waterSMART
Water Management Solutions

Prairie Land and Water Management Strategy

Summary of Prairie Water Workshops

Held in Calgary (Jan 28, 2020), Saskatoon (Feb 4, 2020) and Winnipeg (Feb 6, 2020)

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Distributed on:
February 25th 2020

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1.0 Executive summary / Prairie-wide summary

As part of Western Economic Diversification's (WD-DEO) Prairie Land and Water Management Strategy, WaterSMART Solutions Ltd. (WaterSMART) organized and facilitated three Prairie Water Workshops in Calgary, Saskatoon, and Winnipeg. Convening participants from many diverse organizations, all three workshops had representation from local watershed groups, environmental and non-governmental organizations (ENGO's and NGO's), Indigenous groups and communities, private industry, industry associations, and municipal, provincial, and federal government. Representatives from WD-DEO also attended all three workshops.

The primary objective of the workshops was to ask participants to **identify and discuss water management challenges, opportunities, and priorities**, both Prairie-wide and for each of the three provinces [Alberta/Saskatchewan/Manitoba].

A copy of the slide deck used in each workshop was distributed along with this workshop summary.

1.1 Commonalities

Many of the key points identified by participants were the same across all three provinces. Common themes heard in the discussion regarding **what the projected changes in climate and water resources will mean** for water management (the "water story") on the Prairies were:

- Upstream regions and users have a **responsibility to downstream** regions and users. This theme was discussed within the context of the Master Agreement on Apportionment, considering water quantity and quality within provincial jurisdictions, and in terms of land use or landscape change.
- **Coordination and collaboration** on various scales will be necessary. Collaboration must involve **diverse perspectives** engaging in meaningful conversations that have an impact on decision making.
- Smaller communities are more susceptible to changes in water volumes, and tributaries will be impacted in more extreme ways than major rivers. **Planning** will be key, regional plans must not lose sight of local perspectives.
- **Adaptation** is critical. Agricultural practices will have to adapt to changes. People will have to adapt behaviours, and the fundamental **value of water** needs to be acknowledged in order to drive changes in water management.
- Existing water **storage infrastructure** may need to be used or managed differently to adapt to changes, or there may be a need to build more infrastructure.
- Understanding the economic, social, and environmental value of **environmental goods and services**, such as wetlands, is needed to address many of the opportunities for resilient watersheds.
- Increased **sharing of information, and increased consistent education and transparency** related to water knowledge and data is needed. This was seen as a challenge and as an opportunity.

Common themes heard in the discussion regarding water management **challenges** on the Prairies were:

- Projected increasing variability in **precipitation** will make the amount and timing of water less reliable.
- There is a **lack of funding** for all aspects of water management. Funding challenges were noted related to infrastructure development and maintenance, coordination among governance entities, delivery of watershed programs, and data collection and availability.
- **Water data and monitoring** presents numerous challenges; data and monitoring challenges include inadequate data or monitoring, and inaccessible, out of date, or not easily understood information.
- Many **Indigenous communities** do not have access to high-quality water, are vulnerability to impacts from flooding, and are not included in water management decisions.
- **Land use changes** are not adequately considered when discussing water management. **Land use** changes are creating more or less water availability, altering runoff timing, and impacting watershed health.

Common **opportunities** identified in response to water management challenges on the Prairies include:

- Increase education and raise **public awareness** around water.
- Implement **strategic planning across the Prairies,** in order to work toward a common vision across the Prairie Provinces.
- Include **smaller communities and tributaries** in the planning effort because they will be impacted differently than large rivers.
- **Meaningfully engage** diverse perspectives in water management conversations, including Indigenous representatives and municipal, provincial, and federal governments.
- Increase coverage of provincial **LIDAR mapping**.
- **Understand the economics** of natural and green infrastructure relative to grey infrastructure.
- Improve and protect **water quality**.
- Plan and implement adaptive management and/or expansion of **storage and distribution infrastructure**.
- Pursue **water reuse** with water that is appropriate quality for the secondary purpose.

Workshop feedback demonstrates that there is support and enthusiasm across all three Prairie Provinces to adapt water management and water related practices to improve resiliency in preparation for projected changes in climate and water resources. Participants in all provinces were engaged and willing to share their perspectives and listen to the perspectives of others. There was recognition that some form of collaborative planning across all three provinces will be valuable.

1.2 Differences

In addition to many similarities, there were notable differences in the topics of focus and perspectives that were shared at each workshop.

In **Alberta,** water scarcity and managing for future drought was a key topic of concern, and increased public education and awareness were widely discussed as opportunities.

In **Saskatchewan,** there was focus on the challenges associated with finding the balance between the economics of protecting and preserving natural water storage (drainage). Several conversations in Saskatchewan also centered around water licence allocation, this includes understanding the consequences of upstream allocations, and considering the future total allocations within Saskatchewan.

The challenge of experiencing both flood and drought within the same year and on localized scales was a common topic in **Manitoba**. Manitoba's unique location downstream of many large watersheds in other provinces and in the United States led to greater discussion on the importance and challenges of inter-jurisdictional water management than in the other two provinces.

Water governance across the Prairies was discussed at all three workshops. In Alberta and Manitoba, there was discussion of developing an inter-provincial water agency, such as the Prairie Provinces Water Board (PPWB) or similar, with a broader scope and mandate to capitalize on the opportunities for prairie-wide collaborative water management. In Saskatchewan, conversations focused more specifically on opportunities for water governance within the province.

2.0 Prairie Water Workshop Introduction

As part of Western Economic Diversification's (WD-DEO) Prairie Land and Water Management Strategy, three Prairie Water Workshops were held in Calgary, Saskatoon, and Winnipeg on January 28th, February 4th and February 6th, 2020. These workshops convened groups of 36-58 participants from diverse organizations that are directly or indirectly involved or impacted by water management. All three workshops had representation from local watershed groups, environmental and non-governmental organizations (ENGO's and NGO's), Indigenous groups and communities, private industry, industry associations, and municipal, provincial, and federal government. Representatives from WD-DEO attended all three workshops, which were organized and facilitated by WaterSMART Solutions Ltd. (WaterSMART).

The objectives for the workshops were consistent across the three provinces and included:

1. Introduce the objectives of the Prairie Land and Water Management Strategy work
2. Present and discuss the overall vision for a Prairie Land and Water Management Strategy
3. Present the baseline prairie hydrology to provide a picture of the current prairie water story
4. Identify and discuss water management challenges, opportunities and priorities prairie-wide and for Alberta/Saskatchewan/Manitoba

Each workshop followed a similar structure, including a mix of presentations and facilitated breakout group discussions. Presentation materials and discussion topics for the breakout groups were kept consistent across the provinces, with minor modifications to acknowledge and capture the individual provincial perspective in each workshop. This approach facilitated the analysis of the workshop outcomes to provide a picture of commonalities and differences between the provinces based on a similar set of discussion topics. This workshop summary has been prepared to provide the following;

- An overview of the commonalities and differences in water management challenges, opportunities and priorities across the Prairie Provinces.
- Feedback from the workshop participants on key considerations and next steps for the Prairie Land and Water Management Strategy.
- A brief summary of the presentations that were given.*
- Detailed workshop summaries from each province and each breakout activity.

*Presentation slides were distributed in addition to this workshop summary.

Each workshop began with an hour of presentations to introduce the project, propose a vision for the Prairie Land and Water Management Strategy (the Strategy), and to review prairie-wide baseline hydrology.

All workshops were conducted under the Chatham House Rule. The principle of the Chatham House Rule is that participants are free to use the information that is discussed, but neither the identity nor the affiliation of the speaker or any of the participants may be revealed. For this reason, the workshop participants have not been listed in this workshop summary report.

2.1 Presentation: Project introduction

WD-DEO is mandated to promote the development and diversification of Western Canada's economy and to advance the interests of the West in national economic policy, programs and projects. Beginning in 2019, WD-DEO was tasked with developing a strategy to sustainably manage water and land in the Prairies. The three Prairie Water Workshops, and the Prairie Water Summit held in Regina in June 2019, are part of the engagement work being done by WD-DEO to gather perspectives and ideas from stakeholders across the Prairies. These workshops were designed to facilitate participants in identifying issues, challenges, opportunities, and priorities related to water management in the Prairies. Following the workshops, WD-DEO will prepare a report and recommendations for consideration to deliver to the federal government by March 31, 2020. This report will consider workshop outcomes in addition to the other work that has been done over the past year to support the development of the Strategy.

2.2 Presentation: Vision for the project and the workshop

In water management, scale is critical. We must think about the global context as we develop regional plans that result in local actions to improve water management. Environmental changes are affecting Canada's land and water resources, presenting challenges for water management. A Prairie water strategy can bring the Prairies together to capitalize on global opportunities and guide us toward a shared vision.

The proposed vision for a Prairie Water and Land Management Strategy is a collaboratively developed **framework to support informed water management decisions that promote economic prosperity, community resilience and environmental sustainability across the Prairies**.

This workshop is part of the first step toward achieving the vision and will focus on gathering and understanding prairie-wide hydrology and priorities in the context of changing climatic and socio-economic factors.

2.3 Presentation: Prairie Hydrology

Baseline prairie hydrology was presented to create a common understanding of the prairie watersheds in a changing climate. Pre-read materials sent to workshop participants summarized sub-regional hydrology within each province. The workshop presentation gave a high-level overview of defining features, characteristics, and considerations for the future at a prairie-wide scale.

Figure 1. The Prairie region for this study consists of the Saskatchewan, Missouri, Assiniboine River and Lake Winnipeg watersheds with sub-regions used for the analysis as indicated.

Detailed information on the data sources and methods was distributed with the pre-read materials. A high-level summary was provided during the workshop hydrology presentation, further summarized below:

- Streamflow data were obtained from Water Survey of Canada.
- Projected monthly air temperature and precipitation data were obtained from Environment and Climate Change Canada's (ECCC) Coupled Model Intercomparison Project Phase 5 (CMIP5).
- Future climate data were obtained for 2021-2060 under the Radiative Concentration Pathway (RCP) 4.5.
- Allocation data for Alberta and Saskatchewan were obtained from provincial government agencies. Manitoba government agencies provided commentary regarding regional demand intensity.

The Master Agreement on Apportionment and the Prairie Provinces Water Board was recognized and a high-level overview of their mandate and activities was provided.

Both historical hydrology and projected future climate indicators were presented. Historical hydrology indicators included incremental runoff, inter-annual flow variability, and allocated flow. Projected climatic indicators were air temperature and precipitation. Highlights of those indicators were:

- Incremental runoff is higher in the Western headwater regions. Some prairie reaches lose more water to evaporation than is gained from runoff.

- Prairie sub-regions which lack a reliable mountain snowpack upstream have the highest percentage of inter-annual flow variability.
- The amount of water allocated in water licences varies greatly across sub-regions. Water allocations are highest in the South Saskatchewan River Basin.
- Air temperatures are expected to increase further in the coming decades, particularly during the winter and spring seasons.
- The highest projected increase in precipitation is during the spring, with little change in the summer.

Implications of the projected climate indicators on the hydrology were summarized as follows:

- Increasing summer air temperatures combined with little to no change in summer precipitation is likely to result in hotter, drier periods and increased drought.
- Increasing air temperature and increasing spring precipitation is likely to result in more extreme weather events including wildfires, flooding, heat waves, and drought.
- Climate change impacts are seasonal, which will impact the timing of water availability.
- Winter temperatures are predicted to increase, and more precipitation is expected to fall as rain, which will peak streamflow to earlier in the spring.
- Streamflow in the Prairie regions will continue to shift from a snowmelt-dominated pattern to one that is more mixed, with higher input from rainfall events.
- Rainfall is less reliable than snowpack, which may increase flow variability, especially for late season flows.

2.4 Breakout discussions

Following the three context-setting presentations summarized above, participants engaged in a series of breakout sessions designed to build on the content summarized above. Discussion topics are summarized as follows:

- **Water Story:** What is the current water story for [AB/SK/MB] and the Prairies?
- **Challenges:** What are the water management challenges, Prairie-wide and for [AB/SK/MB]?
- **Opportunities:** What are the opportunities in response to water management challenges for the Prairies?
- **Priorities:** What are the priorities for water management for the Prairies from a [AB/SK/MB] perspective? Priorities for [AB/SK/MB]?

The following sections provide detailed summaries of the breakout session discussions for each workshop.

3.0 Alberta workshop summary

3.1 Water story for Alberta

In the first breakout activity, participants were asked to consider the hydrologic, climatic, and socio-economic context today and into the future, along with their own experience in water management, and discuss what that information means for water management in Alberta and in the Prairies.

3.1.1 What does it mean for Alberta and the Prairies?

- More **storage** may be needed, but it will require thoughtful planning for location and evaporative losses will need to be considered.
- The timing of **water use** does not match the projected shifts in runoff and precipitation. Reuse is needed which may alleviate water use challenges when water availability does not match with demand timing.
- Basins that are not closed to new **allocations** can learn from others that are fully allocated before water stress becomes a concern. Demand will continue to increase, and basins with open allocations should have plans in place ahead of time.
- There is a **global ideology** that our environment needs to be lush and green. This misconception may need to change as areas become increasingly water stressed. How people **value water** also may need to change, both philosophically and practically. Financial motivation may change how water is valued.
- **Agricultural** practices will need to adapt to changes in climate, and farmers will need to adapt to a new soil moisture regime. Areas for consideration include planting practices, crop selection, and harvest times. **Irrigation** systems will need to be resilient and they must mitigate negative downstream impacts. This will be particularly necessary in semi-arid agricultural regions as they are heavily reliant on irrigation. In addition, **irrigation** may be difficult later in the summer if upstream storage is inadequate. Changes in precipitation timing will also impact **soil moisture**, which will, in turn, impact agricultural productivity.
- Increasing variability may mean that past experiences and data are less relevant for predicting the future. **Adapting to change** will require many solutions, changing practices, and increased planning. Adaptation for long-term scenarios will require public buy-in.
- Forests are important for water management and **source water protection**, but many forests in the headwaters regions are at risk for wildfires. Destruction of forests, by fire or diseases, may increase with climate change and have significant impacts on runoff.
- **Water availability** in the late summer will continue to be a challenge due to early melt over frozen ground and projections for lower snowpack. There may be an increased reliance on existing infrastructure to mitigate increasing flow variability.
- **Inter-annual variability** can be affected by land-use and farm management practices (e.g. agricultural drainage) when runoff and infiltration rates are changed. Different types of trees should be considered to help with aquifer development.

