



Environment and
Climate Change Canada

Environnement et
Changement climatique Canada

REDUCTIONS IN PHOSPHORUS LOADS TO LAKE WINNIPEG

CANADIAN ENVIRONMENTAL
SUSTAINABILITY INDICATORS



Canada 

Suggested citation for this document: Environment and Climate Change Canada (2020) Canadian Environmental Sustainability Indicators: Nutrients in Lake Winnipeg. Consulted on *Month day, year*. Available at: www.canada.ca/en/environment-climate-change/services/environmental-indicators/phosphorus-lake-winnipeg.html.

Cat. No.: En4-144/89-2020E-PDF
ISBN: 978-0-660-33765-4

Unless otherwise specified, you may not reproduce materials in this publication, in whole or in part, for the purposes of commercial redistribution without prior written permission from Environment and Climate Change Canada's copyright administrator. To obtain permission to reproduce Government of Canada materials for commercial purposes, apply for Crown Copyright Clearance by contacting:

Environment and Climate Change Canada
Public Inquiries Centre
12th Floor Fontaine Building
200 Sacré-Coeur Blvd
Gatineau QC K1A 0H3
Telephone: 1-800-668-6767 (in Canada only) or 819-938-3860
Fax: 819-938-3318
Email: ec.enviroinfo.ec@canada.ca

Photos: © Environment and Climate Change Canada

© Her Majesty the Queen in Right of Canada, represented by the Minister of Environment and Climate Change, 2020

Aussi disponible en français

CANADIAN ENVIRONMENTAL SUSTAINABILITY INDICATORS

REDUCTIONS IN PHOSPHORUS LOADS TO LAKE WINNIPEG

January 2020

Table of contents

- Reductions in phosphorus loads to Lake Winnipeg.....5
 - Key results5
 - About the indicator6
 - What the indicator measures.....6
 - Why the indicator is important6
 - Related indicators6
 - Data sources and methods.....7
 - Data sources7
 - Methods7
 - Recent changes.....7
 - Caveats and limitations7
 - Resources.....8
 - References8
 - Related information8
 - Annex A. Data tables for the figures presented in this document9

List of Figures

Figure 1. Estimated cumulative reduction in the amount of phosphorus reaching Lake Winnipeg as a result of projects implemented through Environment and Climate Change Canada’s Lake Winnipeg basin programming, Canada, April 2010 to March 2019.....5

List of Tables

Table A.1. Data for Figure 1. Estimated cumulative reduction in the amount of phosphorus reaching Lake Winnipeg as a result of projects implemented through Environment and Climate Change Canada’s Lake Winnipeg basin programming, Canada, April 2010 to March 2019.....9

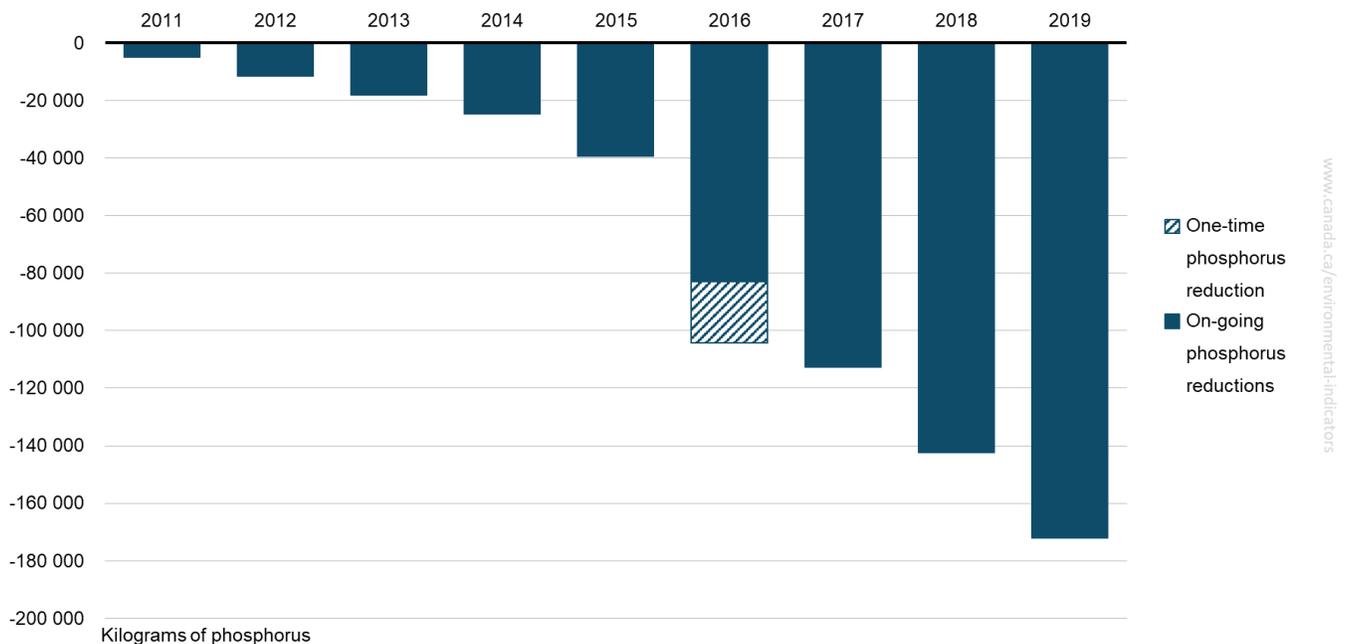
Reductions in phosphorus loads to Lake Winnipeg

