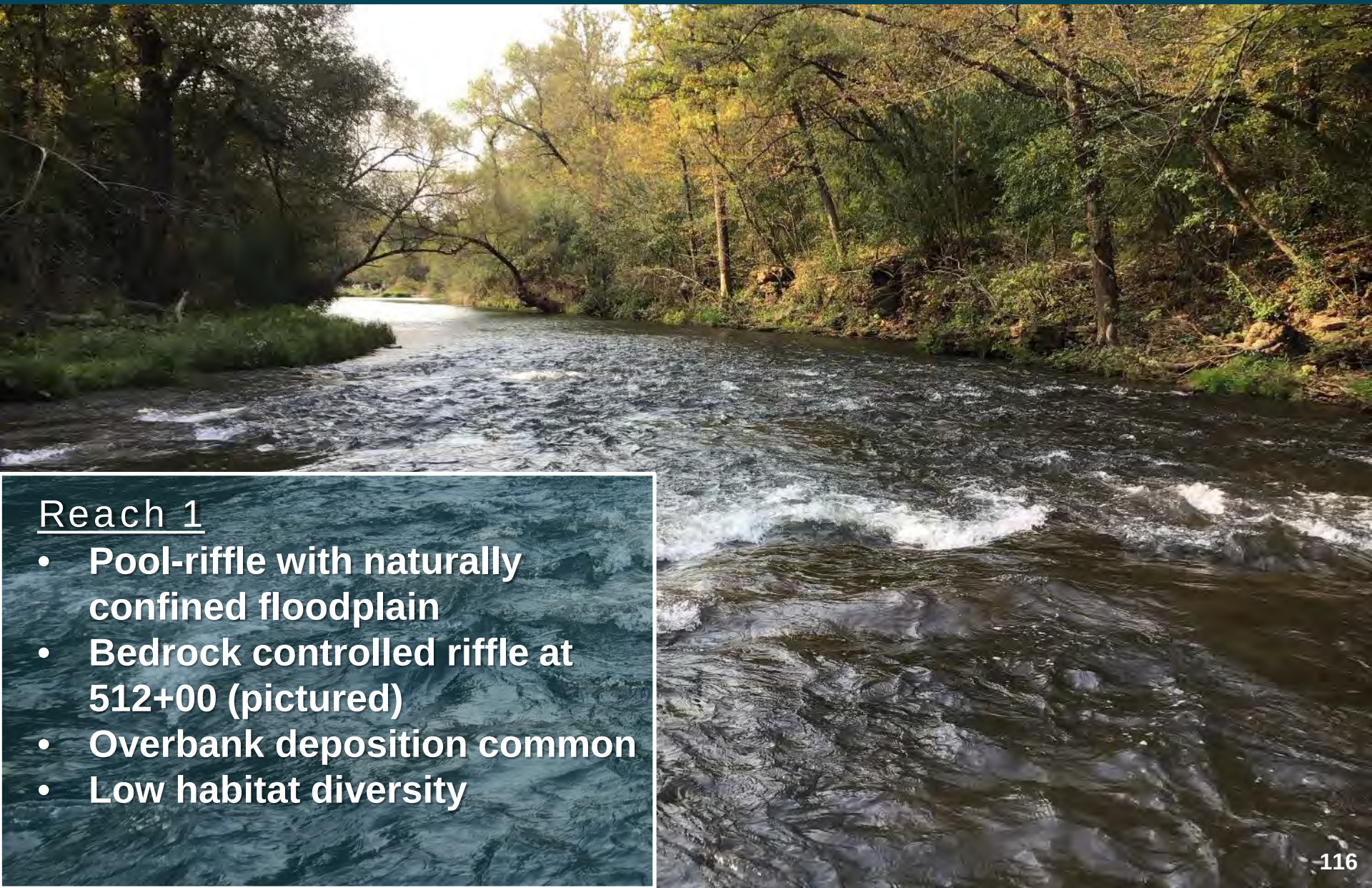
Riverine Habitat Evaluation Below Powell Falls



Methods

- **Over 10 miles of stream surveyed**
- **5 representative subreaches surveyed**

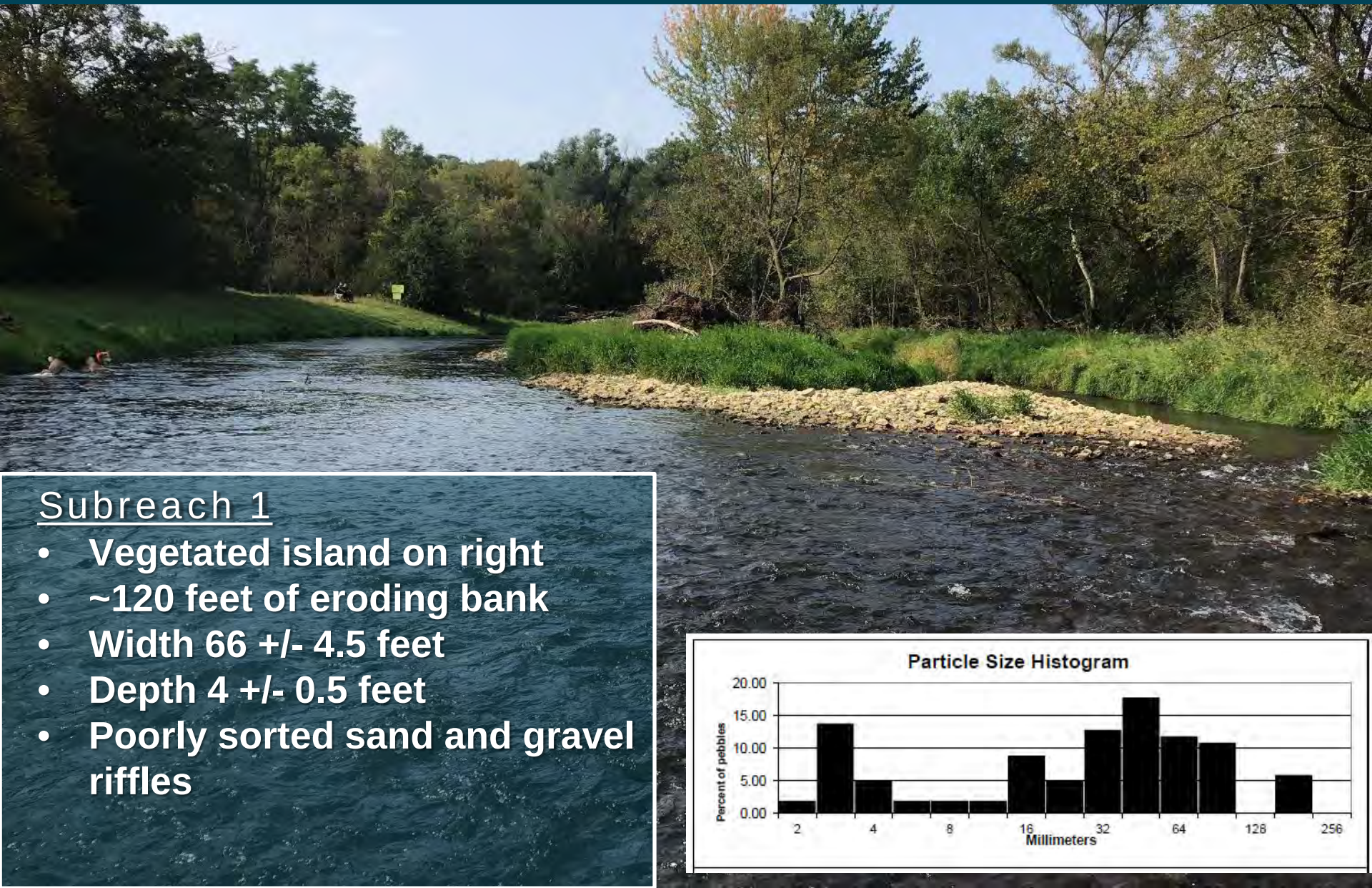
Riverine Habitat Evaluation Below Powell Falls



Reach 1

- Pool-riffle with naturally confined floodplain
- Bedrock controlled riffle at 512+00 (pictured)
- Overbank deposition common
- Low habitat diversity

Riverine Habitat Evaluation Below Powell Falls



Subreach 1

- Vegetated island on right
- ~120 feet of eroding bank
- Width 66 +/- 4.5 feet
- Depth 4 +/- 0.5 feet
- Poorly sorted sand and gravel riffles

Riverine Habitat Evaluation Below Powell Falls

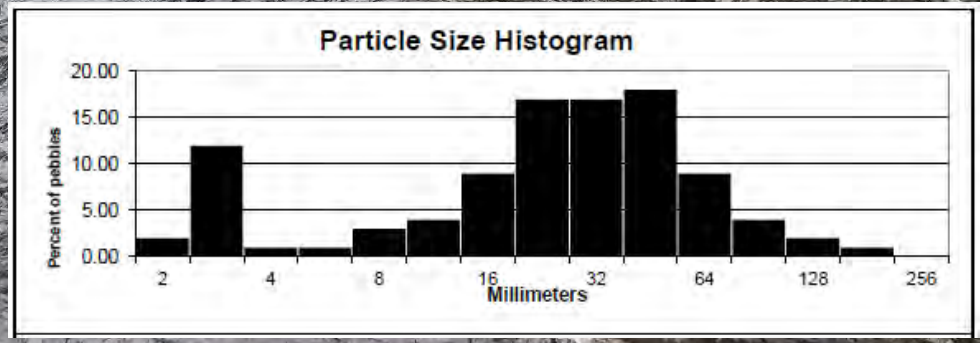
Reach 2

- Pool-riffle with naturally confined floodplain
- Private access a station 432+00
- Overbank deposition common
- Low habitat diversity

Riverine Habitat Evaluation Below Powell Falls

Subreach 2

- Gravel to cobble bar (pictured)
- Width 67 +/- 6.2 feet
- Depth 4 +/- 1.3 feet
- Poorly sorted sand and gravel riffles
- Main habitat coarse riffle substrate



Riverine Habitat Evaluation Below Powell Falls

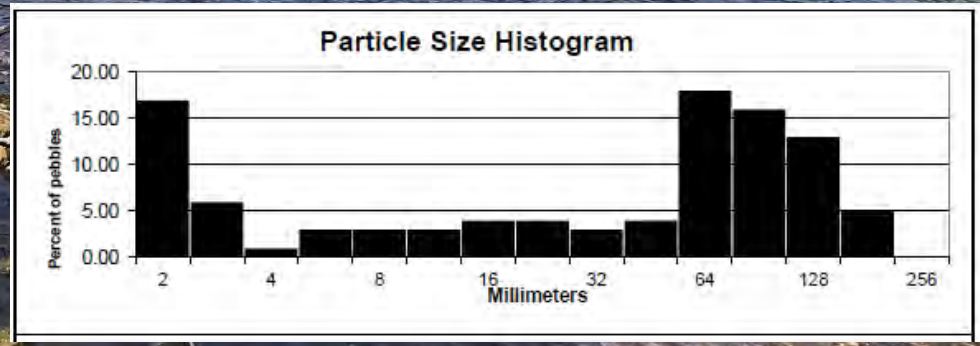
Reach 3

- Pool-riffle with naturally confined floodplain
- Some riffles transitional with runs
- Private access a station 350+00
- Overbank deposition common
- Low habitat diversity

Riverine Habitat Evaluation Below Powell Falls

Subreach 3

- Gravel to cobble bar (pictured)
- Width 61 +/- 10.1 feet
- Depth 4 +/- 1.5 feet
- Poorly sorted sand and gravel riffles
- Main habitat coarse riffle substrate



Riverine Habitat Evaluation Below Powell Falls

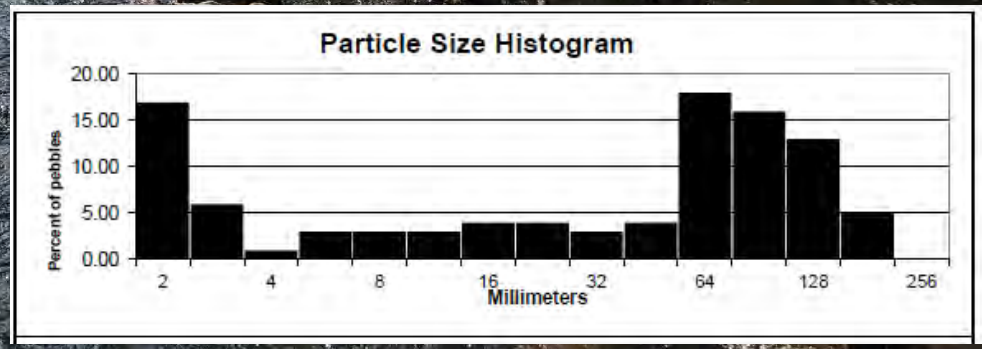
Reach 4

- Pool-riffle with naturally confined floodplain
- Bedrock commonly exposed at outside of meander bends
- Overbank deposition common
- Low habitat diversity

Riverine Habitat Evaluation Below Powell Falls

Subreach 4

- Width 67 +/- 5.4 feet
- Depth 4 +/- 0.2 feet
- Poorly sorted sand to cobble riffles
- Main habitat coarse riffle substrate



Riverine Habitat Evaluation Below Powell Falls

Reach 5

- Upstream – pool riffle with naturally confined floodplain
- Abundant large wood
- Recent avulsion of channel

Riverine Habitat Evaluation Below Powell Falls

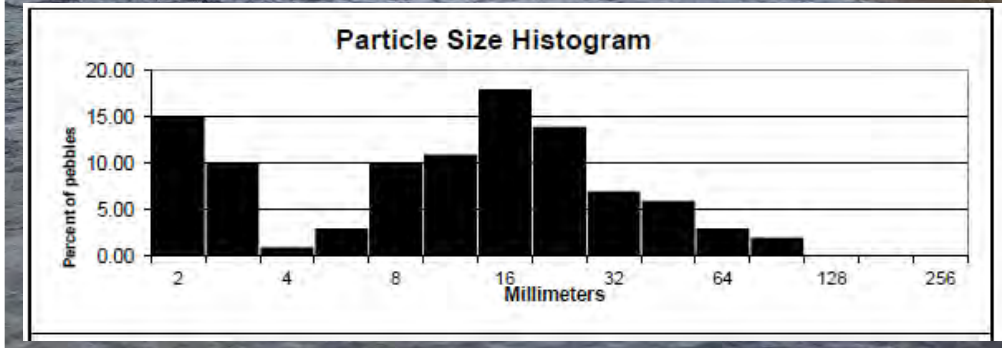
Reach 5

- Downstream – riffle run with naturally confined to unconfined floodplain
- Sand dominated

