

WATER RESOURCES

Management
in Manitoba

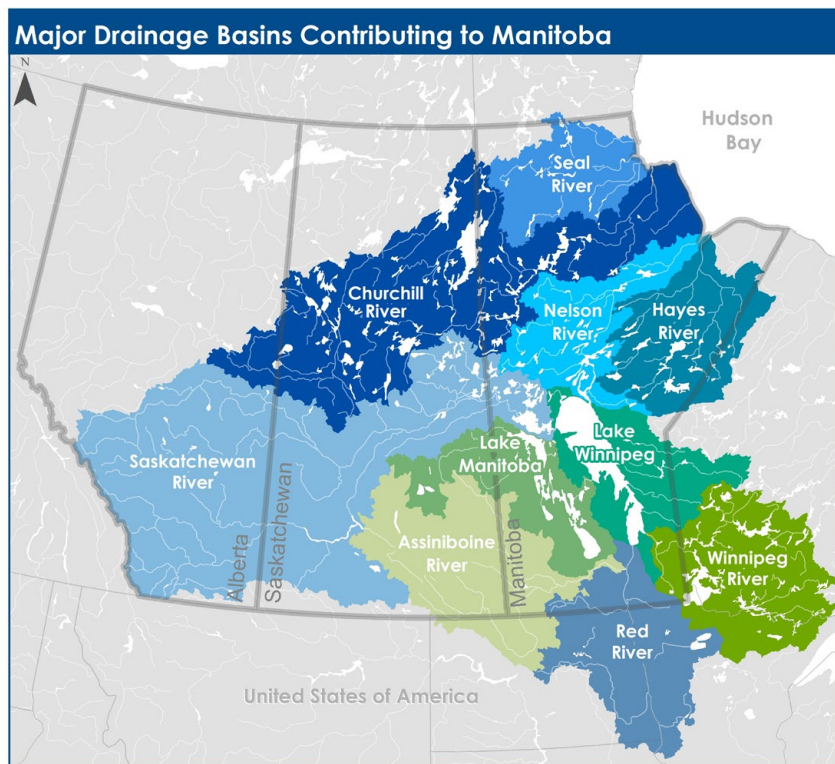
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WATER RESOURCES MANAGEMENT IN MANITOBA

This document provides a brief introduction to where Manitoba's water comes from and how it is managed. Additional detailed information is available in Appendices A through D at the end of this document. Links to further resources are provided where possible.

Manitoba Drainage Basins

The Nelson River basin, which includes all of southern Manitoba, is one of the largest river basins in the world. It extends from the Rocky Mountains in the west and nearly to Lake Superior in the east. Waters from the Red, Winnipeg, Assiniboine/Souris and Saskatchewan Rivers, in addition to many other smaller tributaries, flow into Lake Winnipeg, continue downstream via the Nelson River and eventually discharge into Hudson Bay. Further north, major river systems in Manitoba include the Churchill, Seal and Hayes River basins.



About 70 per cent of Manitoba's surface water comes from upstream jurisdictions. Therefore, the water quantity and quality in Manitoba are greatly impacted by activities and actions that occur further upstream in western Canada, eastern Canada and the United States.

Drainage basins contributing to Manitoba. All images in this document have been supplied by Manitoba Agriculture and Resource Development unless noted otherwise.

Surface Water Management

Surface water is all the visible above-ground water, including lakes, rivers and wetlands. Manitoba's vast geographic drainage area and cold continental climate create great variability in our surface waters. Streamflows and water levels in Manitoba's rivers and lakes vary greatly throughout the year and from year to year. Wet or dry cycles can last for years, yet they may transition quickly from one to the other within a single season. This incredible variation is the principal challenge in surface water management in Manitoba.

Floods and droughts are a major concern in Manitoba. Extreme floods have occurred throughout history, the majority of which are due to spring snowmelt. However, although rare, summer rainfall events can cause significant flooding as well. While floods generally cause intense, localized damage for a short period of time, droughts can occur over large areas and can last for months or even years. Although droughts can occur anywhere in Canada, the most severe and widespread droughts occur on the prairies. Seasonal droughts occur more frequently and can significantly impact various industries, particularly the agricultural sector.

