
Manitoba Water Management Strategy Seeking Perspectives: AN ENGAGEMENT DOCUMENT

**Manitoba's Expert Advisory Council
under The Climate and Green Plan
Implementation Act
AUGUST 2020**

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A. What's This All About?

Water is a key resource for Manitoba's people, environment and economy. We all must work collaboratively to ensure water is sustainably managed now and in the future, while considering the impacts of a changing climate and growing economic and social needs. Although much work has been done to build a strong foundation for water management in the province, Manitoba now needs a comprehensive **provincial water management strategy** that sets out the path forward outlining our goals and how we will meet them.

The Expert Advisory Council, established under the Climate and Green Plan Act, have been asked to provide **advice and recommendations to government** on the **scope** and **elements** of a modernized, coordinated provincial water management strategy for Manitoba.

We are looking for your input. The Expert Advisory Council recognizes that stakeholders provide valuable perspectives and experience that will be vital to informing this strategy. As such, the Expert Advisory Council is seeking input from stakeholders on the scope and elements of a provincial water management strategy. The feedback obtained from stakeholders will be reviewed and considered during the development of the Expert Advisory Council's advice and recommendations to government.

This document was developed as a tool for stakeholder engagement, and is intended to provide an overview and background on water in Manitoba and to initiate discussion on proposed key issues, goals, principles, objectives and performance indicators for a provincial water management strategy.

The Expert Advisory Council looks forward to your feedback and ideas as they develop their advice for the Minister of Conservation and Climate. Thank you for your input.



Red River during fall 2016. All images in this document have been supplied by Manitoba Agriculture and Resource Development unless noted otherwise.

B. Manitoba's Expert Advisory Council

Manitoba's [Climate and Green Plan](#) (the Plan) was released in October 2017 and is Manitoba's path to becoming the cleanest, greenest, most climate resilient province in Canada. To help guide the Manitoba Government's initiatives towards this vision, the Expert Advisory Council (the Council) was formed.

The eight member Council was established under Section 7 of [The Climate and Green Plan Act](#), passed by the Legislature of Manitoba on November 8, 2018. The Council is an independent group of experts with a mandate to provide advice and recommendations to the Minister on the Government of Manitoba's Climate and Green Plan. Specifically, under the Act, the Council is to:

- a. provide advice and recommendations to the minister on programs, policies and measures to be included in the climate and green plan;
- b. review progress on the implementation of the climate and green plan, and provide advice on any required changes to the plan; and
- c. provide advice and recommendations to the minister respecting greenhouse gas emissions reduction goals to be established under section 3.

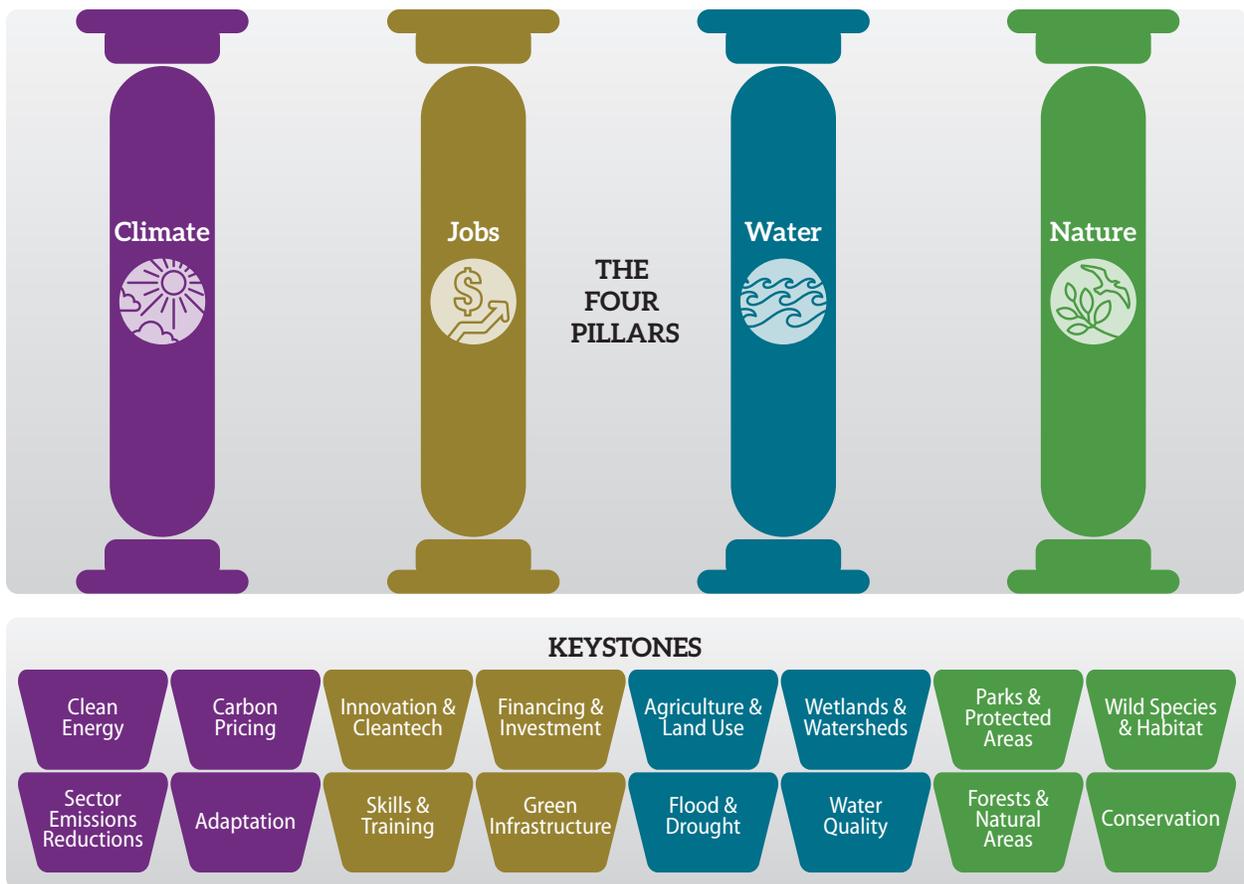
On January 6, 2020, the Minister of Conservation and Climate provided the Council with a [mandate letter](#) that includes a request for them to *provide advice and recommendations regarding the scope and elements of a modernized, coordinated provincial water management strategy for Manitoba* building on approaches enacted by this government.

The advice provided by the Council is to be "comprehensive and holistic" and should consider short- and long-term measures, regulatory and governance changes to support watershed-based management and investments like the Conservation and GROW Trust programs. The advice should consider the potential impacts from a changing climate, including drought and flood cycles and events, as well as recommended actions, measures and governance to sustainably manage water across the province, its basins and its watersheds in a more coordinated manner.

C. Manitoba's Climate and Green Plan and the Water Pillar

The Manitoba Climate and Green Plan is comprehensive and integrated, bringing together the environment and the economy through the strategic approach of sustainable development leadership and innovation.

There are strong links between a changing climate and the health of Manitoba's lands and waters, and these, in turn, are linked to the health of our people and communities. The Plan focuses on the top priorities and needs of Manitobans through its four pillars: Climate, Jobs, Water and Nature.



Water is a key resource for Manitobans, their economy and the natural environment. Manitoba must ensure that water is sustainably managed considering the impacts of a changing climate and growing economic and social needs.

The Water Pillar includes:

- Managing flood and drought;
- Ensuring water quality protection;
- Planning on a watershed scale and protection of wetlands; and
- Agricultural initiatives; support and promotion of best management practices.

The new provincial water management strategy will build on the **Water** Pillar and be a key component to implementing the whole Climate and Green Plan across all four pillars. For example, **Nature** and water go together to conserve Manitoba's natural spaces and species. Species at Risk such as the Bigmouth Buffalo rely on water and associated aquatic habitat that can be impacted by water management. Manitoba's recreational and commercial fisheries generate more than \$450 million per year on average and also could not survive without water. **Climate** change will impact our ability to manage water sustainably as extreme weather events occur and flooding and drought conditions happen. Finally, water is essential to Manitoba's economic base including agriculture and the **Jobs** pillar brings this perspective to bear in creating a provincial water strategy.

D. Building on Past Efforts - Engagement Purpose and Process

Over the past several decades, Manitoba has consulted with the public and stakeholders on water management and water quality, including on Lake Winnipeg. Looking back through time, provincial, federal and other agencies have studied various aspects of water and its management including water infrastructure for drought and flood. Integrated watershed management plans are available for much of southern Manitoba, providing watershed-specific overviews of issues, goals and proposed actions related to water. Additional supporting information is available in [Appendices A through G](#) at the end of this document, and links are provided throughout.

Previous advice and recommendations from Manitobans have resulted in action. Manitobans were recently consulted on various components of the Sustainable Watersheds Bill that modernized four Acts related to water management. Manitoba developed and implemented a new streamlined approach to drainage and water retention under The Water Rights Act that supports “no-net-loss” of wetland benefits. Manitoba has also modernized the former Conservation Districts Program and is now implementing a new Watershed Districts Program that supports healthy and sustainable watersheds in Manitoba. Substantial new funding through the Conservation and GRowing Outcomes in Watersheds (GROW) Trusts are supporting change on the landscape through implementation of activities that create, conserve, or enhance natural infrastructure for the benefit of Manitobans. While this recent work supports a strong foundation for water management, Manitoba now needs a comprehensive water management strategy that sets out the path forward outlining our goals and how we will meet them.

The Council recognizes that stakeholders provide valuable perspectives and experience that will be vital to informing this strategy. As such, the Council is seeking input from stakeholders on the scope and elements of the proposed water management strategy. Engagement meetings with subject matter experts and groups will be held during the summer of 2020. The feedback obtained will be reviewed and considered during the development of the advice and recommendations that will be presented to the Minister of Conservation and Climate later this year.

E. Overview of Water Management in Manitoba

Governance

About 70 per cent of Manitoba's water comes from upstream jurisdictions. While the province of Manitoba is responsible for water management within the province (including for allocation of water, flow regulation, pollution control and authorizing developments that could impact water), the province is greatly impacted by activities and actions that occur outside of its borders. 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 within the province. Jurisdictional complexity is a primary feature of water governance in Manitoba.

The federal government has an important role in transboundary water management and is the lead on Canada-United States arrangements, such as through [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 and 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 A](#). Other federal responsibilities related to water in Canada fall under the federal departments of Environment and Climate Change Canada (including The Canada Water Act), Fisheries and Oceans Canada (Fisheries Act, Species at Risk Act), and Transport Canada (Canadian Navigable Waters Act).

Section 35 of Canada's Constitution Act recognizes and affirms the "existing aboriginal and treaty rights of the aboriginal peoples of Canada". There is also a need for meaningful participation with Indigenous communities and governments in the management of water challenges and development of solutions. Existing formal arrangements with the federal government and between provinces (e.g., the Boundary Waters Treaty or the Master Agreement on Apportionment) do not explicitly include Indigenous governments. Opportunities for inclusion are expanding, including through changes to The Watershed Districts Act to allow formal partnerships with Indigenous governments. Efforts are also ongoing to ensure watershed plans include input from those in Indigenous communities. Shared governance models are also being developed at the municipal level with Indigenous governments, such as the [Collaborative Leadership Initiative](#).

Municipal governments have a role in water management in southern Manitoba. Municipal governments build and maintain water infrastructure including drainage works and water and wastewater treatment facilities. Some municipal governments are members of water co-operatives that supply water for drinking and other uses (for example, Pembina Valley Water Coop). Municipal governments are also the main partner in Watershed Districts, which are at their core provincial-municipal collaborations to deliver water stewardship programs. Most of Manitoba's municipalities (104 of 137 as of January 1, 2020) are partners in the Watershed District Program and with the modernization of the program, interest from the remaining municipalities is growing.