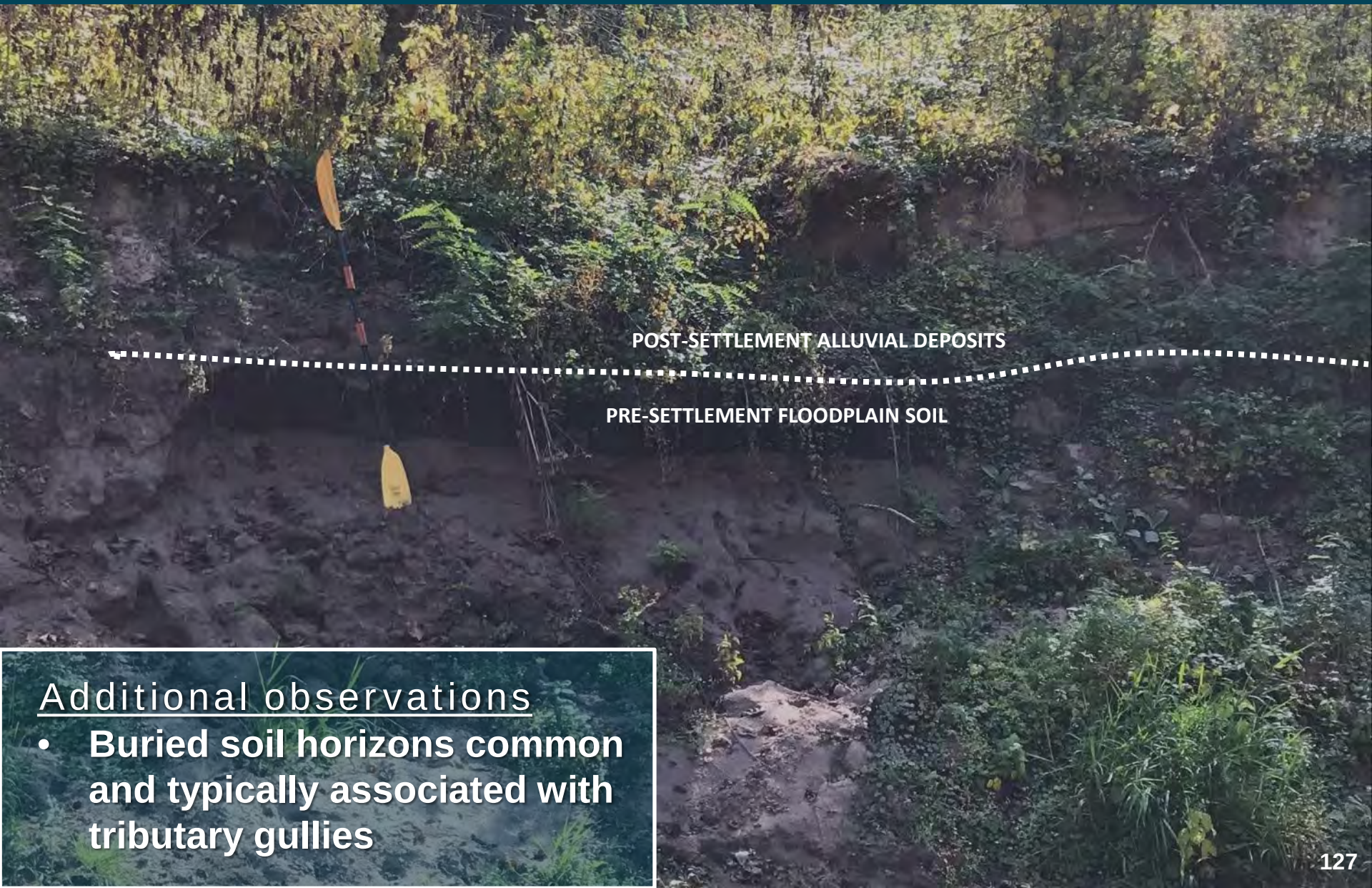
Riverine Habitat Evaluation Below Powell Falls

Subreach 5

- Width 100 +/- 58.3 feet
- Depth 5 +/- 0.8 feet
- Poorly sorted sand to gravel riffles
- Main habitat coarse riffle substrate



Riverine Habitat Evaluation Below Powell Falls



Additional observations

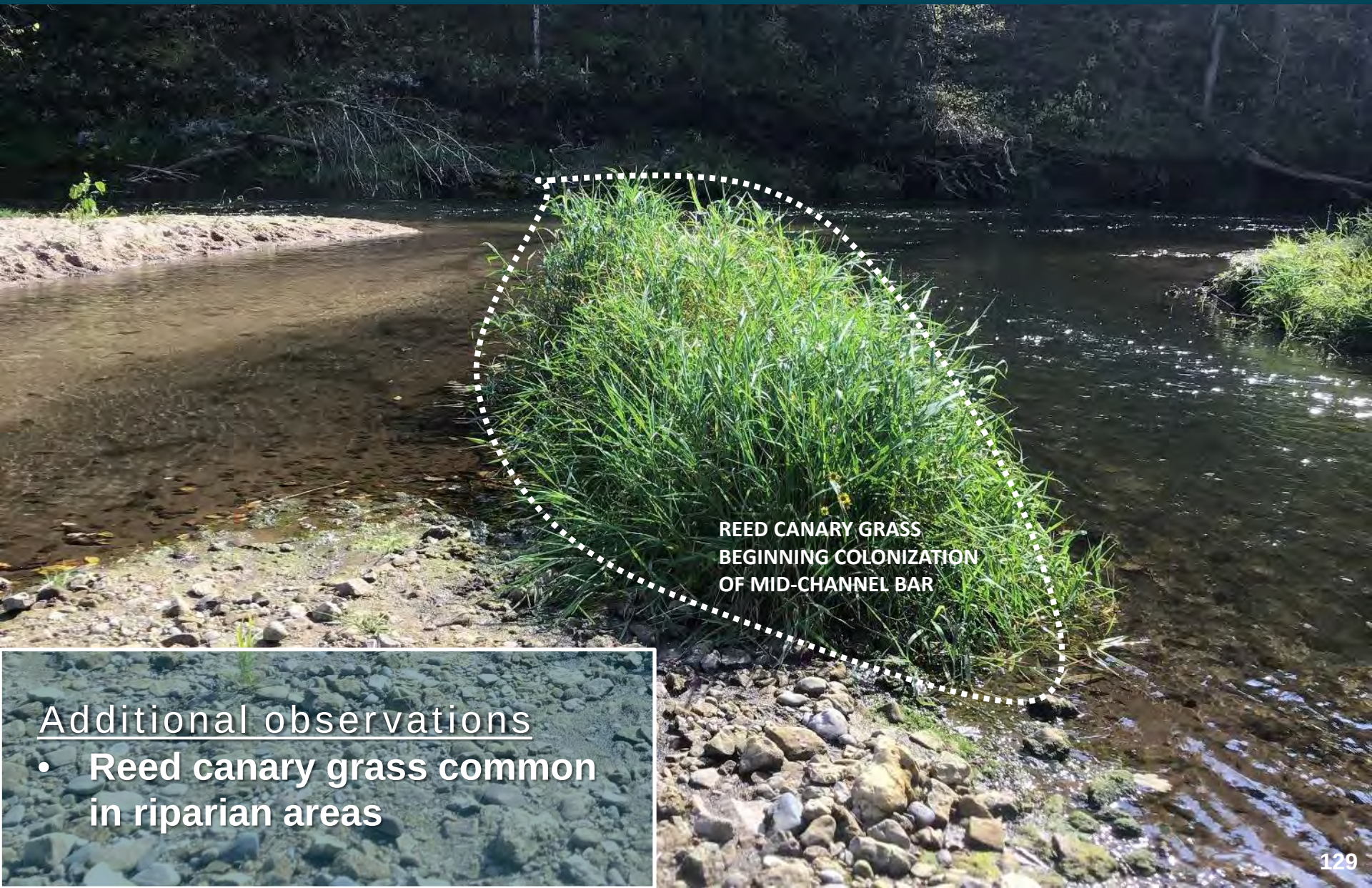
- **Buried soil horizons common and typically associated with tributary gullies**

Riverine Habitat Evaluation Below Powell Falls

Additional observations

- **Massive overbank sedimentation following June floods**

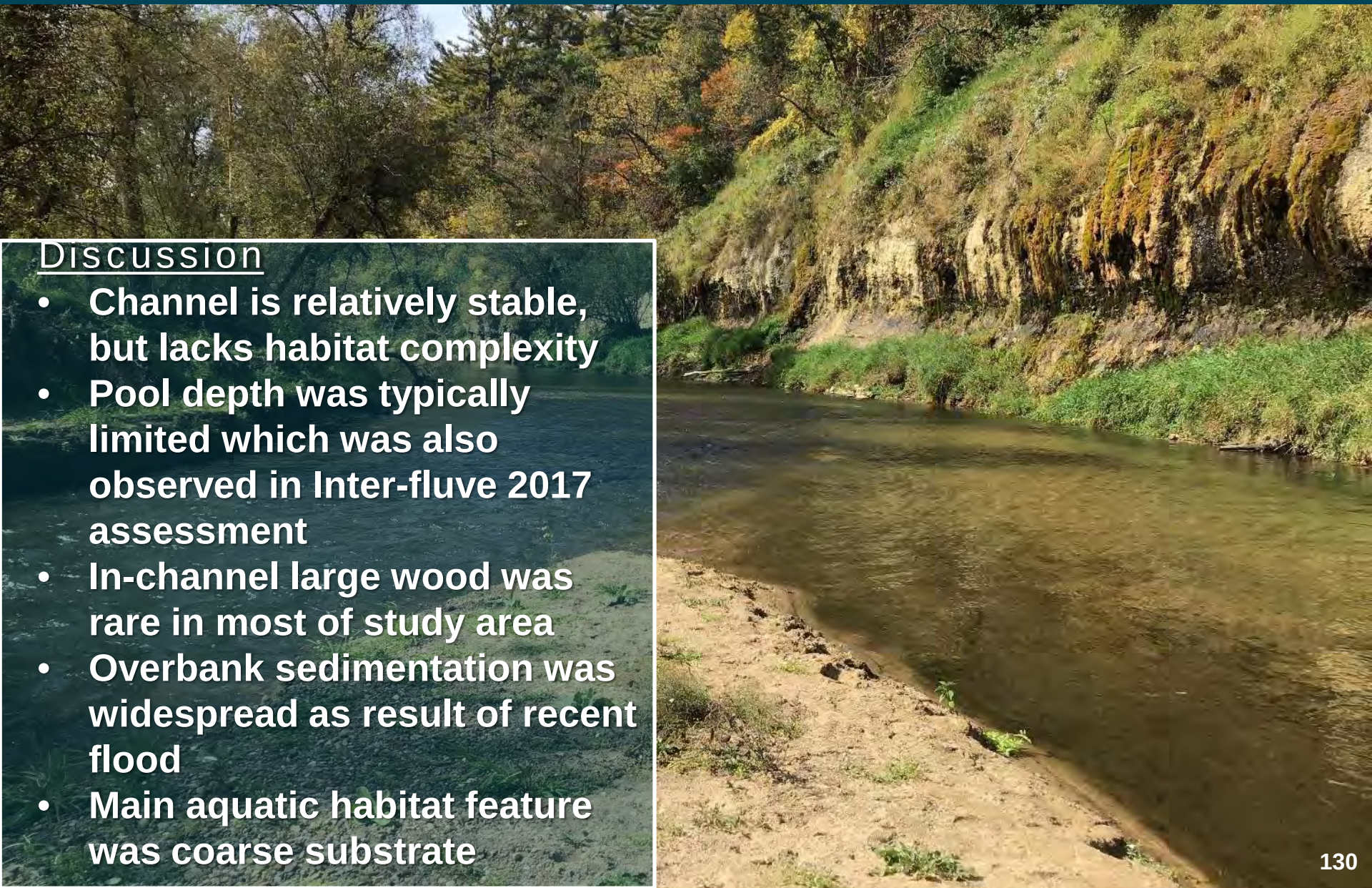
Riverine Habitat Evaluation Below Powell Falls



Additional observations

- **Reed canary grass common in riparian areas**

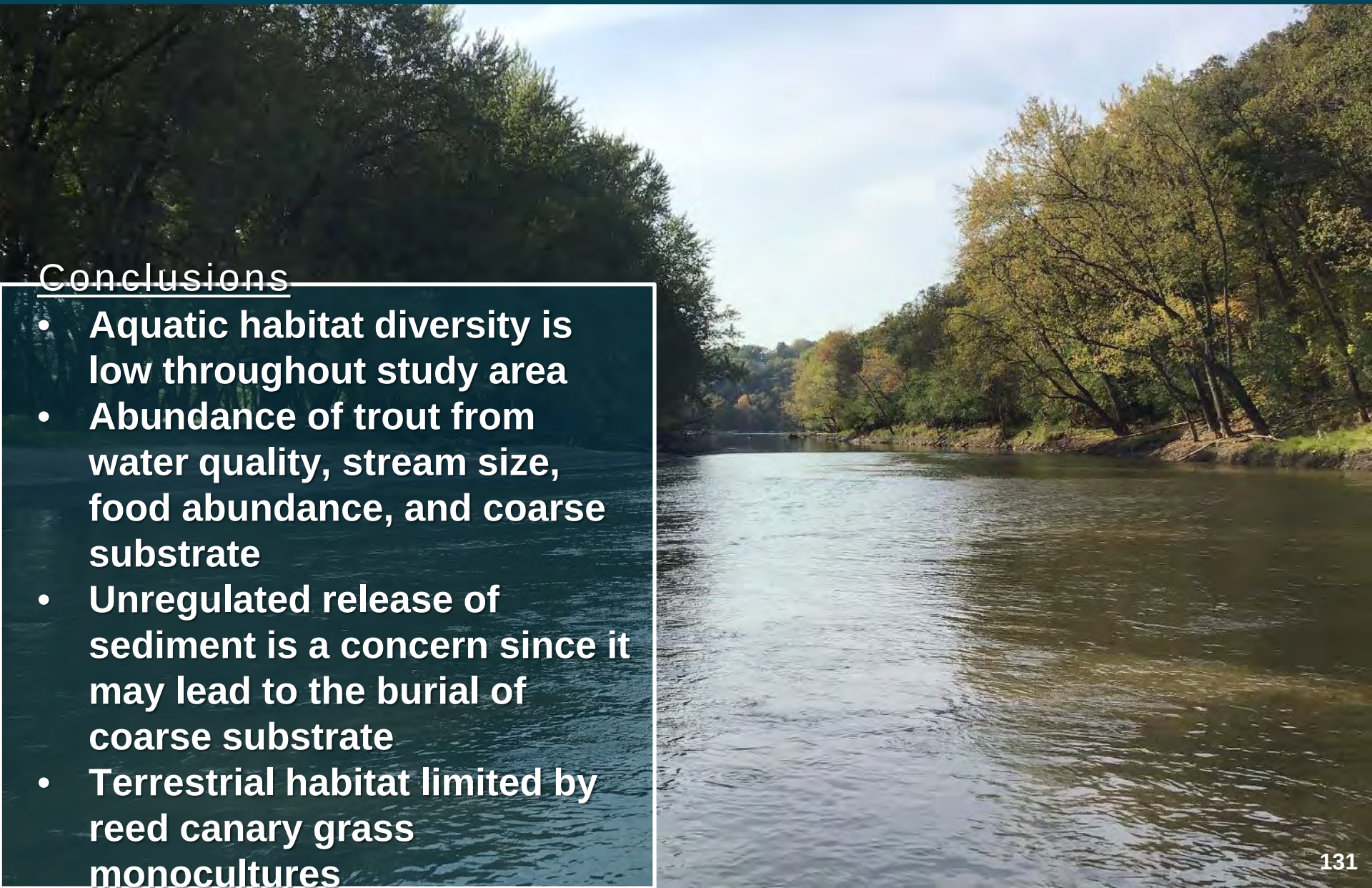
Riverine Habitat Evaluation Below Powell Falls