This natural variability in Manitoba's surface waters is further impacted by land use and land management alteration, road networks, dams, dikes, diversions, and artificial drainage networks. These changes all affect the waters flowing through Manitoba's lakes and rivers.

Manitoba has an extensive network of infrastructure to help control and manage our surface waters. The Red River Floodway receives global recognition for effective flood mitigation. Reservoirs allow for reliable drinking water and irrigation through multi-year droughts. Manitoba Hydro operates fifteen generating stations, supplying about 96 per cent of Manitoba's electricity from hydropower, and sells large amounts of hydropower to our neighbours, bolstering Manitoba's economy. Large infrastructure projects, such as the Churchill River Diversion and the Shellmouth Dam, have significant influence on streamflows and water levels across large regions of Manitoba. While our water infrastructure provides tremendous benefits, it can also have negative effects on the environment and people residing in the impacted areas.

You can learn more about Manitoba's major water infrastructure in Appendix A and hydroelectric development in Appendix B.



Prairie pothole landscape north of Brandon, Manitoba.



Tile drainage installation.

Water Quality Management

Water quality in Manitoba's rivers and lakes varies across the province but is generally suitable for a wide range of uses, including as a source for drinking, recreation, irrigation, industry, and to support fish and aquatic life, while sustaining a wide array of biodiversity. Water quality depends on watershed characteristics, including climate, drainage network, soils and vegetation. Land use practices and management also greatly influence water quality in lakes and rivers.

Manitoba assesses water quality by measuring nutrients, metals, pesticides, bacteria, algae and physical parameters such as turbidity. [Measurements are compared to Manitoba's Water Quality Standards, Objectives and Guidelines.](#) The Standards, Objectives and Guidelines establish limits for discharge to the environment and protect various water uses. Manitoba uses the Canadian Council of Ministers of the Environment's (CCME) Water Quality Index to assess and communicate changes in water quality over time. The CCME Water Quality Index indicates that as of 2018, water quality is generally better in rivers in northern Manitoba as compared to southern Manitoba where the impacts of development can lead to exceedances of water quality objectives and guidelines.

Manitoba also works with Canada and other partners to measure and report on physical, chemical and biological conditions in Lake Winnipeg. In April 2020, the Manitoba government and the Government of Canada released the second edition of the State of Lake Winnipeg report. The report serves as a reference to measure progress towards reducing nutrient loading, assess the overall health of the lake, and provide key information to support current and future research on Lake Winnipeg. Approximately 70 per cent of the water and 50 per cent of the nutrients in Lake Winnipeg originate from outside Manitoba. Manitoba continues to work closely with our neighboring jurisdictions to improve water quality and reduce nutrients. The State of Lake Winnipeg report is available at www.manitoba.ca/lakewinnipeg.



Satellite image of algal blooms on Lake Winnipeg at the end of July, 2012. (Image from Lake Winnipeg Research Consortium)

Groundwater Management

Groundwater exists everywhere, with usable quantities stored in porous sediments and rocks called aquifers. Manitoba is fortunate to have an abundance of high quality, high yielding aquifers that provide reliable sources of water.

Outside of the city of Winnipeg, the majority of Manitoba's residents rely on groundwater for their domestic use. Groundwater is also commonly used for livestock watering, irrigation, parks and industrial and municipal water supplies. Groundwater discharging to the surface is also important in sustaining many streams and rivers, wetlands and their ecosystems.

Aquifers are recharged from spring snowmelt and large rainfall events. Many aquifers store large quantities of water and are less affected than surface water by short or medium-term droughts. Groundwater quality is also less variable than surface water and often requires less treatment to meet drinking water guidelines in municipal water supply systems.

