



The Lake Winnipeg Basin : ECCC Science Program



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Context for the Lake Winnipeg Basin Initiative

- Water Quality in Lake Winnipeg was deteriorating. The chief concern was **nutrient loading (phosphorus and nitrogen) mainly from agricultural run-off and municipal wastewater effluent, leading to massive algal blooms and advanced eutrophication.**
 - In 2004, Manitoba requested federal assistance in addressing Lake Winnipeg water quality issues.
 - Since **almost more than half the total loading originates from outside Manitoba**, the problem and solutions are interprovincial and international in scope.
 - Federal Science capacity **would assist the province** in **developing and understanding** of the lake ecosystem and **guide solutions**
 - In 2007 the **Lake Winnipeg Basin Initiative** has been launched for 5 years based on 3 pillars: governance, stewardship and science.
 - In 2012 program is renewed for another 5 years
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LWBI: Objectives/expected outcomes

LWBI – Environment and Climate Change
Canada-led, Government of Canada
program to improve water quality in the
Lake Winnipeg basin

Outcomes:

- **Reduction in the magnitude and extent of harmful algal blooms by reducing nutrient loading**
- **Reduced beach closures and improved water quality for recreation**
- **Restoration of the ecological integrity of Lake Winnipeg**
- **A sustainable fishery**



Main Results from LWBI (1 &2)

Science Approach	Main deliverable	Links to operational/policy requirements
1. Knowledge gaps related to impacts of human activities	Foundational Research and monitoring data, address land-based loadings to watershed, Representative watersheds for assessing BMPs	Placement and performance of BMPs in agricultural landscape, Models for nutrient management
2. Predictive capabilities	Integrated monitoring modeling capacity to provide nutrient reduction scenarios and impacts	Support Province and other jurisdictions in developing ecological objectives and targets
3. Water quality and biotic monitoring	Monitoring data, trends, assessment of nutrients and selective parameters of concentrations and loadings	Formal agreements: High frequency for Red River, medium for SK-MB and ON-MB sites, CESI Indicator reporting, Selected bio-monitoring variables
4. Lake nutrient dynamics	Understanding on nutrients/algae; internal nutrient loads and science related to HABs in the lake	Reporting on nutrient status, HABs indicator

Freshwaters Initiative – Recent Renewal

The Minister's mandate letter focus:

- *Treat our freshwater as a precious resource that deserves protection and careful stewardship, including by working with other orders of government to protect Canada's freshwater using education, geo-mapping, watershed protection, and investments in the best wastewater treatment technologies*
- *Working in collaboration with the Minister of Fisheries, Oceans and the Canadian Coast Guard, renew our commitment to protect the Great Lakes, the St. Lawrence River Basin and **the Lake Winnipeg Basin***

Under Freshwaters Initiative, Lake Winnipeg Basin program is renewed in Budget 2017 for another 5 years

- **Main Goal: Advance the remediation of Lake Winnipeg by providing the scientific research that informs nutrient management strategies**

Lake Winnipeg Basin Program (2017-22)

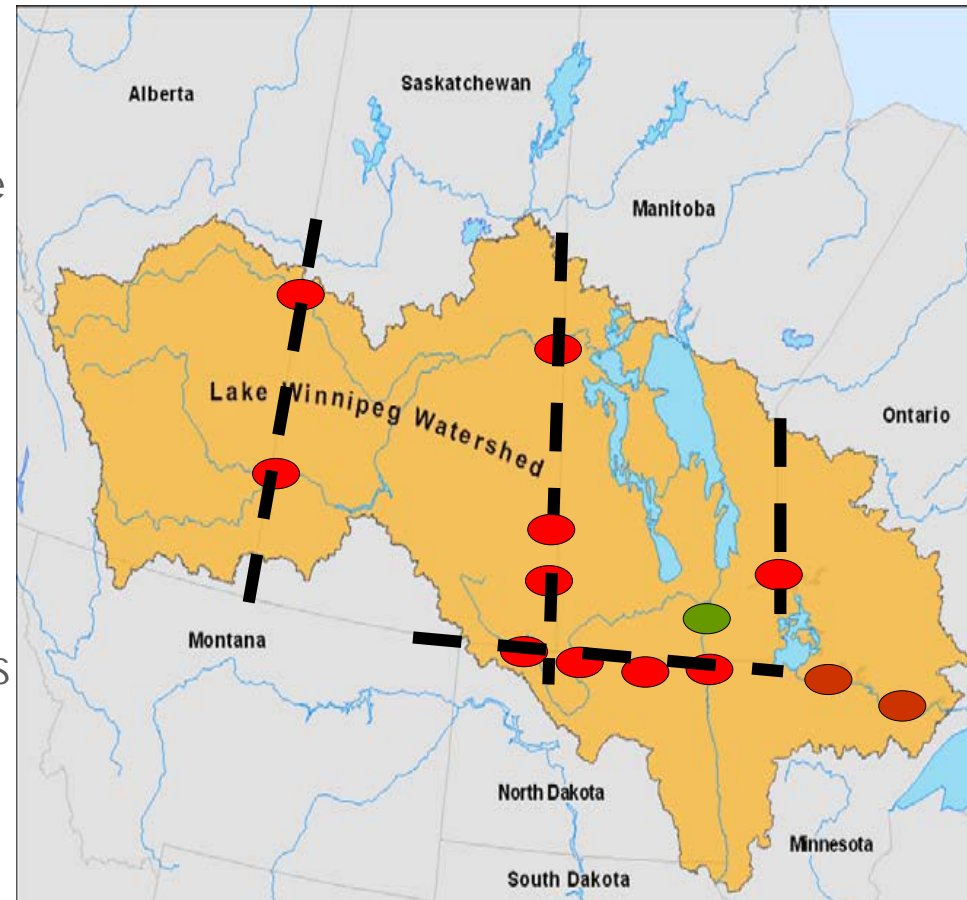
Based on the gaps and ongoing data requirements in the Basin continuity in longer-term outcomes sought:

- Actions to reduce magnitude and extent of harmful algal blooms
- Provide science information of the ecological integrity of Lake Winnipeg under current and future threats (for eg: **mussels, climate change**)

Action	Collaborative Governance	Science	Indigenous Engagement
<ul style="list-style-type: none"> • Effective actions by individuals, farmers, communities, and organizations to manage nutrients • Resources and efforts are targeted and focused on high priority landscapes 	<ul style="list-style-type: none"> • Can-MB MOU facilitating partner and stakeholder collaboration at basin and sub-basin levels, and supporting integrated, timely and adaptive decision-making • Transboundary management bodies establishing transboundary nutrient objectives relevant to L. Wpg nutrient issues • Increased coherence and coordination of federal actions relative to L. Wpg 	<ul style="list-style-type: none"> • A research, monitoring and modelling program developed to inform how the lake and watershed are responding to basin-wide nutrient management decisions • Better understanding of the contribution of nutrient loading to the Lake and ecological response of the lake • Improved ability to report on progress in nutrient management and ecosystem health 	<ul style="list-style-type: none"> • Strengthening Indigenous engagement in identifying priorities and actions • Capacity building, youth engagement and education (science and traditional knowledge)

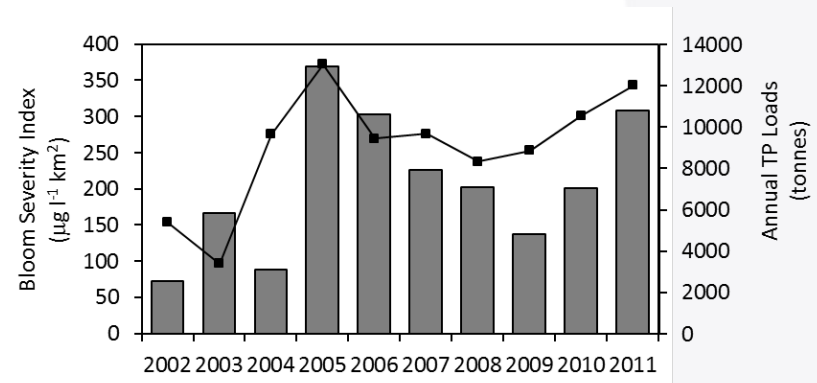
1. MONITORING TO ASSESS STATUS AND TRACK CHANGE

- Transboundary sites monitoring
- Water quality sampling of key Lake Winnipeg tributaries
- Coordinated water quality sampling of Lake Winnipeg with the Province of Manitoba
- Nearshore aquatic sampling in the north and south basins of Lake Winnipeg, including the Netley Libau marsh and eastern tributaries



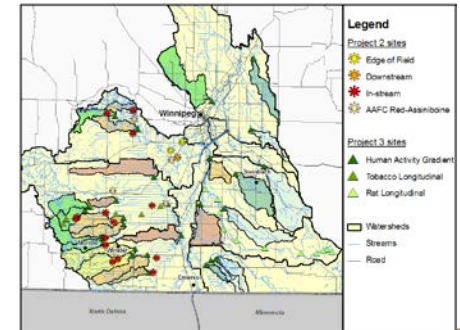
2. REPORTING ON PROGRESS TOWARDS RESTORING A HEALTHY LAKE WINNIPEG

- Development of key ecological, social and economic indicators of lake health (with Manitoba)
- Interpreting and reporting water quality status and trends in the lake and watershed
- Updated State of Lake Winnipeg Report (with Manitoba)
- Open access to data for all stakeholders



