Environment Canada Environnement Canada

Progress Report on the

Lake Winnipeg Basin Initiative

2008/09–2009/10

Part of the Government of Canada's Action Plan for Clean Water

Canada

En4-137/1-2010E-PDF
978-1-100-17162-3

Preamble

The Government of Canada's Lake Winnipeg Basin Initiative was designed to help improve the water quality of Lake Winnipeg. Nutrient enrichment and eutrophication are the primary concern, caused by excessive phosphorous and nitrogen from many sources throughout Lake Winnipeg's vast watershed.

In order to improve the health of Lake Winnipeg, a sound scientific base of knowledge is first required, to determine what, and how much, action is needed. As a result, the major focus of the Lake Winnipeg Basin Initiative has been to bring the Government of Canada's freshwater science and monitoring expertise to bear on the nutrient issues facing the lake and the watershed. This work is a necessary prerequisite in order to determine the appropriate measures needed to reduce nutrient loading into the lake, and to evaluate if such measures are effective in improving the health of Lake Winnipeg.

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The Lake Winnipeg Basin Initiative

Lake Winnipeg is the tenth largest freshwater lake in the world and the sixth largest in Canada. The Lake Winnipeg watershed spans almost one million km^2, extending over four provinces and into four U.S. states.

Water quality has deteriorated in the lake in recent years due to excessive amounts of nutrients, primarily phosphorus and nitrogen, from many point and non point sources such as surface runoff and municipal wastewater effluent. Approximately half of this nutrient load originates from outside Manitoba's borders. The excessive nutrients contribute to the growth of huge tracts of blue-green algae, which rob the lake of oxygen, clog fishing nets, foul beaches and produce harmful toxins.

In 2007, as part of Canada's Action Plan for Clean Water, the Government of Canada announced an investment of $17.7 million over four years, from 2008/09 to 2011/12, to help clean up Lake Winnipeg. The Lake Winnipeg Basin Initiative (LWBI) was developed in response to the Manitoba government's request for federal assistance in addressing scientific needs within Lake Winnipeg and the broader basin, and to facilitate the co-ordination of government and stakeholder efforts in this transboundary watershed.

The LWBI is focused primarily on science, bringing the Government of Canada's freshwater science and monitoring expertise to bear on the nutrient issues facing the lake and the watershed. In addition to science, the LWBI provides support to facilitate governance across the transboundary watershed, and supports stewardship efforts by providing financial assistance through the Lake Winnipeg Basin Stewardship Fund for community based projects.

The LWBI's $17.7 million resources are allocated as follows:

- scientific research, monitoring and information/data support ($12.1 million)
- community stewardship programs ($3.7 million)
- facilitating watershed governance ($1.9 million)

Near term results expected from the LWBI include a model watershed management approach for the Lake Winnipeg Basin that can be applied in other key interjurisdictional watersheds in Canada; an improved science-based understanding of the dynamics of Lake Winnipeg and its Basin to support and inform policy and decision making; and a Canada–Manitoba Agreement to establish a long-term collaborative and coordinated approach between both governments, to support the sustainability of the lake.

Synopsis

This report has been compiled to outline the activities conducted during the first two years (2008/09–2009/10) of the Lake Winnipeg Basin Initiative (LWBI). Significant progress has been made in implementing the LWBI science plan, as well as in the areas of stewardship and facilitating governance.

Activities have focused on developing the physical, chemical and biological knowledge required to describe the sources, transport, fate and effects of nutrients in Lake Winnipeg and throughout the watershed. Hydrological and climate models for Lake Winnipeg and Lake of the Woods have been developed to examine relationships between a variety of physical, chemical and biological processes and characteristics. Remote sensing satellite imagery data has been gathered and used to track algal blooms and assess water quality conditions. Isotope assessment of fish, foodwebs, lake sediments, and nutrients is generating important information and understanding of Lake Winnipeg and Lake of the Woods ecosystems and nutrient processes.

Field work was initiated to examine the transport of nutrients in agricultural watersheds, the impact of snowmelt on nutrient transfer, and the impact of climate change and variability on the water cycle and its implications for nutrient transfer.

A web-based information portal was developed in conjunction with stakeholders, to gather, store and share data concerning the watershed, and provide users with the tools and information they need to make effective water management decisions. Work began to compile and assess existing and historic data on Lake Winnipeg, in order to provide a baseline against which the results of current and future research can be compared.

Most of the science projects and activities will continue throughout the remaining two years of the LWBI, during which the focus will be on completing these activities and synthesizing the results. This information will provide a better understanding of the nutrient dynamics in the watershed, and provide the basis for establishing sustainable nutrient objectives and water quality indicators for Lake Winnipeg.

The Lake Winnipeg Basin Stewardship Fund was launched in 2008/09. Approximately $1.7 million was approved for 25 community stewardship projects in the first three funding rounds. A *Canada-Manitoba Memorandum of Understanding Respecting Lake Winnipeg and the Lake Winnipeg Basin* was developed, to formalize collaboration and coordination of activities amongst the federal and provincial governments in support of Lake Winnipeg.

More details about the activities and progress of the LWBI from 2008/09 to 2009/10 are contained in the following pages. A final report will be prepared in 2012, following the conclusion of the Initiative.

Acknowledgements

Environment Canada's work under the Lake Winnipeg Basin Initiative is conducted in cooperation and partnership with other federal agencies, the Manitoba government and other non-government and academic partners across the watershed, and the scientific community throughout Canada.

In particular, we would like to acknowledge the following agencies: Agriculture and Agri-Food Canada, Fisheries and Oceans Canada, Natural Resources Canada, Canadian Coast Guard, Manitoba Water Stewardship, Manitoba Agriculture Food and Rural Initiatives, Manitoba Conservation, Ontario Ministry of the Environment, Ontario Ministry of Natural Resources, Alberta Environment, Saskatchewan Ministry of Environment, Minnesota Pollution Control Agency, Manitoba Hydro, the Universities of Manitoba, Saskatchewan, McMaster, Guelph and Quebec; Ducks Unlimited Canada, and the Lake Winnipeg Research Consortium.

Environment Canada would also like to acknowledge the following members of the Public Advisory Committee for their contributions in support of the Lake Winnipeg Basin Stewardship Fund. The Lake Winnipeg Basin Stewardship Fund Public Advisory Committee members include:

- Marlene Cook, Deputy Mayor for the City of Selkirk;
- David Crate, Chief of Fisher River First Nation, and a former commercial fisher;
- Robert T. Kristjanson, a fifth-generation commercial fisher;
- Allan Kristofferson, Managing Director of the Lake Winnipeg Research Consortium;
- David Tomasson, a Manitoba Interlake fisher with past involvement in the Hecla Village Harbour Authority and the Freshwater Authorities Advisory Council; and
- Garry Wasylowski, a cattle producer and former Reeve of Armstrong, Manitoba.

Finally, we would also like to acknowledge the work of all the organizations that have participated in, or provided funding and in-kind support for Lake Winnipeg Basin Stewardship Fund projects. A full list of projects can be found in the appendices of this report.

Science (Research, Monitoring and Information)

The Lake Winnipeg Basin Initiative (LWBI) and more specifically the LWBI science plan addresses requests from the Province of Manitoba for federal support in delivering on science needs within Lake Winnipeg, as well as in the broader basin.

The Lake Winnipeg watershed is geographically daunting, encompassing almost one million square kilometres. Governments need data and research on which to base watershed and nutrient management decisions. The work undertaken by Lake Winnipeg Basin Initiative scientists is intended to help partners across the watershed act on the lake's condition based upon solid scientific data and conclusions.

The goal of the LWBI science plan is to understand the gaps related to ecology and nutrient cycling, and the sources and transport mechanisms for nutrients, in order to provide the information needed by decision makers to develop nutrient objectives for the lake. Performance indicators are also needed to assess the health of the lake and watershed and determine how Lake Winnipeg and its watershed respond to nutrient management decisions taken within the basin.

The LWBI science plan encompasses six key deliverables or objectives, as follows, with a number of projects and activities in support of each objective:

- Characterize the physical, chemical and biological nature of Lake Winnipeg to better understand the balance of nutrient enrichment and productivity of fisheries in relation to algal blooms.
- Establish watershed and in-lake nutrient budgets. Additional monitoring sites will be added throughout the basin and will be integrated, where appropriate, with existing water quantity stations.
- Assess and manage non-point contributions of nutrients in the watershed and the lake, and assess the efficacy of agricultural beneficial management practices (BMPs) on the landscape.
- Assess the economic value of clean water and the effectiveness of regulations and social policy on nutrient management.
- Create a single window on-line information portal for sharing data amongst key scientific partners and networks.
- Provide the scientific basis, based on the results of research and monitoring activities, to inform the development the development of nutrient objectives across the watershed.