Within the provincial government, primary responsibility for water can be found in several departments including Manitoba Infrastructure (flooding and infrastructure), Manitoba Agriculture and Resource Development (Watershed Districts, incentive programming, extension, drought, fisheries, and water science including water quality, groundwater and sustainable allocation), Manitoba Conservation and Climate (drainage and water use licensing, Environment Act licensing, drinking water). Other provincial departments including Municipal Relations (the Manitoba Water Services Board which assists municipalities with the development of sustainable water and wastewater works, and Community Planning which assists municipalities and planning districts in developing sustainable land use and development plan policies) and Indigenous and Northern Relations (provision of water and wastewater services to northern communities) also play a role in water and its management in Manitoba.

Finally, Manitoba Hydro is an important stakeholder in water management including in northern Manitoba, along the Winnipeg and Saskatchewan Rivers, and in Lake Winnipeg. In addition to activities that have altered the hydrology of several major river and lake systems, Manitoba Hydro is a partner in water monitoring contributing data on water flows and levels, water quality, and aquatic ecosystems.

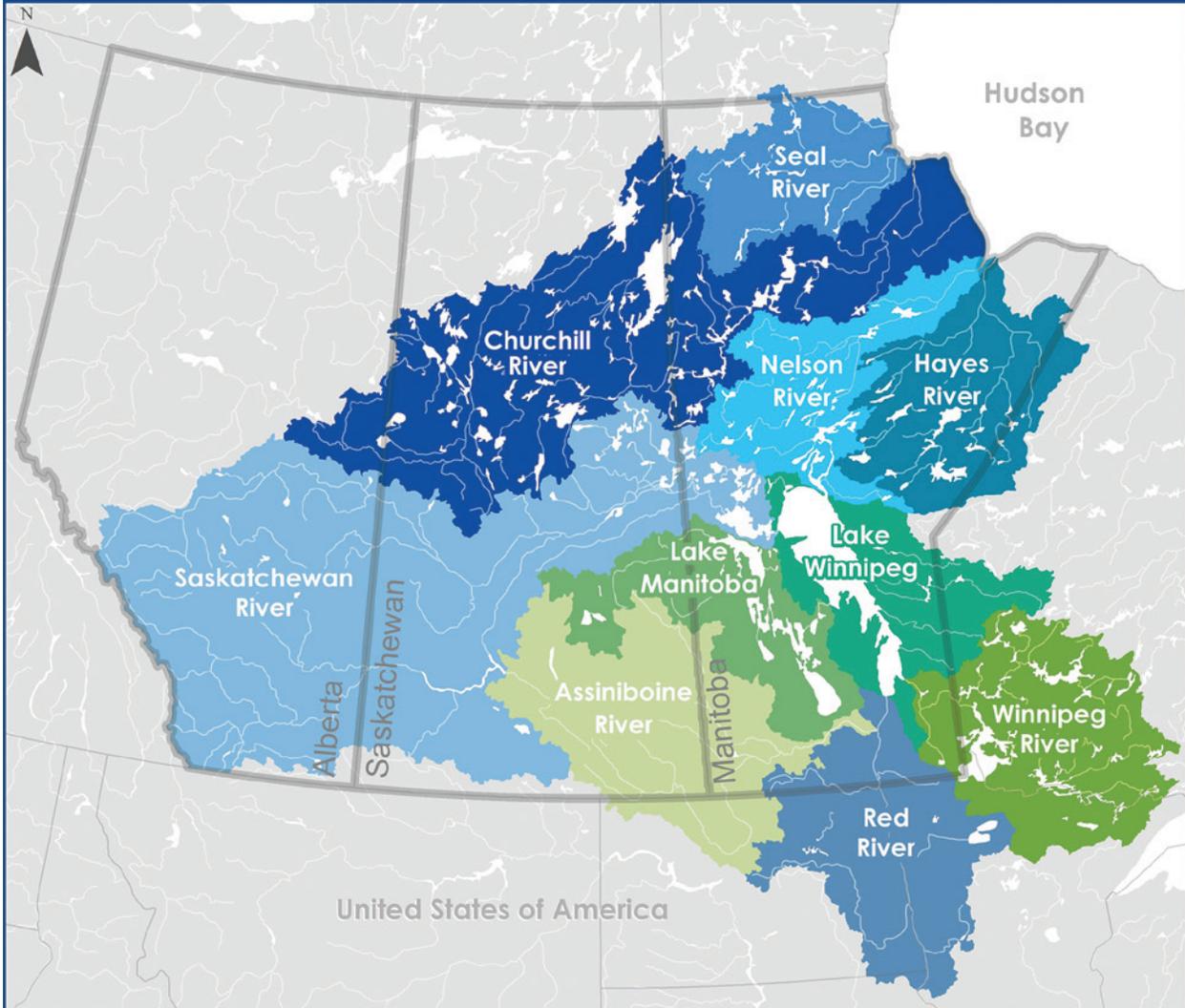
Surface Water Hydrology

The Nelson River Watershed, which includes all of southern Manitoba, is one of the largest drainage areas in the world. It extends from the Rocky Mountains in the west to within kilometres of Lake Superior to the east. Waters from the Red, Winnipeg, Assiniboine/Souris, and Saskatchewan Rivers, in addition many other smaller tributaries, flow into Lake Winnipeg, continue downstream via the Nelson River and eventually discharge into Hudson Bay. Further north, the Hayes and Seal River Basins drain directly to Hudson Bay, alongside a portion of the Churchill River.



Prairie pothole landscape north of Brandon, Manitoba.

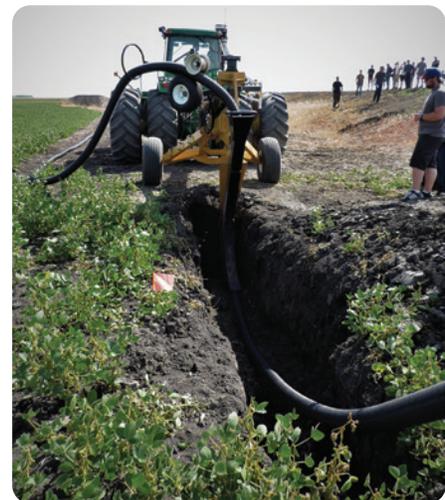
Major Drainage Basins Contributing to Manitoba



Major drainage basins contributing to Manitoba.

The vast geographic drainage area and cold continental climate are key factors that define Manitoba's water resources and cumulate into one driving force – variability. 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 transition quickly from one to the other within a season. This incredible variation is the paramount challenge in water management in Manitoba.

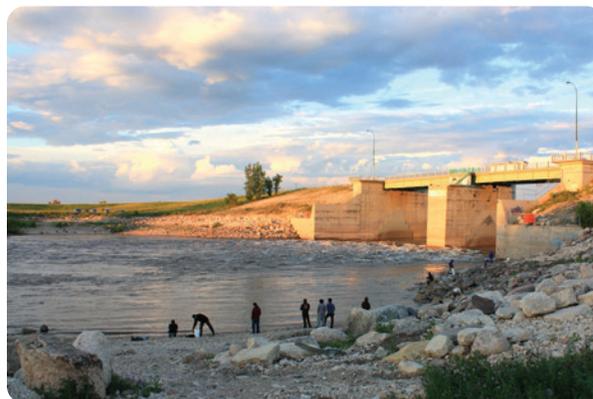
Floods and droughts both play a large role in Manitoba. Extreme floods have occurred throughout the history, including notable events in 1826, 1950, 1997, 2011 and 2014. Most large floods occur during spring as the snow melts. However summer rainfall events can cause significant flooding as well. Although rare, large scale precipitation events can cause significant floods at the basin scale such as the Red River in 2005, the Souris River in 2011, and the Assiniboine River in 2014. While floods generally



Tile drainage installation.

cause intense, localised damage for a short period of time, droughts can occur over large areas and can last for months or even years. Though droughts can occur anywhere in Canada, the most severe and widespread droughts occur on the prairies. In the southern regions of Alberta, Saskatchewan and Manitoba, multi-year droughts were observed in the 1890s, 1930s, 1980s, and 2000s and had vast socioeconomic and environmental impacts. Seasonal droughts occur more frequently and can significantly impact various industries, particularly the agricultural sector.

The natural variation in hydrology in Manitoba is overlaid by anthropogenic landscape changes and infrastructure. Changes include land use change and land management, road networks, dams, dikes, diversions, and artificial drainage networks that all affect the volume and timing of water flowing through Manitoba's lakes and rivers. In inhabited areas, road network ditching and artificial drainage channels have greatly increased the connectivity of the watershed. As a result, water is conveyed more quickly, the contributing drainage area is significantly increased, and the rivers are less effective in fulfilling their natural riverine function,



Floodway control structure.

including to provide aquatic habitat. Manitoba's water control infrastructure, such as the Floodway, receives global recognition for effective flood mitigation. Reservoirs, such as Shellmouth Reservoir, allow for reliable drinking water and irrigation through multi-year droughts. Manitoba Hydro operates fifteen generating stations across the province, supplying about 96 per cent of Manitoba's electricity from hydropower. Large infrastructure projects, such as the Churchill River Diversion, have significant influence on the water regime across large regions of Manitoba, altering flows and levels from their natural fluctuations to a more regulated regime. 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 B](#) and hydroelectric development in [Appendix C](#).

Surface Water Quality

Surface 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, and industry and to support fish and other aquatic life. Water quality depends on watershed characteristics including the hydrological and precipitation regime, soil characteristics, and vegetation cover. Land use practices and management (including of water) also greatly influence water quality in rivers and streams.

The Province of Manitoba assesses water quality through the measurements of general chemistry, nutrients, metals, pesticides, bacteria, algae, and physical parameters such as turbidity. Measurements are compared to [Manitoba's Water Quality Standards, Objectives and Guidelines](#) which establish science-based numeric limits or narrative statements for water quality. 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 Water Quality Index to summarize large, complex water quality datasets and to communicate water quality changes. When compared over time, the Index provides a useful indicator of how water quality may be changing, whether conditions are deteriorating or improving, and which parameters are changing. The Water Quality Index is calculated on an annual basis for each waterbody and produces a number between 0 (poor water quality) to 100 (excellent water quality) that is indicative of overall water quality.

Water Quality Index results for Manitoba rivers are compiled for each ecoregion of the province and the most recent information available is for 2018. Within the Boreal Shield Ecozone, the Water Quality Index was 97 or excellent quality. In the Boreal Plains Ecozone, the Water Quality Index was 78 or fair quality. Within the Prairie Ecozone, the Water Quality Index Value was 71 or fair quality. Therefore, across the rivers and streams monitored, the CCME Water Quality Index definitions indicate that water quality in Manitoba is generally protected with only occasional impairments or conditions that depart from natural or desirable levels. In general, water quality is higher 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. Water Quality Index results are available from 1992 to 2018 and suggest that while there is some inter-annual variability, water quality is relatively stable in each Manitoba ecozone.

Manitoba also works with Canada and other partners to measure and report on physical, chemical and biological conditions in Lake Winnipeg, including related to water quality. In April 2020, the Province of Manitoba 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, will help in the assessment of the overall health of the lake, and also provides key information to support current and future research on Lake Winnipeg. You can access the State of Lake Winnipeg report and learn more about Lake Winnipeg at www.manitoba.ca/lakewinnipeg.