Some areas of the province have issues with the quality of their groundwater because of natural factors. These include saline water in bedrock aquifers west of the Red River and south of the Assiniboine River and areas where [naturally occurring metals such as arsenic](#) are above drinking water guidelines. Unsealed, abandoned wells also allow surface contamination to enter an aquifer and diminish water quality and local groundwater sustainability. Open and [flowing artesian wells](#) waste groundwater and lead to concerns such as localized flooding.

Groundwater may be at risk from overexploitation. The province is managing several major aquifers with defined allowable water use limits and has developed local aquifer management plans.

Aquifers are mapped to understand the groundwater resource, including for management and water use licensing. Widespread mapping of large and medium-sized aquifers in the province was completed in the 1970s, 80s and 90s. However, smaller aquifers are not mapped and newer technology and information is available that could be used to further refine our understanding of larger aquifers.

You can learn more about groundwater management in Manitoba [here](#).

Want to learn more about how you can protect surface and groundwater?

The [Water Protection Handbook](#) is a valuable reference for Manitobans, with information on surface waters and groundwater in Manitoba, water quality and how to protect this valuable resource.

For well owners [Manitoba Well Aware](#) is also a valuable reference.

Water Monitoring in Manitoba

Water monitoring provides key data that increases awareness of existing conditions and guides actions to address future water challenges. Manitoba maintains a number of monitoring networks to help us track and understand water quality and quantity. Manitoba relies on partners such as the federal government, Manitoba Hydro, Watershed Districts, universities, cottage associations and other stakeholders as partners in these data collection activities.

Manitoba collaborates with the federal government and Manitoba Hydro in the [Manitoba Hydrometric Program](#). This program collects water level and flow data in lakes and rivers. In some locations, monitoring has been in place since 1906. Manitoba also operates a provincial groundwater monitoring network, consisting of more than 850 monitoring wells that are used to evaluate and monitor groundwater quality and water levels in major aquifers.

Since the 1970s, the province has [maintained a long-term water quality monitoring program](#) on major rivers and lakes at more than 65 sites throughout Manitoba. Partnerships with Watershed Districts, Manitoba Hydro and the University of Manitoba support these efforts. Since 1999, Manitoba has also maintained a water quality monitoring program on Lake Winnipeg to assess changes to water quality and evaluate impacts to aquatic life. The Lake Winnipeg Research Consortium and their research vessel, the MV Namao, support this work.

Other networks provide critical information to complement the aforementioned monitoring networks. For example, Manitoba maintains several weather networks, monitors soil moisture and collects information on fish and other aquatic species. Programs such as the Coordinated Aquatic Monitoring Program (CAMP), a partnership between Manitoba Hydro and the Manitoba government, monitor and track measures of ecosystem health in a coordinated manner.



Water quality sampling of Manitoba's lakes and rivers.



Lake Winnipeg Research Consortium's research vessel the MV Namao.

Water Governance in Manitoba – Who is Responsible for What?

About 70 per cent of Manitoba's surface water comes from upstream jurisdictions. Water flows across jurisdictional boundaries and Manitoba must continue to work closely with our neighbours in the United States and Canada to protect water quality and quantity in the province.

The federal government has an important role in transboundary water management and is the lead on Canada-United States arrangements, such as The Boundary Waters Treaty. Manitoba participates directly in transboundary boards and committees such as through the International Joint Commission and the Prairie Provinces Water Board. The Water Protection Act was amended in 2018 to recognize the role of grassroots transboundary organizations, such as the Red River Basin Commission and the Assiniboine River Basin Initiative, in supporting transboundary water management. Manitoba is a key participant and funder for both of these organizations. Additional information on transboundary water management in Manitoba can be found in Appendix C.

As laid out in the Path to Reconciliation Act, Manitoba is committed to advancing reconciliation guided by the principles of respect, engagement, understanding and action. Meaningful participation with Indigenous communities and governments in the management of water challenges and development of solutions is a growing and important dialogue. Opportunities for inclusion are expanding. The Watershed Districts Act now encourages formal partnerships with Indigenous governments and efforts are ongoing to ensure watershed plans include input from Indigenous communities.