Activities in support of these deliverables were initiated in 2008/09 on Lake Winnipeg and its major sub-basins, including the Red-Assiniboine and Winnipeg rivers, and Lake of the Woods. These projects support our efforts to develop the scientific knowledge needed by all levels of government to make sound decisions on Lake Winnipeg's health.

Science Deliverable 1: Characterize the physical, chemical and biological nature of Lake Winnipeg to better understand the balance of nutrient enrichment to the lake and productivity of fisheries in relation to algal blooms.

Progress 2008/09-2009/10:

- Water quality and physical lake models allow scientists to examine relationships amongst a number of physical, chemical and biological characteristics. While some physical information for Lake Winnipeg and Lake of the Woods is available, Environment Canada's focus in 2008 was on collecting missing information on meteorology, currents, water temperature, winds, solar radiation, waves, and selected water quality parameters, to provide a better understanding of circulation in Lake Winnipeg. Moorings and buoys were deployed in the north and south basins of Lake Winnipeg. Fieldwork is ongoing and is expected to be completed in 2010/11, with a full analysis of data to be completed in 2011/12.

- A three dimensional model was developed to reflect water circulation and temperature, using the Estuary Lake Coastal Ocean Model (ELCOM). The model successfully simulated the thermal structure, surface currents and water levels of Lake Winnipeg. In 2009, work focused on incorporating nutrients and algae into the model.

Researchers deploy buoy on Lake Winnipeg to study water circulation. Photo Credit: Ram Yerubandi. © Environment Canada 2009

- The Water Quality Analysis Simulation Program (WASP) was applied to Lake Winnipeg to simulate eutrophication, and examine impacts under 62 nutrient reduction scenarios. The models are undergoing further calibration and validation, including coupling with hydrodynamic models. They will be useful in estimating the nutrient reduction required to reduce algal blooms and nutrient concentrations, and assist in developing long-term nutrient management goals.

- Work was initiated to develop and enhance remote sensing technologies to assess the extent of algal blooms in the Lake Winnipeg watershed, including Lake of the Woods. Remote sensing provides observations on a more regular basis and over a broader area than that of intermittent ground-based sampling alone. Satellite observations of aquatic colour are used to illustrate seasonal and annual variability of algal blooms and suspended sediments as well as status and trends in water quality. Satellite imagery was used to identify and track the progress of an extensive bloom of cyanobacteria on Lake of the Woods in September 2009, and has aided in the study of the relationship between wind stirring and bloom dynamics.

- Field surveys were completed in 2009 and additional surveys are scheduled for 2010 to obtain water quality information from aquatic colour signals. The goal is to make

near-real-time observations fully operational by March 2012, providing web-accessible imagery over the lakes and allowing prompt assessments of water quality conditions.

- Researchers are using naturally occurring stable isotopes as forensic 'fingerprints' to determine the origin and follow the fate of various nutrients and foodweb elements in the environment. Isotope measurements will be useful to track future changes in nutrient inputs to the lake, assess long-term changes due to eutrophication and invasive species in Lake Winnipeg, and provide a benchmark to assess the effectiveness of any remediation efforts.

- Stable isotope measurements of fish were conducted to determine sources of water and nutrient inputs into the Lake Winnipeg food web and develop a comprehensive baseline aquatic food web structure. Enhanced focus on food web data collections with extensions to water birds (cormorants) is now underway. Trace metal concentrations in fish will be examined to see how food web isotope patterns can provide information about the transport of these contaminants from fish to birds.

- Stable isotope fingerprinting of nutrients is also being used to help identify the various point and non-point sources of nutrients into Lake Winnipeg, analyze the cycling of organic matter, the processes that lead to algal formation and enhanced biological oxygen demand, and the factors that affect dissolved oxygen and the formation of dead zones in the water. Two years of sampling and analysis for nutrient stable isotopes was completed and a database is being established for Lake Winnipeg, major tributaries and wastewater treatment plants. Sampling and analysis of stable isotope assays of nutrients in major rivers will continue on a monthly basis to reveal the sources dominating nutrient fluxes into Lake Winnipeg. This will assist in assessing and targeting nutrient control strategies.

- Research and monitoring is being undertaken to assess dissolved, particulate and sediment-related nutrient sources in Lake Winnipeg and major tributaries, to improve understanding of lake processes and potential effects on algal blooms. Phosphorus loading occurs from both external and internal sources. External loading stems from precipitation and watershed runoff delivered to the lake via tributaries and groundwater. Internal phosphorus loading occurs from the exchange between lake bottom sediments and the water column. Internal loading may constitute a significant proportion of total loading and is an important aspect of phosphorus cycling in shallow lakes, where winds may increase phosphorus transfer from sediments into the water. Internal recycling of phosphorus may result in substantial delays in realizing any effects from reducing external phosphorus loading.

Sequential sediment trap is deployed from the deck of the MV Namao. Photo Credit: Todd Breedon.

- During the summer 2008 and 2009 *MV Namao* cruises, samples of the top sediment layer were collected at sampling sites in the North and South Basins of Lake Winnipeg.

- Research is underway to characterize the biological communities in the lakes and major tributaries, the impact of algal blooms, and the impact of nutrient enrichment and invasive species on the food web. A review of historical trends in phytoplankton and their relationship with other records was completed, and a Lake Winnipeg benthic assessment was completed as a preliminary report. A summary of toxin levels across the lake in 2008/09 was prepared. Collection and analysis of biological and toxin samples, and sediment cores are continuing.

- A multi-year investigation is underway to determine the status and dynamics of dissolved oxygen in Lake Winnipeg. Dissolved oxygen is crucial to the survival of aquatic ecosystems. Excessive algal growth and associated demands in oxygen consumption can depress oxygen levels. Vertical water quality depth profiling is being conducted at up to 65 stations in the north and south basins of Lake Winnipeg to determine seasonal dissolved oxygen patterns and to apply stable oxygen isotope analysis to measure productivity patterns. The deepest parts of the north basin have been found to be most susceptible to depressed oxygen levels. Evidence to date suggests that several weeks of prolonged hot weather with little wind are the most favourable conditions for oxygen depletion in the north basin.

The Lake Winnipeg Research Consortium research vessel, the M.V. Namao, is the platform for most research conducted on Lake Winnipeg. Photo Credit: Malcolm Conly. © Environment Canada 2009

- Contribution funding was provided in 2008/09 and 2009/10 to the Lake Winnipeg Research Consortium, to support their activities in education and outreach about Lake Winnipeg, and in coordinating research and monitoring through the operations of the *MV Namao* – the only research platform currently operating on Lake Winnipeg.

- Environment Canada also enhanced the research capabilities of the *MV Namao* by designing and supplying a new combined control room and lab addition to its upper deck. Maintenance and calibration services were provided for an integrated water quality parameter data sonde and multiple depth water sampling rosette.

- A suite of instrumentation has been deployed in both Lake of the Woods and Lake Winnipeg to obtain time series measurements of limnology and climatology parameters for use in modeling.

- In 2008, an extensive research and monitoring program was launched on Lake of the Woods in support of the LWBI. Environment Canada and partners, including the Ontario government, are evaluating major sources of nutrients to the lake, including tributaries and shoreline factors (eg. cottages). In 2008 and 2009 Environment Canada monitored 28 stations on the lake for water quality and the predominant algal species, with a focus on those which form blooms. The baseline status of the benthic community is also being established, as this is a key indicator for assessing ecological health. Hydrologic models have been developed to predict patterns in nutrients and algae transport and distribution throughout the lake and are now being evaluated against water quality data.

Monitoring on Lake of the Woods. Photo Credit: Tim Pascoe. © Environment Canada 2009

Science Deliverable 2: Establish watershed and in-lake nutrient budgets. Additional monitoring sites will be added throughout the basin and will be integrated, where appropriate, with existing water quantity stations.

Progress 2008/09-2009/10:

- In 2009/10, an initial assessment of the current monitoring activities in Lake Winnipeg was undertaken, in conjunction with Manitoba Water Stewardship, to assess the ability of the current network of water quality monitoring stations to detect change. The analysis will provide a basis for optimizing the placement of the water quality monitoring network, as well as the frequency and timing of monitoring, in order to detect changes and help to identify the most appropriate performance indicators for meeting future water quality management objectives.
- Water quality sampling techniques and data were collected for Environment Canada and Manitoba sampling sites, to assess the methods and data produced by the two departments. Sampling will be completed in 2010/2011 and an analysis completed in 2011. Results of this work will determine if federal and provincial datasets can be interwoven or if remedial actions are required to ensure comparability of data.