Discussion

- Channel is relatively stable, but lacks habitat complexity
- Pool depth was typically limited which was also observed in Inter-fluve 2017 assessment
- In-channel large wood was rare in most of study area
- Overbank sedimentation was widespread as result of recent flood
- Main aquatic habitat feature was coarse substrate

Riverine Habitat Evaluation Below Powell Falls



Conclusions

- Aquatic habitat diversity is low throughout study area
- Abundance of trout from water quality, stream size, food abundance, and coarse substrate
- Unregulated release of sediment is a concern since it may lead to the burial of coarse substrate
- Terrestrial habitat limited by reed canary grass monocultures

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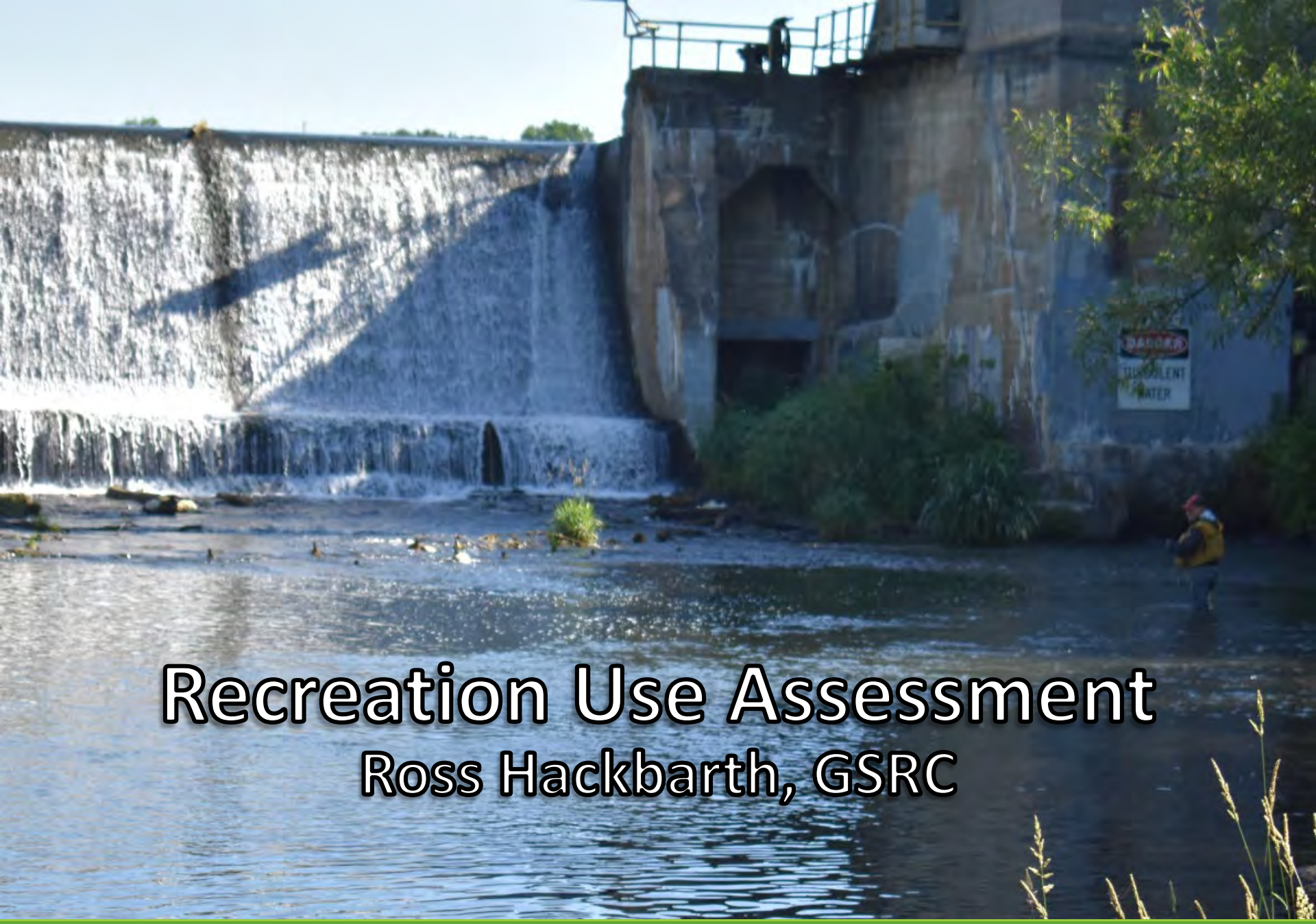
Recreation Use Assessment

Ross Hackbarth, GSRC



Recreation Use Assessment

Ross Hackbarth, GSRC

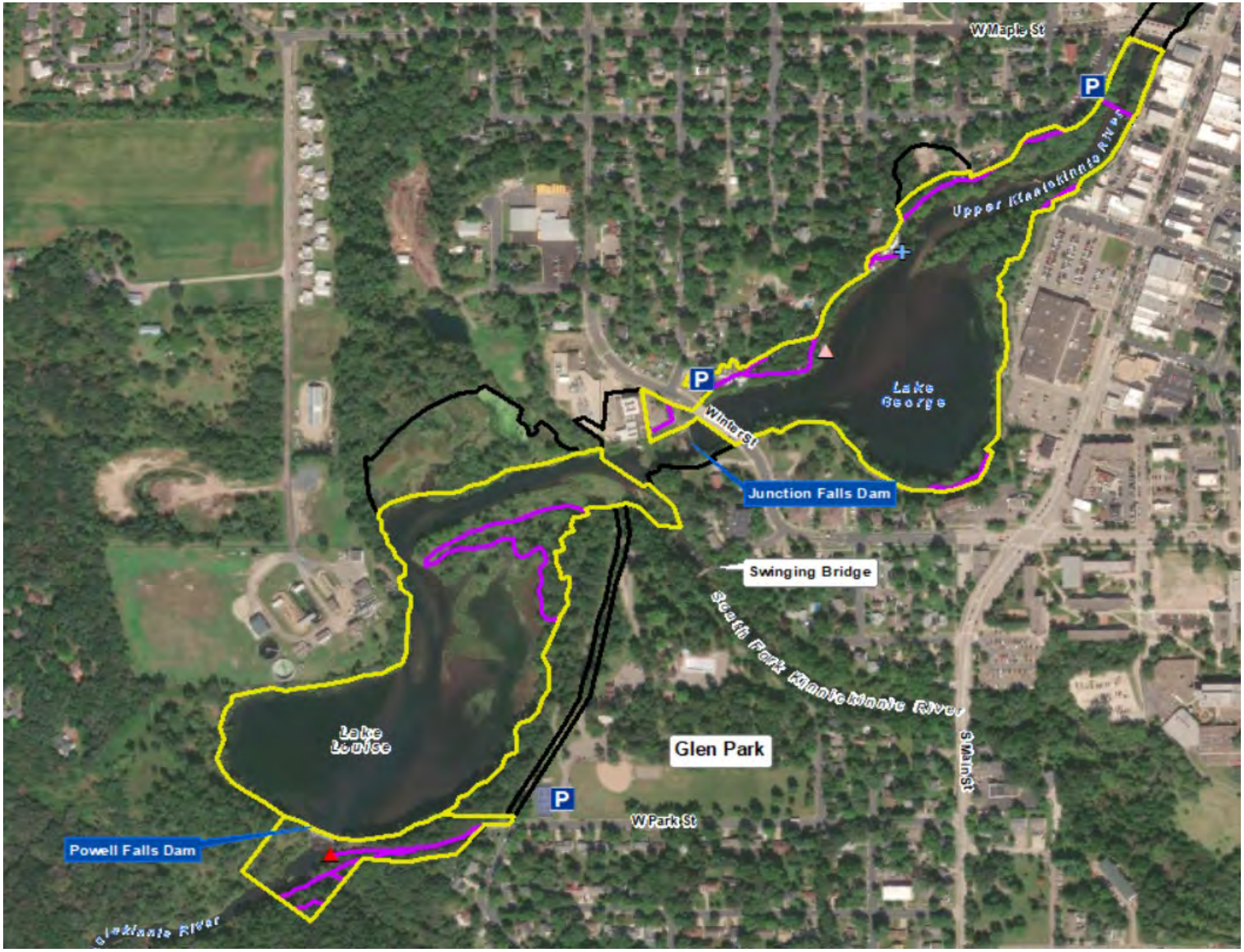
PROJECT OBJECTIVES

Recreation Use Assessment

Objectives:

1. **Document scope of recreation opportunities/amenities and the condition of these amenities.**
2. **Assess recreation use rates for various recreation activities.**
3. **Gauge the public opinion on recreation opportunities in the Project Area.**
4. **Predict future recreation use rates and provide management recommendations if applicable.**

STUDY AREAS


W Maple St
P
Upper Kinnickinnic River
Lake George
P
Winter St
Junction Falls Dam
Swinging Bridge
South Fork Kinnickinnic River
S Main St
Glen Park
Lake Louise
P
W Park St
Powell Falls Dam
Kinnickinnic River

METHODOLOGY

1. **Documentation of Survey Area amenities and conditions.**
2. **Recreation use one-hour spot counts at each Survey Area.**
3. **Recreation user opinion surveys.**

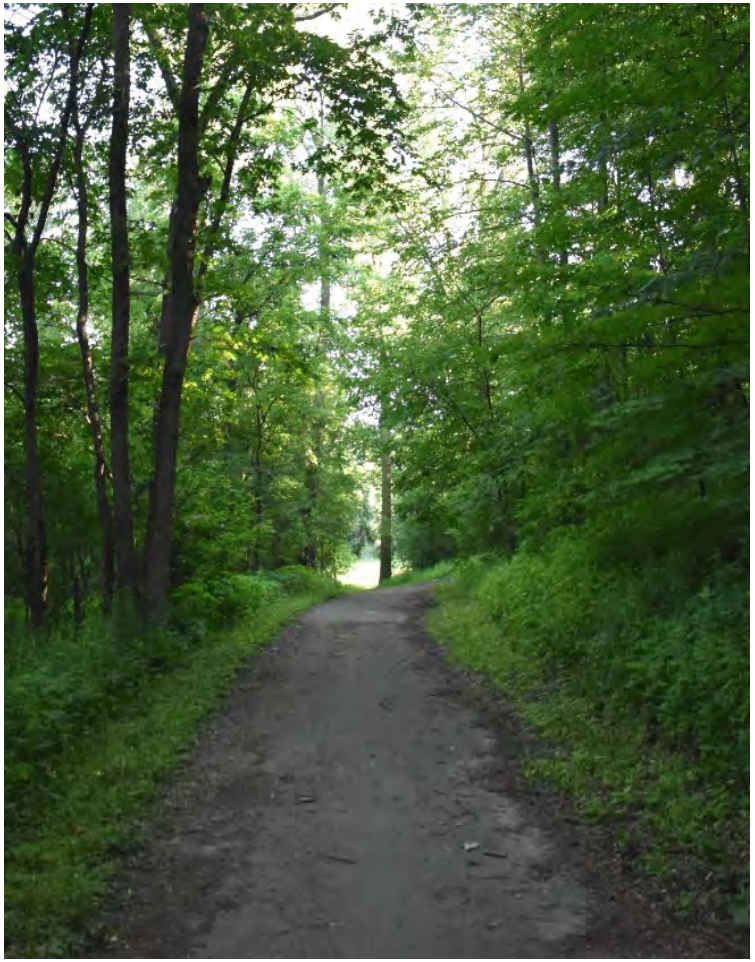
WHITE KINNICKINNIC PATHWAY

Recreation Amenities

WHITE KINNICKINNIC PATHWAY

Recreation Amenities

GLEN PARK TRAILS
Recreation Amenities



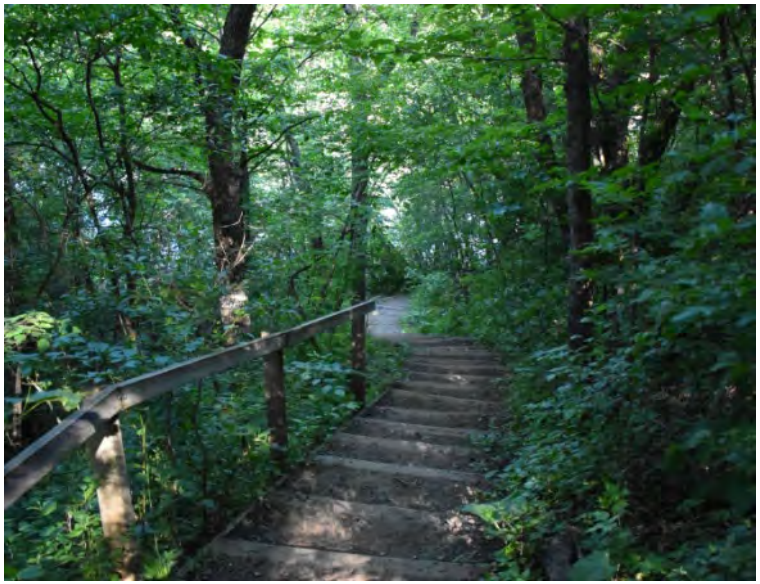
GLEN PARK TRAILS
Recreation Amenities

POWELL FALLS KAYAK LAUNCH

Recreation Amenities

POWELL FALLS KAYAK LAUNCH

Recreation Amenities



WHITE KINNICKINNIC PATHWAY

Focal Point: Lake George (16 acres)

