Playgreen Lake Sediment Transport Study

Hydrodynamic, wave, and sediment transport modeling to assess climate change and Lake Winnipeg Regulation system impacts, to develop resilient long-term sediment management strategies for Playgreen Lake.
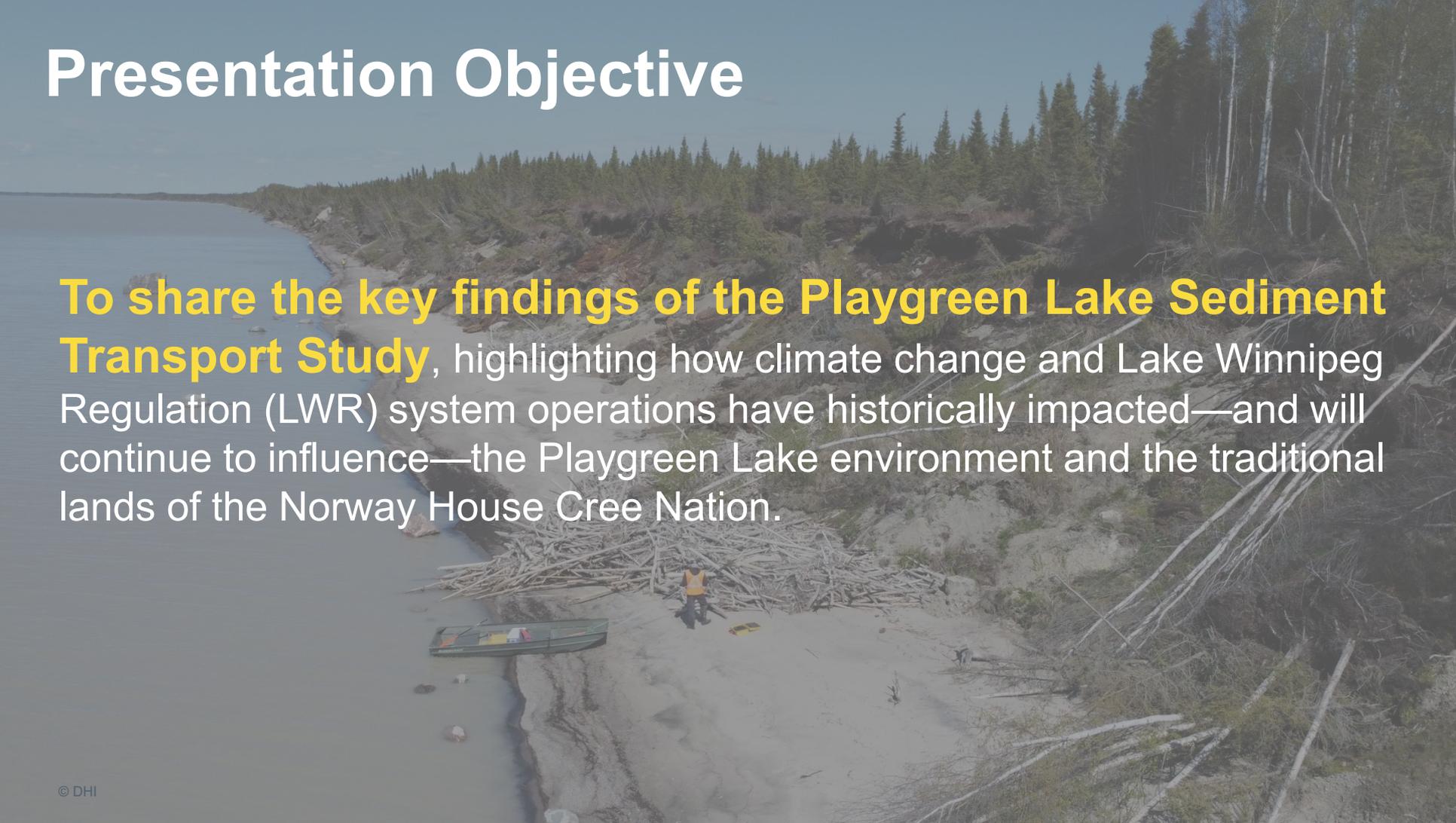
Press Conference

Presentation of Study Findings

February 20th, 2026

DHI Water & Environment, Inc.
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Presentation Objective

To share the key findings of the Playgreen Lake Sediment Transport Study, highlighting how climate change and Lake Winnipeg Regulation (LWR) system operations have historically impacted—and will continue to influence—the Playgreen Lake environment and the traditional lands of the Norway House Cree Nation.