Tracking wetland water levels.
Photo Credit: Chris Spence.

- Sampling began on 25 lakes and reservoirs to evaluate the role of natural lakes and man-made reservoirs in trapping nutrients and reducing nutrient transport into Lake Winnipeg. Study sites include Lakes Dauphin, Manitoba and Winnipegosis, sites along the Saskatchewan and Winnipeg rivers, several small lakes along the Pembina River chain and Lake Ashtabula in North Dakota. Natural lakes have higher retention rates for soluble phosphorus, and reservoirs have higher retention of particulate phosphorus. For water-bodies with similar water renewal times, reservoirs sequester a higher proportion of incoming phosphorus than do lakes. The causes and persistence of these differences are under investigation. Sampling and fieldwork will conclude in 2011.
- Biological monitoring (including monitoring of water quality, phytoplankton, benthos and fish community composition) was undertaken at five littoral and five shoreline sites around the south basin of Lake Winnipeg and at two sites in each of Netley and Libau marshes. Monitoring in the marshes will enable assessment of the effectiveness of marsh restoration efforts. In addition, Lake Winnipeg's deepwater benthic fish community composition is being monitored. These projects will help fill data gaps in littoral and shoreline monitoring in the south Basin of Lake Winnipeg as well as monitoring of deepwater fish communities.

Instream monitoring. Photo Credit: M. Conly

- Enhanced tributary monitoring was conducted in co-operation with Manitoba Water Stewardship, to improve estimates of nutrient flux into the Red River between Emerson and Lake Winnipeg. Currently, the source of the increased nutrients observed between Emerson and Lake Winnipeg is not well understood. In 2009, in agreement with Manitoba, Environment Canada monitoring shifted to increased sampling frequency of the Red River at Emerson during the 2009 flood, while Manitoba sampled Red River tributaries. In 2010, Environment Canada will sample the Morris River and collect samples from rivers entering the east side of Lake Winnipeg while Manitoba will sample other tributaries entering the Red River.
- A federal initiative for monitoring of water quality on the Red River is closely linked to the work being undertaken through the LWBI. Through the Red River Initiative, enhanced monitoring of water quality is ongoing at the Manitoba/U.S. boundary, in cooperation with Manitoba Water Stewardship. Enhanced monitoring will improve estimates of nutrient loading in the Red River from the U.S., and evaluation of water quality against water quality objectives and alerts.

Science Deliverable 3. Assess and manage non-point source contributions of nutrients in the watershed and ultimately to the lake, and assess the efficacy of agricultural Beneficial Management Practices (BMPs) on the landscape.

Progress 2008/09-2009/10:

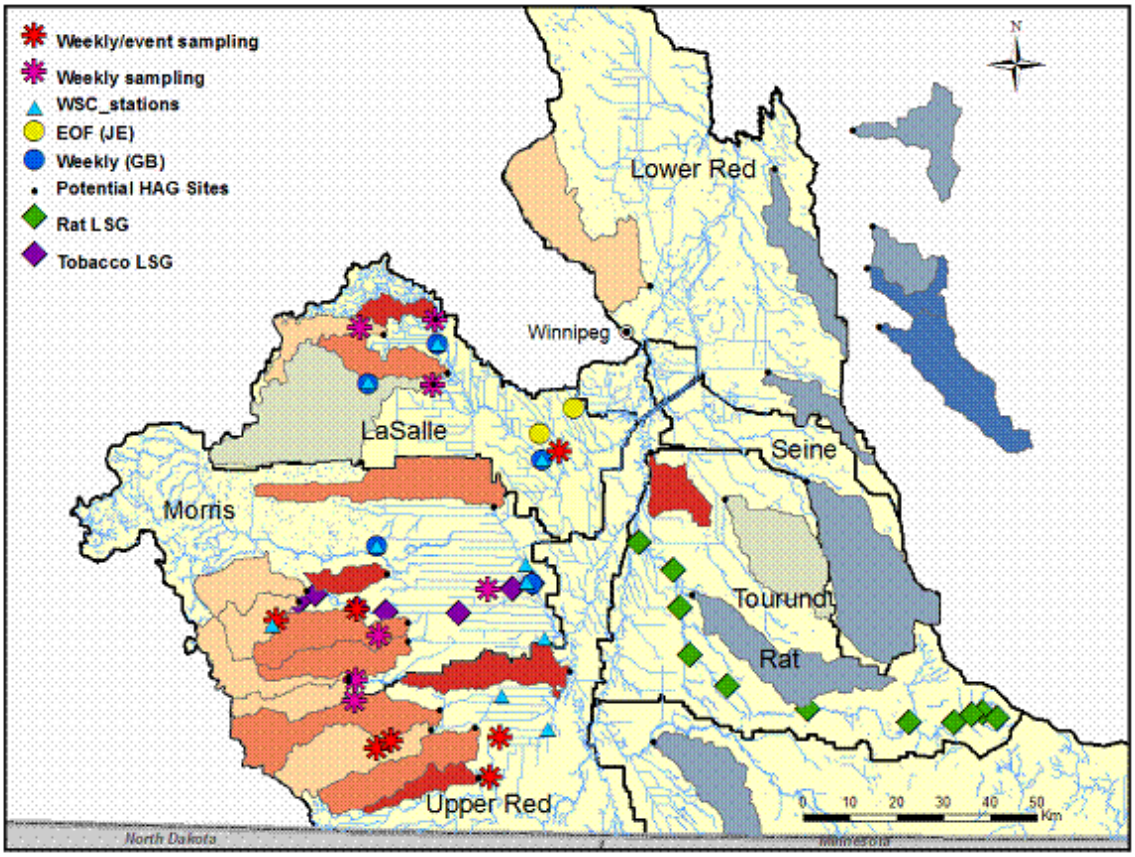
- Research is underway to determine the nature and variation in hydrological inputs into Lake Winnipeg. Statistical analyses have been undertaken to characterize the areas that contribute flows to the Red and Assiniboine Rivers in southern Manitoba. The results indicate that over the past four decades, there has been no statistically significant change in precipitation in the Canadian prairie portion of the Lake Winnipeg watershed and, with the exception of the Red River, there has been no change in the magnitude or frequency of floods and total runoff. Greater flow in the Red River has, however, increased the quantity of water flowing into the Lake Winnipeg.
- A compilation and evaluation of climatological data and landscape hydrology/nutrient transport models was conducted in 2009. Based on output from three regional climate models, mean annual precipitation of the overall Lake Winnipeg watershed is projected to increase by approximately 6–8% by mid-century and result in enhanced annual runoff for the upper Assiniboine and Morris catchments, two sub-basins in which hydrologic modeling was also conducted. Testing and validation is ongoing to couple the models with climate data.
- In addition to hydrologic studies, field work was conducted on the LaSalle, Morris and Rat Rivers to determine the rate at which nutrients are lost from agricultural fields, the extent to which these nutrients are retained in adjacent streams/ditches or supplemented by instream nutrient sources as a result of biological activity, and the quantity of nutrients that are then transported from fields to the Assiniboine and Red rivers. Research to date indicates that it is possible to estimate potential input of nutrients to Lake Winnipeg tributaries from various human activities. Preliminary results indicate that amounts approximately equivalent to 3% of applied N and 6% of applied P enter adjacent streams from cropland, with considerable quantities leaving small agriculturally dominated streams during snowmelt.

Edge of field monitoring for nutrient runoff. Photo Credit: Julie Corriveau. © Environment Canada 2009

- River metabolism across a gradient of human activity is being evaluated. This will aid simulations and prediction of instream nutrient retention. Work is also underway to identify the importance of agricultural nitrogen to key instream biological processes.
- In collaboration with Agriculture and Agri-Food Canada, work is underway to assemble data and model the impacts of land use on water quality of the Red and Assiniboine

Rivers. This project focuses on identifying land use practices that impact surface water quality at a watershed scale, and recommending beneficial management practices.

- The final results from these studies are expected in 2011/12, including the variability in flow and nutrient transport for rivers in southern Manitoba under both the past/present climate and under climate change scenarios. Results are also expected to indicate the contribution of nutrients to the Red and Assiniboine rivers and the role of agricultural sources in contributing these nutrients. These findings will be useful for management strategies to control agriculturally-derived nutrients (e.g., at what time of year and where in the watershed to target actions) and to inform decisions on relative effort directed toward control of point (e.g., sewage) versus diffuse (e.g., agricultural) sources of nutrients.



