Program Abstracts
22st Annual

RAINY-LAKE OF THE WOODS
WATERSHED
2025 FORUM

March 12 - 13, 2025

Minnesota North College, Rainy River Campus
501 U. S. Hwy 71, International Falls, MN

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The organizing committee thanks our 2025 sponsors for assisting with the 22nd annual International Rainy-Lake of the Woods Watershed Forum. This event would not be possible without them:

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- Minnesota Pollution Control Agency
- Jefferson National Parks Association in cooperation with Voyageurs National Park
- Lake of the Woods District Stewardship Association
- Rainy Lake Conservancy
- Rainy Lake Property Owners Association
- Voyageurs Conservancy

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10:20	0:20	Canada Water Agency Lake of the Woods Freshwater Ecosystem Initiative Update Daniel Rokitnicki and Kelly-Anne Fagan
10:40	0:20	International Multi-Agency Arrangement – Priorities Update & Core Monitoring Program Development Mike Kennedy, IMA-TAC Co-chair
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14:30	0:20	Improving Walleye and Lake Whitefish Performance Indicators for Lake Water Level Management on Rainy – Namakan System Benjamin Erb et al.
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15:40	0:20	Developing a phosphorus management plan for the Canadian portion of the Rainy-Lake of the Woods basin: Update Teika Newton
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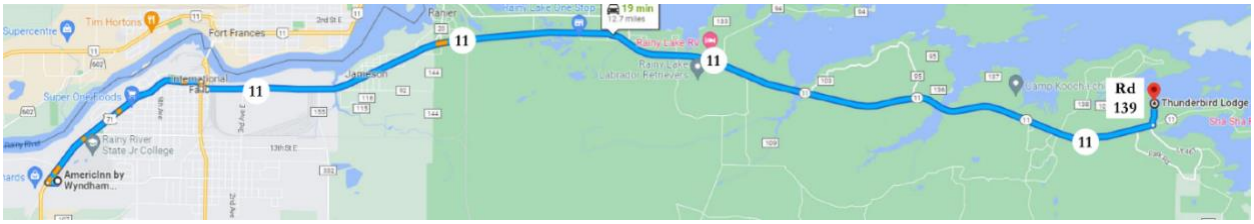
16:30	0:30	**Travel to Thunderbird Lodge**
17:00		**Reception and buffet dinner at Thunderbird Lodge on Rainy Lake** **Awards Presentations:** Kallemeyn Science Award, Wilson Stewardship Award

AmericInn & College → **12 miles / 20 minutes** → **Thunderbird Lodge**
Highway 11 East **Rd 139**



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15:00		**Forum Ends**

Organizing Committee

Teika Newton
Executive Director
Lake of the Woods Water Sustainability Foundation
P.O. Box 112, Kenora, ON P9N 3X1
teikanewton@lowwsf.com

Meghan Mills
International Watershed Coordinator
Lake of the Woods Water Sustainability Foundation
P.O. Box 112. Kenora, ON P9N 3X1
meganmills@lowwsf.com

Andrew Paterson
Research Scientist
Ontario Ministry of Environment, Conservation and Parks
PO Box 39, Dorset, ON POA 1EO
andrew.paterson@ontario.ca

Jesse Anderson
Minnesota Pollution Control Agency
525 Lake Avenue South Suite 400
Duluth, MN 55802
jesse.anderson@state.mn.us

Mike Kennedy
Minnesota Pollution Control Agency
525 Lake Avenue South Suite 400
Duluth, MN 55802
mike.kennedy@state.mn.us

Kelly Sjerven
Biology Instructor
Minnesota North College – Rainy River
1501 Hwy 71, International Falls, MN
kelly.sjerven@minnesotanorth.edu

Lucas King
Territorial Planning Unit,
Grand Council Treaty 3
lucas.king@treaty3.ca

Kayla Bowe
Water Resources Program
Red Lake Department of Natural Resources
P.O. Box 279. Red Lake, MN 56671
kayla.bowe@redlakenation.org

Ryan Maki
Aquatic Ecologist
Voyageurs National Park
360 Highway 11 East, International Falls, MN 56649
ryan_maki@nps.gov

Diana Fred
Environmental Scientist
Environment and Climate Change Canada
150 Main Street, Winnipeg, MB R3C 4W2
diana.fred@ec.gc.ca

Matthew Julius
St. Cloud State University
Department of Biological Sciences
WSB-225, 720 Fourth Avenue South
St. Cloud, MN 56301-4498
mljulius@stcloudstate.edu

Reuben Wagenius
St. Cloud State University
ITV/Video Conferencing
MC 220-15 St. Cloud, MN 56301-4498
reuben@stcloudstate.edu

Todd Sellers
Director
Lake of the Woods Water Sustainability Foundation
P.O. Box 112. Kenora, ON P9N 3X1
tsellers@waverleygroup.com

Day 1 – March 13, 2025

Session 1 – Watershed Governance

IJC / International Rainy-Lake of the Woods Watershed Board Update

Co-Chairs: Jennifer Vincent[1] and Col. Eric R. Swenson[2]

[1]Environment and Climate Change Canada; [2]U.S. Army Corps of Engineers

Abstract

The presentation reviews the International Joint Commission's International Rainy-Lake of the Woods Watershed Board mandate and provides updates on the Board's activities from April 2024 to date. The role and activities of the Water Levels Committee will be discussed, with particular focus on how water levels are managed across the watershed. This presentation will also cover the Board's aquatic ecosystem health endeavors, with a special focus on working with the International Joint Commission and Governments to reduce phosphorus and address toxic algae. Current International Watershed Initiative projects such as Phase 2 of the Objectives and Alerts Project and Core Monitoring Program, the South Shore Erosion investigation, and the adaptive management of the Rainy – Namakan boundary waters will be discussed.

Brief Bio

Jennifer Vincent is the Canadian Co-chair of the International Rainy-Lake of the Woods Watershed Board (IRLWWB) serving alongside her counterpart U.S. Co-Chair Col. Eric Swenson. Jennifer is the Executive Director of Ontario for the Freshwater Management Directorate of the newly created Canada Water Agency (CWA). In her role with the CWA, Jennifer has experience working on the Lake of the Woods Freshwater Ecosystem Initiative, integrating the science, governance and stewardship activities in the basin to restore and protect water quality and ecosystem health in the lake. She brings 25 years of experience in water quality and management to her new role with the Board and has a background in Environmental Sciences (Masters at the University of Guelph, ON) and in Biology (Bachelors at the Wilfrid Laurier University, ON).