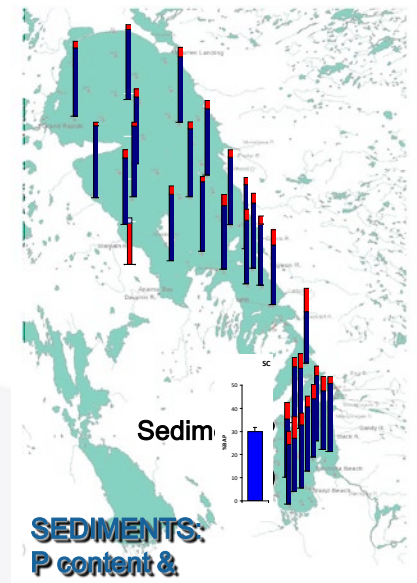
3. RESEARCH TO ADDRESS GAPS ON NUTRIENT SOURCES AND TRANSPORT PATHWAYS TO TRIBUTARIES OF LAKE WINNIPEG

- Studying nutrient loss processes and how the location and scale of different land management practices influence nutrient loss from the land
- Assess effectiveness of beneficial management practices (BMPs) for improving water quality at a watershed scale
- Understanding how groundwater inputs and pathways influence the nutrient loads in streams
- Developing watershed models to test how and where implementing different land management practices can reduce nutrient loss to streams
- Assess how changes in climate may influence nutrient loss to streams



4. RESEARCH ON LAKE ECOSYSTEM COMPONENTS TO ACHIEVE A SUSTAINABLE NUTRIENT BALANCE

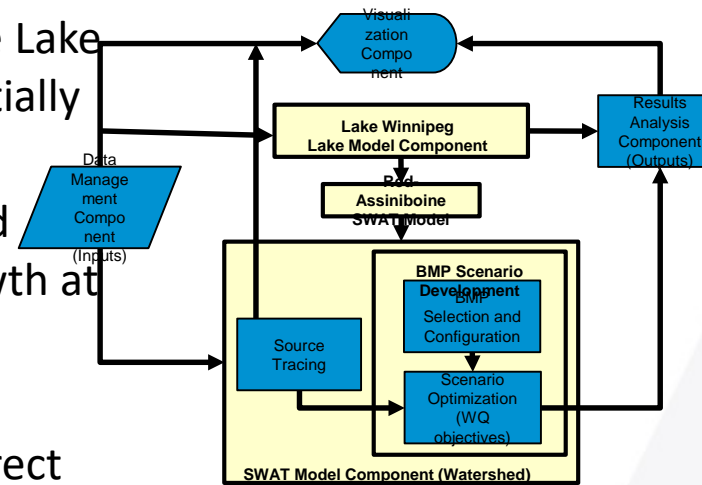
- Studying the impacts of physical processes (temperature, currents, sediments) on nutrient dynamics in the lake
- Improving estimates of algal bloom conditions by optimizing remote sensing information
- Evaluating the food-web structure changes due to invasive mussels, climate change
- Improving estimates of internal nutrient loading
- Identify key factors contributing to changes in planktonic diversity/integrity and occurrence in harmful algal blooms (HABs) and potential for toxicity



SEDIMENTS:
P content &
bioavailability
2008-09

5. INTEGRATED LAKE-WATERSHED MODELLING

- Develop a modelling framework for the US and Canadian portions of watersheds (Assiniboine, Red Rivers SWAT and estimate loading in other Rivers) and integrate with the Lake Model (ELCOM-CAEDYM) to predict water quality spatially and temporally in Lake Winnipeg
- Identify sources of nutrients triggering algal growth and propose management objectives to mitigate algal growth at the local and lake-wide scales.
- Integrate dreissenid mussel effects on P recycling into models in order to assess the relative importance of direct and indirect effects on algal growth and abundance
- Assess climate change impacts on nutrient transport and lake ecological health
- Predict the lake's response to potential nutrient loading reduction actions under current and future climates for improving water quality for developing ecological objectives of the Lake





Environment and
Climate Change Canada

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Canada



Acknowledgements

WSTD- LWBI Science team
LWBP office
Manitoba Sustainable Development
Lake Winnipeg Research Consortium
& several other partners (U of Manitoba, DFO, AAFC....)