Map of Field Sites

1) edge of field sites (yellow circles)
2) stream sites with autosamplers and/or weekly sampling (pink and red stars)
3) stream sites for metabolic studies (small black dots at the downstream end of the orange, red and grey watersheds)
4) sites where water chemistry data are being collected for modeling of BMPs (blue circles)

Science Deliverable 4. Assess the economic value of water, and the effectiveness of regulatory instruments and social policies in managing nutrient inputs on a watershed scale.

Progress 2008/09-2009/10:

- This project is intended to demonstrate preferred nutrient reduction measures for Lake Winnipeg when resulting ecological goods and services (EG&S) co-benefits are included in cost benefit analyses. A report was prepared to assess current practice in Canada for identifying, quantifying and valuing EG&S and how this might be applied to environmental and economic management decisions. The report provided the foundation for development of a framework to estimate the value of EG&S affected by various nutrient management strategies.
- The framework is currently being refined and applied to two case studies: the adoption of agricultural beneficial management practices, and enhanced wastewater treatment for small to medium-sized communities. Project outcomes could be used to assist and inform the future development of a tailored policy instrument design for Lake Winnipeg. The table below provides examples of possible EG&S that may be valued in the studies.

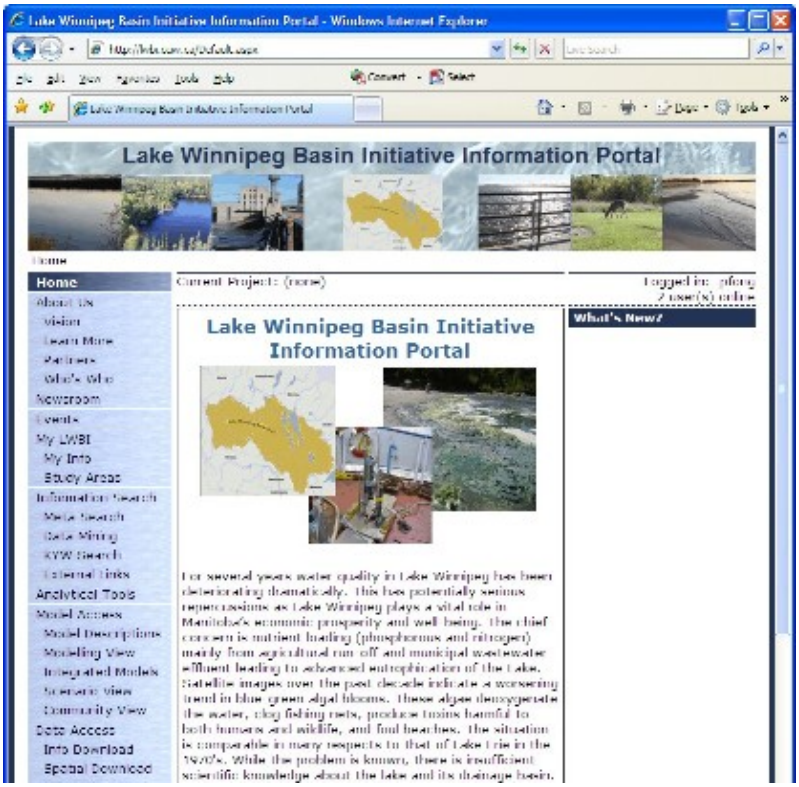
Ecological Goods and Services Related to Nutrient Management Strategies in the Lake Winnipeg Basin

Economic Benefits from Potential EG&S	Nutrient Management	Crop Selection	Conservation Tillage	Vegetated Buffer Zone	Surface Water Control Structures	Constructed Wetlands
Maintain good air quality	$		$	$		$
Water purification		$		$		$
Maintain water quality	$	$	$	$	$	$
Regulate water cycle (flood control)		$	$	$	$	$
Maintain good quality soil	$	$	$	$	$	
Provision of terrestrial & aquatic habitat		$	$	$		$
Maintain biodiversity	$	$	$	$		$
Carbon sequestration		$	$	$		$
Reduction of GHG emissions	$	$	$	$		
Provision of aesthetic landscapes		$		$		$
Enhance recreational activities				$		$

Science Deliverable 5. Develop a single window information portal to promote data sharing with key partners, and allow appropriate data sharing with other networks.

Progress 2008/09-2009/10:

- The intent of the Lake Winnipeg web-based information portal is to gather and facilitate access to relevant scientific data, models, information and tools leveraged through the research activities of Environment Canada and stakeholders. The portal will include expert-developed decision support tools, providing added capacity for partners in government and non government organizations, and enabling long term information sharing, collaboration, and support for water management and decision making.
- Environment Canada worked with partners to develop and obtain data, and provide guidance on modeling standards. Two major workshops were organized with partners and stakeholders, focusing on user needs, data sources, and modeling.



- A prototype of the portal was developed based on workshop discussions. Models were applied on three pilot watersheds (LaSalle, Boyne and Little Saskatchewan).
- Work is continuing to obtain and integrate additional data, add tools, build online modeling capacity and to further refine the portal to meet the needs of stakeholders and users. Over the next two years, long term external portal hosting opportunities will be explored.

Science Deliverable 6. Provide a scientific basis, based on the results of LWBI research and monitoring, to inform the development of nutrient objectives for Lake Winnipeg and major tributaries, and performance indicators to assess the ecological health of Lake Winnipeg and the watershed.

Progress 2008/09-2009/10:

- Environment Canada began work with the Manitoba government and other partners to draft a report assessing Lake Winnipeg's physical, chemical and biological characteristics from 1999–2007. The report will compile and assess historic data for Lake Winnipeg, highlight recent research on the lake, explore current and emerging issues of concern to the health and integrity of Lake Winnipeg, and provide a baseline against which the results of current research and monitoring activities can be compared. The report is expected to be finalized in 2010.
- Environment Canada began work to provide input to Manitoba on a framework for establishing and evaluating nutrient objectives for Lake Winnipeg and tributaries. A report on the framework is expected to be completed in March 2011.
- These projects, along with the data collected from the LWBI research and monitoring projects, will provide a basis for moving forward on informing the establishment of ecologically relevant nutrient objectives for Lake Winnipeg and major tributaries. This information will also help identify appropriate performance indicators that can be used in the future to assess the ecological health of Lake Winnipeg and the watershed.

Facilitating Governance

In scope, the Lake Winnipeg Basin is both inter-provincial and international, and involves a myriad of stakeholders, jurisdictions, and activities. Long-term collaboration and coordination between relevant stakeholders is fundamental to the health of the Basin.

While there are some successful water management bodies in place (e.g. Prairie Provinces Water Board, International Joint Commission Boards, Lake of the Woods Control Board), there is no over-arching mechanism to engage stakeholders, or to integrate and coordinate activities in a cohesive and efficient manner for the entire Lake Winnipeg Basin.

The LWBI was developed partly in response to the Manitoba government's request for federal support in addressing science needs, but also to help facilitate government and stakeholder efforts across this transboundary watershed.

Progress 2008/09-2009/10:

- Environment Canada participated as an ex-officio member of Manitoba's Lake Winnipeg Stewardship Board. The Board was established by Manitoba to make recommendations on how to reduce nutrient loading to Lake Winnipeg.
- Environment Canada, along with Manitoba Water Stewardship, co-chaired a federal/provincial Lake Winnipeg committee, and a science sub-committee, intended to identify opportunities for collaboration and share information about respective programs and activities.
- Environment Canada was a signatory to a multi-agency working arrangement to foster transboundary coordination and collaboration for enhancing and restoring water quality in the Lake of the Woods watershed.
- Environment Canada established a Lake Winnipeg Basin Office in Winnipeg in 2009/10. This office coordinates the activities of the LWBI, works with existing water governance bodies, and provides a forum for communication.
- A *Canada-Manitoba Memorandum of Understanding Respecting Lake Winnipeg and the Lake Winnipeg Basin* was developed. The MOU was undertaken through section 4 of the *Canada Water Act*, and is intended to provide for a long-term collaborative and coordinated approach between the two governments to ensure the sustainability and health of the Lake Winnipeg Basin.

- In 2009/10, Environment Canada undertook consultations with senior regional representatives of other federal departments in order to begin the development of a proposed MOU Implementation Steering Committee. The Committee will be chaired by Environment Canada and Manitoba Water Stewardship and will oversee the implementation of the MOU and the development of subsidiary arrangements.