Amenities

- Walking path
- Maintained lawn, street lamps, benches
- Kayak/boat take-out
- Fishing pier
- Parking lot (7 spaces)

Conditions

- Weedy/areas of dense algae
- Overall well-maintained pathway and associated amenities
- No bathrooms/toilets

WHITE KINNICKINNIC PATHWAY

Rank	Recreation Activity	Users Observed	Users Per Hour
1	Walking/Running	288	9.60
2	Biking	132	4.40
3	Looking at Dam/Flooding	92	3.07
4	Dog Walking	80	2.67
5	Canoeing/Kayaking	25	0.83
6	Skateboarding/Rollerblading	9	0.30
7	Birding/Nature Observing	8	0.27
8	Fishing from Shore	5	0.17
9	Picnicking	4	0.13
10	Berry-picking	3	0.10
11	Sightseeing	1	0.03
12	Photography	1	0.03
-	All Activities (Total)	648	21.6

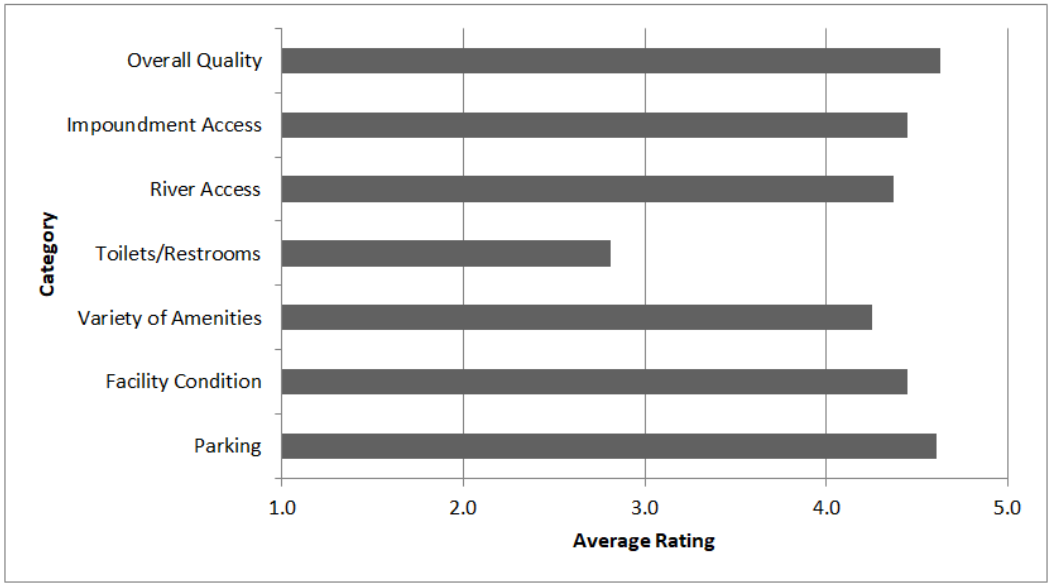
Type of Day	Total Recreation Users	Recreation Users per Hour
Weekday	342	26.3
Weekend	242	18.6
Holiday	64	16.0

Notes

- Most common activities used pathway
- Close to River Falls downtown and surrounding neighborhoods
- Parking: 4.27 vehicles/hour on weekdays, 2.33 vehicles/hour on weekends

WHITE KINNICKINNIC PATHWAY

Participated in recreation survey before?		Gender		How many in group?	
Yes	13.9%	Male	27.8%	1-2	69.4%
No	86.1%	Female	72.2%	3+	30.6%
Vehicle(s)?		**Resident of River Falls?**		**Ever visited Project Area before?**	
Yes	27.8%	Yes	77.8%	Yes	97.2%
No	72.2%	No	22.2%	No	2.8%



Notes

- Most common activities: walking, dog walking, and bicycle riding
- Over-crowding never observed
- Complaints: weeds in lake, goose poop, lack of bathrooms

GLEN PARK TRAILS

Focal Point: Junction Falls Dam and Lake Louise

Amenities

- Walking path
- Hiking trails
- Water access
- Parking lot (Glen Park)

Conditions

- Paved trail in good condition
- Pre- and post-flood conditions drastically different at base of Junction Falls Dam

GLEN PARK TRAILS

Rank	Recreation Activity	Users Observed	Users Per Hour
1	Walking/Running	224	7.23
2	Dog Walking	28	0.90
3	Swimming	16	0.52
4	Fishing from Shore	12	0.39
5	Fly Fishing	6	0.19
6	Biking	5	0.16
6	Photography	5	0.16
8	Picnicking	3	0.10
9	Canoeing/Kayaking	2	0.06
10	Flying a Drone	2	0.06
-	All Activities (Total)	303	9.77

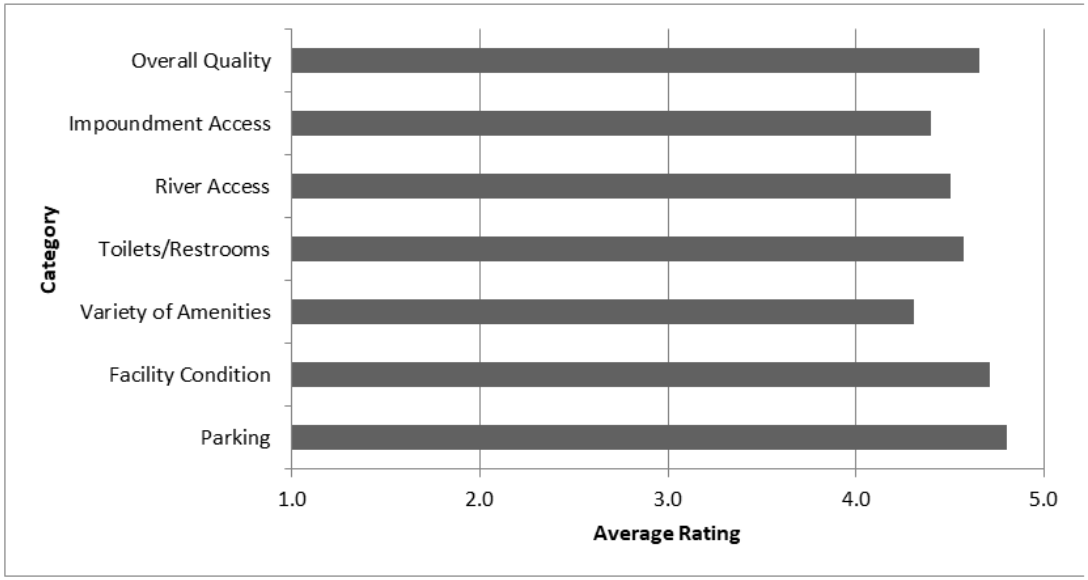
Type of Day	Total Recreation Users	Recreation Users per Hour
Weekday	136	9.1
Weekend	144	12.0
Holiday	23	5.8

Notes

- Most common activities were walking and dog walking
- No one observed on bank of Lake Louise
- Parking (Glen Park): 26.6 vehicles/hour on weekdays, 38.1 vehicles/hour on weekends

GLEN PARK TRAILS

Participated in recreation survey before?		Gender		How many in group?	
Yes	6.3%	Male	40.6%	1-2	84.4%
No	93.7%	Female	59.4%	3+	15.6%
Vehicle(s)?		**Resident of River Falls?**		**Ever visited Project Area before?**	
Yes	65.6%	Yes	68.8%	Yes	93.7%
No	34.4%	No	31.2%	No	6.3%



Notes

- Most common activities: walking, dog walking
- Over-crowding never observed
- Complaints: weeds in lake, Lake Louise isn't accessible

POWELL FALLS KAYAK LAUNCH

Focal Point: Powell Falls Dam and Kinnickinnic River

Amenities

- Kayak launch
- Hiking trails
- Kayak staging area with picnic tables

Conditions

- Trails steep and uneven in areas
- Pre- and post-flood conditions drastically different at base of Junction Falls Dam
- No bathrooms/toilets

POWELL FALLS KAYAK LAUNCH

Rank	Recreation Activity	Users Observed	Users Per Hour
1	Canoeing/Kayaking	458	15.80
2	Walking/Running	116	4.00
3	Fly Fishing	38	1.31
4	Dog Walking	33	1.14
5	Fishing from Shore	22	0.76
6	Biking	17	0.59
7	Swimming	9	0.31
8	Sightseeing	5	0.17
9	Scout River for Fishing	3	0.10
10	Photography	2	0.07
-	All Activities (Total)	703	24.2

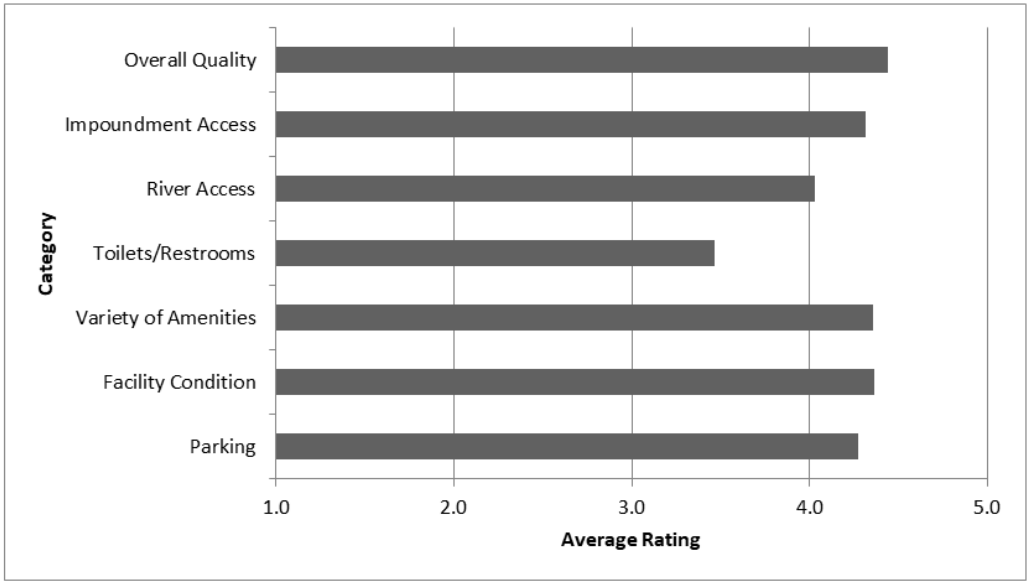
Type of Day	Total Recreation Users	Recreation Users per Hour
Weekday	217	15.5
Weekend	367	33.4
Holiday	119	29.8

Notes

- Most common activity was kayaking and canoeing
- Much busier on weekends and holidays
- Parking (street): 12.0 vehicles/hour on weekdays, 1.86 vehicles/hour on weekends

POWELL FALLS KAYAK LAUNCH

Participated in recreation survey before?		Gender		How many in group?	
Yes	16%	Male	58%	1-2	62%
No	84%	Female	42%	3+	38%
Vehicle(s)?		**Resident of River Falls?**		**Ever visited Project Area before?**	
Yes	90%	Yes	48%	Yes	88%
No	10%	No	52%	No	12%

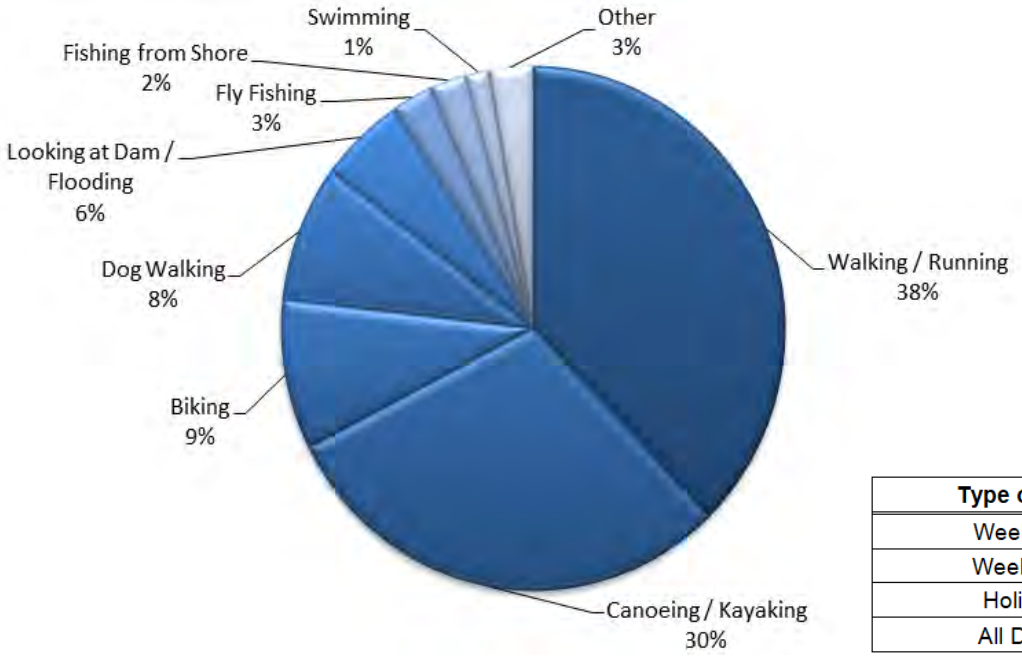


Notes

- Most common activities: kayaking and canoeing
- Kayaking loading zone observed full multiple times
- Complaints: over-crowding, lack of accessibility

PROJECT AREA SUMMARY

White Kinnickinnic Pathway (Lake George): Popular for paved pathway activities, most accessible
Glen Park Trails (Junction Falls Dam/Lake Louise): Popular as an area of exploration
Powell Falls Kayak Launch (Lower Kinnickinnic River): Kayaking and canoeing



Notes

- Average respondent visited 76.1 times per year
- Most out of town visitors came for kayaking at Powell Falls
- Overall aesthetic rating was 4.05 out of 5

Type of Day	Total Recreation Users	Recreation Users per Hour
Weekday	686	16.7
Weekend	762	20.6
Holiday	206	17.2
All Days	1654	18.4

FUTURE RECREATION USE

Population Growth Estimates for River Falls, Wisconsin (Zip Code: 54022)

Year	2010	2020	2030	2040	2050[1]
Population	41,019	43,575	46,125	46,825	47,527
Estimated Growth	n/a	6.2%	5.9%	1.5%	1.5%
Population Growth Coefficient	n/a	1.062	1.059	1.015	1.015

Source: WI DOA 2020

[1] A projection was not provided for 2050; the growth projection for 2040 was repeated as an estimation.

