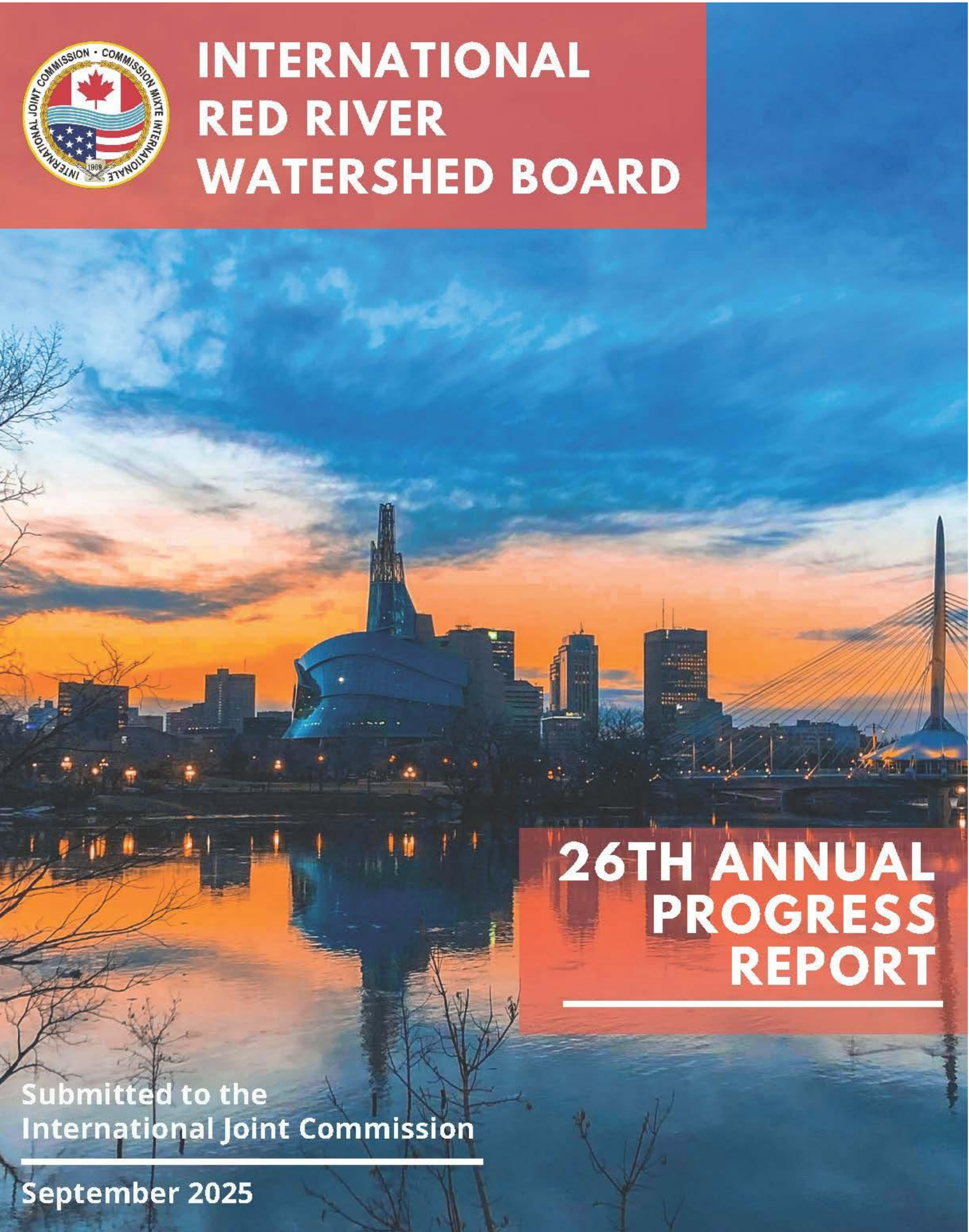
INTERNATIONAL RED RIVER WATERSHED BOARD



26TH ANNUAL PROGRESS REPORT

Submitted to the International Joint Commission

September 2025

INTERNATIONAL
RED RIVER WATERSHED
BOARD

CONSEIL INTERNATIONAL
DE LA RIVIERE BASSIN
VERSANT ROUGE

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Commissioners:

The International Red River Watershed Board is pleased to submit its Twenty Sixth Annual Progress Report to the International Joint Commission.

Respectfully submitted,

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Co-Chair, Canadian Section

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Executive Summary

Overview

This report documents water quality trends and exceedances of objectives, effluent releases, and control measures for the Red River Basin for the 2024 Water Year (October 01, 2023, to September 30, 2024). In addition, this report describes the activities of the International Red River Watershed Board and its various committees in the 2024 Reporting Year (April 01, 2024, to March 31, 2025). Given that the 'Water Year' and the 'Reporting Year' are not aligned, the actual activities reported cover more than one year in length starting October 01, 2023 and ending September 30, 2024 for the 'Water Year' and starting April 01, 2024 and ending March 31, 2025 for the 'Reporting Year'.

The units of measure presented in this report are those of the respective agencies contributing to this report. Where possible, conversions have been provided.

Key Achievements and Challenges

The Board met all of its requirements and more. All required meetings of the Board were held as planned in January and August, and the Board Co-Chairs presented updates on Board activities at the IJC the semi-annual appearances in April and October. In addition, the Board held two interim meetings to advance strategic and workplan objectives and discuss new criteria for assessing IWI projects. The Board advanced the two ongoing IWI projects and submitted one new IWI project to the IJC for approval. The Board held two public engagement sessions (only one is required), and this annual report is the final requirement for the year.

This year the Board held several outreach and engagement events, including two public meetings. One public meeting was held in Grand Beach, MB in conjunction with the August Board Meeting and brought together IRRWB Board and Committee members, International Joint Commission staff, residents and guests of Grand Beach and members of the Grand Beach Cottagers Association. An article on the Public Meeting was subsequently published in the Selkirk Record.

The other public meeting was held in January 2025 in Grand Forks, ND in conjunction with the Red River Basin Commission's Annual Land and Water International Summit Conference and featured a presentation from the Aquatic Ecosystem Health Committee (AEHC).

The Board hosted a Cultural Literacy Training Session in conjunction with its summer meeting to further advance recommendations from the Indigenous Nations' Roundtable held in 2023. The Session took place in Brokenhead Ojibway First Nation near Lake Winnipeg in Manitoba. The Session allowed for Board and Committee members to hear from Indigenous knowledge keepers in the basin on a range of topics, including Indigenous and Tribal Laws, and included a tour of the Brokenhead Wetland Interpretive Trail.

In October 2024, the Aquatic Ecosystem Health Committee presented on the Fish Movement Study at a webinar hosted by the Canadian Water Resources Association's Manitoba Branch.

Throughout the year, the IRRWB's Committees continued to advance projects and other activities such as the Hydrology Committee's (HC) low flow frequency study and ecosystem flow needs investigations. The AEHC continued the Fish Movement Study, tagging over 1,100 fish in the Red River such as Lake Sturgeon, Walleye, Bigmouth Buffalo and Freshwater Drum, and the Reconnect the Red River Program, a North Dakota initiative focused on improved connectivity throughout the Red River. The Reconnect the Red River Program contributes to the restoration of sturgeon populations by enhancing spawning locations through the modification of barriers that previously impacted spawning migration.

The Board nominated and approved four new board members to replace departing members and successfully filled two key vacancies in the Committee structure: both the U.S. and Canadian Co-Leads of the Water Quality Committee. Several new Committee members were approved, including Indigenous members to the various committees.

2024 was another significant year for the Board with the approval of strategic goals, acceptance by the IJC of the updated workplan, and approval of a set of criteria for new IWI projects that are linked to the new strategic goals. The Board continued to address reduced Secretariat capacity and vacant Board and Committee positions and explored opportunities for engaging Indigenous participation and advancing a culture of climate change adaptation and resilience.

Future Outlook

In the year ahead, we anticipate more discussion and initiatives to address water quality concerns (particularly exceedances), new IWI projects to advance strategic objectives, and improvements to our public communication and outreach.

List of Abbreviations

AEHC – Aquatic Ecosystem Health Committee

AIS – Aquatic Invasive Species

HC – Hydrology Committee

ICTT – Indigenous Collaboration Task Team

IJC – International Joint Commission

IRRB – International Red River Board

IRRWB – International Red River Watershed Board

IWI – International Watersheds Initiative

OEC – Outreach and Engagement Committee

RRB – Red River Basin

RRBC – Red River Basin Commission

WQC – Water Quality Committee

1. Introduction

In April 2000, the International Joint Commission (IJC) formally merged its International Red River Pollution Board and International Souris-Red Rivers Engineering Board consolidating the water quality and water quantity responsibilities of the former boards, to form the International Red River Board (IRRB). This consolidation formalized the already emerging cooperative efforts of the former boards toward an integrated approach to transboundary water issues in the basin.

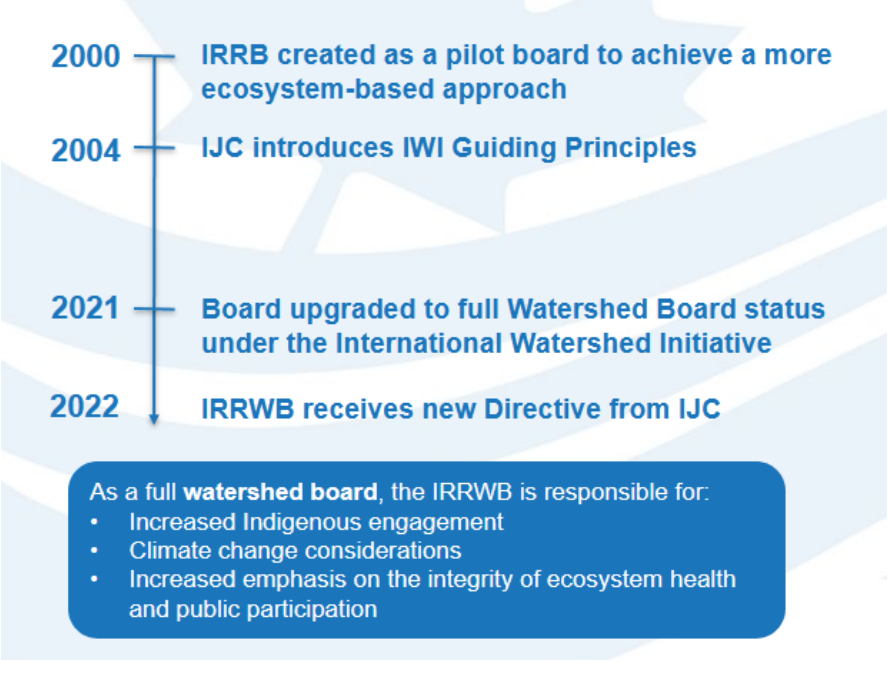

Figure 1: *A timeline of the history of the IRRWB in its transformation from a pilot IJC board to a full watershed board*.

In 2022, the IJC provided the IRRWB with an updated Directive which significantly expanded the responsibilities of the Board, formally dropping the Poplar River from the mandate, and resulting in a name change to, 'International Red River Watershed Board (IRRWB)'. Since then, the Board began to align its work plan with the IWI and the updated IJC Directive. The updated Directive is included in Appendix C.

This report is the Twenty Sixth IRRWB annual progress report to the IJC and contains water quality, quantity, and ecosystem health information for the basin in the 2024 Water Year (October 1st, 2023, to September 30th, 2024) and Board activities extending through March 31st, 2025. The report highlights Committee work, provides an update on hydrological, water quality and aquatic ecosystem health-related activities in the basin, and describes the IRRWB's progress towards implementing its strategic objectives.

2. Directive and Responsibilities

The IRRWB is responsible for assisting the IJC in avoiding and resolving transboundary disputes regarding the waters and aquatic ecosystems of the Red River, its tributaries, and aquifers. This is accomplished using the best available science and knowledge of the aquatic ecosystems of the basin to identify, understand, and address emerging watershed issues. The Board's mandate covers the Red River basin, excluding the Assiniboine and Souris Rivers. The Red River Basin is illustrated in Figure 2.

The following is a summary of the mandated responsibilities of the IRRWB:

1. Focus on all aspects of Aquatic Ecosystem Integrity
2. Maintain awareness of Land Use, Socioeconomics and Government Activities
3. Be a Forum for sharing information on science, knowledge, issues, and best practices
4. Report on the State of the Aquatic Ecosystem of the Red River Basin
5. Recommend objectives for Aquatic Ecosystem Integrity
6. Encourage governments to maintain contingency plans on emergency matters that may impact Aquatic Ecosystem Integrity
7. Encourage governments to promote a culture of climate change adaptation and resilience
8. Develop and promote a culture of climate change adaptation and resilience, and their effects on the Aquatic Ecosystem using monitoring, reporting, adaptive management, and emergency warning
9. Report on progress by governments in implementing IRRWB and IJC recommendations
10. Involve the public

The Board's priorities are informed by the IJC's Directive (2022) to the IRRWB, The primary objective of the IRRWB is to support the Aquatic Ecosystem Integrity (AEI) of the Red River Basin as a whole. The Board's work is also informed by the 2023 Strategic Plan which focuses on activities such as providing recommendations to the Commission, regularly reporting on progress towards objectives, involving all orders of government and the public in the resolution of issues, and a commitment to understanding climate change risks and impacts. In 2024, the Board was focused on adapting its workplan to reflect the new Directive and transitioning Committee work to address Board priorities. Board committee activities focused largely on reporting on the state of the aquatic ecosystem of the Red River Basin. The Board's current workplan is provided in Appendix D of this report.

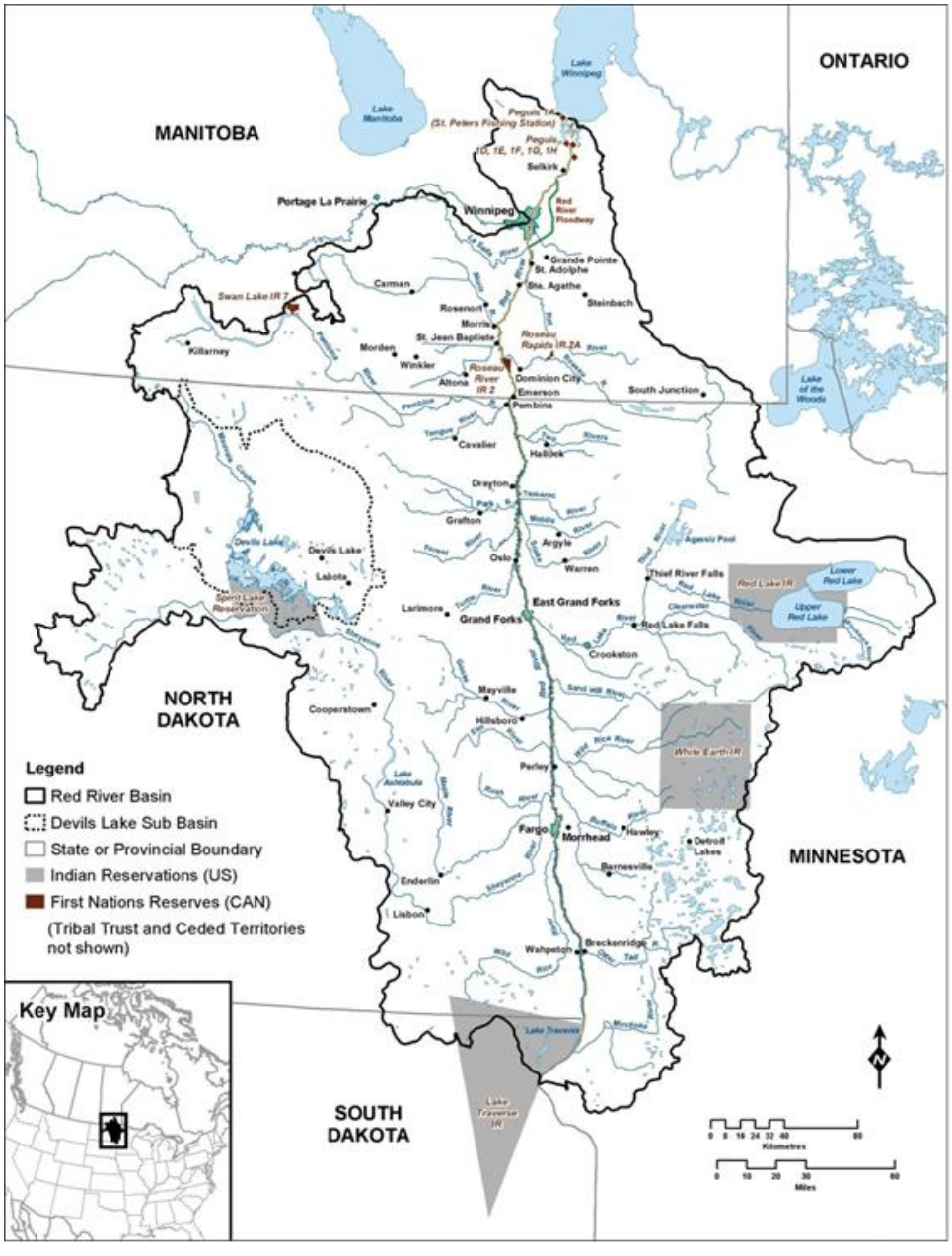

Figure 2: Red River Basin and its tributaries.

3. Governance and Organizational Structure

The International Red River Watershed Board (IRRWB) is one of only three formally recognized full watershed boards designated by the International Joint Commission (IJC). The IRRWB has 22 members, with an equal number of members from the U.S. and Canada. Board members are appointed by the Commission and serve in their personal and professional capacity and not as representatives of their agencies. Board membership in 2024 is provided in Table 1. Membership is representative of a variety of U.S. and Canadian governmental, scientific and academic agencies and organizations, including members from U.S. Indigenous Tribes and Canadian First Nations.

Table 1. IRRWB membership in 2024

International Red River Watershed Board Members in 2024	
Canadian Section	**U.S. Section**
Canadian Co-Chair **Patrick Cherneski** Canada Water Agency	*U.S. Co-Chair* **Colonel Eric Swanson/ Karl Jensen (alternate)** United States Army Corps of Engineers
Melissa Hotain Director of Intergovernmental Affairs, Sioux Valley Dakota Nation	**April E. Walker** *ICTT Co-Lead* Red River Valley Alliance, Turtle Mountain Band of Chippewa Indians
Annette Trimbee, Ph.D Métis President, Vice-Chancellor MacEwan University	**Dr. Mark Bellcourt** White Earth Nation
Nicole Armstrong Manitoba Environment and Climate Change	**Maureen Gallagher** U.S. Fish and Wildlife Service
Mark Lee, *Hydrology Committee co-lead* Manitoba Environment and Climate Change	**Molly Costin** Minnesota Pollution Control Agency
Chris Propp Manitoba Transportation and Infrastructure	**Karl Rockeman** North Dakota DEQ
Dr. Eric Liu Agriculture and Agri-Food Canada	**Reice Haase** North Dakota Department of Water Resources
Dimple Roy International Institute for Sustainable Development	**Jason Gildea** U.S. Environmental Protection Agency
Mayor Larry Johannson City of Selkirk, MB	**Brian Holmer** Red River Basin Commission, OEC Co-Lead
Colin Angus Environment and Climate Change Canada	**Karen Ryberg** U.S. Geological Survey
Dr. Lianne Postma Fisheries and Oceans Canada	**Nathan Kestner** Minnesota Department of Natural Resources
Canadian Section Board Secretary **Girma Sahlu** Canada Water Agency	*U.S. Section Board Secretary* **Rebecca Seal-Soileau, Ph.D.** /Lauren Allin United States Army Corps of Engineers

Committees

Board activities addressing the Directive are supported, in part, by five committees listed below. Membership is comprised of Board members (noted with asterisks) and partners.

Table 2. Hydrology Committee membership in 2024

Hydrology Committee	
Canadian Section	**U.S. Section**
Mark Lee* (co-lead) Manitoba Environment and Climate Change	Dan Thomas (co-lead), USGS
Kayla Moore, Agriculture and Agri-food Canada	Michaela Halvorson, Water Appropriation Division, North Dakota Department of Water Resources
Dr. Haitham Ghamry, Fisheries and Oceans Canada	Andrew Graham, Minnesota Department of Natural Resources
Sandrina Rodrigues, National Hydrological Services, Environment and Climate Change Canada	Ted Preister, Red River Basin Commission
Chris Propp*, Manitoba Transportation and Infrastructure	Randy Gjestvang, Water Development Division, North Dakota Department of Water Resources
	Brett Hultgren, U.S. Army Corps of Engineers
	Tyson Jeannotte, Houston Engineering

Table 3. Water Quality Committee membership in 2024

Water Quality Committee	
Canadian Section	**U.S. Section**
Elaine Page (co-lead) ECCC	Joshua Wert (co-lead), ND DEQ
Nicole Armstrong*, Manitoba Environment and Climate Change	Molly Costin*, Minnesota Pollution Control Agency
Lieserl Woods, Canada Water Agency	Brian Fuder, Red River Retention Authority
Daniel Rheault, Manitoba Environment and Climate Change	James Noren, U.S. Army Corps of Engineer
Jason Vanrobaeys, Health Canada	Ted Preister, Red River Basin Commission
Elise Watchorn, Environment and Climate Change Canada	Micah Bennett, U.S. Environmental Protection Agency
	Peter Wax, North Dakota Department of Environmental Quality

Table 4- AEH Committee membership in 2024

Aquatic Ecosystem and Health Committee	
Canadian Section	**U.S. Section**
Lee Gutowsky (co-lead) DFO	Nicholas Kludt (co-lead), Minnesota DNR
Doug Watkinson, Fisheries and Oceans Canada	Todd Caspers, North Dakota Game and Fish
Geoff Klein, Manitoba Conservation and Water Stewardship (Fisheries Branch)	Dr. Stacie Blue, Turtle Mountain Band of Chippewa Indians
Jeff Long, Manitoba Conservation and Water Stewardship (Fisheries Branch	Amanda Hillman-Roberts, Minnesota Department of Natural Resources
	Benjamin Holen, North Dakota Fish and Game

Table 5. Outreach and Engagement Committee Membership 2024

Outreach and Engagement Committee	
Canadian Section	**U.S. Section**
Ute Holweger(co-lead) ECCC	Brian Holmer *(co-lead), ND DEQ
Dimple Roy*, International Institute for Sustainable Development	Mark Bellcourt*, White Earth Nation
Mayor Larry Johannson*, City of Selkirk, MB	Ted Preister, Red River Basin Commission

Table 6. Indigenous Collaboration Task Team Membership in 2024

Indigenous Collaboration Task Team	
Canadian Section	**U.S. Section**
Ute Holweger (co-lead) ECCC	April Walker *(co-lead), ND DEQ
Phoenix Combe/Marci Riel, Manitoba Métis Federation	Cliff Crowell, White Earth Nation
Melissa Hotain, Director of Intergovernmental Affairs, Sioux Valley Dakota Nation, MB	Brian Fuder, Red River Retention Authority
Geoff Reime/Tina Keeper, Southern Chiefs' Organization	Mark Bellcourt*, White Earth Nation
Dimple Roy*, International Institute for Sustainable Development	Ted Preister, Red River Basin Commission
Annette Trimbee*, Métis President and Vice-Chancellor of MacEwan University	

4. Basin Hydrology Conditions and Trends

The IRRWB continues to regularly monitor basin hydrology and trends as part of its ongoing mandate to focus on watershed integrity, maintain awareness of new and ongoing stressors, and report to the Commission. This work is conducted through the Hydrology Committee**.** Hydrologic conditions updates are provided at IRRWB meetings and board IJC semi-annual appearances.Hydrological conditions, including water quantity, in the Red River Basin during 2024 were as follows for each season.

Climate Influences (El Niño, La Nina, Intermodal)

At the beginning of 2024, a strong El Niño persisted through February, leading to mild temperatures, significantly reduced snowpack, and fewer extreme cold events in Manitoba. These El Niño conditions weakened during the spring, transitioning into an El Niño Southern Oscillation (ENSO)-neutral phase. By December 2024, La Niña conditions emerged.

Spring 2024

Manitoba's Hydrologic Forecasting Centre's 2023 Fall Conditions Report stated that heading into freeze-up in fall 2023, soil moisture in the Red River basin was below normal to normal, with the southern tip of the basin above normal. Most of the basin was classified between abnormally dry (D0) and extreme drought (D2). The driest areas were in the Pembina and Roseau River Basins. The very southern and western portions of the basin are not classified as having dry or drought conditions.

A rainfall event with a maximum total of approximately 2.4 inches of precipitation recorded at Sonora, ND, occurred in the headwaters of the Red River from Dec 25-27, 2023 (North Dakota Agricultural Weather Network, 2024) caused a substantial rise in flow on the mainstem Red River and the Wild Rice River and the resulting streamflow exceeded the "much above normal" (90th-highest percentile) streamflow for the Wild Rice River and reached the 95th percentile of flow for the Red River for the time of year (U.S. Geological Survey, 2024). Both the U.S. Geological Survey (USGS) streamgage on the Wild Rice River near Abercrombie, ND (05053000) and the Red River at Fargo, ND (05054000) briefly exceeded their respective flood stages and the flow at the Red River at Grand Forks, ND streamgage (05082500) was measured at 5590 cfs (158 cms) on January 3rd, at the peak of the event (U.S. Geological Survey, 2024).

Flow at the Emerson gauge peaked January 6th at 6460 cfs (183 cms). The wave of flow caused the level to rise 2.1 m at the Emerson gauge. This caused the ice to rise and open water to form along the river edges. Warnings were released to ice fishers and other recreational users to not use the river. Flows have been receding since the peak and are currently at 3100 cfs (88 cms), which is much above normal and near the historical record maximum for the time of year.

The National Weather Service (NWS) Grand Forks Forecast Office outlook on March 14 stated the risk for significant flooding was very low and that the risk would primarily be from rainfall, as the soil moisture remained below normal, and snowpack had melted away across the Basin. Manitoba's Flood Outlooks were consistent with the NWS outlooks. The last Flood Outlook issued by the Hydrologic Forecast Centre on March 20 stated the risk of significant flooding was low for the Red River main stem and tributaries.

Average daily temperatures in March remained cool, delaying ice-off until early April. Due to the relatively dry conditions at time of freeze-up and the lack of snowpack accumulation during the winter, ice-off did not result in any significant increase in flows and there were no streamgages in the Red River Basin that reached flood stage from ice-out. The spring peak at Emerson was 8,300 cfs (235 cms) on March 21st. This peak is exceeded in 80%, or four out of five years, on average. The flow receded briefly into the below normal range.

Drought concerns increased after the snowpack had melted. Flow measured at most streamgages in the Red River Basin was "below normal" at the beginning of April but rose well into the "normal" range throughout the month, as up to 3.5 inches of rain fell in the southern Basin, reducing to 2.5 in the middle and down to 1.5-2 inches in the north (National Oceanic and Atmospheric Administration (NOAA) – National Water Prediction Service, 2024). May was an even wetter month with 4-7 inches falling throughout the basin, with the majority of the basin receiving 5 inches, or more (NOAA National Water Prediction Service, 2024). Most of the 2024 Water Year peaks occurred in May, with some streamgages, including the Red Lake River at Crookston, MN, having reached their peak in June from continued precipitation since May (U.S. Geological Survey, 2024). Fargo, ND had a peak of 6,960 cfs (197 cms) at 22.16 ft on May 27, 2024; not a top 10 peak (U.S. Geological Survey, 2024). Grand Forks, ND had a peak of 19,400 cfs (566 cms) at 27.34 ft on May 29, 2024; not a top 10 peak (U.S. Geological Survey, 2024).

Summer 2024

The above normal rain in April, May and June increased soil moisture and water levels to above normal across the basin. The Red River peaked at Emerson at 21,300 cfs (600 cms) in early July, well above the spring peak. The gauge at Emerson has remained above normal to well above normal throughout the summer of 2024. By the end of June, no drought conditions were reported in the Red River basin in the drought monitor assessments. Flow on the Red River at US streamgages at Fargo and Grand Forks, ND as well as at the Emerson streamgage in Canada, has remained "above normal" or "much above normal" for the remainder of the summer.