The Lake Winnipeg Basin Stewardship Fund

In an on-going effort to promote stewardship, protect water resources and achieve desired outcomes, Environment Canada was allocated $3.64 million ($2.67 million in grants and contributions) under the Lake Winnipeg Basin Initiative, to develop and administer a Lake Winnipeg Basin Stewardship Fund. The Fund supports projects or activities having concrete, demonstrable results to reduce pollutants, and in particular, nutrient loads.

The Lake Winnipeg Basin Stewardship Fund is administered by Environment Canada with the assistance of multi-agency technical reviewers, and a Public Advisory Committee (PAC). The Fund contributes to, and leverages other community resources to address challenges to Lake Winnipeg and its watershed. The Fund supports "tried and proven" activities, studies and projects in addition to innovative techniques, technologies and measures to:

- reduce nutrient inputs from rural and urban sources;
- control point and non-point sources of nutrients;
- rehabilitate priority aquatic ecosystems that support nutrient reduction and sequestration; and
- enhance research and monitoring capacity to assist in decision making.

Additional consideration is given to projects and activities demonstrating:

- cost effective reductions in nutrient loads to the lake;
- on-going benefits to the lake and watershed;
- a high probability of success; and
- a high level of support for the project from credible third parties.

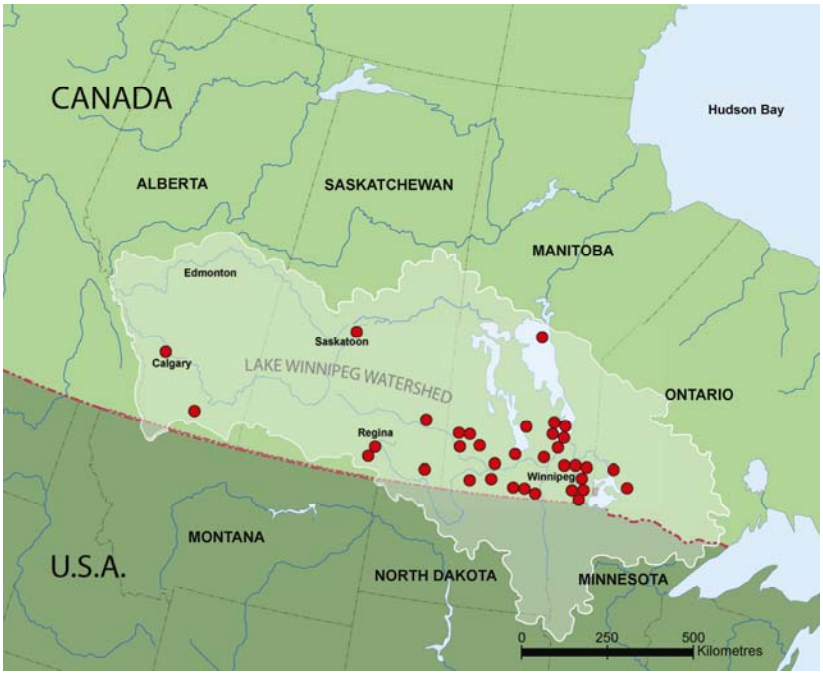
The Fund's contribution is limited to one-third of project costs and targets a one-third provincial contribution. In some cases the Fund may provide up to two-thirds of total project costs. Emphasis is placed on leveraging other funding sources and collaborative partnerships. In cases where other federal programs are supporting partners in the project, the total federal contribution cannot exceed two thirds of the total project cost.

Lake-friendly project by South Basin Reeves and Mayors.
Photo Credit: L. Remillard.

Progress 2008/09-2009/10:

- In 2009, a Public Advisory Committee representing the interests of people who live and work around the lake was established, to provide project funding recommendations to the Minister of the Environment.

- Through the first three rounds of the Fund, Environment Canada approved contribution funding of $1.75 million to 25 recipient groups to implement stewardship projects in the Lake Winnipeg Basin. Most of the projects are multi-year projects, ending in either 2011 or 2012. Two of the 25 approved projects did not subsequently proceed.
- Projects have been funded in all four provinces within the Lake Winnipeg Basin.
- In the first three rounds of the Fund, approximately $6.9 million in cash and in-kind contributions was leveraged through 139 participating project partners.



Map of projects funded under the Lake Winnipeg Basin Stewardship Fund Rounds 1-4.

- For every dollar approved through the Lake Winnipeg Basin Stewardship Fund, approximately $3.92 in partner cash and in-kind contributions were generated.
- Seven Lake Winnipeg Basin Stewardship Fund projects were completed by the end of the 2009/10 fiscal year, resulting in:
  - ✓ 530 head of livestock restricted from surface waters
  - ✓ 4050 metres of fencing installed to restrict livestock access to surface waters and riparian areas
  - ✓ 7500 metres of stream/lake bank protected or stabilized
  - ✓ 7810 native plants, trees and shrubs planted over an area of 8886 m^2
  - ✓ 75 kilometres of land surveyed to identify riparian rehabilitation and pollution sites
  - ✓ two sampling methodologies designed and implemented

For More Information

For more information about the Lake Winnipeg Basin Initiative, please contact:

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Website: www.ec.gc.ca/doc/eau-water/winnipeg_e.html

Appendix 1

Lake Winnipeg Basin Stewardship Fund – Completed Projects

Project Name: The Sustainability of Municipal Wastewater Irrigation in the Interlake Region of Manitoba as a Means of Nitrogen and Phosphorus Abatement for Lake Winnipeg

Project Proponent: East Interlake Conservation District

Environment Canada Contribution: $6,257

Description: Wastewater irrigation, as an alternative to discharging wastewater directly to waterways leading to Lake Winnipeg, was assessed. The project involved three short-term field demonstrations of wastewater irrigation, municipal/town council focus groups on wastewater irrigation and a local resident survey to assess perceptions on wastewater re-use within their communities. The project concluded that sustainably irrigating forage crops would be challenging. The combination of soils with only ratings of fair for irrigation and the low quality of wastewater limits the long term sustainability of irrigation.

Project Name: Building Capacity for Ecological Infrastructure Investments in the Red River Basin

Project Proponent: Red River Basin Commission

Environment Canada Contribution: $55,000

Description: The main objective of this project was to build capacity within municipalities and counties by jointly developing methodologies to examine the costs and benefits of investing in maintaining and restoring natural environments (or ecological infrastructure) to improve water quality within and outside their jurisdictions. Canadian municipalities and counties in the U.S. discussed costs and benefits of restoring natural environments to improve interjurisdictional water quality. A data gap analysis report was completed, that examines the biophysical, infrastructure and socio-economic datasets required to develop a sophisticated decision support system for ecological infrastructure investments. Three case study sights were selected as test sights to develop and apply models.

Project Name: Meewasin Valley Authority Riparian Restoration

Project Proponent: Meewasin Valley Authority

Environment Canada Contribution: $21,608

Description: The goal of the project was to improve water quality of the South Saskatchewan River and Lake Winnipeg by restoring natural vegetation to a series of damaged shore lands. Water quality in the South Saskatchewan River and Lake Winnipeg has improved by restoring natural vegetation to damaged shore lands and by educating the public on the importance of riparian zones in river ecology.

Project Name: Qu'Appelle River Water Quality Mitigation Project

Project Proponent: Upper Assiniboine River Conservation District

Environment Canada Contribution: $4,300

Description: A large agricultural deposit of livestock waste, considered to be a point source of nutrient located in a seasonally flooded oxbow lake directly upstream (3 km) of the confluence of the Qu'Appelle and Assiniboine Rivers, was removed.

Agricultural nutrient runoff has been reduced through the use of fencing, alternate watering sources for cattle and riverbank vegetation zones.

Project Name: Seine River Riparian Enhancement Program

Project Proponent: Seine-Rat River Conservation District

Environment Canada Contribution: $25,000

Description: The Seine River Riparian Enhancement Program assessed the relative health of the existing Seine River riparian areas and rehabilitated/ protected its riparian areas through subsidized Beneficial Management Practices (BMPs) which targeted the most severely affected areas. Agricultural nutrient runoff to the Seine River has been reduced through the use of fencing, alternate watering sources for cattle and riverbank vegetation zones.