- Alberta generates a lot of water that flows to other provinces and therefore has a responsibility to **downstream communities**.
- Future water stress will negatively affect **economic development**, especially in highly allocated basins. Industries that are reliant on water throughout the province will be impacted by changes in runoff and flow timing. Flood recovery, preparation and mitigation will also have significant economic impacts on farmers, municipalities and other industries.
- Water management and other activities on the landscape have **cumulative impacts** on watersheds, which will continue to increase as more water management and new activities are implemented.
- The **environment** must be acknowledged as a stakeholder in this project. Changes to the land, such as increased paving and road development, will impact natural water systems and change how water moves through the watershed.
- **Education** and telling the water story will become increasingly important to promote water conservation, increase public valuation of water and inform individual behaviour relating to water. Current public interest in water is largely dependent on whether there has been a recent flood or drought.
- **Collaboration** between everyone in the watershed and across legal jurisdictions is essential. Collaborative water management requires resources for implementation. Cumulative changes will require significant interagency planning.
- Downstream users and baseline conditions must be considered when **planning** for impacts and efficient water use.
- There are **communities** that bring in water because they do not have access to adequate quantity or quality of water.
- **Real-time water use data** will help us understand and manage usage, and it will create accountability. Both will help inform basin management decisions.
- Alberta needs a more "resilient" **water management system** that can respond to and manage flood, drought, and population growth. There needs to be ability to enforce regulations more strongly, such as the *Water Act* and Wetland Policy (e.g. to limit non-point source agricultural drainage).
- A critical element of a resilient water management system is to have proper **data**. Monitoring infrastructure needs to be left intact and more monitoring could be done (more stations).
- Air temperature impacts aquatic species. Fish live within ranges of temperature, and changes in water temperatures could increase the prevalence of **aquatic invasive species**.
- Changes in climate will have the greatest impact on Eastern watersheds **as impacts accumulate moving downstream**. This includes changes to incremental runoff being magnified due to cumulative upstream basins, nutrient loading, and more diversions required to compensate for lack of moisture.
- With estimated multi-year droughts and large floods, there is potentially a need for more **infrastructure**.

3.1.2 Additional considerations

- The impacts of forestry practices on runoff should be considered.
- It is important to consider how we are managing wetlands in connection to other water systems and groundwater.
- Extremes in climate and hydrological data can be lost when only an average trend line is presented. This is particularly relevant in the Prairies because of the naturally high variability.
- The Prairie Land and Water Strategy may be missing an opportunity by excluding the Northern regions.
- Water that is not returned to the system, for example, consumptive use, should be considered. As an example, RDRWA is doing a study on the impacts of the volumes of water used for hydraulic fracturing.
- Wetland drainage increases the effective drainage area, which has implications for flooding and for filtration/water quality. Dr. Faramarzi at the University of Alberta has research on wetland drainage that may be useful.

3.2 Challenges

3.2.1 Category: Water quantity, supply and availability

Challenges:

- Change in precipitation timing and interannual water availability.
    - We need to find the balance between different sectors and ensure water is available to everyone.
- Watershed sensitivity to change in precipitation.
- Communication of sensitivities of flow and their subsequent effects.
- Building and funding infrastructure to protect against extreme events.
- Ensuring equity and access to water.
- International agreements and trans-boundary issues.
    - For example, the question was asked about when water will be available for Canadian use in the Milk River basin.
        - There is a letter of intent that allows the US to divert more than their allocation of water from the St Mary's system and to repay it during higher flow periods.
        - There is a public perception that since water is going past, there is water available. But this may not be true – restrictions can be a barrier to having water security.
- Ageing infrastructure increases the risk of failure.

3.2.2 Category: Water quality and watershed health

Challenges:

- Loss of wetlands and degradation of riparian areas.

- Biology-dominated definition of wetlands under the Wetland Policy.
- Land use impacts on watershed health.
- Cumulative effects of hydroelectric dams.
- Removal of harmful and emerging contaminants from drinking water (i.e. pesticides and pharmaceuticals).
- Allocations for rivers and lakes.
- Lack of understanding of the value of green infrastructure in Alberta and Prairie-wide.

3.2.3 Category: Regulatory and governance

Challenges:

- The lack of a reuse policy in Alberta.
- The approach to water rights, transfers, and managing cumulative effects.
- Wetland drainage is reducing our ability to manage extreme floods and droughts.
- Simultaneously managing for extremes in high and low flows in the same year.
- Access to, funding for, and transparency in real time data for individual users, industry, and municipalities.
- The lack of flow monitoring on small tributaries.
- Integrating Traditional Knowledge with Western science and data.
- A lack of resources for some groups to participate in collaborative efforts (e.g. municipalities).
- There is a lack of understanding about the difference between net use and allocation and the transboundary implications. Net use must also include considerations of water quality.
- The lack of political will to prioritize and fund water management solutions.
- Upstream Alberta needs to consider downstream users.

3.2.4 Category: Water demand and access

Challenges:

- Allocations and the need to use water more efficiently.
- The need to change the philosophy on consumption.
- Some parts of Alberta are fully allocated: what does this mean for downstream users?
- The lack of public education and understanding.
- The lack of access to water and the boil water advisories for Indigenous communities, which is being heightened by growing community populations.
- Water reuse.
- Demand can be highly variable and is time and space based. We can't think about demand without considering availability.
- The currently fully allocated areas are in the south of the province where the highest populations live – and this is where the population will grow the most.

- Pipelines for drinking water and sewer improve water security for dryer parts of the province – what are the impacts of these? It creates more demand on the river among other things.
- Water licences sometimes allow users to return flows further downstream, resulting in the upstream reach being without that water.
- Invasive species can impact infrastructure, water quality, regional water security, recreational activities, and can drive costs up.
- There is a two-tiered decision system that decides who gets priority access to water, who has the right to water, and who we divert water to (especially in regions with less water supply).
    - This is not just regarding drinking water, but also regarding water for livestock, crops, and industry.
    - How do we decide who gets water?
- Rural versus urban knowledge and practices:
    - Past educational campaigns designed for urban users creates a lack of understanding around how rural populations need to use water. This difference can create resentment. For example, urban users may not understand why farmers need to irrigate during the day.

3.3 Opportunities

3.3.1 Category: Water quantity, supply and availability

Opportunities:

- On stream or off stream storage to help manage the change in precipitation timing.
    - Where is this appropriate?
        - There is an opportunity for all provinces – but the biggest use will be for irrigation which increases demand simultaneously throughout the provinces.
        - Projects need to be located where they will best meet demand, which requires collaboration throughout the watershed.
- The Red Deer basin water supply needs to look at supporting water and forests. For example, the Red Deer landscape plays a big role in water supply, and the landscape impacts on water can be overlooked.
- Recent flood events have impacted people and made them aware of the importance of watershed management.
- There is an opportunity for public education for those facing challenges, and to gather their perspectives. For example, we need to gain insight into landowner needs and to develop improved management plans.
- We need infrastructure to deal with erratic flows.
    - There needs to be a conversation where we explore options and figure out where infrastructure is necessary and where other solutions exist (for example, the use of landscape and other green infrastructure).
- Improve water management discussions and change the regulatory systems.

    - Change the licensing structure as senior licenses currently get water first. We could explore if there is a better way to manage this by exploring regulatory options that allow for storage during high flows.
    - Examine how access to water can be improved.
    - Understand the different needs of users and sectors and create a new regulatory framework around this understanding.
    - Legal barriers exist that prevent the operation of effective flood defenses. This needs to be examined.
    - Look to see if there are senior licensees not using water, and if this water could be reallocated.
        - British Columbia has looked at dropping FITFIR and allocating sector by sector. Other jurisdictions rank water users and prioritize this way.
- Communicate the recyclability of water and how river systems work.
    - There is a perception that water conflict is worse than it is when the reality is that there are already multiple users working together. For example, hydro uses the same water three times to generate electricity.
- Work with WPACs to communicate as they have the resources to support widespread communication and education programs.
    - WPACs can frame large issues of importance.
    - Review the Approved Water Management Plan report as it shows how the water management plan has worked.
- Education materials need be implemented as soon as a drought or flood event occurs as this is when the public will pay most attention to the message.
- Make better use of existing off stream storage by more efficiently managing diversion rates – current diversion rates can be slow.
- Better monitoring on tributaries as well as main stems, including investing in more and better monitoring to gain a better understanding of the systems.
- Private irrigators not in irrigation districts must be considered.
- Q: Could evaporation from canals and reservoirs be reduced?
    - Some canal systems have been put into pipelines to reduce evaporation.
    - It is impractical to cover a reservoir.
- There are opportunities to 'train' vegetation to survive drought conditions by stressing plants.
    - Education is needed to communicate plant dormancy – yellow does not mean dead.
- The Alberta Geological Survey has mapped groundwater recharge systems and areas, and current water use within Alberta.
- Use groundwater in place of surface water.
- Below ground aquifer storage would eliminate evapotranspiration. This is currently not always economically feasible, but it may become so in the future.

3.3.2 Category: Water quality and watershed health

- Challenges and opportunities associated with the loss and degradation of wetlands and riparian areas:
    - Classification of wetlands under the Wetland Policy:
        - There are different interpretations of the definition of "wetland" between government and the scientific community, and the current policy is very much focused on plants only. Experts are needed to inform the definition of a wetland, including biologists and other ecosystem experts. Invaluable Traditional Knowledge should also inform the definition.
        - There is an opportunity to incorporate hydrology, soil, plants, Traditional Knowledge and other aspects of the wetland ecosystem into the wetland definition by bringing in experts.
    - Preservation of municipal wetlands:
        - There is an opportunity to highlight wetlands and riparian areas as assets to municipalities by embedding their value in municipal statutory planning. There is also the potential to frame wetlands as a management system for extreme events and as an insurance policy.
    - Government policy does not include protection of riparian areas in the same way as wetlands. There is a recommendation from the Alberta Water Council to do so, but this is not on the same level as the Wetland Policy:
        - There is an opportunity to add protection and preservation of riparian areas to the Wetland Policy.
    - There is an opportunity to review the implications of the Drainage Act in the context of climate change.
    - The Wetland Policy is in place, but enforcement is crucial to its success and varies between industries:
        - There is an opportunity to increase consistency of Wetland Policy implementation across different sectors, and especially within the white zones on private land.
        - There is also an opportunity to increase education about wetlands by increasing consistency of Wetland Policy implementation.
- Challenge to understand how ecological systems change over time and respond to different land use and cumulative impacts in the region.
- There is an opportunity to improve watershed health and water quality by reverting back to a regulatory system with more regional offices. This change will provide a "boots on the ground" perspective, which is important because those on the ground understand what is happening in the watershed and can see any changes firsthand.
- There is an opportunity to implement community-based monitoring and to increase citizen stewardship and education.
- There is an opportunity for municipal planning to consider floodplain development restrictions and/or conditions. This could be supported by an earlier opportunity to recognize the value in

wetlands and riparian areas within municipal development planning because floodplains are a type of riparian area. Insurance denials could drive these changes.

- Long-term studies on the effects of hydroelectric dams, including cumulative effects downstream, are lacking:
    - There is an opportunity to implement flow management strategies that consider/support the downstream health of aquatic species. The Fisheries Management Act could be used as a 'lever' in this process.
- The South Saskatchewan river needs to flood occasionally in order to maintain natural processes. For example, natural regeneration of Cottonwood forests is dependent on flooding. Changing river flows through management structures and reducing flood events could negatively impact those natural processes.
- Infrastructure impact assessment:
    - There is an opportunity to include more hydrological assessment in the Environmental Impact Assessment process for large scale infrastructure. The scope could also include impacts on surrounding smaller systems because these streams can be more vulnerable to change. The scale of infrastructure relative to the scale of the stream is important.
- There is an opportunity to coordinate data collection, storage, and use for informing decisions and actions. Decisions and actions are limited if there are not data available. Decision making frameworks need to turn data into actionable items to support decision makers.
- Many resources have been invested in generating existing plans and studies that have made voluntary recommendations based on the findings of the report.
    - There is an opportunity to change recommendations from voluntary to mandatory actions.
    - Alberta Environment has great planning capacity but may be lacking on implementation.
- There is an opportunity to solidify the hierarchy of nested plans (from Prairie-wide to province to sub-region), that align on regional goals from headwaters through to the end of the system.
    - The challenge is that there are completely different legislative frameworks across Alberta, Saskatchewan, and Manitoba.
- There is an opportunity to improve downstream water quality through funding partnerships with municipalities that support the construction of facilities and/or implementation of technology to increase the removal of contaminants such as pharmaceuticals and pesticides.
    - Challenge: funding is required to install high tech water treatment facilities, and knowledge of concentrations and how to measure emerging contaminants is still developing.
    - There is an opportunity for water treatment with both natural and green resources.
    - There is an opportunity to revisit level of water treatment and to work towards fit-for-purpose water treatment and use.
- There is an opportunity to increase recognition and understanding of the economic value of natural assets (EGS). This is linked with an opportunity to investigate the economics at which the decision to build green versus traditional infrastructure is made.

    - There is an opportunity for partnerships with municipalities to test green versus grey infrastructure impacts on water management to increase understanding of the economics of different solutions to water management.
- There is an opportunity to use existing planning documents, including statutory and voluntary, to support the watershed, and as tools to make informed decisions.

