Environment and Climate Change Canada
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REDUCTIONS IN PHOSPHORUS LOADS TO LAKE WINNIPEG

CANADIAN ENVIRONMENTAL SUSTAINABILITY INDICATORS

Canada

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February 2023

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Reductions in phosphorus loads to Lake Winnipeg

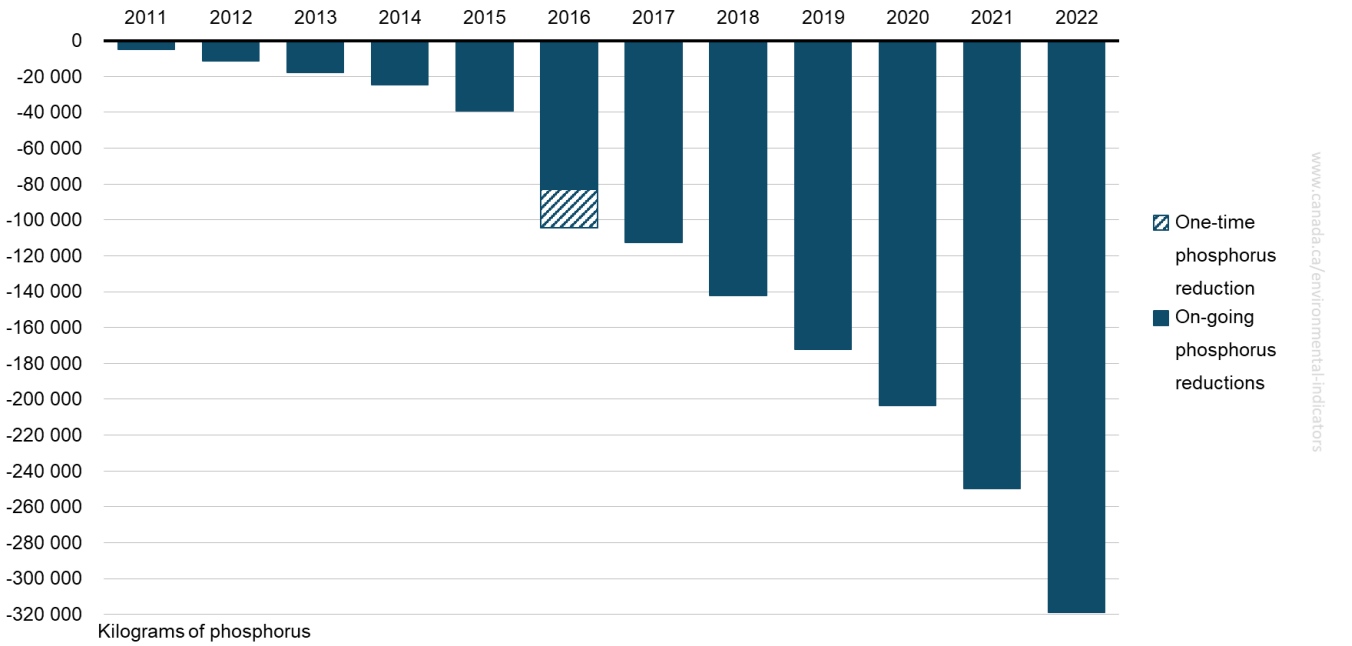
Phosphorus is an essential plant nutrient. However, when phosphorus levels are too high, they can have harmful impacts on a lake's water quality and food web as observed in Lake Winnipeg. Reducing the amount of phosphorus that enters Lake Winnipeg helps to improve the health of the lake.

This indicator shows the extent to which projects completed since 2010 with funding from Environment and Climate Change Canada's Lake Winnipeg basin programming have reduced the amount of phosphorus reaching Lake Winnipeg.

Key results

- Projects funded by Environment and Climate Change Canada and completed between 2010 and 2022 have prevented an estimated 318 947 kilograms of phosphorus from reaching Lake Winnipeg

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 2022



Data for Figure 1

Note: The estimated reduction in phosphorus load is based on the results of Environment and Climate Change Canada's Lake Winnipeg basin programming funded projects completed between April 2010 and March 2022. Estimated phosphorus reductions for each project are summed yearly to calculate the cumulative total. One specific project, the bioremediation of a retired municipal wastewater lagoon, prevented 21 345 kilograms of phosphorus from reaching Lake Winnipeg in 2016. Year refers to fiscal year, which runs from April 1 to March 31. The year 2022 therefore refers to April 1, 2021 to March 31, 2022.
Source: Environment and Climate Change Canada (2022) Lake Winnipeg Basin Program.