Fall 2024

Manitoba's Hydrologic Forecasting Centre's 2024 Fall Conditions Report showed that heading into freeze-up the Red River basin in Manitoba and the northwest USA had above normal soil

moisture conditions, while the eastern and southern portions of the basin in the USA had below normal soil moisture conditions. The US Drought Monitor corroborated this assessment with the drought conditions in the US portion of the basin showing no drought in the northern third of the basin, “Abnormally Dry” for a swath between Grand Forks and Fargo and “Moderate Drought” for the remainder of the southern basin, heading into winter (U.S. Drought Monitor, 2024).

Winter 2024

In Manitoba, precipitation since November 1st, 2024, was above normal on the western side of the Red River, and normal to below normal on the eastern side. Although much of the heavy precipitation in November fell as rain and was not reflected in the snowpack.

The snow water equivalent information from Environment and Climate change Canada showed decreasing snowpack towards the south of the basin, with little to no snow in the Fargo region and south. The southern and easter portions of the basin in the USA were classified between abnormally dry (D0) and moderate drought (D1) throughout the winter (U.S. Drought Monitor, 2024). The baseflow of the Red River was “normal” for the US portion of the basin and “above normal” throughout the winter for the Canadian portion.

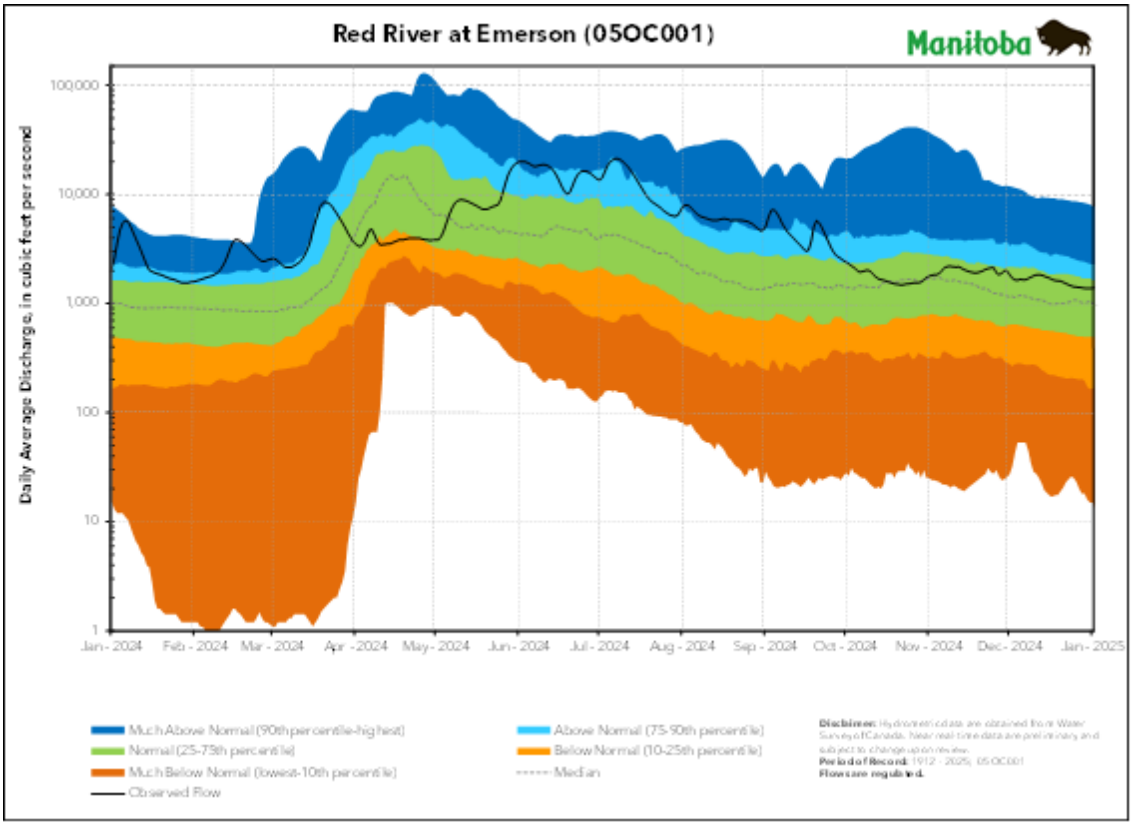

Figure 3: Streamflow percentile plot for the Red River at Emerson (05OC001) January 1, 2024-December 31, 2024.

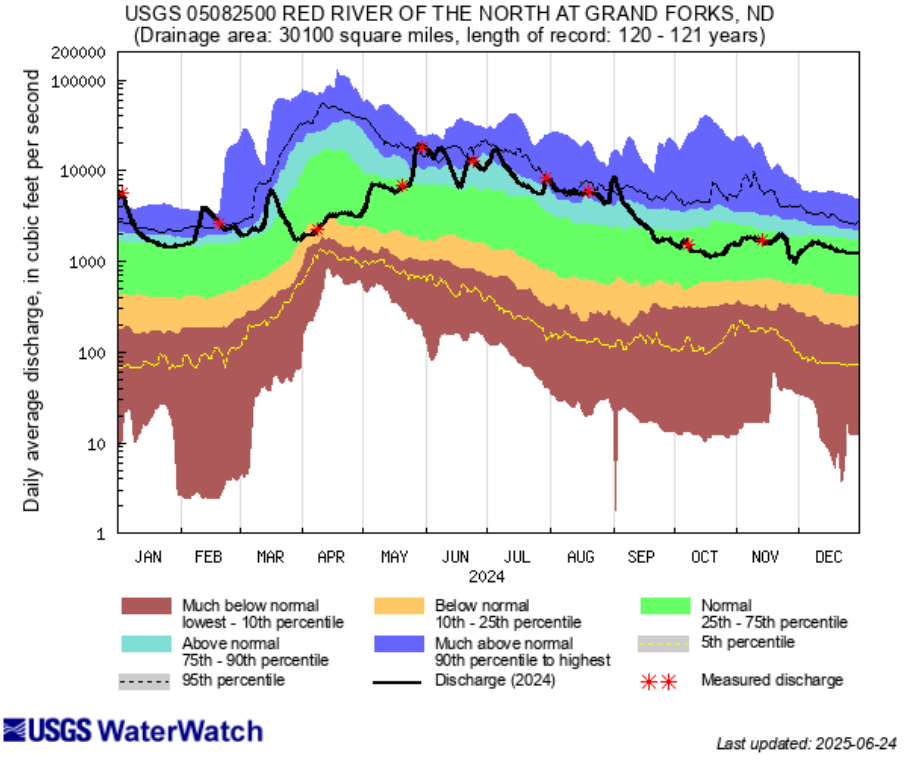

Figure 4: Streamflow percentile plot for the Red River at Grand Forks (05082500) January 1, 2024-December 31, 2024 (USGS WaterWatch -- Streamflow conditions).

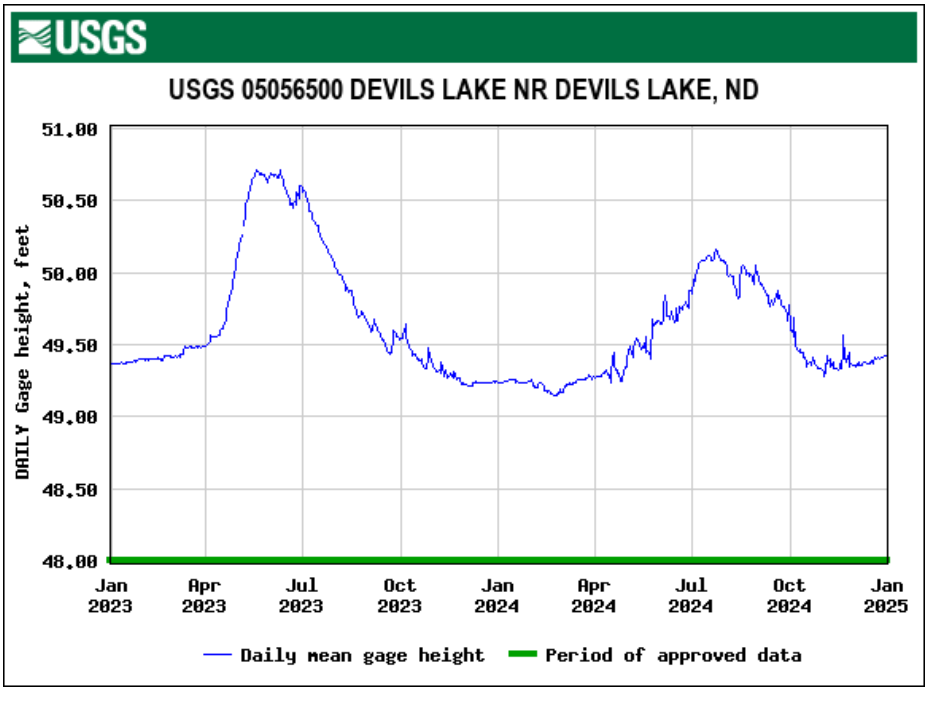

Figure 5: Devils Lake Gage Height January 1, 2023–December 31, 2024 (https://waterdata.usgs.gov/nwis/dv?cb_00065=on&cb_00065=on&format=gif_default&site_no=05056500&legacy=&referred_module=sw&period=&begin_date=2023-01-01&end_date=2024-12-31).

The IWI project "Evaluating drought risk of the Red River of the North Basin using historical and stochastic streamflow upstream from Emerson, Manitoba" was completed. Details are found under Section 11.

Additional Activities

The Hydrology Committee tracked progress on Red River bathymetric data collections along the main stem of the Red River. A bathymetric survey from the Red River Floodway inlet to the international border was completed in 2022 by Manitoba Transportation and Infrastructure. In 2024, the US Army Corps of Engineers (USACE) completed a bathymetric survey from the international border to south of Fargo, ND. The Hydrology Committee will coordinate harmonization of the data sets to allow for binational studies.

Future activities for Commission consideration

1. **Low flow planning and collaboration:**
    - Low flow frequency study
    - Ecosystem flow needs investigations (bathymetry collection, modelling)

2.Climate Change Considerations. Monitoring of conditions, undertaking hydrologic investigations, and reporting on jurisdictions' response to floods and droughts helps track the resilience of the basin to hydrologic extremes.

5. Water Quality

The International Red River Watershed Board (IRRWB) is responsible for monitoring and reporting on water quality at the Canada–United States boundary along the Red River. This includes monitoring and reporting on compliance with binational water quality objectives including total dissolved solids (TDS), dissolved oxygen (DO), chloride (Cl), sulphate (SO_4), and Escherichia coli (E. coli) and monitoring and reporting on compliance with binational alert levels for metals and pesticides. The Board has also been reporting against the nutrient objectives and loading targets for total nitrogen and total phosphorus since the nutrient objectives and targets were established in 2022 (Table 7). Detection of exceedances of the objectives and alert levels serves as a trigger mechanism for the Board to report to the IJC and for the IJC to report to governments and may lead agencies to take appropriate action to prevent or to mitigate potential problems, and to minimize the potential for recurrence.

The Water Quality Committee (WQC) plays a central leadership role in supporting the IRRWB's mandate and provides coordination among participating agencies on transboundary water quality issues. The committee monitors and reports conditions at the international boundary, alerts the Board to potential water quality concerns, undertakes studies and investigations as directed, and makes recommendations based on its findings. It also facilitates communication and collaboration among jurisdictions and stakeholders in the Red River Basin.

The IRRWB's workplan for the 2023–2024 water year emphasized comprehensive water quality monitoring at the international boundary. The program aimed to assess compliance with binational water quality and nutrient objectives, detect exceedances of alert levels, and provides a scientific basis for water quality management in the Red River basin.

The WQC continues to focus on the Board's nutrient management strategy, which was the original basis for its establishment. Following the 2022 approval of nutrient objectives and loading targets, the committee has prioritized their implementation and continues to explore opportunities to reduce nutrient loading to the Red River and its watershed. This includes sharing best practices across jurisdictions.

In 2023, the committee supported the Board in developing a new draft three-year work plan under the directive approved in May 2022, with significant progress made during a strategic workshop in August. Looking ahead, the committee's priorities for the next three years include implementing the approved nutrient objectives, reviewing and updating water quality objectives and alerts at the boundary and completing an IWI project on salinity trends in the basin.

Methods and Summary Table of Findings

Environment and Climate Change Canada (ECCC) conducted sampling at Emerson, Manitoba, with frequency adjusted seasonally: monthly during ice cover, weekly during open water, and twice weekly during the spring freshet or flood events. Water quality data were collected through grab samples between October 1, 2023, and September 30, 2024. These were analyzed for physical, chemical, and biological parameters. Nutrient concentrations were assessed during the open water season (April–October), and nutrient loads were calculated using a five-year rolling average based on flow and concentration data.

Table 7. Summary of Exceedances – Red River at the International Boundary (Oct 1, 2023 – Sept 30, 2024)

Parameter	Objective	Exceedances (#/Total)	% Exceeding	Maximum Value (Date)
Dissolved Oxygen	> 5 mg/L	0 / 40	0%	5.64 mg/L (Jul 10)
Total Dissolved Solids	500 mg/L	35 / 40	88%	1161 mg/L (May 21)
Chloride	100 mg/L	0 / 40	0%	98.9 mg/L (Dec 5)
Sulphate	250 mg/L	24 / 40	60%	583 mg/L (May 21)
E. coli	< 200 CFU/100 mL	1 / 14	7%	310 CFU/100 mL (Oct 4)

Table 8. Nutrient Concentrations and Loads – Red River at the International Boundary

Parameter	Objective/Target	Observed Value	Meets or Exceeds
Total Phosphorus	0.15 mg/L (concentration)	0.36 mg/L	Exceeds
Total Nitrogen	1.15 mg/L (concentration)	2.36 mg/L	Exceeds
Total Phosphorus	1,400 tonnes/year (load)	3,163 tonnes/year	Exceeds
Total Nitrogen	9,525 tonnes/year (load)	18,921 tonnes/year	Exceeds

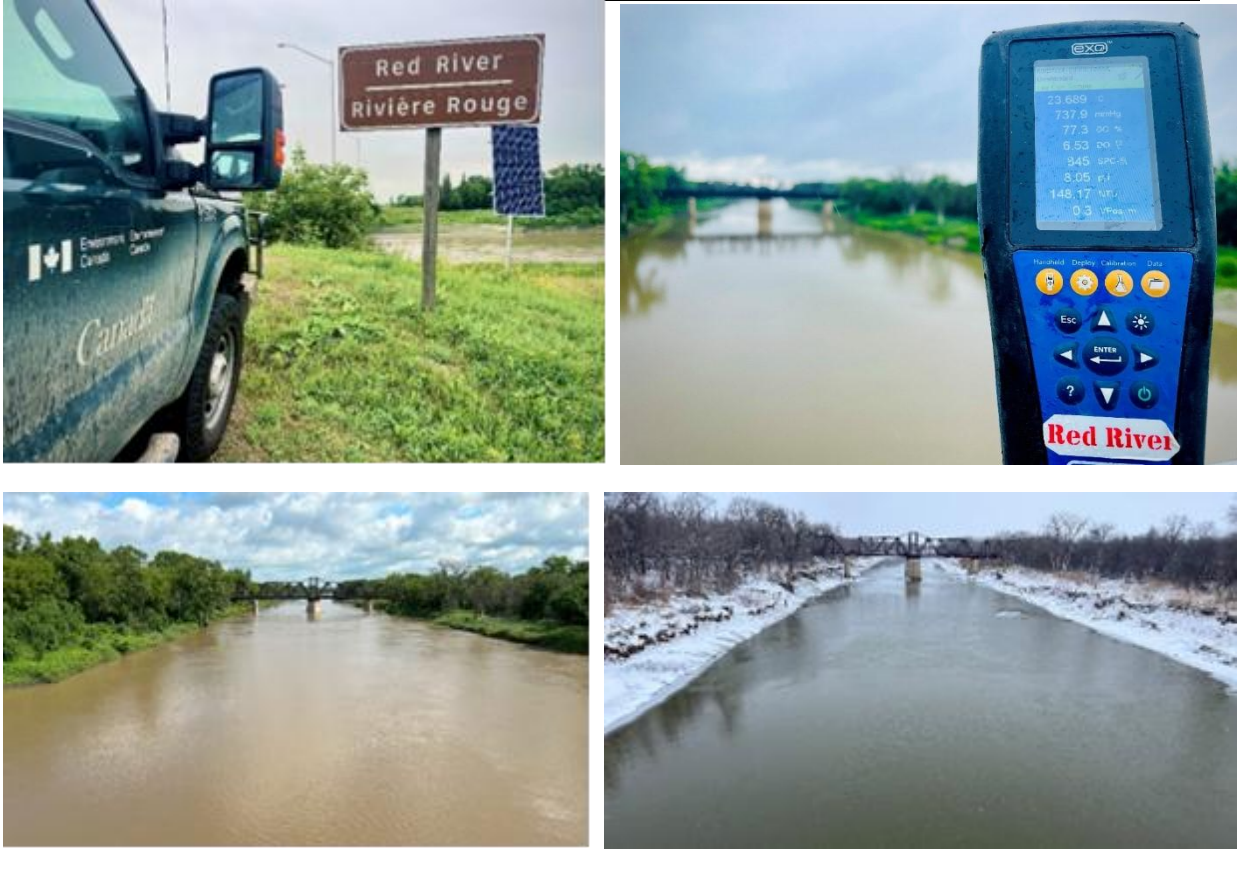

Figure 6: Water quality monitoring on the Red River at the Canada-US boundary by Environment & Climate Change Canada.

Results

The IRRWB's monitoring program for 2023–2024 successfully fulfilled its directive to assess and report on water quality at the international boundary. Dissolved oxygen and chloride levels met their respective objectives throughout the year. *E. coli* exceeded the objective in one sample, indicating general compliance. However, total dissolved solids and sulphate frequently exceeded their objectives, consistent with long-term trends (Table 1; Appendix F-1).

Nutrient concentrations and loads for both total phosphorus and total nitrogen significantly exceeded their respective objectives and targets. The 2024 open water season mean concentrations were 0.36 mg/L for phosphorus and 2.36 mg/L for nitrogen, both well above the established thresholds. Similarly, five-year average nutrient loads were more than double the targets, reflecting persistent nutrient enrichment in the Red River (Table 2; Appendix F-1). These objectives and targets were formally adopted in 2022 following IJC recommendations and represent a major milestone in transboundary nutrient management.

Alert level monitoring revealed exceedances for several metals, including cadmium, manganese, iron, and zinc. Cadmium presence may indicate anthropogenic sources, while iron and manganese are naturally occurring. Pesticide monitoring detected five compounds in 100% of samples, though all were below Canadian aquatic life protection guidelines (Appendix F-2). Monitoring also identified a wide range of current-use pesticides, including insecticides, herbicides, and fungicides. The IRRWB continues to track these trends and acknowledges the need for further research into the long-term effects of low-level pesticide exposure.

6. Aquatic Ecosystem Health

The Aquatic Ecosystem Health Committee (AEHC) supports the IRRWB in fulfilling the Board directive to maintain and enhance the aquatic ecosystem health of the Red River Basin. In alignment with the IRRWB's 2022 Directive and the AEHC Terms of Reference (2024), the committee applies best available science and engages a diverse membership of federal, state, provincial, and academic experts to guide its work.

The AEHC has the following responsibilities under the Board's direction:

- Supports aspects of the Board's Directive pertaining to aquatic ecosystem health, including monitoring and studying biotic communities and aquatic processes.
- Provides scientific and technical recommendations to the Board and alerts the Board to activities that may affect ecosystem health.
- Implements a multi-year workplan focused on species monitoring, fish passage, invasive species, and habitat restoration.
- Facilitates coordination and collaboration across jurisdictions, ensuring knowledge sharing and stakeholder engagement.
- Ensures accountability through co-chair reports, meeting minutes, and semi-annual reporting, as required by the IRRWB.

The Board's AEHC complies with IJC guidance on consensus decision-making, transparency, and Indigenous inclusion. All activities and deliverables are coordinated in consultation with the IRRWB and in accordance with its strategic priorities.

Summary of Workplan Objective, Key Initiatives and Programs

The AEHC contributes to the Board workplan by working on key activities that align with the IRRWB's directive focused on a resilient and ecologically functional Red River Basin. The AEHC's strategic activities in 2024 are listed below, with IWI projects detailed under Section 11. i

1. ***Fish Movement and Connectivity***

Key Initiative: Red River Telemetry Program

The AEHC continues to support and coordinate the Lake Winnipeg Fish Movement Program, now in its 10th year. This large-scale acoustic telemetry initiative has involved the tagging of over 1,140 fish across 10 species. The focus in 2024 included:

- New tagging of Sauger, Silver Redhorse, and Bigmouth Buffalo near St. Andrews Lock and Dam.
- Deployment of new acoustic receivers at St. Andrews Lock and Dam and the former Drayton Dam site (now a rock-arch-rapids) to assess fish passage effectiveness.
- Analysis of habitat use and movement data from the VEMCO Positioning System (VPS) in Lake Winnipeg, highlighting seasonal occupancy patterns of Walleye, Freshwater Drum, and Lake Whitefish.

This program contributes critical biological data to inform fish passage, connectivity, and water management decisions in both Canada and the US.

2. ***Species of Concern***

Key Initiative: Monitoring Bigmouth Buffalo, Lake Sturgeon, and Mapleleaf Mussels

- Ongoing tracking of Bigmouth Buffalo and Lake Sturgeon (Fig. 7), with tags extending to 2028.
- Monitoring of movement across modified structures such as the former Drayton Dam (Fig. 7) to assess recovery potential and barrier effectiveness.
- Initiation of brail sampling surveys for Mapleleaf Mussel (*Quadrula quadrula*) in urban Winnipeg, a species listed as threatened under the *Species at Risk Act*.

These activities support long-term tracking of species-at-risk and assessment of human impacts on habitat and connectivity.

3. ***Aquatic Invasive Species (AIS)***

The AEHC continues to evaluate current and projected invasive threats in the basin. This remains a workplan priority for future implementation.

Roseau River Restoration

While no restoration was implemented in 2024, the AEHC is working with the Seine-Rat-Roseau Watershed District and the Roseau River Anishinaabe First Nation to develop partnerships and funding proposals. These efforts aim to support channel restoration that will benefit 18 fish species and two mussel species of concern.

Public Engagement

Public dissemination of the Board's work on Aquatic Ecosystem is bolstered through notable peer-review scientific publications by members of the AEHC Appendix A).

Fathom database migration facilitates data sharing across agencies and jurisdictions.

Methods and Summary Table of Finding

Area of Work	Methods Employed	Key Findings	Notable Outcomes
Fish Movement and Connectivity	- Surgical tagging and acoustic telemetry using Innovasea transmitters and receivers - Receiver downloads (Lake Winnipeg: ~220; Red River: post-flood delay) - Cross-jurisdictional data sharing via Fathom database	- Over 1,140 fish tagged across 10 species - 2024 tagging: 42 Sauger, 40 Bigmouth Buffalo, 40 Silver Redhorse - Six new receivers deployed at both St. Andrews Lock and Dam and Drayton Dam - Walleye are the most frequent VEMCO Positioning System users, Freshwater Drum and Lake Whitefish exhibit seasonal patterns (Fig. 3)	- Ongoing transboundary fish movement dataset - Preliminary results show strong seasonal habitat use (e.g., Walleye dominant in spring/summer, absent in winter) - Evaluation of fish passage at Drayton initiated, with evidence of improved fish passage
Species of Concern	- Continued acoustic tracking of tagged Bigmouth Buffalo and Lake Sturgeon (tag life to 2028) - Mussel brail sampling survey for *Quadrula quadrula* (Mapleleaf) in Winnipeg near bank armoring sites	- Continued detection of cross-border movement patterns for Bigmouth Buffalo and Lake Sturgeon - Mussel survey underway (completion expected summer 2024)	- Builds evidence base for species-at-risk recovery - Monitoring supports evaluation of hydrologic structures and urban habitat modifications
Aquatic Invasive Species (AIS)	- Angler-reported suspected *Prussian Carp* near Fargo, ND (Aug 2024) - Visual ID confirmed by AB expert -Environmental DNA (eDNA) screening: 25 US + 26 CAN water samples - Swabs of angler gear tested using goldfish and Prussian carp genetic markers	- No Prussian Carp detected in any samples - Goldfish DNA detected in one water sample at the catch location - Many swabs showed ambiguous marker (common carp cross-reactivity); further tests in progress	- Early warning response coordinated through AEHC - Increased interjurisdictional communication (MN, ND MB, Department of Fisheries and Oceans) - AEHC proposed as lead international forum for AIS coordination in Red River Basin
Habitat Restoration (Roseau River)	- Strategic engagement with Seine-Rat-Roseau Watershed District and The Nature Conservancy Minnesota - Discussions with Roseau River Anishinaabe First Nation underway - AEHC members identified for technical, regulatory, and Indigenous liaison roles	- Confirmed plans to initiate a fish passage project at Dominion City dam, aiming to restore full connectivity to the Roseau River system - AEHC expertise in fish passage and Lake Sturgeon restoration recognized as a valuable contribution	- AEHC positioned to support funding applications and coordinate future restoration - Project aligns with ecosystem function and species-at-risk recovery goals

Figure 7: Marshall Stuart holding a Lake Sturgeon caught below Orwell Dam on the Otter Tail River, 2024 (Credit: Travis Moore).

Figure 8: The newly constructed rock-arch-rapids at the former Drayton Dam site, North Dakota.

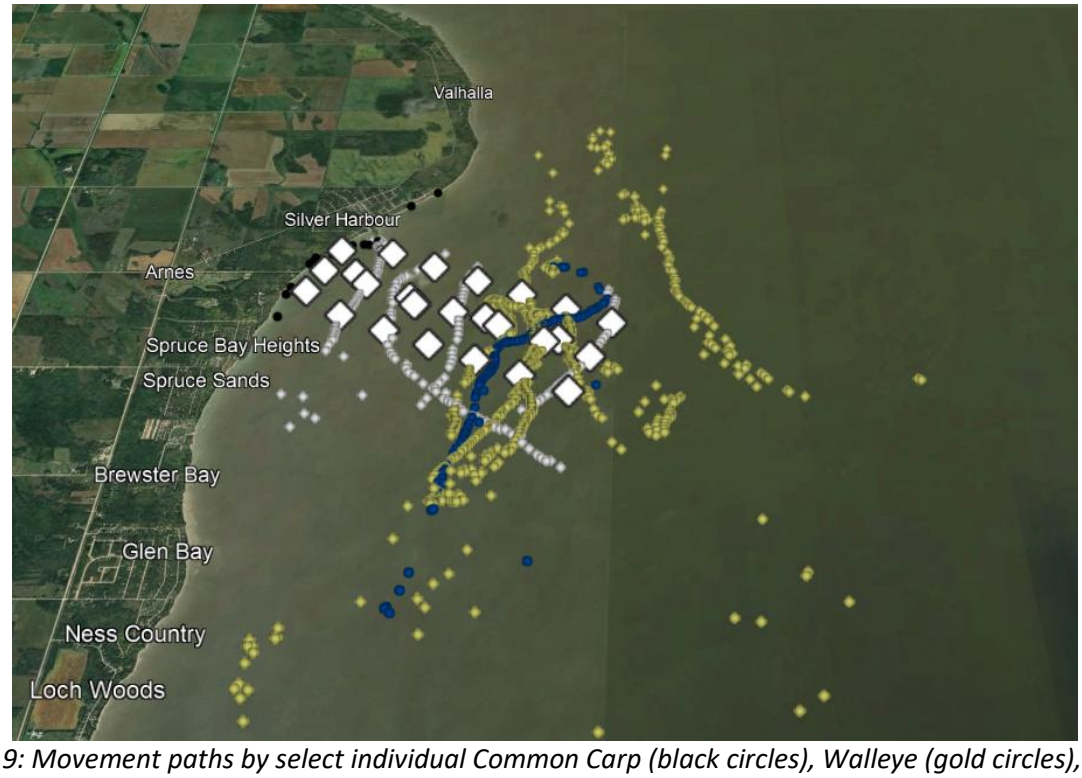

Figure 9: Movement paths by select individual Common Carp (black circles), Walleye (gold circles), Freshwater Drum (blue circles), and Lake Whitefish (silver circles) in the VEMCO Positioning System array (white diamonds) on Lake Winnipeg.