Colonel Eric R. Swenson is the Commander and District Engineer, U.S. Army Corps of Engineers – St. Paul District and is on assignment to Maui for the wildfire recovery efforts. Karl Jansen (former Commander of the St. Paul District and Co-Chair of the International Rainy-Lake of the Woods Watershed Board, the Water Levels Committee, the International Lake of the Woods Control Board, and the International Red River Watershed Board. He was also an alternate member of the International Souris River Board) now serves as the St. Paul District deputy district engineer and is the IJC appointed Alternate to COL Swenson on IJC Boards. The district serves the American public in the areas of navigation, flood risk management, environmental enhancement, water and wetlands regulation, recreation sites and disaster response.

Location of Study

The Board's geographic mandate includes the entire Rainy-Lake of the Woods Watershed.

Canada Water Agency Lake of the Woods Freshwater Ecosystem Initiative Update

Daniel Rokitnicki[1], Kelly-Anne Fagan[2]

[1]Canada Water Agency, Burlington, ON, Canada
[2]Canada Water Agency, Toronto, ON, Canada

Abstract

The Canada Water Agency has coordinated the implementation of the Lake of the Woods Freshwater Ecosystem Initiative (LOW FEI) since 2023, building on a foundation of science, assessment, and engagement. The LOW FEI continued core programming in 2024 focused on science and new support for projects that take action to reduce phosphorus loads to the lake. This presentation will provide an update on progress in the delivery of a renewed and expanded program in Lake of the Woods and the initiative's goals and next steps.

Brief Bio

Daniel Rokitnicki is a Program Coordinator in the Freshwater Management Directorate of the newly established Canada Water Agency (CWA). Daniel coordinates activities for the CWA's Lake of the Woods Freshwater Ecosystem Initiative (FEI), which is focused on the most pressing challenge affecting water quality and aquatic ecosystem health in this Rainy-Lake of the Woods basin: preventing toxic and nuisance algae. In this role, Daniel coordinates activities related to program implementation, partner engagement, and administering the new funding stream that supports taking action to reduce phosphorus loads to Lake of the Woods. He is also a former Canadian secretary to the IJC's International Rainy-Lake of the Woods Watershed Board.

Location of Study

Rainy-Lake of the Woods basin.

International Multi-Agency Arrangement – Priorities and Activities Update

Mike Kennedy

Minnesota Pollution Control Agency

Abstract

This presentation will provide background information, as well as updates on the priorities and activities from the past year from the International Multi-Agency Arrangement, its Technical Advisory Committee and its three subcommittees: Aquatic Invasive Species; Water Quality, Nutrients & Contaminants; Core Monitoring & Collaborative Research Needs.

Brief Bio

Mike Kennedy is a member of the International Multi-Agency Arrangement (IMA) Work Group and a co-chair of the IMA-Technical Advisory Committee. He holds a B.S. from Bemidji State University and a Masters from University of Minnesota. Mike has worked for the Minnesota Pollution Control Agency for over 25 years in environmental education and water quality.

Location of Study

Rainy-Lake of the Woods basin

Session 2 – Aquatic Invasive Species

Susceptibility Index for Zebra Mussels in Lakes (SIZL): A Voyageurs National Park case study of a multiple factor risk assessment method for zebra mussel establishment based on water quality

Smith, J.C[2]., Christensen, V.G.[1], Katona, L.R.[1], Trompeter, H.E[1]., Maki, R.P[2]., Sandborn, D.E[3].

[1]U.S. Geological Survey Upper Midwest Water Science Center, 5840 Enterprise Drive, Lansing, MI 48911
[2]National Park Service, Voyageurs National Park
[3]Large Lakes Observatory, University of Minnesota - Duluth

Abstract

To predict the likelihood of zebra mussel establishment in lakes, many previous studies used single water-quality parameters. We used single-factor methods and multiple factor methods in a case study from Voyageurs National Park. These multiple factor mussel establishment assessment methods included our own Susceptibility Index for Zebra Mussels in Lakes (SIZL) and aragonite saturation state. Water was sampled at 30 sites in the park in 2023 for a variety of water-quality conditions, including parameters that affect mussel survival. Our 2023 results were combined with existing datasets to determine locations that are at greatest risk for the establishment of zebra mussels. The compiled results indicate that physical lake characteristics and water-quality conditions put the large, interconnected lakes in the park at greater risk of zebra mussel establishment than the smaller interior lakes. Mukooda and O'Leary Lakes were identified as the interior lakes most at risk for zebra mussel establishment, although these lakes along with all other sampled interior lakes had alkalinity and calcium concentrations below thresholds conducive to zebra mussel establishment. Sullivan Bay in Kabetogama Lake was the most at risk area in the large lakes. Lakes and areas at risk were similar between methods, but the more holistic multi-factor assessment might better represent the likelihood of zebra mussel establishment compared to single-factor methods. Resource managers could use the results of the SIZL method or other information from this study to focus additional inspections, decontaminations, and regulations to protect the most at-risk areas. Multiple factor methods, such as SIZL, may be an option for zebra mussel risk assessments in other lakes.

Brief Bio

James Smith is a biological science technician at Voyageurs National Park. James' position is shared between the park, where he works on long term water quality monitoring in the waters in and surrounding Voyageurs, and the Great Lakes Network where he assists in region wide aquatic ecosystem monitoring. James is originally from Anchorage, Alaska where he grew up paddling, camping, and snowboarding. James started his career at Izembek National Wildlife Refuge in Alaska and has worked in south Texas, New Mexico, and Oregon. James is thrilled to be at Voyageurs and is most excited to enjoy evenings paddling calm waterways and collecting popular hot dish recipes to make his own.

Location of Study

Voyageurs National Park lakes

Efficacy of treatment methods used in wetland restoration and control of hybrid cattail in Northen Minnesota

Haley Smith[1], Windels,S[1], Warmbold, J[1]

[1]Voyageurs National Park

Abstract

Invasions of non-native hybrid cattails (*Typha x glauca*) have a cascade of negative impacts on wetlands in the southern boreal forest systems of northern Minnesota's lakes. These aggressive monocultures outcompete local shoreline, emergent, and submergent plant communities. To maintain the ecosystems crucial to fish and bird communities of northern Minnesota, the Voyageurs Wetland Restoration Program was initiated in 2016. Using an adaptive management framework, the project has trialed numerous restoration methodologies in the 88,000-hectare areas that make up Voyageurs National Park. Pre-and post vegetation assessments have taken place within treatments areas, and now include post-treatment follow up monitoring dating back to 2017. Analysis indicates that the use of total removal of floating mats have the largest impact on decrease of *T. x glauca* percent cover (a 99.2% decrease), and results of the decrease maintain over the course of the six-year monitoring window thus far. Rush cover class, a crucial nesting habitat for some secretive marsh birds, was also shown to be positively impacted by total removal and burning (1139% and 40% increase, respectively). Six treatment methodologies will be discussed. This project has gone through multiple phases, and novel treatment techniques yet to be trialed as well as future direction will also be discussed.

