

**Lake Winnipeg South Basin
Sensitive Habitat Inventory and Mapping (SHIM) 2011-12**

SECTION A:

**CITIZEN'S LAKE WINNIPEG
SOUTH BASIN REPORT**

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THE 2011-2012 SHIM REPORT: WHAT'S IN IT?

The Citizens Report you are reading is Section A of the 2011-2012 Lake Winnipeg SHIM project report.

Section B of the 2011-2012 SHIM report includes: The Foreshore Inventory Mapping report, and the Shoreline Habitat Inventory Mapping report. The Ecological Habitat Index for the SHIM fieldwork data analysis is included here also.

The Lake Winnipeg South Basin Shoreline Segments 2011 Sensitive Habitat Inventory and Mapping Project (SHIM) Reports;

- Foreshore Inventory Mapping,
- Ecological Habitat Index Ranking,
- An Overview of Fish and Fish Habitat in the Littoral Zone of the Lake Winnipeg South Basin,
- Survey of Avian and Vegetation Communities in the Littoral and Riparian Zones of the Lake Winnipeg South Basin,

were written by SHIM team members, based on the field observations and data collections and are also part of Section B.

Section C is the Recommendations arising from this first demonstration SHIM project for a Manitoba Lake. A preface written by Alex Salki, project lead for the Lake Winnipeg Foundation describes the project.

Section D includes the References and Sources, and all other appendices, and attachments.

There are two Acknowledgements listings: in the Citizens Report, and at the beginning of the SHIM report.

Each section of the SHIM 2011-2012 report begins with a cover page that lists the contents for that section.



INTRODUCTION TO LAKE WINNIPEG FOUNDATION SENSITIVE HABITAT INVENTORY AND MAPPING (SHIM) PROJECT 2011-2012

Lake Winnipeg Foundation Inc. (LWF), a charitable, non-government organization, was established in 2005 to promote the restoration and protection of Lake Winnipeg and its watershed. In 2010, the Lake Winnipeg Basin Stewardship Fund (LWBSF) presented an opportunity for the LWF to propose a project that would enhance research and monitoring capacity to assist in decision making for Lake Winnipeg. Based on an ecosystem assessment model developed by the Community Mapping Network in British Columbia (Mason and Knight, 2001; Mason and Booth, 2004) and applied to several provincial lakes, a proposal "Sensitive Habitat Inventory and Mapping of Foreshore Areas of Lake Winnipeg South Basin and Development of Shoreline Management Guidelines" was prepared by the LWF and submitted to the LWBSF.

With funding awarded by the LWBSF and additional support from Thomas Sill Foundation, Fisheries and Oceans Canada, and the Small Change Fund, the LWF coordinated the Lake Winnipeg SHIM project. The team of environmental specialists assembled by the LWF undertook field data collection, data analyses, report preparation, data product development, and project management and included: Terra Limnic Consulting (Winslaw, BC), Native Plant Solutions (DUC, Winnipeg, Mb), Aquatic Environmental Services (St. Andrews, Mb); Whelan Enns Associates Inc. (Winnipeg, Mb), Benson Fishers (Gimli, Mb), University of Manitoba, and Washington State University.

In addition to providing science-based information on Lake Winnipeg south basin shorelines, SHIM will help to locate point and non-point nutrient sources, identify priority aquatic ecosystems that support nutrient reduction and sequestration, and achieve overall nutrient load reductions to the lake, the ultimate goal of the LWBSF program. Scientific studies indicate that most nutrients to Lake Winnipeg come from sources closest to the Lake (State of Lake Winnipeg 1999 to 2007). Communities and infrastructure situated directly adjacent to Lake Winnipeg, pose significant risks to water quality from nutrient and contaminant loading and to fish and wildlife from shore habitat alteration, disruption, or destruction.