Results

The AEHC's 2024 activities addressed the IRRWB Directive by delivering critical ecosystem health mandates through strategic telemetry research, cross-border coordination, and rapid response to emerging invasive threats. Key results include progress on fish passage evaluation and an international investigation of a suspected invasive species.

1. Fish Movement & Passage

As part of the long-term fish telemetry program, data were processed from 2016 to 2024 to assess passage at two key structures: St. Andrews Lock and Dam (SALD, Manitoba) and Drayton Dam (North Dakota).

Key results from the fish passage analysis by Marshall Stuart, former MSc Graduate under Dr. Mark Pegg (University of Nebraska-Lincoln), include:

- 151 upstream and 158 downstream passage events were recorded at Drayton Dam.
    - Bigmouth Buffalo accounted for 93% of upstream and 84% of downstream events.
    - The modified structure (August 2023) significantly improved passage: fish were ~4 times more likely to pass under the modified condition (Hazard Ratio = 4.18; 95% CI: 2.38–7.35).
    - Passage times dropped sharply post-modification, from 24.8 days (unmodified) to 1.0 day (modified).

- At St. Andrews Lock and Dam**,** passage was less frequent**,** despite more potential attempts:
    - Only three Lake Sturgeon and 20 Freshwater Drum were recorded passing upstream from 2016 to 2024.
    - Upstream passage events coincided with operation of the fishway and floodway; one Lake Sturgeon passed upstream during May–June 2022.
    - Passage via the lock is suspected but could not be confirmed due to lack of operational records.

These findings strongly support the AEHC's workplan objective to evaluate the effectiveness of barrier modification and highlight the value of detailed, species-specific passage data. The work remains integral to assessing ecological connectivity and guiding future infrastructure and restoration planning. Unfortunately, planned continuation of the program is tenuous, as IWI funding is currently suspended despite initial project approval. Alternative sources of support are actively being pursued by members of the AEHC.

2. Invasive Species: Prussian Carp Investigation

In August 2024, a potential Prussian Carp (*Carassius gibelio*) was reported from the Red River north of Fargo, North Dakota. This prompted a cross-border investigation coordinated by AEHC members and partners.

Key actions and findings:

- Visual ID by fisheries biologists by Minnesota Department of Natural Resources and independent confirmation by Alberta Environment and Protected Areas suggested a possible Prussian Carp. However, both parties acknowledged that only DNA can verify the sighting.
- Environmental DNA (eDNA) samples (51 total: 25 U.S., 26 Canada) and gear swabs were tested:
    - No Prussian Carp DNA was detected.
    - One filtered water sample was positive for Goldfish DNA**,** consistent with existing Goldfish presence in the Fargo area.
    - Other ambiguous signals (e.g., GFND2 marker) were attributed to Common Carp and are undergoing further genetic clarification.
- Given the visual identification and high reproductive potential of Prussian Carp, this finding was treated seriously.
- AEHC facilitated rapid international coordination, including notifications to:
    - Red River Fisheries Steering Committee
    - Minnesota Department of Natural Resources, Manitoba Government, Department of Fisheries and Oceans-Canada
    - International Red River Watershed Board (IRRWB)

Though not confirmed via genetic evidence, this suspected invasion event highlights the need for continued AIS vigilance, strengthened early detection networks, and rapid genetic confirmation pathways.

Indigenous Collaboration and Traditional Knowledge

In order to advance the IJC Directive for providing a continuous and inclusive forum using science and traditional knowledge, the Board stood up the Indigenous Collaboration Task Team (ICTT). The Board prioritized the advancement of foundational efforts to bridge existing knowledge gaps between the IRRWB and Indigenous Nations. This work is necessary to inform future approaches and opportunities that support integration and inclusion of Indigenous peoples and knowledge in board activities and decision-making. For the betterment of the basin, we strive to bring Traditional Knowledge to the Board's activities.

The Board's ICTT work is guided by the recommendations of the 2023 Indigenous Nations Roundtable.

Key Initiative 1- Indigenous Representation

In 2024, the task team has endeavored on behalf of the Board to recruit and recommend Indigenous representatives at the committee level. As a part of the recommendation, acknowledgement and approval for committee member participation is sought from the elected leadership of their communities. This process allows the Board to share with these communities our work and our desire to collaborate.

Key Initiative 2- Indigenous engagement through Indigenous-Led Events

During this year, the ICTT has presented the Board opportunities to participate in Indigenous led activities. Upcoming events are included in regular reports to the board creating a greater awareness of opportunities to participate, that can inform board and committee members of the concerns, and priorities of Indigenous communities within the basin.

Key Initiative 3- Foundational work in support of a Data Policy

Implementing a Data Policy has been identified as a necessary effort to establish the appropriate framework for future collaborations with Indigenous people in the Basin. IRRWB must demonstrate a commitment to respect Traditional Knowledge in order to facilitate collaboration. The ICTT and IRRWB recognize that while this is a high priority and that it is essential to provide a foundation for future collaborations, it is also vitally important that we carry out this work in an informed manner. Therefore, the ICCT has worked to provide opportunities for critical conversations, facilitated by subject matter experts, to take place with our board and committee members.

In August of 2024, a Cultural Literacy Training was hosted as part of the IRRWB Summer meeting in Brokenhead Ojibway Nation, near Lake Winnipeg in Manitoba, Canada. The training

included a tour, presentations, and discussions. An executive summary and presentation materials have been archived and will be made available to the Board Members (2025).

Key Initiative 4- Collaboration with Indigenous Peoples for watershed health

The ICTT facilitated the sharing of several Community Collaborative Rain Hail and Snow (CoCoRaHS) kits with Indigenous Peoples in the basin including the Manitoba Metis Federation, Turtle Mountain Band of Chippewa Indians, and the White Earth Nation.

Figure 10: Brokenhead Wetland Interpretive Trail- August 2024. Photo by Karl Jansen.

Results:

To date, the IRRWB has adopted the first four recommendations made in the 2023 Roundtable and expressed support for the remaining:

- **Make room for Ceremony (Acknowledge and Respect)**
- **Participate in events led by Indigenous Peoples (Opportunities are being identified)**
- **Partner with Indigenous Peoples (Studies, Data Collection, Knowledge Identification)**
- **Enable Indigenous Representation at the Committee Level**
- Find way for representation to be chosen by Indigenous communities (at committee level)
- Find a way to have an intergenerational approach. Engage with and include Tribal/First Nations Elected Leaders and youth
- Support Binational Indigenous Collaboration (between the United States and Canada)
- Develop a Data Practices Act
- Foster Relationships (Continue engagement)

- Consider framing studies with the 7 teachings: Love, Respect, Bravery, Truth, Honesty, Humility, and Wisdom. This is intended to help to preserve the meaning of Traditional Knowledge by providing and including some Cultural context.

Crucial conversations around the remaining three (3) recommendations continue, and subject matter experts are being identified for participation.

- Meaningful Inclusion and Engagement-(Commit to uphold Consultation and Consent requirements).
- Respect Indigenous Knowledge- Create, Adopt, Develop and be accountable for new approaches.
- Reference UNDRIP and Treaty Promises in the work of the Board. Support the inherent rights of Indigenous People to their traditional territories.

*Figure 11: Roundtable recommendations*10. Outreach and Engagement

The IRRWB's Outreach and Engagement Committee (OEC) meets monthly to advance Board priorities and workplan activities. The following three priorities were identified by the IRRWB in 2024 and are in development:

Priority 1 – State of the Basin Reporting

This priority addresses the Strategic Objective to document the current state of the watershed, changing trends and key knowledge gaps and is informed by the workplan item to create a State of the Basin Report, inclusive of both Indigenous knowledge and perspectives, and Western science. This priority has been advanced by engaging a graduate student on the creation of

recommendations for the Board on different opportunities for initiating a State of the Red River Basin Report. This project will likely be finalized in 2025 and presented to the Board at that time to explore how the recommendations can be implemented.

Priority 2 – Inform and involve the public in the work of the IRRWB including providing timely, pertinent and public-friendly information and knowledge

Based on the Strategic Objective to ensure all people in the watershed are well-informed and have meaningful opportunities to engage and have dialogue with the IRRWB and governments on issues, this priority seeks to develop plain language information for awareness of IRRWB activities and engage the public in the work of the IRRWB. The Outreach and Engagement Committee assists in the organization of public meetings in conjunction with the IRRWB's Annual Board Meetings and has also developed a Communications Plan to assist the IRRWB in the advancement of future outreach and engagement opportunities.

In August 2024, the Board partnered with the Grand Beach Cottage Owners' Association to host a public session at Grand Beach, Manitoba. The public meeting was later featured in the Selkirk Record in an article titled "International Red River Watershed Board hosts public meeting in Grand Beach" (Figure 10).

Another highlight facilitated by the Outreach and Engagement Committee is the Fish Movement Study Webinar presented by the Canadian Co-Chair of the Aquatic Ecosystem Health Committee to the Canadian Water Resources Association's Manitoba Branch Webinar Series in October 2024.

Priority 3 – Science Communications Training

Science Communications Training enables scientists and other professionals to communicate scientific knowledge and findings in a way that is accessible and easily understood by a variety of audiences, including the public. Currently, effective communication between the IRRWB and the public has been identified as a gap and bridging this gap has been identified as a priority of the workplan. The Board submitted its IWI proposal to the IJC and anticipates that the training will take place mid-year of 2025.

10 The Selkirk Record Thursday, September 5, 2024

International Red River Watershed Board hosts public meeting in Grand Beach

Mayor Larry Johannson joins board as new member

By Katelyn Boulanger

The International Red River Watershed Board held a public meeting on Aug. 21 in Grand Beach to let local residents know what the board does and why this international alliance is important in our region.

The meeting started with board member Mark Lee introducing himself and the other members of the board, before a land acknowledgement took place.

Rebecca Seal-Sollieau the board's secretary from the US Army Corp then stepped up to moderate the meeting letting attendees knew that the board was interested in feedback from them.

"Management and understanding and building relationship with the water resources throughout all of our basins really depends on all of us having two-way communication from science and then the people that live there and experience it," she said.

Karl Jansen, the United States co-chair of the International Red River Watershed Board took to the front to talk about the International Red River Watershed Board's beginnings.

"I'll talk a little bit high level about the International Joint Commission, but I'll tell you that the most important thing that we do is interact with the people that we serve," he said.

Jansen then went on to talk about the International Joint Commission which was founded in 1909 with the International Joint Waters Treaty. This treaty is important because there's no other agreement like it internationally.

"We have two countries, neighbours who are peacefully working through issues with shared waters. In other parts of the world, people go to war over their water," he said explaining that this is a terrific model for the rest of the world.

International Red River Watershed Board is the board that deals with the Red River watershed which is one of many watersheds that span the US-Canada border and they report to the International Joint Commission.

A noteworthy local member of this board is Selkirk Mayor Larry Johannson who is a recent addition to the board.

Canadian Chair of the Board Patrick Cherneski then took to the stage to go more into detail.

"[The Red River is a] really interesting basin. It's often described as a bit of a bathtub. Water very much has to flow north. There's an escarpment on each side. Everyone here is familiar with the flooding in the Red River Valley and that was one of the original issues that the Board was created for," he said.

Though the International Joint Commission was created over a century ago, the International Red River Watershed Board came to being in 2000 in response to the flood of 1997. Though the flood kickstarted the Board, their mandate has expanded to include the not just dealing with issues that can increase flooding but health of the watershed.

Cherneski explained that a big part of the board's job is monitoring across water supply, across water quality, across aquatic ecosystem health and supporting the health of the aquatic life and integrity of the aquatic ecosystem.

One of the requirements of each of the International Joint Commission boards is to produce a report with information each year and residents can learn more from this report which is available online at the International Red River Watershed Board website.

He then went on to explain the structure and members of the International Red River Watershed Board and how it maintains parity between both countries by including members from both sides of the border.

From there, the presentation was taken over again by Lee who discussed some of the many projects that the International Red River Watershed Board is involved in.

"It's about a million square kilometers of land so there's a lot going on across that watershed that affects Lake Winnipeg. There are about 7 million people that live in the watershed. So, a lot of people from all across the watershed [and] the decisions they make ultimately impact Lake Winnipeg. So, it's a big problem. When you want to improve Lake Winnipeg, there's a big area and a lot of people that you have to impact," said Lee.

Something that Lee noted was that though the Red River is only the third largest river contributing water to Lake Winnipeg, it contributes about 70 per cent of the Lake's phosphorus. He explained that the rich fertile land in the region has a naturally higher load of phosphorus but human activity is also contributing to this number.

He then went into the history of the area and how the very flat terrain in addition to the heavy clay soil means that water isn't absorbed as well by the land leading to why the Red River Valley naturally has so much flooding. He showed this using a 3-D map which showed the topography of the region.

After talking about hydrology Lee moved on to water quality.

"Canada and the US have agreed on bi-national objectives on water quality on the Red River. We've been monitoring, as a board, water quality for a long time. They had five parameters in 1969. They added more parameters in 1986 and most recently, and probably most interesting to this group, in 2022 they added nutrient objectives," said Lee.

The nutrient objectives currently indicate that the International Red River Watershed Board is trying to reach 1990 levels of nutrients, this is because this was about when the severity and frequency of algae blooms increased.

The final bit of the presentation at the meeting was taken over by Lee Gutowsky the International Red River Watershed Board's aquatic ecosystem co-chair who spoke about the work that they have been doing monitoring fish in the Red River.

Right now about 11,050 fish have been tagged over 30 species with transmitters that can be picked up by receivers in the Red River and Lake Winnipeg. Gutowsky explained that this does require fish to swim by a receiver but it allows them to track the movement of fish in the river.

"One fun fact about channel catfish is that when you tag these fish, they're able to actually expel their transmitter. They just ingest it into the intestine and excrete it. So they're really difficult to study. We've had a tough time getting data from channel catfish," said Gutowsky.

Gutowsky then went through a couple of restoration projects that have taken place removing dams to increase fish interconnectivity in the river.

From there, there was a short question and answer period followed by a presentation by Grand Beach's Betty Clark. Clark spoke about her experience of the Red River, Grand Beach and Lake Winnipeg as a long-time Grand Beach resident.

Clark spoke about how her father purchased their cottage in 1950 for $300 and how in the past ice was cut from the Lake for the community's iceboxes. A very interesting memory that she shared was about how the train whistling as it came into town to pick up passengers was also the last call whistle.

In conclusion, she said, "After 71 years in my little piece of paradise, I cannot help but have the confidence that all will be well with the expertise of this fine group. Many thanks."

Lake Winnipeg & the Red River

RECORD PHOTO BY KATELYN BOULANGER

Mark Lee and a topographical map of the Red River Basin.

Figure 12: Article from the Selkirk Record: International Red River Watershed Board hosts public meeting in Grand Beach, published September 5th, 2024 (https://selkirkrecord.ca/split_document.aspx?doc=SelkirkRecord090524.pdf#page=10).

Results

In the coming year, the Outreach and Engagement Committee will continue to advance priorities related to the IRRWB's Strategic Objectives and Workplan. This includes identifying further opportunities for engaging the public in the work of the Board through public meetings and communication materials. Participation in Science Communications Training in the coming year will facilitate this, allowing board members to explore new outlets and approaches for sharing scientific findings with a broader audience. Recommendations on the advancement of a State of the Red River Basin Report will also be received in the next year, which will guide the board's approach to reporting on aquatic ecosystem health throughout the basin in a way that is public-friendly and informative.

8. International Watersheds Initiative Projects

The IRRWB currently has two active IWI projects. The following is a list of IRRWB's active projects as well as those currently under development. A list of completed projects has also been included.

ACTIVE PROJECTS

1. Evaluation of factors contributing to trends in sulfate, chloride and total dissolved solids in the Red River Basin: Statistical models (Led by WQC, started October 2023 expected completion 2025)

This project is Phase one of two complementary projects that seek to identify factors contributing to changes in sulfates, chloride and total dissolved solids (salts) concentrations over time and the relative effect of those factors on exceedances of water quality objectives.

This project consists of two phases; Phase 2 of the project will be based on the results of Phase 1:

1. Phase 1:
    a. Identify factors contributing to changes in salt concentrations from 2000-2015 (attribution of temporal trends) and evaluate the relative contribution of those factors to water quality objectives.

Phase 1 of this project is valued at approximately $209,000 USD/$289,000 CAD.

2. Assessing Outcomes of Dam Modifications to Facilitate Fish Passage in the Red River Watershed (Led by AEHC, submitted 2024; in procurement phase)

This project, proposed in 2024 by the Aquatic Ecosystem Health Committee, intends to build upon the research conducted in the 2021 IWI Project "Red River Telemetry Study" by providing additional insight into the frequency at which fish are moving through areas that have been modified to facilitate fish passage e.g. Drayton Dam. This project also seeks to identify other key fish behaviours for a suite of target species (i.e., Lake Sturgeon, Bigmouth Buffalo, Freshwater Drum, Walleye) that represent a broad range of life-histories.

This three-year project is valued at approximately $228,000 USD/$314,000 CAD and seeks to complete the following objectives:

1. Improve spatial resolution of the telemetry array near dams to evaluate timing of fish passage and space use;
2. Continue monitoring broad scale movement on the expanded telemetry array; and
3. Use data to inform management decisions and future passage projects in the context of ecologically and culturally important species.

PROPOSED PROJECTS

Proposed Project 1. Science Communications Training (submitted, led by OEC)

Effective communication between the IRRWB and the public has been identified as a gap. To work on addressing this gap, the Outreach and Engagement Committee submitted an International Watersheds Initiative (IWI) proposal to the IJC to offer participation in a series of Science Communications Training sessions to IRRWB board and committee members. To enable collaboration between other IJC boards, this training will also be offered to the International Rainy-Lake of the Woods Watershed Board and the International Souris River Board, both of which expressed an interest in the training. This training aligns directly with the International Watersheds Initiative's Seven Operating Principles, specifically the following:

- Involvement of local expertise;
- Public engagement;
- Open and respectful dialogue.

RECENTLY COMPLETED

Evaluating drought risk of the Red River of the North Basin using historical and stochastic streamflow upstream from Emerson, Manitoba (Led by Hydrology Committee, Started May 2020 and completed January 2024)

To understand the potential for drought conditions along the Red River, the U.S. Geological Survey undertook a study to develop a water-balance model of the Red River Basin upstream of Emerson and stochastic hydrometeorological data to derive a set of synthetic streamflows that would be used to statistically characterize the potential for periods of extreme low flows over the next 50 years. Additionally, the Red River sulfate study is a follow-up to the Red River trend analysis and is dependent upon output from this Red River low-flow study. The full report citation and link is listed in Appendix B

1. Building the foundations for Indigenous collaboration in the International Red River Basin – Phase 2 (Cultural Literacy Training) – 2024

1. Supporting Wastewater Utility Nutrient Voluntary Performance Improvement Through Training and Technical Assistance in the Red River Basin - 2021
2. Building the foundations for Indigenous collaboration in the International Red River Basin – Phase 1 – 2021
3. Drought Risk Analysis of Stochastically Generated Streamflow for the Red River Basin – 2019
4. Red River Telemetry Study – 2018
5. Water Quality Trend Analysis for the International Red River – 2017

For more information on recently completed IWI projects, please visit:
https://www.ijc.org/en/rrb/iwi-projects

9. Accountability and Transparency

Budget Overview and Report

The International Red River Watershed Board (IRRWB) does not have a budget per se. The Board and its Committees heavily rely on in-kind support from members and/or their agencies/employers. As such, the IRRWB and the IJC are grateful for these contributions and the ongoing support of its members as this provides immense value to advancing the priorities of the board. Costs of water quality monitoring are covered by member agencies. Funding for projects is mainly provided by the International Watersheds Initiative (IWI). There are currently two active IWI projects being implemented by the IRRWB, at a total value of approximately $436,000 USD/$600,000 CAD.

Board Meetings

In the reporting year of 2024-25, the Board held two in-person Board Meetings (August 2024 in Brokenhead, Manitoba and January 2025 in Grand Forks, North Dakota) and two virtual Board Meetings (June 2024 and November 2024).

Public Engagement and Communications

This past year, the IRRWB held two in-person Public Meetings. On August 21st, 2024, the Board held a Public Meeting at the Grand Beach Community Club in Grand Beach, Manitoba. The meeting was held in collaboration with the Grand Beach Cottage Owners' Association and featured presentations from Board Co-Chairs, Hydrology Committee Canadian Co-Lead, Aquatic Ecosystem Health Committee Canadian Co-Lead, and long-time residents of Grand Beach.

The second Public Meeting was held on January 16th, 2025, at the Alerus Center in Grand Forks, North Dakota, in conjunction with the Red River Basin Commission's International Summit Conference. The Public Meeting featured a welcome message and openings from Ted Priester of the Red River Basin Commission, and Commissioners of the International Joint Commission, and included a presentation from Nicholas Kludt, Co-Lead of the Aquatic Ecosystem Health Committee.

In the Spring of 2024, the IRRWB's Outreach and Engagement Committee (OEC) drafted a Communications Plan. The Communications Plan identifies communication priorities of the Board for 2024-2026 in alignment with the IRRWB's workplan. The Communications Plan outlines the roles and responsibilities of the OEC in relation to the delivery of the plan and communication priorities and includes a communications calendar to identify anticipated outreach and engagement opportunities throughout the year. The Communications Plan also identifies the importance of drafting key messages to simply explain the Board's mandate, its activities, and responsibilities. Key Messages have since been drafted for the Board and are saved on the IRRWB SharePoint site.

In early 2025, an IWI Proposal was submitted to the IJC by the Outreach and Engagement Committee to host a series of Science Communications Training Sessions offered by the Alan Alda Center for Communicating Science. The proposed training directly aligns with the Board's responsibilities as an International Watershed Board to involve the public in the work of the Board through the provision of timely, pertinent, and public friendly information. This series of training sessions would also be offered to interested members of the International Rainy-Lake of the Woods Watershed Board and the International Souris River Board. Both Boards have demonstrated an enthusiastic interest in the training opportunity.

Actions Related to Commissioners' Priorities

The IRRWB reports to the Commission and therefore is responsible for acting in accordance with the IJC Commissioners' Priorities. The IRRWB's Workplan is aligned with the IJC's Directive to the IRRWB, describing areas of activity that contribute to an overall objective of supporting the aquatic ecosystem integrity of the Red River Basin.

10. Conclusion and Future Direction

The IRRWB was faced with key challenges that it is working on addressing:

1) Committee Composition: The Board continues to fill vacant positions in its committees despite challenges that have arisen from government transitions and reduced Secretariat capacity. This past year, we were successful in appointing at least one Indigenous member to each of the Committees. Progress continues to be made in appointing additional Indigenous participants to the various Committees.
2) Mandated Responsibilities to Address Climate Change: The Board is exploring opportunities to develop and promote a culture of climate change adaptation and resilience.
3) Outreach and Communications: Translating scientific information and knowledge into public-friendly information helps inform and engage a broader audience in the work of the IRRWB. Opportunities to do so present themselves through ongoing partnerships, continued public outreach, a new and improved Annual Report, and the identification of opportunities for State of the Basin Reporting as a watershed board.

Despite these challenges, 2024 was another significant year for the Board with the approval of strategic goals, acceptance by the IJC of the updated workplan, and approval of a set of criteria for new IWI projects that are linked to the new strategic goals. In the year ahead, the Board will continue with ongoing monitoring and reporting, in addition to exploring the following opportunities:

1) Nutrient objectives (Nitrogen and Phosphorus): Water quality objectives and exceedances are an increased priority. The Board plans to further explore a potential response regarding water quality exceedances, including for nutrients.
2) International Watershed Initiative (IWI) Projects: The Board will continue to advance existing IWI projects and bring forward new project proposals and activities identified in the updated workplan that advance the strategic goals and the Directive responsibilities. This includes but is not limited to the implementation of a series of Science Communications Training Sessions for the IRRWB.
3) Outreach and Engagement: The Board continues to explore opportunities for publicly sharing information and for partnering with other institutions in the basin, such as the Red River Basin Commission and academic institutions.
4) Board and Committee Composition and Structure: The Board will further discuss how to promote a culture of climate change adaptation and resilience through the adjustment and alignment of the Board and Committee structure. New Terms of Reference for Committees are also underway, to be approved and implemented by the next Annual Report.

5) Indigenous Collaboration: Through the support of the Indigenous Collaboration Task Team, the Board continues to find opportunities to strengthen relationships with Indigenous partners and enable meaningful participation in both Board and Committee work.

APPENDIX A – References and Further Reading

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APPENDIX B – Directive to the International Red River Watershed Board

DIRECTIVE TO THE

INTERNATIONAL RED RIVER WATERSHED (May 26, 2022)

History of Directive

Pursuant to the Boundary Waters Treaty of 1909, wherein Canada and the United States agree to certain provisions including regarding the maintenance of navigation, water levels, flows, and water quality of boundary waters, responsibilities have been conferred on the Commission under a 1948 Reference from the governments of Canada and the United States with respect to the use and apportionment of the waters along, across, or in the vicinity of the international boundary from the eastern boundary of the Milk River drainage basin on the west up to and including the drainage basin of the Red River on the east, and under the May 1969 authorization from the governments to establish continuous supervision over the quality of the waters crossing the boundary in the Red River and to recommend amendments or additions to the objectives when considered warranted by the International Joint Commission.

The directive from the International Joint Commission dated February 7th 2001 consolidated the functions of two former boards created pursuant to the above responsibilities, the International Red River Pollution Board and the International Souris-Red Rivers Engineering Board, into one board, known as the International Red River Board (IRRB). This Directive replaces the February 7th 2001 directive given that on [date] the International Joint Commission designated the IRRB an International Watershed Board, which shall now be named the International Red River Watershed Board (IRRWB), requiring it to operate pursuant to International Watershed Initiative principles and approaches.

Definitions

“Aquatic Ecosystem of the Red River Basin” means the structure, function and interacting components of water, land, air, and living organisms that relate to the Water Resources of the Red River Basin.

“Aquatic Ecosystem Integrity” means that the Aquatic Ecosystem of the Red River Basin can support and maintain a community of organisms that has species composition, diversity, functional organization, supporting processes, and rates of change comparable to those of

natural habitats within the Red River Basin.

“Red River Basin” means the Red River excluding the Assiniboine and Souris Rivers.

“Water Resources of the Red River Basin” means the Red River and any order tributary to the Red River including deltas, tributaries of deltas, wetlands, and lakes which contribute water to the Red River, whether in liquid or frozen state and includes groundwater and aquifers.

Objective

The objective of the IRRWB is to support the Aquatic Ecosystem Integrity of the Red River Basin pursuant to this Directive.

Direction

The IRRWB operates under the authority of the Commission as set out in this Directive.

> Commission’s direction to the IRRWB is to achieve the Objective by assisting the Commission in preventing and resolving disputes relating to the Aquatic Ecosystem of the Red River Basin through implementation of its responsibilities under this Directive in accordance with the seven operating principles of an International Watershed Board (attached as Schedule A).