Brief Bio

Haley Smith is the Wetland Ecologist at Voyageurs National Park where she focuses on restoration of ecosystem functions within wetlands. She has worked extensively in plant ecology and restoration work, with special focuses on plant disease ecology and climate change adaptability. Prior to her work at Voyageurs National Park, she worked as a restoration horticulturist in the Pacific Northwest for the U.S. Forest Service. She has also worked in surface coal mine restoration in Appalachia. She received her B.S. from Oklahoma State in Forestry, and M.S. from the University of Tennessee in Plant Pathology. She would like to remind you that everything you love about a lake starts in a wetland.

Location of Study

Voyageurs National Park

Clean Your Johnson (motor) and other programs in AIS Prevention in Cook County, MN

Amanda Weberg

Cook County Minnesota Soil and Water Conservation District, 411 W Second St Grand Marais MN 5564
Amanda.weberg@co.cook.mn.us

Abstract

Cook County, MN is bordered by Lake Superior, Canada, and the Boundary Waters Canoe Wilderness Area making it the best place to work in AIS prevention. Humor has been essential to get residents to remember AIS prevention methods and this talk details the program's successes and challenges. The "Clean Your Johnson" campaign has been a staple in business bathrooms since 2016. Attend this session if you want to learn the silly ways AIS education works in the tip of Minnesota's arrowhead.

Brief Bio

Amanda Weberg is the Aquatic Invasive Species Program Supervisor for Cook County, MN Soil and Water Conservation District in Grand Marais, MN. The position started eight years ago with Amanda developing AIS programming using the Minnesota AIS prevention aid. Prior to working in the wonderful world of AIS prevention Amanda has been a freshwater mussel histologist at Virginia Tech, a water chemist at the Center of Limnology in Boulder, CO, and a Lake Superior zooplankton and macroinvertebrate specialist. Amanda will give an overview of Cook County, Minnesota's various AIS prevention plan objective implementations.

Location of Study

Cook County, Minnesota

Session 3 – Monitoring and Adaptive Management

Grand Council Treaty #3 Environmental Monitoring Initiatives

Michaela Novak*, Nick Norris*, and Laine Fyke*

Zhaagimaa Waabo Territorial Planning Unit. Grand Council Treaty #3. PO BOX 1720, Kenora, ON P9N 3X7

Abstract

The Territorial Planning Unit (TPU) of Grand Council Treaty #3 works to protect and preserve the traditional lands and waters of the Anishinaabe Nation of Treaty #3. The TPU leads environmental monitoring programs for water quality, invasive species, climate impacts, and species at risk (SAR) with Treaty #3 communities. The Community-Based Monitoring (CBM) Program has been running since 2018, in which baseline water quality data is collected along with water samples for heavy metals, nutrients, and contaminants such as *E. coli*. As of 2024, the CBM Program includes climate monitoring for weather, precipitation, ice, and long-term water quality trends. In 2024, the TPU expanded testing for Zebra Mussel veliger presence in Treaty #3 waters. A total of 68 samples were taken with no veligers found. DNA testing for the invasive *Phragmites* increased this year, and a total of 84 DNA samples were taken from roadside locations across Treaty #3 and physical characteristics of *Phragmites* stands were also assessed for patterns in physical appearance. Outside of field-based monitoring the TPU has started to create a Treaty #3 SAR website to build community SAR protection capacity through easy access to SAR related education, policy, and recovery strategies.

Brief Bio

Michaela Novak earned a B.Sc. in Biology and a Certificate in Indigenous Studies from Dalhousie University, in which she focused on the protection of aquatic species while incorporating holistic methods of conservation. She is the Invasive Species Coordinator for Grand Council Treaty #3, leading monitoring for terrestrial and aquatic invasive species across Treaty #3 Territory.

Nick Norris is an Environmental Monitoring Coordinator with the Territorial Planning Unit based in Dryden, Ontario. He coordinates species at risk monitoring territory-wide and assists with the CBM water quality program focused on the Eastern portion of Grand Council Treaty #3. He has spent many years utilizing the hands-on learning method, starting in baseline monitoring programs on his home rez of Wabigoon Lake Ojibway Nation.

Laine Fyke is an Environmental Monitoring Coordinator with the Territorial Planning Unit of Grand Council Treaty #3. She coordinates the Community Based Water and Climate Monitoring Program with the Treaty #3 communities to assess water body health across the territory and collect baseline climate data. Laine earned a B.Sc. in Physical Geography from the University of Manitoba, where she focused on hydrology and climate science.

Location of Study

Eagle Lake, Island Lake, Kenora ON, Dryden ON, Fort Frances ON, Lake of the Woods, Wabigoon Lake, Laurenson's Creek, Rainy Lake, Rainy River, Winnipeg River, Grassy Narrows Lake, English River, Big Grassy River, and many more areas in Treaty #3.

On the ongoing Rainy River and Rainy-Namakan Integrated Ecosystem Response Models (IERMs) update into the Integrated Social Economic and Environmental (ISEE) system and outcomes

Marianne Bachand*, Olivier Champoux, Audrey Moffett, Patrice Fortin, Émile Chouinard, Nicolas Fortin, Gabriel Poirier, Jean Morin.

Hydrodynamic and Ecohydraulic section, National Hydrological Services, Environment and Climate Change Canada, 801-1550, Ave d'Estimauville, Québec, QC, G1J 5E9, Canada marianne.bachand@ec.gc.ca

Abstract

During the 2013-2018 Rainy-Namakan 2000 Rule Curve (2000RC) Study, ECCC developed two integrated modeling systems called Integrated Ecosystem Response Model (IERM). They were used to evaluate environmental impacts of rule curves, one IERM specific to the Rainy River and another one for the Rainy Lake and Namakan Chain of Lakes (Namakan Reservoir). In recent years, the same team involved in the legacy IERMs have built a similar, but faster, modular, and shareable tool known as the Integrated Social Economic and Environmental (ISEE) system for the Lake Champlain-Richelieu River and the Lake Ontario and St. Lawrence River. Like the IERM, the ISEE system is also designed to quantify the benefits and drawbacks of alternative rule curves by using Performance Indicators (PIs). However, the ISEE system not only allows calculation of the PIs for assessing flood impacts on the ecosystems as the IERM does, but also on economics (e.g., damage to buildings, flooded roads) and social issues (social and territorial sensitivity). It uses a georeferenced database and a collection of open-source Python scripts designed to model PIs in aquatic and riparian areas, and to evaluate management scenarios that consider long-term hydrological variability. The ISEE system relies exclusively on free, open-source Python libraries, which facilitates migration, updates, and the development of a sustainable structure for sharing and collaborating with partners and organizations. Outputs from ISEE can also be integrated easily in visualization tools such as dashboards and story maps. Developers from ECCC are now finalizing the update phase of the Rainy River and Rainy-Namakan modeling from the IERM to the ISEE system in support of the International Rainy-Lake of the Woods Watershed (IRLWW) Board - Adaptive Management Committee (AMC).