Creating a baseline inventory of existing Lake Winnipeg south basin shoreline conditions is the first step in preparing an integrated master plan for any future sustainable development options. All shoreline activities require that regulators have access to science-based information, to guide decisions for the protection, rehabilitation or development of shoreline areas. The Lake Winnipeg SHIM is a first attempt to provide some of this missing information.

Alex Salki,
Lake Winnipeg Foundation



LAKE WINNIPEG FACTS

- Lake Winnipeg is Canada's sixth great lake and the tenth largest freshwater lake in the world, covering 23,750 square kilometers.
- Lake Winnipeg is over 440 kilometers long.
- Lake Winnipeg's shoreline is more than 1,750 kilometers.
- The lake is divided by a very narrow channel only 2.6 kilometers wide. The larger north basin is 110 km wide, the south basin is 40 km wide at its widest part.
- Lake Winnipeg covers 3.7 % of the surface area of Manitoba.
- Several rivers drain into Lake Winnipeg. These include: Red River, Winnipeg River, Bloodvein River, Poplar and Nanowin Rivers, Berens River.
- Lake Winnipeg volume is 284 cubic kilometers.
- The lake supports a \$20+million/year commercial freshwater fishery and 23,000 Manitobans live along Lake Winnipeg shores.
- Tourism centres, cottage developments, resorts, and parks are found through most of the south basin region.
- Manitoba Hydro uses Lake Winnipeg as the main storage reservoir in its hydroelectric power generation system.
- Lake Winnipeg is the largest hydro reservoir in North America, and the third largest in the world after Lakes Superior and Victoria.



LWF

**LAKE
WINNIPEG
FOUNDATION**

LAKE WINNIPEG WATERSHED FACTS

- The Lake Winnipeg watershed is second largest in Canada at 953,250 km², across 4 provinces and 4 US states.
- The Lake Winnipeg watershed contains about 90 per cent of Canadian Prairies' agricultural land.
- The Canadian portion of the watershed is home to 5.5 million people (80 per cent of whom are urban dwellers) and 20 million livestock.
- The Lake Winnipeg watershed fish community has 79 species or 44% of total number fish species in Canada.

LAKE WINNIPEG HISTORY

Lake Winnipeg and Lake Manitoba are remnants of prehistoric Glacial Lake Agassiz. It is believed that Henry Kelsey was the first European to see the lake, in 1690. He adopted the Cree language name for the lake: *wīnipēk* (ᑦᑎᑦᐅᑦ), meaning, "muddy waters". The Red River Colony established south of the lake, took the lake's name for Winnipeg, the capital of Manitoba. The first Europeans to live along the shores of the south basin were Icelandic.

Lake Winnipeg lies along one of the oldest trading routes in North America. Furs were traded along this route between York Factory on Hudson Bay, longtime headquarters for the Hudson's Bay Company, over Lake Winnipeg and the Red River Trails to the Minnesota and Mississippi Rivers at Saint Paul, Minnesota. With establishment of the Thirteen Colonies, a quite significant increase in trade occurred over Lake Winnipeg between Rupert's Land and the United States.

Aboriginal peoples have travelled, fished, and traded on the Lake, and throughout the watershed, since the retreat of the glaciers. Certain of the modern day First Nations communities on the Lake were significant Hudson Bay Company trading posts, due to the Company selecting sites already used for trade, and habitation by these First Nations. Numbered Treaties one, two, three, four, and five, signed in 1871, 1872, 1873, 1874, 1875, include the shorelines of Lake Winnipeg or its waters.

Today there are many First Nation and Metis communities along the shores of the Lake, and throughout the watershed. The Aboriginal fishery in Lake Winnipeg's north basin is 200 years old, and a major contributor to the economy of Manitoba.