Playgreen Lake & Lake Winnipeg
Siltation, Erosion and Water Quality Concerns

- **Lake Winnipeg Regulation (LWR)** is an engineered system of control structures and diversion channels, commissioned in 1976, **with the intent to increase Lake Winnipeg outflow capacity by ~50% above natural conditions.**

- **Developed and operated by Manitoba Hydro** to reduce flood risk around Lake Winnipeg and optimize hydroelectric power generation along the Nelson River.

- **As early as 1985, 2-Mile Channel itself was officially identified as an active sediment source**, with greater contributions than Warren Landing, supplying lacustrine clay and fine-grained till into Playgreen Lake. (MacLaren Plansearch Inc., 1985)

to Jenpeg
8-Mile Channel
NHCN
Norway House
Playgreen Lake
Lake Winnipeg
2-Mile Channel
Warren Landing
August 11, 2022

2-MILE CHANNEL
Source: https://www.gov.mb.ca/sd/images/water/licensing/lwr_two_mile.jpg

NHCN seeks to strengthen and validate its understanding of past, ongoing, and future sediment dynamics within Playgreen Lake to inform practical, implementable management strategies that protect and sustain their traditional lands.

Primary Study Objectives:

1. **Identify Drivers of Observed Changes to Playgreen Lake**
   Assess natural (waves, ice, inflow) and anthropogenic (channels, regulation) influences on sediment and shoreline dynamics.
2. **Evaluate Role of LWR System**
   Analyze impacts of 2-Mile and 8-Mile Channels on turbidity, erosion, and sedimentation.
3. **Develop Mitigation Strategies to Mediate Adverse Sedimentation Impacts**
   Explore structural and operational solutions (e.g., shoreline armouring, sediment bypassing, LWR modifications).
4. **Assess Future Climate Change Impacts**
   Understand impacts of projected reductions in ice cover on future sediment dynamics.

Key Questions Shaping the Present-Day Understanding of Playgreen Lake

Question

Flow Diversion

- How does the flow at 2MC channel compare to the flow at Warren Landing, and how has this changed from pre-LWRS conditions ?

- What are the flow statistics for each of the inflow/outflow of Playgreen Lake?

Sediment Transport

- Did Playgreen Lake suspended and fine sediment deposition increase after the construction of 2MC? If yes, how much?

- What is the fate of fine sediment plumes entering Playgreen Lake from 2MC?

- How does the contribution of sediment from 2MC compare to Warren Landing, and how has this changed from pre-LWRS conditions ?

- Can structural interventions such as shoreline hardening, bypass jetties at 2MC, or a combination, reduce sediment input ?