During the last two years, the Rainy-Namakan IERM to ISEE system migration included result validation of all the PIs to ensure they are consistent with those of the 2000RC Study, and eventually with the expected benefits of the 2018RC. New datasets were also gathered from various partners and organizations, including original bathymetry data, allowing the upgrade in both Rainy River and Rainy Lake-Namakan Reservoir, of crucial physical models that are the very basis of all the PIs (e.g., Digital Elevation Model, etc.). Additionally, collaborative work with researchers, First Nations and National Park was and are being undertaken to improve the modeling system and develop new PIs in subsequent years. This work in progress is intended to support the protection of wildlife species that hold deep cultural and socioeconomical importance and help better consider local priorities regarding water management.

Brief Bio

Dr. Bachand serves as a Project Coordinator in the Hydrodynamic and Ecohydraulic Section (HES) at Environment and Climate Change Canada (ECCC). She earned her Ph.D. in plant biology from Université Laval in 2013, focusing on the resilience of boreal forests to deer overabundance. Following her doctoral studies, she transitioned to ecohydraulic modeling during her postdoctoral research. Dr. Bachand has developed various habitat models for different species and a wetland model used in evaluating the 2000 Rule Curves for the Rainy Lake and Namakan Reservoir System. Since 2016, she has held her current position, contributing to the creation of additional habitat and wetland models for water bodies along the Canada-U.S. border, including Lake Champlain-Richelieu River Basin, St. Marys River, St. Lawrence River, and Lake Ontario. These models support water-level management, climate change impact assessments, and evaluations of flood mitigation measures.

Location of Study

Rainy and Namakan reservoirs

Improving Walleye and Lake Whitefish Performance Indicators for Lake Water Level Management on Rainy – Namakan System

Benjamin Erb[1], Andrew Hafs[1], Marianne Bachand[2], Audrey Moffett[2], Ryan Maki[3]

1 Bemidji State University benjamin.erb@bemidjistate.edu
2 Environment and Climate Change Canada
3 Voyageurs National Park

Abstract

Rainy Lake and Namakan Reservoir are large boreal reservoirs on the border of Minnesota and Ontario. These reservoirs can see large fluctuations in water level, which can affect the quantity and quality of available spawning habitat for fish. This project exists to validate and expand upon a model provided by Environment and Climate Change Canada (ECCC) which predicts spawning sites for Walleye and Lake Whitefish in the Rainy-Namakan System. This model was created to provide information for a review of the effects of a change in water level management made in 2000 (2000 Rule Curve). Model validation can be accomplished by sampling for fish eggs (Walleye in the spring, Lake Whitefish in the fall), and comparing sample data to the predictive model. Walleye eggs were sampled on Rainy Lake only, as previous data exists for Namakan Reservoir. However, no previous data exists for Whitefish eggs anywhere in the system, so it was necessary for Whitefish eggs to be sampled on Rainy Lake as well as two lakes of Namakan Reservoir (Kabetogama and Namakan Lakes). However, non-official data was taken from fishermen for use in model building. Thirty sites each were selected for Walleye and Whitefish egg sampling, covering both Minnesota and Ontario waters. Walleye eggs were sampled between 25 cm and 1 m of water using a scap net, and Lake Whitefish eggs were sampled using furnace-filter egg mats in 2 – 4.5 m of water. The first of two field seasons showed eggs present at 19 of 30 sites for Walleye, and 9 of 30 sites for Lake Whitefish. Walleye egg sampling occurred between April 29th and May 9th, 2024, when water temperatures were between 3.8 and 13.1° C. Walleye eggs first appeared at 4.1° C and egg counts peaked between water temperatures 5.3 and 7.5° C. Lake Whitefish egg sampling occurred between October 15th and November 23rd when water temperatures were between 12 and 3° C. Lake Whitefish eggs were first sampled at 7.9° C, and peak egg counts occurred between water temperatures of 5.9 and 7.2° C. All sampling in 2025 will be conducted at new sites on the Rainy – Namakan System.

Brief Bio

Benjamin Erb is a graduate student under Dr. Andrew Hafs at Bemidji State University. His thesis project involves testing and expanding upon a model provided by Environment and Climate Change Canada which predicts spawning sites for Walleye and Lake Whitefish in Voyageurs National Park. He also received his undergraduate degree from Bemidji State University in 2019.

Location of Study

Rainy–Namakan system

Towards sustainability of the Shoal Lake walleye fishery – First Nation involvement in data collection and management decisions

Brian G. Kotak*[1], Fred Greene[2], James Williams[3], Michelle Riley[3] and Bill Galbraith[4]

[1.] Miette Environmental Consulting Inc. Pine Falls, MB. miette.env@icloud.com
[2]Iskatewizaagegan #39 Independent First Nation (Shoal Lake #39)
[3]Ontario Ministry of Natural Resources, Kenora District
[4]Indigenous Services Canada, Winnipeg, MB

Abstract

In 1983, the commercial and sport fishery for walleye in Shoal Lake was closed due to the collapse of the walleye population. This collapse was due to overharvest. Periodic monitoring through the use of Fall Walleye Index Netting (FWIN) programs, particularly since the late 1990s, has demonstrated a positive trend of recovery of the walleye stocks. In 2022, the Kenora District of Ontario Ministry of Natural Resources (OMNR), with funding support from Indigenous Services Canada, initiated a fisheries monitoring, training program and engagement project with fishers and community members from the two First Nation communities located on the lake (Shoal Lake #39 and #40). The project provided training and involvement in collaboratively conducting a FWIN in late 2022 with OMNR, as well as community meetings to discuss the results. The 2022 FWIN indicated a continued improvement in the walleye population, including metrics such as Catch Per Unit Effort, a large improvement of the number of age classes of walleye (from 8 in 1998 to 16 in 2022) as well as good representation of walleye in older age classes. Total mortality rate of walleye was close to approaching that which would be expected from an unfished body of water in Ontario. Additional surveys (Broadscale Monitoring as well as FWIN) also were completed in 2023 and 2024 with participation from the two communities. With positive signs of walleye recovery, the communities are now engaging in discussions of their vision for next steps for the fishery.