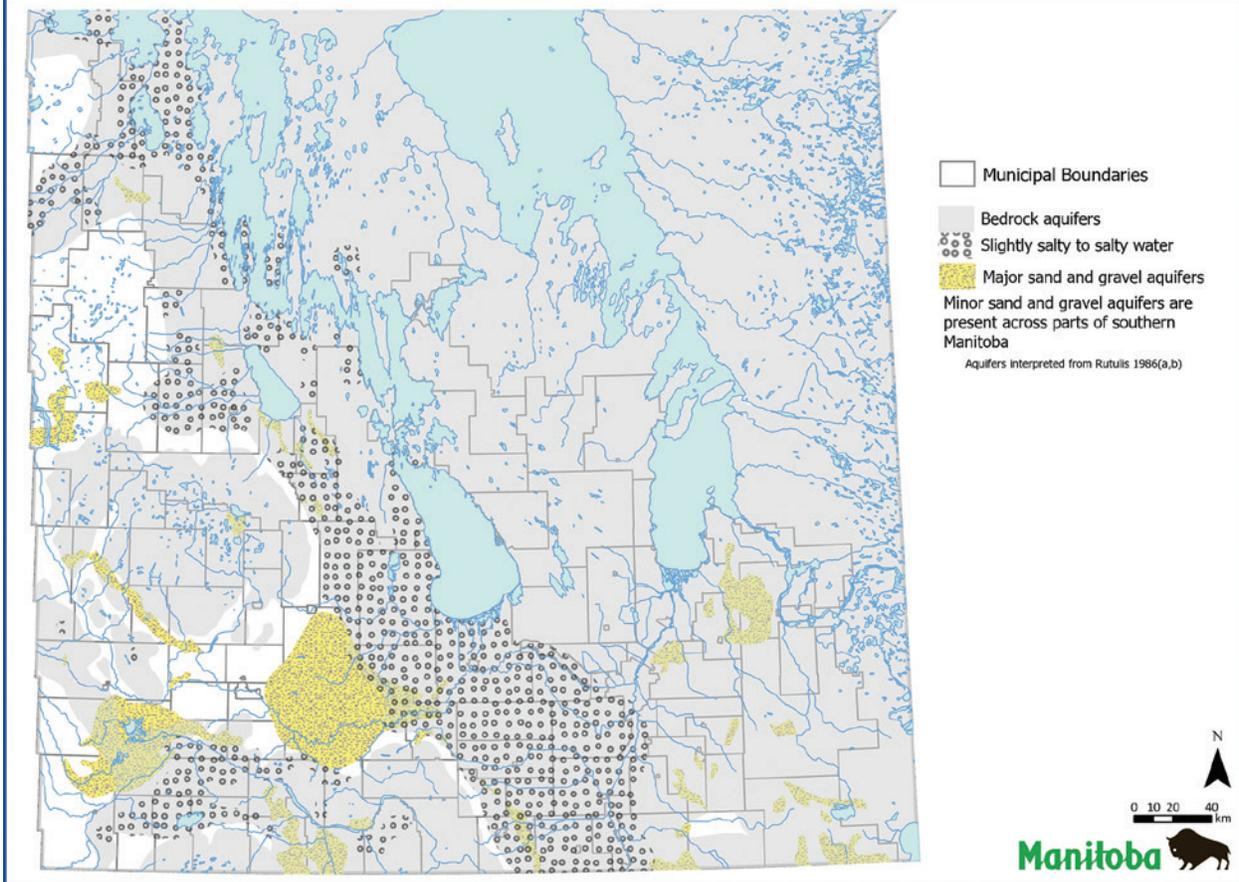
Groundwater

Groundwater exists everywhere under the ground but it can only be developed in usable quantities when it is stored in porous sediments and rocks called aquifers. Manitoba is fortunate to have an abundance of high quality, high yielding aquifers that can be used as a reliable source of water. Outside of the City of Winnipeg, the majority of Manitoba's residents rely on groundwater for their domestic requirements. Groundwater is also commonly used for livestock watering, irrigation, parks, industrial and municipal water supplies. Groundwater discharging to the surface is also important in sustaining many streams and rivers, wetlands and their ecosystems.



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

Generalized Aquifers in southern Manitoba



Generalized Groundwater Aquifers in Manitoba.

Aquifers are recharged from spring snow-melt and large rainfall events. Many aquifers store large quantities of water that is less affected than surface water by short- or medium-term droughts, which adds reliability and resiliency to water supplies. Groundwater quality is also less variable than surface water and frequently requires less treatment to meet drinking water guidelines in municipal water supply systems.

Although some aquifers may be very close to the ground surface which can be more readily affected by surface contamination, many aquifers are deeper and provide a significant natural barrier to contamination. In areas where there is little protective cover over an aquifer there is potential for contamination of the groundwater, such as in the [Rockwood area](#). Other areas of the province have naturally occurring groundwater quality issues. 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 a direct conduit for surface contamination to enter an aquifer and diminish water quality and local groundwater sustainability.

Groundwater may be at risk from overexploitation and the province currently manages several major aquifers with defined allowable water use limits and have developed local aquifer management plans. Groundwater resources are wasted where artesian wells are left to [flow](#) unrestricted. This leads to local concerns such as ice build up in ditches during the winter, localized flooding and southeast of Winnipeg, a substantial decrease in the flowing well area since the region was first settled.

Aquifers are mapped using subsurface information most commonly derived from water well reports. Widespread groundwater occurrence and aquifer mapping was completed in the province from the 1970s to the 1990s, resulting in large and medium sized aquifers being mapped. However, smaller aquifers are not mapped and newer information exists to refine boundaries of larger aquifers. Mapping is required to understand the groundwater resource including management and licensing. 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

Manitoba maintains a number of monitoring networks to help us to understand the quality and quantity of water available in the province. For many of these networks, the Manitoba government 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.

For water quantity, Manitoba is a partner with the federal government and Manitoba Hydro in the [Manitoba Hydrometric Program](#) which monitors water levels and flows in rivers and lakes. The long term network includes stations that have been monitored since 1906. Manitoba also operates a [provincial groundwater monitoring network](#) consisting of more than 850 monitoring wells that are used to evaluate and monitor ambient groundwater quality and water levels in major aquifers.



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



Water quality sampling of Manitoba's lakes and rivers.

Since the 1970s, the province has [maintained a long-term water quality monitoring program](#) on major streams, rivers and lakes at more than 65 sites throughout Manitoba where up to 150 water quality variables are measured. Long-term monitoring at some sites has been supported by partnerships with Watershed Districts, Manitoba Hydro and the University of Manitoba. Manitoba has also maintained an active long-term water quality monitoring program on Lake Winnipeg since 1999 to assess the changes to water quality and evaluate impacts to aquatic life. Work on the lake is facilitated by the Lake Winnipeg Research Consortium and their research vessel the MV Namao.

There are also other monitoring networks that provide critical information to complement information collected on water quality and quantity. For example, Manitoba maintains several weather networks, monitors soil moisture, and collects information on fish and other aquatic species. There are also programs such as the Coordinated Aquatic Monitoring Program (CAMP), a partnership between Manitoba Hydro and the Province of Manitoba, where multiple measures of ecosystem health (water quality, benthic invertebrates, fish, etc) are monitored and tracked in a coordinated manner.

F. Key Issues

The following section introduces a high level summary of the key water issues that should be considered when developing a Provincial Water Management Strategy.

Key Issue 1: Water Sustainability

Although the supply of surface water and groundwater in Manitoba is generally adequate and of excellent quality, water may not be available where or when or in the quantity or quality it is needed to support basic human needs, the natural environment, and economic development.

In agri-Manitoba, demand for water is highest during the growing season. However, many of Manitoba's streams only flow reliably during spring snowmelt. Water use from these intermittent streams is less desirable as it comes with a higher risk of water shortage and requires construction of off-channel storage. This has resulted in higher water use within certain regions of the province that have lower risk, more secure water sources such as aquifers or rivers with storage infrastructure allowing for continuous flows (e.g., Shellmouth Reservoir/Assiniboine River). Other areas of agri-Manitoba have an abundance of water available throughout the year but may be limited by water quality challenges that makes use from these sources (primarily groundwater) undesirable. For example, bedrock aquifers in the Red River Valley west of the Red River and south of the Assiniboine River are too saline to develop for most purposes without extensive treatment. Deeper bedrock aquifers in the western portion of the province are also generally saline. This salinity is a naturally occurring phenomenon.

Although water is still available within most regions, and readily available in northern Manitoba, several surface water and groundwater sources in southern Manitoba are close to or fully allocated, including the Boyne River and much of the Assiniboine Delta Aquifer. Additional information on the licensing and allocation of water within Manitoba can be found in [Appendix D](#). In these areas of high demand, the potential for economic development and growth have become limited, particularly in the agricultural sector. As industry and social needs continue to grow in the future, Manitoba will face increased pressure to further develop existing water supplies or risk further limiting growth. We also know that projected changes in future climate and hydrology will have impacts to water supply and demand. However, water availability under a changing climate and future demand across sectors are currently not fully understood.



Irrigated potato production west of Carman, Manitoba.



The spillway at Stephenfield Reservoir.

Want to know more about how Manitoba considers the instream flows that are necessary to ensure that aquatic ecosystems are protected and maintained? **Appendix E** provides more information on how **instream flow needs** are assessed in Manitoba.

Water sustainability is further impacted by competing uses for water and the conflicts that arise due to the management and operation of multi-purpose water infrastructure. Multi-purpose water infrastructure includes reservoirs, diversions, or other water infrastructure that aims to optimize several objectives, such as flood control, water supply, or recreation. An example of multi-purpose water infrastructure in Manitoba is Shellmouth Dam and Reservoir. An additional consideration is Manitoba's downstream location relative to other jurisdictions. Upstream activities and developments can impact water sustainability in Manitoba. To that end, Manitoba supports and participates on many transboundary water management organizations, boards, and task teams to collaboratively manage transboundary waters.



Irrigation pumps along the Assiniboine River.

Key Issue 2: Extremes in Moisture

Water management in Manitoba is characterized by variability and extremes, and the province has experienced severe floods and droughts throughout time, resulting in substantial impacts to communities, infrastructure, the economy and the environment.

Since the devastating flood of 1950, southern Manitoba has implemented extensive flood control measures, particularly in the Red River Valley and the Assiniboine River Basin. Since the 1997 "Flood of the Century", more than \$1 billion has been invested in flood mitigation efforts in Manitoba, preventing tens of billions of dollars in damages. The system mitigates human risk and infrastructure damage during flood events, resulting in a considerable decrease in the number of properties damaged and the number of people evacuated during spring floods. However, damages from recent floods are still significant. For example, the 2011 flood had an economic impact of over a billion dollars, including hundreds of millions of dollars of financial assistance payments and 2.9 million acres of farmland left unseeded, as well as multi-year disruptions to infrastructure systems and emotional stress for thousands of Manitobans.



Floodwaters cause road closures in the RM of Ritchot in 2011.



Aerial view of flooding in southeastern Manitoba.

To further mitigate flood risk, there are two **Designated Flood Areas** (DFAs) in Manitoba under Section 17 of The Water Resources Administration Act. Any new, permanent structures to be built within the Red River DFAs must be constructed with flood protection to a specified flood protection level (e.g., 200-year flood). More recent flood protection investments include the Lake Manitoba and Lake St. Martin outlet channels that 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. A summary of major flood protection, water supply and drainage infrastructure in Manitoba is provided in **Appendix B**.



Excess moisture on agricultural land near Carman, Manitoba.



Dry, cracked soils during a drought event in agri-Manitoba.