Provincial government responsibility for water is distributed across several provincial departments:

- **Manitoba Infrastructure** (flooding and infrastructure, Emergency Measures Organization)
- **Manitoba Conservation and Climate** (drainage and water use licensing, Environment Act licensing and drinking water)
- **Manitoba Agriculture and Resource Development** (Watershed Districts, incentive programming, extension, drought, fisheries and water science, including water quality, groundwater and sustainable allocation)
- Other provincial departments including **Municipal Relations** (Community Planning), **Central Services** (Manitoba Water Services Board), and **Indigenous and Northern Relations** also play a role in Manitoba's water management

Municipal governments have a role in water management in southern Manitoba by building and maintaining water infrastructure, including drainage works and water and wastewater treatment facilities. Some municipal governments are members of water cooperatives that supply water for drinking and other uses (for example, Pembina Valley Water Coop). Municipal governments are also the main partners in the Watershed Districts Program, which is a provincial and municipal collaboration. Watershed Districts develop watershed management plans under The Water Protection Act and deliver grassroots water stewardship programming. Most of Manitoba's municipalities (105 of 137 as of April 1, 2021) are partners in the Watershed District Program, and with program modernization, interest from the remaining municipalities is growing.

In northern Manitoba, [Resource Management Boards](#) co-manage the natural resources in defined areas (Resource Management Areas). Manitoba Indigenous and Northern Relations serves as the provincial lead in the management and implementation of the boards established under these agreements. Each of the nine existing boards develop and implement land use plans and resource management plans.

Manitoba Hydro is an important contributor to water management, particularly in northern Manitoba, along the Winnipeg and Saskatchewan Rivers and Lake Winnipeg. Manitoba Hydro produces hydropower by operating a network of generating stations. They are a partner in water monitoring, contributing data on water flows and levels, water quality and aquatic ecosystems.

A summary of key provincial and federal water legislation is provided in Appendix D.



Red River during fall 2016.

Appendix A - Major Water Infrastructure in Manitoba

Flood Protection Infrastructure

After the flood of 1950, which devastated much of the city of Winnipeg, Manitoba began investing in various infrastructure solutions to mitigate the impacts of future floods. One of the most significant flood protection measures in Manitoba is the [Red River Floodway](#), which protects the city of Winnipeg. The original floodway was built between 1962 and 1968. However, in response to the 1997 Flood of the Century, Canada and Manitoba invested an additional \$628 million to expand the Red River Floodway to protect the city of Winnipeg from a one-in-700 year flood event.

Located on the Assiniboine River, 24 kilometers northwest of Russell, Manitoba, is the [Shellmouth Dam and Reservoir](#). The dam was designed as a multi-purpose reservoir, and began operating in 1971 to provide flood damage reduction to Winnipeg and other communities along the Assiniboine River, and to provide a more reliable water supply for downstream users. Since construction of the dam, additional operation objectives have emerged, such as flood protection of downstream agricultural lands, ecosystem health requirements and recreational interests on the reservoir. Of particular note is the substantial recreational fishery on this reservoir.



Portage Diversion during the 2011 flood event.

Further downstream, just west of Portage la Prairie is the Portage Diversion, a 29 kilometer long channel that diverts water from the Assiniboine River northward into Lake Manitoba. The [Portage Diversion](#) began operating in 1970 and provides flood protection to the city of Winnipeg and the communities along the Lower Assiniboine River. The [Assiniboine River dike system](#) consists of continuous dikes on both the north and south sides of the river, starting near Portage la Prairie and running along the river to a short distance downstream of Baie St. Paul. The dikes prevent overflows from the river and offer flood protection to a number of communities adjacent to and south of the river, while also protecting agricultural land.