Projected Total Recreation Days for Project Area

Recreation Activity	2020 Recreation Assessment		Projected Summer Recreation Days		
	Users Observed	Summer Recreation Days	2030	2040	2050
Walking / Running	628	10,293.6	11,151.6	11,749.0	12,593.1
Canoeing / Kayaking	485	5,645.3	5,464.2	4,969.4	4,494.1
Biking	154	2,512.7	2,663.6	2,741.4	2,888.2
Dog Walking	141	2,188.9	2,318.1	2,352.8	2,388.1
Looking at Dam / Flooding	92	2,158.6	2,286.0	2,320.3	2,355.1
Fly Fishing	44	490.1	492.0	462.9	427.6
Fishing from Shore	39	613.4	615.8	579.4	535.1
Swimming	25	385.4	413.5	429.8	453.7
Skateboarding / Rollerskating	9	173.5	183.7	186.4	189.2
Birding/Nature Observing	8	124.8	132.5	134.9	137.7
Photography	8	134.2	142.4	145.0	148.0
Picnicking	7	65.1	69.1	70.4	72.1
Sightseeing	6	65.4	69.2	70.2	71.3
Berry-picking	3	70.4	74.7	76.0	77.6
Scout River for Fishing	3	70.4	74.5	75.7	76.8
Flying a Drone	2	21.8	23.1	23.4	23.8
Total	**1,654**	**25,014**	**26,174**	**26,387**	**26,932**
Percent Increase	**n/a**	**n/a**	**4.6%**	**0.8%**	**2.1%**

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Gulf South Research Corporation

GSRC

Archaeology Survey

Rachel Klabacka-Williams, TRC

KEY STAFF

Rachel Klabacka-Williams

Has worked in Archaeology since 1999 and has been conducting Hydroelectric Project surveys since 2011

Amanda McMahon

Has worked in Archaeology and has been conducting Hydroelectric Project Surveys since 2015

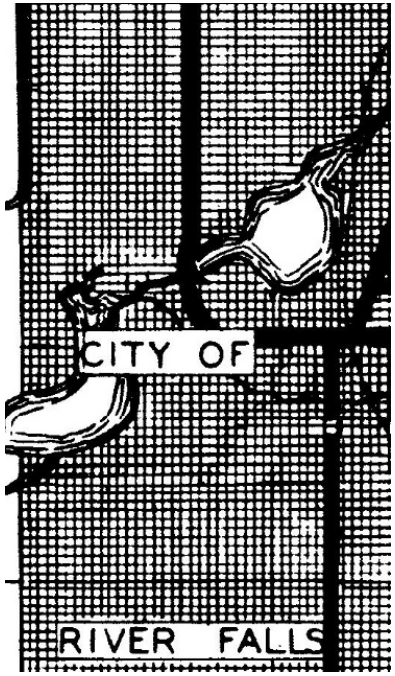
Allen Van Dyke

Has worked in Archaeology since 1973 and has been conducting Hydroelectric Project surveys since 1992

National Historic Preservation Act and Section 106

- **National Historic Preservation Act (NHPA) (*36 CFR Part 800*)**
  - Was enacted in 1966 to require the acting agency to take into account the affects on cultural resources and to establish a program for the Preservation of Historic Properties throughout the Nation.

- **Section 106**
  - Outlines the process and required steps for implementing the NHPA and requires licensees or license applicants to identify all cultural resources and assess the effects on these resources.

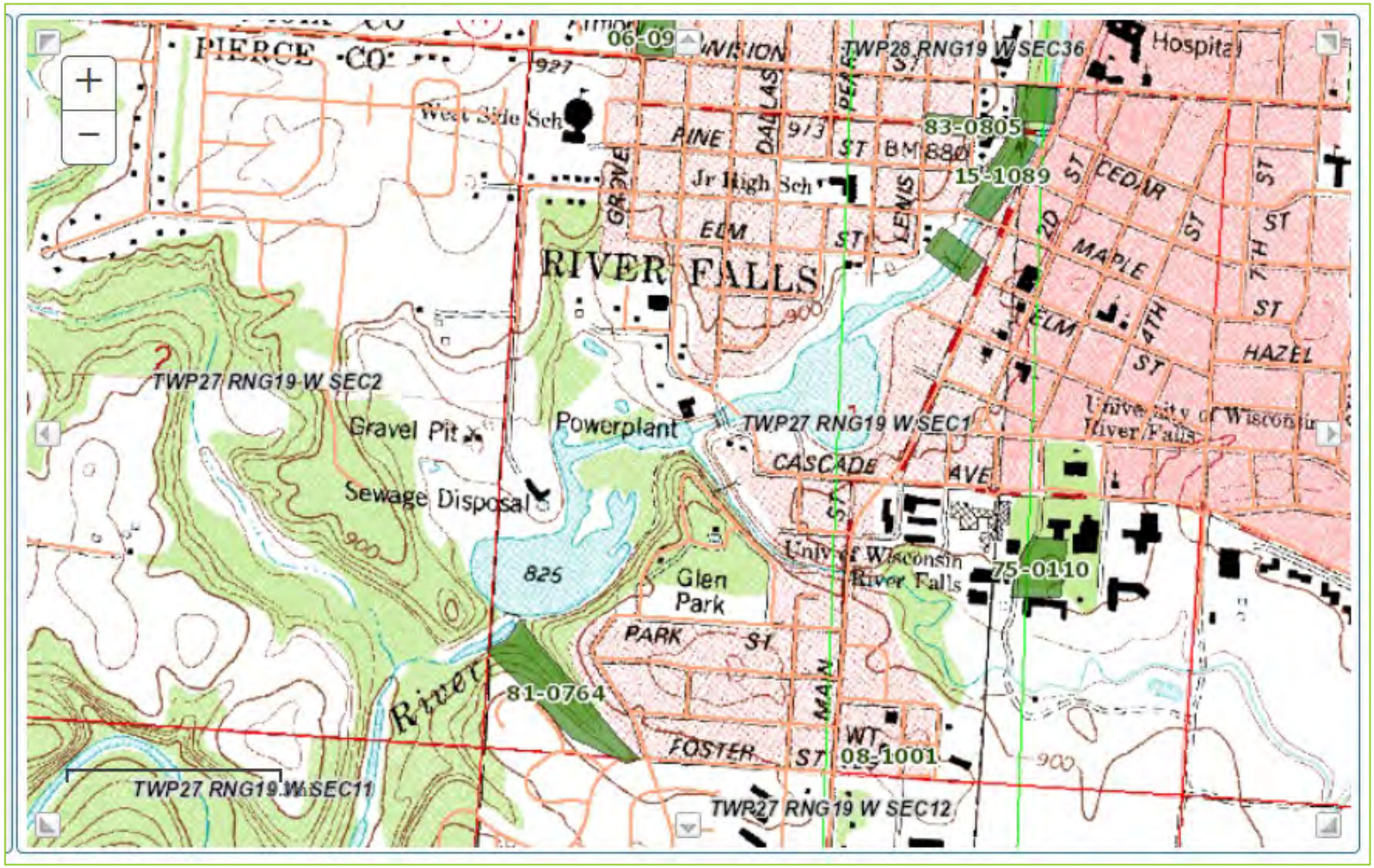


Phase I Archaeological Survey

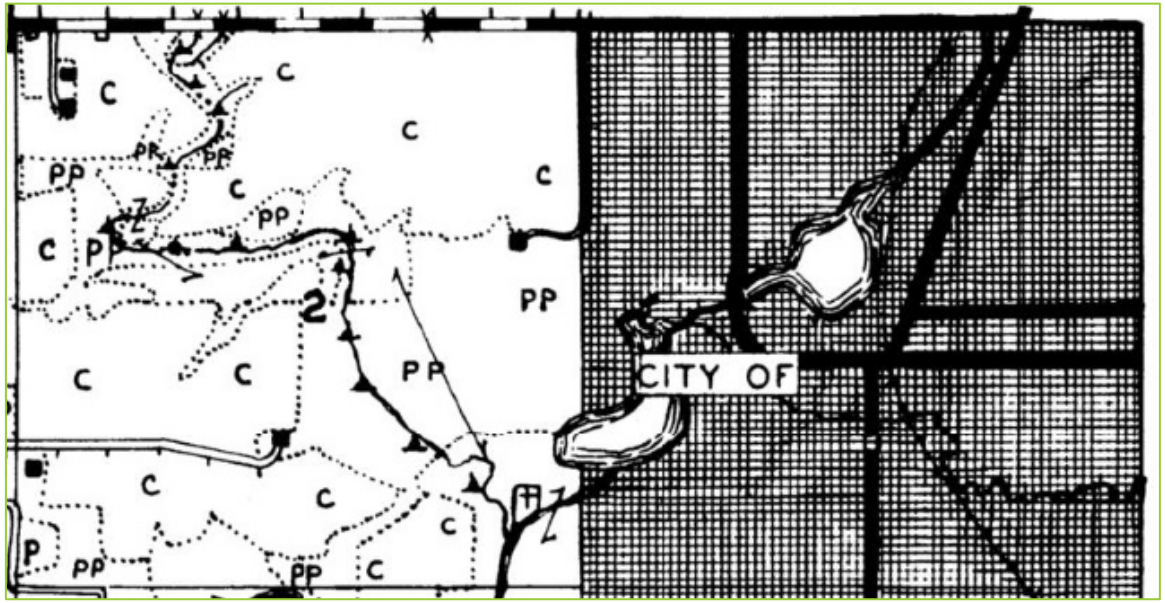
- **Literature and Archives Research**
  - SHPO files - Archaeological Site and Previous Surveys;
  - National Register of Historic Places Inventory;
  - Historic Maps and Aerial Photography;
  - County Histories;
  - Etc…
- **Fieldwork**
  - Shoreline Review;
  - Shovel Testing and Surface Collection.

Literature and Archives Research Results

SHPO Files – Accessed through the Wisconsin Historic Preservation Database



1848 General Land Office (GLO) Survey Plat Map



1947 Wisconsin Land Economic Inventory (WLEI) Plat Map

1939 Aerial Photograph of River Falls, WI

Archaeological Fieldwork Results

Junction Falls

Junction Falls

2020 Survey Map

Shoreline Review

Shovel Test Survey

Powell Falls

Powell Falls

2020 Survey Map

Shoreline Review


DANGER
TURBULENT
WATER

Shovel Test Survey

Conclusions and Recommendations

- **Junction Falls**
  - Visual inspection of the shoreline did not encounter any areas of erosion, the shoreline appears to be well vegetated and stable;
  - Shovel testing did not encounter any subsurface archaeological artifacts or deposits;
  - **Nothing was found and no additional archaeological work is recommended until that stipulated by the Historic Resources Management Plan (HRMP).**

- **Powell Falls**
  - Visual inspection of the shoreline did not encounter any areas of erosion, the shoreline appears to be well vegetated and stable;
  - Shovel testing did not encounter any subsurface archaeological artifacts or deposits;
  - **Nothing was found and no additional archaeological work is recommended for this Project.**

Thank You
and
Questions?

Sediment Study

Pete Haug, Ayres & Ben Lenz, TRC

Powell Falls Dam Removal Sediment Study Ecological Risk Evaluation

Objective 1 – Compare the amount of sediment that could be released downstream of Powell Falls Dam to average releases and determine the level of ecological risk to the downstream geomorphology and aquatic resources.

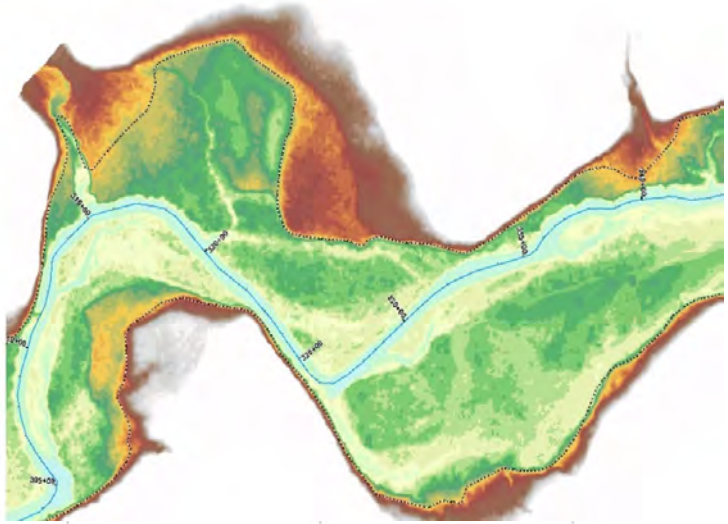
Objective 1 geomorphological risk evaluation

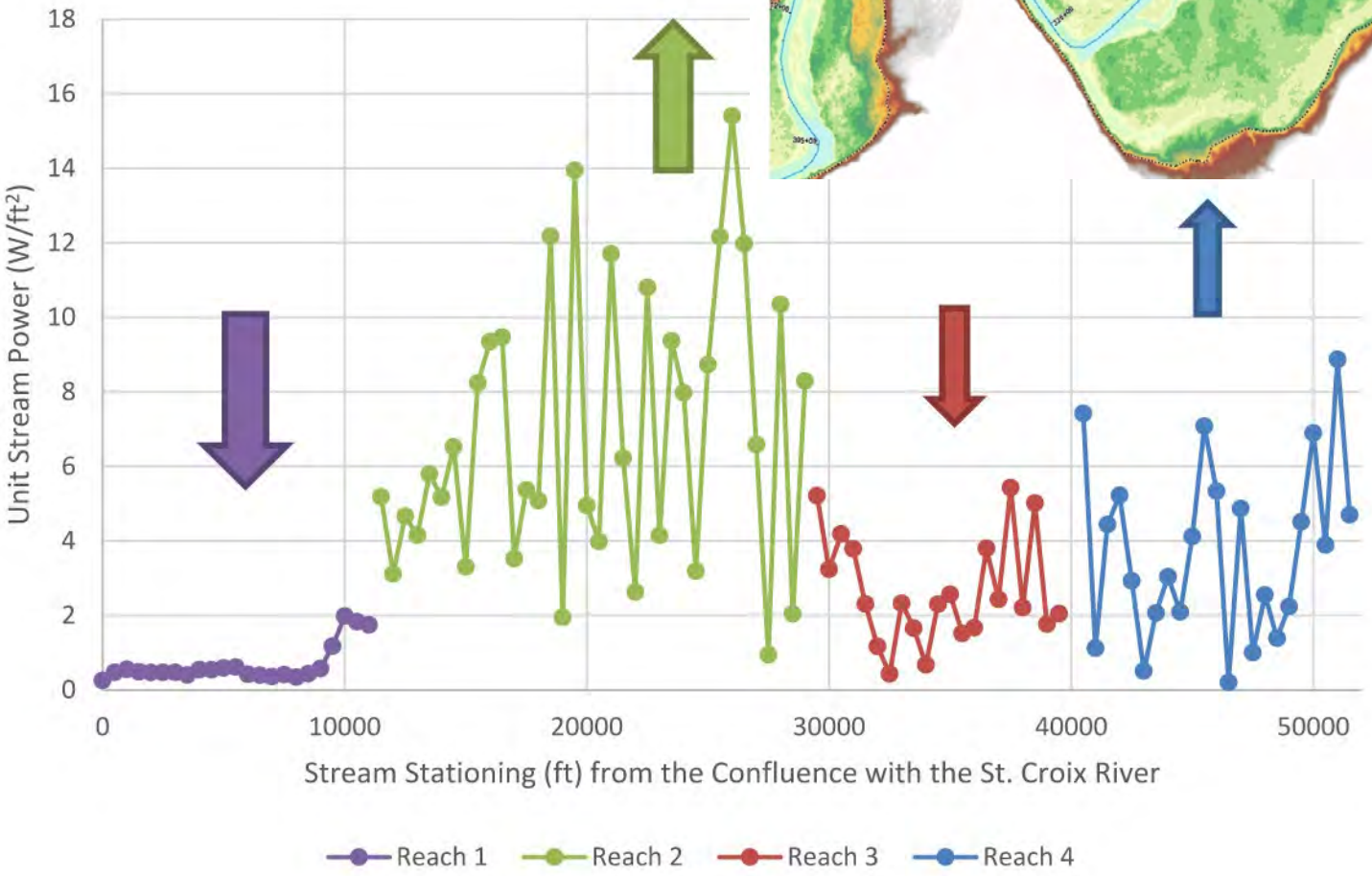
1) Determine existing channel morphology
    a) geomorphologically distinct reaches
    b) description of each reach's sediment capacity
    c) estimate sensitivity to new sediment influx

2) Estimate dam removal impacts
    a) expected average and maximum sediment influx
    b) opinion of Kinnickinnic reach responses
    c) opinion of St. Croix response

Note that this study was planned as a desktop study, but staff did do some field reconnaissance to see conditions following the 2020 flood and better inform how future sediment releases might similarly impact the lower Kinnickinnic.