While much has been done to mitigate the risk of flooding in Manitoba, the risk of a severe multi-year drought is of particular concern for the province. Droughts extending over a broad area can have significant effects on a wide range of water sensitive sectors, including agriculture, power generation, fisheries, forestry, drinking water supplies, recreation, as well as on wildlife and aquatic ecosystems. In some areas of the province, available water supplies during a multi-year drought may not be adequate to meet the demands of all licensed and domestic users. Other

water users may not have adequate infrastructure to access water at low flows or levels. As the last severe multi-year drought occurred in the late 1980s, there is not a comprehensive understanding of these potential vulnerabilities under current water use and infrastructure arrangements. The **Manitoba Drought Management Strategy** was released in 2016 to increase Manitoba's resiliency to drought and minimize the impact of future droughts. Work is ongoing to implement the initiatives outlined in the strategy, including assessments of drought preparedness at the basin-scale.

Extremes of moisture can result in significant losses for the agriculture sector in particular. For instance, wet weather in spring can delay seeding and result in lower yields or large areas left unseeded. Extreme flood events, such as in 2011 and 2014, can have tremendous impacts on farmers and on Manitoba's economy. Wet weather in the fall (e.g., 2019) can also lead to losses and cause challenges for harvest. In some cases, producers have to deal with both extremes within the same season. There is a need for farms to become more resilient to withstand the on-farm challenges that accompany these extremes in moisture.



Floodwaters wash out a road near Forrest, Manitoba during unprecedented rains in June 2020.

Key Issue 3: Maintaining Healthy Watersheds

Healthy watersheds provide significant ecological goods and services such as clean water, wildlife and fish habitat, biodiversity, and increased resiliency to extreme events. Some of the economic benefits of healthy watersheds include reduced drinking water treatment and infrastructure costs, reduced flood and drought mitigation costs, increased property values, and increased revenue and job opportunities, including through recreation.

Clean water is essential to sustain important water uses including for drinking, recreation, irrigation, livestock and to protect aquatic life. A key water quality issue in Manitoba is excess nutrient loading, which is of the major factors contributing to algal blooms on Lake Winnipeg and in other waterbodies across Manitoba. Though nutrients are required for healthy lakes and rivers, excess nutrients can lead to harmful algal blooms that can spoil drinking water, ruin beaches, reduce property values, and damage fish and other aquatic life. Many freshwater ecosystems around the world have experienced more frequent and intense algal blooms in recent decades, including Lake Winnipeg. These changes are further accelerated by wet cycles that transport greater nutrient loads to Lake Winnipeg and rising temperatures that favour the development of cyanobacteria or blue-green algae blooms.



Interlake field inundated by snowmelt in 2014.



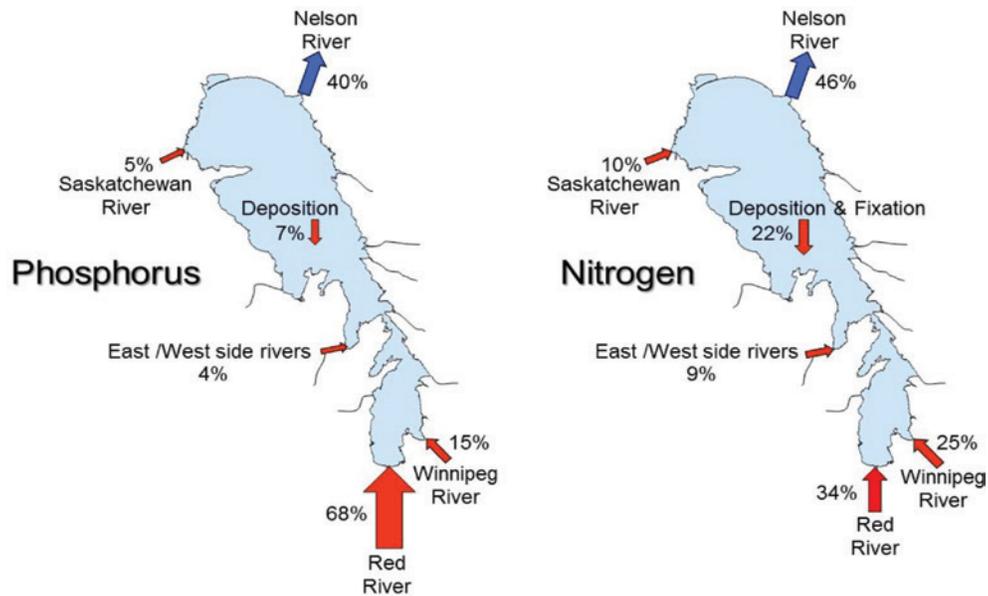
Excess moisture on agricultural land in the RM of Grey.



Photo of a typical cyanobacteria algal bloom.

Actions to improve water quality in Lake Winnipeg are challenging due to the large scale of the Lake Winnipeg watershed, over one million square kilometres, and the many small sources of nutrients across the basin. Virtually all of our activities across the Lake Winnipeg watershed, including point sources such as wastewater discharges and non-point sources such as runoff from agriculture and urban areas contribute nutrients to Lake Winnipeg. Approximately 70 per cent of the water and 50 per cent of the nutrients in Lake Winnipeg originate from outside Manitoba. Therefore, Manitoba continues to work closely with our neighbouring jurisdictions to take action to improve water quality and reduce nutrients. Water quality objectives for

nutrients are in place in the rivers that flow into Manitoba from the west through the Prairie Provinces Water Board. For the Red River, which contributes about 70 per cent of the nutrient load to Lake Winnipeg, the International Joint Commission's International Red River Board has recommended nutrient load targets and concentration objectives that are being considered for adoption by the United States and Canadian federal governments.



Percent contribution of main tributaries to annual average total phosphorus and total nitrogen loads to Lake Winnipeg (from *Lake Winnipeg: Nutrients and Loads, a Status Report*, Manitoba Agriculture and Resource Development)

Of the 50 per cent of the nutrient load that comes from within Manitoba, approximately one third comes from municipal and industrial wastewater, one third comes from runoff from land including from agricultural areas, and one third is considered natural background that would have reached Lake Winnipeg even in the absence of human activities.

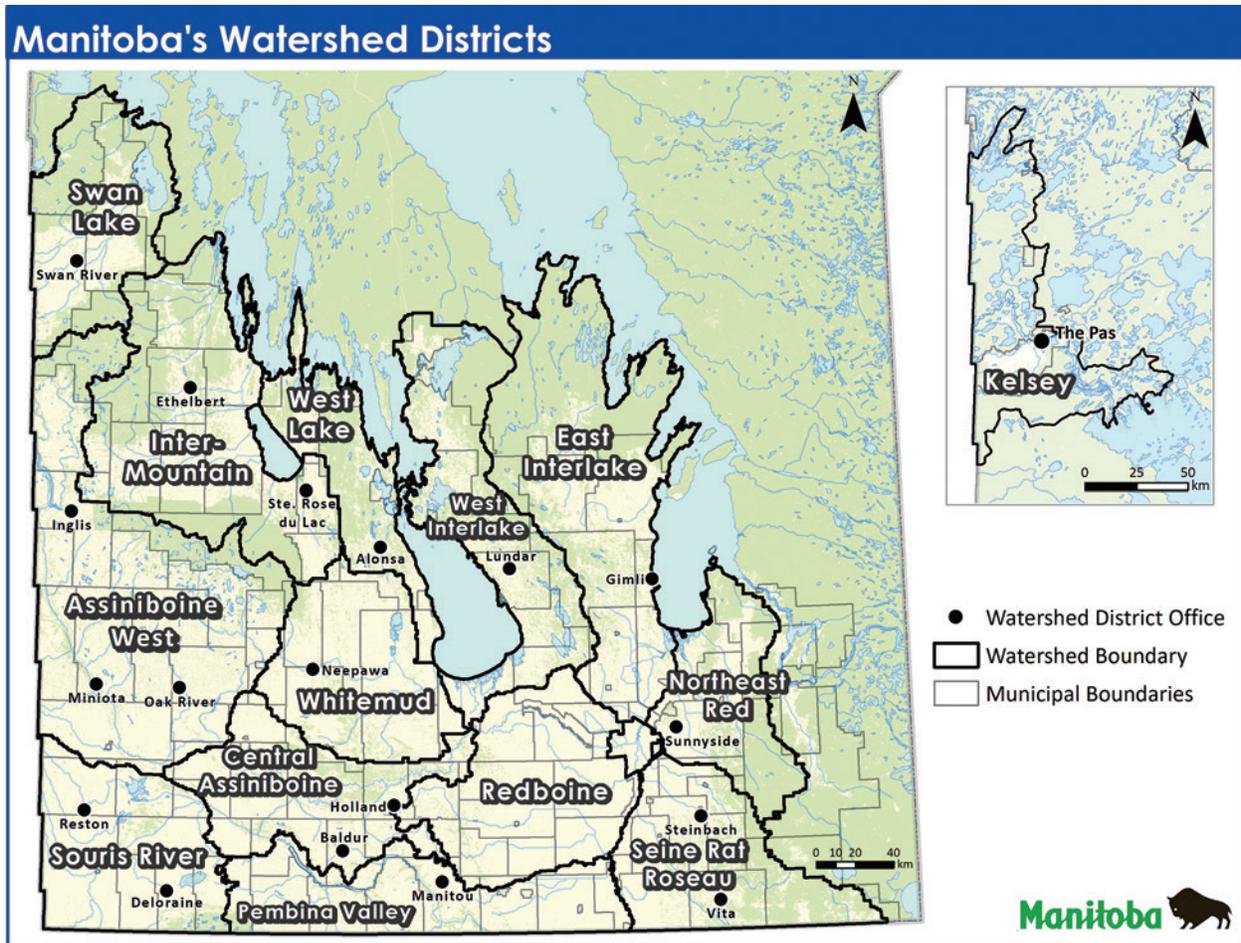
Aquatic Invasive Species

Invasive Species are organisms (animals, plants, parasites, viruses) not native to a region that when introduced, either intentionally or accidentally, may out-compete native species for available resources. Invasive species may become successful in their new environments due to their high reproductive rates and absence of native predators and diseases. Invasive species can have negative economic, social, environmental and human health implications.

Manitoba has a program to stop the spread of aquatic invasive species such as zebra mussels from invaded to uninvaded waterbodies within Manitoba, and to prevent the introduction of aquatic invasive species into the province. The program is focused around five main pillars including Legislation; Prevention (including the Watercraft Inspection, Public Engagement and Partnership programs); Monitoring; Early Detection and Rapid Response; and Adaptation. The future provincial water management strategy will not include a strategy for the prevention and mitigation of aquatic invasive species. However, you can learn more about aquatic invasive species and work underway in Manitoba [here](#).

Manitoba has shifted to a watershed-based approach for delivery of water management activities that support healthy watersheds. In particular, Manitoba's new [Watershed Districts Program](#) has shifted to watershed-based boundaries. The Watershed Districts Program is focused on supporting healthy and sustainable watersheds through water and land stewardship programs and partnerships. Watershed Districts also lead the development of [integrated watershed management plans](#) across southern Manitoba. Twenty-three plans have been developed to date and four more are currently in development. Of the twenty-three plans, nine are approaching the end of their implementation cycle and will be coming up for renewal in the next few years.

As the Water Planning Authority under The Water Protection Act, the watershed district takes a ground up approach working with local residents, stakeholders and the provincial government to identify key watershed issues, goals for the watershed, and actions that should be taken to address the issues. Integrated watershed management plans and the planning process continues to evolve over time. For example, newer plans include more watershed specific technical products such as source water protection plans and surface water management plans including a distributed water storage study and a drought preparedness study that outlines how prepared the watershed is for future droughts and assessments of water retention opportunities. Efforts to enhance the planning process are underway to increase implementation activities outlined in the plans. You can learn more about watershed districts and watershed planning in Manitoba at manitobawatersheds.ca.