3.3.3 Category: Regulatory and governance

Opportunities:

- Water reuse:
    - Develop water quality standards:
        - Water being reused must be "fit for purpose" and the fit for purpose standards must be set but unique to each purpose (for example, grey water versus black water versus irrigation).
        - A system needs to be in place to track water quality standards after each reuse.
        - The public must be willing to accept the standards set, and proper education of the public will be key to garnering support.
- All regulations and governance need to be flexible as more data become available. Political will needs to be present to update for new realities.
    - The end point or ultimate goals of water management need to be defined so we know what we are planning for.
    - There needs to be a process available to open up statutes and review and amend as necessary to reflect new conditions. However, this will create the risk of unravelling the progress which went into developing the regulations.
- Increase the political will to drive improvements in water governance:
    - The challenge with this opportunity is that improvements mean different things to different people, and it will be difficult to decide who would get to vote on potential changes.
    - The *Water Act* has the tools to support wetlands, but the political will is not there to enforce legislation.
- Develop water management plans for all watersheds in the Prairies.
- Develop a parallel independent water agency.
- Raise the profile and increase the mandate of PPWB Committee on Hydrology:
    - They could develop more consistent measures of flow to understand opportunities Prairie-wide.
    - Collect data, and test existing metrics (for example, IFNs for each watershed) and the usefulness of metrics to meet environmental needs.
    - The agency could help manage the differences in water legislation among provinces.
- Make data available to those who need it (there is a lack of open source data):
    - Data should be made available online and in real-time.
    - This will require more monitoring and fewer cuts to existing monitoring systems.

- Put a dollar value on water:
    - Put a tax or royalty on water use and use the money to fund metering for water use (for example, a royalty system on the Milk River).
    - Water use data should be metered and must be made publicly available.
    - This could help drive the implementation of BMPs to get best value.
    - Valuing water can result in cost savings and greater investment (for example, in the Murray-Darling basin, the crop mix changes were based on the current value of water).
    - This will help drive a better understanding of the value of water and wetlands, and will place a value on conservation (maintenance, mitigation, and retention of wetlands, for example).
    - Developing the value of water could be included in water management plans.

3.3.4 Category: Water demand and access

Opportunities:

- High demand in low supply regions can drive efficiencies, particularly when these areas are facing limited supply or supply challenges.
- If demand and access are limited in some areas, reuse is an opportunity to have more water available. Multiple uses create more opportunities where you don't have to redraw.
- Storage both on and off stream: we currently aren't storing enough water, so storage is an opportunity, and it will increase economic development.
- Cost benefit studies on technology and investments need to be conducted to look at the long-term value of what we will gain from opportunities to make better water decisions.
    - For example, should we invest in behaviour changes or in technology? We need to determine what provides the bigger benefit.
- We need to account for return flows (where and when).
- Water sharing agreements: collaborative groups can be created to deal with priority access / licence priority, and there is an opportunity to share funding and resources.
- Water commissions can work well for rural regions or multiple municipalities – pool water allocations and manage these collectively.
    - Need to respect the rules/governance.
    - Need to have local expertise.
- Increase irrigation where it is feasible and appropriate:
    - For example, the Red Deer River isn't fully allocated.
    - Irrigatable water is being made available from efficiencies (i.e. pipelines) which will help us feed the world.
- The Water-Energy Nexus:
    - It takes energy to use water, for example, diverting, pumping, and treating water. We need to evaluate any opportunities available from coupling water systems with energy systems.
- Communities benefit from irrigation, not just the individual farmer:

  - Public education is needed about the benefits of irrigation so that people can better understand why certain industries are publicly funded.
  - We need to quantify the economic development value of other water uses and make this information public.
- For watersheds with less water available, we need to investigate the opportunity for regional pipelines.
  - Alternatively, we need to decide if we should just invest in places that are less water dependent. Do we move the water to the people or the people to the water?
  - We also need to determine the scale and scope of moving water for different purposes.
- Water security and efficiency can be mutual:
  - Efficient infrastructure can leave more water in a secure reservoir.
  - Adaptive behaviour leads to water security and efficiency.
  - Innovative solutions and a change in mindset can lead to water security – these are tools we currently have but we need to apply them in ways that work better (for example, deeper dugouts.)
- Incentivize water conservation.

3.4 Priorities

3.4.1 Category: Water quantity, supply and availability

Impact:

- Cost involved / funding opportunities / GDP
- Water volume
- Number of people impacted
- Land use
- Environmental effects, both positive and negative

Urgency:

- Time
- Is urgency just one measure of importance? If so, is this the most important measure?
  - Risk could be a better measure
- The scale of the problem dictates the urgency

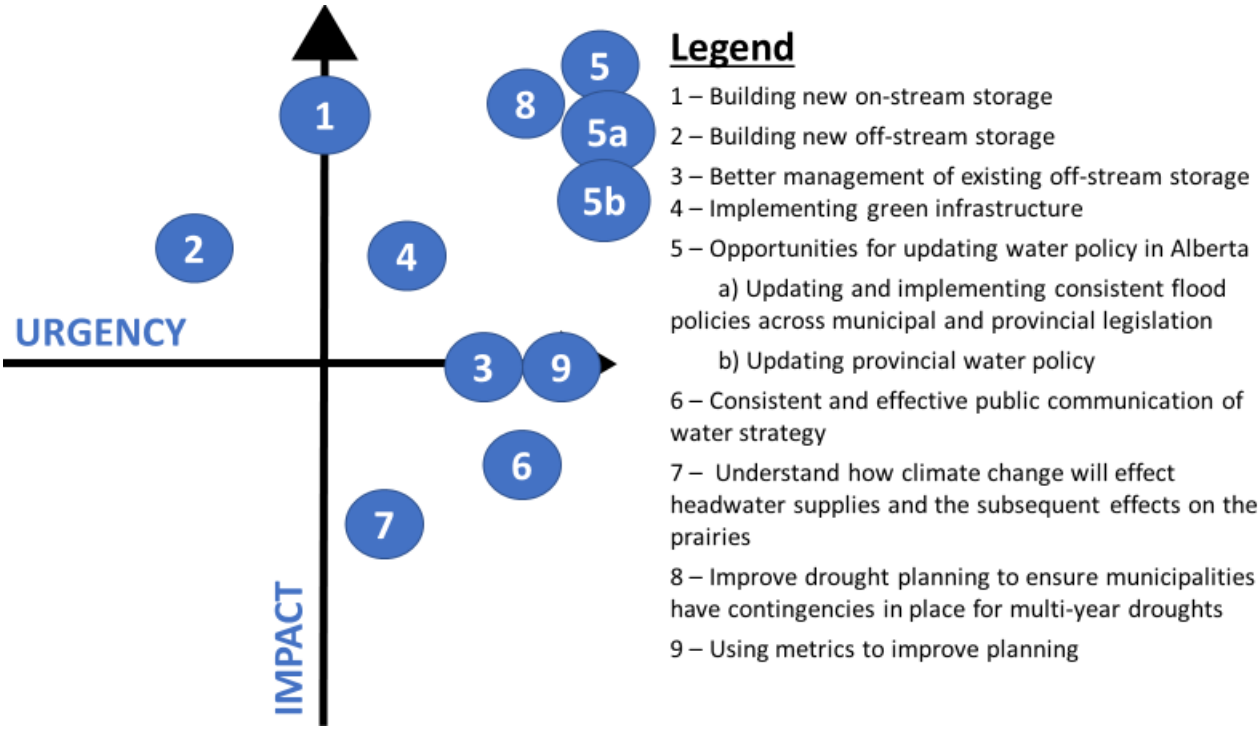


Figure 2. Priorities matrix for water quantity, supply and availability in Alberta.

1. On stream storage such as reservoirs can be used to manage water supply.
    - A lot of reservoirs have been built with power generation in mind rather than water management. Consider multi-purpose operations for new storage.
    - This is a high impact opportunity because the water volumes stored would be high.
    - There will be other impacts because it is a high cost opportunity, and it could create flooding. On-stream storage also generates methane.
    - Medium urgency opportunity because preparation is required, and because on-stream storage will take time to plan.
        - Planning storage must happen in parallel with the general discussion on water management with natural assets, which is also an opportunity to pursue.
2. Building new off stream storage.
    - On stream has broader benefit but off stream also has benefits. Many of the points discussed for on-stream storage points apply to off stream storage (see #1).
    - Need to consider hydraulic connectivity.
3. Better management of existing off stream storage.
    - This may be through higher diversion rates and better use of existing infrastructure.
4. Green infrastructure can help mitigate the variability in flow.
    - Green infrastructure can aid water availability by storing water in wetlands.
    - High impact opportunity:
        - Lower cost, but we still need to plan for those costs.
        - Human health aspects must be considered (i.e. stormwater ponds).

- Medium urgency
    - Need to plan where it will go, and the longevity of the project.

5. Opportunities for updating water policies in Alberta.
    a. There is a need for an updated flood policy in Alberta, but there is little political will to change this due to blowback.
        - Standards implemented by municipalities must fall in with provincial structure.
        - Smaller scale (municipal) flood policy implementation would be advantageous.
        - Q: What prevents municipalities from designating flood areas?
            - There are tools to do this to a limited extent, but provincial guidance must be followed, and this needs to be changed and to be consistent with flood policy.
            - High impact because of the high cost, the human health implications and the high environmental risk.
        - High urgency because an unpredictable flood event could occur any time and yet there are still gaps in regulation.
    b. Opportunity to update overall water policy within the province (i.e. the Water Act).
        - Regulatory regime does not account for how the watershed is dynamic and does not accommodate our need to be flexible with water use. Policies do not explicitly mention climate change, which can impact policy.
6. More effective communication of our water strategy.
    - Our water strategy needs to be effective and consistent to each stakeholder, and it should be targeted to individuals. In particular, people are receiving mixed messages regarding water that will be available in the future.
7. Understanding about how headwater supply will change over time needs to be understood, including the impacts from climate change such as shorter winters and faster snowmelt on the Prairies.
    - The Government of Alberta conducted a study on this in some streams, but the conclusion was that more data and longer monitoring is needed to draw firm conclusions.
        - If it's hotter earlier, the snow will melt faster. Does this need data to support or is anecdotal evidence enough?
        - Q: do you think we should be looking at the rate of snow melt?
            - Yes, but more monitoring should not preclude us from acting now – we have a lot of data from AEP that supports a faster snow melt. We don't necessarily have all the information to create effective models.
            - California is an example of where models precluded people from taking appropriate action and now they are struggling. They may also be struggling from inadequate or too few studies.
8. Coordination and communication of drought planning to ensure municipalities have contingencies in place.

- The Alberta Water Council has a guide for multi-year drought for municipalities. The hope is that it will address some coordination issues. In addition, there is interest in running a real-world test simulation to test impacts.

9. Opportunity for understanding and implementing metrics with associated triggers that can be used to improve planning (i.e. reservoir levels metric).
    - This will inform our understanding of the urgency of other opportunities.

General comment: It is important to turn these into actions. Otherwise the impact or urgency do not matter.

Question: Is there an opportunity to improve irrigation efficiency in the provinces?
Response: There is, but a lot of improvements have been made already. It is a similar story for municipalities. Municipalities also need to communicate that naturalized green storage is good.

3.4.2 Category: Water quality and watershed health

Impact:

- High impact opportunities affect a high number and diversity of stakeholders
- High impact opportunities consider many values, such as the triple bottom line (i.e. ESGs)
- High impact opportunities have a high cost associated with failure to act

Urgency:

- Urgency depends on whether it is a current or future challenge
- Urgency depends on level of threats and managing risk
- Urgency depends on whether there is a tipping or critical point where it becomes much more difficult to deal with the problem (i.e. a point at which the cost of a cure is higher than the cost of prevention)

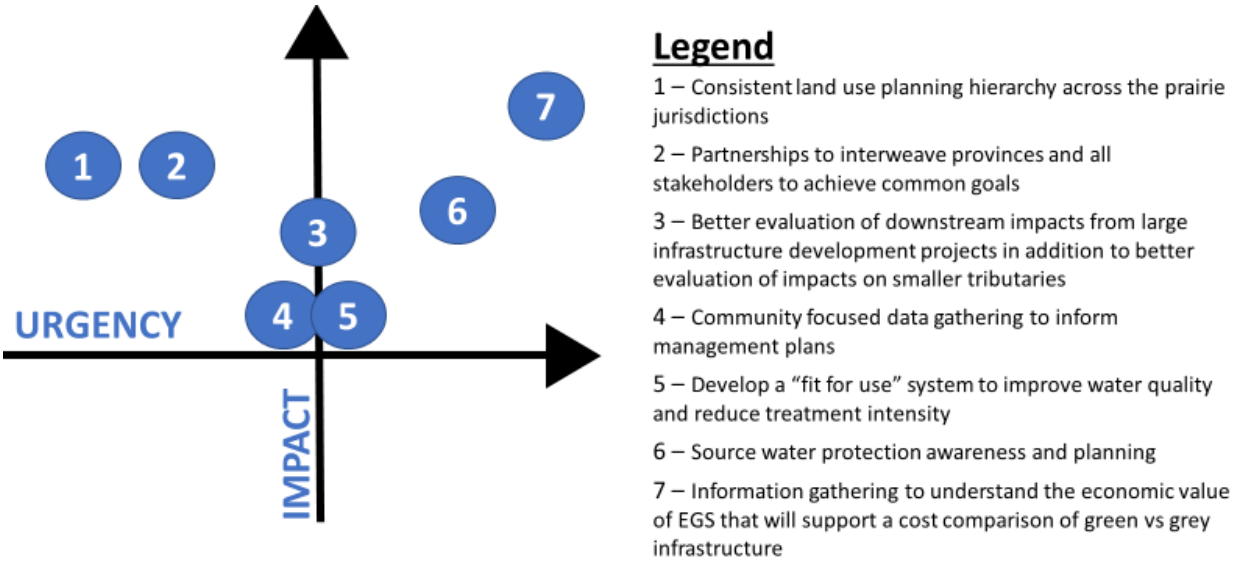


Figure 3. Priorities matrix for water quality and watershed health in Alberta.