*Climate Change Effects also considered (i.e. ice reduction / higher lake levels)
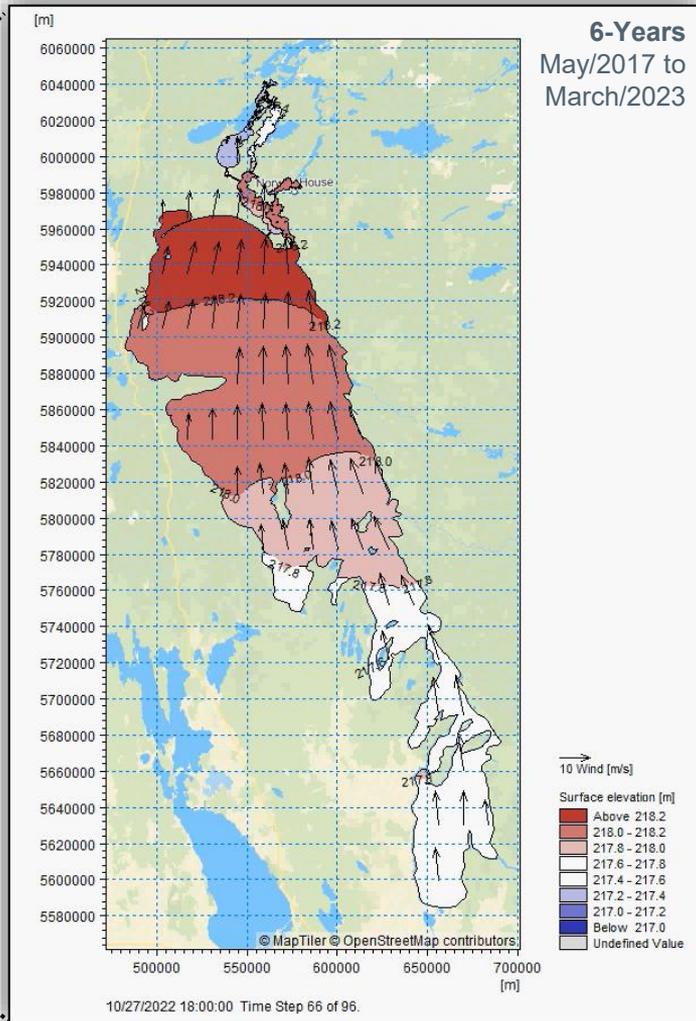
Lines of Evidence Considered in our Study