Manitoba's Watershed Districts.

Manitoba also has a framework specific to aquifer management planning under The Groundwater and Water Well Act that mirrors the watershed management planning process under The Water Protection Act. Aquifer management plans identify issues relating to the protection, management, conservation or restoration of groundwater within an aquifer management zone. Three aquifer management plans were developed prior to the implementation of the Act ([Winkler](#), [Oak Lake](#), [Assiniboine Delta Aquifer](#)) and are in various stages of implementation.

Northern Manitoba

Manitoba's Watershed Districts Program and the current watershed management planning process focus on southern Manitoba. While specific water issues may be different in the north, there may be opportunities to expand formal planning activities under The Water Protection Act to northern Manitoba. **Resource Management Boards** may be an option for water planning in northern Manitoba. Through the respective adverse affects settlement agreements (for example, Northern Flood Agreement, Grand Rapids Forebay and others), Resource Management Boards were established to 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 are mandated to develop and implement land use plans and resource management plans and could provide a natural forum for conversations around water management in the north.

Manitoba Hydro is an important stakeholder in water management including in northern Manitoba, along the Winnipeg and Saskatchewan Rivers, and in Lake Winnipeg. The Manitoba Government and Manitoba Hydro are partners in the Coordinated Aquatic Monitoring Program (CAMP) with an objective to track aquatic ecosystem health. CAMP uses scientifically defensible methods to monitor environmental effects associated with hydroelectric development in Manitoba. CAMP also monitors waterbodies outside of Manitoba Hydro's generating system. These off-system waterbodies will help determine how other factors, like climate, affect the aquatic environment. You can learn more about CAMP here <http://www.campmb.com/>.

Key Issue 4: Emerging Risks

There is a need to improve the understanding of future risks to water management in Manitoba and to implement adaptation measures to increase preparedness and resiliency. Issues such as climate change, land use change, and contaminants of emerging concern are all risks that Manitoba will face in the near future.

Climate change poses real and potentially significant risks to Manitoba's environment, economy and the social fabric of our communities. **Canada's Changing Climate Report** shows that that Manitoba will experience warmer temperatures, changes in precipitation and a greater frequency of extreme events, including droughts and floods. Additionally, changes in climate are also expected to shift the timing and availability of water, with increased risk of water supply shortages in summer. Climate models indicate that agricultural regions will likely see hotter, drier, and longer summers, but increased fall, winter and spring precipitation. The occurrence of such changes to climate are likely to have significant implications on water supply, agriculture, and the environment; the impacts, however, are currently not well understood.

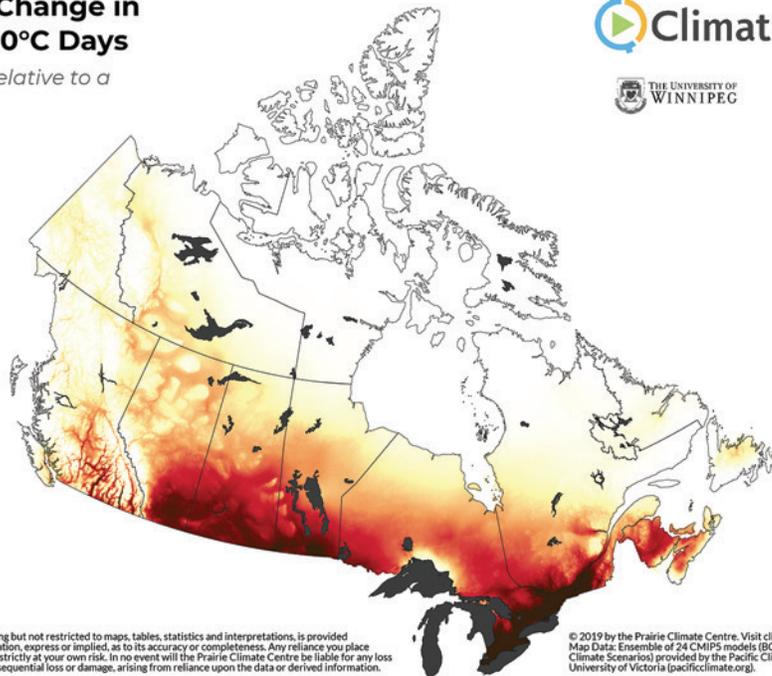
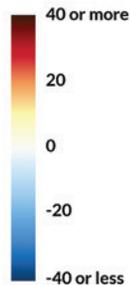
Agriculture is a key industry in Manitoba and an adequate supply of clean water is imperative for this important sector to continue to flourish. Presently in the province, less than 1 per cent of cropland is irrigated. Higher value crops such as potatoes and vegetables tend to fall within that 1 per cent while the vast majority of producers are dryland farmers. However, over the past 10 years there has been a trend towards more irrigation of non-specialty and, in particular, long-season crops. Climate change is a looming threat to this sector, with projected changes in future climate and hydrology posing additional stress on existing areas of high demand and low supply. Hotter and drier summers may potentially make the crop water deficit in Manitoba large enough where it becomes economically viable to irrigate more crops, thus further increasing the demand for water.

2051-2080 Projected Change in Annual Number of +30°C Days

Under the *RCP8.5* scenario, relative to a baseline of 1976-2005



Change in Days
Relative to 1976-2005



The information disseminated by the Prairie Climate Centre including but not restricted to maps, tables, statistics and interpretations, is provided as a public service. It is provided without any warranty or representation, express or implied, as to its accuracy or completeness. Any reliance you place upon the information contained here is your sole responsibility and strictly at your own risk. In no event will the Prairie Climate Centre be liable for any loss or damage whatsoever, including without limitation, indirect or consequential loss or damage, arising from reliance upon the data or derived information.

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Another emerging risk facing Manitoba are contaminants of emerging concern (CEC). CECs are natural and/or man-made chemicals and other substances that may be detected in the environment at concentrations that may cause adverse effects to aquatic life, wildlife, and human health. Scientists have only recently been able to study the impacts of CECs due to improvements in analytical laboratory procedures. Examples of CECs include pharmaceuticals and personal care products, endocrine disrupting compounds, persistent organic pollutants, flame retardants, surfactants, nanomaterials (e.g., silver nanoparticles), microplastics, among others. CECs are released to aquatic environments from a variety of point and non-point sources. Wastewater treatment facilities cannot fully remove CECs during the treatment process and these contaminants can be discharged directly to surface waters. Although toxic effects to aquatic ecosystems are known for some compounds, many CECs lack water quality objectives or guidelines making environmental risk assessments challenging. For example, estrogenic compounds detected in aquatic environments downstream of wastewater treatment facilities have been shown to cause endocrine disruption and the feminization of male fish resulting in changes to their behaviour, physiology and reproduction. While some CECs degrade in the natural environment, others have the potential to persist for long periods and may bioaccumulate or biomagnify up the food chain.

G. Alignment with Provincial Priorities

Below is a high level summary of Manitoba’s provincial priorities that relate to water. Priorities are provided to initiate discussion as to which priorities are most important to Manitobans and where there may be opportunities to align our future water management strategy to these priorities.

Provincial Priority 1:

Effective watershed governance that enhances watershed planning and engagement of all stakeholders and rights holders across watersheds.

As noted above, water governance in Manitoba includes the province of Manitoba, the federal government, indigenous governments, upstream jurisdictions, municipal governments and others. While water does not recognize jurisdictional boundaries, responsibilities of the various governments is based on administrative boundaries and this impacts the application of acts, regulations, bylaws and water programming.

Within the province, Manitoba has shifted to watershed boundaries for water planning and stewardship programming. Manitoba’s integrated watershed management planning process is established under The Water Protection Act and requires consultation with specific entities including municipalities and Indigenous communities. Watershed Districts are the planning authorities for integrated watershed management plans and with support from the province, districts engage local communities and key stakeholders to develop watershed plans. Action resulting from the locally developed plans is also enhancing the focus on delivery of local action including through incentive funding such as the **GROW** and **Conservation Trusts**. Other engagement on water management occurs through consultation on specific issues such as drainage (https://www.gov.mb.ca/sd/consultations/pdf/drainage_discussion.pdf) and through transboundary water groups such as the Red River Basin Commission and the Assiniboine River Basin Initiative.



Blackbird Creek on a sunny day.



An agri-Manitoba valley landscape.

Open MB provides Manitobans with a place to engage with government to share ideas, stories and knowledge. It is also an easy way to find government reports and data. Engage MB is part of Open MB and provides a platform for sharing views as part of the Manitoba government decision-making process.

Provincial Priority 2:

Promoting sustainable land use planning initiatives, including agricultural, development and environmental considerations.

Land use planning in Manitoba is legislated by **The Planning Act** and guided by the **Provincial Planning Regulation**. The Provincial Land Use Policies (PLUPs) state the provincial interest in land, resources and sustainable development, and serve as a guide to planning districts and municipalities in preparing local development plans. The PLUPs include nine policy areas, each focused on a specific area of provincial interest supported by land use planning. For example, the Agriculture, Water, and Infrastructure Policy Areas all recognize the importance of protecting land and water resources to ensure a healthy environment and support climate change mitigation and adaptation. The General Development policy ensures that development minimizes economic risks to the public, anticipates future needs and cumulative impacts, protects ecological integrity and maximizes public investments.



Riparian area in an agri-Manitoba valley.

The planning process also requires local authorities to prepare **drinking water** and **wastewater management plans**. Development plans are required under The Planning Act to consider and be mutually supportive of the policies of integrated watershed management plans and aquifer management plans. A development plan must consider sound land use planning, including sustainable land use, climate change mitigation and adaptation, and water quality protection.



Municipal lagoon at Treherne during spring snowmelt.

There are formal linkages between land use planning and watershed planning through The Planning Act and The Water Protection Act. However, given the critical link between activities on the land and their impact on water, there may be opportunities to further strengthen these linkages. Scale is also an important consideration for planning activities, both for land and water. Development plans could be guided by broader regional plans and watershed plans could be guided by basin level plans.

Provincial Priority 3: Committing to no net loss of water retention in watersheds.

Manitoba's Climate and Green Plan commits to a no net loss of water retention in watersheds. With wetland loss across the prairies, many watersheds have lost significant portions of their water holding capacity. The intent of the commitment under the Climate and Green Plan is to enhance the capacity of watersheds to hold water thereby reducing flooding, mitigating drought, and potentially providing an alternate water source for water users such as irrigators. Water retention in watersheds can be enhanced through wetland restoration and construction, through the construction of water retention structures such as dugouts and irrigation reservoirs, and through improved soil health.



Wetlands in the Pembina Valley Watershed District.



Wetland at sunset.

Manitoba's amended [Water Rights Act](#), which came into effect in October 2019, helps to meet this commitment by enshrining a no-net-loss of wetland benefits (including water retention) into Manitoba's process for licensing of drainage and water control works. As part of the Climate and Green Plan, Manitoba committed to continue to inventory wetlands across the province as part of a new policy approach to no-net-loss of water retention. In part with support from the Manitoba government, [Manitoba Habitat Heritage Corporation](#) and [Ducks Unlimited](#) have contributed to the current inventory. However, more work remains to complete the wetland inventory for the province. More information on the amended Water Rights Act is available at www.manitoba.ca/drainage.

Provincial Priority 4: Reducing nutrient loading and improving water quality in lakes and rivers.

Manitoba's Climate and Green Plan identifies actions to reduce nutrient loading such as improving wastewater treatment as well as implementing beneficial farming practices and protecting wetlands.