Existing channel morphology





Existing channel morphology

- Four geomorphologically similar reaches were found
- Stationing numbered per hydraulic engineering convention from mouth of river and heading upstream
- Same reaches as in other studies except the upstream Reach 4 in this study was split into two reaches in the habitat study.

	Channel Slope (ft/ft)	Valley Slope (ft/ft)	Avg Unit Stream Power (Watts/ft^2)	Bankfull Width (ft)	Valley Width (ft)	Alluvial Channel Type
Reach 1	0.0007	0.0008	0.68	73	469	Dune - Ripple / Pool - Riffle
Reach 2	0.0031	0.0035	6.86	57	242	Pool - Riffle
Reach 3	0.0027	0.0032	2.53	48	464	Pool - Riffle
Reach 4	0.0031	0.0035	3.86	52	359	Pool - Riffle

Dam Removal Impacts: Sediment Supply

- Case 1 Studied:
  - Pre-removal = 10,000 tons or more per year
  - +10,000 tons (5000 CY) in Yr 1 after removal
  - Tapering down to +2,000 tons (1000 CY) in Yr 6 after removal
- Case 1 represents the release of 33,000 tons (16,500 CY) during annual flood events.

- Case 2 Studied:
  - Pre-removal = 10,000 tons or more per year
  - +90,000 tons (45,000 CY) in Yr 1
- Case 2 assumes that a 10- year or larger flood comes through the partially removed dam, eroding the full trapezoid of sediment where the future channel is expected within the former Lake Louise.

The USBR dam removal guidance predicts about 1700 tons in the average Kinni sandbar or about 40,000 tons in the non-backwater reaches. In addition, there is no less than 100,000 tons in just the main channel dunes of the lower Kinni near the St. Croix confluence and approximately a million tons in the overbank "delta bar" (discussed later).

Dam Removal Impacts: Sediment Transport

- Case 1 (normal flows):
  - Much of sediment released will transport in channel through same mechanism that is transporting sand after the 2020 flood.
  - Temporary impacts include pool filling, point bar formation, increased sand thickness on inside of meander bends, and some sand deposited on the floodplain during annual flow events.
  - Silt would likely wash through the Kinnickinnic within a couple months; sand may take a few years to travel from dam to St. Croix.
- Case 2 (major flood):
  - As this would happen during a 10-year or larger flood event, much of the sediment would be deposited in the floodplain, inundating current floodplain deposits with several feet of new sand and silt.
  - Because the Kinnickinnic is entrenched with narrow valley margins, there is very little risk of avulsion (major river alignment changes). However, there are areas documented in the report that could experience lateral channel migration during the Case 2 scenario.

Summary of Sediment Capacity: Reach 1

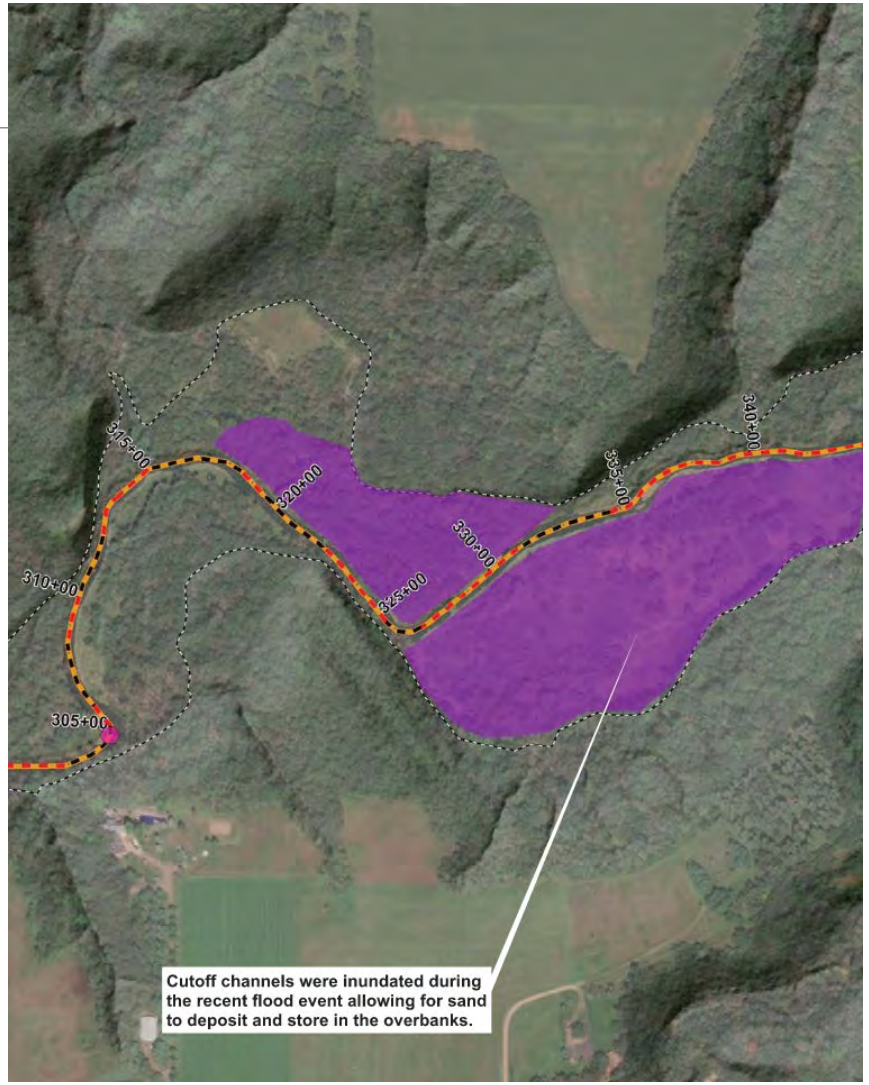
- This reach is downstream near mouth of Kinnickinnic River
- Dune-ripple planforms (sand bed, uniformity in channel, and generally less ecological function and habitat heterogeneity than other reaches
- Significant amounts of stored sand in channel and in overbank near delta
- Expected impacts after dam removal: temporary deposition on top of dune bed and permanent deposition on overbanks.

Summary of Sediment Capacity: Reach 2

- This reach is upstream of CTH F
- Reduced valley width and increased confinement
- Highest stream power between dam and St. Croix is in this reach
- Sand deposits from 2020 flood found in eddies and on point bars.
- Pool-riffle channel throughout
- Expected impacts after dam removal: temporary pool filling but steep reach should flush pools faster than other reaches.

Summary of Sediment Capacity: Reach 3

- This reach is upstream of 1130th Street and continues upstream about 2 miles
- Confinement is less than for Reach 2, so the channel slope and stream power are also reduced.
- Wider valley margins and the confluence of two larger tributary channels dominate this reach.
- Expected impacts after dam removal: permanent deposition on overbank during floods and temporary filling of pools during low flow periods.



Summary of Sediment Capacity: Reach 4

- This reach is from the Powell Falls Dam to about 2.2 miles downstream.
- Riverbed has very little sand from 0 to 600 feet below Powell Falls, mainly exposed bedrock and cobble with some gravel. Some sand is stored on the overbanks, likely from the 2020 flood.
- Expected impacts after dam removal: most changes of any reach, especially within 1000 feet of dam, including temporary filling of pools and possibly permanent changes from a bedrock thalweg below the dam to gravel thalweg and more sand bars between banks.

Dam Removal Impacts: St. Croix Effects

- Current Sediment Capacity:
  - 25,000 tons per year at St. Croix Falls (6240 sq. mile watershed)
  - More than 30,000 tons per year at Prescott (8570 sq. mile watershed)
  - Volume of sand stored in the “delta bar” and bank at the mouth of the Kinnickinnic greatly exceeds the total volume of Lake Louise sediment (by 10x or more).
  - The 2020 flood and dam removal sediment releases will likely have similar impacts to the St. Croix. Permanent impacts are expected to include expansion of the delta bar and thicker channel dunes.

POWELL FALLS DAM REMOVAL SEDIMENT STUDY ECOLOGICAL RISK EVALUATION

Objective 2 - Assess the potential effects on geomorphology and aquatic resources based on the predicted level of ecological risk.

FERC Requirement

Use "*Dam Removal Analysis Guidelines for Sediment*" (Randle and Bounty 2017) and "*Guidelines for Dam Decommissioning Projects*" (USSD 2015)

Objective 2 ecological risk evaluation elements

1) Water quality
2) Downstream aquatic habitat for species of concern
3) Downstream aquatic species or life stages
    a) fish eggs
    b) mussels
    c) invertebrates
4) Riparian vegetation
5) Aquatic species migration
6) Restoration of riverine habitat in reservoir area
7) Restoration of riverine habitat dynamic processes
    a) physical habitat features
8) Ice jams considerations
9) Recreational use

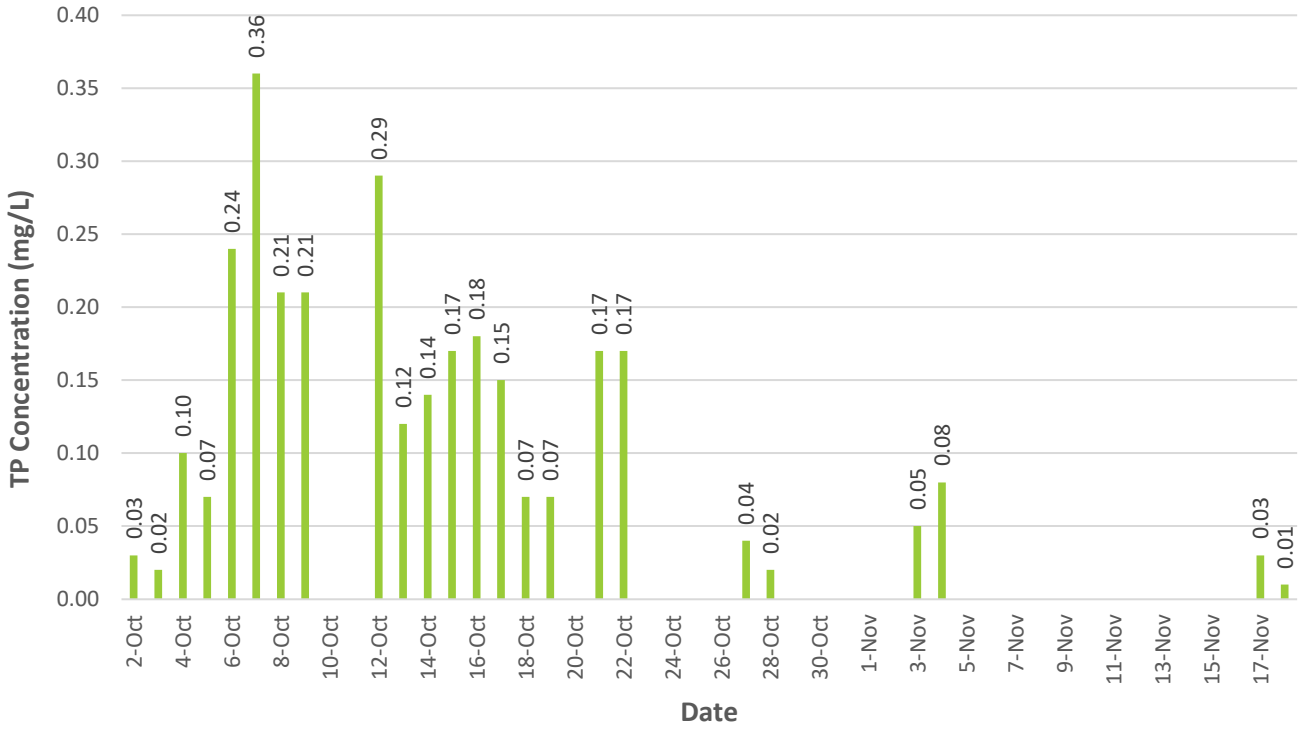
Methods

- Utilize recently collected water data related to the drawdown event.
- Integrate the Objective 1 analysis and relicensing studies results.
- Compare the Powell Falls Dam setting with relicensing studies results and literature-based research.
- Comprehensive qualitative risk and benefit analysis