Brief Bio

Dr. Brian Kotak is President of Miette Environmental Consulting Inc, located in Pine Falls, MB. Since 2000, he has been coordinating a training and engagement program in Manitoba called the Collaborative Stock Monitoring Program. Under the program, indigenous commercial fishers are trained in conducing fishery monitoring studies in collaboration with provincial fisheries biologists. Using the monitoring data, the fishers and their fisher associations work collaboratively with the Province of Manitoba to review the status of their fishery and make required changes to the commercial fishery. Dr. Kotak has acted as a resource to Shoal Lake #39 and #40 since the inception of the fishery project on Shoal Lake in 2022.

Location of Study

Shoal Lake, northwestern Ontario

Developing a phosphorus management plan for the Canadian portion of the Rainy-Lake of the Woods basin: Progress Update

Teika Newton

Lake of the Woods Waters Sustainability Foundation

Abstract

A collaborative project was begun in 2024 to develop recommendations for a phosphorus management plan (PMP) for the Canadian portion of the Rainy-Lake of the Woods watershed. LOWWSF is facilitating the planning process, based on the planning framework described in a *Framework for a Domestic Phosphorus Management Plan for the Rainy River and Lake of the Woods* (https://lowwsf.com/pmp-framework/). The purpose is to develop consensus recommendations to support phosphorus load reduction to Lake of the Woods to meet goals (phosphorus concentrations, loads) drawing on phosphorus targets articulated in studies by ECCC (2016-2020) and the Minnesota Pollution Control Agency (2021), and recommendations for international water quality objectives for phosphorus developed through the International Joint Commission. The project will also establish a network of interested parties (governments including Indigenous, industry, civil society), to support ongoing activities and future efforts, supporting an adaptive.

Brief Bio

Teika Newton is Executive Director of the Lake of the Woods Water Sustainability Foundation. Teika is a long-time participant in regional watershed science, policy, and governance activities. She is a member of the International Rainy–Lake of the Woods Watershed Board, and in the past has co-chaired the Board's Community Advisory Group, Engagement Committee, and Adaptive Management Committee. Teika also has been helping to guide the IJC Board's work on climate adaptation since 2016. Over the past two years, Teika shepherded a complex project through the International Joint Commission, engaging international agencies and partners working on water quality issues in the Rainy River and Lake of the Woods basins to propose international water quality objectives and adopt alert levels through the regional IJC watershed board for nutrients and contaminants of concern.

Location of Study

Lower Rainy River subbasin and Lake of the Woods subbasin

Lake of the Woods - Southern Shore Barrier Island Erosion Investigation – Phase I Report

Zachary Morris PE*[1] and Craig Taylor*[2]

1 AMI Consulting Engineers, 3276 Fanum Road, Suite 100, St. Paul, MN 55110
Zac.Morris@amiengineers.com
2 LimnoTech, 7300 Hudson Blvd, Suite 295, Oakdale, MN 55128 ctaylor@limno.com

Abstract

This presentation will provide an overview of findings from Phase I of the Southern Shore Barrier Islands Erosion Investigation, focusing on Pine, Curry, and Sable Islands in Lake of the Woods. Over the past century, these barrier islands have experienced significant degradation, prompting community interest in identifying the underlying causes of erosion and exploring potential restoration strategies. The study utilized advanced coastal modeling and field investigations to evaluate erosion processes, identify key drivers, and propose conceptual design solutions for island restoration. The presentation will detail these findings, including modeling results, suspected erosion mechanisms, and preliminary restoration concepts. Phase II, currently in planning, is expected to commence in fall 2025.

Brief Bio

Zac Morris has extensive experience designing waterfront structures and stabilizing shorelines. He has a deep understanding of coastal designs given his hands-on construction experience and design expertise. He frequently leads scientific studies such as wave and sediment transport analyses, seafloor mapping, and underwater inspections. Zac has a knack for applying theoretical concepts and models while remaining practical to ensure constructability. He enjoys challenging projects and serves as the Coastal and Riverine Department Manager for AMI.

Craig Taylor is a hydraulics and restoration specialist. Craig has over 15 years of professional experience in restoration design, physical hydraulics, sediment transport, and H&H modeling. Craig has a passion for water and has been a long-time fan of Lake of the Woods. Craig also serves as an instructor at the University of Virginia's Landscape Architecture graduate program.

Location of Study

Lake of the Woods & Rainy River

Session 4 – Nutrients, Algae, and Cyanotoxins

The Lake of the Woods TMDL: Understanding current and future nutrient dynamics

Adam J. Heathcote*[1], Mark B. Edlund*[1], Shane Bowe[2], Kayla Bowe[2], Hailey M. Sauer[1], Lienne Sethna[1], Mari Leland[1], Joe Hadash[3], Jesse Anderson[3], Cary Hernandez[3]

[1]St Croix Watershed Research Station, Science Museum of Minnesota, 16910 152nd St. N, Marine on St Croix, Minnesota
[2] Red Lake Department of Natural Resources, Red Lake, Minnesota
[3] Minnesota Pollution Control Agency, St Paul, Minnesota

Abstract

The Lake of the Woods TMDL outlines a path toward meeting water quality goals through focused nutrient management, a fuller understanding of nutrient sources, a continued decline in internal loads to LoW, and effectiveness monitoring. Toward these goals we are doing enhanced water quality monitoring in the southern basin, reassessing sediment phosphorus inventories, and updating internal loading estimates.

Two years of intensive bi-weekly effectiveness monitoring of water quality and cyanotoxins coupled with water column dynamics has furthered our understanding of nutrient limitation, algal production, cyanotoxin seasonality and abundance, and patterns of lake stratification. In 2023-2024, Lake of the Woods southern basin exceeded nutrient and chlorophyll standards and remained nitrogen-limited throughout much of the growing season supporting large late-season harmful cyanobacterial blooms and abundant toxin production of anatoxin-a and microcystin. Buoys with thermister and dissolved oxygen sensors recorded patterns of stratification and mixing that likely enhanced seasonal internal nutrient loading.