Project Name: Souris River Riparian Enhancement Program

Project Proponent: Turtle Mountain Conservation District

Environment Canada Contribution: $25,000

Description: This project initiated the Souris River Riparian Enhancement Program, a component of the Turtle Mountain Conservation District's East Souris River Watershed Plan (2006). Agricultural nutrient runoff to the Souris River has been reduced through the use of fencing, alternate watering sources for cattle and riverbank vegetation zones.

Project Name: Advancing Netley-Libau Marsh Restoration Efforts

Project Proponent: International Institute for Sustainable Development

Environment Canada Contribution: $44,000

Description: The project promoted the nutrient reduction benefits of marshland restoration to community stakeholders. This project expanded on the International Institute for Sustainable Development's Netley-Libau Marsh Research.

Appendix 2

Lake Winnipeg Basin Stewardship Fund – Ongoing Projects

Project Name: Down the Drain – A Demonstration Landscape; Using Plants and Natural Systems to Clean our Water

Project Proponent: Rivers West Red River Corridor Inc.

Environment Canada Contribution: $46,014

Status: Project to be completed in November 2010.

Description: The project will design and construct a bioretention system near a local community centre and school to prevent nutrients from nearby fertilized fields, rooftops and parking lots from entering the lake's watershed. The project will also educate and engage the surrounding community and local schools through on-site interpretative discussion on the project and water quality challenges facing Lake Winnipeg.

Project Name: Thunder and Silver Creeks Surface Water Management Project

Project Proponent: Upper Assiniboine River Conservation District

Environment Canada Contribution: $25,000

Status: Project to be completed in November 2010.

Description: The *Thunder and Silver Creeks Surface Water Management Project* will improve and protect water quality by limiting nutrient loads and reducing the impacts of local flooding. In cooperation with local landowners, the project team will select key sites for the implementation of beneficial management practices such as reconstructing wetlands, building water retention ponds, and the development of in-stream erosion structures.

Project Name: Nutrient Management through Livestock Management

Project Proponent: Assiniboine Hills Conservation District

Environment Canada Contribution: $17,580

Status: Project to be completed in December 2010.

Description: The project will improve water quality along the Little Souris River through livestock management activities along three key sites. Landowners and cattle operators near these sites will be engaged to develop two winter and one summer riverbank management sites. With the ultimate goal of nutrient reduction and improved water quality, the project will employ a number of management practices such as: fencing restricting livestock creek access and the provision of alternative watering and overwintering sites located away from the riverbank.

Project Name: Pembina River Watershed Integrated Watershed Management Plan Implementation Action Plan NOW

Project Proponent: Pembina Valley Conservation District

Environment Canada Contribution: $25,000

Status: Project to be completed in March 2011.

Description: The project will address nutrient issues at three sites through two types of activities. First, the project will restrict cattle access and reduce riverbank erosion in two sites along Rock Lake and Killarney Lake, ultimately diverting nutrient and sediment loads to Lake Winnipeg. Landowners will be engaged in this project, ensuring that cattle access to waterways is restricted and alternate arrangements are made for watering and rotational grazing. Second, this project will construct a water retention dam above an eroding gully close to Rock Lake, reducing sediment runoff in drinking water sources and larger waterways entering Lake Winnipeg.

Project Name: Lake Wahtopanah Nutrient Reduction Project

Project Proponent: Little Saskatchewan River Conservation District

Environment Canada Contribution: $25,000

Status: Project to be completed in March 2011.

Description: In cooperation with local landowners, the *Lake Wahtopanah Nutrient Reduction Project* will reduce phosphorus levels from both point and non-point sources by re-establishing perennial cover in riparian corridors lacking permanent vegetative cover. This project will identify areas with impaired riparian health using aerial photos, then implement best management practices in these areas including restoration of riparian buffers and grassed waterways, installing offsite watering systems, and construction of retention ponds.

Project Name: Upper Oak River Non-Point Source Nutrient Reduction Project

Project Proponent: Upper Assiniboine River Conservation District

Environment Canada Contribution: $25,000

Status: Project to be completed in March 2011.

Description: This project will identify priority sites for restoration along the Upper Oak River sub-watershed using aerial photographs, and work with landowners at these sites to re-establish perennial cover. In addition to reducing nutrient loads to the Lake Winnipeg watershed, these riverbank improvements will benefit local aquatic ecosystems, and reduce erosion and sediment runoff.

Project Name: Moose Mountain Creek Phosphorus Reduction Project

Project Proponent: Cornerstone Regional Economic Development Authority

Environment Canada Contribution: $37,250

Status: Project to be completed in March 2011.

Description: Beneficial management practices (BMPs) that reduce agricultural phosphorus loads and improve water quality are being promoted. Perennial forage seeding, exclusion fencing, portable windbreaks and portable water systems are all improving water quality. Stewardship agreements are engaging landowners to convert cropland to perennial forage, restore wetlands and improve both winter site and riparian zone management. BMPs are being promoted across the watershed through outreach activities such as field demonstration days, public newsletters and on-site farm visits by technicians.

Project Name: Wastewater Pond Systems in Cold Climates

Project Proponent: Spectrum Scientific Inc.

Environment Canada Contribution: $132,767

Status: Project to be completed in March 2011.

Description: A wastewater pond system (WPS) will be adapted to Manitoba's climate using a modified greenhouse structure. The second goal of the project is to provide educational opportunities and to disseminate the results of the study. High school students enrolled in the Manitoba Science Academy will participate in the research; present research papers and bring an awareness of the WPS system to the next generation of scientists. The project is a pilot scale demonstration of a wastewater pond treatment that will be open to visitors who want to emulate the system on their farm or municipality.

Project Name: Development of a Preliminary Total Phosphorus Budget and Water Quality Modeling for Lake of the Woods

Project Proponent: Lake of the Woods Water Sustainability Foundation

Environment Canada Contribution: $135,254

Status: Project to be completed in March 2011.

Description: A phosphorus budget and water quality modeling are being developed to assist decision-making for phosphorus management in the Lake and its watershed. The Lake of the Woods Water Sustainability Foundation and partners are collaborating on this project.

Project Name: Modeling Water Quality in the South Basin of Lake Manitoba

Project Proponent: University of Manitoba

Environment Canada Contribution: $25,000

Status: Project to be completed in March 2011.

Description: Understanding of Lake Manitoba water quality will be improved by this study, which will also provide a basis for evaluating nitrogen and phosphorus reduction efforts. This research may also be used to measure the impact of Lake Winnipeg stewardship initiatives.

Project Name: Achieving Successful Wetland Restoration in the Assiniboine River Watershed

Project Proponent: Assiniboine Watershed Stewardship Association Inc.

Environment Canada Contribution: $139,400

Status: Project to be completed in December 2011.

Description: The Assiniboine Watershed Stewardship Association (AWSA), in partnership with the Saskatchewan Watershed Authority (SWA) and Ducks Unlimited Canada (DUC), will conduct a reverse auction to establish the true compensation cost landowners expect for the restoration of previously drained wetlands. Source water quality in the Assiniboine River and its tributaries will be improved, and Lake Winnipeg will benefit from better downstream water quality.

Project Name: Lake Friendly Campaign

Project Proponent: South Basin Mayors and Reeves Inc.

Environment Canada Contribution: $187,480

Status: Project to be completed in March 2012.

Description: The *Lake Friendly Campaign* will reduce nutrient contributions to Lake Winnipeg by informing and educating consumers about products that are the best environmental choice for Lake Winnipeg. The Campaign will identify products that are "lake friendly" through a product labelling campaign ("It's Lake Friendly") and will educate Manitobans on the impacts of nutrients on Lake Winnipeg and how the public can reduce these impacts.

Project Name: Development of a Model/Experimental Watershed Representative of the Manitoba Prairie Pothole Region

Project Proponent: Ducks Unlimited Canada

Environment Canada Contribution: $379,800

Status: Project to be completed in March 2012.

Description: Ducks Unlimited Canada and partners will establish a watershed monitoring network and water quality modeling that will be used to determine how changes in land use affect water quality. Wetlands will also be restored and monitored as part of this project.

Project Name: Icelandic River and Washow Bay Creek Non-Point Source Nutrient Abatement Program

Project Proponent: East Interlake Conservation District

Environment Canada Contribution: $25,000

Status: Project to be completed in March 2012.

Description: Agricultural nutrient runoff will be reduced into the Icelandic River and Washow Bay Creek through the use of fencing, alternate watering sources for cattle and riverbank vegetation zones.

Project Name: Morden's Community Lead Environmental Action on Nutrient Elimination and Removal (CLEANER) in Dead Horse Creek

Project Proponent: University of Winnipeg

Environment Canada Contribution: $109,372

Status: Project to be completed in March 2012.