1. Data & studies from Manitoba Hydro, the Government of Manitoba and Gov. Canada
2. Field data collected by DHI (spring 2024)
3. Global, National & Regional climate change models and projections
4. Remote sensing and Earth observation technologies
5. Extensive calibrated numerical models of physical processes (water levels, currents, waves, sediment transport)
6. Desktop review and application of scientific first principles
7. Community knowledge, lived experiences, and oral histories
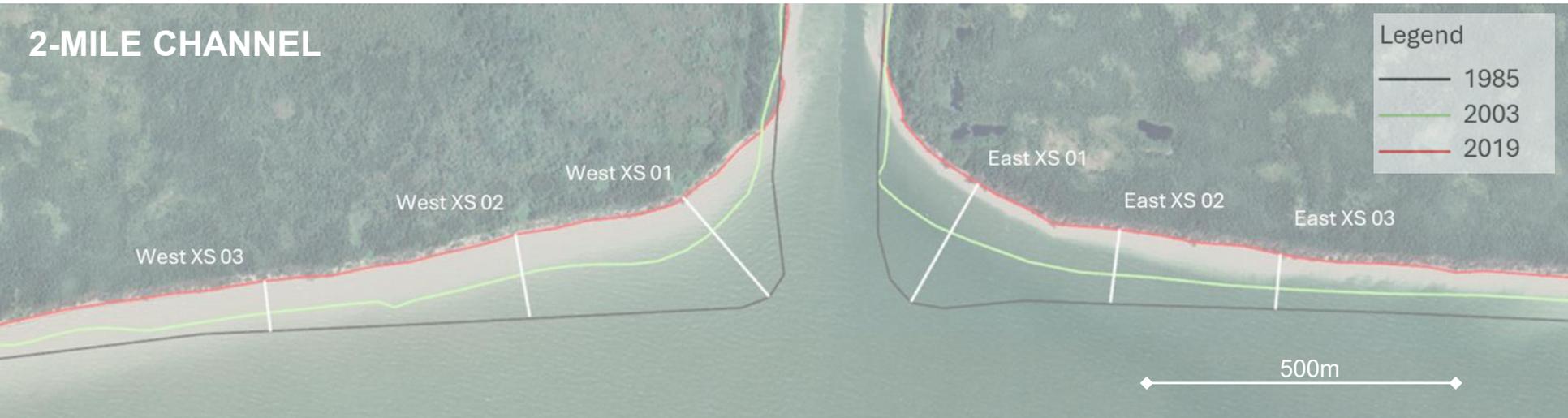
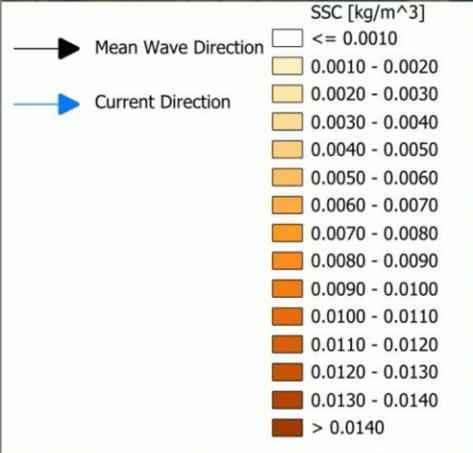# Modelling the Lake Winnipeg Regulation System & Playgreen Lake
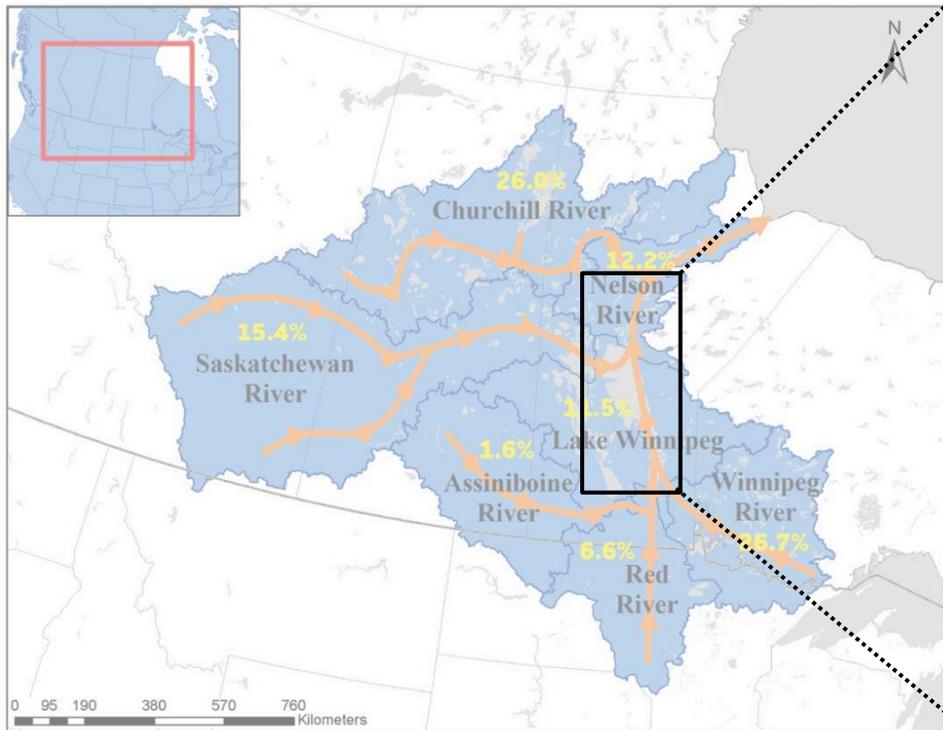
Source: Manitoba Hydro: per cent contributions are calculated based on 1981-2010 average inflows available for outflow. For the Churchill River, only a portion of the inflow available for outflow is diverted into the Nelson River.
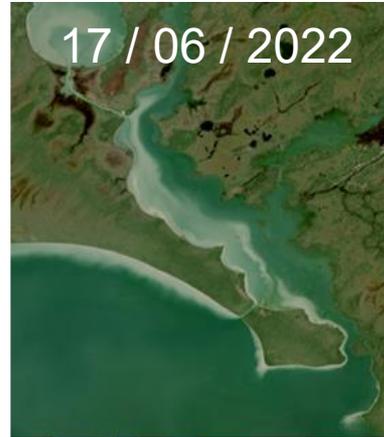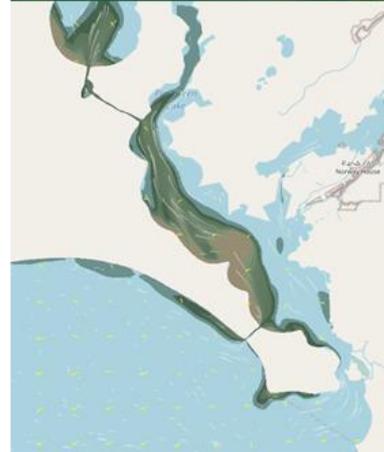
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June 2022 Storm Event on Lake Winnipeg