Manitoba is reducing nutrient loading from wastewater treatment facilities through the Manitoba Water Quality Standards, Objectives and Guidelines Regulation. As of January 1, 2016, large and medium-sized industrial and municipal wastewater treatment facilities (that is serving more



Nitrogen and phosphorus sources such as liquid livestock manure are required by law to be applied to land as a fertilizer.

than 2,000 persons) are required to meet a 1.0 mg/L total phosphorus effluent standard. In addition, major wastewater treatment facilities (that is serving more than 10,000 persons) are required to meet a 15 mg/L total nitrogen effluent standard when building new or expanding. Most facilities across Manitoba are now meeting the standards and we are seeing measurable reductions in their nutrient loads to rivers and streams in the Lake Winnipeg watershed. However, more work needs to be done including to improve nutrient removal from the single largest contributor of nutrients to the Lake Winnipeg watershed, the City of Winnipeg's North End Water Pollution Control Centre. Manitoba and the City of Winnipeg are working closely together accelerate the timelines for upgrades to achieve the nutrient standards.



City of Winnipeg North End Water Treatment Plant.

For nutrient runoff from land including agricultural areas, the [Nutrient Management Regulation](#) restricts nutrient application in sensitive areas and requires that nutrients are not over applied or applied on frozen soils. All sources of nutrients are regulated including from manure, municipal biosolids, compost, and inorganic fertilizer. Both the Nutrient Management Regulation (under [The Water Protection Act](#)) and the Livestock Manure and Mortalities Management Regulation (under [The Environment Act](#)) require substances containing nitrogen and phosphorus including manure and biosolids to only be applied to land as a fertilizer. Farmers with larger livestock operations are also required to file an annual [Manure Management Plan](#) and golf courses are required to file an annual Nutrient Management Plan. While many agricultural crops require phosphorus and nitrogen fertilizer to grow, Manitoba, Fertilizer Canada, and the Keystone Agricultural Producers continue to encourage "4R" nutrient management strategies to improve nutrient management and protect water quality. This refers to ensuring that apply the right amount of fertilizer at the right time, right place and from the right source.

In 2018, Manitoba proclaimed the Sustainable Watershed Act which amended existing legislation including The Water Protection Act. The Act enables Manitoba to set nutrient targets for Lake Winnipeg and its main tributaries (Red, Winnipeg, Saskatchewan and Dauphin Rivers). Nutrient targets will provide important benchmarks for measuring progress and for communicating to nutrient contributors the extent of nutrient reductions required. In the meantime, Manitoba [reports annually](#) on nutrient concentrations in Lake Winnipeg and its tributaries. Nutrient targets are also critical to the development of water quality trading programs. Manitoba and others such as the



4R Nutrient Stewardship principles and practices optimize crop production and reduce risk to water quality.

Red River Basin Commission are exploring options for water quality trading that could allow a market based approach to work alongside water quality regulation to improve water quality. While more work is required to determine if a trading approach could work in the Lake Winnipeg watershed, setting nutrient targets for Lake Winnipeg and its tributaries is an important first step.

Provincial Priority 5:
Using infrastructure, including natural infrastructure, to manage water sustainably and effectively.

Funding to maintain aging built water infrastructure is an issue that infrastructure managers are facing more frequently, not just in Manitoba but across Canada. Climate change is expected to put additional strain on these aging infrastructure systems, further reducing their effectiveness. While specific numbers for Manitoba were not available in [Canada's Infrastructure Report Card](#), infrastructure managers such as Watershed Districts have expressed concerns regarding the availability of resources required to maintain and where necessary, upgrade water infrastructure.



The spillway at Stephenfield Reservoir.

Current provincial priorities for new built infrastructure include working with Canada to complete the Lake St. Martin and Lake Manitoba outlet channels to enhance flood protection to communities throughout Manitoba. Manitoba will also strengthen the province's existing network of flood mitigation infrastructure with a greater emphasis on pre-emptive environmental investments that achieve greater climate resiliency. For example, recent funding from the province includes a \$33 million one time investment for damage prevention and climate resiliency projects, including a flood proof transportation route from Winnipeg to the United States border, Building Sustainable Communities grants to support 344 projects for community development, and six projects across five rural municipalities to build climate resilience.

Natural infrastructure is defined as natural systems and resources such as plants, soil and wetlands that are actively managed by humans to provide outcomes and benefits. Manitoba is prioritizing natural infrastructure solutions to support climate change adaptation, environmental sustainability and agricultural productivity. The first round of Conservation Trust projects for 2020 have been awarded to 19 different conservation organizations, helping to preserve and enhance Manitoba's natural infrastructure. Activities funded by the Conservation Trust include conserving biodiversity, mitigating floods and droughts, supporting climate-change mitigation through carbon sequestration, improving soil health, preserving waterways and decreasing soil erosion. The Conservation Trust is permanently endowed to support and inspire conservation projects for generations. The fund is expected to generate on average \$5 million a year, which will be invested into conservation efforts throughout

Manitoba every year. A second round of Conservation Trust and GROW Trust grants focused on watershed projects will be announced later in 2020. Other initiatives include the completion of [distributed retention studies](#) in tandem with watershed management plans to identify potential water retention projects across agri-Manitoba watersheds.



Kenton Dam at sunset.

Provincial Priority 6: *Enhancing climate resiliency.*

Manitoba's Climate and Green Plan outlines the vision of making Manitoba the cleanest, greenest and most climate resilient province. The plan to achieve this vision includes understanding the changes affecting our environment and economy and planning for and adapting to those changes.

Manitoba is making investments into key organizations, such as the Prairie Climate Service Network, that provide governments, businesses, non-government organizations and sectors with reliable climate data and information, enabling them to make informed decisions on addressing climate risk management and adapting to climate change. Manitoba Hydro has made significant investments in building a foundation of knowledge and tools to conduct climate change impacts studies, with a primary focus on understanding future water supply availability for their system and how this will impact their operations.



Storage of spring runoff and tile drainage water in retention pond for irrigation use.



Storage of tile drainage water in reservoir at edge of field near Culross, Manitoba.

While adaptive capacity is already strong in Manitoba, continuous improvements are necessary to maintain and build climate resilience. Examples of climate change adaptation include increased irrigation for crops during drought periods and improved infrastructure to protect communities from floods and droughts. The investments in natural infrastructure outlined above, such as the GROW and Conservation Trusts, will make Manitoba more resilient to climate change.

Other actions aimed at improving climate resiliency include initiatives under The Made-in-Manitoba Climate and Green Plan such as the Sustainable Agriculture Incentives Program. Delivered through [AgAction Manitoba](#), this targeted incentive

programming is available to agricultural producers to advance the adoption of on-farm Beneficial Management Practices (BMPs). These BMPs improve agri-ecosystem resilience to climate change, deliver ecological goods and services such as improved water quality and enhance the environmental sustainability of farm operations in Manitoba. To be eligible, farmers are required to complete an Environmental Farm Plan (EFP), which is a voluntary, confidential, self-assessment of a producer's own farm or ranch delivered in partnership with Keystone Agricultural Producers (KAP). Environmental farm planning helps farmers to manage risk on their farm operations with respect to water quality and supply, soil health, air quality and biodiversity. Environmental Farm Planning began in Manitoba in 2004 and is currently supported through the [Canadian Agricultural Partnership](#).

Innovative initiatives and partnerships could provide novel solutions to water management issues as we strive to enhance our climate resiliency. Some examples include the Aqua-hacking competition led by the International Institute for Sustainable Development to improve water quality of Lake Winnipeg and the Extremes of Moisture coordinated research project between the Manitoba Wheat and Barley Growers Association, government, industry and researchers.

Provincial Priority 7: *Sustaining economic development and supporting the growth of a local circular economy.*

A reliable supply of good quality water is essential for economic growth. In Manitoba, billions of dollars are generated each year as a direct result of our vast supplies of water, including through hydroelectricity, fishing, tourism, industrial use and agriculture. Water flowing through Manitoba's Hydro's generating stations results in over \$2 billion of revenue annually to the economy. Angling is an important economic activity resulting in \$400 million of economic activity. The commercial fishing industry accounts for an additional \$80 million. Manitoba's farmers turned sunshine and rainfall more than \$6 billion in farm gate revenue. The products grown on Manitoba's farms generated further economic activity in processing.



Grand Beach crowds on Canada Day, 2011.

Two examples of the economic activity from processing crops are the Roquette Pea processing plant, and the Simplot potato processing plant. The investment by the companies is close to a billion dollars and will create hundreds of jobs.

Manitoba's new [Economic Growth Action Plan](#) focuses on a nimble approach to economic development and a collaborative relationship between government and the private sector. The plan identified priority areas including the development of targeted sector strategies as a way to foster competitiveness, facilitate growth, identify investment opportunities and address economic barriers in the province. In 2019, the [Manitoba Protein Advantage](#) was developed as part of the Economic Growth Action Plan and outlines a strategy for sustainable protein production, processing and innovation. The vision of the strategy is for Manitoba to become North America's protein supplier of choice, leading Canada in sustainable protein industry growth.



Another economic development priority in the agricultural sector is in Manitoba's canola and soybean industry. Manitoba's commitment to increase biodiesel content from two per cent to five per cent will require increased market diversification opportunities and increased on and off-farm processing investment and jobs.

In the recently announced **Manitoba Works** jobs plan, Manitoba has committed to creating 40,000 new jobs. Manitoba Works aims to build on Manitoba's strengths to grow trade, investment and job creation, and to ensure that policies in areas like permitting, infrastructure investment and regulatory reform align with the Economic Growth Action Plan. As businesses grow and develop, the need for water and waste water treatment will increase. As new housing development occurs with the expansion of Manitoba's economy and population there will also be an increased need for domestic water supply.

What is a circular economy?

A circular economy is an alternative to a traditional linear economy (make, use, dispose) in which we keep resources in use for as long as possible, extract the maximum value from them while in use, then recover and regenerate products and materials at the end of each service life.

In a circular economy, production and consumption create the smallest possible amount of loss and waste. Material efficiency leads to environmental benefits that a world striving to distance itself from overconsumption needs to ensure sustainable development. A circular economy also offers economic and social benefits.

Connections between a Manitoba provincial water management strategy and the innovative ideas associated with development of a circular economy can be explored as the water management strategy is developed.

H. Goal, Guiding Principles, and Objectives

The section below outlines a starting point for discussion on the goal, guiding principles and objectives of a water management strategy for Manitoba.

Goal and Scope Considerations

The proposed goal of Manitoba's water management strategy is "to manage water sustainably as a key resource for Manitobans, ecosystems and the economy, considering the impacts of a changing climate and growing economic and social needs."

It is proposed that Manitoba's water management strategy should address the management of water as a resource for the benefit of multiple water uses including human consumption, the environment, and economic development. The emphasis of the strategy should include ensuring that sufficient water supplies are available now and in the future and that the quality of water is adequate for use. The strategy will not address the specific management of the activities of water users. For example, management of Manitoba's recreational and commercial fisheries or aquatic species at risk, and efforts to prevent the spread of Aquatic Invasive Species will not be addressed in the strategy. Treatment of water for drinking or industrial uses will also not be addressed in the strategy. However, management of water as a resource to ensure that it is available for drinking and industrial use in sufficient quantities and of sufficient raw water quality should be addressed. The strategy is also expected to focus on water management issues in southern Manitoba where pressures on water supply and risks to water quality are most urgent. The strategy will focus on provincial responsibilities but will recognize coordinated actions by other actors such as the federal government, Indigenous governments, neighbouring provincial, US federal and state governments, municipalities, and Watershed Districts.

Manitoba's water management strategy will include short term actions (implemented within five years) to address immediate issues related to water management but also include longer term actions (implemented over 15 to 20 years) that will support the strategy's goal over the longer term.