Map of the Lake Winnipeg Watershed (Provided by International Institute for Sustainable Development (IISD))

LAKE WINNIPEG WATER QUALITY

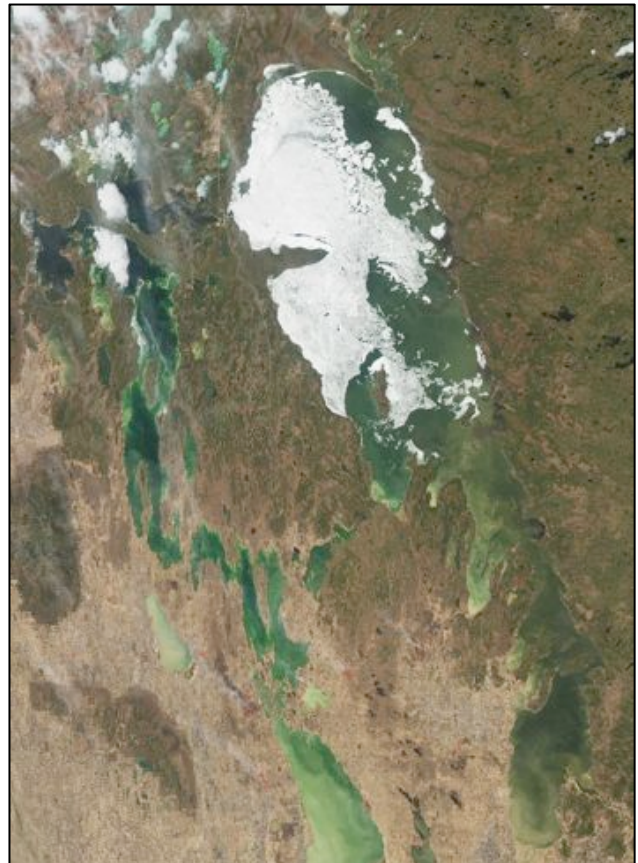
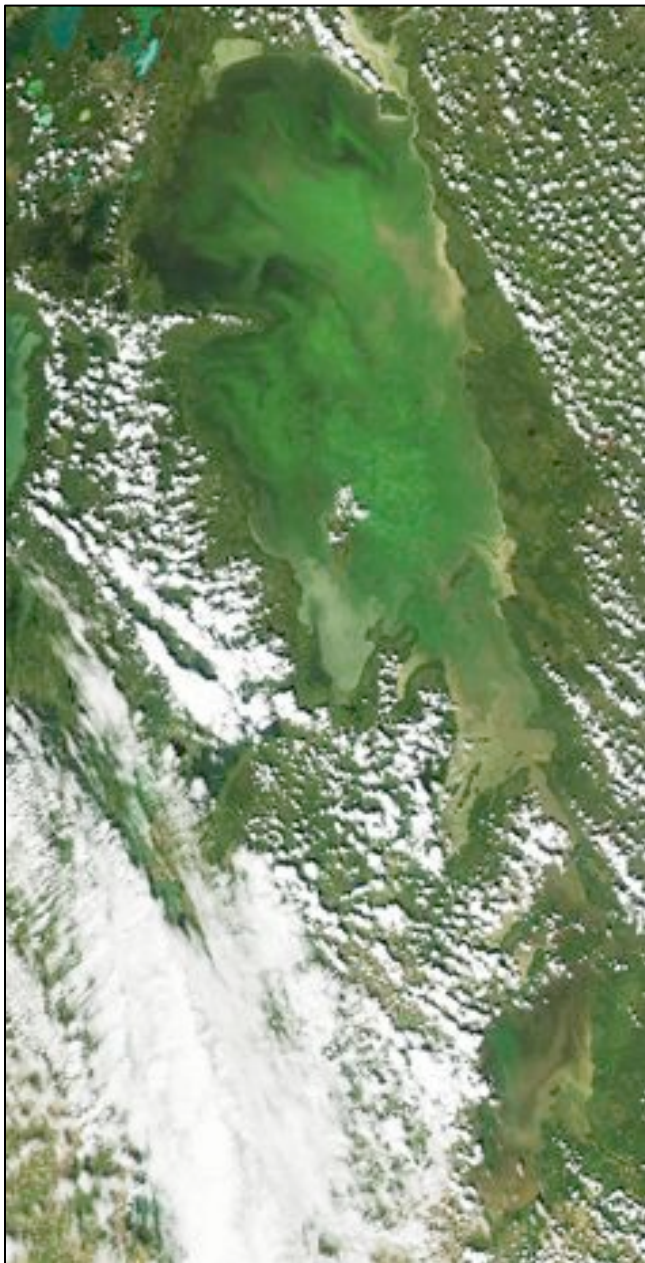
The quality of water in Lake Winnipeg has deteriorated during the past three decades principally as a result of excess phosphorus loaded into the lake from watershed sources.