2022-06-17 12h

SSC [kg/m^3]

Mean Wave Direction — <= 0.0010

Current Direction — 0.0010 - 0.0020
0.0020 - 0.0030
0.0030 - 0.0040
0.0040 - 0.0050
0.0050 - 0.0060
0.0060 - 0.0070
0.0070 - 0.0080
0.0080 - 0.0090
0.0090 - 0.0100
0.0100 - 0.0110
0.0110 - 0.0120
0.0120 - 0.0130
0.0130 - 0.0140
> 0.0140

15/06

16/06

17/06

Models Extensively Calibrated to Data & Observations

15 / 06 / 2022 16 / 06 / 2022 17 / 06 / 2022
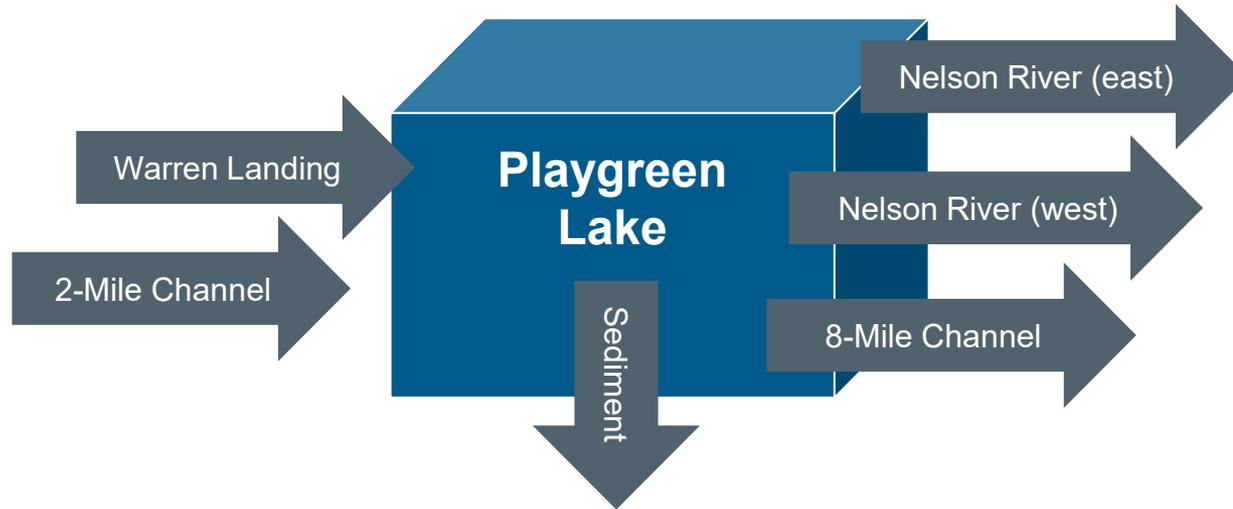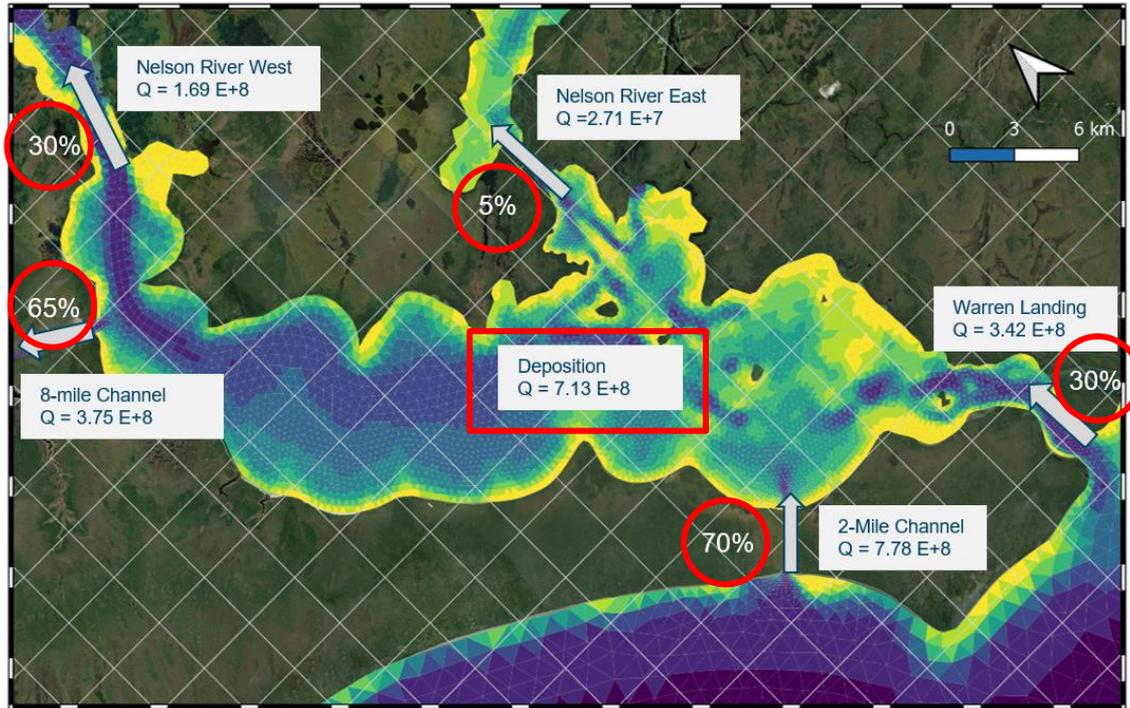
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MODEL