Responsibilities

To fulfil this Directive, the IRRWB shall:

1. Focus on all aspects of Aquatic Ecosystem Integrity which includes but is not limited to ground and surface water quality, quantity, levels, flows, and biological elements.
2. Maintain an awareness of current and emerging land use and development and socio-economic activities and conditions and the potential or existing impact of these activities and conditions on the Aquatic Ecosystem Integrity of the Red River Basin, including through maintaining an awareness of the activities of other governments (federal, provincial, state, municipal and/or Indigenous as relevant) and their agencies and institutions;
3. Provide a continuing and inclusive forum for the identification, discussion and resolution of relevant existing and emerging issues, science and traditional knowledge, and the sharing of information and best practices;
4. Develop an approach, maintain and report on the state of the Aquatic Ecosystem of the Red River Basin;

5. Recommend to the Commission objectives for Aquatic Ecosystem Integrity, including objectives related to the watershed and the component parts of the Red River Basin, and where objectives have been agreed to by governments of the Red River Basin:
    - Maintain continuing surveillance and perform inspections, evaluations and assessments, as necessary, to determine compliance with the objectives;
    - Encourage the responsible governments (federal, provincial, state, municipal and/or Indigenous as relevant), including their regulatory and enforcement agencies and the Commission to take steps to ensure that the objectives are met;
    - Review and update if necessary the objectives every five years or more frequently if circumstance so require;
    - Report yearly to the Commission on this provision, unless circumstances require more frequent reporting.
6. Encourage the responsible governments (federal, provincial, state, municipal and/or Indigenous as relevant) and their appropriate authorities, such as resource and emergency planning agencies, to develop and promote a culture of climate change adaptation and resilience, including flood, drought, and wildfire mitigation, management and preparedness and associated land management and conservation approaches.
7. Develop and promote a culture of climate change adaptation and resilience, including flood, drought, and wildfire mitigation, management and preparedness and associated land management and conservation approaches, and their effects on the Aquatic Ecosystem by:
    - Monitoring and reporting on the adequacy of mitigation, management and preparedness activities, procedures, data and information collection networks, and warnings;
    - Encouraging and facilitating adaptive management and the development, maintenance and sharing of collaborative and innovative data and information systems and forecasting and hydrodynamic techniques, mapping and models;
    - Encouraging governments to develop improved procedures for emergency warnings and to improve communication of emergency forecasts;
    - Interacting with all levels of government to help decision-makers become aware of these issues;
    - Monitor potential effects of flood, drought, and wildfire mitigation, management and preparedness and associated land management and conservation approaches and other works in the Red River Basin, and encourage cooperative studies necessary to examine these effects;
8. Encourage governments to establish and maintain contingency plans, including early warning and coordination procedures, for appropriate reporting and action on

emergency matters that may impact Aquatic Ecosystem Integrity including accidental discharges or spills, floods, droughts and wildfires and associated land management and conservation approaches.

9. Monitor and report on progress by relevant governments (federal, provincial, state, municipal and/or Indigenous as relevant) in implementing the IRRWB and Commission recommendations.
10. Involve the public in the work of the IRRWB, facilitate provision of timely, pertinent, and public-friendly (in terms of readability and accessibility) information and knowledge translation in the most appropriate manner including electronic information networks, and conduct an annual public meeting.

Accountability and Reporting

The IRRWB is accountable to the Commission and therefore shall:

1. Provide an annual report to the Commission on the state of the Red River Basin, progress made towards fulfillment of the Objective and the responsibilities set out in this Directive, plus other reports as the Commission may request or the IRRWB may feel appropriate in keeping with this Directive.
2. Provide a tri-annual assessment of progress to the Commission evaluating the effectiveness in achieving the Objective and any recommendations to improve effectiveness;
3. Ensure adequate opportunities are provided for the public to comment on the IRRWB's activities including on the adequacy of progress towards the Objective and effectiveness of fulfilment of this Directive;
4. Inform the Commission, in advance, of plans for any public meetings or public involvement in the IRRWB deliberations. The IRRWB shall report, in a timely manner, to the Commission on these meetings, including the representations made;
5. Provide the text of media releases and other public information materials to the Secretaries of the Commission for review and approval by the Commission's Public Information Officers, prior to their release;
6. Inform the Commission of any developments or cost impediments, actual or anticipated, which are likely to affect fulfilment of the IRRWB's responsibilities or attainment of the objective of this Directive, and provide the IRRWB's proposed plan to address fulfilment of its responsibilities under the circumstances.

Membership

1. The IRRWB shall have an equal number of members from each country.
2. The IRRWB shall be comprised of members representing a wide range, if not all interests in the Red River Basin to include, but not limited to, Indigenous, conservation, and municipal members.
3. The Commission shall normally appoint each member for a three-year term. Members may serve for more than one term.
4. Members shall act in their personal and professional capacity to uphold and achieve the objective and fulfil this Directive, and not as representatives of their countries, agencies, institutions or communities.
5. The Commission shall appoint one member from each country to serve as co-chairs of the IRRWB.
6. At the request of any member, the Commission may appoint an alternate member to act in the place of such member whenever the said member, for any reason, is not available to perform such duties as are required of the member. An alternate member may not act as a co-chair.
7. The co-chairs of the IRRWB shall be responsible for maintaining proper liaison between the IRRWB and the Commission, and among the IRRWB members. Chairs shall ensure that all members of the IRRWB are informed of all instructions, inquiries, and authorizations received from the Commission and also of activities undertaken by or on behalf of the IRRWB, progress made, and any developments affecting such progress.
8. Each chair, after consulting the members of the IRRWB, may appoint a secretary. Under the general supervision of the chair(s), the secretary(ies) shall carry out such duties as are assigned by the chairs or as decided by the IRRWB.
9. The IRRWB may establish such committees and working groups as may be required to discharge its responsibilities effectively. All committees established by the IRRWB must be established in accordance with the terms of this Directive and operate according to Terms of Reference approved by the Commission. The Commission shall be kept informed of the duties and composition of any committee or working group.

Meetings, Management and Administration

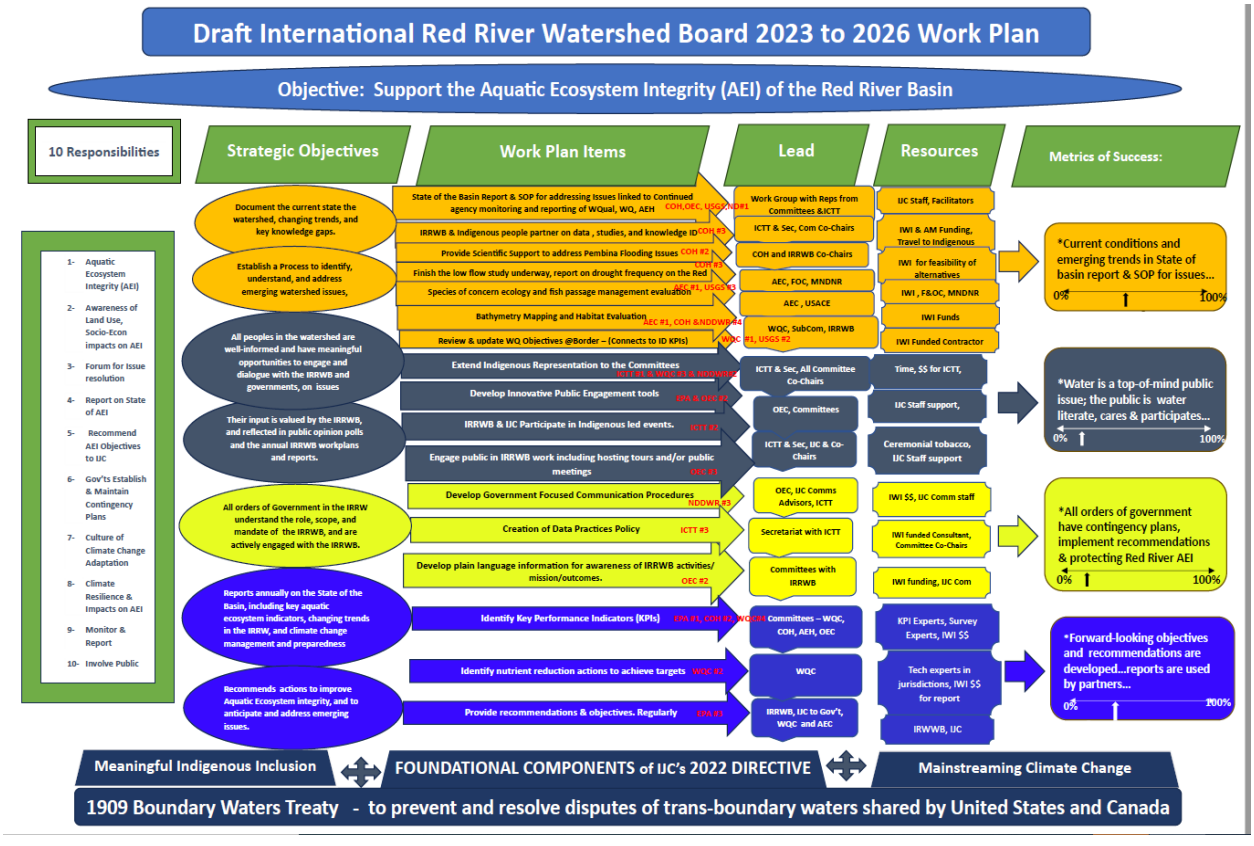
1. The IRRWB shall conduct its work by consensus as per the Commission's Guidance on Board Consensus Document dated March 20, 2020.
2. In the event of any unresolved disagreement among the members of the IRRWB, the IRRWB shall refer the matter forthwith to the Commission for decision.

3. If, in the opinion of the IRRWB or of any member, any instruction, directive, or authorization received from the Commission lacks clarity or precision, the matter shall be referred promptly to the Commission for timely and appropriate action shall be promptly communicated to the IRRWB.
4. Ordinarily, members of the IRRWB, committees, or working groups will make their own arrangements for reimbursement of necessary expenditures.
5. Reports, including annual reports, and correspondence of the IRRWB shall, normally, remain privileged and be available only to the Commission and to members of the IRRWB and its committees until their release has been authorized by the Commission.

Duration of Directive

1. This Directive continues until amended or discontinued by the Commission.
2. The Commission may amend this Directive and/or existing instructions or issue a new Directive and/or instructions to the IRRWB at any time.

APPENDIX C – Workplan



APPENDIX D – Additional Information on Water Quality

D-1 – Water Quality Objectives

The IJC recommended the establishment of water quality objectives for a limited number of variables at the International Boundary in April 1968, and the recommendation was approved by governments in May 1969. These variables with binational objectives included dissolved oxygen, total dissolved solids, chloride, sulphate, and fecal coliform bacteria. *E. coli* replaced fecal coliform as a water quality objective in October 2010.

Several exceedances of binational water quality objectives were observed during the 2023-2024 water year, as summarized in Table 1. Additional detail on each parameter is provided.

Table 1 International Red River Board Water Quality Objectives Summary of Exceedances Red River at the International Boundary Oct 1 2023 to Sept 30 2024 Water Year

Parameter	Objective	Exceedances		
		Number (total # samples)	% samples exceeding	Maximum (Date)
Dissolved Oxygen	>5 mg/L	0 (40)	0%	5.64 ** (Jul 10th)
Total Dissolved Solids	500 mg/L	35 (40)	88%	1161 (May 21st)
Chloride	100 mg/L	0 (40)	0%	98.9 (Dec 5th)
Sulphate	250 mg/L	24 (40)	60%	583 (May 21st)
E. coli	<200 colonies /100 ml	1 (14)	7%	310 (Oct 4th)

***Minimum value for Dissolved Oxygen*

Dissolved Oxygen

Observed levels of *dissolved oxygen* did not fall below the objective of 5 mg/L during the 2023-2024 water year. The minimum observed value was 6.13 mg/L on July 10th, 2024. Minimums often occur in summer, especially when discharge increases following significant rain events.

Total Dissolved Solids

Total Dissolved Solids (TDS) exceeded the objective of 500 mg/L in 88% of samples (Figure 11). Exceedances have been common over the last number of years: typically TDS values remain above the objective except where diluted by the higher flows of the spring freshet or other flooding. The highest observed value of TDS was 1161 mg/L on May 21st, 2024.

Chloride

Observed levels of *chloride* did not exceed the objective (100 mg/L) during this reporting period. The maximum concentration was 98.9 mg/L on December 5th, 2023. In recent years, chloride has occasionally exceeded the objective at low frequencies.

Sulphate

S*ulphate* exceeded the objective of 250 mg/L in 60% of samples during the 2023-2024 water year (Figure 12). Sulphate exceedances have been common over the last number of years. The maximum value measured was 583 mg/L on May 21st, 2024.

E. coli

The bacteriological characteristics of the Red River are assessed on the basis of observed *Escherichia coli* bacteria. The presence of *E. coli* in water is an indicator of impacts via human and/or animal wastes. During the 2023-2024 water year, *E. coli* bacteria counts exceeded the objective (200 colony forming units per 100 mL) in one sample, with a concentration of 310 CFU/100mL.

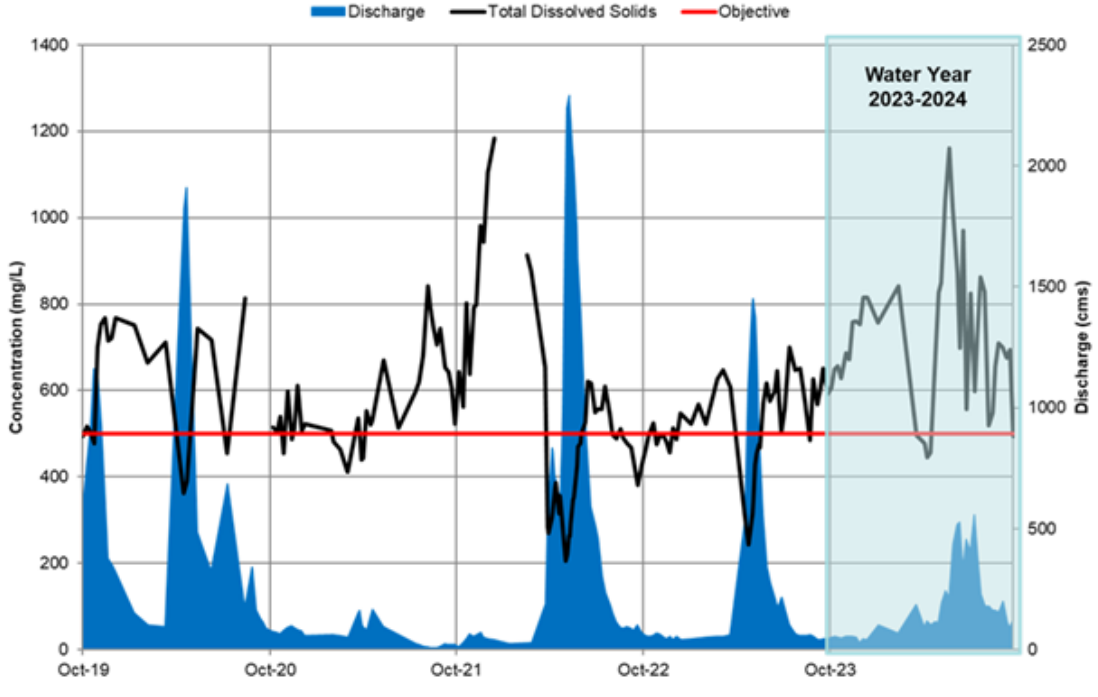


Figure 13: Total Dissolved Solids (TDS) concentrations and exceedances on the Red River at the International Boundary.

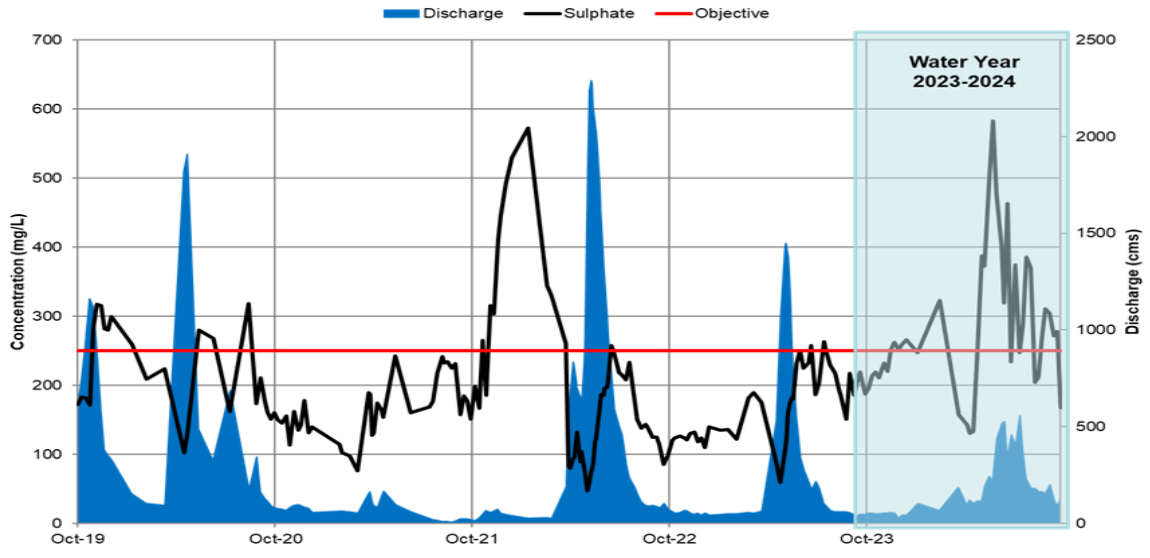


Figure 14: Sulphate concentrations and exceedances on the Red River at the International Boundary.

Water Quality Objectives and Targets for Phosphorus and Nitrogen

In May 2020, the IJC recommended the adoption of nutrient objectives and targets at the International Boundary, and in October 2022, the recommendation was approved by governments. The parameters total nitrogen and total phosphorus are each evaluated against ***concentration objectives*** as well as ***loading targets***. Nutrient concentrations and nutrient loads are reported in Table 2.

Table 2 Nutrient Concentrations and Loads, Red River at International Boundary			
Parameter	**Nutrient Concentration Objective**	**2024 Open Water Season Mean Concentration**	**Meets or Exceeds**
Total Phosphorus	0.15 (mg/L)	0.36	Exceeds
Total Nitrogen	1.15 (mg/L)	2.36	Exceeds
Parameter	**Nutrient Load Target**	**2019-2023 Average Load**	**Meets or Exceeds**
Total Phosphorus	1,400 (tonnes / year)	3,163	Exceeds
Total Nitrogen	9,525 (tonnes / year)	18.921	Exceeds

Nutrient Concentration Objectives

An open water season mean concentration is calculated as the average concentration in all samples collected between April 1st and October 30th in a given year. The open water season mean is compared against the concentration objective to determine compliance.

Total Phosphorus

The Apr-Oct mean total phosphorus concentration for the 2024 open water season was 0.36 mg/L, which exceeded the objective of 0.15 mg/L (Figure 13). Total phosphorus has consistently exceeded the concentration objective value for several decades.

Total Nitrogen

The Apr-Oct mean total nitrogen concentration for the 2024 open water season was 2.36 mg/L, which significantly exceeded the proposed objective of 1.15 mg/L (Figure 14). Total nitrogen has consistently exceeded the concentration objective value for several decades.

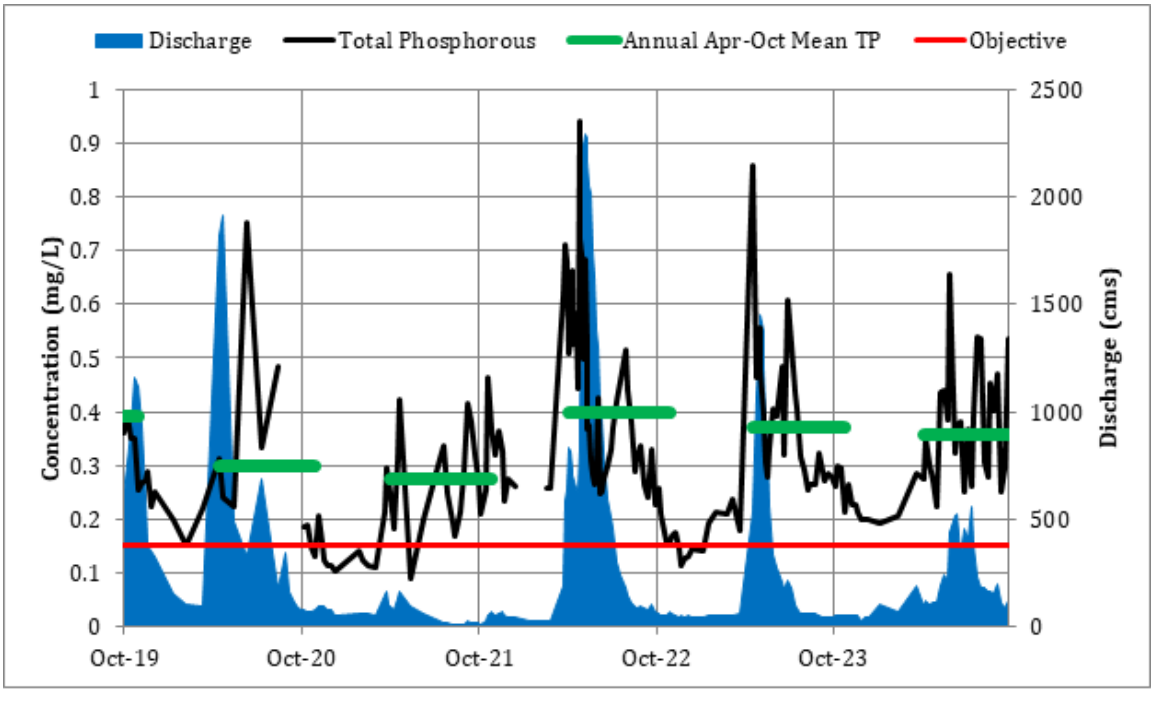


Figure 15: Total Phosphorus concentrations on the Red River at the International Boundary.

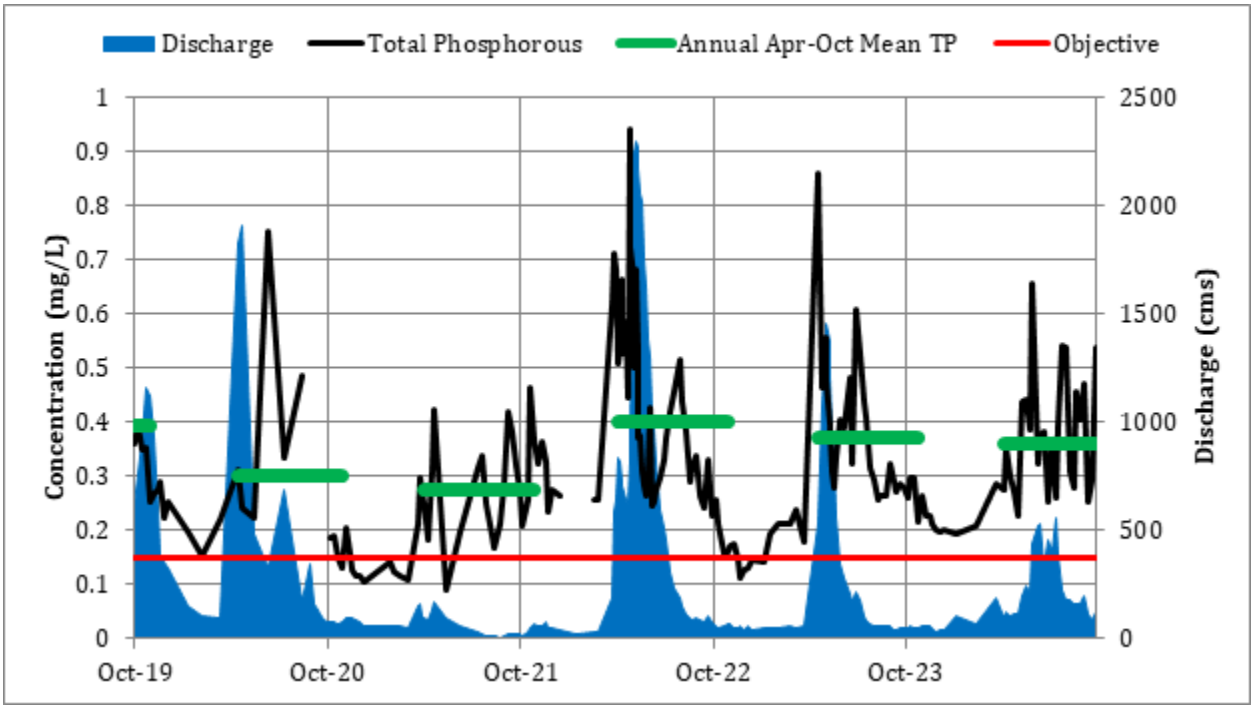


Figure 16: Total Nitrogen Concentrations on the Red River at the International Boundary.

Nutrient Loading Targets

Nutrient loads are calculated by calendar year based on concentrations and river flows. The nutrient loading target is applied to the five-year rolling average load to determine compliance.

Total Phosphorus

The total phosphorus load for the five-year period ending in 2023 was 3,163 tonnes per year, exceeding the loading target of 1,400 tonnes per year. Phosphorus loads have consistently exceeded the target for several decades.

Total Nitrogen

The total nitrogen load for the five-year period ending in 2023 was 18,921 tonnes per year, exceeding the loading target of 9,525 tonnes per year. Nitrogen loads have consistently exceeded the target for several decades.

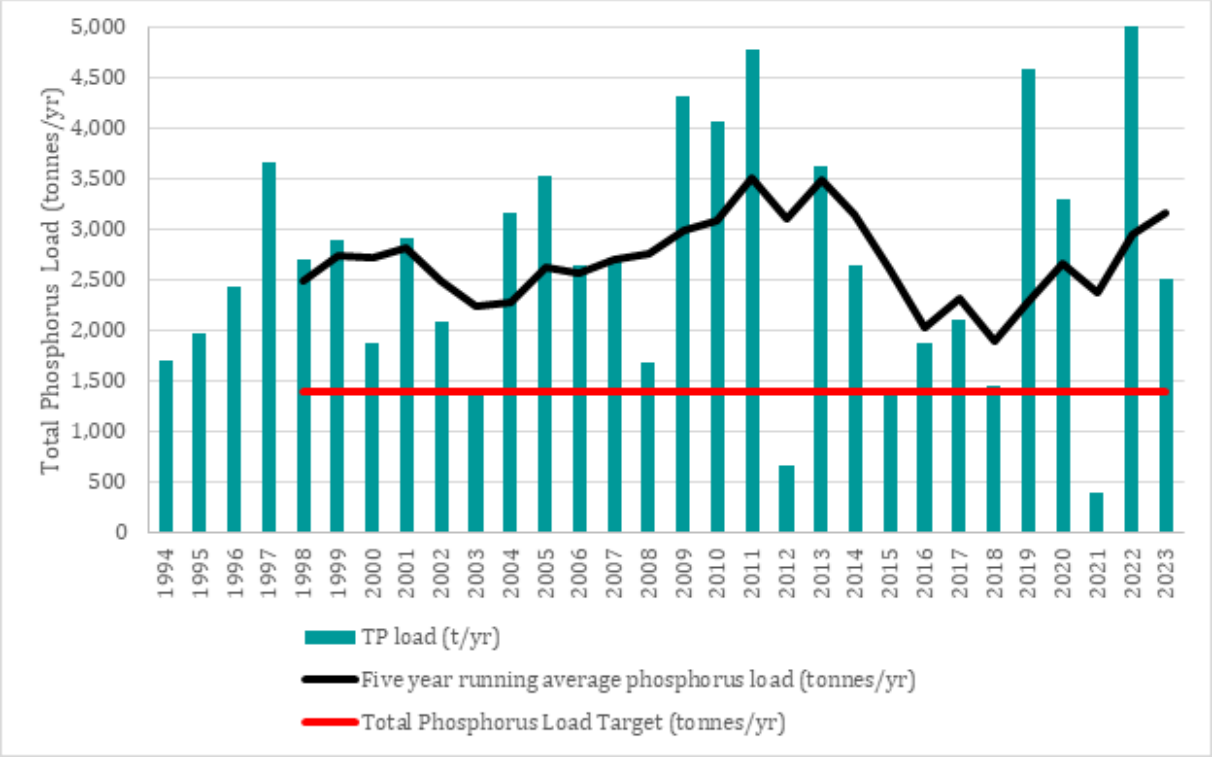


Figure 17: Total Phosphorus loads on the Red River at the International Boundary.