Blue-green algae accumulate as surface scums and contribute to Lake Winnipeg's ranking as the most eutrophic large lake in the world.

Lake Winnipeg Satellite Images

Image on the Right – April 28, 2012

Image Below – August 21, 2011



LAKE WINNIPEG TEMPERATURE AND CLIMATE

From 1909 to present, August water temperatures in the south and north basins of Lake Winnipeg have increased by 1.9°C and 1.0°C, respectively.

Based on our knowledge of air and water temperature relationships, and predicted climate changes in the Lake Winnipeg region, south basin summer water temperatures could rise from their present range of 20° - 25°C to between 25° and 30°C by 2085.

Open water seasons will lengthen and ice cover periods will shorten, due to climate change (State of Lake Winnipeg 1999-2007).

Significant increases in precipitation and runoff in the southern parts of the Lake Winnipeg watershed, and extreme weather events, including a weather bomb in fall of 2010, require an improved understanding of the influence of climatic factors on Lake Winnipeg and its shorelines.

NUTRIENTS AND LAKE WINNIPEG – WHAT IS EUTROPHICATION?

Human activities across the Lake Winnipeg watershed have increased nitrogen and phosphorus reaching the lake. Sources include: municipal sewage, septic fields, crop fertilizers, industrial discharges, livestock manure, and urban runoff. Land drainage quickly moves runoff water and nutrients from fields directly into streams and rivers, and into Lake Winnipeg.

Satellite images now show large algae blooms in both the north and south basin of Lake Winnipeg. Some of these algae blooms produce toxins. Algae, especially blue-green algae, can affect the entire Lake Winnipeg ecosystem. Large algae blooms are now occurring more frequently in the north basin of Lake Winnipeg.

Sediment cores from the bottom of the Lake Winnipeg south basin show total algae has increased 300 to 500% during the twentieth century. All algae types have also increased since 1940.

Blue-green species of algae dominate Lake Winnipeg in summer and fall as phosphorus levels increase and water temperatures warm. Blue-green algae die off and their decomposition depletes oxygen, a condition that can kill fish and aquatic organisms in Lake Winnipeg's food web. Toxins produced by some blue-green algae can harm aquatic life, wildlife, pets, livestock, and people.

Eutrophication is unusual growth of aquatic plants because surface waters are rich with nutrients, mostly phosphorus and nitrogen. Eutrophication of surface waters is now a serious water quality problem for Lake Winnipeg. In fact, among the world's ten largest lakes, Lake Winnipeg is the most eutrophic, based on chlorophyll levels, which show the amount of algae present during summer.

In the Red River watershed, nutrient-rich soils and field-applied fertilizers add significant nutrient loads to Lake Winnipeg. Nutrients wind-lifted into the atmosphere are rain-washed into the lake and contribute as well to the amount of nutrients reaching the lake.

Nutrient loading to Lake Winnipeg is rising as indicated by the increasing frequency, intensity, and duration of algae blooms. Nutrient loading reductions are needed to reverse deteriorating water quality in Lake Winnipeg.



SHORELINE HABITAT INVENTORY MAPPING 2011-12

WHAT IS IT AND WHAT DID WE LEARN?