SUSPENDED SEDIMENT BOX MODEL

A box model accounts for what is going in and out of a defined area or volume. In this case the "box" is Playgreen Lake and what is going "in" and "out" is the fine suspended sediment carried by the flows.

Sediment Transport Model – Box Model Results

Sediment Flow Through Main Channels – Present-day Conditions


Playgreen Lake discharge box model. Average accumulated yearly fine sediment discharge (kg) over a 6-year representative simulation (2017 – 2023)

n°	Scenarios Considered
1	Present-Day Conditions
2	Without LWR system (removal 2MC & 8MC)
3	Ice coverage reduction
4	No Ice coverage
5, 6, 7	Sediment bypassing jetties (three versions)
8	Hardening Lake Winnipeg shoreline (sediment source)

Key Findings

1. **The LWR system - particularly the 2-Mile Channel - is the primary driver of fine sediment delivery from Lake Winnipeg into Playgreen Lake,** <u>**contributing approximately 70% of the total load**</u> and leading to elevated turbidity and sedimentation.

2. **Playgreen Lake functions as a sediment trap,** with average annual deposition significantly influenced by the 2-Mile Channel. <u>**Without the channel, sediment accumulation would decrease by approximately 50%.**</u>

3. **Climate change—particularly the loss of winter ice cover— acts like a cumulative stressor that could increase sediment inputs by up to 75%,** as waves have more time to erode shorelines when the lake isn't frozen. <u>**Shoreline erosion rates could accelerate annually up to 25-50% by mid- to late-century.**</u>