1. Consistent land use planning hierarchy across the prairie jurisdictions:
    a. Including both statutory and voluntary land use plans.
    b. One big sustainable system that supports planning decisions going forward (e.g. a land planning hierarchy) and finds opportunities to achieve a vision state.
2. Partnerships to interweave provinces and all stakeholders to achieve common goals:
    a. Supports opportunity #1 (above).
3. Better evaluation of downstream impacts from large infrastructure development projects, in addition to better evaluation of impacts on smaller tributaries.
4. Community-focused data gathering to inform management plans.
5. Develop a "fit for use" system to improve water quality and reduce treatment intensity.
    a. Smaller communities would benefit the most from this opportunity; for larger communities, the cost might be too high. This is therefore a medium impact.
6. Source water protection awareness and planning:
    a. SWP is important for other ecosystem goods and services (EGS) and natural infrastructure. Therefore, it is high impact and high urgency.
7. Information gathering to understand the economic value of EGS that will support a cost comparison of green versus grey infrastructure:
    a. High impact and high urgency because it will support and drive other opportunities, including source water protection (see opportunity #6).
    b. Example: County of Beaver is experiencing challenges with drainage of roadways and culverts and are looking into natural infrastructure solutions.

3.4.3 Category: Regulatory and governance

Urgency:

- The longer you wait, the worse it gets
- Could be broken up into short, medium, and long-term opportunities
- The perception of irreversibility
    - Education can be used for those who perceive improperly
    - Urgency can be used to motivate people to take action
- Actions should be sequenced according to urgency
- Urgency is more likely driven by perception while impact is likely more fact-based

Impact:

- More science-based and measurable than urgency
- Degree to which you achieve the desired outcome
- The opportunities that create the information and data to support decision-making
- Opportunities that improve environmental performance or provide socioeconomic benefit

- General note: the feasibility of opportunities is not addressed by the matrix.

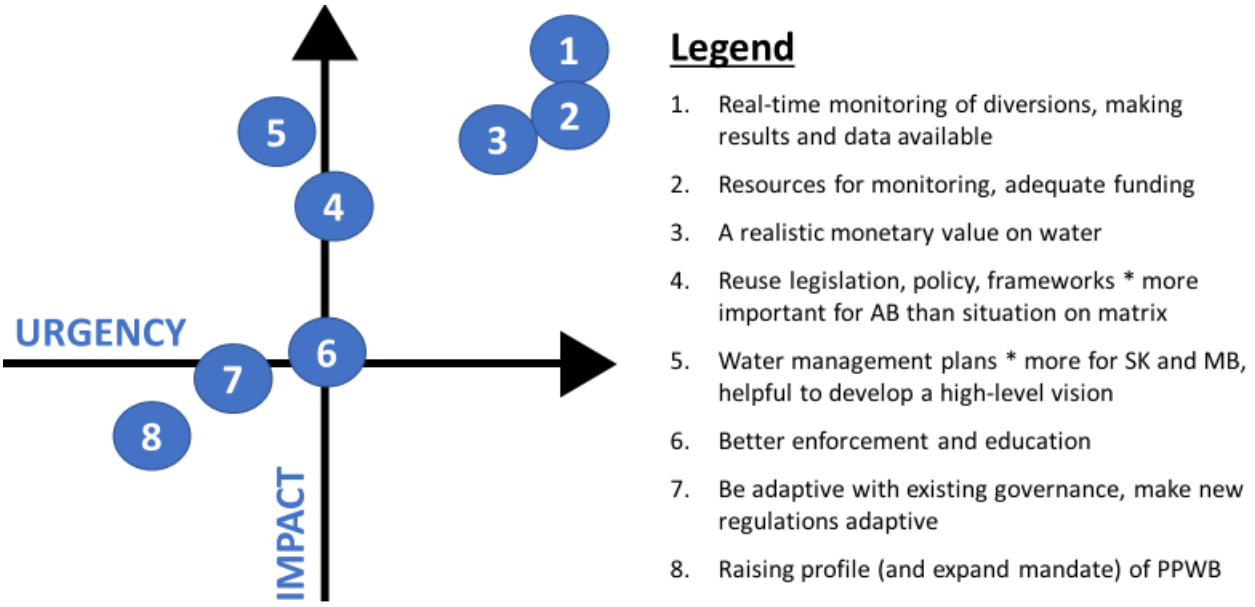


Figure 4. Priorities matrix for regulatory and governance in Alberta.

1. Real-time monitoring of diversions and making results and data available publicly accessible (e.g. online):
    - Highest impact and urgency.
    - Required for decision making.
2. Resources for monitoring (e.g. adequate funding):
    - Required for data collection in the previous bullet.
3. Realistic monetary value on water.
4. Release of water reuse legislation, policy, and frameworks:

- More applicable to Alberta than other provinces given allocation issues.

5. Completion of Water Management Plans for all Prairie basins:
   - More urgent for Saskatchewan and Manitoba as many are already done in Alberta.
   - Useful to develop a high-level vision for a Prairie-wide water management strategy.
   - Plans must be completed and approved by Cabinet.
6. Better enforcement and education around wetland rules and regulations:
   - This is necessary Prairie-wide.
   - It addresses issues related to agricultural drainage.
7. Add adaptive principles to existing governance and legislation and make new regulations adaptive:
   - Required for changes we are expecting and not expecting in the future as we need to be prepared to adapt as necessary.
   - We need to be careful of the scope of changes and how / what we are changing.
8. Raising the profile and expanding the mandate of PPWB:
   - Educate and actively promote PPWB via public channels.

3.4.4 Category: Water demand and access

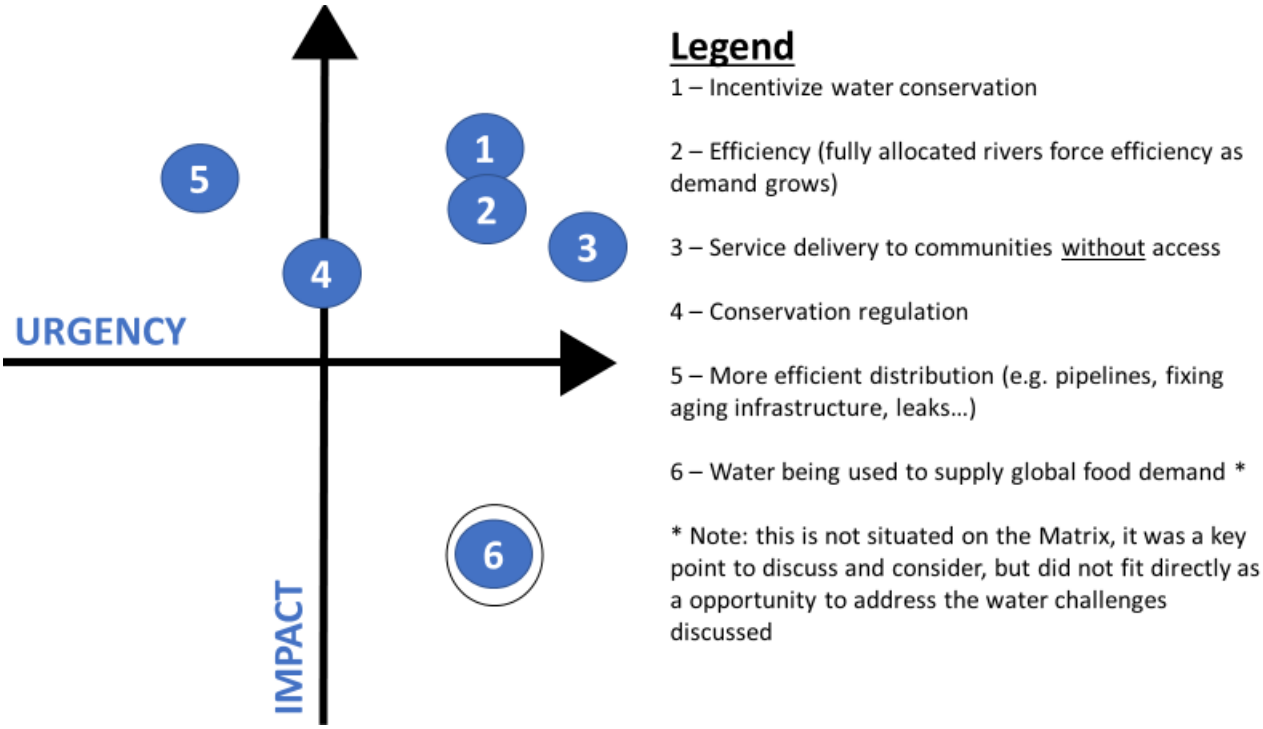


Figure 5. Priorities matrix for water demand and access opportunities in Alberta.

1. Incentivize water conservation:
   - High for both urgency and impact.
   - We need to look at the cost benefit (long term value) of opportunities.

- Examine the economic development aspects of choosing future opportunities.
  - i.e. future water pipelines – we need to know the full benefit versus the full cost.
  - Irrigation districts are funded because the entire province benefits. What is it worth to a dry area to get water?
- Coupling water and energy:
  - Will incentives for conserving energy equate to conserving water?
- Change of mindset:
  - We need to have adaptive behavior – this is urgent.

2. High demand can drive efficiency, particularly when coupled with limited supply:
   - Urgency is high, but only when the river is fully allocated or in places that need supply (i.e. SSRB versus Red Deer).
   - Saved water from users with efficiencies can be offered to other users who need it more. This decreases urgency.
   - Sub-regional / local priority.
3. Service delivery to communities without access:
   - Meeting demand for Indigenous communities is urgent.
   - This is huge impact and urgency for First Nations, and it can also create economic development opportunities for these groups.
4. Conservation Regulation:
   - Increased irrigation on the Red Deer – we are trying to feed the world.
   - Urgent.
   - Conservation in an urban perspective, for example, getting more water supply for drinking. Do we have to make people more efficient through regulations or by incentivize the population?
   - Impact – is dependent on the type of conservation regulation / incentive.
5. More efficient distribution (pipelines) and collection:
   - This is about fixing leaks, aging infrastructure, and lead in pipes.
   - Big impact in areas with infrastructure deficits.
   - If there is a drought, the urgency will increase.
   - Huge urgency locally.
6. Agri-food / agricultural production used for global food demand:
   - May become urgent because water is needed to supply food.
   - It is urgent in China but not here yet.
   - Which output is the protein of the future? Is it beef? Pulses? A change is coming that will have huge water implications.

General note: this exercise was difficult because impact and urgency depend on the time and place that we are looking at. The exercise also doesn't consider the social, economic, environmental perspectives.

4.0 Saskatchewan workshop summary

4.1 Water story for Saskatchewan

In the first breakout activity, participants were asked to consider the hydrologic, climatic, and socio-economic context today and into the future, along with their own experience in water management, and discuss what that information means for water management in Saskatchewan and in the Prairies.

4.1.1 What does it mean for Saskatchewan and the Prairies?

- Saskatchewan will need to **manage water carefully** because it is vulnerable to increased fluctuations in climate due to high dependence on upstream headwaters. Tributaries to major rivers may become increasingly important to support regional growth.
- **Groundwater** will experience increasing pressure, especially during drought, but groundwater resources are not well understood across the Prairies from a quality and quantity perspective.
- Water management planning needs to be proactive instead of reactive. **Adaptability** of infrastructure will be important. New projects must work within the confines of water that is available and consider efficiency from the outset to prepare for the future.
- Water managers in Saskatchewan recognize that one day more basins in Saskatchewan **may be fully allocated**, which could start to impact economic development. Allocation transfer systems and reuse may be needed to mitigate demand. It was recognized that Alberta may have lessons to share with Saskatchewan to plan for management in highly allocated basins.
- Respecting the **apportionment agreement** and working with Prairie Provinces Water Board to meet requirements will continue to be important.
- **Water quality** issues will get worse, including increasing algae blooms, invasive species, and salt accumulation from flood and drought cycling.
- More awareness around **drainage** will be necessary along with an updated picture of the significant non-contributing basins in the province.
- Given potential for more frequent and greater magnitude of **floods**, people/ business/ gov't may need to adapt to flooding, rather than control flooding in some instances.
- Saskatchewan's agriculture industry is a large contributor to the **economy** and is vulnerable to drought.
- Storage to **capture earlier snowmelt** must be explored, but any new storage and conveyance should come with coordination between the Prairie Provinces. Smaller communities with smaller storage capacity are and will continue to be more susceptible to fluctuations in water supply.
- What happens upstream matters to those downstream. Water managers will need to **coordinate across provinces and across sectors** because changes in any one province or sector will impact the others.
- Need to work towards **integrated water management** including drainage, stormwater management and water supply.

- **New crops** and potentially **higher value crops** or modified varieties may be developed in Saskatchewan to respond to changes in climate. Irrigation may become more important to mitigate variability in precipitation, but other factors must be considered.

4.1.2 Additional considerations

- Defining resilience across the Prairies will include finding a balance between public good, industrial development and environmental preservation.
- The Strategy needs to include smaller tributaries because they will be impacted differently than the big mainstem rivers.
- Impacts to producer insurance purchases and claims should be included in the Strategy.
- The Crop Insurance Corporation should be included in discussions regarding the Prairie Water Management Strategy development.
- Actual and consumptive use are important to tell the real story of water stress, not just allocation.

4.2 Challenges

4.2.1 Category: Water quantity, supply and availability

Challenges:

- Increasing seasonal changes at the local and sub-basin scale.
- The need for more data and hydrometric monitoring stations.
- Variability in precipitation.
- Flood and drought cycles affect everyone, including communities and agriculture.
- Flood management is expensive and the challenge is “who will pay for it”?
- Saskatchewan could use more LIDAR to support flood management and infrastructure decisions.

4.2.2 Category: Water quality and watershed health

Challenges:

- Within the province of Saskatchewan there are divergent views on the vision for water management.
- Water is treated as a commodity versus a public good.
- Maintaining water quality, and water quality standards in the context of Treaty rights.
- Riparian health is impacted by water quality challenges.
- Invasive species.
- The reactionary approach to water management (e.g. WSA).
- The lack of place-based policy.
- Increased salt resulting from drought and flood.
- The lack of understanding of how water storage on the landscape impacts the structure of the landscape.

- Water quality challenges in standing water and tributaries (and to some extent, mainstems) is showing no improvement and in some places, getting worse due to slow loss of nutrients from agriculture and older wastewater treatment technology. Climate change is exacerbating this challenge. Toxic algal blooms are an example of a water quality challenge, especially in South Saskatchewan lakes.
- Finding the balance between the economics of protecting and preserving water storage (i.e. wetlands and sloughs) versus draining and farming.
- Different rural and urban perspectives on what is acceptable land management practice.
- The need to share knowledge about quality impacts.
- Natural systems are typically smaller and therefore more resilient. Challenge is that we have large systems that are inherently less resilient.