The [Fairford River Water Control Structure](#) is used to maintain water levels on Lake Manitoba upstream of the dam and on the Fairford River, Lake St. Martin and Dauphin River downstream of the dam. Until the flood of 2011, the control structure was effective in managing Lake Manitoba levels within the established range. Based on recommendations from the 2011 Flood Review Task Force and the Lake Manitoba and Lake St. Martin Review Committee, the [Lake Manitoba and Lake St. Martin outlet channels project](#) are being designed to provide enhanced flood protection to both Indigenous and non-Indigenous communities, agricultural producers and recreational users along Lake Manitoba, Lake St. Martin and the Dauphin River.

In addition to the major flood infrastructure investments made by the province, many cities, towns, communities and individuals have invested in flood infrastructure, such as ring dikes around communities and other vulnerable properties.

Water Supply Infrastructure

Winnipeg's drinking water comes from [Shoal Lake](#), located in the southeast corner of Manitoba at the Manitoba-Ontario border in the Lake of the Woods Watershed. Construction of the Winnipeg Aqueduct began in 1915 and was completed in 1919. Since Shoal Lake is at a higher elevation than Winnipeg, gravity carries water down the aqueduct from Shoal Lake to the city.

Other major water supply systems include the Pembina Valley Water Cooperative, a privately held not for profit cooperative owned by fourteen member municipalities. The Cooperative's pipeline distribution system covers a service area of 9,000 square kilometres and serves a population base of approximately 50,000 people. Other major water cooperatives in southern Manitoba include Cartier Regional Water Cooperative and the Yellowhead Regional Water Cooperative.

Manitoba owns and maintains ninety dams, about two-thirds of which were built by the Prairie Farm Rehabilitation Administration (PFRA), including the dams at Stephenfield, Rivers, Morden, Jackson Lake and Neepawa. Many of these dams were built in the 1960s with the primary purpose of water supply (municipal, domestic

and irrigation), stockwatering and water conservation. Many of these reservoirs also now have a recreational component as cottage and campground development has occurred over time. Recreational fisheries have also been developed on many of these sites, adding to the complexity of their management and use. During the last several decades, many communities have transitioned off these small dams for their municipal water supplies and now use more secure groundwater sources or obtain water from a regional water cooperative.

The Lower Assiniboine River Pump Sites transfer water from the Assiniboine River into the Mill Creek, La Salle River and Elm River systems. These three pump sites were constructed in 1984 to provide a dependable water supply for municipal, domestic, irrigation and stockwatering purposes for the La Salle River Watershed.



The spillway at Jackson Lake.

Drainage Infrastructure

Manitoba owns over 4,750 kilometers of provincial drains, and there are many additional kilometers of drains owned and maintained by municipalities and some Watershed Districts. As summarized in the provincial infrastructure inventory, Manitoba owns approximately 13,000 thru-dike culverts and 3,350 culvert crossings (including highway crossings on the agricultural drainage network).

The estimated asset replacement value for Manitoba-owned flood protection, water supply and drainage infrastructure is approximately 7 billion dollars.

Drainage of privately owned land is common, particularly in agricultural areas. Privately owned drainage projects must be registered or licensed under The Water Rights Act.



Major drain maintenance along PR 336.



A drainage network in south central Manitoba.

Links to Select Studies:

- [Assiniboine River and Lake Manitoba Basins Flood Mitigation Study](#) (2016)
- [Manitoba Drought Management Strategy](#) (2016)
- [Provincial Flood Control Infrastructure Review of Operating Guidelines](#) (2015)
- [2011 Manitoba Flood Review Task Force](#) (2013)
- [Lake Manitoba and Lake St. Martin Regulation Review](#) (2013)
- [Inventory of flooding related reports, studies, plans and publications](#)

Appendix B - Hydroelectric Development in Manitoba

Manitoba's rivers have been used commercially to generate hydroelectric power for over a century, with the first generating stations being built in 1911. It was not until 1930 that The Water Power Act and Regulations came into force to ensure the sustainable allocation of the province's water power resources in a competitive environment, where a number of privately owned companies were developing hydroelectric power. In 1961, Manitoba Hydro was established to ensure that all Manitobans had access to reliable and affordable electrical power. Manitoba Hydro operates a network of 15 generating stations on the Nelson, Winnipeg, Saskatchewan, Burntwood and Laurie rivers, which supply 96 per cent of Manitoba's electricity. Manitoba Hydro also exports hydroelectricity to Saskatchewan, Ontario and the United States.