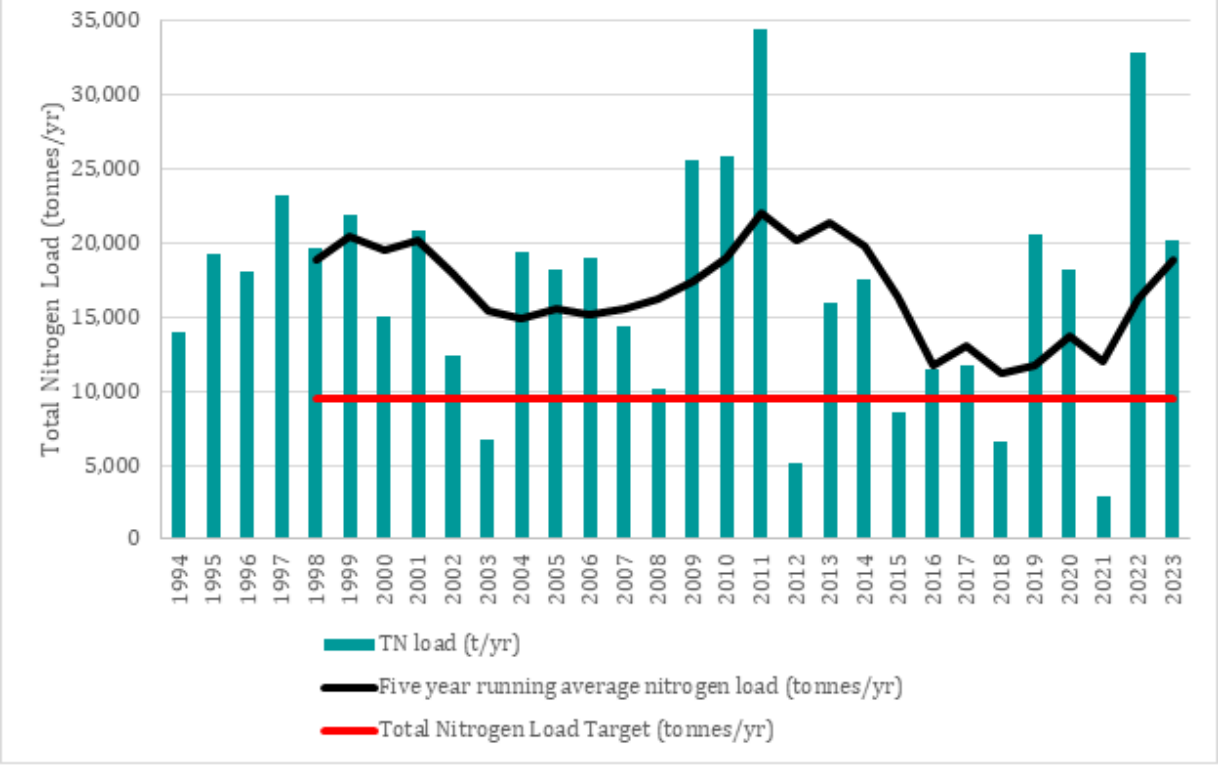


Figure 18: Total Nitrogen Loads on the Red River at the International Boundary.

APPENDIX D-2 – Water Quality Alert Levels

The former International Red River Pollution Board established alert levels for suites of pesticides, metals and toxic substances in 1986. For pesticides, the alert level is described as "not detectable in water", while specific metals have concentration values for alert levels. The following table details the number of alerts detected by Environment & Climate Change Canada (Water Quality Monitoring and Surveillance Division) during the reporting period (Table G1).

Metals

A total of 40 water samples were collected and analyzed for metals and toxic substances during the reporting period (Table G1). Four metals were detected in exceedance of alert levels. Cadmium, manganese and iron each had exceedance rates of 92-100%, with maximum values detected in May 2024. Zinc exceeded the alert level in one sample. Iron and manganese are components in natural soils; however, the detection of higher levels of cadmium may indicate anthropogenic sources. Higher metals concentrations tend to correspond to higher flow and higher particulate matter events. The exceedance rates seen this water year are consistent with rates in recent years for these metals.

Table G1 Exceedances of Alert Levels, Red River at International Boundary

October 1, 2023 to September 30, 2024

Parameter	Units	Alert Level	Number of Samples	Number of Exceedences %	Maximum Exceedence Value (Month)	Canadian Environmental Quality Guideline
Metals (total):						
Cadmium	µg/L	Detect	40	**40 (100%)**	0.569 (May)	0.37ug/L[1]
Chromium	µg/L	50	40	0	--	NG
Iron	µg/L	300	40	**37 (92%)**	12000 (May)	300 ug/l[1]
Manganese	µg/L	50	40	**39 (98%)**	936 (May)	200 ug/L[2]
Selenium	µg/L	10	40	0	--	1 ug/l[1]
Zinc	µg/L	47	40	1 (2%)	57 (May)	30 ug/l[1]
Toxic Substances:						
Arsenic	µg/L	10	40	0	--	5 ug/l[1]
Boron	µg/L	500	40	0	--	29 mg/l[1]
Total PCB	ng/L	Detect	--	--	--	NG
Pesticides:						
2,4-D	ng/L	Detect	14	**14 (100%)**	661 (Jul)	4000 ng/l[1]
Bromoxynil	ng/L	Detect	14	**11 (79%)**	51 (Jun)	5000 ng/l[1]
Clopyralid	ng/L	Detect	14	**11 (79%)**	141 (Jul)	NG[5]
Dicamba	ng/L	Detect	14	**10 (71%)**	832 (Jul)	10000 ng/l[1]
Imazamethabenz-methyl a	ng/L	Detect	14	**0**	--	NG
Imazamethabenz-methyl b	ng/L	Detect	0	--	--	NG
MCPA	ng/L	Detect	14	**14 (100%)**	62.7 (Jun)	2600 ng/l[1]
Mecoprop (MCPP)	ng/L	Detect	14	**13 (93%)**	7.48 (Sep)	NG
Picloram	ng/L	Detect	14	**6 (43%)**	87.7 (Jun)	29000 ng/l[1]
Aldrin	ng/L	Detect	0	--	--	NG
g-Benzenehexachloride	ng/L	Detect	13	0	--	10 ug/l[1]
Pentachloroanisole	ng/L	Detect	0	**--**	--	NG
Atrazine	ng/L	Detect	13	**13 (100%)**	1150 (Jul)	1800 ng/l[1]
Desethyl Atrazine	ng/L	Detect	13	**13 (100%)**	97.1 (Jul)	NG
Metolachlor	ng/L	Detect	13	**13 (100%)**	1330 (Jul)	7800 ng/l[1]
P,P-DDE	ng/L	Detect	13	7 (54%)	0.364 (Jun)	NG
Alpha-Endosulfan	ng/L	Detect	13	0	--	3 ng/l[1,4]
Beta-Endosulfan	ng/L	Detect	13	0	--	3 ng/l[1,4]
Heptachlor Epoxide	ng/L	Detect	0	--	--	NG
Metribuzin	ng/L	Detect	13	**13 (100%)**	149 (Jul)	1000 ng/l[1]

Notes:

1. Canadian Water Quality Guidelines for the Protection of Aquatic Life (http://st-ts. ccme. ca/)
2. Canadian Water Quality Guidelines for the Protection of Agriculture (http://st-ts. ccme. ca/)
3. Guideline value corrected for minimum value for hardness (mg/L CaCO3) in the reporting period (http://st-ts. ccme. ca/?lang=en&factsheet=93)
4. Guideline value is for technical grade Endosulfan, which is a mixture of the two biologically active isomers (α and β)
5. NG = No guideline established

Pesticides

Based on a total of up to 14 water samples, 11 pesticides and metabolites with alert levels (greater than detection concentration) were monitored during the 2023-2024 water year (Table G2). Five compounds (2,4-D, Atrazine, Desethyl Atrazine, MCPA, and Metolachlor) were detected in 100% of the samples. The detection levels for all compounds were all below the Canadian Guidelines for the Protection of Aquatic Life. Given that the Red River basin is an agriculturally dominated region, the presence of pesticides is expected. The detection of banned pesticides (legacy contaminants) is not unusual given the slow bio-degradation rate of these chemicals. P,P-DDE is a legacy contaminant detected during this reporting period.

Environment and Climate Change Canada recently enhanced the monitoring of current use pesticide concentrations to include a broader range of pesticides during open water conditions. These include insecticides (neonicotinoids), herbicides (sulfonyl ureas) and fungicides (including carbamates) pesticides. In 2023-24, detections included 8 of 14 insecticides, 10 of 17 herbicides and 12 of 21 fungicides. The pesticides with the highest frequency of detection are summarized in Table G2.

The IRRWB continues to closely monitor trends in these concentrations and their frequency of detection with the intention to update its assessment as new scientific information becomes available. The IRRWB recognizes that there is very little scientific information available to assess the implications of long-term exposure to low concentrations of pesticides and herbicides by aquatic organisms and humans.

Table G2 Detections of Current Use Pesticides, Red River at International Boundary October 1, 2023 to September 30, 2024 Water Year					
Parameter	**Units**	**Number of Samples**	**Detections (%)**	**Maximum Value (Month)**	**Canadian Environmental Quality Guideline[1]**
Fungicides					
Azoxystrobin	ng/L	7	100	25.2 (Aug)	NG[2]
Boscalid	ng/L	7	100	48.9 (Aug)	NG
Cyproconazole 1	ng/L	7	71	2.92 (Jul)	NG
Cyproconazole 2	ng/L	7	71	2.62 (Aug)	NG
Metconazole	ng/L	7	71	2.33 (Aug)	NG
Propiconazole	ng/L	7	100	92.7 (Aug)	NG
Pyraclostrobin	ng/L	7	100	1.25 (Aug)	NG
Pyrimethanil	ng/L	7	71	0.269 (Aug)	NG
Tebuconazole	ng/L	7	100	60.7 (Aug)	NG
Tetraconazole	ng/L	7	100	13.1 (Aug)	NG
Fungicides (Carbamates)					
Aldicarb	ng/L	7	0	-	1000 ng/L[1]
Metalaxyl	ng/L	7	100	10.6 (Jun)	NG
Pirimicarb	ng/L	7	0	-	NG
Insecticides (Neonicotinoids)					
Acetamiprid	ng/L	7	14	0.107 (Apr)	NG
Chlorantraniliprole	ng/L	7	100	8.42 (Jun)	NG
Clothianidin	ng/L	7	100	45.6 (Jun)	NG
Dinotefuram	ng/L	7	29	4.33 (Nov)	NG
Imidacloprid	ng/L	7	100	20.4 (Jul)	2301 ng/L[1]
Thiamethoxam	ng/L	7	86	36.7 (Jun)	NG
Herbicides (Sulfonyl Ureas)					
Chlorsulfuron	ng/L	7	29	2.65 (Nov)	NG
Diuron	ng/L	7	100	79.2 (Nov)	NG
Flumetsulam	ng/L	7	100	18.4 (Jul)	NG
Fomesafen	ng/L	14	100	143 (Jul)	NG
Metsulfuron	ng/L	7	86	2.29 (Nov)	NG
Tribenuron	ng/L	7	86	5.92 (Jul)	NG
1. Canadian Water Quality Guidelines for the Protection of Aquatic Life (http://st-ts. ccme. ca/)					
2. NG = No guideline established					

APPENDIX E – Agency Reports

Environment and Climate Change Canada | Environnement et Changement climatique Canada | Canada

1. Environment Canada Climate Change Canada – Canada Water Agency Activities

Update to the International Red River Watershed Board on Canada Water Agency and Environment and Climate Change Canada's Freshwater Activities

KEY UPDATES (August 2025)

Canada Water Agency

Mr. Mark Fisher joined the Canada Water Agency (CWA) as President in March, 2025. Previously, he was the President and CEO of the Council of the Great Lakes Region (CGLR), which provides a forum for government, business, non-government, and stakeholders to develop pathways and solutions to a sustainable future in the Great Lakes region. Before joining CGLR, Mr. Fisher served as a foreign policy advisor in the Privy Council Office.

The Honourable Julie Dabrusin was appointed as the Minister of Environment and Climate Change on May 13, 2025. The Minister is also responsible for the CWA.

The CWA Agency continues to deliver major elements of the Federal Freshwater Action Plan, announced in Budget 2023. This includes an investment of $64.5 M over 10 years in the Lake Winnipeg Basin Freshwater Ecosystem Initiative (FEI) starting in 2023-24 to support the protection and restoration of Lake Winnipeg and its Basin. Investments will continue to support science and stakeholder-led efforts and include efforts to explore more targeted approaches to nutrient reduction.

Lake Winnipeg Basin Freshwater Ecosystem Initiative

Grants and Contribution Funding

- 21 stakeholder projects, totaling $3.5M over two years, were approved under the Lake Winnipeg Basin Program in 2024. Funding for new projects commencing in 2025/26 will be announced in Fall 2025.
- Since Budget 2017, the LWBP has invested over $15.1 M to support stakeholder-driven action in the Lake Winnipeg Basin. Project descriptions are available on the program's website.

Ongoing collaborative arrangements with other government departments

- Through the Lake Winnipeg FEI, the Canada Water Agency is developing a delivery framework to test and evaluate more targeted approaches to reducing nutrient loading

to Lake Winnipeg. An Advisory Committee (with representation from Environment and Climate Change Canada (ECCC), Agriculture and Agri-Food Canada (AAFC), Manitoba Environment and Climate Change, Manitoba Agriculture and various other non-government partners) has been established to inform this work and assist in exploring areas of mutual interest and cooperation, and leverage expertise and experience.

- The CWA and AAFC are continuing to collaborate through a three-year Letter of Agreement to address knowledge gaps and advance the understanding of the effectiveness of agricultural nutrient management practices in the Lake Winnipeg Basin focused on four general priority areas: Beneficial Management Practices (BMPs) trade-offs, Phosphorus mass-balance, Tile drainage, and Nutrient hot-spots.
- Activities continue under the Canada-Manitoba Memorandum of Understanding (MOU) Respecting Lake Winnipeg and its basin, including efforts to pursue opportunities to enhance the engagement of Indigenous Peoples in the work of the MOU Steering Committee. This includes exploring future state of ecosystem reporting that is informed by diverse knowledge systems and supports decision-making at multiple scales.

Environment and Climate Change Canada

Lake Winnipeg Science Plan

- The Lake Winnipeg Science Plan builds on previous science efforts that characterized the state of Lake Winnipeg. Research is aimed at improving knowledge of nutrient export to streams and understanding impacts of climate variability and invasive species on the lake. The science plan includes four priority areas:
    - reporting on progress towards restoring a healthy Lake Winnipeg
    - monitoring to assess status and track changes
    - research on nutrient sources and transport pathways to the lake
    - research on lake ecosystem components to achieve a sustainable nutrient balance
    - Ongoing science collaborations with external partners on Lake Winnipeg-related work include:
    - o Manitoba Environment and Climate Change (Morison) – Water Quality Monitoring Station (WQMS) partners carry out under-ice winter water quality sampling in the North & South Basin. Helicopter surveys were successfully completed in Feb/March 2025.

      o ECCC-led research (Lin) – WQMS conducted ice coring in on Lake Winnipeg in winter 2025 to investigate relationships between dissolved oxygen dynamics and ice phenology. A manuscript has been prepared for peer review: https://authorea.com/users/566491/articles/1232027-ice-and-winter-dissolved-oxygen-modelling-in-lake-winnipeg

o ECCC-led research (Binding) – WQMS conducts ground truthing of remotely sensed harmful algal blooms.

o Manitoba Environment and Climate Change (Chadney) – When blooms are found, WQMS samples for algal toxin analysis and cyanobacterial ID and enumeration. Intense, vast blooms were encountered in 2024, particularly during the fall survey.

o ECCC Atmospheric Monitoring – WQMS located the lost weather & oceanographic buoy from the Lake Winnipeg Narrows in fall 2024.

Water Quality Monitoring

- Long-term transboundary water quality monitoring is ongoing on the Red River at Emerson. ECCC reports regularly on behalf on the Water Quality Committee on Red River water quality monitoring and adherence to binational objectives and nutrient loading targets.
- Red River Emerson Automated Station: o The Red River at Emerson is monitored weekly during the open water season and monthly during the ice cover season.

  o The Red River at Emerson is also continuously monitored via an auto-monitor tower. Hourly water quality data is available for public access on the federal open data portal: https://data-donnees.ec.gc.ca/data/substances/monitor/automated-fresh-water-quality-monitoring-and-surveillance-data/. Data files for the Red River are those with station ID MA05OC0001. The portal has been updated with Red River data through 2023. Historic data dating back to 1971 are also available.

- Other ECCC water quality sampling in the Red River and its tributaries:
  o Monitoring on the Red River at Selkirk occurs monthly under the Canada-Manitoba Agreement and includes an interagency comparative lab sample with Manitoba Environment & Climate Change.

  o Long-term water quality monitoring is ongoing at three additional transboundary sites within the Red River watershed: Pembina River at Windygates (Canada-Manitoba Agreement), Souris River at Westhope, and Souris River at Sherwood (International Souris River Board).

- Lake Winnipeg Nearshore Monitoring: o Three water quality monitoring surveys were conducted in 2024: spring, summer and fall. Surveys are conducted in the north and south basin and in Netley-Libau Marsh.

National Hydrological Services (NHS)

ECCC is mandated to monitor and provide advice on domestic and international transboundary water levels and flows in Canada's inland waters, as well as on federal lands. The NHS delivers on this mandate through two sub-activities: *National Hydrometric Program* and *Inter-jurisdictional Water Management*.

- Remote camera site condition photos are now available on the login side of the Water Office for the following sites:
  o 05OJ022 Red River at Breezy Point

  o 05PE031 Winnipeg River at Darlington Bay

- 3 miscellaneous operation stations were added to the network. These are for high-water measurements as requested by the Lake of the Woods Secretariat.
  o 05PE005 Lake of the Woods outlet at Mink Creek (reactivation)

  o 05PE032 Lake of the Woods Eastern Outlet above Kenora Dam

  o 05PE033 Lake of the Woods Western Outlet above Norman Dam and Powerhouse Site No.4

- Link to real-time hydrometric data at the Water Office: Real-Time Hydrometric Data - Water Level and Flow - Environment Canada

Inter-jurisdictional Water Management

<u>Prairie Province Water Board (PPWB)</u>

- The mandate of the PPWB is to ensure that transboundary waters in the Prairie region are protected and equitably shared as per a formal agreement, the Master Agreement on Apportionment. The Board serves as a forum for cooperative water management. The Board is supported by four technical committees: water quality, hydrology, groundwater and flow forecasting. ECCC conducts all water quantity, water quality and meteorological monitoring that informs the Board's activities.
- ECCC monitors monthly water quality on twelve rivers crossing the interprovincial boundaries between Alberta, Saskatchewan and Manitoba. In 2024, the water quality monitoring program continued as planned.
- The PPWB Committee on Water Quality (COWQ) completed a review of interprovincial water quality objectives for 12 transboundary rivers crossing the Alberta/Saskatchewan and Saskatchewan/Manitoba boundaries and provided recommendations to the Board for updating the water quality objectives previously adopted in 2021. In March 2025, members of the PPWB accepted the recommendations from the Committee. Once signed by all Ministers, the Water Quality Objectives in the Master Agreement on Apportionment (MAA) will be updated and made available online at: https://ppwb.ca/

- A new Schedule on aquifers and groundwater is in the process of being added to the Master Agreement on Apportionment (MAA). Once signed by all partners, Schedule F will serve as a risk-based framework for the collaborative management of transboundary groundwater. This addition significantly increases the attention and activities on groundwater through the MAA and will help ensure the impacts of development in one province do not appreciably harm the groundwater quantity and quality in the neighboring province.

International Joint Commission

- Through the National Hydrometric Service (NHS) and the Water Quality Monitoring and Surveillance Program, ECCC provides technical, engineering and secretariat support to domestic and international water management boards to assist the Government of Canada in meeting its mandated obligations under the Department of Environment Act, International Boundary Waters Treaty Act and water quality and quantity monitoring agreements.
- Through an MOU with the International Joint Commission (IJC), the NHS works in conjunction with US agencies to provide ongoing water quantity science and monitoring coordination, technical and engineering support and advice for water management and apportionment, and during major flood and drought events. The NHS also provides hydrological and hydraulics engineering expertise to assess environmental impacts and cumulative effects of proposed projects under the Canadian Impact Assessment Act and manages licensing for activities that may alter the flow of rivers flowing into the United States in accordance with the International River Improvement Act.

2. U.S. Army Corps of Engineers Flood Control Activities

Introduction

The U.S. Army Corps of Engineers (USACE) St. Paul District has a long history of involvement in water resource issues in the Red River of the North Basin. The St. Paul District operates reservoirs for flood control, recreation and environmental purposes.

USACE works with other federal and state agencies, municipalities, local watershed districts, environmental groups, and local communities to address water resource problems and opportunities in the basin. USACE also regulates work in navigable waters and other waters of the United States; for this activity, the Omaha District is responsible for part of the Red River of the North Basin in North Dakota, and the St. Paul District is responsible for other areas of the basin in North Dakota and Minnesota.

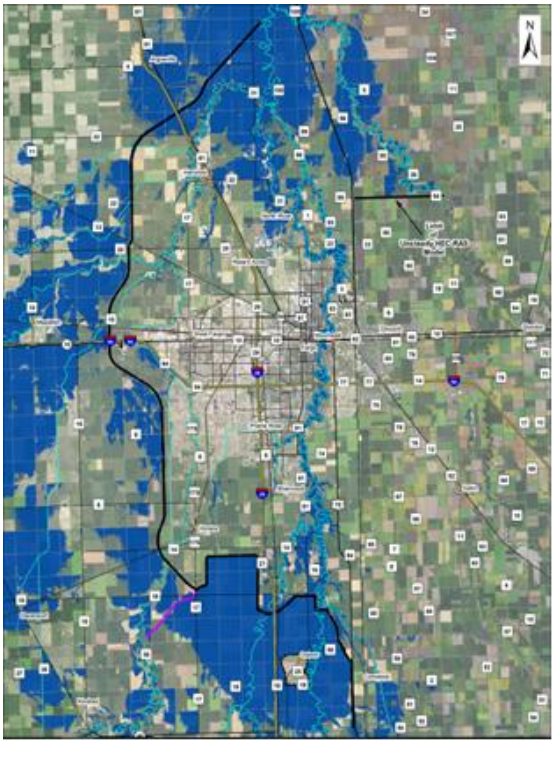
Currently, USACE activities in the basin include conducting flood risk management and ecosystem restoration studies, updating USACE reservoir water control manuals, constructing flood risk management and ecosystem restoration projects, and providing emergency technical assistance and disaster response.

Current Construction Projects

Fargo-Moorhead Metropolitan Area Flood Risk Management Project

Fargo, North Dakota; Moorhead, Minnesota

The project was authorized in the Water Resources Reform and Development Act of 2014 and funded to begin construction in 2016. It includes building a 20,000 cubic feet per second diversion to the west of Fargo with upstream staging and storage. Once construction is complete, the diversion would operate for events larger than a 20-year flood event. The project will provide permanent flood risk management to a metropolitan area of nearly 260,000 people.



Fargo-Moorhead Diversion Project area.

The $3 billion project is being implemented using a split delivery plan. Under this plan, the local sponsor constructs the diversion channel using a public-private partnership (P3), and USACE constructs the Southern Embankment or “dam” portion of the project. Federal

construction began in spring 2017 and is ongoing for the Diversion Inlet Structure, Wild Rice River Structure, Red River Structure, I-29 Grade Raise, and Southern Embankment Reaches SE-1B, 2A, 2B, 3, 4 and 5. Construction of the Southern Embankment Reach SE-1, Drayton Dam Fish Passage Mitigation (see below), and Drain 27 Wetland Restoration are complete. The sponsors selected their P3 developer, Red River Valley Alliance, in June 2021, and construction of the diversion channel began fall 2022. The project is scheduled to be operational in time for a spring 2027 flood event. The federal work was funded to completion in the Infrastructure Investment and Jobs Act of November 2021 (Public Law 117-58).

Drayton Dam Fish Passage Mitigation Project

Drayton, North Dakota

This aquatic ecosystem restoration project will provide fish passage and eliminate dangerous hydraulic conditions at Drayton Dam while maintaining the pool for water supply and bank stability. Construction has included removing and replacing the existing dam and creating an arched-rapid fishway, which provides rock riffles for fish movement. The project is included as mitigation for the Fargo-Moorhead Metropolitan Area Flood Risk Management Project. A construction contract was awarded in May 2022 and was completed in November 2023. The contractor completed riverbank vegetative establishment in fall 2024.North Dakota Environmental Infrastructure Program (Section 594)

Drayton Dam Fish Passage construction. Image from USACE.

Drone photograph of the nearly complete Drayton Dam project (August 29, 2023). Image courtesy of the North Dakota Game and Fish Department.

USACE is authorized to assist communities and rural areas in North Dakota under this program. USACE provides design and construction assistance for wastewater treatment and related facilities; combined sewer overflow; water supply, storage, treatment, and related facilities; environmental restoration; and surface water resource protection and development.

Section 594 of the Water Resources Development Act of 1999, Public Law 106-53, as amended, authorizes the following sanitary sewer systems where the work is performed by the nonfederal sponsor.

City of Aneta Water and Sanitary Sewer Replacement Project

The city of Aneta's sanitary sewer and water infrastructure, originally installed around 1960, is aging and creating problems for the community. The city has been proactive with portions of their infrastructure, recently replacing their water tower, several fire hydrants, and 3 blocks of emergency water main replacement. However, the sewer mains, a majority of the water mains, and services have not been updated. The proposed project consists of replacing all of the above noted sanitary sewer and water mains. Also included in the scope of work is replacement of manholes, service lines, hydrants, and valves; repair of sections of street, curb and gutter, and sidewalk; and improvement of ramps in accordance with the American with Disabilities Act. In fiscal year 2022, the city of Aneta received $4,887,500 for this project. USACE executed a project partnership agreement with the city of Aneta on November 2, 2023. Construction is ongoing and is expected to be completed within fiscal year 2026.

City of Cando Water and Sanitary Sewer Replacement Project

Approximately two-thirds of the city of Cando's sanitary sewer system is older vitrified clay pipe. The exact age of the pipe is unknown, but it is estimated that this pipe has been in the ground for 65 years or more. These clay sewer mains are at the end of their service life and are starting to deteriorate. The purpose of this project is to replace and rehabilitate the deteriorating sanitary sewer system and water mains throughout the city of Cando. This project will help prevent possible health and safety hazards by addressing system deficiencies and reducing the possibility of a sewer collapse and backup into homes and businesses. In fiscal year 2022, the city of Cando received $3,275,000 for this project. USACE executed a project partnership agreement with the city of Cando on March 19, 2024. Construction is ongoing and is expected to be completed during fiscal year 2026.

City of Enderlin Drinking Water and Water Treatment Plant Improvement Project

The city of Enderlin is currently working to identify what the city's environmental infrastructure funding will be put towards. The city of Enderlin has hired a consultant to assist in this effort. In fiscal year 2022, the city of Enderlin received $3,800,000 for this project. Once the city priorities are determined, USACE will work with the community to execute a project partnership agreement for construction.