4.2.3 Category: Regulatory and governance

Challenges:

- We lack the infrastructure and data to properly manage drainage and stormwater on both a watershed and prairie-wide basis.
- Stormwater management is particularly important for downstream stakeholders. If upstream land managers alter drainage (e.g. by cutting down trees or draining wetlands), this will impact those downstream.
    - Any initiative to manage local drainage as a group of farmers could be a challenge.
- The economic balance of use, drainage/treatment, and recreation.
- The Environmental Impact Assessment process appears to have had a change in purpose and is now focused on approvals:
    - Very little discussion is going on about carrying capacity on the Prairies.
- Indigenous involvement 'at the table' is necessary from the beginning:
    - Indigenous communities should be involved in policy, R&D, legislative and regulatory development, and economic development decisions.
- Integrated governance is needed:
    - Integrate all owners of infrastructure (Federal, Provincial, municipal, and First Nations).
    - Integrated planning (consider distribution, drainage, and mitigation, etc.).
- Proactive management of water quality on recreational lakes is needed. The Qu'Appelle Lakes are likely to get "soupier" earlier and this will become an economic challenge.
- Need governments at the table with an agreement on principles of a vision (which should lead to implementation):
    - Encourage governments to work together and "drive in the same direction". This should include the three provinces, the federal government, Indigenous groups, and municipalities.
- Saskatchewan has 466 organized communities. Many don't have the necessary resources to upgrade. Where does the money come from for treatment and distribution?

4.2.4 Category: Water demand and access

Challenges:

- Balance the use of groundwater and surface water.
- What does 'fully allocated' in Alberta mean? Are there lessons that can be learned?
- Drainage impacts the ability of downstream users to access quality water:
    - This includes the ability of First Nation's to provide high quality water for their communities and livestock.
    - Small communities and recreators are also impacted.
- Homeowners on lakes may be impacted as lake water quality may get worse earlier in the year.
- The lack of information on actual water use is a significant challenge.
- Small urban areas lack the funds necessary to upgrade/implement water and wastewater treatment.
- The biggest challenge to any and all water management is a lack of political will:
    - Interprovincial sharing is a challenge.
    - Cooperation within provincial boundaries is challenging.
    - It is important to have everyone at the table, but this is a challenge.
- Competing demand isn't just an inter-provincial issue – there's also the intergovernmental component within the provinces. Different levels of government need to come together to address water issues.
- The lack of understanding amongst the public about how water is used is a challenge. There is poor recognition of the potential opportunities that better water use can provide.
- Identifying clearly what the challenge to water access is for a specific a community or situation can be difficult, but it is very important. Is it governance? Infrastructure? Availability? Quality? Funding?
- Whose responsibility is it to provide access to water for limited areas? The government? The user?
    - When lack of access is a question of infrastructure, whose responsibility is it to provide access? If you need infrastructure to provide access, and you can't raise financing locally, then you have to rely on government grants, and they aren't available in all situations.
    - Funding infrastructure for water access utilizing public funds needs to start with an increased public understanding of the need for water access and the infrastructure that will provide it.
    - Public understanding is the foundation on which public support to fund infrastructure with public funds is built upon.
- Understanding future demand for sub-basins/regions is a challenge which leads to an opportunity.

4.3 Opportunities

4.3.1 Category: Water quantity, supply and availability

Opportunities:

- The biggest opportunity is to smooth out the peaks and the variability. This can be done in a number of different ways, detailed below. Not one water management method should be employed; many different management techniques should be incorporated:
    - Remediation of wetlands presents an opportunity to increase storage and create habitat and recreation locations.
    - Increased storage will also allow for hydro opportunities.
- There is an opportunity for micro-hydro to be employed at an irrigation distribution level. Micro hydro can be used for farmers to power their homes and their pivots.
- Increased storage is a big opportunity. This is paired with increased distribution infrastructure. With increased distribution infrastructure, distribution will need to be prioritized between industry, municipalities, irrigation, recreation, and other diversified water use. There will be an opportunity to use the same distribution infrastructure to supply multiple needs, such as community water supply and irrigation:
    - Off stream storage should also be considered, rather than just on stream.
    - There are also challenges associated with storage. A full cost benefit analysis will need to be completed when considering additional storage; the benefits of storage are not always greater than the cost. One example of this is the proposed Meridian Dam, where it was found that the costs were much higher than the benefits.
    - Additional access is needed to water at lower costs, which will attract industry. For example, a pea processing facility passed on the opportunity to develop in Saskatchewan because they could not access water.
- There are opportunities to increase water efficiency within communities and within agricultural practices. One example is the dairy industry, which is a big water user. Is there an opportunity to increase efficiency within the dairy sector?
- Saskatchewan could look at further evaluating drainage practices as there is already some work underway in this area.
- Development in flood plains should be restricted. LIDAR and flood mapping is required in order to implement development restrictions.
- More data needs to be collected, including LIDAR, flow, precipitation, and temperature data. Increased data will allow for increased development and increasingly efficient water management.
- Water security planning needs to be completed. This needs to include planning for both water quality and quantity and should consider all water users.
- Water allocations versus water consumption should be evaluated to create a better understanding. There is also an opportunity to communicate current allocations differently.

- Water needs to be discussed differently, and water education is very important. There is an opportunity to create a narrative and talk about the interconnections and priorities around water. An increase in communication will also create social license for water use.

4.3.2 Category: Water quality and watershed health

Opportunities:

- Public opinion on what is acceptable in terms of water quality and watershed health is evolving. There is more advocacy for water quality and watershed groups. Social license to address water management challenges is increasing.
- To get ahead of the story, there is an opportunity for early education on what factors impact water quality. Consistent language should be used to tell the story.
- There is an opportunity to build Indigenous knowledge and perspectives into water governance in a meaningful way:
    - The environment has a right to water.
    - Water is linked to the entire ecosystem.
    - Reconciliation needs dialogue.
- There is an opportunity to build a long-term perspective into the architecture of watershed management planning.
- Deliberate inclusion of diverse perspectives and integration into the architecture of watershed management planning is an opportunity. The number of perspectives needs to be balanced.
- There is an opportunity to use mapping (LIDAR) to assess risk and opportunities at a local level.
- There is an opportunity to improve water quality.
- Use different people, perspectives, governance, information, and evolving social license in an open and strategic way to make infrastructure investment decisions that benefit the economy and society.
- Develop policy based on diverse perspectives (provincial policy through WSA).
- Develop a long-term vision that considers the passage of time.
- Revisit the structure of water administration in Saskatchewan. For instance, why is WSA separate from SK Environment? The structure of departments relative to one another needs to be examined.
- There is an opportunity to improve communication within government departments.
- There is an opportunity to learn about other impacts on the landscape from drainage.
- Incorporate multiple management objectives into drainage management.
- Let the land be part of the system.
- Revisit the idea that management equals capital investment.
- There is an opportunity to look for the next big infrastructure project, but we need to consider how that would fit in with existing downstream control structures.
- There is an opportunity to reimagine communities in the context of sustainable land and water management.

4.3.3 Category: Regulatory and governance

Opportunities:

- Develop a single table for water management issues among stakeholders:
    - Governance and authority mechanisms in the province are fragmented: there is no single provincial authority for water.
    - Saskatchewan is one of the only provinces that does not have a legislated water council-type entity.
    - The entity should be inclusive of First Nations.
    - The entity could identify and manage flood-prone areas using LIDAR or another method.
- Develop a comprehensive or strategic plan around water for Saskatchewan:
    - This plan could be developed by a water-council type entity.
    - To develop the plan, we would need to identify what end goals we want to achieve.
        - Needs to be informed by data (see below).
    - The development of a strategic plan would require commitment from all levels of government.
- Develop a data repository for all types of water data (groundwater, allocation, water quality, etc.) and develop or assign an entity to provide public access to the information in real-time:
    - The body that manages the data needs the capacity to be able to review the data on an ongoing basis for quality/ integrity.
    - The data repository could reference and be informed by existing resources and datasets.
    - Data outcomes could be integrated with existing research (e.g. Prairie Water Project) and be used to inform economic decisions.
    - Data would be used as the basis for developing principles for water management (economic, municipal, environmental) in a potential strategic plan for water in the province.
    - A data repository could be developed for Saskatchewan and the Prairies as a whole.
- Prevent illegal and unmitigated drainage:
    - Greater enforcement of existing drainage rules is needed.
    - We need a way to incentivize not draining, or a way to de-incentivize drainage – i.e. connect those who benefit with those who pay.
        - For example, New York City examined the cost of wastewater treatment with the cost of implementation of upstream BMPs. The solution was to pay upstream users to implement BMPs, which resulted in cost savings versus building a treatment plant. A similar system could be implemented in Saskatchewan.
    - Explore alternative funding mechanisms for funding proactive measures over the long term (e.g. water stewardship) as the economy, environment, people are dependent on high quality water and sufficient supply.

- The issue is that investment in prevention of water issues saves the public sector money, but it is difficult for public bodies to find funds and incentives for prevention.
    - For example, Britain has a natural trust that sets aside land and waterways.
    - Social impact bonds could be used to improve watersheds (investors support initial capital costs and the government pays to the program when the outcomes are achieved).
- It is critical that funding is set aside and not spent on other areas as government priorities change.

4.3.4 Category: Water demand and access

Opportunities:

- Better understanding of the current and future needs/demands on the scale of small rural regions within the province we can plan better:
    - There is an opportunity to better plan by utilizing a better understanding of upcoming demand and availability – we need the better ability to address challenges like droughts.
    - There's an opportunity to build public awareness through a consumer awareness campaign. A better public understanding will lead to public support for government action on water.
    - There is an opportunity to increase public awareness of the true monetary value of water.
    - Building better public understanding will be better accomplished if the public information building body is seen as impartial and not representative of a particular industry(s).
- Need an understanding of actual demand challenges:
    - We need to be clear about the differentiation between existing and potential demand to support new activities/economic growth.
    - The potential demand that adding one input to an area that can support an entire new industry does not mean that adding that input will cause the actual demand of that entire industry to materialize. Industry actually developing or moving to that area depends on more factors that just water access.
    - There's too much of a tendency for the public as critics to say that A necessarily equals B.
- Create a public awareness and education program:
    - Utilize the provincial water licencing websites to inform people about water, water governance, and the true monetary value of water.
    - There is an opportunity from having publicly available information on licences and users etc.
    - Must be driven (hosted/lead) by an organization recognized as impartial.

- Development of a strategic plan, developed by all entities including government, users, funders, etc.
    - It should support cooperation, understanding, and funding.
    - Cost-benefit analyses and planning is needed.
    - It should support regulations.
- Small communities face big challenges with planning for redevelopment or for the long term because funding is limited and only able to deal with immediate issues and problems.
    - Two options are regionalization (amalgamation), or community relocation which is not realistic.
    - Regionalization also needs the will of all member municipalities for long term planning; ideally all municipalities are on board.
    - Each community has different priorities.
    - At least a 20-year plan is needed.
    - Self-governing bodies that manage rural community water allocations are needed:
        - Builds self-reliance and a sense of pride, ownership and community.
        - Fosters mutual support for problem-solving and infrastructure development.
        - Requirement is a champion organization to lead.
        - This may be prompted by an extreme event, for example, a flood.
- Higher efficiency is an opportunity on an individual basis, industry basis, municipal community basis, etc.:
    - Efficiency in various forms is needed, for example, in rainwater harvesting.
- How do we drive/deliver efficiency? Many opportunities:
    - Incentives?
    - Costs?
    - Constraints on growth?
    - Water pricing?
    - Educating the public?

4.4 Priorities

4.4.1 Category: Water quantity, supply and availability

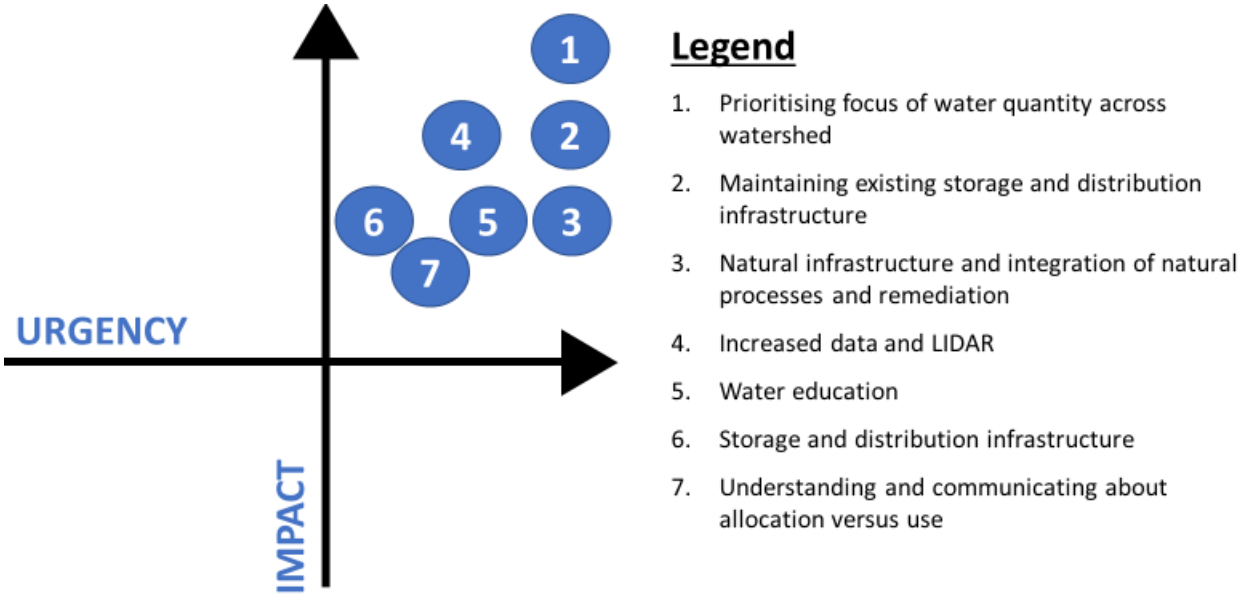


Figure 6. Priorities matrix for water quantity, supply and availability in Saskatchewan.