Sediment cores were collected from six sites in 2024 to recalculate sediment phosphorus inventories across southern Lake of the Woods. Total phosphorus and phosphorus fractions were analyzed and compared to phosphorus inventories from the same sites sampled in 2012 to determine if sediment phosphorus inventories have declined in LoW. Coupled with these efforts have been ongoing sediment incubations to check if oxic and anoxic internal loading rates may have similarly changed since they were first estimated in 2011. Declines in internal loading are anticipated and necessary to meet TMDL objectives and targets.

Brief Bio

Adam Heathcote is the Director of the Science Museum of Minnesota's St Croix Watershed Research Station and Mark Edlund is a Senior Scientist at SCWRS. They have both been long invested in studying sediment and nutrient dynamics in Lake of the Woods and its watershed.

Location of Study

Southern Basin of Lake of the Woods

Trends in Algal Bloom Indices in Lake of the Woods, A Comparison of 25 years of Monitored and Satellite-Derived Datasets

Caren Binding[1] and Jesse Anderson*[2]

[1]Environment and Climate Change Canada, Canada Centre for Inland Waters, 867 Lakeshore Rd. Burlington, ON Canada L7S 1A1 caren.binding@canada.ca
Canada
[2]Minnesota Pollution Control Agency, 525 South Lake Ave Suite 400
Duluth, MN 55802-2300 jesse.anderson@state.mn.us

Abstract

This study compares in situ and satellite-derived indices of algal bloom conditions in the South Basin of Lake of the Woods from 1999-2024. Lake of the Woods is ideally suited for using remote sensing technologies to monitor algal biomass, and is correspondingly difficult to physically sample, due to its large size, complexity, and geographic variability in bloom conditions. In-lake monitoring data were compiled from many international partners including Environment and Climate Change Canada, Ontario MNR, MPCA, Red Lake Nation, Science Museum of Minnesota, the MN DNR and volunteers – where jointly over 600 samples of Chl-a were collected from 1999-2023. Algal blooms were defined by ECCC when chlorophyll-a concentrations exceed 10 ug/L, which is analogous to Minnesota's water quality standard and impairment of swimmable use. Despite inter-annual variability, significant decreases in satellite-derived bloom intensity and severity have been reported, suggesting the lake may now be responding to historical nutrient reductions. In contrast, in-lake chlorophyll-a datasets suggest slight increases when comparing conditions over two time intervals: 1999-2010 versus 2011-2023, including an increase in maximum concentrations indicative of nuisance or severe nuisance algal blooms. A detailed analysis of the differences between these in situ and satellite derived bloom metrics will be presented, highlighting spatial and temporal variability in bloom conditions not captured using traditional in situ measurements. ECCC's EO Lake Watch Program remains a fundamental tool to track annual bloom conditions and long-term cooperative progress in nutrient reductions and lake restoration.

Brief Bio

Caren Binding is a Research Scientist Aquatic Optics and Remote Sensing at Environment and Climate Change Canada. She delivers research and products relevant to ECCC's mandate to ensure the conservation and protection of aquatic ecosystems. She specialises in satellite remote sensing for inland water quality applications and is lead for the EOLakeWatch program.

Jesse Anderson is a Research Scientist with the Minnesota Pollution Control Agency in Duluth, Minnesota. For over 25 years he has worked in surface water quality monitoring, assessment, research, and TMDLs. He is an active member of NALMS and an Associate Editor for Lake and Reservoir Management. Jesse is MPCA's lead scientist on water quality issues on the Rainy River and Lake of the Woods.

Location of Study

Lake of the Woods

Updates from IISD-Experimental Lakes Area

Cassidy Mazur

IISD-Experimental Lakes Area, cmazur@iisd-ela.org

Abstract

In this presentation, IISD Experimental Lakes will provide an overview of some current and research projects and priorities at its world-renowned freshwater research facility.

Brief Bio

Cassidy Mazur is IISD Experimental Lakes Area's Senior Education and Outreach Officer. Cassidy is an environmental education professional focusing on making environmental science and stewardship accessible and engaging. Working primarily with youth, her work aims to inspire young people with environmental science and a connection to the natural world. She has experience and passion for experiential learning, outdoor education, interpretation, science communications, environmental science fieldwork, and community relations. Cassidy holds a bachelor's degree in environmental studies, with a focus on environmental education, from the University of Manitoba.

Location of Study

IISD-Experimental Lakes Area

Spatial variation in algal bloom composition and potential toxicity over a 24-hour period: A pilot study in Voyageurs National Park

James Smith[2], Leon Katona[1], Victoria Christensen [1], Jaime LeDuc[2], Ryan Maki[2], Hayley Olds[1], and Hailey Trompeter[1]

1. U.S. Geological Survey Upper Midwest Water Science Center, 5840 Enterprise Drive, Lansing, MI 48911. lkatona@usgs.gov
2. National Park Service, Voyageurs National Park

Abstract

Algal blooms are typically sampled during daylight hours despite evidence from laboratory studies that some potent cyanotoxins are influenced by environmental factors, such as sunlight. A pilot study was conducted in September 2021 to assess the variation in bloom assemblage composition and the abundances of three cyanotoxin genes every three hours over a 24-hour period at two adjacent locations on Kabetogama Lake, MN. Sample locations were at the end of a dock and the adjacent shoreline. Bloom composition showed little variation over 24 hours but varied substantially between locations. While bloom composition at the dock site was dominated by diatoms, the shoreline had proportionally more cyanobacteria, including many filamentous taxa that may produce cyanotoxins. Similarly, cyanotoxin gene abundances varied more strongly between sampling locations than over the 24-hour period, with the shoreline location having greater abundances of genes necessary for the synthesis of the neurotoxin anatoxin-a and the hepatotoxin microcystin than the dock location. These results highlight the natural variability in composition and potential toxicity of algal blooms at locations (docks and shorelines) where the public may be exposed to them. Continued research exploring the spatial and diurnal variability of bloom composition and toxicity will help water resource managers identify locations and times of day or night when the public might be at increased risk of exposure to cyanotoxins.

Brief Bio

James Smith is a biological science technician at Voyageurs National Park. James' position is shared between the park, where he works on long term water quality monitoring in the waters in and surrounding Voyageurs, and the Great Lakes Network where he assists in region wide aquatic ecosystem monitoring. James is originally from Anchorage, Alaska where he grew up paddling, camping, and snowboarding. James started his career at Izembek National Wildlife Refuge in Alaska and has worked in south Texas, New Mexico, and Oregon. James is thrilled to be at Voyageurs and is most excited to enjoy evenings paddling calm waterways and collecting popular hot dish recipes to make his own.