Phosphorus is an essential plant nutrient. When phosphorus levels are too high or too low, they can have harmful impacts on a lake's food web. Reducing the amount of phosphorus that enters Lake Winnipeg will help improve the health of the lake. The indicator shows the extent to which projects funded by Environment and Climate Change Canada's Lake Winnipeg Basin Program have reduced the amount of phosphorus reaching Lake Winnipeg.

Key results

- Projects funded by Environment and Climate Change Canada and completed between 2010 and 2019 have prevented an estimated 172 023 kilograms of phosphorus from reaching Lake Winnipeg
- One specific project, the bioremediation of a retired municipal wastewater lagoon, prevented 21 345 kilograms of phosphorus from ever reaching Lake Winnipeg in 2016

Figure 1. Estimated cumulative reduction in the amount of phosphorus reaching Lake Winnipeg as a result of projects implemented through Environment and Climate Change Canada's Lake Winnipeg basin programming, Canada, April 2010 to March 2019



[Data for Figure 1](#)

Note: The estimated reduction in phosphorus load is based on the results of Lake Winnipeg basin programming funded projects completed between April 2010 and March 2019. Estimated phosphorus reductions for each project are summed to calculate the total. Year refers to fiscal year, which runs from April 1 to March 31. The year 2019 therefore refers to April 1, 2018 to March 31, 2019.

Source: Environment and Climate Change Canada (2019) [Lake Winnipeg Basin Program](#).

The amount of phosphorus reaching Lake Winnipeg is reduced by projects which have received funding for activities such as:

- building retention ponds which intercept water flow across the landscape and capture nutrients
- stabilizing river banks and lake shorelines
- restoring wetlands
- constructing fences to prevent livestock from entering lakes and rivers

Environment and Climate Change Canada, the Manitoba government and other partners are engaging people in nutrient reducing activities and supporting innovative nutrient reduction demonstration projects and research.

Environment and Climate Change Canada's support for these types of efforts through the Lake Winnipeg Basin Program will help Manitoba achieve its long-term goal of reducing phosphorus concentrations in the lake to pre-1990 levels of approximately 0.05 milligrams per litre.

About the indicator

What the indicator measures

The Reductions in phosphorus loads to Lake Winnipeg indicator shows the extent to which projects funded by the Lake Winnipeg Basin Stewardship Fund (April 2010 to March 2017) and the Lake Winnipeg Basin Program (since March 2017) have reduced the amount of phosphorus reaching the lake from its watershed. By changing how land is managed, the amount of phosphorus reaching Lake Winnipeg is lowered, and restoration of the lake can occur.

Why the indicator is important

Clean freshwater is an essential resource. It protects the biodiversity of aquatic plants and animals. We use it for manufacturing, energy production, irrigation, swimming, boating, fishing and for domestic use (for example, drinking, washing). Degraded water quality damages the health of freshwater ecosystems and can disrupt economic activities, such as fisheries, tourism and agriculture. When phosphorus levels in water become too high, aquatic plant growth can become excessive and harmful. The decay of excess plant material can reduce the amount of oxygen available for fish and other aquatic animals. High nutrient levels can also lead to harmful algal blooms, which can kill animals that use the water and affect human health. Conversely, too little phosphorus can result in not enough plant growth to support a lake's food web, which can result in a collapse of the fishery.



Pristine lakes and rivers

This indicator supports the measurement of progress towards the following [2019 to 2022 Federal Sustainable Development Strategy](#) long-term goal: Clean and healthy lakes and rivers support economic prosperity and the well-being of Canadians.

It is used to assess progress towards the target: By 2022, reduce nutrient loadings in the Lake Winnipeg Basin by an estimated 44 700 kilograms per year in support of Manitoba's plan to reduce phosphorus in Lake Winnipeg by 50% to pre-1990 levels.

In addition, the indicator contributes to the [Sustainable Development Goals of the 2030 Agenda for Sustainable Development](#). It is linked to the 2030 Agenda's Goal 6, Clean water and sanitation and Target 6.3, "By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally."

Related indicators

The [Nutrients in Lake Winnipeg](#) indicator reports on the status of total phosphorus and total nitrogen levels in Lake Winnipeg and its 3 largest tributaries: the Red, Saskatchewan and Winnipeg rivers.

The [Phosphorus levels in the offshore waters of the Great Lakes](#) and the [Nutrients in the St. Lawrence River](#) indicators report the status of total phosphorus and total nitrogen levels in those 2 ecosystems.

The [Water quality in Canadian rivers](#) indicators provide a measure of the ability of river water across Canada to support plants and animals.