City of Kenmare Drinking Water and Water Treatment Plant Improvement Project

The city of Kenmare's sanitary sewer infrastructure was originally installed in 1947 and consists of over 42,000 feet of sewer main. Camera inspections of the sanitary sewer mains show that the pipe is aging and creating significant problems. The city of Kenmare's water distribution system was originally built in 1906. Despite some updates to the water system over the years,

there are still some asbestos cement pipes and cast iron pipes. There have been water main breaks in recent years, and while they have been repaired temporarily, temporary repairs are not a sustainable option. The purpose of this project is to replace water mains and sanitary sewer pipes to help both address infrastructure needs and lower the operational costs of the systems. In fiscal year 2025, the city of Kenmare received $3,600,000 for this project. USACE anticipates executing a project partnership agreement with the city in 2025.

Current Studies

Continuing Authorities Program Section 14 – Sheldon Road Bridge

Sheldon, North Dakota

The purpose of the Continuing Authorities Program Section 14 project is to evaluate alternatives and formulate a plan to stabilize the riverbank adjacent to Sheldon Road in order to prevent the bridge from eroding into the Sheyenne River. The project is located where Sheldon Road crosses over the Sheyenne River approximately 4.75 miles south of Sheldon, North Dakota.

The bank of the Sheyenne River adjacent to the west side of the south abutment of the Sheldon Road Bridge, located on County Road 54, is threatened by severe erosion. Surveys estimate that approximately 30 linear feet has eroded since 2006 and that the riverbank continues to erode today. The erosion is threatening the use of Sheldon Road Bridge. Without proper intervention, erosion could continue and potentially affect the integrity of both the bridge and the County Road 54 roadway.

Ransom County, the nonfederal sponsor, submitted a request for assistance on February 12, 2018. USACE worked closely with Ransom County on the federal interest determination, which was approved July 13, 2020. Following the completion of the feasibility phase, the study report was approved June 2, 2021. A project partnership agreement between USACE and Ransom County was executed March 22, 2023.

The design and implementation phase of the project will be cost-shared at 65% federal and 35% nonfederal and will utilize a design/build multiple award task order contract. USACE anticipates awarding a contract for the design/build in fall 2025, with construction taking place in 2026.

Tribal Partnership Program:

Red Lake River Fish Passage and Zah Gheeng Marsh Restoration

Red Lake River, Minnesota

The Tribal Partnership Program will address the degradation of culturally significant habitat faced by the Red Lake Nation on their tribal lands along the Red Lake River and the Zah Gheeng Marsh. The study will assess and make recommendations related to fish passage through a low-head dam and wetland restoration opportunities along the Red Lake River. The Red Lake River is the only outlet to Lower Red Lake, which is completely within the boundaries of the Red Lake Nation in Red Lake, Minnesota. The Zah Gheeng Marsh is adjacent to the Red Lake River, immediately downstream of Lower Red Lake. The Red Lake River is a tributary to the Red River of the North.

The Zah Gheeng Marsh has not been functioning as it did before construction of the Red Lake Dam and channelization of the Red Lake River. Previous efforts to restore marsh function include construction of the low-head dam and inlet structures that pass flows into the marsh directly from Red Lake. The Red Lake Dam, channelization, low-head dam and inlet structures are USACE projects. The purpose of the feasibility study is to examine the hydrologic restoration of the Zah Gheeng Marsh as it relates to waterfowl and fur-bearing mammal habitat and a low-head dam on the Red Lake River in conjunction with wetland hydrology and fish passage.

A feasibility cost-share agreement between USACE and the Red Lake Nation was signed on June 16, 2021. The study includes gathering information, formulating alternatives, analyzing costs, benefits and environmental impacts, and recommending a plan on how to address hydrologic restoration and fish passage. USACE is drafting a feasibility study report with an integrated environmental assessment in coordination with the Red Lake Nation Tribal Council. A draft version of the report is being reviewed by Red Lake Nation Department of Natural Resources and the St. Paul District. In Winter 2026, a public meeting and review will be held. The final report is scheduled for Summer 2026.

Sustainable Rivers Program

Mud Lake, Wheaton, Minnesota

Under the Sustainable Rivers Project (SRP), the St. Paul District is evaluating the environmental effects of a drawdown, fall flooding, and minimum releases at Mud Lake via the White Rock Dam to provide shorebird and waterfowl habitat. Water releases would discharge into the Bois de Sioux River. The SRP is a USACE-The Nature Conservancy partnership that focuses on modifying operations at USACE dams to enhance habitat conditions for the plants and animals that depend on downstream river flows.

In 2020 and 2021, the scoping of opportunities and constraints to modify discharges from Mud Lake included coordination with agency partners. During scoping, there was general agreement from agencies that it would be possible to operate the dam in a way that would benefit both shorebirds and fisheries by identifying minimum flows and managing ramping rates. USACE's

environmental assessment has evaluated how operating the White Rock Dam to drawdown and flood Mud Lake will affect the hydrologic regime in the Bois de Sioux River and the organisms it supports, as well as other effects to the surrounding environment. USACE completed the draft environmental assessment to support this drawdown and signed the finding of no significant impact in July 2023. A successful drawdown was achieved in September 2023. Drawdowns are incorporated into the current water control manual; therefore, drawdowns are expected to be implemented annually as conditions allow.

Updates to Water Control Manuals at USACE Projects

In fiscal year 2023, the following USACE projects received funding to begin water control manual updates.

- Lake Traverse (Reservation Dam)/Mud Lake (White Rock Dam)
    - The update is expected to take three years (at a minimum, assuming future appropriations).
    - In February 2023, USACE conducted a public meeting to gain input from the public and stakeholders on the proposed update.
    - In May 2023, USACE conducted an internal workshop to create building blocks for modeling based on the public and stakeholder input (delayed due to spring flooding).
    - In June-August 2023, USACE modeled building blocks.
    - In September 2023, USACE looked at results of the building block runs and combined building blocks into alternatives for phase 2 modeling.
    -

In fiscal year 2024, the following USACE projects received funding for water control manual updates.

- Lake Traverse (Reservation Dam)/Mud Lake (White Rock Dam)
    - Year 2 is funded.
    - Year 2 includes phase 2 modeling (in progress), sharing phase 2 results with the public and stakeholders for input on phase 3 modeling (January-February 2024), phase 3 modeling, and completion of the draft decision document (September 2024).
- Lake Ashtabula (Baldhill Dam)
    - Update is expected to take two years, as it is assumed that the manual is more up to date and that fewer phases of modeling will be required (at a minimum, assuming future appropriations).
    - Year 1 includes initial public/stakeholder meetings (October 2023), phase 1 modeling (March 2024), mid-point public/stakeholder meetings (May 2024), and phase 2 modeling (July-August 2024).
- Red Lake (Red Lake Dam)
    - Update is expected to take three years (at a minimum, assuming funding).

- Year 1 includes initial public/stakeholder meetings (November 2023) and phase 1 modeling (August 2024).

Planning Assistance to States and Tribes (Section 22)

Long-Term Flood Solutions Plan

North Dakota and Minnesota

USACE has been working on a Planning Assistance to States and Tribes (PAS) project for the Red River Basin Commission (RRBC). The project consists of developing a basin-wide, long-term flood risk reduction plan for the Red River watershed within Minnesota and North Dakota. Specifically, USACE developed updated hydrologic and hydraulic models for the basin to assess the 1.0%, 0.5% and 0.2% chance exceedance events and the possibility of flood risk reduction through potential upland storage impoundments for rarer flood events. Sensitivity to variations in precipitation and snowmelt patterns were also included. USACE updated existing hydraulic models, and the sponsor provided basin-wide hydrology models of the tributaries to be used in the storage analysis. USACE incorporated current and projected precipitation variability to evaluate potential impacts on future flood magnitudes. The project had a 50/50 cost share with the RRBC, with a federal contribution of $325,000. The project was completed in 2024 and is a companion study to the Red River of the North Comprehensive Study/Downstream Storage Project.

Red River of the North Comprehensive Study/Downstream Storage Project

North Dakota and Minnesota

USACE is currently working on a PAS project with RRBC to develop a distributed storage analysis for the portion of the basin downstream of Halstad, Minnesota. This project will complement the existing storage model upstream of Halstad. Additional hydrology models were developed by RRBC consultants to provide the basin detail required for the analysis. All required hydraulic models are complete and ready for use for the Virtual Thaw Progression model runs. The Phase II report and appendices have been reviewed and are complete. This project has a 50/50 cost share with the RRBC, with a federal contribution of $312,500. The project is currently delayed due to funding constraints. USACE and the RRBC are working together to address the funding constraints. This project is a companion study to the Long-Term Flood Solutions Plan PAS project.

Red River of the North Main Stem Bathymetric Study

North Dakota and Minnesota

USACE and the North Dakota Department of Water Resources, with support from the RRBC, have executed a project partnership agreement to obtain bathymetric data for the Red River of the North main stem from White Rock Dam to the Canadian border. This project is being done under the PAS program. The goal is to provide up-to-date channel geometry for the entire main

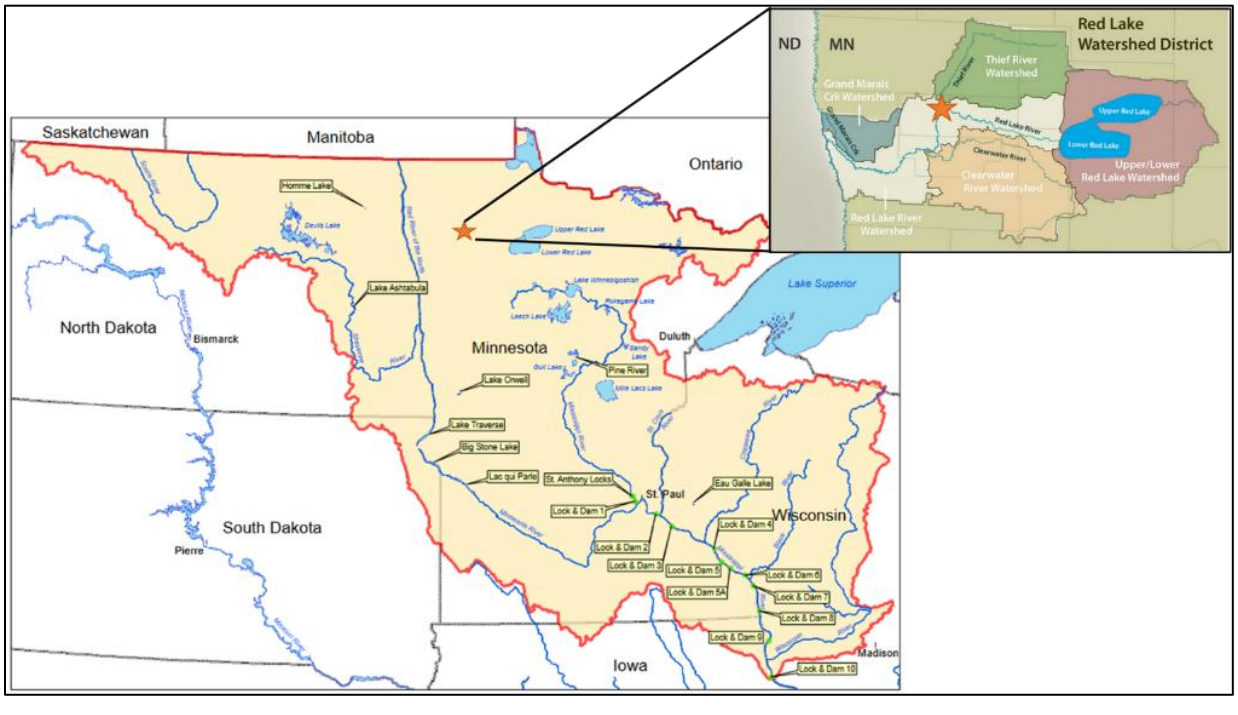
stem river in the United States, 444 river miles. This project has a 50/50 cost share with the North Dakota Department of Water Resources. This project was completed in 2024.

Red Lake River Reservoir (Thief River Falls)

Thief River Falls, Minnesota

The scope of this effort was to provide technical assistance and data analysis to assist the city of Thief River Falls in evaluating site suitability of a preferred water intake alternative location for the city's raw water intake. The goal of the technical assistance was to provide information to help the city evaluate the current state of sedimentation in the river from the existing raw water intake to approximately 1 mile upstream near Centennial Park (map provided below).

USACE and the city of Thief River Falls executed a federal cost-share agreement to obtain bathymetric data, sediment depth and deposition patterns, and presence of standard hazardous, toxic, and radioactive waste contaminants in the vicinity of the preferred raw water intake site location. This project was completed in January 2025. The resulting technical assistance is being used by the city as baseline information for studies and design efforts involving the installation of a new raw water intake and screen in the area upstream of Thief River Falls and the Red Lake River reservoir.



Red Lake River Watershed District map.

Red River of the North Flood Conveyance Study

North Dakota and Minnesota, near Oslo

USACE St. Paul District and the North Dakota Department of Transportation and Minnesota Department of Transportation (collectively, State DOTs) have entered into an agreement on July 11, 2024, for the development of a comprehensive water resources plan to identify and prioritize feasible alternatives to reduce the frequency and duration of road closures due to flooding of the Red River of the North. The St. Paul District is providing hydrologic and hydraulic modeling expertise to the project and is currently developing the existing conditions hydraulic model. The State DOTs will be developing alternatives that the St. Paul District will analyze with the hydraulic model to assess their impacts on flood levels in the area. The project is scheduled to be completed in 2027.

Ongoing Programs

Silver Jackets

USACE has worked with the U.S. National Weather Service, the U.S. Geological Survey, and others on the placement of soil moisture and temperature instrument packages around the basin to provide detailed hydrologic parameters to improve spring flood forecasts. In 2017, a project to update river gage datum to the current standard (NAVD 1988) and provide consistent elevations for the river stages across the basin resulted in the conversion of 34 river gages. This gage datum conversion project received $150,000 of Bipartisan Infrastructure Law funding in 2022 under the Floodplain Management Services Program to continue the effort and was completed in 2024.

Emergency Operations

During flood events in the St. Paul District's area of responsibility, the St. Paul District provides emergency assistance in support of the locally-led flood response. In this effort, the St. Paul District becomes part of a larger force made up of local, state, and federal responders as well as volunteers.

In 2023, the St. Paul District provided both technical and direct assistance in multiple communities due to spring flooding. The flood area manager and assistant area managers continue to better define roles and solidify relationships with communities in the affected basins to continually improve support. The district's emergency management team is also prepared to provide water assistance due to drought.

In 2023, under Public Law 84-99 authority, three communities (one within the Red River Basin) requested USACE assistance post-event for the rehabilitation of damaged levees from the 2023 spring flood event. As a result, the team is completing three Project Information Reports identifying recommended repairs and associated cost estimates. These reports will be

submitted to the Mississippi Valley Division for review and approval in spring 2024. In 2023, the Mississippi Valley Division approved the repair of three projects damage by flooding in 2022. USACE plans to complete the repairs at the Oslo and St. Vincent, Minnesota, and Pembina, North Dakota, systems during the 2025 construction season.

3. Minnesota Pollution Control Agency Activities

The information in this report is from July 1, 2024, to June 30, 2025

Watershed Restoration and Protection Strategy

There are 17 major tributaries to the Red River in Minnesota. The Minnesota Pollution Control Agency has developed Watershed Restoration and Protection Strategy (WRAPS) reports for each of these watersheds. Each WRAPS consists of monitoring, stressor identification, modeling, public participation/input and any associated TMDLs. The WRAPS and all associated Total Maximum Daily Load (TMDL) studies have been completed on all 17 watersheds, in the Red River Basin, as indicated below. This completes cycle 1 of the watershed approach for the Red River Basin.

The second cycle of monitoring has begun which will result in WRAPS Updates, as needed, for each watershed with any necessary TMDLs. Most of the watersheds in the Red River Basin are set to be sampled starting in 2023 through 2026 with a few that began in 2022. For the summer of 2025 the MPCA is monitoring (fish, macroinvertebrate, and discrete water quality) the following watersheds in the Red River Basin Monitoring is expected to be completed by the end of September (monitoring is done for two years in each watershed):

- Red Lake River Watershed (2nd year)
- Grand Marais Creek Watershed (2nd year)
- Lake of the Woods Watershed (1st year)
- Tamarac River Watershed (2nd year)

This next sampling cycle will create more recent monitoring data to inform the WRAPS and implementation work being done by local government partners.

Watershed Restoration and Protection Strategy reports:

Name	Status	Final WRAPS Approved
Bois De Sioux River	**Complete & Approved**	4/8/2020
Buffalo River	**Complete & Approved**	4/9/2016
Clearwater River	**Complete & Approved**	1/8/2021
Mustinka River	**Complete & Approved**	9/26/2016
Otter Tail River	**Complete & Approved**	10/14/2021
Red Lake River	**Complete & Approved**	11/20/2019

Red R. - Grand Marais Creek	**Complete & Approved**	4/11/2019
Red R. - Marsh River	**Complete & Approved**	6/24/2021
Red R. - Sandhill River	**Complete & Approved**	4/13/2017
Red R. - Tamarac River	**Complete & Approved**	3/21/2019
Roseau River	**Complete & Approved**	12/3/2020
Snake River (Red R. Basin)	**Complete & Approved**	12/3/2020
Thief River	**Complete & Approved**	3/18/2019
Two Rivers	**Complete & Approved**	6/10/2019
Upper Red River	**Complete & Approved**	12/22/2017
Upper/Lower Red Lake	**Complete & Approved**	5/21/2021
Wild Rice River	**Complete & Approved**	06/29/2022

Total Maximum Daily Load (TMDL)

TMDLs with completed WRAPS in the Red River Basin can be found at the following website, along with additional information: https://www.pca.state.mn.us/water/total-maximum-daily-load-tmdl-projects#approved-6123248a.

National Pollutant Discharge Elimination System (NPDES)/State Discharge Elimination (SDS) wastewater permits and releases/bypasses

There were 4 individual National Pollutant Discharge Elimination System (NPDES)/State Discharge Elimination (SDS) permits issued of which 2 were for domestic wastewater treatment plants and 2 were for industrial facilities. There were also 5 general NPDES/SDS permits reissued of which 3 were to sand and gravel facilities, 1 to a municipal wastewater treatment pond system, and 1 for remediated groundwater pumpout. There were 2 wastewater related incidents/releases, both of which were noted as wet-weather releases or bypasses from municipal wastewater treatment plants.

Changes to NPDES/SDS Feedlot Permits

The MPCA modified its existing NPDES/SDS permit language to include Nitrogen BMP's in vunerable groundwater areas, visual inspections of land application sites, and requirements relating to manure transfer, winter application of manure, and sampling of discharges.

Link to the fact sheet: **Notable Changes to the Feedlot General Permits**

The Minnesota Pollution Control Agency (MPCA) is proposing to amend existing Minnesota Rules Chapter 7020 governing animal feedlots. The main purpose of this rulemaking is to amend existing feedlot rules to improve land application of manure practices to address nitrate and fish kills, establish additional technical standards to protect water quality and avoid fish kills. This rulemaking also updates the rule to address changes in livestock and poultry operation/business practices, account for new agency data services, and modernize outdated rule language.

Other

Flood Damage Reduction Work Group 5 Year Monitoring Program

The MPCA continues to provide water quality monitoring equipment (i.e., sondes) and technical support for the Red River Basin Flood Damage Reduction Work Group's (FDRWG) five-year monitoring program (5YMP). The goal of the program, which is funded through an appropriation from the Legislative-Citizen Commission on Minnesota Resources (LCCMR), is to assess the natural resource-related outcomes of 10-12 flood damage reduction projects in the Red River Basin. The 5YMP will include various combinations of watercourse condition monitoring, load monitoring upstream and downstream of impoundment sites, floristic quality assessments as an indicator of habitat quality, and geomorphic assessments of stream channel restoration projects. Moore Engineering, Inc. has been contracted to carry out the water quality monitoring activities of the program. During 2024 (first year of monitoring), water quality condition monitoring was performed at four project sites (i.e., Wolverton Creek, Roseau Lake, Spring Brook, and Klondike). Each of these sites are being monitored again in 2025, along with two additional first year sites (i.e., Brandt Impoundment and Angus-Oslo Impoundment). Monitoring for this year is expected to continue every two weeks until mid-August.

Nutrient Reduction Strategy:
From 2022 to 2024, Minnesota advanced its Nutrient Reduction Strategy (NRS) implementation in multiple ways. Following a comprehensive five-year Minnesota NRS progress report released in 2020, Minnesota began a planned revision of its NRS, which is scheduled to be completed in 2025. Highlighted below are select progress updates and descriptions of new endeavors and products from the past two years. The 2014 Minnesota NRS and the five-year progress report can be found on Minnesota's Nutrient Reduction Strategy as well as other updated materials, progress tracking displays, and webinar recordings from the current NRS revision process.

Clean Water Act Section 319 Nonpoint Source Pollution Program – The federal 319 nonpoint source pollution program was restructured in Minnesota to provide 16 years of stable local funding for small watersheds. The program focuses on relatively small watersheds to make it more manageable to get the detailed assessment needed for goal setting, source identification,

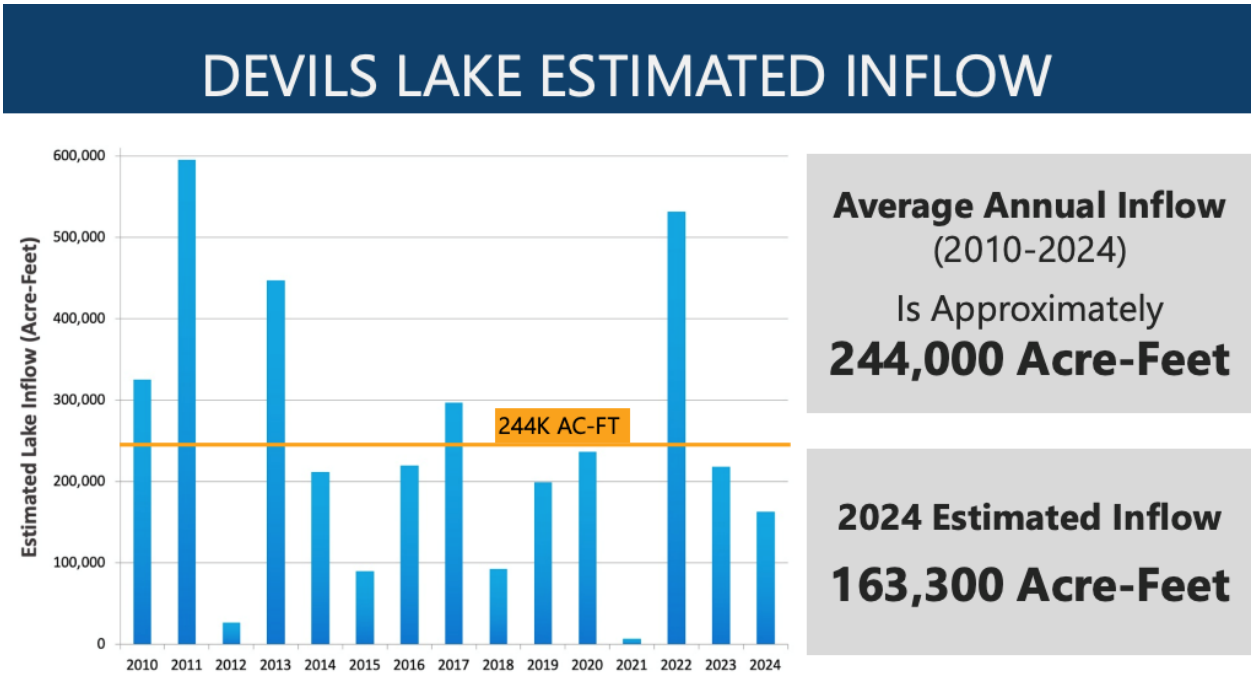
critical area identification, implementation targeting, and performance evaluation monitoring. Thirty-five watersheds have been selected to receive this funding, all with either a direct or indirect focus on nutrients. More information is available on the Section 319 Small Watershed program here.

State Funding Assistance for BMP Implementation – Over the State FY 2024-25 biennium, Minnesota's 25-year Clean Water, Land, and Legacy funding provided approximately $200 million for protection and restoration implementation activities, while in FY 2022-23 a combination of Clean Water funds, local, and federal dollars resulted in $198 million for nonpoint pollution reduction actions. The figure below outlines the distribution of best management practices (BMPs) that have been implemented to address non-point source watershed pollution in Minnesota since the inception of the Legacy amendment. More information about these funds can be found in the 2024 Clean Water Fund Performance Report. More information on practices implemented to address water quality can be found at Minnesota's Healthier Watersheds Tracking System.

4. North Dakota Department of Water Resources Activities

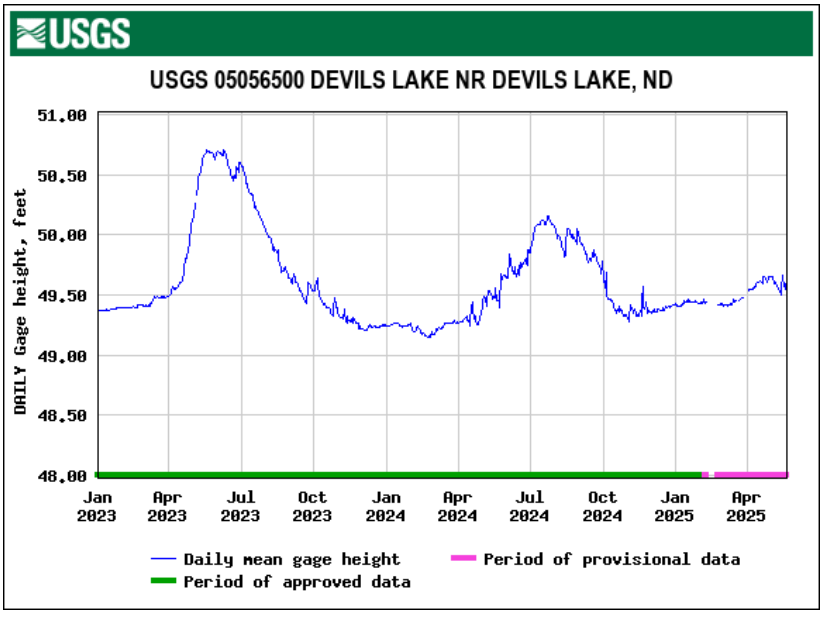
Devils Lake Sub-Basin

The estimated 2024 Devils Lake inflow of approximately 163,300 acre-feet is less than the 244,000 acre-feet of average inflow calculated since 2010. The total estimated precipitation of approximately 31 inches was much higher than the 20.9 average precipitation calculated since 2010. Most of the precipitation occurred during late spring and early summer. Even with above average precipitation, runoff was lower because the initial soil moisture condition was dry, storage was available in many depressions in the watershed, and crops required more moisture during the growing season.



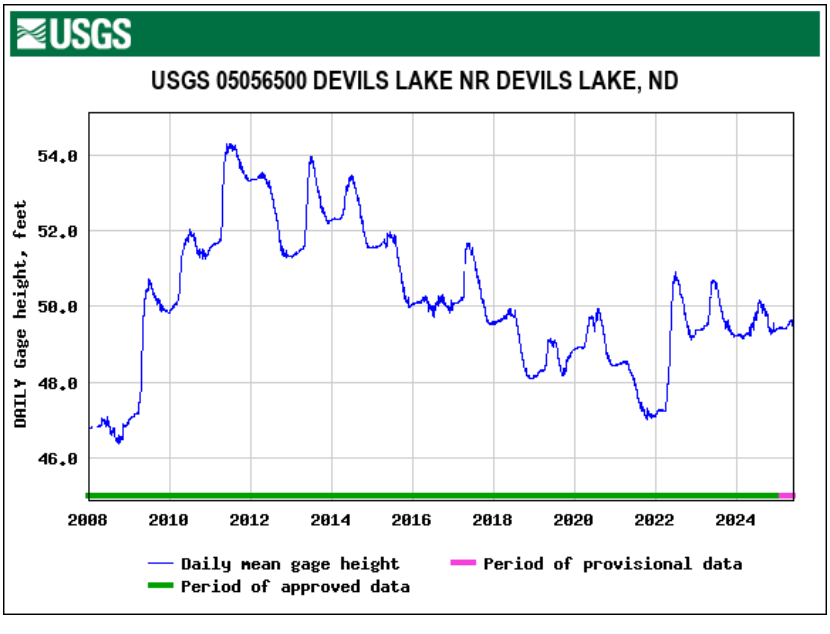
Annual Inflow into Devils Lake

The Devils Lake stage was 49.2 feet on January 1, 2024. Runoff from rains in early summer of 2024 caused the lake level to increase by approximately 1.0 feet to 50.2 feet on July 23. It remained near that level through much of August, before slowly receding. The lake stage was 49.3 feet by the beginning of November 2024. The January 1, 2025 stage was 49.4.