The 2011-12 Lake Winnipeg Foundation shoreline habitat inventory mapping demonstration project tried something new, something not done in Manitoba lakes before. The urgent need for data and information to support effective solutions for the health of Lake Winnipeg promoted the foundation to look for new tools to use. Foreshore Inventory Mapping (FIM), and Shoreline Habitat Inventory Mapping (SHIM) methods are being used on British Columbia lakes.

The Environment Canada Lake Winnipeg Basin Stewardship Fund (LWBSF) and other donors provided funding and a range of in kind good and services for this first SHIM project in Manitoba. The LWBSF is based on a Canada and Manitoba agreement to implement high-impact solution-oriented projects aimed at reducing nutrient loads, and improving the ecological sustainability of Lake Winnipeg and its watershed

The aim was to test the SHIM methods in an inventory of shorelines in most of the south basin of Lake Winnipeg. The shoreline was identified in shoreline segments, with sample sites identified in certain of the segments. While an extraordinary year for high waters, summer 2011 weather cooperated with the schedule for the shoreline inventory. Ultimately results of this and other SHIM projects in Lake Winnipeg will support new management guidelines and procedures for the lake, and lakes in the watershed.

During winter 2011-12 the geographic positioning system (GPS) data from the shoreline inventory fieldwork, field notes details, and sample site data were entered into extensive spreadsheets in order to analyze the data, and into a geographic information system (GIS) in order to show and map the results. Photos documented the shoreline inventory, and samples from sample sites confirm observations and data. Certain government of Manitoba data was included. The data dictionary for British Columbia shoreline inventories was used, with Lake Winnipeg specific data acquired in comments fields, and added from field notes.

Written reports regarding the SHIM inventory fieldwork, and a detailed FIM/SHIM report describing the findings are provided in the full Lake Winnipeg Foundation SHIM 2011-12 report. (Section B) An Ecological Habitat Index (EHI) report for each shoreline segment, based on criteria and the results of the fieldwork, is among the results of the demonstration project. A detailed report, with findings for the EHI, is provided in Section B also.

Recommendations from the 2011-12 SHIM project are included in Section C of this report. Highlights from the recommendations, and what this first SHIM project told us are included in this Citizen's Report.

While a first project of its kind in Manitoba, the summer 2011 inventory provides a wealth of information about Canada's sixth great lake.



SOME SHIM 2011-12 HIGHLIGHTS**

- Approximately 60% of the south basin shoreline is predominantly natural.
- The remaining 40% of the south basin shoreline is disturbed.
- Fourteen % of the shoreline shows no visible impact.
- Sand was the major shoreline type in 56% of the study area, wetland 12%, gravel 8%, rocky 8%

- The two largest shoreline lands uses are natural areas (40%), and single-family dwellings (39%).
- Natural lands, and single-family dwellings are the two most common shoreline land uses.
- Portions of the south basin shoreline are heavily modified. Some shoreline segments include between 40 and 80 structures or modifications.

- The ecological habitat index (EHI) analyses show approximately 70% of shoreline segments have very high, high, or moderate ecological values.
- Fifteen shoreline segments have a low or very low EHI ranking.
- Absence of man-made shoreline modifications (retaining walls, docks, roads) is characteristic of high ecological value shoreline.
- Many 'shoreline erosion protection' structures are built without standards or oversight.
- Certain 'shoreline erosion protection' structures are not effective.

- Lake Winnipeg south basin contains a diverse and abundant fish community.
- Stream mouth and wetland habitats are important areas for biodiversity.
- Recent developments in stream mouths and wetlands present ecosystem threats.
- Distribution, type of development affects ecosystem biodiversity values, including fish habitat.

- Lake Winnipeg south basin lacks protection for wetlands, conservation zones, significant biological areas, and species.
- Sand beach shorelines support the greatest diversity of both wildlife and tree species.