The [Household use of chemical pesticides and fertilizers](#) indicator reports on how many people in Canada use pesticides and fertilizers on their lawns and gardens.

Data sources and methods

Data sources

The amount of phosphorus diverted from Lake Winnipeg through the Lake Winnipeg Basin Program was either estimated by Environment and Climate Change Canada, or provided by funding recipients using data from the final reports of funded projects.

More information

The estimated phosphorus load reductions are calculated using the results of Environment and Climate Change Canada funded projects completed in the Lake Winnipeg watershed between April 2010 and March 2019. The indicator includes data for all projects completed by March 31, 2019.

From 2008 to 2019, the Lake Winnipeg Basin Program funded 98 projects. Of the projects funded, 45% are having a direct impact on phosphorus loading and 55% are having an indirect impact. The indicator reports on projects resulting in direct reductions of phosphorus loadings to Lake Winnipeg.

Methods

Load reductions were estimated for each project using project-specific equations that were either derived independently based on project data or from the Lake Simcoe Clean-Up Fund: Phosphorus Reduction Calculation Report.¹ The report is applicable to projects in the Lake Winnipeg basin because it uses generic land use models collected from scientific literature. The results for each year were added to estimate the total loading reduction.

More information

In general, the concentration of phosphorus reaching a watercourse is determined by the form and chemical nature of the phosphorus compounds and the degree of contact with the soil, soil pH, soil texture, soil type and aerobic conditions. Projects to reduce phosphorus inputs from agriculture include practices such as limiting livestock access to streams through fencing and installing alternate watering sources. Other projects include those that protect or stabilize stream banks or lake shores by installing erosion-control structures and planting trees and shrubs.

Once a project has been initiated, its impact on the removal of phosphorus in water running off the landscape is accounted for on a yearly basis. Loading reductions achieved each year over the life of the project are added to projects completed in 2010. In this way, the reduction of phosphorus runoff due to projects aggregates on the landscape.

The phosphorus reduction results are calculated estimates, the figures for each project type were summed to produce the final number.

Recent changes

The indicator used to be reported as part of the [Nutrients in Lake Winnipeg](#) indicators. The Nutrients in Lake Winnipeg indicators included an indicator on nutrients levels and an indicator on nutrients load reductions. Each indicator is using a different data source that are not available at the same time. As such, it was decided to report the 2 indicators separately to improve the timing of reporting with the release of the latest available information.

Caveats and limitations

The indicator assumes that each phosphorus reduction project completed through the Lake Winnipeg Basin Program resulted in a permanent reduction in phosphorus loads to Lake Winnipeg.

The indicator does not compare results to data measuring annual phosphorus loads or the overall land use and activity changes in the basin that might affect phosphorus loading.

¹ Sealock L (2011) Lake Simcoe Clean-Up Fund: Phosphorus Reduction Calculation Report. Great Lakes Management and Reporting Section, Environment Canada.

The indicator relies on the most appropriate equations to predict phosphorus loading reductions from the implementation of the projects. Despite the rigour behind them, uncertainty exists when using these equations.

Resources

References

Sealock L (2011) Lake Simcoe Clean-Up Fund: Phosphorus Reduction Calculation Report. Great Lakes Management and Reporting Section, Environment Canada.

Related information

[Lake Winnipeg Basin Program](#)

Annex

Annex A. Data tables for the figures presented in this document

Table A.1. Data for Figure 1. Estimated cumulative reduction in the amount of phosphorus reaching Lake Winnipeg as a result of projects implemented through Environment and Climate Change Canada's Lake Winnipeg basin programming, Canada, April 2010 to March 2019

Year	Estimated phosphorus removal (kilograms of phosphorus/year)	Estimated one-time phosphorus removal (kilograms of phosphorus)	Total estimated phosphorus removal over all years (kilograms of phosphorus)
2011	4 906	n/a	4 906
2012	1 586	n/a	11 398
2013	0 ^[A]	n/a	17 890
2014	122	n/a	24 504
2015	8 194	n/a	39 312
2016	7 403	21 345	82 869
2017	7 504	n/a	112 584
2018	0 ^[A]	n/a	142 299
2019	9	n/a	172 023

Note: n/a = not applicable. ^[A] No new phosphorus reduction projects were funded that year. The estimated reduction in phosphorus load is based on the results of Lake Winnipeg basin programming funded projects completed between April 2010 and March 2019. Estimated phosphorus reductions for each project are summed to calculate the total. Year refers to fiscal year, which runs from April 1 to March 31. The year 2019 therefore refers to April 1, 2018 to March 31, 2019.

Source: Environment and Climate Change Canada (2019) [Lake Winnipeg Basin Program](#).

Additional information can be obtained at:

Environment and Climate Change Canada

Public Inquiries Centre

12th Floor Fontaine Building

200 Sacré-Coeur Blvd

Gatineau QC K1A 0H3

Telephone: 1-800-668-6767 (in Canada only) or 819-938-3860

Fax: 819-938-3318

Email: ec.enviroinfo.ec@canada.ca