Devils Lake water stage: January 1, 2023 through May 22, 2025. (Figure courtesy of USGS.)

The water elevation of Devils Lake experienced an annual increase of more than 2 feet several times in recent history. The figure below shows the large increases in water elevation due to the 2009 and 2011 runoff. The highest stage in recent history was recorded in June 2011 at 54.3 feet. The natural outlet to the Sheyenne River is at a stage of 58.0 feet.



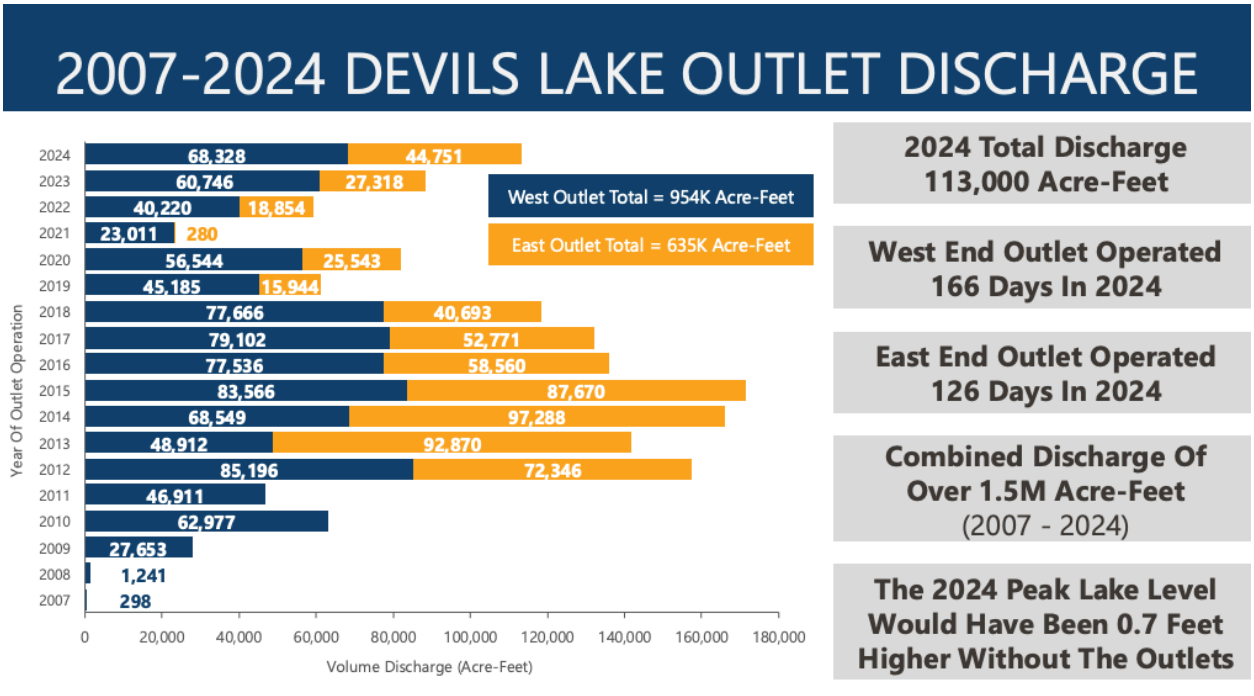
Devils Lake water stage: From 2008 through May 22, 2025. (Figure courtesy of USGS.)

Note: All elevations provided are based on the 1929 datum.

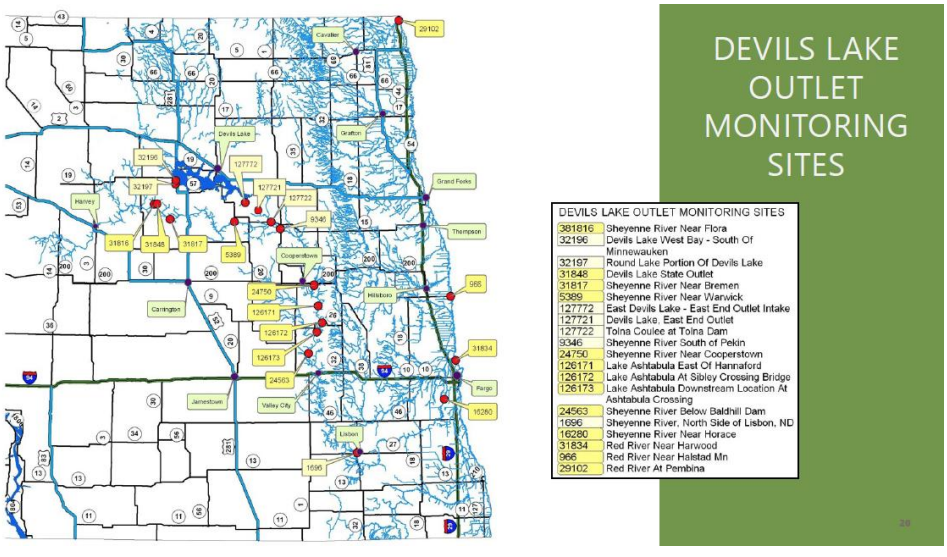
Stage + 1400 feet = Elevation in 1929 datum

Stage + 1401.33 feet = Elevation in 1988 datum

The state of North Dakota owns and operates two outlets: West End and East End outlets. A summary of the annual outlet discharge is provided in the following graph. The West End outlet started operation for the 2024 discharge season on May 6. Discharge continued until October 22, with some short disruptions due to minor maintenance requirements. The East End outlet started operation on May 14. Water quality thresholds limited the discharge from the East End outlet. It was shut down for the year on October 18. A total of about 113,000 acre-feet of water was discharged during 2024, above the annual average discharge of about 104,000 acre-feet calculated starting from 2010. Over 1.5 million acre-feet of water has been discharged through the outlets from 2007 through 2024.

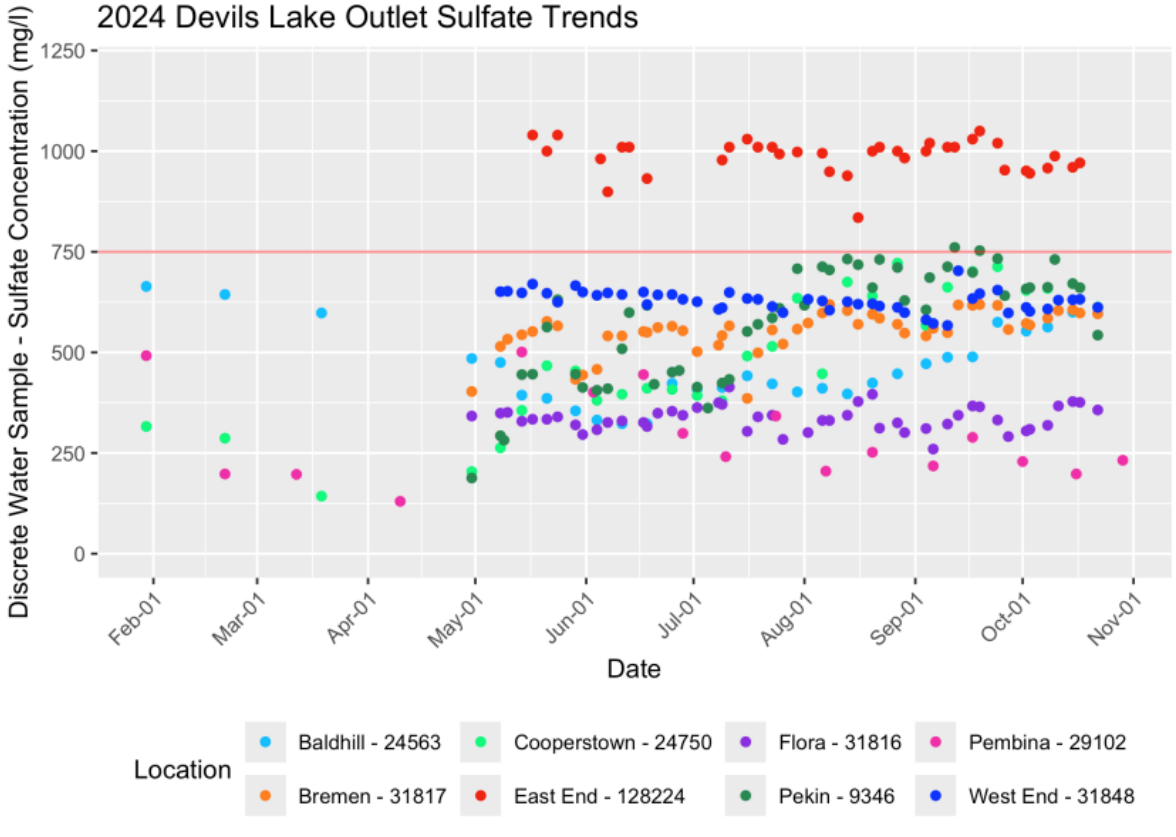


Water quantity and quality thresholds are in place for operating the outlets. The locations of the monitoring sites are shown in the following map.



Outlet Monitoring Sites

The following table shows the range of sulfate levels measured at various locations, from February 1, 2024 through November 2024.



The Devils Lake Outlets Management Advisory Committee (DLOMAC) met in Devils Lake on April 16, 2024. The DLOMAC members stated that an emergency condition exists, and that pumping should continue at the maximum amount allowable. The DLOMAC met for the last time on May 7, 2025. Passing of Senate Bill 2308 during the 2025 North Dakota Legislative Session resulted in the elimination of the DLOMAC. The North Dakota Department of Water Resources (NDDWR) remains committed to public engagement and will continue to host annual public meetings to solicit feedback and share updates with stakeholders.

Pembina River Area Border Dike

The Pembina River Basin Task Team completed their report in December 2024, including recommendations to the governments of the United States and Canada on the next phases. The ND DWR is anxious to partner with Manitoba to continue moving the project forward.

Managed Aquifer Recharge (MAR)

The NDDWR had previously assessed the managed aquifer recharge potential for glacial drift aquifers in ND. A report was completed in 2024, that includes a map with the results of the assessment ranking the areas under different tiers for MAR. The map is available in the link below.

https://www.dwr.nd.gov/pdfs/managed_aquifer_recharge_fact_sheet.pdf

The next phase of investigation includes a more extensive analysis for 3 aquifers listed below located in the Red River Basin.

1. Elk Valley Aquifer in Grand Forks County
2. Spiritwood-Warwick Aquifer in Benson/Pierce Counties
3. Wahpeton Buried Valley Aquifer in Eastern Richland County.

The link below provides additional details of the investigation.

https://www.dwr.nd.gov/info_edu/news_and_media/pdfs/2025_02_25_nd_dwr_identifies_three_aquifers_to_study_for_managed_aquifer_recharge.pdf

Pushing Remote Sensors (PRESENS) Network

The NDDWR continues to expand the PRESENS network in the state. This publicly available information includes water levels, precipitation, soil moisture, soil temperature, barometric pressure, and air temperature. Approximately 600 units were in operation in 2024. 53 of these units included rain gage and soil moisture sensors. Data is available at: https://mapservice.dwr.nd.gov/index.php?active=presens

Red River Bathymetry

The NDDWR partnered with the U.S. Army Corps of Engineers to obtain bathymetry of the Bois de Sioux River and Red River, extending downstream to the border. The data collection is complete and is available for public use at https://lidar.dwr.nd.gov/

Other Flood Preparedness and Mitigation Efforts

Red River Regional Detention Study:

The Red River Basin Regional Detention Study is a cooperative effort between the U.S. Army Corps of Engineers (COE), Red River Basin Commission (RRBC), Red River Management Board of MN (RRWMB) and Red River Joint Water Resource District of ND (RRJWRD). One of the main purposes of the study is to determine the extent of temporary flood water storage necessary to reduce the peak of the 100-year flood by 20 percent. The study will also look at the extent of peak flow reduction that this same amount of storage would provide for the 200-year and 500-year floods. Consultants for the RRWMB and RRJWRD have provided updated hydrology for an array of proposed detention sites distributed in the basin. The COE has updated the hydraulic model of the Red River and the lower segments of the tributaries. The existing conditions hydraulic model has been verified using several historical events. Hydraulic analysis of the changed hydrology conditions with the proposed dams in place has not been completed on the Red River. Additional funding will be needed to complete the study. This will require an updated agreement between the COE and RRBC. The RRWMB and RRJWRD have already approved additional funding.

Watershed Operations Projects: Floodwater Detention Structures:

The Red River Retention Authority (RRRA) and Natural Resource Conservation Service (NRCS) partnered with local sponsors to pursue 20 watershed studies with the main purpose of flood damage reduction. There are currently 3 authorized watershed plans in ND which includes the Tongue River Stabilization Project in Pembina County, Amenia Ring Dike Project along Rush River, and North Branch Park River Watershed. The plans for the Upper Maple River Watershed, Shortfoot Creek Watershed in the upper portion of Wild Rice River watershed, and the North Branch Antelope Creek Watershed in Richland County are currently under review. Once the plans are authorized by NRCS and approved by the sponsoring Water Resource District, final design would be pursued.

Dam Rehabilitation Studies:

Studies are currently underway for the rehabilitation of 6 high hazard dams located in the northeast corner of North Dakota. The dams include: Senator Young Dam on the Tongue River, Olson Dam on the Tongue River, Bourbanis and Herzog Dams on the Tongue River, Fordville Dam on the Forest River, Matecjek Dam on the Forest River, and Larimore Dam on the Turtle River. The NRCS is overseeing the study of these dams that do not currently meet the dam safety requirements. The structures were built in the 1960's or 1970's.

Alternatives to upgrade the structures to current standards are being analyzed. Some of the alternatives include breaching the structure, increasing capacity of service spillway, hardening the auxiliary spillway, and raising the top of the dam.

The plan for Bylin Dam on the Upper Forest River has been authorized by the NRCS. Preliminary draft plans are expected to be completed for most of the remaining dams by the summer of 2025.

5. North Dakota Department of Health Activities

Ambient Water Quality Monitoring Program

In May 2019, the North Dakota Department of Health's (NDDoH) Environmental Health Section transitioned to its own cabinet agency within the state. The Environmental Health Section separated from the NDDoH and became known as the North Dakota Department of Environmental Quality (NDDEQ). Within the NDDEQ, the Watershed Management Program is responsible for ambient surface water quality monitoring activities.

In 2012, the USGS North Dakota Water Science Center completed an analysis of the state's ambient water quality monitoring network, including the North Dakota Department of Environmental Quality's (NDDEQ) fixed station ambient monitoring network and the ND Department of Water Resources (formerly State Water Commission) High/Low flow network. In addition to evaluating trends, providing loading estimates and providing a spatial comparison of sites, the report, entitled "Evaluation of Water-Quality Characteristics and Sampling Design for Streams in North Dakota, 1970-2008" (http://pubs.usgs.gov/sir/2012/5216/), provided recommendations for a revised water quality monitoring network for rivers and streams in the state. These recommendations were made to ensure adequate coverage, both spatially and temporally, which is necessary to estimate trends, estimate loads and provide for general water quality characterization in rivers and streams across the state.

Beginning on January 1, 2013, and based on the recommendations provided in the USGS report, the NDDEQ, in cooperation with the USGS and the SWC, implemented a revised ambient water quality monitoring network for rivers and streams. The highest level of sites, design level 1, consist of a network of 32 basin integrator sites located across the state with 16 level 1 sites located in the Red River basin (Figure 8, Table 4). These sites are sampled 8 times per year, twice in April, once each in May, June, July, August, and October, and one time in the winter (January) under ice. The next level, design level 2, consists of 25 sites with 12 level 2 sites located in the Red River basin (Figure 8, Table 5). These sites are sampled 6 times per year, once each in April, May, June, August and October and once under ice during the winter (January). The lowest level of sites, design level 3, consists of 25 sites. There are 12 level 3 sites located in the Red River basin (Figure 8, Table 6). These sites are only sampled 4 times per year, once each in April, June, August and October. Under the current design, the USGS samples all the design level 2 sites (except for the Red River at Harwood which is sampled by the NDDEQ) and all the design level 3 sites. In the Red River basin, the NDDEQ samples 8 level 1 sites, while the USGS samples 8 sites.

At all level 1, 2 and 3 sites field measurements are taken for temperature, dissolved oxygen, pH and specific conductance. Sampling and analysis at all level 1, 2 and 3 sites consist of general

chemistry, dissolved trace elements, and total and dissolved nutrients (Table 7). In addition to these water quality parameters, total organic carbon (TOC), dissolved organic carbon (DOC), total suspended solids (TSS), and E. coli bacteria are sampled and analyzed for at all level 1 sites (Table 7). E. coli bacteria are only sampled during the recreation season (May-September). In addition to sampling for these analytes, the Red River at Fargo, the Red River at Grand Forks, and the Red River at Pembina are sampled for total suspended sediment. The analysis of the total suspended sediment samples is conducted by the USGS Iowa Sediment Laboratory. All chemical analysis of samples is performed by the NDDEQ's Laboratory Services Division.

As of October 2023, four (4) sites in the Fargo-Moorhead area are now being sampled by the USGS-GF. Previously, these four sites were sampled by the NDDEQ. These sites are being monitored as part of the Fargo Diversion Project in order to collect consistent water quality data pre, during, and post construction of the Fargo Diversion channel in order to document any water quality changes associated with the project. All field measurements and analysis remain the same as noted above. These four sites are denoted with an asterisk (*) below.

Table 4. Level 1 North Dakota Ambient Water Quality Monitoring Sites in the

Red River Basin. USGS Site ID	NDDEQ Site ID	Site Name	Latitude	Longitude	Design Level	Responsible Agency
05051300	385055	Bois de Sioux River near Doran, MN	46.1522	-96.5789	1	NDDEQ
05051510	380083	Red River at Brushville, MN	46.3695	-96.6568	1	NDDEQ
05053000	380031	Wild Rice River near Abercrombie, ND	46.4680	-96.7837	1	USGS-GF*
05054000	385414	Red River at Fargo, ND	46.8611	-96.7837	1	USGS-GF
05057000	380009	Sheyenne River near Cooperstown, ND	47.4328	-98.0276	1	NDDEQ
05058000	380153	Sheyenne River below Baldhill Dam, ND	47.0339	-98.0837	1	NDDEQ
05058700	385168	Sheyenne River at Lisbon, ND	46.4469	-97.6793	1	NDDEQ
05059000	385001	Sheyenne River near	46.6316	-97.0006	1	USGS-GF*

		Kindred, ND				
05060100	384155	Maple River below Mapleton, ND	46.9052	-97.0526	1	USGS-GF*
05066500	380156	Goose River at Hillsboro, ND	47.4094	-97.0612	1	USGS-GF
05082500	384156	Red River at Grand Forks, ND	47.9275	-97.0281	1	USGS-GF
05083000	380037	Turtle River at Manvel, ND	48.0786	-97.1845	1	USGS-GF
05085000	380039	Forest River at Minto, ND	48.2858	-97.3681	1	USGS-GF
05090000	380157	Park River at Grafton, ND	48.4247	-97.4120	1	USGS-GF
05100000	380158	Pembina River at Neche, ND	48.9897	-97.5570	1	USGS-GF
05102490	384157	Red River at Pembina, ND	48.9769	-97.2376	1	USGS-GF

6. USGS Water Resource Investigations and Activities

Streamflow Conditions January 2024-January 2025

The 2023-2024 winter season (Dec-Jan-Feb) can mostly be characterized as warm and wet for the Red River Basin, with the Fargo-Moorhead weather station recording the warmest ever winter season at an average temperature of 26.5 degrees Fahrenheit (F) and the second wettest at 3.83 inches of precipitation (NWS Grand Forks Forecast Office, 2024b). The January average temperatures were 5-10 degrees F above normal for all National Weather Service (NWS) weather stations in the Red River Basin. The NWS Grand Forks weather station recorded 12 days of temperatures below normal in the middle of January, while the rest of the days were well above average for that location (NWS Grand Forks Forecast Office, 2024a). The span of colder days in mid-January allowed for the formation of a deeper frost layer of 20-30 inches for most of the Basin (NWS Grand Forks Forecast Office, and NWS North Central River Forecast Center, 2024a).

Snow cover by January 31st was minimal for most of the Basin, except for the northwest corner of MN (NWS Grand Forks Forecast Office, 2024a). Except for the last 3 days of the month, February was another month with average daily temperatures around 20 degrees F above normal as measured at the NWS Grand Forks weather station. Average monthly temperatures were 12-18 degrees F above normal for all NWS weather stations in the Basin. This was the warmest February on record for the Fargo-Moorhead NWS weather station with an average of 30.9 degrees F recorded (NWS Grand Forks Forecast Office, 2024b). There was also no snowfall for the month of February until February 27, when a blizzard brought 6 inches of snow to a small region in the center, and 2-4 inches for much of the remainder, of the Basin (NWS Grand Forks Forecast Office, 2024b).

Drought conditions at the end of December showed Abnormally Dry conditions for a majority of the Basin, except for the area at the international border, which showed Severe Drought. This intensified throughout the winter season to Abnormally Dry for more portions of the southern Basin and an increased area of Moderate and Severe Drought in the north, by the end of February (U.S. Drought Monitor, 2024a).

Streamflow conditions at the time of freeze-up were in the normal range for the Red River and most of the major tributaries, with the exception of the Sheyenne, the Wild Rice, and the Goose Rivers, which were all flowing at above normal going into the winter season (U.S. Geological Survey, 2024b). A rain event occurred in the headwaters of the Red River from Dec 25-27, with a maximum total of approximately 2.4 inches of precipitation recorded at Sonora, ND, (North Dakota Agricultural Weather Network, 2024a).

This rain event caused a substantial rise in flow on the mainstem Red River, the Maple River and the Wild Rice River resulting in streamflow for all three to exceed the 95th percentile, or “much above normal”, streamflow for this time of year (U.S. Geological Survey, 2024b). All other streams in the Red River Basin mostly remained unaffected from this precipitation event. This increase in flow, coupled with mild temperatures, prevented formation of good ice at many USGS streamgage locations until much later in the winter season, preventing the collection of streamflow measurements until February or March, in most cases (U.S. Geological

Survey, 2024a). Streamflow remained at or just above normal for the remainder of the winter season, with the exception of a rise into "much above normal" for a short period in mid-February, due to a precipitation event that resulted in 0.5-0.75 inches of precipitation for a significant portion of the central Basin, from Fargo up to Baudette and 0.25-0.4 inches for the remainder of the Basin, excluding only the Devils Lake subbasin (NOAA National Water Prediction Service, 2024a).

The National Weather Service (NWS) Grand Forks Forecast Office held the first Spring Flood Outlook webinar of 2024 on January 25, at which time the outlook showed a low risk for significant (moderate or higher) flooding in the Basin, due to relatively normal frost depths, much below normal snowfall and below to near normal soil moisture and precipitation (NWS Grand Forks Forecast Office, and NWS North Central River Forecast Center, 2024a). Subsequent outlooks were provided on February 15, February 29 and lastly on March 14, each progressively reducing the risk of significant flooding.

The outlook on March 14 stated the risk for significant flooding was very low and that the risk would primarily be from rainfall, as the soil moisture remained below normal and snowpack had melted away across the Basin, by this time (NWS Grand Forks Forecast Office, and NWS North Central River Forecast Center, 2024b).

Average daily temperatures in March remained cool, delaying ice-off until early April (North Dakota Agricultural Weather Network, 2024c). Due to the relatively dry conditions at time of freeze-up and the lack of snowpack accumulation during the winter, ice-off did not result in any significant increase in flows and there were no streamgages in the Red River Basin that reached flood stage from ice-out (U.S. Geological Survey, 2024a).

Flow at most streamgages in the Red River Basin was "below normal" at the beginning of April but rose well into the "normal" range throughout the month, as up to 3.5 inches of rain fell in the southern Basin, reducing to 2.5 in the middle and down to 1.5-2 inches in the north (NOAA National Water Prediction Service, 2024b). May was an even wetter month with 4-7 inches falling throughout the Basin during that month, with the majority of the Basin receiving 5 inches, or more (NOAA National Water Prediction Service, 2024c). This resulted in drought conditions to reduce from Abnormally Dry in the middle of the Basin and Moderate and Severe Drought from Grand Forks north to the international border at the end of April, to no drought at all for the entire Basin by the end of May (U.S. Drought Monitor, 2024b). Streamflow on the mainstem Red River and most major tributaries also increased to "much above normal" flows by the end of May. The only exceptions were the Sheyenne River and the Pembina River, which remained in the 76-90th percentile, or at "above normal", as seen in figures 4 and 6 below (U.S. Geological Survey, 2024b).

The month of June remained wet, with a range of 3-7 inches of rain measured throughout the Basin. The heaviest rainfall amounts were found in two bands running southwest to northeast across the Basin. One band of 5-7 inches of rainfall stretched from Jamestown, ND in the southwest, through Cooperstown, Grand Forks and up through Thief River Falls, MN in the northeast, while a second stretched from the Tewaukon Wildlife Refuge near the ND/SD border, through Abercrombie, ND and up through Detroit Lakes, MN at the southern end of the Basin (NOAA National Water Prediction Service, 2024d). July was much drier with rainfall only about half of normal rainfall amounts in the Basin for the month of July, with the exception of the very southern end of the Basin and the eastern portion, with slightly more

than 100% of normal rainfall amounts recorded in Grand Forks (NOAA National Water Prediction Service, 2024e). August brought more rainfall again, with rainfall amounts mostly in the normal, to slightly above (130%) the normal range for the region. The exception was again the central portion of the Basin, with the epicenter at Grand Forks, which recorded over double the normal amount of rainfall for August (NOAA National Water Prediction Service, 2024f). September was a much drier month for most of the Basin again, with the exception this time being the far northwestern portion of the Basin, including the Pembina River valley, which experienced up to 8.5 inches of rainfall or about three times the normal rainfall amount for the month of August (NOAA National Water Prediction Service, 2024g).

Precipitation amounts in October were again well below normal for that month, with precipitation only ranging from 20-50% of normal for the entire Basin, with the southern end being the driest (NOAA National Water Prediction Service, 2024h). The month of November provided precipitation again, mostly in the form of rainfall, with twice and three-times the amount of rainfall recorded in the Basin than is normal for the month of November. This equaled to approximately 2.5 inches up and down the entire length of the US portion of the Basin (NOAA National Water Prediction Service, 2024i).

The precipitation patterns noted above resulted in the drought monitor not registering any drought or even Abnormally Dry conditions in the Red River basin until the end of September, which saw Abnormally Dry (D0) conditions in the southern third of the Basin (U.S. Drought Monitor, 2024c). This intensified to Moderate Drought (D1) conditions for the same region and Abnormally Dry conditions migrating north to Grand Forks by October 8, 2024 (U.S. Drought Monitor, 2024d) and by October 22, drought conditions had intensified to Severe Drought (D2) in the far southern reaches of the Basin, Moderate Drought from around Abercrombie north to Fargo and Abnormally Dry from Fargo north to Grand Forks. Except for on the MN side of the river, which showed Abnormally Dry conditions, while the Basin north of Grand Forks remained drought free (U.S. Drought Monitor, 2024e).

These drought conditions remained relatively unchanged until the November 19 report, which reduced the drought severity in the southern Basin from Severe to Moderate Drought, due to the substantial amount of precipitation that fell in November (U.S. Drought Monitor, 2024f). These drought conditions, with no drought in the northern third of the basin, Abnormally Dry for a swath between Grand Forks and Fargo and Moderate Drought for the remainder of the southern basin prevailed through the end of the calendar year (U.S. Drought Monitor, 2024g).