1. Prioritizing the focus of water quantity across watershed:
    - There are different water quantity challenges across watersheds; they are not uniform across Saskatchewan or the Prairies. The water quantity challenges need to be understood at a basin level scale and then prioritized.
2. Maintaining existing storage and distribution infrastructure:
    - There is already a lot of storage and distribution infrastructure. People rely on this infrastructure: if it did not exist it would be devastating to farmers, communities, industry and others. This is already being done but is highlighted as high urgency and high impact.
3. Natural distribution infrastructure and integration of natural processes and remediation:
    - Additional infrastructure is needed in order to attract industry and realize the potential for agricultural development.
4. Increased data and LIDAR:
    - Increased data and LIDAR are needed before any major decisions are made, such as large infrastructure decisions.
5. Water education:
    - Increased water education will develop a basis for having a broader conversation about what needs to be done.
6. Storage and distribution infrastructure:
    - Storage and distribution infrastructure should be considered once there is additional data to help in evaluating the need for and the location of infrastructure.

7. Understanding and communicating about allocation versus use:
    - The WSA has an opportunity to communicate more broadly about allocations.

The development of a drought contingency strategy was also discussed as a high priority, which the WSA is currently developing.

4.4.2 Category: Water quality and watershed health

Impact:
- Higher impact if it affects more people
- Consider how far does it move the system from its current state
- Consider how fast does it move the system from its current state
- Consider how permanent are the effects, how difficult the challenge is to reverse

Urgency:
- Need agreement on how to prioritize water use
- Consider how fast the action will take to have the desired effect
- Consider whether the challenge is irreversible

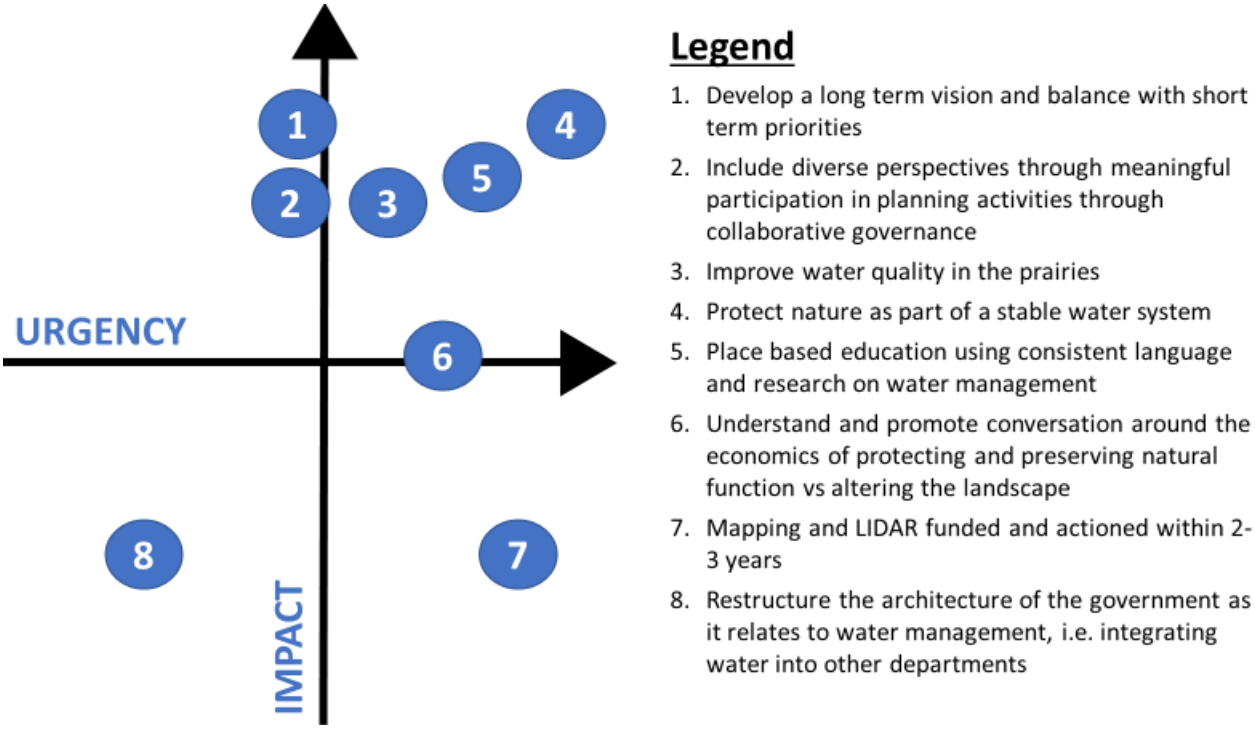


Figure 7 Priorities matrix for water quality and watershed health in Saskatchewan.

1. Develop a long-term vision and balance with short term priorities:
    a. Urgent for prioritizing use.

2. Include diverse perspectives through meaningful participation in planning activities through collaborative governance that allows perspectives to be heard by and influence decision makers (e.g. the original intent of watershed organizations in Saskatchewan):
    a. Less urgent because time needs to be taken to meaningfully consider perspectives.
3. Improve water quality in the Prairies:
    a. High impact because it affects many people.
    b. Urgency depends on the specific water quality challenge (i.e. is there risk of irreversible change such as the Lake Winnipeg step change in lake dynamics).
4. Protect nature as part of a stable water system:
    a. High impact and urgency due to the irreversibility of some ecological challenges.
5. Place based education using consistent language and research on water management:
    a. High impact and high urgency because this will promote long-term solutions.
6. Understand and promote a conversation around the economics of protecting and preserving the natural function versus altering the landscape (i.e. through drainage):
    a. This is a similar idea to ensuring that social and environmental factors are driving decisions in addition to economics, as well as the understanding of tangible market value versus intangible value and public good.
7. Mapping and LIDAR funded and actioned within 2-3 years:
    a. High urgency because it is seen as low hanging fruit.
    b. Lower impact because it may not contribute to fundamental change in water management. Water management is currently happening without LIDAR in Saskatchewan.
8. Restructure the architecture of the government as it relates to water management (i.e. integrate water into other departments).

4.4.3 Category: Regulatory and governance

Impact:

- Based on the number of people affected
- The number of dimensions impacted (i.e. social, environmental, and economic) and the magnitude of effect on each dimension
- The impact is relative to the status quo

Urgency:

- The need to implement an opportunity now
- The consequences of not implementing an opportunity

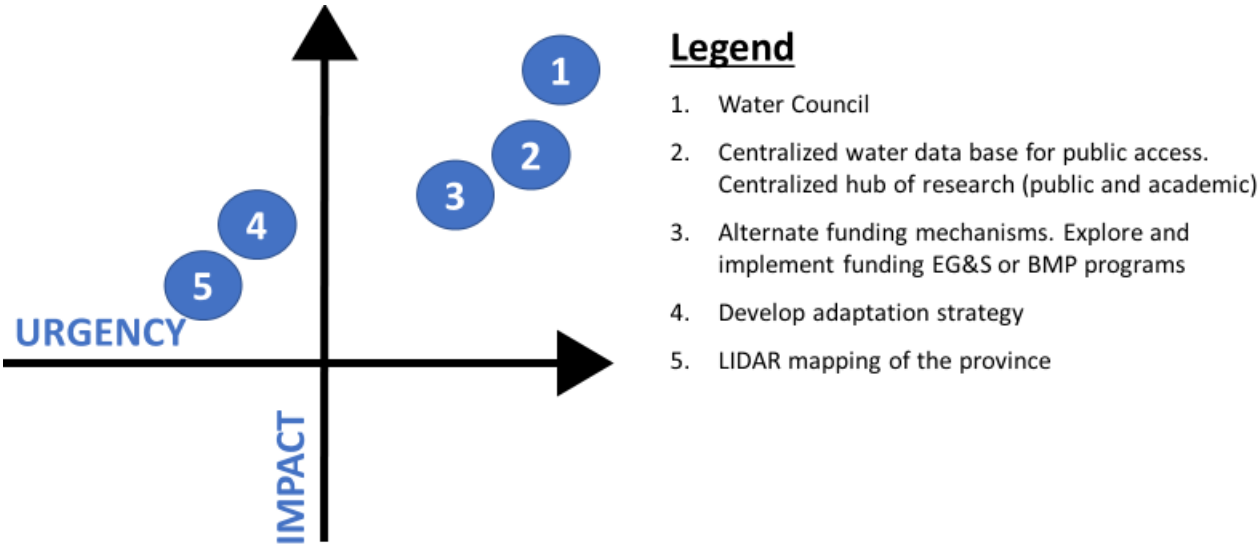


Figure 8. Priorities matrix for regulatory and governance in Saskatchewan.

1. Create a single authority for water management in the province:
    - The council could address provincial issues but also help interface with other provinces to understand and address interjurisdictional issues.
    - The current fragmentation of authoritative bodies and the scope of issues that a council could address makes this opportunity high urgency and impact.
2. Create a centralized water database for Saskatchewan:
    - The water database would include publicly accessible data available in real-time (online) on flows and a centralized hub of existing research (public and academic).
    - Once put together, the existing research library could be reviewed to identify opportunities for water management.
    - The database would be used to develop plans and inform further opportunities for water management and so is high impact and urgency.
3. Measures put in place to explore and implement alternate funding mechanisms to prevent illegal drainage. Illegal drainage has significant impacts on downstream users both within and outside the province:
    - One potential solution is to fund EG+S or BMP programs.
    - Public education would be required to ensure that the issues and solutions are well-understood, and that awareness is great enough that people will support enforcement.
    - Given that drainage is a current and ongoing issue for the province, it is urgent to address, but not as high impact as the previous opportunities.
4. Develop a strategic plan/adaptation strategy for water for the province of Saskatchewan:
    - Benefits are limited to Saskatchewan, so the impact is lower.
    - A strategy should be created after a water council and database are developed. It should be used to understand the current state of water in the province.
5. Create a LIDAR map of the province to develop and identify flood-prone areas:

- The LIDAR program could be run by a potential water council.
- It is the lowest impact and urgency as it is a tool for flood mapping and scale and therefore the impact would be within provincial boundaries.
- Some areas have had LIDAR completed and have found it to be of moderate use; impact at a province-wide scale may be greater.

4.4.4 Category: Water demand and access

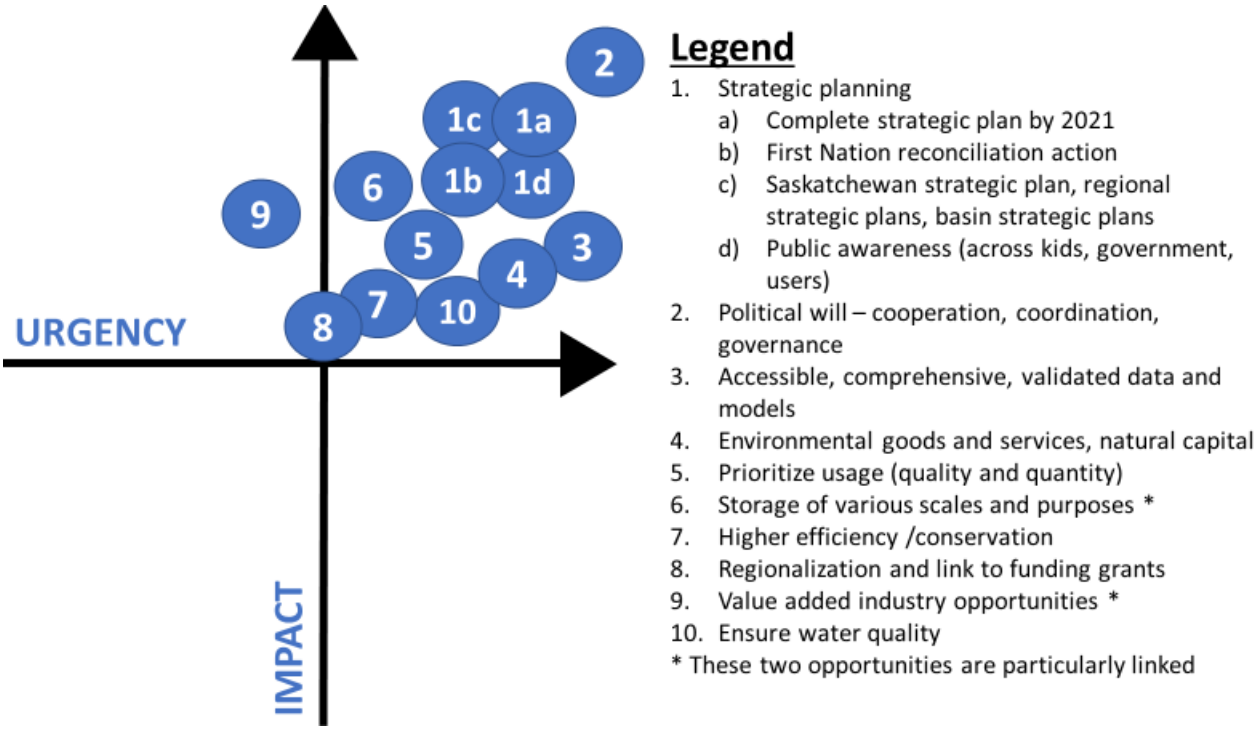


Figure 9. Priorities matrix for water demand and access in Saskatchewan.

1. A Strategic Water Plan completed by 2021:
    - Province wide, then region wide, then basin wide. Saskatchewan needs to develop a strategic plan for the province first so that it is ready when it sits at the regional table with Alberta to develop the region wide strategic plan:
        - Alberta is more advanced than Saskatchewan.
        - Strategic plans are needed more urgently in some basins than others.
    - Public process is important.
    - Economic modeling should be a part of or captured within the strategic plan.
    - First Nations reconciliation: First Nations need to be intimately involved in the development of a strategic plan and the resulting activities. They have a right to be, for reconciliation purposes, and because they have a lot to bring to the table.
2. We need a more streamlined decision-making process that includes political, community, and governance coordination.

- We need to have everyone at the table to develop and deliver an impactful strategic plan.
- We need to move fast because we've already lost a lot of time/ground as a result of our slow action thus far.