By reducing nutrient loading, the amount of phosphorus reaching Lake Winnipeg can be lowered, which will improve water quality and the ecosystem health of the lake.

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

- building retention ponds that intercept water flow across the landscape and capture nutrients
- stabilizing river banks and lake shorelines
- restoring wetlands

- supporting innovative technologies related to small scale waste water management systems
- implementing management practices that 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 by 50% to pre-1990 levels.

About the indicator

What the indicator measures

The Reductions in phosphorus loads to Lake Winnipeg indicator shows the estimated extent to which projects funded by the Lake Winnipeg Basin Stewardship Fund (from April 2008[1] to March 2017) and the Lake Winnipeg Basin Program (since March 2017) have reduced the amount of phosphorus reaching the lake from its watershed.

Why this indicator is important

Clean freshwater is an essential resource as it supports healthy aquatic ecosystems. We use it for manufacturing, energy production, irrigation, swimming, boating, fishing, traditional cultural practices, and for domestic use such as drinking and washing. Degraded water quality damages the health of freshwater ecosystems and can disrupt economic activities, such as fisheries, tourism and agriculture, and can negatively impact Indigenous traditional uses.

When phosphorus levels in water become too high, aquatic plant growth can become excessive and harmful to the ecosystem health of the lake. 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 adversely affect human health. Conversely, too little phosphorus can result in not enough plant or algal growth to support a lake's food web, which could reduce fish populations and impact local fisheries. Reducing the amount of nutrients, such as phosphorus, reaching Lake Winipeg will help improve the health of the lake.

Related initiatives

This indicator contributes to the Sustainable Development Goals of the 2030 Agenda for Sustainable Development. It is linked to 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 Phosphorus loading to Lake Erie indicators report on the total phosphorus loadings flowing directly into Lake Erie or from its tributary rivers.

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

[1] The Lake Winnipeg Basin Stewardship Fund, part of the Lake Winnipeg Basin Initiative, was funded from 2008 to 2017. The first nutrient reduction projects were funded in fiscal year 2010 to 2011, with the first results being reported in March 2011.

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 Environment and Climate Change Canada's Lake Winnipeg basin programming was either provided in final project reports submitted by funding recipients or estimated by Environment and Climate Change Canada.

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 2022. The indicator includes data for all projects completed by March 31, 2022.

From 2008 to 2021, Environment and Climate Change Canada's Lake Winnipeg basin programming funded 153[2] projects. Of the projects funded, 50% are having a direct impact on phosphorus loading and 50% 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.[3] The Lake Simcoe 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.

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[2] Projects approved by Environment and Climate Change Canada (ECCC) are funded through Contribution Agreements that are signed with individual funding recipients. For some projects, where a Contribution Agreement is already in place with a funding recipient, ECCC may chose to amend that agreement to include additional project activities and funding instead of signing a new one. In these cases, the project is not counted as a new project and therefore not reflected in the total number of projects that are approved annually by ECCC. However, the phosphorus reductions realized through additional activities carried out via amended agreements are included in the calculations for this indicator.

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

Caveats and limitations

The indicator assumes that each phosphorus reduction project completed through Environment and Climate Change Canada's Lake Winnipeg basin programming has resulted in a permanent annual reduction in phosphorus loads to Lake Winnipeg.

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

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

Lake Winnipeg Basin Program interactive map

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 2022

Year	Estimated phosphorus removal (kilograms of phosphorus per 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	112 583
2018	0[A]	n/a	142 298
2019	9	n/a	172 022
2020	1 609[B]	n/a	203 355[B]
2021	14 881	n/a	249 569[B]
2022	23 164	n/a	318 947

Note: n/a = not applicable. [A] No new phosphorus reduction projects were funded that year. [B] The value has been updated as a result of a correction in the reported value from a completed project.
Source: Environment and Climate Change Canada (2022) Lake Winnipeg Basin Program.

Additional information can be obtained at:

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