Hydroelectric development began in southern Manitoba with the construction of six generating stations along the Winnipeg River from 1911 to the mid 1950s, and the Grand Rapids generating station along the Saskatchewan River in 1965. Additional stations were built on the Laurie River in 1952 and 1958, and Kelsey generating station was constructed on the Nelson River in 1961 to supply power for mining operations and community development in northern Manitoba. To meet the growing demand for electricity in southern Manitoba, the Churchill River Diversion and the Lake Winnipeg Regulation (including Jenpeg generating station) projects were pursued and completed in the 1970s. Between 1970 and 2012, four additional generating stations were built along the Burntwood and lower Nelson rivers (Wuskwatim, Kettle, Long Spruce and Limestone), and Keeyask generating station is currently under construction with an anticipated completion date of 2022.

The use of storage reservoirs, such as Lake Winnipeg and Southern Indian Lake, allow Manitoba Hydro to store water from peak runoff periods (e.g., spring melt) and then use that water later in the year when demand for electricity is highest (i.e., in winter). This reservoir storage also helps Manitoba Hydro mitigate the risks resulting from the variability in water levels and flows, such as during a prolonged drought.

The Impacts of Hydroelectric Development

The development of hydropower has created a reliable and renewable energy supply that has benefitted many Manitobans. However, this development has also resulted in many adverse impacts to the environment and people, including many Indigenous communities.

In 2013, at the recommendation of the Clean Environment Commission, Manitoba Hydro, in cooperation with the Manitoba government, began a Regional Cumulative Effects

Assessment for all hydroelectric development in the Churchill, Burntwood and Nelson River systems. During hearings for Bipole III, the Clean Environment Commission noted that past hydroelectric developments in northern Manitoba have had a profound impact on communities in the area of these projects, as well as on the environment upstream and downstream. Completed in 2016, the report retrospectively assesses and describes the cumulative effects of hydroelectric development on the people, the water, and the land in these three watersheds.

Appendix C - Transboundary Water Management in Manitoba

Manitoba shares a number of transboundary watersheds with upstream jurisdictions including Alberta, Saskatchewan, Ontario, North Dakota and Minnesota. Because water does not recognize jurisdictional boundaries and flows across borders, activities and developments including drainage, dams, and diversions across these shared transboundary watersheds can impact downstream water quantity and quality in Manitoba.

Manitoba participates in a number of transboundary boards and committees intended to support cooperation on transboundary water management, including:

- [International Joint Commission](#)
- [International Red River Board](#)
- [International Souris River Board](#)
- [International Rainy-Lake of the Woods Board](#)
- [Prairie Provinces Water Board](#)
- [Red River Basin Commission](#)
- [Assiniboine River Basin Commission](#)
- [Partners FOR the Saskatchewan River Basin](#)

Manitoba also has a number of transboundary agreements in place, including:

- [Canada-Manitoba Memorandum of Understanding Regarding Lake Winnipeg and its Basin](#)
- [Saskatchewan-Manitoba Memorandum of Understanding Respecting Water Management](#)

Appendix D - Links to Relevant Legislation

Provincial

- [The Climate and Green Plan Act](#)
- [The Environment Act](#)
- [The Groundwater and Water Well Act](#)
- [The Manitoba Water Services Board Act](#)
- [The Planning Act](#)
- [The Red River Floodway Act](#)
- [The Water Power Act](#)
- [The Water Protection Act](#)
- [The Water Resources Administration Act](#)
- [The Water Rights Act](#)
- [The Watershed Districts Act](#)

Federal

- [Canada Water Act](#)
- [Fisheries Act](#)
- [Species at Risk Act](#)
- [Canadian Navigable Waters Act](#)
- [Constitution Act and the Duty to Consult](#)
- A full list of federal legislation related to water can be [found here](#).