- Incidental observations of approximately 2221 birds, and twenty-five bird species.
- Thirty-eight bird species were identified during onshore sampling.
- The sandy shore type was the most preferred habitat by avian communities.

- Sand beach shorelines supported the greatest diversity of both wildlife and tree species.
- The most common tree species observed are green ash, trembling aspen, Manitoba maple, white birch, and balsam poplar.
- Shorelines rated as very sensitive and sensitive habitats are very important for supporting species diversity.
- Little information is available on Lake Winnipeg wildlife and plant communities.

*** Highlights based on science and technical reports for Lake Winnipeg Foundation 2011 SHIM field work, in project study area.*

Natural vs Disturbed Percentage of the Study Area

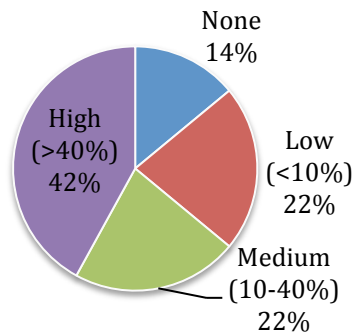


Natural and Disturbed Shoreline in Study Area

The majority of the study area shoreline was categorized as natural (60%), with remaining shoreline disturbed (40%).

SELECTED CHARTS FROM SHIM REPORT

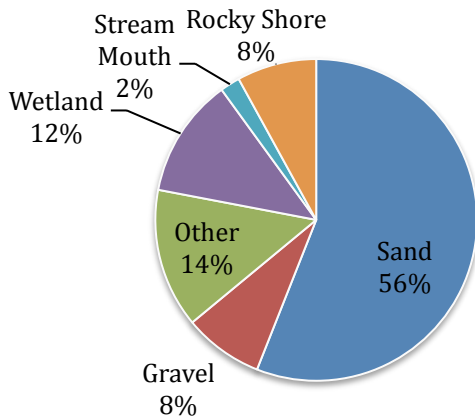
Level of Impact



Discussion

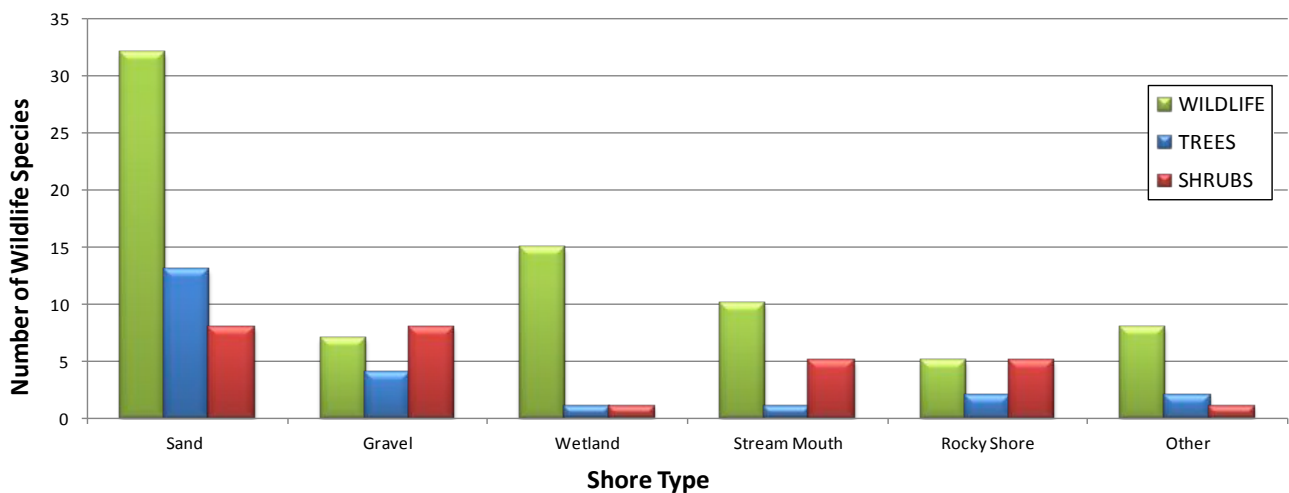
42% of the shoreline is highly altered by anthropogenic activities, 22% moderately altered, and 22% falls into the low alteration category. 14% of the shoreline in the study area shows no visible impact based on observation at the time of the study.