3. Comprehensive modeling and data to support the strategic plan.
    - We need centralization of data, common agreement on data to utilize, and access to the data that inform decisions and strategic plans.
4. Acknowledgement and understanding of the environmental and economic importance of wetlands.
    - Wetlands benefit the environment, communities and individuals.
    - Increasing amounts of evidence demonstrate a wetland's ability to increase/benefit mental health.
    - Wetlands and ways to measure their benefits need to be included in strategic planning.
5. Prioritize usage including quality and quantity.
6. Water storage infrastructure of all kinds at the reservoir and on-farm (wetland) level:
    - For capturing water for later use and for preventing loss.
    - For the economic opportunity that better/more water storage reservoirs could provide. There is a missed opportunity resulting from the current lack of water storage infrastructure. Putting fish in the farm dugout is good; selling fish from the dugout and putting that money back into the economy is better.
7. More action is needed to achieve higher efficiency and conservation.
8. Regionalization – once regionalization becomes prioritized, it becomes operationalized and has support that drives movement:
    - An outcome of regionalization is to prioritize grants as these are needed for regionalization to be implemented (typically occurs on a 30/30/30 scale). This requires an understanding of how your infrastructure impacts others.
9. We need to look at the value-added industry opportunities of providing better water access and addressing future water challenges. This includes water reuse opportunities.
10. It is important to maintain/ensure/improve water quality.

5.0 Manitoba workshop summary

5.1 Water story for Manitoba

In the first breakout activity, participants were asked to consider the hydrologic, climatic, and socio-economic context today and into the future, along with their own experience in water management, and discuss what that information means for water management in Manitoba and in the Prairies

5.1.1 What does it mean for Manitoba and the Prairies?

- The Manitoba water story is characterized by **extremes**: too much or too little water, sometimes in the same season. These **local realities** are difficult to capture when data are averaged to summarize regional characteristics. **Scale is critical** when identifying and addressing challenges and opportunities in this province.
- Manitoba's downstream location relative to the other jurisdictions presents unique challenges for quality and quantity. Water management in Manitoba is highly influenced by upstream water management; therefore, **inter-jurisdictional coordination** is important to manage these issues in light of projected changes. Existing frameworks for inter-jurisdictional water management should inform future initiatives.
- Impacts of flooding and diversions to mitigate flooding have been severe on many **communities**. Transparent water management decision making when tradeoffs are being considered will be essential to respect the rights of First Nations and other communities that will be impacted by those decisions.
- Increasing floods and droughts will continue to negatively impact the **agriculture** industry, perhaps at a higher frequency. More irrigation may be implemented if the moisture deficit changes.
- Maximum flows may need to be incorporated into the Master Agreement on Apportionment to protect Manitoba from **flooding**.
- More water brings more nutrients. Increased runoff upstream will bring not only more water but more nutrients to Manitoba, exacerbating existing issues with **water quality**.
- We will need to understand how to use our significant existing **infrastructure** in light of changes in climate and hydrology but also changes in competing needs for water.
- **Wetlands** are and will continue to be important for addressing both quality and quantity issues. A greater understanding of wetlands will be required to manage water resources now and into the future, including their role in surface water hydrology and flood and drought mitigation potential. **Ecological goods and services** will play an important role in offsetting other land use impacts on hydrology in the Prairies.

5.1.2 Additional considerations

- There is more data available for the Red River and Winnipeg basins and it needs to be integrated in the Prairie Water Strategy.

- Work to date is focused on rivers. We need to expand the scope of the Strategy to include wetlands.
- In Manitoba water is allocated at a much finer scale than the allocated flows as presented for other provinces. The Government of Manitoba is currently mapping the data in a similar way to how it was mapped in the hydrology presentation for other provinces, but at a finer scale. The hydrology presentation highlighted that there are different allocation systems across the Prairie Provinces, and different ways of viewing allocations.
- Water management and the impact on Indigenous communities, from both a quality and a quantity perspective, has been missed in this presentation. Increased engagement with the communities is needed.
- Lake Winnipeg is an important feature in the Prairies as this is where all of the drainage ends up. Lake Winnipeg is a good indicator of how water is being managed across the Prairies.
- There needs to be a balance between preserving the natural environment and allowing for other land use and agricultural development.
- Topographic maps for the whole Prairie region would be helpful in identifying potential storage locations.

5.2 Challenges

5.2.1 Category: Water quantity, supply and availability

Challenges:

- There has been a moratorium on wet industries, or high water intensity industries, specifically on industries that have high treated water intensity.
- More data needs to be made available, and this data needs to be available and presented at a smaller scale.
- There have been increasing severe droughts.
- The First Nations perspective is missing, and there has been a loss of communities and of community infrastructure from flooding.
- Water is not always available when it is needed, where it is needed.
- There have been drier summers and heavier precipitation in the fall.
- There is not enough water in some highly allocated basins. This is creating challenges in increasing development in the agriculture industry.
- There are increasing risks in water supply reliability; the risk of a multi-year drought is particularly of concern in Manitoba.
- There have been groundwater shortages seen in some parts of Manitoba.

5.2.2 Category: Water quality and watershed health

Challenges:

- Watershed district coverage is incomplete. Not all municipalities are covered by a watershed district and some have only partial coverage:
    - Finding resources to expand watershed districts is a challenge.
- Nutrient overload of waterbodies is increasing and ongoing. Specific challenges relating to nutrients include:
    - It is still unknown which practices to manage nutrient runoff work best in Manitoba, given the unique conditions.
    - Focus is on phosphorus loading because this drives eutrophication in lakes.
- There is a need to understand the ramifications of the potential loss of fisheries.
- There is a lack of consensus on the role of buffer strips and the role of phosphorus in eutrophication.
- We need to understand what is being returned to the system in wastewater.
- The province of Manitoba has strict nutrient guidelines but cannot control the upstream inputs, creating an unequal economic playing field.

5.2.3 Category: Regulatory and governance

Challenges:

- Poor water quality in freshwater lakes.
- Lack of LIDAR information for the province:
    - This information will help inform flood management.
- There are delays in funding from federal and provincial authorities for municipal infrastructure (Winnipeg WWTP).
- There is a lack of expertise and access to information within municipalities to construct large infrastructure projects.
- Meaningful and culturally appropriate inclusion of First Nations perspective in Prairie water projects, which are currently under the colonial governance system.
- The lack of data disclosure and transparency (e.g. allocations).
- It is challenging to make decisions with our lack of data.
- It is currently a challenge to understand what data exist and where they are located.
- It is difficult to address challenges and opportunities with inconsistent data sources and measurement among provinces.

5.2.4 Category: Water demand and access

Challenges:

- Agreements address minimum flows, but not maximum flows crossing between provinces:
    - There are many competing uses for water and competing users of infrastructure.
- Mixed messages regarding economics of drainage, such as the benefits of agriculture and the cost of loss of ecosystem services.

- Lack of public understanding and awareness:
    - Even if people are interested, they may not know where to look for information or understand it as it is presented.
    - Some information is currently available through online webpages, social media, etc. but it is not easy to find or understand.
    - Allocation issues – most people do not understand this. They don't know that water is allocated, and, in some instances, that it is fully allocated.
- Lack of access and accessibility issues are important.
- Localized opinions often do not consider other users: there are certain very vocal user groups.
- Interprovincial planning is time-consuming and difficult to reach consensus, this is a challenge.

5.3 Opportunities

5.3.1 Category: Water quantity, supply and availability

Opportunities:

- In order to manage the increase in risks associated with water supply security (droughts) and floods, there is a need and an opportunity to increase capital expenditure.
- There is a need to make the funding for infrastructure available and transparent. This is a particular opportunity and a challenge in Manitoba as the province has had challenges accessing funding that should have been made available through the bilateral agreements with the federal government:
    - There is a need for certainty around funding for infrastructure, and the lack of funding raises the question: should alternate forms of funding be looked at for infrastructure projects?"
    - There is a need to prioritize where the funding will be allocated.
    - The need for long term strategic planning is required. There is an opportunity to incorporate planning time into the funding process. There needs to be advanced notice that funding will become available; this will ensure that projects that are not 'shovel ready' can be funded.
- Big picture planning is needed in order to release economic growth. This should allow the Prairie Provinces to be globally competitive and environmentally sustainable in the agriculture space. A provincial and Prairie-wide water strategy should be developed to allow economic opportunities to be realized. There are many small groups working independently carrying out projects; these groups should be guided and supported by the Prairie wide strategy.
    - Large infrastructure projects and past reports and studies need to be cataloged and prioritized across the Prairie provinces.
        - Note that the Manitoba government is working on a process to capture and catalog past reports and studies.
    - The planning should allow for smaller infrastructure projects as well. These projects would complement larger infrastructure projects.

    - Smaller studies could be funded and prioritized according to the Prairie-wide strategy.
    - The big picture planning should link water planning between floods and droughts, perhaps through the development of water ponds to store water when there is an abundance of water and to release water when there is a shortage.
    - Infrastructure should be valued, with a cost benefit assessment and a ROI. This should be done for proposed new large infrastructure as well as for natural infrastructure.
        - An understanding of natural infrastructure is needed and there needs to be an economic value assigned to natural infrastructure.
- Water supply infrastructure needs to be upgraded, which will reduce water quality risks. Funding is needed to upgrade infrastructure.
- There is an opportunity to develop increased irrigation infrastructure which could be modeled after the Irrigation Districts in Alberta. Irrigation infrastructure will start to address the challenge of not having water available where it is needed.
- A reliable water supply needs to be developed for southern Manitoba. A reliable water supply will allow for industrial development which has turned away due to lack of water security.
- Increased irrigation infrastructure and water supply certainty will allow for the growth of the secondary agriculture industry through agricultural processing.
- There is an opportunity to use land for both water retention and for crops. Currently, there is no economic incentive for farmers to retain water on their land, as it is more profitable to plant crops. There is an opportunity to retain water earlier in the season, and then release the water and plant crops. This is a nutrient reduction strategy that also helps mitigate floods.

5.3.2 Category: Water quality and watershed health

Opportunities:

- Find solutions that pay for themselves (e.g. trust funds for wetland conservation, protection, rehabilitation and compensation such as GROW and ALUS).
- Develop a continued understanding and research related to storage and reuse of water on landscape, which could provide both water and nutrients for the land. Long term storage is an opportunity to hold and use spring freshet for irrigation and to return nutrients to the land.
- Short term storage may help mitigate flooding, but it exacerbates nutrient loading:
    - Controlled tile drainage and subsurface storage are solutions for holding water on landscape.
- Target solutions based on the local context and at major nutrient export sites to maximize watershed impact and co-benefits.
- There is an opportunity for collaboration and coordination to maximize co-benefits by involving everyone who could benefit from the solutions.
- There is an increasing business focus on building resilience to climate change and emerging markets for environmental services.

- There is an opportunity for flexible taxation schemes for land (i.e. lower land taxes for areas taken out of production).
- There is an opportunity for targeted engagement in highly altered environments that are known to have less desire/interest in participating in compensation programs.
- Challenge: what about compensation for those that didn't alter the landscape? We need to consider if this is creating inequitable system.
- There is an opportunity to expand watershed districts, but it is challenging because resources are needed to do this.
- There is an opportunity for increased collaboration with watershed districts, because the districts are an effective way to administer programs.
- There is an opportunity to generate more funding for watershed district programs:
    - May be an emerging opportunity for global and local participation as businesses focus on sustainable development goals.
    - The following examples have/had varying degrees of success but could be considered models for future initiatives:
        - Lake Winnipeg Friendly
        - EPCOR tax to fund monitoring and implementation
        - Iowa lawsuit
- There is an opportunity to combine data sources (from industry, government, communities, citizens) to create a better picture of water resources.

5.3.3 Category: Regulatory and governance

Opportunities:

- Greater data transparency:
    - Data are required to make informed regulatory and governance decisions.
    - Decisions should be made based on the best available data.
- Consistency of data:
    - Inconsistency in measurement and reporting of data among provinces leads to challenges in decision-making (e.g. allocation is defined differently by AB/SK vs. MB).
- Synthesis and analysis of data is needed to determine issues and challenges:
    - Synthesis should present data in a way that everyone (including the public) can understand and use.
- Expand the scope of the MAA or develop a new body to address interprovincial water management issues:
    - There is no existing body to address interprovincial water issues including EG+S, wetlands, and climate change. Related issues such as pollution and irrigation are also not addressed.

    - SK and MB have created a separate agreement to deal with drainage and watershed planning. There is an opportunity to expand this agreement to other jurisdictions (e.g. AB).
- Organizations in MB currently deal with water issues on a one-off basis. A symposium could be created to bring organizations together to discuss issues as a group:
    - There is a lack of knowledge of what the issues are; a forum that brings people together could help identify and drive collaborative solutions.
- Add momentum and resources to the upcoming Canada Water Agency who may be well-positioned to address interprovincial issues:
    - Discussions for the upcoming Agency are not currently far along.
- Procure and confirm long-term funding for water management projects:
    - Funding should be assured and dedicated.
    - It should be recognized that funds will need to increase on a periodic basis, especially with a growing population, economy, and climate change, etc.
- There are many water programs administered through various MB government departments:
    - There is an opportunity to increase efficiency in administration of funding programs for water in the province.
- Ensure First Nations are at the table for all discussions:
    - Greater involvement in governance, not just consultation, from all Nations.
    - Recognize and address UN defined human rights to water and sanitation (UNDRIP commitment):
        - Include First Nations at all levels of planning.
        - Include First Nations in economic opportunities: they are willing to participate and want to be involved
        - Educate the public about First Nations water issues

5.3.4 Category: Water demand and access

Opportunities:

- Make information accessible and actively provide/promote to the public.
- Ensure strong leadership, locally and politically.
- Ensure Integrated Watershed Management planning province wide, on a watershed-scale:
    - Collaboration and collective planning processes are needed.
    - Upfront and open recognition that consensus is ideal, but not likely to be reached and the planning will still go ahead with the majority satisfied.
- Possibly extend the mandate of the Prairie Provinces Water Board:
    - Must include Indigenous co-management.
    - Potentially include collaboration with Canada Water Agency.
- Develop intergovernmental relationships between four groups: SK, MB, AB, and Indigenous government.