Streamflow reflected the above noted weather patterns in that most streams in the Basin had flows that were “above”, or “much above” normal for most of the summer, until the month of September, when most fell back into “normal” flow conditions and remained there for the rest of the calendar year. The only exception was the Pembina River, which experienced its peak in September due to over 8 inches of rainfall in the Pembina River valley, mostly in the Langdon, ND area. November did see a small bump back up into “above normal” flows at most streams in the Basin, but that flow also came quickly back down to “normal” again (U.S. Geological Survey, 2024b). Except for the Red River, the Maple River, the Minnesota Wild Rice River and the Pembina River, most streamflow peaks occurred in late June or early July. Water Year peaks for the Red River mostly occurred in late May, however, due to the distribution of rainfall throughout the Basin in the 2024 water year, the Red River at Wahpeton peaked on June 4, 2024. The heavy rainfall band in the southern end of the Basin hit the headwaters of

the Ottertail River more in June than those in May, allowing for the June peak at Red River streamgages upstream of Fargo to surpass the peak that had occurred in late May.

The more widespread distribution of heavy rainfall throughout the Basin in May contributed to the May peak being higher on all other Red River streamgages downstream of Fargo. Except for the Pembina River, which peaked due to the isolated heavy rainfall in the Pembina River Valley in September, all other major tributaries to the Red River peaked either in May, late June, or early July, as a consequence of a wet May and additional heavy rainfall in June, as noted above (U.S. Geological Survey, 2024a). Peaks for Red River Basin USGS streamgages with at last 70 years' worth of data are noted below (U.S. Geological Survey, 2025):

05054000, Red River of the North at Fargo, ND

Peak streamflow of 6,960 cfs at 22.16 ft on May 27, 2024; not a top 10 peak.

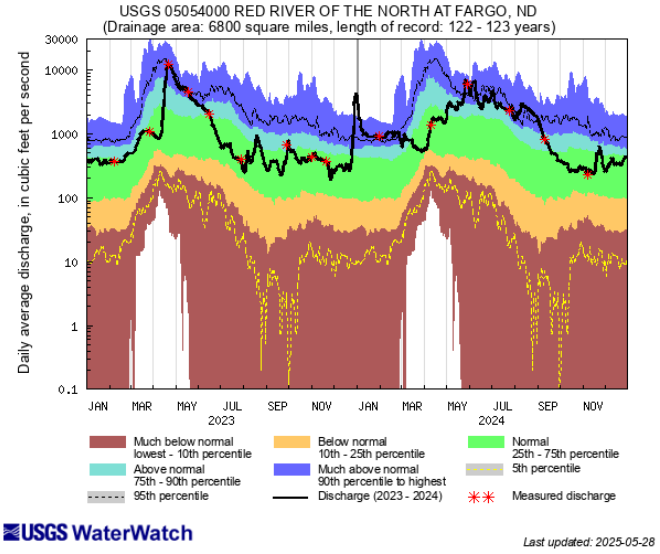


Figure 1: Streamflow at the Red River of the North at Fargo, ND January 1, 2023-January 1, 2025 (https://waterwatch.usgs.gov/index.php?id=wwchart_sitedur).

05082500, Red River of the North at Grand Forks, ND

Peak streamflow of 19,400 cfs at 27.34 ft on May 29, 2024; not a top 10 peak.

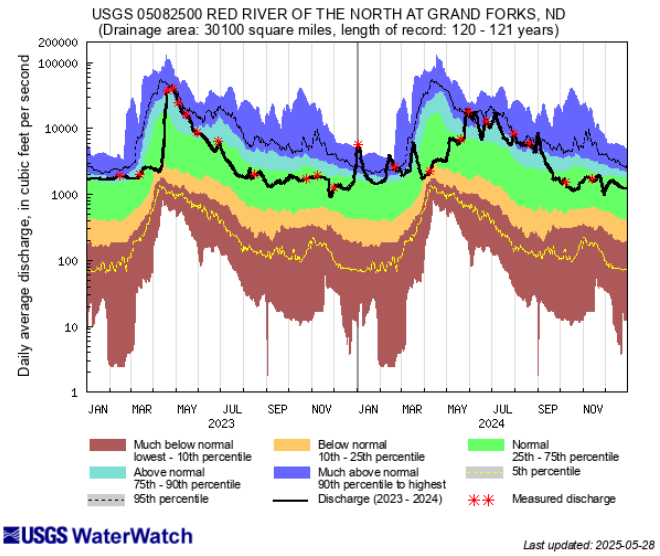


Figure 2: Streamflow at the Red River of the North at Grand Forks, ND January 1, 2023-January 1, 2025 (https://waterwatch.usgs.gov/index.php?id=wwchart_sitedur).

05053000, Wild Rice River nr Abercrombie, ND

Peak streamflow of 1,800 cfs (est) at 19.44 ft on June 30, 2024; not a top 10 peak.

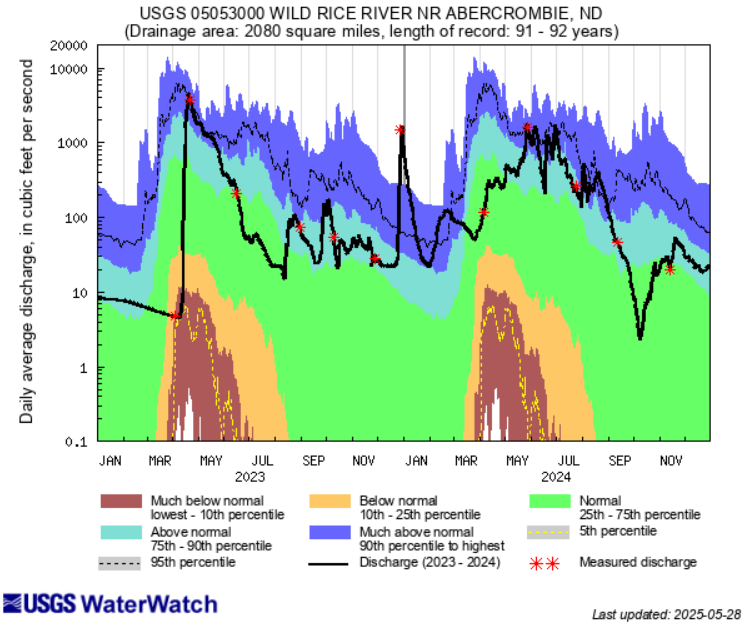


Figure 3: Streamflow at the Wild Rice River nr Abercrombie, ND January 1, 2023-January 1, 2025 (https://waterwatch.usgs.gov/index.php?id=wwchart_sitedur).

05059000, Sheyenne River nr Kindred, ND

Peak streamflow of 1,620 cfs at 10.25 ft on June 26, 2024; not a top 10 peak.

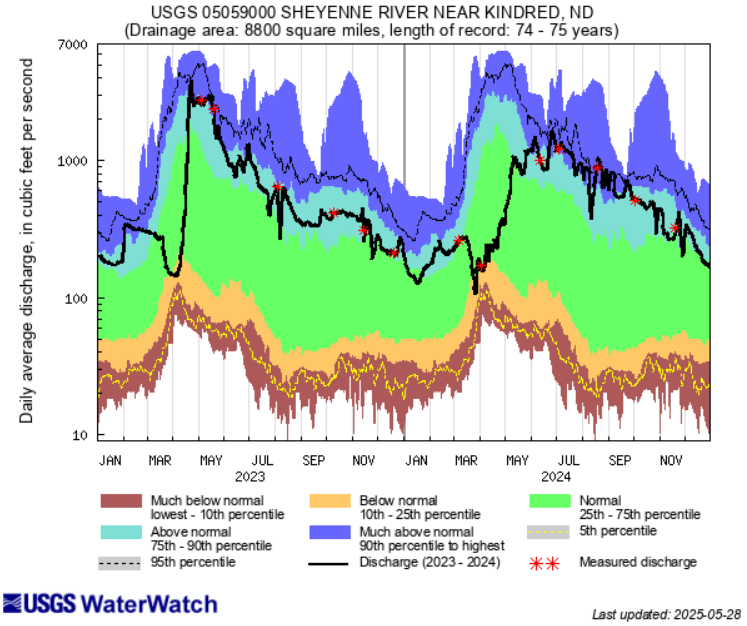


Figure 4: Streamflow at the Sheyenne River nr Kindred, ND January 1, 2023-January 1, 2025 (https://waterwatch.usgs.gov/index.php?id=wwchart_sitedur).

05079000, Red Lake River at Crookston, MN

Peak streamflow of 9,400 cfs at 15.7 ft on July 3, 2024; not a top 10 peak.

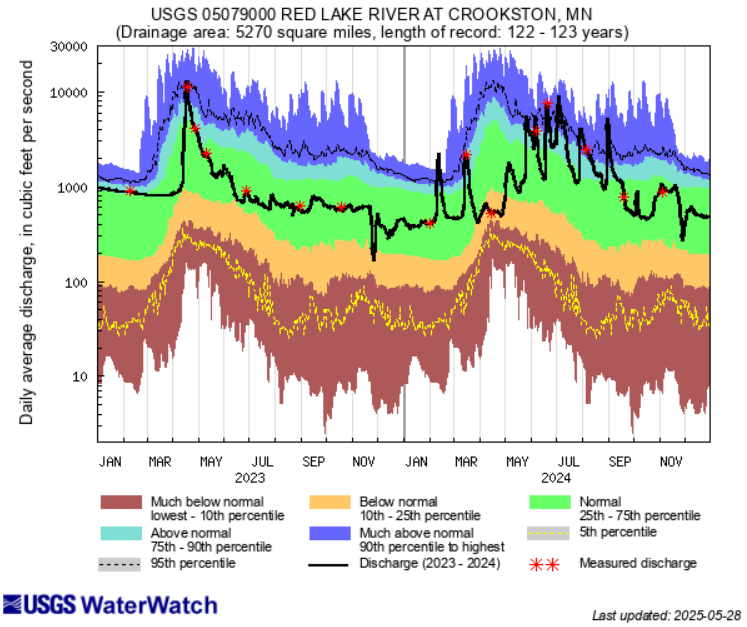


Figure 5: Streamflow at the Red Lake River at Crookston, MN January 1, 2023-January 1, 2025 (https://waterwatch.usgs.gov/index.php?id=wwchart_sitedur).

05100000, Pembina River at Neche, ND

Peak streamflow of 3,860 cfs at 16.36 ft on September 18, 2024; not a top 10 peak.

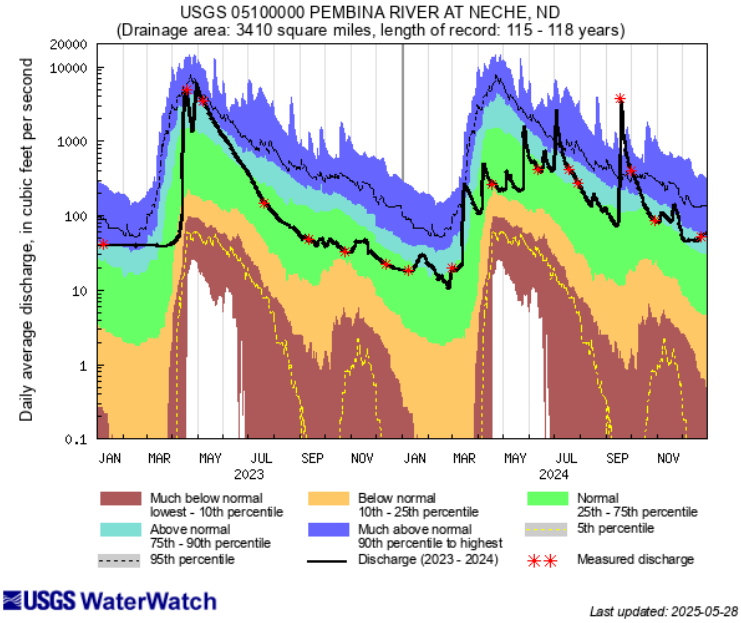


Figure 6: Streamflow at the Pembina River at Neche, ND January 1, 2023-January 1, 2025 (https://waterwatch.usgs.gov/index.php?id=wwchart_sitedur).

Devils Lake Subbasin

The Devils Lake Basin was subject to same mild temperatures and meager snowfall in the 2023-2024 winter season, as the rest of the Basin. Lake levels therefore did not rise until the first rain event on April 16 of just under 0.90 inches. An additional 1.16 inches of rain fell April 26-27 and another 0.49 inches April 29-30 (North Dakota Agricultural Weather Network, 2024b). In total, the month of May saw an average of approximately 5 inches of rain fall in the entire Devils Lake region, with a total of 3.09 inches recorded by the Cando, ND NDAWN station over May 23-24 (NOAA National Water Prediction Service, 2024c, North Dakota Agricultural Weather Network, 2024b).

The month of June added another 6.12 inches of rain to the region, with 2.09 inches falling on June 27, as recorded by the Cando, ND NDAWN station. July added just over 2 more inches between July 1 and the 14 (North Dakota Agricultural Weather Network, 2024b). All this combined for a rise of approximately 0.86 ft in the Devils Lake level from April 16 to the peak on July 23, with a peak mean daily value of 50.16 ft. The instantaneous peak, which is wind aided, was recorded as 50.35 ft on July 12, 2024 (U.S. Geological Survey, 2025). Pumping

resumed out of the west-end outlet on May 6 and out of the east-end outlet on May 14 (North Dakota Department of Water Resources, written commun(s)., May 6 and May 14, 2024) and continued until October 18th for the east-end outlet and October 22nd for the west-end (North Dakota Department of Water Resources, written commun(s)., October 22, 2024).

Devils Lake level fell steadily from the peak in July with some bumps due to rain events in August and September, to level out at around 49.4 ft (mean daily) at the close of the 2024 calendar year, or just slightly above the 49.2 ft level at the beginning of the year (U.S. Geological Survey, 2025).

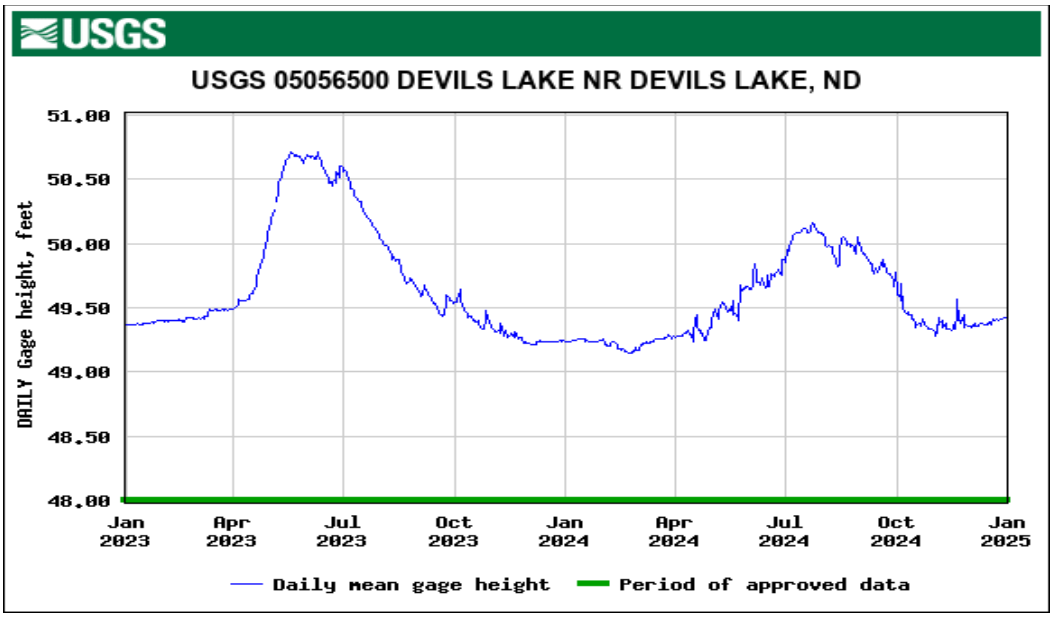


Figure 5: Devils Lake Gage Height January 1, 2023–December 31, 2024 (https://waterdata.usgs.gov/nwis/dv?cb_00065=on&cb_00065=on&format=gif_default&site_no=05056500&legacy=&referred_module=sw&period=&begin_date=2023-01-01&end_date=2024-12-31).

USGS Scientific Investigations Update

Fargo-Moorhead Diversion Monitoring

A monitoring program began in October 2019 in the Fargo-Moorhead area to detect any changes from the construction and operation of the various aspects of the Fargo-Moorhead Diversion project. The program is meant to provide consistent sampling methods and critical site locations to detect trends in water quality and to estimate constituent loads (mass per time) for understanding of how water-quality constituents are transported and how that could change throughout the project. Continuous, real-time monitoring upstream and downstream of the project also provides information on changes in water-quality that might happened on a shorter timescale such as from rainfall-runoff events, spills, and channel disturbances. The

current program is designed for sampling before, during and after construction of the Diversion and consists of:

- 10 Sampling Locations
    - Red River at Halstad, Georgetown, Harwood, Fargo, and Hickson.
    - Sheyenne River at Kindred and Harwood
    - Wild Rice River at Abercrombie and St. Benedict
    - Maple River below Mapleton.
- 8 scheduled samples per year - January, April (2 samples), May, June, July, August, October.
- Increased sampling during flood conditions.
- 3 continuous water-quality monitors for (water temperature, specific conductance, pH, dissolved oxygen, and turbidity).
    - Red River at Georgetown, Fargo, and Hickson
- All sites operated for continuous discharge, excluding Red River at Harwood.

Data collection for the first phase, pre-construction, is complete and a report has been published (Galloway and others, 2024). The second phase of data collection, during construction, began fall 2022 and continues through fall 2027.

Red River Low-flow Study

The Red River is susceptible to periods of dry conditions that have the potential to adversely impact ecological conditions and water supply. To understand the potential for drought conditions along the Red River, the USGS began a study to develop a water-balance model (WBM) of the Red River Basin upstream of Emerson and stochastic hydrometeorological data to derive a set of synthetic streamflows that would be used to statistically characterize the potential for periods of extreme low flows over the next 50 years.

A report was published in March 2025 that describes the WBM coupled with stochastic weather inputs to simulate possible future low-streamflow conditions and to present model simulation results for evaluating drought risk in the basin upstream from Emerson. The stochastic streamflow model was developed in three stages: (1) analysis of historical changes in annual low streamflow related to changes in land use and climatic persistence; (2) development of a WBM for simulating monthly streamflow in response to climatic inputs; and (3) evaluating future drought risk by coupling stochastic climate inputs with the WBM (referred to as the stochastic streamflow model).

To determine the future risk of low-streamflow conditions in the Red River of the North Basin, a block-bootstrap method was used to generate multiple possible future climates. These stochastically generated weather time series were then input to a water-balance model to simulate a distribution of possible streamflows. Three sets of experiments were performed, with each experiment containing a set of scenarios. Based on these climate predictions, the drought scenario that best matches a future anticipated drought scenario can be used to produce an estimate of the low streamflow response for a given subbasin. This method of deriving streamflow can

also be used to estimate low streamflow at other streamgages. The full report citation and link is listed here:

Redoloza, F.S., Glas, R.L., Nustad, R.A., and Ryberg, K.R., 2025, Evaluating drought risk of the Red River of the North Basin using historical and stochastic streamflow upstream from Emerson, Manitoba: U.S. Geological Survey Scientific Investigations Report 2025–5002, 58 p., https://doi.org/10.3133/sir20255002.

Red River Sulfate Study

The Red River sulfate study is a follow-up to the Red River trend analysis and is dependent upon output from the Red River low-flow study. This project was set up to develop trend attribution models for the Red River at Emerson and the Red River at Selkirk. Two categories of explanatory variables will be evaluated for this project: natural or hydroclimatic variables and anthropogenic variables. Natural/hydroclimatic variables will be considered first and then anthropogenic sources. Based on the large and consistent increases in sulfate occurring about the same time as the onset of the wetter conditions in the basin, we expect that the natural/hydroclimatic variables such as shallow groundwater flow or runoff from saturated soil will explain a large component of the trends. Output from the Red River low-flow water balance model (WBM) that represent the components of runoff will be used for natural/hydroclimatic variables.

The hydroclimatic factors analyzed were increased shallow groundwater runoff and increased overland runoff. The anthropogenic factors considered were crop changes over time, land use changes, road salt usage, atmospheric deposition, and population growth. Road salt use was eliminated as a factor as it did not affect sulfate, and only affected chloride with a small decrease. Sulfuric atmospheric deposition has been decreasing and was also eliminated. Population growth has been small and was also eliminated as a factor.

Eighteen sites were used to look at short term (1990-2015) attribution in the Red River Basin. Eight sites were used for long-term (1970-2015) trend attribution and were implemented into the water balance models. As far as hydroclimatic variables go, excess flow was the most important factor affecting sulfate concentrations meaning the higher concentrations are during the wettest periods. Emerson was used as the first site because it was integrated the whole basin.

For anthropogenic sources, crop data and land use were analyzed. Annual crop data by county gathered from National Agricultural Statistics Service was used to sum together for the total acres in each crop type. Crop type caused a slight increase but is a small factor compared to excess runoff. Land use was also calculated for each site from data published in Falcone (2018). Highest concentrations came from more cultivated crops as seen from the short-term trends of land use. The anthropogenic factor of land use affects the hydroclimatic trend in salt concentration. Although no publication will be completed for this study, this information was provided to IJC staff in the form of a slide presentation in April 2025.

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7. IRRWB Annual Report 2024-2025

Activity Report: Agriculture and Agri-Food Canada (AAFC)

Sustainable Canadian Agricultural Partnership 2023-2028

As part of the Sustainable Canadian Agricultural Partnership, the AgriScience Program, including both Clusters and Projects Streams, serves to mobilize partnerships between industry, government, and academia by funding projects that support pre-commercial science activities and research that benefits the agriculture and agri-food sector and Canadians. Since April 2023, the Clusters Stream has supported 22 Science Clusters (e.g., Beef, Canola, Agronomy, Pulse, Dairy, Wheat, Cropping Systems, Swine, Grape & Wine, Biomass, Organic, and Horticulture) that will run until 2028. These clusters are focused on three priority areas: climate change and environment; economic growth and development; and sector resilience and societal challenges.

Research, Development and Technology Transfer Activities

AAFC research activities are ongoing. With collaborative applied research, knowledge and information transfer occurring on the effectiveness of various beneficial management practices (BMPs) in reducing potential risks to surface water.

Science and Technology Branch (STB) also issues an internal project proposal process that supports activities across the RDT continuum.

Active research projects with activities in Manitoba with potential relevance to the health of Red River watershed and Lake Winnipeg, include:

a. Advancing remotely-sensed soil moisture and snow monitoring to enhanced data for cold-regions hydrological applications.
b. Comparative current-use pesticide dynamics in three priority basins of Canada, including watershed sampling in Swan Lake First Nation.
c. Evaluating how climate change, land use and on-farm management practices influence the hydrological characteristics of a wetland and its ability to capture and store carbon.
d. Advancing phosphorus management in Canadian manured soils using ecosystem approach to improve use efficiency and ensure one health.
e. A multidisciplinary approach to improve phosphorus management in Canadian agro-ecosystems.
f. SCAP-ASC-13 Organic Cluster Activity #7 - Optimizing the environmental and agronomic co-benefits of recycled phosphorus inputs for organic field crops.

g. Mitigating Climate Change in Manitoba: Investigating Carbon Sequestration and Greenhouse Gas Emission Reduction Strategies in Agriculture through the Living Labs Approach.
h. AAFC Hydrologist in Brandon was involved in discussions with the province of Manitoba, potato producers and the University of Manitoba in an effort to identify solutions in addressing the potato industry's water needs for expansion.

Agricultural Climate Solutions

Agricultural Climate Solutions (ACS) is a multi-stream program that will help to develop and implement farming practices to tackle climate change. By developing, evaluating, adopting, and surveying agricultural technologies and practices, ACS is focused on sequestering carbon, reducing greenhouse gas emissions and delivering environmental benefits.

ACS includes the Living Labs Program that transfers knowledge to other farmers so that they can deploy solutions that are tailored to their region and promote environmental sustainability and resiliency in the agriculture sector. Projects are selected based on the potential to store carbon and/or reduce greenhouse gases. Projects also contribute to environmental co-benefits, such as finding ways to conserve clean water, increase soil water holding capacity, and improve nutrient use efficiency.

A new Manitoba Living Lab was announced November 15, 2023. The lead partner is the Manitoba Association of Watersheds, who previously led Living Lab – Eastern Prairies under the former Living Laboratories Initiative, which ended in 2023.

The Living Lab develops and tests BMPs for nutrient management, natural and agricultural landscapes, water retention, agroforestry, crop and livestock integration, grazing management, rhizome microbiome, soil organic matter growth and soil health, as well as facilitating better use of resources. A key focus of these activities will be to bridge the gap between understanding and implementation. In collaboration with partner organizations within the living lab, the Manitoba Association of Watersheds also encourages knowledge transfer and exchange between local producers, federal and provincial researchers, Indigenous communities, and other partners.

AAFC's Living Labs Manitoba team established 210 potential project locations with 33 producers, 2 First Nations, and 30 partnering organizations. They participated in 8 information sharing (flyers, articles, conference presentations), 10 outreach events, and 23 co-development sessions. The team worked with a range of summer students and trained one post-doctoral researcher.

Thanks to the collaboration between AAFC and ECCC researchers through Living Labs Manitoba, a manuscript describing predictors of P loss from perennial forages has recently been published. The results suggest that P losses will not be elevated, should increased land area be planted to perennial crops to increase carbon sequestration and soil P fertility be carefully managed.

An analysis of the potential to reduce the runoff loss of P in the Basin, particularly a slow-release form of P fertilizer that can be recovered from wastewater treatment (struvite), has also been accepted for publication. This research is a product of both on-farm collaborations formed under the Living Labs project and Organic Science Cluster funded research.

Co-development on AAFC led projects is moving forward with individual producers. Projects involving natural landscapes, pastures and perennial forages have begun this summer. Projects focused on annual crop land have also been initiated over the course of the current field season.

The external lead partner (i.e., MAW) has established teams for the different activities, with some projects already initiated.

Canada-Manitoba Lake Winnipeg MOU Steering Committee, and Joint AAFC-ECCC Watershed Science Coordination Committees

AAFC continues to participate on the CA-MB Lake Winnipeg MOU committee as a standing member (Dr. Felicitas Katepa-Mupondwa; delegate: Dr. Eric Liu) and its reinstated Science Coordination Subcommittee (Dr. Henry Wilson), and provide expertise related to water issues that impact agriculture in the region.

Drs. Eric Liu (AAFC) and Ram Yerubandi (ECCC) are co-chairs for the Winnipeg Watershed Science Committee. Other AAFC members include Dr. Henry Wilson, Dr. Jonathan Challis, and Dr. Taras Lychuk.

Contribution to inter-jurisdictional organizations and boards

AAFC continues to participate on the Prairie Provinces Water Board (PPWB) and its technical committees which undertake work that contributes to the goals and objectives of the Lake Winnipeg initiative. AAFC has representation on the Board (Dr. Eric Liu, Mr. Ron Woodvine), on the Committee on Hydrology (Mr. Ron Woodvine), the Committee on Water Quality (Dr. Henry Wilson, Dr. Jonathan Challis - alternate), the Committee on Groundwater (Dr. Kayla Moore), and the Committee on Flow Forecasting (Mr. Trevor Hadwen).

AAFC continues to participate on the International Joint Commission (IJC) - International Red River Watershed Board (IRRWB) as a standing board member (Dr. Eric Liu). AAFC representatives provides scientific input and professional expertise for establishing water quality targets and developing a nutrient management strategy for the Red River Basin through its participation in the Water Quality Committee (Dr. Henry Wilson) and Hydrology Committee (Dr. Kayla Moore) of the IJC-IRRWB.

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