Location of Study

Voyageurs National Park, MN (Kabetogama Lake)

Session 5 – Sediment – Nutrient Studies

Little Fork Sediment Impairment Update and Progress

Mike Kennedy (MPCA), Sam Soderman (Koochiching SWCD), Phil Norvitch (NSL SWCD), Matt Gutzmann (Itasca SWCD)

1 Minnesota Pollution Control Agency, 525 S Lake Ave # 400A Duluth, MN 55802
mike.kennedy@state.mn.us
2 Koochiching Soil and Water Conservation District, 501 3rd st ste 100
International Falls, MN 56649, Sam.Soderman@co.koochiching.mn.us
3 North St. Louis Soil and Water Conservation District
4 Itasca Soil and Water Conservation District

Abstract

The Littlefork River is 160 miles long flowing from north central St. Louis County to the Rainy River west of International Falls. The Littlefork River is impaired for aquatic life due to excess sediment and the Littlefork Sediment Fingerprinting and budgeting project was completed to identify sources of sediment throughout the watershed. This project was a collaboration between many different Tribal, state, local and federal agencies to address an impairment on the Littlefork River. The results from this project will help guide local agencies in project location, development, and implementation of BMPs to address sediment issues. This presentation will describe what we were facing 10 years ago, what sediment fingerprinting and budgeting did, the results from that study, and the next steps for addressing sediment in the watershed.

Brief Bio

Mike Kennedy holds a B.S. from Bemidji State University and a Masters from University of Minnesota. He has worked for the Minnesota Pollution Control Agency for over 25 years in environmental education and water quality.

Sam Soderman holds a B.S. in Environmental Science from Minnesota State University, Mankato. He has been with Koochiching Soil and Water Conservation District since 2014 in the role of Water Resource Specialist.

Location of Study

Littlefork River Watershed

Effects of tile drainage on stream morphology, nutrient transport, and particulate losses

Gianna Saarenvirta and Catherine Eimers

Trent University, 1600 West Bank Drive Peterborough, ON Canada, K9L 0G2 giannasaarenvirta@trentu.ca

Abstract

Agricultural intensification allows more crops to be produced per unit land area and is needed in order to meet global demands for food, fiber, and fuel. Attendant with the expansion of row crop agriculture has been an increase in tile drainage, which allows poorly drained soils to be brought into production and also extends the growing season. As such, tile drainage can be viewed as one component of agricultural intensification.

While tile drainage has clear agronomic benefits, it can have negative impacts on water quality. Interestingly, tile drainage may have a dual effect on erosion and particulate losses in agricultural systems. On one hand, tile drainage may decrease the amount of overland flow and surface erosion occurring in fields by improving infiltration and encouraging subsurface drainage. On the other hand, tile-drainage may augment streambank erosion and thus shift the location of particulate losses within watersheds from fields to rivers. Furthermore, tile drainage often goes hand-in-hand with conservation tillage efforts - which raises several problems:

1. We are assuming that no-till and tile drainage have fixed the erosion problem,
2. We may be underestimating erosion and transport of particulate-associated nutrients (e.g., phosphorus; PP) at the landscape scale, and
3. We are not monitoring in the correct locations.

Other geomorphic changes associated with agricultural modification, like stream straightening and ditching, may further destabilize streambanks and enhance particulate transport within channels. However, this has never been examined in the Canadian context. Overall, this proposed project is looking to address the question: 'How has agricultural intensification affected stream geomorphology, and particulate and nutrient transport, in northern Ontario?' We address this question in northwestern Ontario, which is a compelling location for agricultural stream research, as unlike the extreme southwest of the province, which has been intensively agricultural for over a century, the northwest portion of the province contains a gradient of agricultural development, as well as is very recently (within the last 20 years) becoming agriculturally intensified (i.e. implementing tile drainage).

Brief Bio

Gianna Saarenvirta is 3rd year PhD student at Trent University conducting research in the Rainy River watershed.

Location of Study

Pinewood River Watershed

Paleolimnological indicators of eutrophication in remote, low-nutrient lakes in the Superior National Forest, Minnesota

Amelia Wilson-Jackson, Lienne Sethna, Adam Heathcote, Mark Edlund, David Burge

University of Minnesota, St Croix Watershed Research Station, Science Museum of Minnesota, 16910 152nd St. N, Marine on St Croix, Minnesota

Abstract

Increasing reports of harmful algal blooms by cyanobacteria (cyanoHABs) from remote, low-nutrient, northern lakes within Minnesota's Superior National Forest have prompted a paradigm shift in our understanding of the linkages between anthropogenic nutrient loading and cyanoHAB occurrence. Previous research in this region has shown that shallow lakes (<10 m) with observed cyanoHABs were sensitive to internal phosphorus (P) loading; however, a lack of long-term monitoring data hinders our understanding of whether the rise in cyanoHAB occurrence has occurred under recent climate change or if these lakes have supported cyanobacterial blooms for the last ~150 years. In this study, we use dated sediment cores collected from eight lakes within the Superior National Forest to track changes in phosphorus (P) dynamics, algal community composition, and diatom-inferred ecological conditions. Taken together, these paleolimnological proxies of environmental change will allow us to characterize if and how cyanoHABs have increased in frequency or intensity with changes in lake mixing regime. Our research has found that lakes with observed cyanoHABs have increased in total P accumulation, cyanobacterial biomass, and the proportion of planktonic diatoms over the last 75 years. These results suggest that remote lakes experiencing contemporary cyanoHABs have become more sensitive to internal loading as they become more polymictic due to changes in their thermal structure. Our research shows that shallow, remote lakes in northern Minnesota have been responding to a warming climate since the 1950s, resulting in changes to their mixing regimes, internal nutrient loading rates, and algal community composition.

Brief Bio

Amelia Wilson-Jackson was a laboratory technician at the Science Museum of Minnesota's St. Croix Watershed Research Station where her canoe country expertise was critical to the success of this project. She is currently a PhD graduate student at the University of Minnesota.

Location of Study

Rainy River/Lake of the Woods watershed

Session 6 – Monitoring and Management 2

ECCC 2023/24 Water Quality Monitoring Update

Diana Fred

[1.] Environment and Climate Change Canada, Winnipeg, Manitoba diana.fred@ec.gc.ca

Abstract

An update of the 2023/24 ECCC monitoring in the Rainy/Lake of the Woods Watershed. A look at parameters of interest with reference to suggested objectives, including discussion of observations of note.

Brief Bio

Diana Fred is the Environment and Climate Change Canada Water Quality Monitoring Program Lead for the Rainy River/Lake of the Woods watershed.

Location of Study

Lake of the Woods and Rainy River.