Guiding Principles

The following guiding principles are proposed for Manitoba's water management strategy:

- 1. Sustainable Management** – Water is an essential and finite resource that is critical to Manitoba's people, environment and economy. Manitoba will protect surface water and groundwater quality and quantity for the benefit of all users, including people and the environment, now and in the future.
- 2. Support for Economic Development** – Water is critical to economic development in Manitoba and we need to ensure that water is allocated sustainably to support current and future development. Economic development can occur through water-based industries, the agricultural sector, community development through municipal use of water for drinking and wastewater assimilation, and development associated with our recreational and commercial fisheries and other aspects of the natural environment.
- 3. Basin and Watershed Based** – Manitoba recognizes the need to link land and water management across watershed and basin scales. Planning and management at the watershed-scale will reflect and address the challenges unique to each basin.

4. **Long-term Planning Horizon** – Sustainable water management requires a long-term planning approach that takes climate change into account.
5. **Indigenous Participation** – Meaningful participation with Indigenous communities and governments in the management of water challenges and development of solutions, including use of traditional knowledge.
6. **Partnerships and Collaboration** – All Manitobans have a stake in water management. Government, industry, communities and other stakeholders will work collaboratively and share responsibility for water management within Manitoba's watersheds.
7. **Science and Evidence Based** – Use of science, knowledge, technology, and innovation to inform clear governance and decision making. Use of the best available practices and tools to support flexible and adaptive water management.

Objectives

As part of Manitoba's commitment to measure progress, transparent reporting on progress is being implemented through **balanced scorecards** that report on four Priority Areas:

- Quality of Life
- Working Smarter
- Public Service
- Value for Money

The objectives of Manitoba's provincial water management strategy should support Manitoba's overall commitment to improving the quality of life in our province and to delivering the best results for taxpayers. Objectives should also support the vision of Manitoba's Climate and Green Plan – to be the cleanest, greenest, most climate resilient province in Canada.

The following objectives from Manitoba's balanced scorecard are proposed for Manitoba's provincial water management strategy:

- Create conditions to improve quality of life
- Advance reconciliation
- Sustain Manitoba's unparalleled natural environment
- Foster private investment for economic growth
- Foster and advance innovation
- Involve Manitobans in decision making

I. Performance Indicators

Performance indicators are meaningful measures to track and report progress when trying to accomplish a goal. There are ten proposed indicators to assess the performance of Manitoba's water management strategy:

1. Percent of agricultural land under an Environmental Farm Plan
2. Acres of conservation areas
3. Number of new production and processing developments
4. Total water retention capacity (acre-feet of water storage), net loss/gain of wetlands
5. Number of Indigenous Communities engaged in water planning activities
6. Hectares of wetlands restored and protected
7. Investment in infrastructure to enhance resilience (\$) (technology and natural)
8. Avoided cost because of infrastructure investment (\$)
9. Manitoba water quality index
10. Nitrogen and phosphorous loads compared to nutrient load targets

Additional information on how the proposed indicators relate to Manitoba's Climate and Green Plan and Manitoba's balanced scorecard is provided in [Appendix F](#).



Riparian area south of Pilot Mound, Manitoba.

J. Next Steps

Congratulations if you made it this far! With background on water management in Manitoba and an understanding of the proposed goal, scope, objectives, guiding principles and performance indicators for a “future provincial water management strategy”, the Expert Advisory Council is now looking for your input. The following are guiding questions on which the EAC requests your response. Please visit www.engagemb.ca for more information.



Out for a walk in Homewood, Manitoba.

Engagement Questions

Key Issues

Key Issues are high level topics that affect all Manitobans regardless of political jurisdiction, geographic region, or organization. We identified four Key Issues that need to be considered when developing a Water Management Strategy.

1. **Water Sustainability:** availability of water when and where we need it for basic human needs, the environment and the economy.
2. **Extremes in Moisture:** water in Manitoba is variable, and floods or droughts have significant impacts to communities, infrastructure, the economy, and the environment.
3. **Watershed Impacts:** Healthy watersheds provide significant ecological goods and services, but in some cases human activities have reduced their effectiveness (e.g. excess nutrient loading,).
4. **Emerging Risks:** There is a need to improve the understanding of future risks to water management in Manitoba and to implement adaptation measures to increase preparedness and resiliency. Issues such as climate change, land use change, and contaminants of emerging concern are all risks that Manitoba will face in the near future.

Questions

1. Are these the right Key Issues? Are there any that we have missed? Or any that should not be included?
2. Which of these Key Issues is the most important to you/your organization and why?

Provincial Priorities

Provincial Priorities are current areas of focus for the Government of Manitoba. Seven relate specifically to water management in Manitoba. We believe that any future strategy should with or contribute to these Provincial Priorities wherever possible.

The Provincial Priorities that relate to water are:

1. Effective watershed governance including enhancing watershed planning and engagement of all stakeholders and rights holders across watersheds
2. Promoting sustainable land use planning initiatives, including agricultural, development and environmental considerations
3. Committing to no-net-loss of water retention in watersheds
4. Reducing nutrient loading and improving water quality in lakes and rivers
5. Utilizing infrastructure, including natural infrastructure, to manage water sustainably
6. Enhancing climate resiliency
7. Sustaining economic development and supporting the growth of a local circular economy

Questions

1. What do you think of these priorities? Is anything missing or any that you think should not be there?
2. Should any of these priorities be given particular focus? If so, what would you suggest government should be doing?
3. How should the government be connecting and working with communities, organizations, and others?
4. Who should pay for the implementation of a Water Management Strategy?

Guiding Principles

Guiding Principles are beliefs and values that help direct planning when trying to achieve a goal. They ensure our actions align with our values. We have identified seven Guiding Principles to help guide us as we develop a Water Management Strategy for Manitoba.

- Do you agree with the following seven guiding principles? If not, what principles would you add, delete or modify?
 1. **Sustainable Management**
 2. **Support for Economic Development**
 3. **Basin and Watershed Based**
 4. **Long-term Planning Horizon**
 5. **Indigenous Participation**
 6. **Partnerships and Collaboration**
 7. **Science and Evidence Based**

Questions

1. Are these the right principles to guide a future Water Strategy? If not, what should be added or removed?
2. Do any of the principles stand out to you as particularly important? If so, how would you suggest they be given the attention required?

Performance Indicators

Performance Indicators are meaningful measures to track and report progress when trying to accomplish a goal. There are ten Performance Indicators we identified to assess how well Manitoba's Water Management Strategy is performing:

1. Percent of agricultural land under an Environmental Farm Plan
2. Acres of conservation areas
3. Number of new production and processing developments
4. Total water retention capacity (acre-feet of water storage), net loss/gain of wetlands
5. Number of Indigenous Communities engaged in water planning activities
6. Hectares of wetlands drained, restored and protected
7. Investment in infrastructure to enhance resilience (\$) (technology and natural)
8. Avoided cost because of infrastructure investment (\$)
9. Manitoba water quality index
10. Nitrogen and Phosphorous loads compared to nutrient load targets

Questions

1. Are these the right indicators for a Manitoba water management strategy? If not, what performance indicators would you add, delete or modify?
2. Do you know of any best practices in other jurisdictions that should be looked at to inform a future Strategy for Manitoba?
3. What do you hope a new Water Management Strategy would accomplish? What would you personally be looking for to signify that a water management strategy is successful? What changes do you expect to see? How will you know the strategy is working?

Elements of a Future Water Strategy

Questions

1. What do you consider to be the most important aspects of a Water Strategy for Manitoba?
2. Are there any specific programs, policies, approaches that you would like to suggest?
3. Is there any additional feedback that you'd like to provide on the development of a water strategy for Manitoba?

Appendix A

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](#)
- [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 B

Major Water Infrastructure in Manitoba

Flood Protection Infrastructure

After the devastating Winnipeg flood of 1950, Manitoba began investing in various infrastructure solutions to mitigate the risk 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 further expand the Red River Floodway to protect with 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. 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 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 protecting inundation of agricultural land.



Portage Diversion during the 2011 flood event.

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,



Floodway control structure.

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 and communities have invested in flood infrastructure, including community ring dikes.

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. Gravity carries water down the aqueduct from Shoal Lake to Winnipeg as Shoal Lake is at a higher elevation than 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 kilometers 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.



The spillway at Jackson Lake.

Manitoba owns 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 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 of these small dams for their municipal water supplies and now use more secure groundwater sources or obtain water from a regional water co-operative.

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.

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.

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](#)



Major drain maintenance along PR 336.



A drainage network in south central Manitoba.

Appendix C

Hydroelectric Development in Manitoba

Manitoba Hydro has been providing electricity to Manitobans for over a century. As of 2018, **15 generating stations** on the Nelson, Winnipeg, Saskatchewan, Burntwood and Laurie rivers supply 96 per cent of Manitoba's electricity from hydropower, on average. Hydroelectric development began in southern Manitoba with the construction of six generating stations along the Winnipeg River in 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 (1952, 1958) and Kelsey generating station was constructed on the Nelson River (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 within an anticipated completion date of 2022.

The availability 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., winter). Reservoir storage also helps Manitoba Hydro mitigate the risks associated with the high variability in system inflows, such as a prolonged drought event. However, in turn, projects such as the Churchill River Diversion and Lake Winnipeg Regulation have significant influence on the water regime in parts of the Nelson/Churchill River watersheds, altering flows and levels from their natural fluctuations to a more regulated regime defined by how the infrastructure is operated.

Churchill River Diversion

The Churchill River Diversion Project (CRD) began operation in 1977 under a 1973 Interim Licence issued under The Water Power Act. The Interim Licence allowed Manitoba Hydro to divert waters from the Churchill River into the Rat/Burntwood/Nelson River system and impound waters on Southern Indian Lake and the Rat River. Approximately 85 per cent of Churchill River flow is diverted towards the generating stations on the Burntwood River and lower Nelson River, which account for about 75 per cent of power generation in Manitoba.

The CRD has three main components: (1) Missi Falls Control Structure, which regulates the amount of water passed down the Churchill River and impounds Southern Indian Lake, raising the lake level three metres; (2) South Bay Diversion Channel, a 9.3 kilometre long channel that allows Churchill River water to flow into the Rat/Burntwood/Nelson River system; and (3) Notigi Control Structure, a dam on the Rat River that regulates the amount of water diverted into the Nelson River and creates an impoundment on Rat Lake.

In 1986, Manitoba Hydro began operating the CRD Augmented Flow Program. The program involves deviating from the range of water levels and flows stipulated in the 1973 Interim licence. This deviation has affected the range of lake levels on Southern Indian Lake and the releases from the Notigi Control Structure. Hydro has requested and received annual approvals for the Augmented Flow Program from the Minister of Conservation and Climate. Once approved, the Augmented Flow Program forms part of the operating regime set out under the Interim Licence. In 2009, Manitoba Hydro asked the Province of Manitoba to issue a Final Licence. The process of issuing the Final Licence is currently ongoing.

Lake Winnipeg Regulation

Regulation of Lake Winnipeg water levels is achieved through a series of excavated channels and improvements between Lake Winnipeg and the Nelson River, and construction and operation of Jenpeg Generating Station. The channels and improvements allow for up to fifty per cent more outflow from Lake Winnipeg than under natural conditions and the control structure regulates the flow of water from Lake Winnipeg, converting the lake into a significant storage reservoir. Lake Winnipeg Regulation has the primary benefit of providing a reliable water source for the downstream hydropower generating stations along the Nelson River and the secondary benefit of mitigating extreme water levels caused by floods and droughts.