Description: This extensive water sampling and analysis program is identifying and monitoring sources of phosphorus and nitrogen along Dead Horse Creek, Plum River and the Red River near Morden, Manitoba. University undergraduate and high school students will contribute research products and practices to potentially reduce phosphorus and nitrogen in these waterways. Students will also lead community-based social marketing efforts to encourage Morden area residents to deposit less phosphorus and nitrogen in the town's storm and sanitary wastewater systems.

Project Name: **Paleolimnological Determination of Water Quality Change in Lake Winnipeg for Use as Management and Remediation Goals**

Project Proponent: University of Regina

Environment Canada Contribution: $100,000

Status: Project to be completed in March 2012.

Description: Seven researchers from four universities will coordinate new data with previous studies to create long-term record of historical water quality changes within the north basin of Lake Winnipeg. Key project conclusions will show present and past changes in algae growth, zooplankton, increases in potentially-toxic cyanobacteria, and changes in retention of nutrients such as nitrogen (N), phosphorus (P), and carbon (C) by the lake. Taken together, this research will develop a concrete measurement of the lake's composition to assist in setting ecologically relevant objectives for nutrient reduction, and the future management and protection of Lake Winnipeg.

Appendix 3

2008/09 LWBI Research, Information and Monitoring Projects - $3.86M for 24 Projects and Activities

Research

Lake Winnipeg Research Consortium – Federal contribution to research on *MV Namao* research vessel, Lake Winnipeg Research Consortium

Project Title: Pilot Project on the Use of Valuation and Market Based Instruments (MBIs) for Nutrient Reduction in Lake Winnipeg

Project Title: Scenario investigations on the efficacy of BMP implementation and land use change in reducing nutrient concentrations in agricultural tributaries of the LW Basin.

Project Title: Transport of nutrients from agricultural watersheds through tributaries in the Lake Winnipeg Basin

Project Title: Removal of nutrients by biota in agricultural tributaries in the LW Basin

Project Title: Contemporary Hydrology of the Lake Winnipeg Basin: Implications to non-point source contribution of nutrients to Lake Winnipeg

Project Title: Climate Impacts on the Landscape Hydrology/Nutrient Transport of the Lake Winnipeg Watershed

Project Title: Lake of the Woods Physical Limnological Modeling

Project Title: Lake Winnipeg Nutrient Loading and in-lake processes

Project Title: Lake of the Woods in-lake Nutrient Dynamics

Project Title: Lake Winnipeg Algal Taxonomic Assessments

Information

Project Title: Lake Winnipeg Basin Initiative Laboratory Support – National Laboratory for Environmental Testing

Project Title: WQ Monitoring & Data Management

Project Title: Federal-Provincial Baseline Science and Data Assessment for Lake Winnipeg

Project Title: Development and Implementation of Information and Decision Support Portal for the Lake Winnipeg Basin, Decision-support and Integrated Modeling and Scenarios/Impact analyses for Information Portal Development

Project Title: Development and Implementation of Information and Decision Support Portal for the Lake Winnipeg Basin, Partnership, Data Coordination and Capacity Development for Lake Winnipeg Information Portal

Monitoring

Project Title: Federal-Provincial Baseline Science and Data Assessment for Lake Winnipeg

Project Title: Nutrient Sequestration, Transport, and Effects to the Lake Winnipeg Ecosystem

Project Title: Nutrient Sequestration, Transport, and Effects to the Lake Winnipeg Ecosystem – Lake of the Woods Component

Project Title: Red River Fish Monitoring/Non-native species assessment

Project Title: Priority Ecosystem Surveillance, Red River (Emerson)

Project Title: Red River tributary study

Project Title: Red River mainstem invertebrate monitoring

Project Title: Canada–US Biomonitoring in tributaries to the Red River

Project Title: Lake Winnipeg Basin nutrient sequestration

Appendix 4

2009/10 LWBI Research, Information and Monitoring Projects – $3.51M for 22 Projects and Activities

Research

Project Title: Lake Winnipeg Research Consortium – Federal contribution to research on *MV Namao* research vessel

Project Title: Development of Analytical Framework for EG&S approach to support nutrient reduction in Lake Winnipeg

Project Title: Scenario investigations on the efficacy of BMP implementation and land use change in reducing nutrient concentrations in agricultural tributaries of the LW Basin.

Project Title: Transport of nutrients from agricultural watersheds through tributaries in the Lake Winnipeg Basin

Project Title: Removal of nutrients by biota in agricultural tributaries in the LW Basin

Project Title: Contemporary Hydrology of the Lake Winnipeg Basin: Implications to non-point source contribution of nutrients to Lake Winnipeg

Project Title: Climate Impacts on the Landscape Hydrology/Nutrient Transport of the Lake Winnipeg Watershed

Project Title: Stable Isotope Assessment and Food-web structure and function

Project Title: Lake of the Woods Physical Limnological Modeling

Project Title: Lake Winnipeg Nutrient Loading and in-lake processes

Project Title: Lake of the Woods in-lake Nutrient Dynamics

Project Title: Remote Sensing Technologies to Assess Algal Blooms in Lake Winnipeg Basin

Information

Project Title: Lake Winnipeg Basin Initiative Laboratory Support – National Laboratory for Environmental Testing

Project Title: WQ Monitoring and Data Management

Project Title: Development and Implementation of Information and Decision Support Portal for the Lake Winnipeg Basin, Decision-support and Integrated Modeling and Scenarios/Impact analyses for Information Portal Development

Project Title: Development and Implementation of Information and Decision Support Portal for the Lake Winnipeg Basin, Partnership, Data Coordination and Capacity

Project Title: Lake Wpg Basin Geospatial Data Management

Project Title: Assessment and Optimization of Sampling Network

Project Title: EC/MB Baseline Science and Data Assessment for Lake Winnipeg

Monitoring

Project Title: Nutrient Sequestration, Transport, and Effects to the Lake Winnipeg Ecosystem

Project Title: Nutrient Sequestration, Transport, and Effects to the Lake Winnipeg Ecosystem – Lake of the Woods Component

Project Title: CABIN Bio-monitoring in sub-basins of Lake Winnipeg

Appendix 5

Canada-Manitoba Memorandum of Understanding

Canada-Manitoba Memorandum of Understanding Respecting Lake Winnipeg and the Lake Winnipeg Basin

Between

THE GOVERNMENT OF CANADA,
represented herein by the Minister of the Environment,
who is responsible for the Department of the Environment

("Canada")

AND

THE GOVERNMENT OF MANITOBA,
represented herein by the Minister of Water Stewardship,

("Manitoba")

Canada and Manitoba are collectively called "the Parties".

WHEREAS Canada and Manitoba (the Parties) share the vision of a healthy, prosperous and sustainable Lake Winnipeg for present and future generations;

AND WHEREAS, Lake Winnipeg is the 10th largest freshwater lake in the world based upon surface area and the 3rd largest freshwater reservoir;

AND WHEREAS, the Lake Winnipeg basin encompasses a drainage area of over one million square kilometres, in four Canadian provinces, and four American states, and is impacted by water related decisions and actions taken by governments in those states and by decisions of the Canadian and American federal governments;

AND WHEREAS, the Lake Winnipeg basin is home to over six million people, and human activities from agriculture, urban and industrial development have resulted in increasing amounts of nutrients and other substances being deposited into Lake Winnipeg;

AND WHEREAS, Lake Winnipeg supports significant economic activity in the region, particularly through fishing and recreation industries;

AND WHEREAS, the Parties recognize the importance of the health of Lake Winnipeg and its basin to the ecological, social and economic well-being of Manitobans and other residents of the basin;

AND WHEREAS, the Parties are concerned about environmental degradation of the water quality of Lake Winnipeg and the long-term ecological health of Lake Winnipeg and the Lake Winnipeg basin;

AND WHEREAS, the federal and provincial governments each have responsibilities relating to water and the Parties thus share mutual interests in cooperating to protect the water quality and ecological health of Lake Winnipeg and the Lake Winnipeg basin;

AND WHEREAS, the Parties recognize the need to coordinate their respective efforts to develop and implement scientific research and monitoring activities and to promote and undertake governance and management activities aimed at protecting the ecological health of Lake Winnipeg and the Lake Winnipeg basin;

AND WHEREAS, the *Canada Water Act* encourages federal-provincial cooperation in the examination and resolution of water resource issues and provides for arrangements with provinces respecting water resource management;