Applying novel algal harvesting technology to restore lake ecosystems and produce a high value organic fertilizer

Matt Julius

St. Cloud State University, 225 Wick Science Building, St. Cloud MN, 720 4th Avenue South
St. Cloud, MN 56301-4498 mljulius@stcloudstate.edu

Abstract

TO COME

Brief Bio

Prof. Matt Julius received his Ph.D. from the University of Michigan U.S.A.in 2000, After leaving Michigan in 2000 he accepted a professorship at St. Cloud State University in central Minnesota, U.S.A. He was promoted to associate professor in 2005 and full professor in 2008. His primary research interests involve the systematics and evolution of diatoms (a group of microscopic algae), with focus on cladistic analysis utilizing morphology of fossil and extant species. While these studies continue to be his focus of choice, he maintains an active research presence in aquatic resource management and bioderived nanomaterials. He is also an associate editor for *Diatom Research.* Julius is keenly interested in applying his work with cladistics, evolution, and diatoms to those interested within and outside of the diatom community. He has developed cladisitic exercises for the undergraduate classroom and has happily participated with the SimRiver diatom education project. His long-term research goals are largely focused on utilizing morphological and molecular based evolutionary trees for development of species level taxonomic revisions useful for identification of diatoms for applied applications.

Location of Study

Lake of the Woods

Sulfate in the Rainy River-Headwaters: downstream transport of sulfate to and through Birch Lake to the BWCAW boundary, in Lake and Saint Louis counties, Minnesota (69-0003-00)

Matt Norton

Northeastern Minnesotans for Wilderness, c/o Matt Norton, 16 N. 1st Ave. E., Ely, MN 55371
Matt@savetheboundarywaters.org

Abstract

Northeastern Minnesotans for Wilderness (NMW) has a professional water quality monitoring program. NMW's monitoring staff have been properly trained to follow appropriate field data and sample collection methods. The equipment NMW uses is the same as used by MPCA and EPA, and NMW follows or exceeds MPCA & EPA SOPs for QA/QC. A state-certified lab analyzes all data reported to MPCA, and samples for SO4 are analyzed using method 300. At monitoring sites with MPCA site IDs, the program has produced 998 sulfate sample datapoints in our Rainy River-Headwaters watershed study area, exclusive of QC results (field replicates, field blanks, and bottle blanks).

The geographic scope of the program's sulfate data collection has steadily expanded since its start in 2020. The area of interest since 2020 has included Birch Lake and its tributaries. Since 2022 NMW has also been monitoring on the North Kawishiwi River and Farm Lake. Since 2023 NMW has also been monitoring on Garden Lake, Fall Lake on the BWCAW boundary, and in Bear Island River (tributary to White Iron Lake) and Shagawa River (tributary to Fall Lake).

NMW's dataset, combined with several dozen MPCA-collected sulfate datapoints in our study area from 2021 & 2022 (2021 data is available at one monitoring site and 2022 data is available at six monitoring site), and several dozen White Iron Chain of Lakes Association-collected SO4 datapoints from numerous sites in 2023, shows how SO4 is transported through the study area. The 2023 and 2024 datasets offer the clearest picture of SO4 transport, and the 2022 dataset is nearly as revealing.

The presentation with introduce an interactive data viewer tool that improves understanding of SO4 transport through waters with relatively short residence times, by allowing for adjustment of data average color-coding, the viewing of individual years' worth of data at all monitoring sites or of data averaged across all years at all monitoring sites. The tool also allows display of monitoring site IDs and the number of sample results (N) at each sample site.

Brief Bio

Matt Norton is Policy & Science Director for Northeastern Minnesotans for Wilderness (NMW) and Save the Boundary Waters, and oversees NMW's water monitoring program. Matt has undergraduate and master's degrees in biology and forest science from Yale University, and a law degree from the University of Michigan Law School. Matt has worked since 2002 to protect Minnesotans' air, water, and public lands, including with NMW since 2016, and previously with the Minnesota Environmental Partnership and the Minnesota Center for Environmental Advocacy.

Location of Study

Lake of the Woods & Rainy River

Phragmites- Friend or Foe: Management Decisions Based on the Presence of Non-Native Phragmites in Voyageurs National Park

Harris Kramer and Haley Smith

Voyageurs National Park c/o 30 E Golden Lake Rd, Circle Pines, MN harrislkramer@gmail.com

Abstract

In 2016, Voyageurs National Park initiated the Wetlands Restoration Project, which aimed to combat non-native (hybridized) cattail and restore ecological diversity to many of the wetlands in the park. Entering the later stages of this project, the presence of stands of *Phragmites* has presented the question: Is space being created for another non-native to take the cattail's space? It can be difficult to tell the Minnesota native *Phragmites* (*Phragmites australis* subsp. *americanus*) from the non-native (*Phragmites australis* subsp. *australis*) without genetic testing. In the fall of 2024, samples were collected for genetic testing along with physical characteristic data to determine if further genetic testing is in fact needed to determine future *Phragmites* populations. Evidence from genetic testing conducted by Treaty #3 shows the presence of both the native and non-native subspecies of *Phragmites* around Voyageurs National Park. Since genetic testing has not been conducted in Voyageurs National Park the presence of the non-native subspecies is unknown. The physical characteristics collected will be compared to the genetic samples to determine if physical characteristics alone can be used to determine Phragmites stands while in the field.

This presentation will discuss sampling techniques, why knowing the subspecies is important, and future management efforts depending on the genetic results.

Brief Bio

Harris Kramer is a seasonal Biological Science Technician working for the National Park Service. After he graduated from St. Olaf College in 2022, Harris moved around the country to work as a field technician for both the National Park Service and university research stations. During his second field season at Voyageurs National Park, he began developing a project on determining the native status of Phragmites in the park. Harris is interested in land management, human/nature interactions and relationships, and invasive species.

Location of Study

Voyageurs National Park

Appendix A: Organizations Represented at the Forum

To Be Completed after Registration Closes

To Be Completed after Registration Closes

Appendix B: Meetings of Other Groups Co-located Around the Forum Program

Insert Draft Forum Week Schedule

Acronyms

IRLWWB	IJC International Rainy-Lake of the Woods Watershed Board
EC	Engagement Committee of the IRLWWB
CAG	Community Advisory Group to the IRLWWB
IAG	Industrial Advisory Group to the IRLWWB
IMA WG	International Multi-Agency Arrangement Working Group (managers)
IMA TAC	International Multi-Agency Arrangement Technical Advisory Committee
LWCB	Lake of the Woods Control Board
LOWWSF	Lake of the Woods Water Sustainability Foundation
WLC	Water Levels Committee of the IRLWW