Objective 2 Results

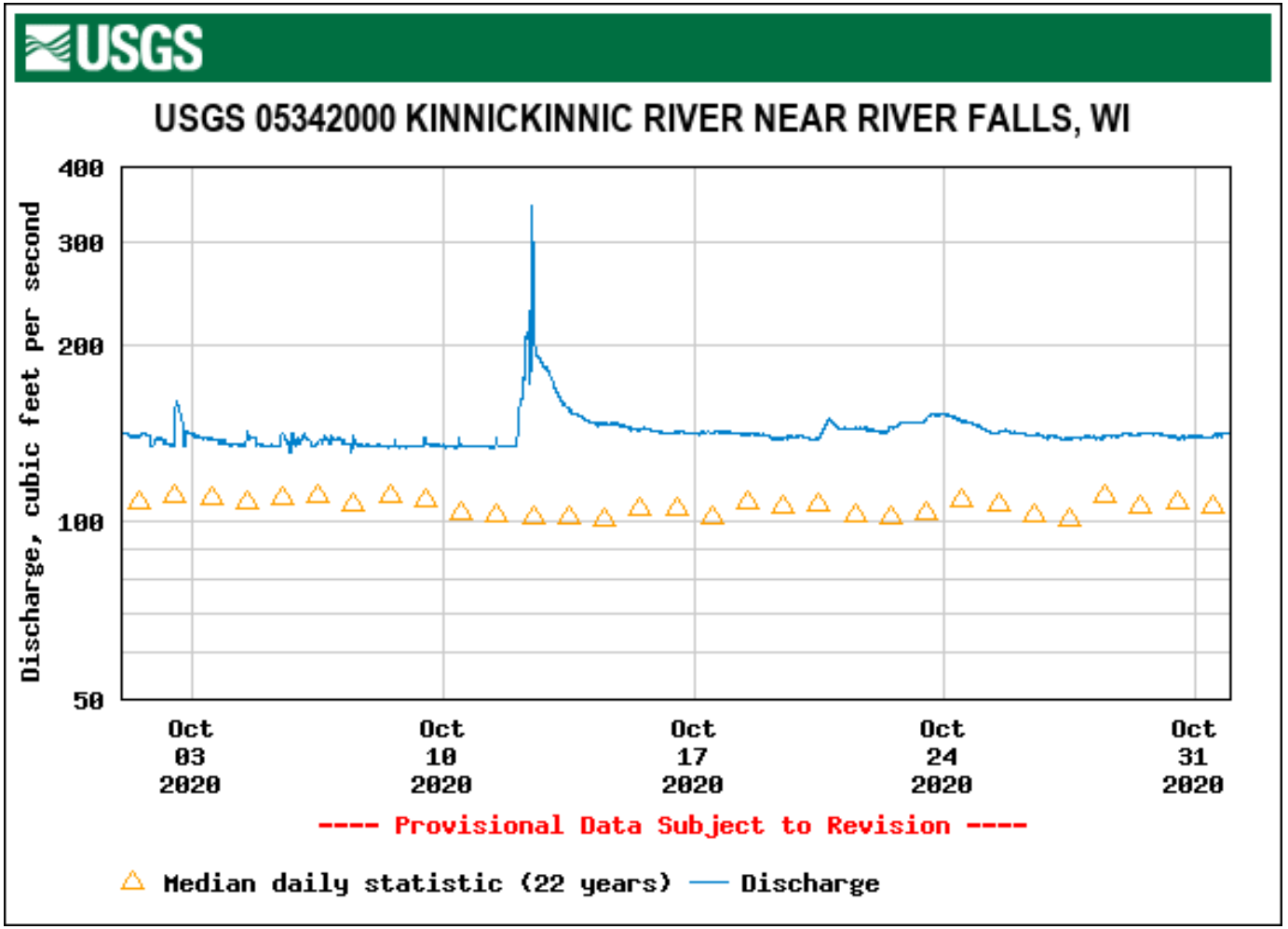
1) Water quality impacts - Phosphorus

- Increase during drawdown
- Primary productivity absent due to end of growing season



Objective 2 Results

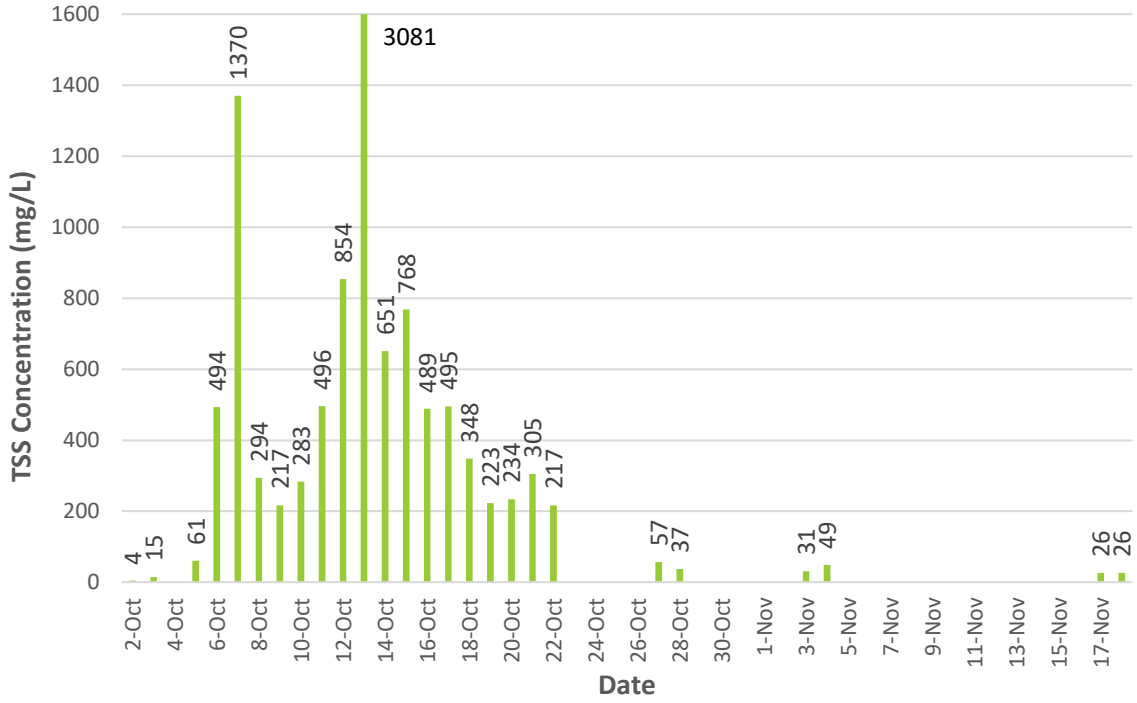
1) Water quality impacts -



Objective 2 Results

1) Water quality impacts - Suspended solids

- Increase during drawdown
- Predicted element



Objective 2 Results

2) Downstream aquatic habitat for species of concern

- Pool depth decrease by fine sediment deposition immediately downstream of Powell Falls
- Riffle features maintained

Source: GoogleEarth, imagery collection date prior to October 2, 2020

Source: Source: Kinnickinnic Corridor Collaborative, https://www.youtube.com/channel/UCB-jCo-8r4iQVowaFzC1UhQ

Objective 2 Results

3) Downstream aquatic species or life stages

a) fish eggs - downstream of Powell Falls, flexibility during early part of spawn season

b) mussels - Absent

c) invertebrates - downstream of Powell Falls, productivity occurred earlier in season, habitat diversity benefits

Objective 2 Results

4) Riparian vegetation - *Palustrine Floodplain Forest*

- Adapted to dynamic nature of disturbance
- Seasonally saturated organic soils
- Mosaic of small patches of vegetation with different species composition and successional stages
- Intolerance to lack of sediment deposition

► **Deposition of fine sediment out of channel benefits riparian vegetation**

Objective 2 Results

5) Aquatic species migration

- No blockages reported by drawdown sediment release or during June flood

Objective 2 Results

6) Restoration of riverine habitat in reservoir area

- Primary benefit of dam removal

A screenshot of drone footage shows the Lake Louise riverbed on Jan. 1, 2021. Photo by Kinni Corridor Collaborative

Objective 2 Results

7) Restoration of riverine habitat dynamic processes
   a) physical habitat features

- bars, islands, large wood features, and side channel activation

Source: GoogleEarth, imagery collection date prior to October 2, 2020

Source: Source: Kinnickinnic Corridor Collaborative, https://www.youtube.com/channel/UCB-jCo-8r4iQVowaFzC1UhQ

Objective 2 Results

8) Ice jams considerations

- Groundwater influence decreases likelihood
- No prior evidence
- Dam removal is a neutral factor

Objective 2 Results

9) Recreational use impacts

- Boat launch downstream of Powell Falls reduced depth

Source: GoogleEarth, imagery collection date prior to October 2, 2020

Source: Source: Kinnickinnic Corridor Collaborative, https://www.youtube.com/channel/UCB-jCo-8r4iQVowaFzC1UhQ

Ecological Risk-Benefit Comprehensive Summary

Impact	Risk		Benefit	
	Short-term	Long-term	Short-term	Long-term
Water quality	M	L	L	H
Sedimentation				
Trout habitat	H	L	L	H
Freshwater mussels	L	L	L	L
Floodplain vegetation	M	L	L	H
Fish movement	L	L	L	H
Impoundment				
Riverine conditions	L	L	M	H
Instream Habitat				
Substrate complexity	H	L	M	M
Invertebrate taxa	M	L	M	M
Ice Jams	L	L	L	M
Recreation	H	L	L	H

Questions

Powell Falls Decommissioning Plan

Pete Haug, Ayres

Powell Falls Dam Decommissioning Plan

Objective – Provide a general overview of decommissioning and schedule.

Specific methods proposed in the Revised Study Plan:

- Discuss dam removal case studies from WI/MN
- Survey site for access and disposal options
- Identify environmental, health, and safety mitigation measures
- Investigate long-term maintenance and monitoring considerations
- Describe sediment management and cofferdam sequencing
- Prepare drawings, schedule, and milestones

Decommissioning Plan: Case Studies

Woodley Dam (40mi from PF)

2009 end of project

Grimh Dam (93mi from PF)

2012 end of project

Decommissioning Plan: Case Studies

Gordon Dam (104mi from PF)

2015 end of project

Minnesota Falls Dam (141mi away)

2013 end of project

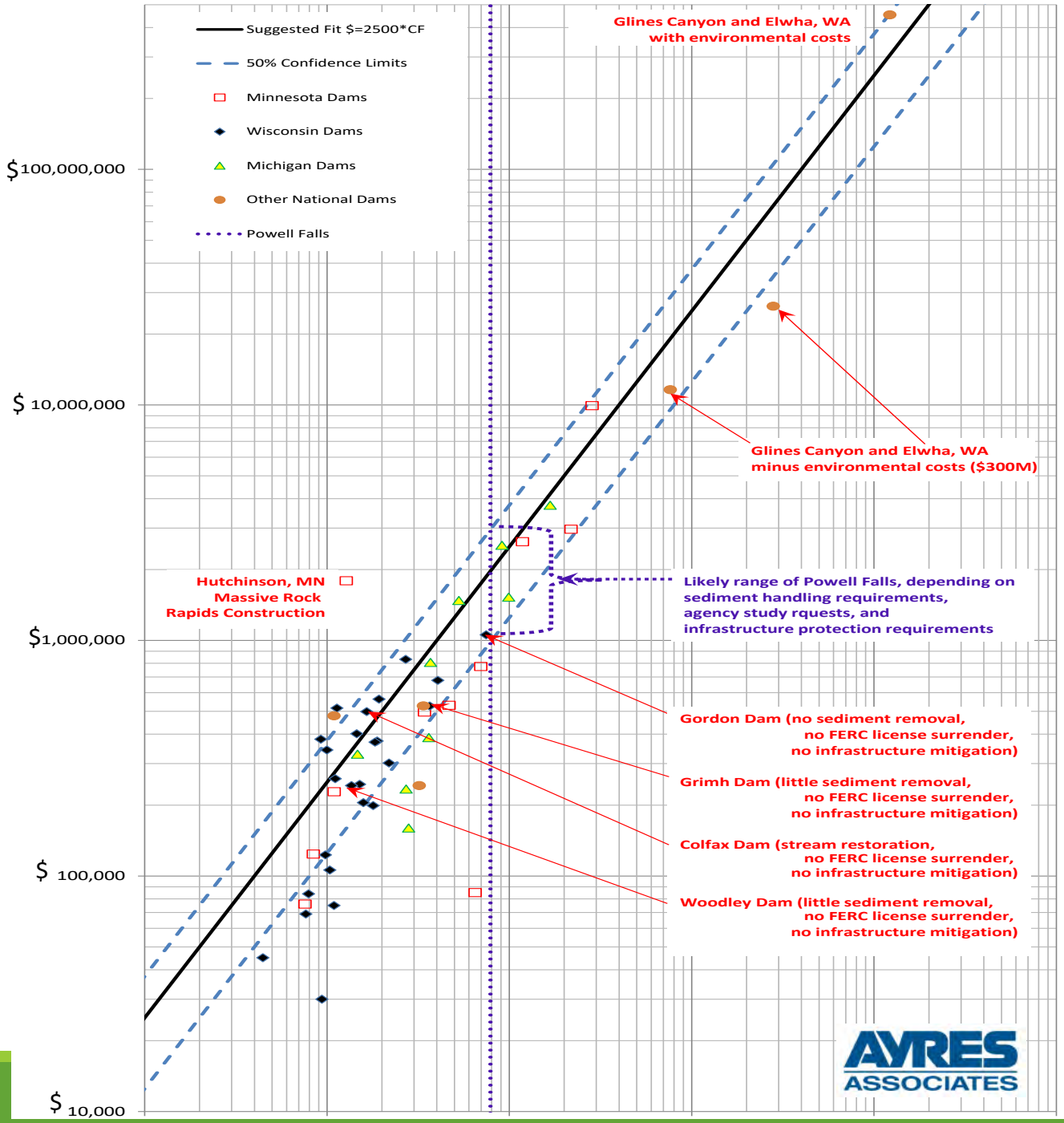
Decommissioning Plan: Case Studies

Lessons learned from Case Studies

- Powell Falls is in the middle of the case studies for costs, sediment in the impoundment, impacts to infrastructure, and construction costs

- Largest contributors to project risk are:
  - Sediment release during construction -> vegetate lakebed early
  - Floods impacting dam removal safety -> post-tensioned sections need to come out completely in stages
  - Excessive dewatering costs -> draw down impoundment and keep it down

- Powell Falls expected costs are a function of project complexity.
- Powell Falls is within the range of previous dam removal complexities.
- Early draw down and early lakebed vegetation will likely result in costs on the low end of this expected uncertainty band.