4. **Infrastructure-based interventions (jetties, shoreline armouring) offer only limited reductions (10-15%) of sediment deposition** and are likely not cost-effective relative to their impact. These conclusions underscore the limited return on investment offered by conventional structural measures.
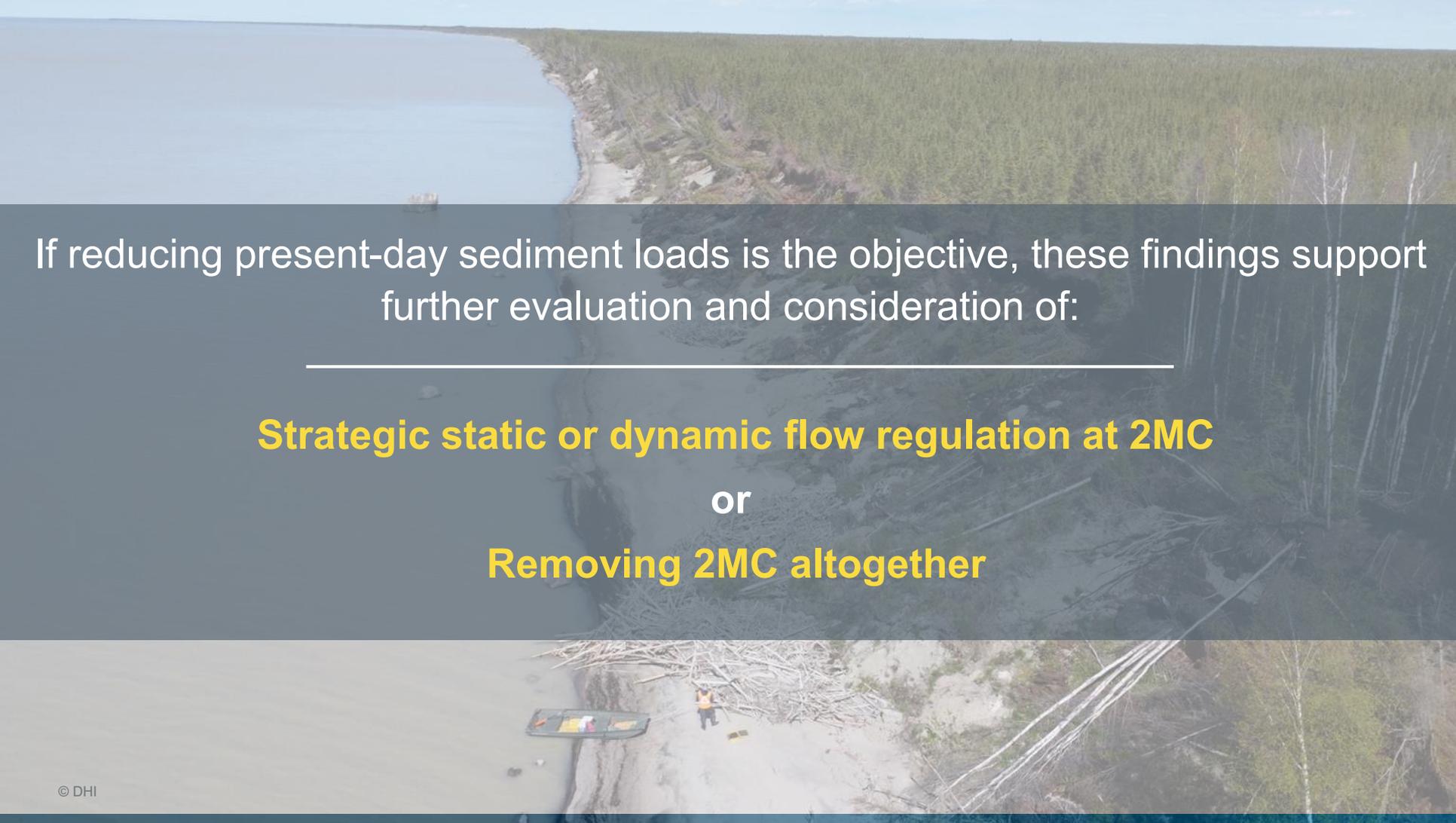
If reducing present-day sediment loads is the objective, these findings support further evaluation and consideration of:

Strategic static or dynamic flow regulation at 2MC

or

Removing 2MC altogether

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