Major Shore Types in Study Area



Discussion

The major shore type in the study area were sand (56%), wetland (12%), gravel (8%) and rocky (8%). Segments categorized as "Other" (14%) included; segments that were mostly or highly developed with heavy shoreline modification, hardened shorelines, many single family dwellings, large marinas, man-made beaches, roads and dikes very close to shoreline or on the shoreline. (See segments; 7, 9, 10, 11, 16, 19, and 33.)



Discussion

Number of onshore species observed by shore habitat type in the Lake Winnipeg south basin for wildlife, trees and shrubs.

SHORELINE HABITAT INVENTORY MAPPING 2011-12

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VOLUNTEERS:

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Acknowledgements for the SHIM 2011 fieldwork component of the project are in the SHIM 2011 Science and Technical Report.

LAKE WINNIPEG FOUNDATION



**LAKE
WINNIPEG
FOUNDATION**

GUIDING PRINCIPLES

MISSION

To identify and support solutions that restores and protects the health of Lake Winnipeg and its watershed through research, public education, advocacy, management and collaboration.

VISION

A clean, healthy Lake Winnipeg and Watershed for present and future generations.

PRIMARY GOALS

RESEARCH

To provide financial support for scientific research. We firmly believe that there are solutions and that scientific research is the key. It is research that will create an understanding of the complex relationships between the lake and its watershed. Research will show the impact of nutrient and contaminant loading, erosion, habitat and wetland loss, and drainage alteration on Lake Winnipeg health. While much has been learned, Lake Winnipeg and its watershed have received relatively little scientific study and much remains to be learned. This knowledge can be used to educate anyone interested in the Lake as well as to influence decision makers and consumers. Without this knowledge, well-informed decisions and appropriate environmental management plans cannot be made.

EDUCATION

To communicate lake and watershed knowledge, which encourages societal changes that benefit lake health for future generations.

ADVOCACY

To encourage individual citizens and their governments to promote ecological health through individual behavior, legislation, policy and programs

MANAGEMENT

To endorse and promote lake management based on the best current science

COORDINATION and COLLABORATION

To act as an umbrella organization for people working on issues that affect Lake Winnipeg and its watershed

CITIZEN'S REPORT SOURCES:

- o *Restoring the Health of Lake Winnipeg, Lake Winnipeg Implementation Committee,*
- o *Lake Winnipeg South Basin Sensitive Habitat Inventory and Mapping (SHIM) 2011-12*
- o *Wikipedia*
- o *Climate Change Connection*
- o *IISD – An Ecosystem Services Assessment of the Lake Winnipeg Watershed – Phase 1 Report*
- o *Lake Winnipeg Research Consortium Inc.*
- o *Lake Winnipeg Stewardship Board 2007 Report*
- o *Government of Manitoba 2011 State of the Lake Report*
- o *All Images Provided by SHIM Team*



DRAFT



0 2 4 8 12 16
Kilometers

**Lake Winnipeg South Basin
Sensitive Habitat Inventory and Mapping (SHIM):**

Legend



Scale: 1:500,000
Datum: NAD-83
Projection: UTM Zone 14 N

Data Sources:
EPA (Point Locations)
Manitoba Lands Initiative (Point Locations, Primary Roadways, Secondary Roadways, Railroads, Hydrological Features, Water Bodies, Parks, Protected Areas)
Geomatics (First Nation Reserve Lands)

Map for Illustrative Purposes Only
Whelan Enns Associates Inc.
April 30, 2013 (Version 2)

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