AND WHEREAS, the *Water Protection Act* (Manitoba) recognizes the importance of inter-jurisdictional agreements protecting water, and the shared right and responsibility of all jurisdictions in the Hudson Bay Drainage basin to protect water resources within the basin;

AND WHEREAS, the Governor General in Council has by Order-in-Council No. xx dated xx, authorized the Minister of the Environment to enter into this Memorandum of Understanding for Canada; and

AND WHEREAS, the Lieutenant-Governor in Council has, by Order-in-Council No. xx dated xx, authorized the Minister of Water Stewardship to enter into this Memorandum of Understanding for Manitoba,

NOW THEREFORE, THE PARTIES COMMIT TO THE FOLLOWING:

SECTION 1 – DEFINITIONS

In this Memorandum of Understanding (MOU):

a) "aquatic ecosystem" means the community of flora and fauna functioning and interacting together within their aquatic habitats and habitats immediately adjacent to and associated with surface waters.

b) "Lake Winnipeg" means the surface waters and shoreline of Lake Winnipeg.

c) "Ministers" means the Minister of the Environment for Canada and the Minister of Water Stewardship for Manitoba.

d) "nutrients" means elements necessary for the development and sustainment of aquatic life.

e) "senior representatives" means for Canada, the Regional Director General for Environment Canada, Prairie Northern Region, and for Manitoba, the Assistant Deputy Minister, Ecological Services Division, for Manitoba Water Stewardship.

SECTION 2 – PURPOSE

The purpose of this MOU is to facilitate a cooperative and coordinated approach between the Parties in their efforts to understand and protect the water quality and ecological health of Lake Winnipeg and its basin, and achieve a healthy, prosperous and sustainable Lake Winnipeg for present and future generations.

SECTION 3 – PRINCIPLES

The following principles will direct and guide the actions of the Parties under this MOU**:**

a) *Openness and Transparency.* The Parties are concerned with the ecological health and sustainability of the entire Lake Winnipeg basin insofar as this affects the water quality and aquatic ecosystem health of Lake Winnipeg. Consequently, the Parties agree to the sharing of information with each other, stakeholders and interested parties.

b) *Cooperation and Collaboration*. The Parties wish to work together to identify priorities to achieve the vision of a sustainable Lake Winnipeg. The Parties agree to work together to identify priorities for science activities. Also, the Parties intend to coordinate the activities of their respective departments to ensure comprehensive monitoring, management, communication and governance activities, in order to maximize synergies and avoid duplication.

c) *Maximizing the Benefits of Existing Resources or Mechanisms.* The Parties may rely upon other existing federal-provincial agreements, arrangements and other decision-making mechanisms to support this MOU.

d) *Accountability for Activities.* The Parties are committed to undertaking individual and collaborative efforts in keeping with the principles set out in the MOU. The Parties understand that although this MOU does not commit the transfer of resources between them in the carrying out of projects and initiatives related to this MOU, the Parties may agree to jointly fund projects developed under subsidiary arrangements of this MOU.

SECTION 4 – GEOGRAPHICAL SCOPE OF MEMORANDUM OF UNDERSTANDING

The geographical scope of the MOU is Lake Winnipeg and its basin and downstream receiving environment, within the Province of Manitoba.

SECTION 5 – SUBSIDIARY ARRANGEMENTS

a) The Parties agree that they may, from time to time, develop subsidiary arrangements to outline the nature and scope of collaborative programs of scientific study, management and governance for the purpose of this MOU that are a priority to the Parties and that will benefit from cooperative and coordinated action.

b) Subsidiary arrangements may be developed at any time and will come into effect upon signing by senior representatives for the Parties. Each subsidiary arrangement will remain in effect for the duration of this MOU unless it specifies an earlier expiry date.

c) Subsidiary arrangements may be amended by the senior representatives for the Parties at any time in the same manner as the subsidiary arrangement was made.

d) Subsidiary arrangements may be terminated by either Party giving the other at least six (6) months written notice. If the Parties terminate this MOU, all subsidiary arrangements are also terminated, unless the Parties agree otherwise in writing.

SECTION 6 – MANAGEMENT AND COORDINATION

a) The Parties will establish a Steering Committee to oversee the implementation of this MOU. The MOU Steering Committee will be co-Chaired by the senior representatives of the Parties who will report to their respective Ministers.

b) The Terms of Reference for the Steering Committee are set out in Appendix 1.

SECTION 7 – COMMITMENT TO NOTIFY

The Parties acknowledge that the actions of one government often have effects on other governments, and therefore commit to providing written notice of change in policies or programs that could have an impact on the achievement of the objectives of this MOU.

SECTION 8 – TRANSPARENCY AND INFORMATION SHARING

a) Subject to applicable access to information, privacy and other relevant legislation, the Parties intend to make available, at no cost to each other, and on a regular basis, all relevant data relating to or arising out of the activities under this MOU.

b) The Parties recognize that all data, research documents, and other materials produced by either of the Parties will remain the property of that Party, and one Party will not use, publish, distribute or disclose any information, data, research documents, or materials produced by the other Party without first obtaining permission from the other Party.

c) This MOU and any activity conducted pursuant to it are not intended to affect or diminish any proprietary rights or interests of the Parties.

SECTION 9 – COMMUNICATIONS

a) The Parties intend to collaborate, where possible, in developing public education and information materials, and in developing and implementing media relation plans with respect to this MOU to ensure consistent messages.

b) The Parties expect that where collaborative efforts do not occur in developing public education and information materials, the Party developing the materials will provide it to the other Party for information, prior to public release.

c) The Parties acknowledge that all communications involving Canada must conform to the requirements of the federal *Official Languages Act* (Canada) as well as all language related policies, guidelines and directions provided by the Treasury Board of Canada.

d) The Parties will treat information related to or generated as a result of this MOU in accordance with the requirements of applicable federal and provincial legislation.

SECTION 10 – AMENDING THE MOU

This MOU may be amended by agreement in writing by both Parties. Any amendment becomes part of this MOU.

SECTION 11 – SETTLEMENT OF DISPUTES

At the onset of a dispute, the Parties, or their senior representatives, agree to meet promptly for the purposes of attempting, in good faith, to resolve this dispute. The Parties are committed to working collaboratively to avoid and resolve any disputes concerning the interpretation or implementation of this MOU.

Any disputes regarding the interpretation or implementation of the MOU will be resolved by consultation between the Parties and will not be referred to a tribunal or other third party for resolution.

SECTION 12 – LANGUAGE OF MOU

This MOU is prepared in the English and French languages, and each version is equally valid.

SECTION 13 – DURATION OF MOU

a) This MOU comes into force on the date of signature by the Ministers and remains in force for a term of five (5) years, unless terminated earlier by one of the Parties in accordance with paragraph 13 c).

b) The Parties may extend this MOU for an additional term of five (5) years. Such an extension will require the mutual written consent of the Parties prior to the expiration of this MOU.

c) Either Party may terminate this MOU upon providing six (6) months written notice to the other Party.

SECTION 14 – REVIEW OF MOU

a) Prior to the expiration of each five (5) year term of this MOU, senior representatives will initiate a review the effectiveness of the MOU to assist the Parties in deciding whether to extend or renew this MOU.

b) The process to assess the effectiveness of this MOU will be coordinated by both senior representatives.

SECTION 15 – COMPLIANCE WITH LAW

a) Nothing in this MOU alters the legislative or other authorities of each of the Parties with respect to the exercise of their legislative or other authorities under the Constitution of Canada.

b) The Parties acknowledge that this MOU is governed by the applicable laws of Canada and Manitoba.

SECTION 16 – NOTICES

Notices will be sent to:

a) For Canada:

Regional Director General
Environment Canada – Prairie and Northern Region
Twin Atria Bldg
4999 – 98th Avenue
Edmonton, Alberta
T6B 2X3

b) For Manitoba:

Assistant Deputy Minister
Ecological Services Division
Manitoba Water Stewardship
200 Saulteaux Crescent
Winnipeg MB R3J 3W3

IN WITNESS WHEREOF, this Memorandum of Understanding is signed for Canada by the Minister of the Environment and for Manitoba, by the Minister of Water Stewardship.

www.**ec.gc.ca**

Additional information can be obtained at:

Environment Canada
Inquiry Centre
351 St. Joseph Boulevard
Place Vincent Massey, 8th Floor
Gatineau QC K1A 0H3
Telephone: 1-800-668-6767 (in Canada only) or 819-997-2800
Fax: 819-994-1412
TTY: 819-994-0736
Email: enviroinfo@ec.gc.ca