The Lake Winnipeg Regulation project is operated by Manitoba Hydro, for which they received an Interim License under The Water Power Act to control water levels on the lake in 1970 and a Supplementary Interim Licence in 1972. In 2011, Manitoba Hydro asked the Province of Manitoba to issue a Final Licence. The process of issuing the Final Licence is currently ongoing. The Final Licence would run until July 2026, which is 50 years from the completion of construction and commencement of operation of Lake Winnipeg Regulation.

This licence allows Manitoba Hydro to set Lake Winnipeg outflows as required for power production purposes when the wind-eliminated level of Lake Winnipeg is between 216.7 metres (711.0 ft) and 217.9 metres (715.0 ft) above sea level. When the lake level is above 217.9 metres, Manitoba Hydro must operate at a maximum discharge until 217.9 metres is reached. When the lake level is below 216.7 metres, Manitoba Hydro must operate outflows as ordered by the Minister responsible for The Water Power Act. Since the beginning of Lake Winnipeg Regulation in 1976, the average lake level has increased marginally by 0.06 metres (0.2 ft). Generally, the annual lake level cycle is similar to the pre-regulation period; however, the overall variability in lake levels has been reduced.

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. Negotiation between five impacted First Nations (represented by the Northern Flood Committee), Manitoba Hydro, the Province of Manitoba, and Canada resulted in the [Northern Flood Agreement](#) (NFA) being signed in 1977. The agreement was designed to address the effects that all existing and planned hydroelectric development and operation has on First Nation lands, pursuits, activities and lifestyles. Implementation of the agreement proved challenging, resulting in Manitoba Hydro entering into unique Comprehensive Implementation Agreements and individual settlement agreements with First Nations and other residents. Manitoba Hydro continues to work with Pimicikamak/Cross Lake Band of Indians, Manitoba and Canada to implement the NFA.

The Water Power Act

In Manitoba, all hydroelectric generating stations and other structures related to water power generation require a license under the [Water Power Act](#) and its [Regulations](#). Currently there are 18 water power projects that have been licensed either at the Interim or Final stage. Interim Licences allow the licensee to build, test and confirm the licence terms, such as operating guidelines, are suitable. If the licensee has met the terms and conditions of the Interim Licence, a Final License is issued, providing authorization to operate for up to a maximum of 50 years. The licensing process continues to react to evolving societal expectations regarding issues of stewardship of the resource and equity issues for both locally impacted residents and Manitobans as a whole.

Appendix D

Water Use Licencing in Manitoba

The Drainage and Water Rights Licensing Branch of Manitoba Conservation and Climate is responsible for issuing Water Rights Licences for water use in Manitoba. Any individual or corporation who wishes to use surface water or groundwater must first obtain a licence under The [Water Rights Act](#) and regulation. Domestic, irrigation, or agricultural use less than 25,000 litres per day (L/day) does not require a licence. Licences are categorized by the type of source, either groundwater or surface water, and the purpose of use: agricultural, irrigation, municipal, domestic, industrial, or other. Water is also reserved to support aquatic ecosystems and provide environmental flows (Appendix E).

To ensure sustainable allocation of Manitoba's water resources and protect against future water shortages, limits are placed on how much water can be allocated from a given aquifer or stream. When the licensed water use reaches the allocation limit, that source is considered to be fully allocated. Licence applications are then reviewed to assess the effects the withdrawal will have on the water source and determine the remaining water available for allocation. Additionally, depending on the required volume of water, an Environment Act License is also required. The minister may refuse to issue a licence if, in the opinion of the minister, the action authorized by the licence would negatively affect an aquatic ecosystem.

Upon approval of an application by Manitoba Conservation and Climate, a Water Rights Licence is issued. The precedence of water rights licenses is determined by the submission date of the licence application. This method of establishing precedence is commonly referred to as the principle of first-in-time, first-in-right. Where the date of submission of any licence is identical with the date of submission of any other licence, the licences have precedence in relation to one another according to the priority of purpose. Priority of purpose is as follows:

1. Domestic purposes;
2. Municipal purposes;
3. Agricultural purposes;
4. Industrial purposes;
5. Irrigation purposes;
6. Other purposes.

Additional information on Water Rights Licensing in Manitoba can be found [here](#).

Appendix E

Instream Flow Needs

In Manitoba, water is allocated under The Water Rights Act which requires consideration of in-stream flows that are necessary to ensure that aquatic ecosystems are protected and maintained. Instream flow needs (IFN) studies examine as many as five aspects of riverine structure and function to determine how much water is required to maintain riverine health for an indefinite period. Instream flow study approaches have been developed by international practitioners using specific approaches and methodologies. The five aspects include: hydrology, geomorphology, connectivity, water quality and biology. **Hydrology** is considered the master variable, since all other variables depend on it. An IFN study examines a system's hydrology, looking at all aspects of the hydrograph, including amount, duration, and timing of flows – all of which affect and are linked to the other response variables. For instance, fishes that have evolved and adapted to spring freshets at a certain time and for a certain duration and at a certain flow, are not necessarily able to adjust their life-histories to an altered freshet. In Manitoba, each Water Use Licence application undergoes a hydrological assessment as part of the calculation of water available for allocation.

Elsewhere in Manitoba, there are intermittent efforts on several agri-Manitoba streams to undertake more complex work that also considers the other four aspects of riverine structure and function. **Connectivity** examines the lateral, vertical and longitudinal continuity of a stream. Lateral connectivity is an assessment of how permeable (or not) the streams banks are and what wetted habitats are possible within the riparian area. Vertical connectivity is an assessment of the connection between ground water and surface water, while longitudinal connectivity is the determination of how much uninterrupted flow a system has along its length. Interrupting longitudinal connectivity is broadly understood to have a negative impacts to aquatic biological systems. **Geomorphology** is an assessment of how flows affect sediment erosion and deposition, bank form and stability and channel shape. Geomorphological responses to flows create various habitat typologies which accommodate and meet different species' needs. **Water quality** is a measure of the structural water quality result of streamflow but is not reflective of nutrient or pollutant loadings. As such, the water quality component of IFN is generally limited to understanding the inherent linkage between flow, riverine form and dissolved oxygen in the water column. **Biology** is the measured determination of what lives in a stream under various flow conditions and the consequent habitats of those flows. Biological assemblages are known to exist in a dynamic equilibrium. Understanding the difference between natural variations of the biological assemblage from an assemblage altered by insufficient flow blends the art and science of IFN work.

In general, many Manitoba streams are robust and resilient to altered flows thereby maintaining biodiversity. However, that resiliency is not unlimited and overtaxing resiliency could lead to a substantial loss of biodiversity; something Manitoba has agreed to protect as a signatory to the [Convention on Biodiversity](#).

Appendix F

Performance Indicators

The Council has been asked to provide advice and recommendations on performance indicators for the Climate and Green Plan as a whole. This advice is expected to focus on key meaningful measures to track and report progress and performance and support Manitoba's new transparent system of balanced scorecards and its focus on outcomes. Potential key indicators for Manitoba's water management strategy are described below in context with Manitoba's Climate and Green Plan and Balanced Scorecard.

MADE-IN-MANITOBA CLIMATE AND GREEN PLAN			MANITOBA BALANCED SCORE CARD		RECOMMENDED INDICATORS FOR THE WATER MANAGEMENT STRATEGY
Manitoba Climate and Green Plan Water Pillar Keystone	Manitoba Climate and Green Plan Water Pillar Expected Result	Manitoba Climate and Green Plan Water Pillar Possible Indicators	Corresponding Manitoba Balanced Scorecard Priority Area	Corresponding Outcome Objective	Potential Key Indicator (measure)
Agriculture and Land Use	Maintenance and enhancement of our healthy agri-ecosystem	<ul style="list-style-type: none"> - production of agriculture products in concert with ecological goods and services - hectares of natural capital (e.g., wetlands, riparian areas, grasslands, woodlands), conserved, restored and improved - number and type of BMP implemented by watershed - soil health - environmental farm plans created or renewed 	Quality of Life: Improving Outcomes for Manitobans	<p>Create Conditions to Improve Quality of Life</p> <p>Sustained Manitoba's Unparalleled Natural Environment</p> <p>Foster Private Investment for Economic Growth</p>	<ol style="list-style-type: none"> 1. Percent of agricultural land under an Environmental Farm Plan 2. Acres of conservation areas 3. Number of new production and processing developments
Watersheds and Wetlands	Healthy and sustainable wetlands and watersheds	<ul style="list-style-type: none"> - hectares of wetlands inventoried in Manitoba - hectares of restored wetlands in rural Manitoba - hectares of wetlands lost - number of watershed plans create or renewed - ratio of watersheds with watershed plans versus watersheds without watershed plans - number of watershed-based distributed water retention studies completed - number of acres (or percentage) of LiDAR capture across Manitoba - acre-feet of water stored 	Quality of Life: Improving Outcomes for Manitobans	<p>Create Conditions to Improve Quality of Life</p> <p>Advance Reconciliation</p> <p>Sustain Manitoba's Unparalleled Natural Environment</p>	<ol style="list-style-type: none"> 4. Total water retention capacity (acre-feet of water storage), net loss/gain of wetlands 5. Number of Indigenous Communities engaged in water planning activities 6. Hectares of wetlands restored and protected

MADE-IN-MANITOBA CLIMATE AND GREEN PLAN			MANITOBA BALANCED SCORE CARD		RECOMMENDED INDICATORS FOR THE WATER MANAGEMENT STRATEGY
Manitoba Climate and Green Plan Water Pillar Keystone	Manitoba Climate and Green Plan Water Pillar Expected Result	Manitoba Climate and Green Plan Water Pillar Possible Indicators	Corresponding Manitoba Balanced Scorecard Priority Area	Corresponding Outcome Objective	Potential Key Indicator (measure)
Flood and Drought	Effective forecasting, mitigation, and response to flooding and drought	<ul style="list-style-type: none"> - number of watershed-based drought preparedness assessments completed - number of water control structures used to enhance landscape features and manage water (volume of water stored or diverted) - number of flood and drought-related calls to crisis lines - Number of flood hazard maps available for community planning - proportion of at-risk communities with ring-dike protections - proportion of regional health authorities and municipalities with flood and drought plans in place - full cost of resources provided by Manitoba government to assist Manitobans during events - number of communities and individual properties protected to the design flood protection level (FPL) - flood damages avoided through operation of water control structures - reduction in agricultural losses to flooding (measured through Agri Insurance claims) - reduction in private, municipal and provincial disaster financial assistance claims 	<p>Quality of Life: Improving Outcomes for Manitobans</p> <p>Working Smarter: Delivering client-centred services</p>	<p>Create Conditions to Improve Quality of Life</p> <p>Foster and Advance Innovation</p>	<p>7. Investment in infrastructure to enhance resilience (\$) (technology and natural)</p> <p>8. Avoided cost because of infrastructure investment (\$)</p>
Water Quality	Clean water throughout Manitoba for drinking, habitat, recreation, and economic development	<ul style="list-style-type: none"> - Manitoba's Water Quality Index, as published by the Canadian Council of Ministers of the Environment - number of Manitoba communities under a boil water advisory that persist for more than one month - number of watershed-based targets for nutrient reduction in place - number of farms (or acres) using 4R practices for nutrient management - refers to ensuring that we apply the right amount of fertilizer at the right time, right place and from the right source. - number of wastewater treatment facilities with nutrient removal - number of waterborne illness outbreaks - number of recreational water exceedances 	<p>Quality of Life: Improving Outcomes for Manitobans</p>	<p>Sustain Manitoba's Unparalleled Natural Environment</p> <p>Create Conditions to Improve Quality of Life</p>	<p>9. Manitoba water quality index</p> <p>10. Nitrogen and Phosphorous loads compared to nutrient load targets</p>

Appendix G

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](#).