Decommissioning Plan: Approach

EXPECTED PERMIT CONDITIONS

- Worksite safety signage/fencing
- Controlled rate of drawdown
- Construction equipment cleaning
- Sediment barriers in-stream and on land throughout construction
- Reservoir restoration is two part – quick rooting cover crops and long-term establishment of natives
- 5-year monitoring period for bank erosion

AYRES' RECOMMENDATIONS

- 2+ growing seasons of drawdown prior to removing dam
- Mitigate sediment as reasonably practicable but understand that some sediment release can be accommodated by downstream river
- Sediment removal is cheapest in traps created by turbidity barriers or against the upstream face of dam
- Expect a large flood to occur during construction

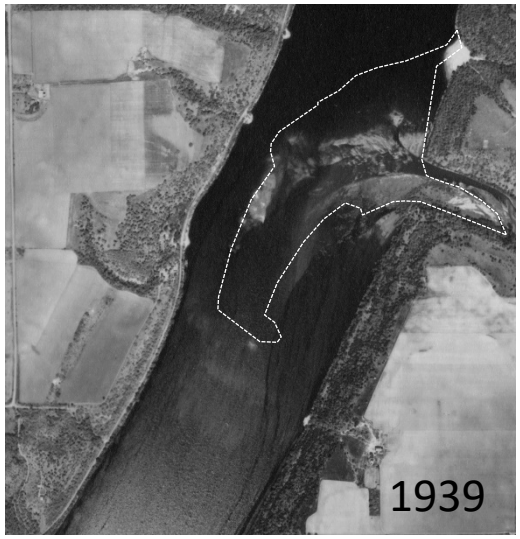
Decommissioning Plan: Sediment Management

SUSPENDED LOAD

- Highly variable suspended load at CTH F bridge
- 733 tons per day on April 2, 1998
- 1 ton per day on multiple dates
- Regressed average = 6400 tons per year
- 7500 tons predicted during the 72 hours of the 2020 flood

BED LOAD

- Ayres found no published values for bed load in the Kinnickinnic
- However, bedload is usually the same magnitude as suspended load for Wisconsin streams – likely 5000 to 10000 tons per year at CTH F bridge.
- To put all this in perspective, the 66 acre “delta bar” contains more than a million tons of sediment.



- The 66 acre “delta bar” likely contains between 600,000 and 1,500,000 cubic yards, which is well over 1,000,000 tons of sediment.
- The maximum expected release from removal of Powell Falls Dam is 33,000 to 90,000 tons.

Decommissioning Plan: Sediment Management

SUMMARY OF SEDIMENT TODAY

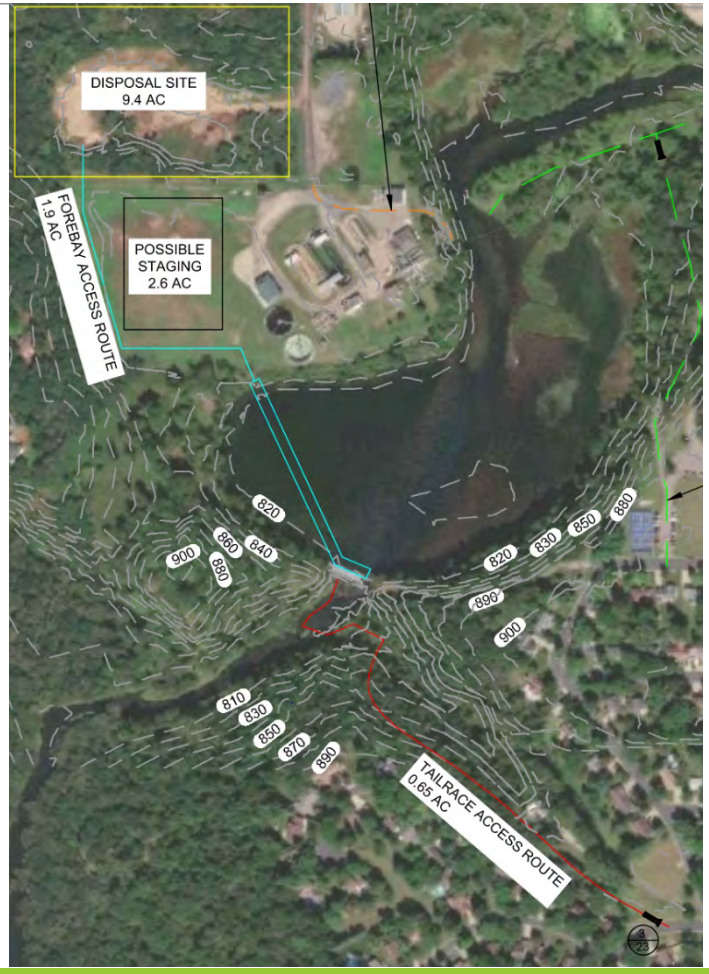
- Annual average sediment release at the dam is estimated to be 10,000 tons per year (suspended + bedload)
- 40,000 tons of bedload is estimated to be stored in the Kinnickinnic's free flowing sections and another 100,000 tons is estimated in the backwater area near the St. Croix.

AYRES' EXPECTATIONS OF SEDIMENT MANAGEMENT

- Suspended + bedload sediment release during construction is expected to be 33,000 to 90,000 tons over the first six years following dam removal.
- Use DNR standard practices for sediment containment and management.
- Drawings show details used on other projects with good success.

Decommissioning Plan: 2021 Activities Expected

- Manually seed lakebed and then aerially seed lakebed
- Permit applications for sediment management and license amendment request
- Construct access route to tailrace
- Sediment management in tailrace
- Naturally dewater lakebed sediments (up to a year process)

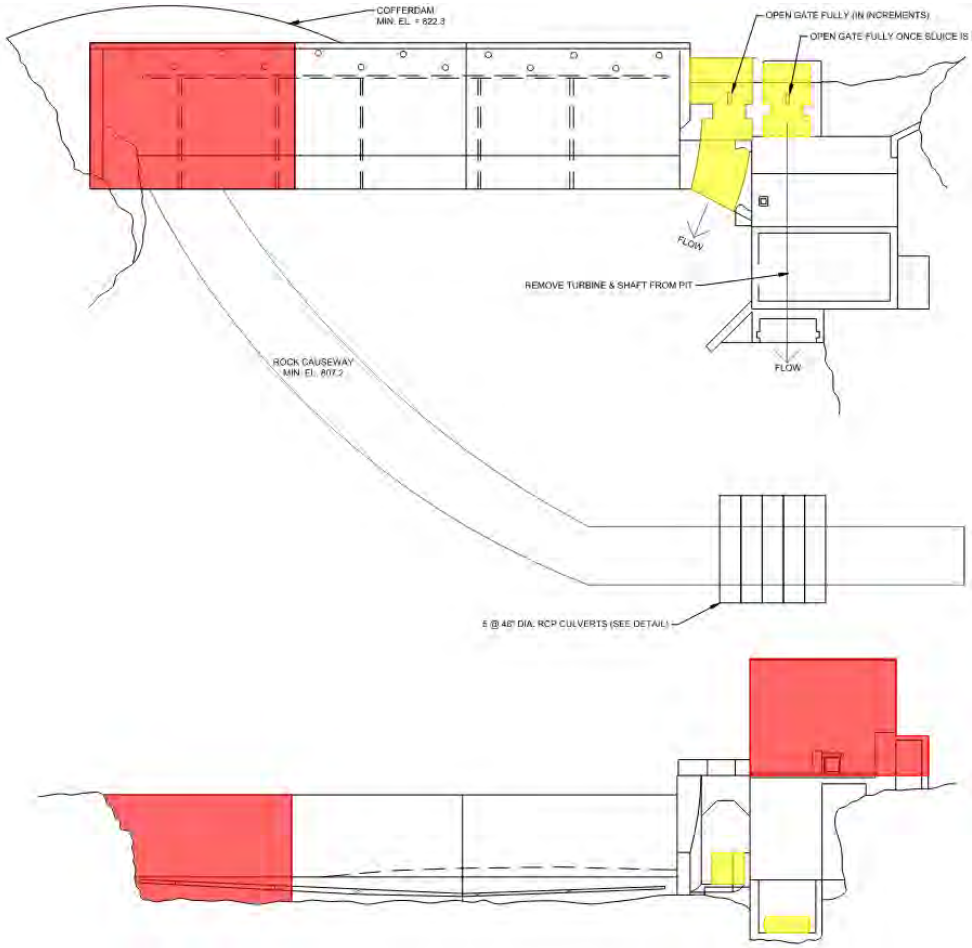


Decommissioning Plan: 2022 Activities Expected

- Monitor lakebed vegetation growth and invasive species
- Monitor and armor sanitary sewer infrastructure as necessary
- Sediment management in tailrace
- Naturally dewater lakebed sediments (up to a year process)
- Finalize dam removal drawings for anticipated WDNR submission
- Finalize lakebed restoration plan

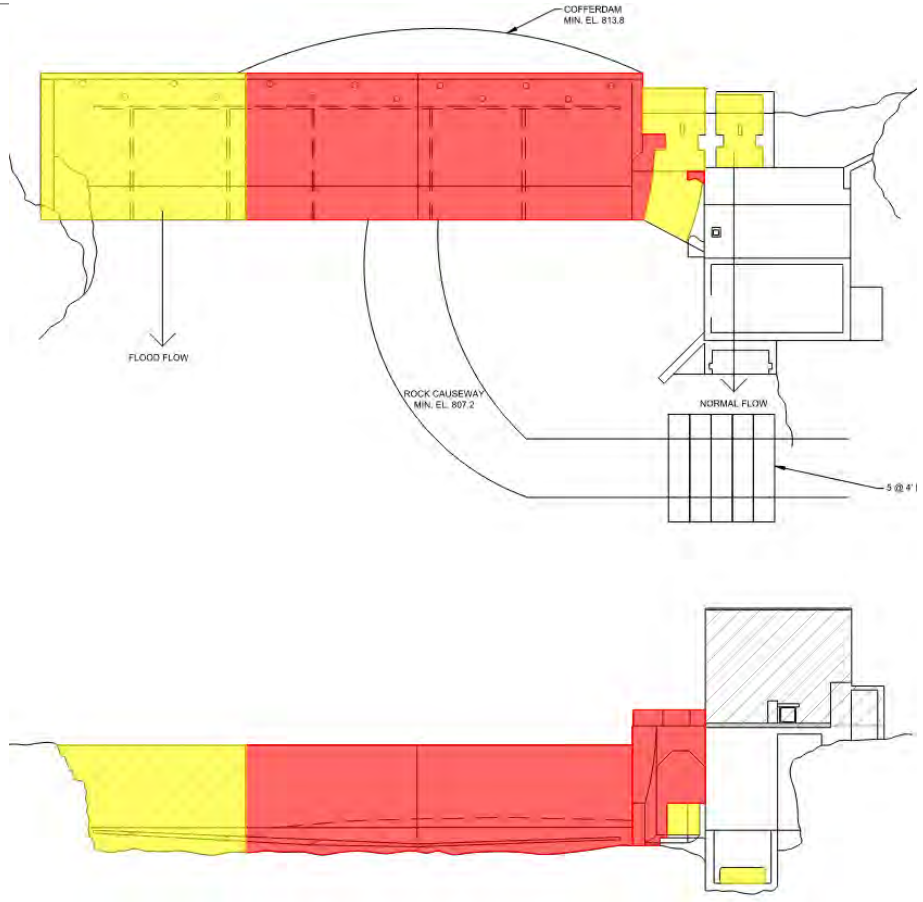
Decommissioning Plan: 2023-4 Activities Expected

- Apply for grants, finalize funding arrangements
- Bid construction project after all permits are in hand
- Build causeway from disposal site to dam
- Remove west end of spillway to allow causeway to come through dam
- Sediment management in tailrace
- Remove top of powerhouse



Decommissioning Plan: 2024-6 Activities Expected

- Implement lakebed restoration plan
- Remove rest of spillway
- Remove sluice gate structure
- Stabilize powerhouse foundation for future reuse
- Remove causeways and access roads
- Remove sediment management system
- Monitor bank erosion and invasive species



Decommissioning Plan: 2026-30 Activities Expected

- Monitor bank erosion and invasive species

Decommissioning Plan: Schedule

- Amendment to remove Powell Falls from the FERC license submitted in 2021
- Sediment containment and management construction starts in 2021
- Dam removal construction permit applications submitted no later than 2022
- Dam removal construction ends no later than 2026

Milestone	Deliverable(s)	Estimated Time of Completion
Initial Study Report Submittal	Draft Decommissioning Plan	January 31, 2020
Initial Drawdown for Inspection	Inspection Report and Refill Options	December 18, 2020
RFMU Workshop on Options for Plan Forward	Decision on Preferred Plan and Schedule for Decommissioning	January 19, 2021
Updated Study Report Submittal	Final Decommissioning Plan	January 30, 2021
Updated Study Report Meeting	Virtual Meeting	February 9, 2021
License Amendment Application Submitted to FERC	Request to remove Powell Falls from existing FERC license	March 2021
Lakebed Seeding (1)	Hand seeding of lakebed	March 2021
Applications Submitted	Permits for sediment management and access road improvements	March 2021
Permits Issued by WDNR and USACE		Late April 2021
FERC Authorization Received to Improve Flow Management and Temporary Abutment Protection	Turbine removed, sluice gate operation improved, right abutment sandbagged	June 2021
Lakebed Seeding (2)	Drone seeding of lakebed	June 2021
Monitoring of Infrastructure	Wastewater line crossings monitored, adaptive management for repair needs	2021-2026 with riprap placed prior to the start of river diversion (large opening)
Sediment Management	Removal of tailrace sediments and installation of sediment trap	Summer 2021
FERC Amendment Decision	FERC decision received	April 2022
Sediment Management Annual Evaluation	Evaluate need to remove tailrace sediments	Annually until dam removal is complete
Final Design of Dam Removal	Plans and Specifications	Fall 2022
Final Restoration Plan	Plans and Specifications	December 2022 [7]
Permit Applications Submitted	Removal permit applications	December 2022 [8]
Contractor Mobilization	Notice to Proceed	June 1, 2023
Dam Removal Completed	Dam removal phase completed	December 31, 2026
Restoration Monitoring, Management, and Implementation	Recreational, Habitat, and Corridor Use Improvements; Invasive Species Monitoring	June 1, 2023 to December 31, 2028

Next Steps

Responsible Party	Pre-Filing Milestone	Date*
All stakeholders	Updated Study Report Meeting	2/9/2021
Licensee	Updated Study Report Meeting Summary	2/24/2021
Licensee	Amendment Application for Powell Falls Surrender	3/15/2021
Licensee	Draft License Application Due	4/3/2021
Stakeholders	Draft License Comments Due	7/2/2021
Licensee	License Application Filed	8/31/2021
Licensee	Public Notice of License Application	9/14/2021

*Dates based on FERC Revised Process Plan and Schedule issued on 7/10/2019

Final Thoughts & Questions

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