- Look for partnerships with other similar management entities (e.g. the Lake Winnipeg Basin Program).
- Look at the potential opportunities to coordinate money/funding programs.
- Conduct a cost-benefit analysis for where and how to move water from areas of excess to areas of increasing demand.
- Protect the interest of water on the landscape – use the "no net loss" concept. Structure this in policy to recognize the impact to the environment.
- Implement a pan-Prairie mechanism with solid structure and policy for Environmental Impact Assessment.

5.4 Priorities

5.4.1 Category: Water quantity, supply and availability

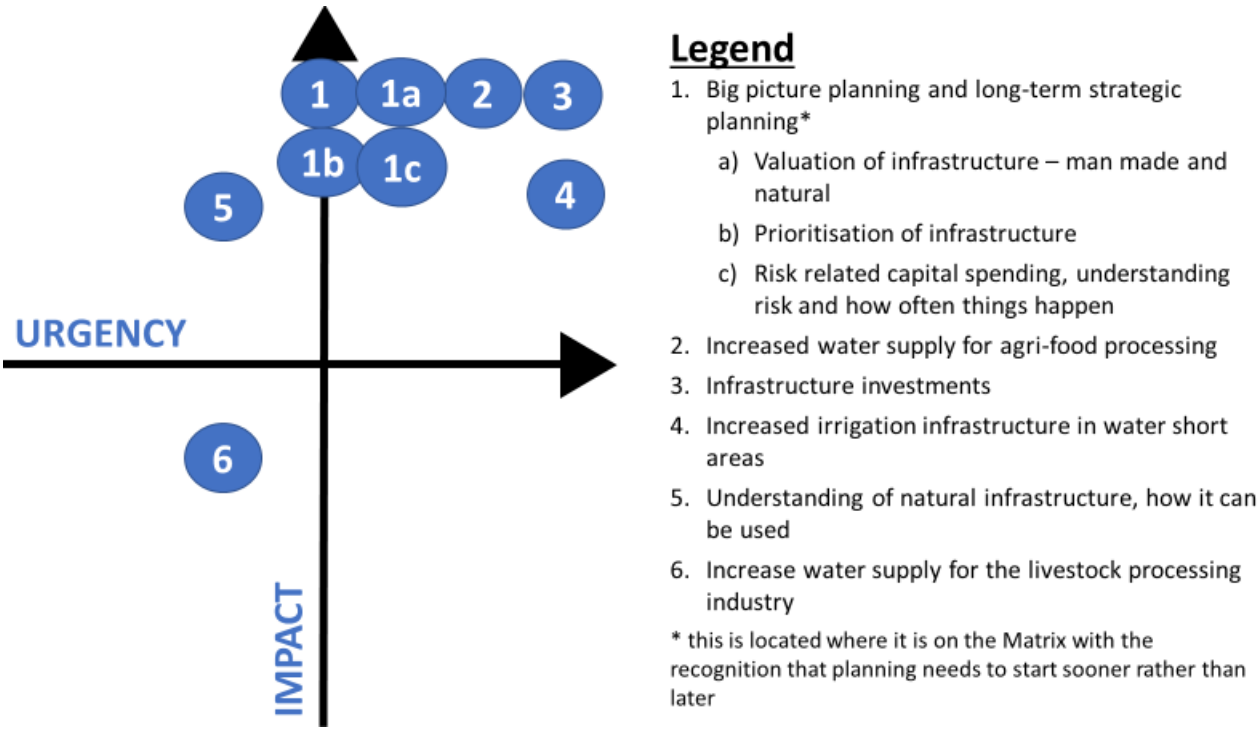


Figure 10. Priorities matrix for water quantity, supply and availability in Manitoba.

1. Big picture planning and long-term strategic planning (this is located where it is on the Matrix with the recognition that planning needs to start sooner rather than later).
    a. Valuation of manmade and natural infrastructure:
        i. Valuation should include ROI and cost benefit analysis.
        ii. Studies have shown that natural infrastructure is cheaper up front, cheaper to maintain, and lasts longer.
    b. Prioritization of infrastructure.
    c. Risk related capital spending, understanding risk and how often things happen.

Additional commentary related to #1:

- Big picture planning needs to be started to ensure that smaller decisions can be made within the big picture.
- This is placed where is it because it has the potential to have a high impact; however, there is less urgency because it will be a long-term initiative. There is medium urgency recognizing that a long term, big picture strategy will not be completed immediately, however the process should be started.
- Collaboration in this long term, big picture planning initiative.
- Multi-purpose water management infrastructure will be needed.
- Additional water management infrastructure will need to be considered within the existing water management system; operations of current infrastructure will need to be considered (it is noted that there are additional challenges associated with operating multipurpose water management infrastructure).

2. Increased water supply for agri-food processing.
3. Infrastructure investments:
    a. Investments in infrastructure for water supply for humans is highly urgent as it impacts human health.
4. Increased irrigation infrastructure in water short areas:
    a. There is a risk that if there is no investment in irrigation infrastructure there will be loss of yields and the reliability of Manitoba as an agricultural supplier will be questioned by large companies. This may force investment out of Manitoba.
5. Build an understanding of natural infrastructure and how it can be used.
6. Increase water supply for the livestock processing industry.

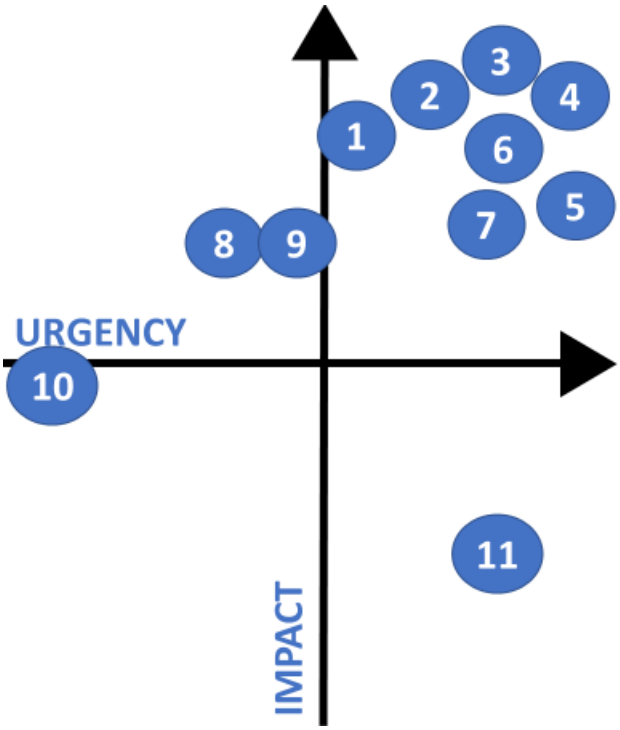
5.4.2 Category: Water quality and watershed health

Impact:

- Higher impact if it can be scaled to result in measurable change
- Higher impact if it has the ability to be matched in context to have greater impact
- Effectiveness in solving the problem
- Ability to measure the impact

Urgency:

- Time sensitivity of the opportunity – is there a window of time when the opportunity is possible?
- How great is the risk, is it immediate or future risk?
- Is the risk irreversible, is there risk of irreparable harm?
- Does it prevent compounding or cumulative impacts?



Legend

1. Adopt UNDRIP and acknowledge that access to water and sanitation is a human right
2. Systematic approach to improving surface water management at regional and local scales based on key local risks
3. Increase ability to define objectives of BMPs and establishing metrics and targets for those BMPs
4. Implement targeted solutions for areas that are major phosphorus contributors
5. Intergovernmental communication and coordination using an effective and science-based strategy to address nutrient management (P+N)
6. LIDAR for aerial mapping of elevation to do hydrology modelling that can support targeting of efforts
7. Meaningful participation with Indigenous communities and governments
8. Expand scope/role of watershed districts
9. Expand size of watershed district jurisdictions
10. Maintain and leverage increasing market for sustainably produced agriculture, i.e. canola
11. Develop and deliver transparent costing breakdowns for major water infrastructure projects

Figure 11. Priorities matrix for water quality and watershed health in Manitoba.

1. Adopt UNDRIP and acknowledge that access to water and sanitation is a human right:
    a. High impact because it could subsequently lead to improvements to water quality and other issues with Lake Winnipeg.
2. Systematic approach to improving surface water management at regional and local scales based on key local risks. This could include storing water on site and could be done through watershed districts.
    a. High impact and high urgency because it is known to work, it is efficient, and it has many co-benefits.
3. Increase the ability to define objectives of BMPs and establish metrics and targets for those BMPs.
4. Implement targeted solutions for areas that are major phosphorus contributors:
    a. High impact and high urgency because a coordinated approach at scale will have measurable impacts.
5. Intergovernmental communication and coordination using an effective and science-based strategy to address nutrient management (phosphorus and nitrogen).
    a. High urgency because this strategy will provide direction for other opportunities.
6. LIDAR for aerial mapping of elevation to do hydrology modelling that can support targeting of efforts.
7. Meaningful participation with Indigenous communities and governments:
    a. High urgency because it supports many other opportunities.
8. Expand scope/role of watershed districts:

a. Lower urgency because the process has already been started. We need to increase the capacity of districts first, then start expanding the scope of projects.

9. Expand the size of watershed district jurisdictions:
    a. Impact based on scalability and delivering more beneficial programs.
10. Maintain and leverage the increasing market for sustainably produced agriculture, i.e. canola.
11. Develop and deliver transparent costing breakdowns for major water infrastructure projects.

5.4.3 Category: Regulatory and governance

Impact:

- Impact can be negative or positive
- Includes environmental, socioeconomic considerations

Urgency:

- Whether opportunity should be addressed immediately or in the future

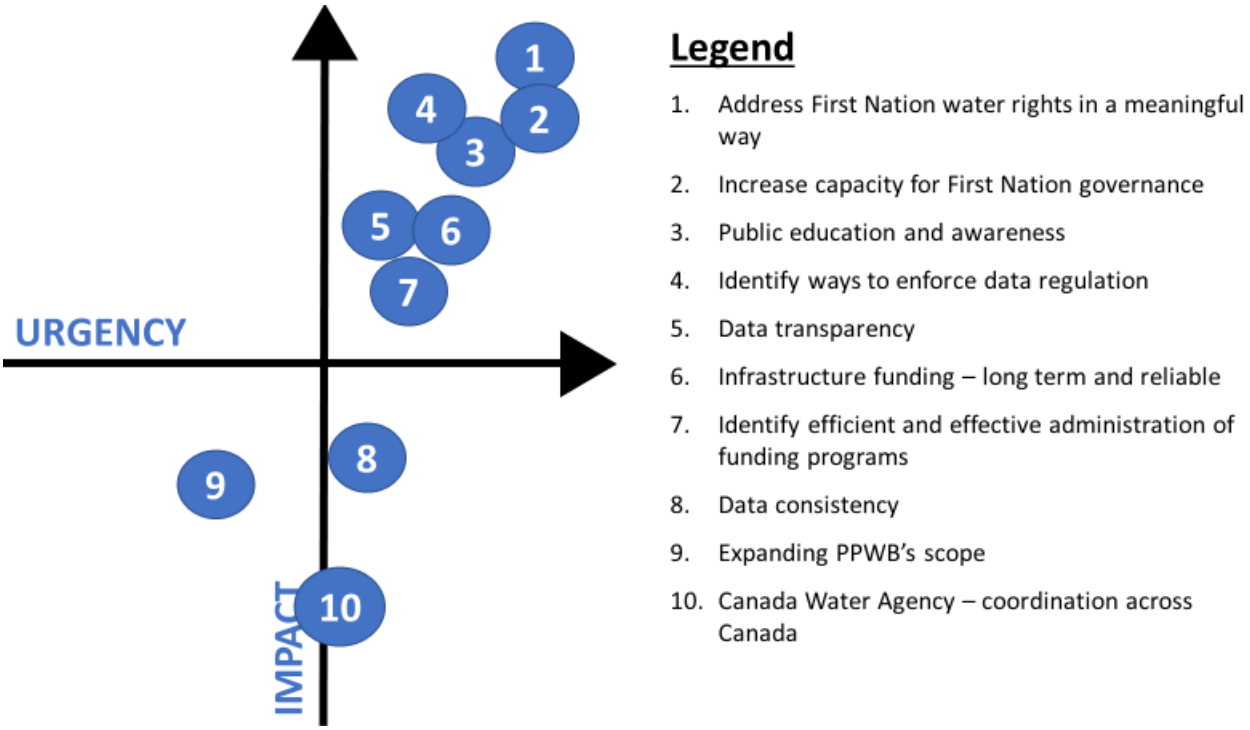


Figure 12. Priorities matrix for regulatory and governance in Manitoba.

1. Address First Nations water rights in a meaningful way:
    - Recognize that governance structures of First Nations do not necessarily align with western governance structures.
    - First Nations do not always have capacity to be involved in all projects.
    - This is applicable to the Prairies as a whole.
2. Increase the capacity for First Nations governance.
3. Create public education and awareness.

- This is useful for all other opportunities. Public awareness and education are necessary to bring issues that need to be addressed to the forefront and to drive action.
- This could be done and is necessary across the Prairies.

4. Identify ways to enforce existing drainage regulations:
    - Difficult to know the impact of this as compliance may increase with enforcement.
    - This could lead to backlash from those wanting to do drainage.
    - This is an interjurisdictional issue, but the impacts and urgency are greater for those downstream (i.e. SK and MB).
5. Data transparency:
    - We need allocation data for Manitoba.
    - Other jurisdictions may also have transparency issues, so the impact is higher.
6. Long-term, reliable infrastructure funding:
    - May be difficult to get funding and the political will to fund major projects may be low.
    - Impact and urgency are moderate as projects could be built/ funded across the Prairies.
7. Identify efficiencies in administration of funding programs:
    - This would need to be driven by government.
    - The impact and urgency are limited to Manitoba.
8. Data consistency:
    - There are existing data that are shared and consistent among provinces. This refers primarily to how allocation is defined by each province, so impact and urgency are low.
9. Expanding PPWB scope and mandate:
    - The issues that could be addressed by the PPWB could be addressed via other avenues (e.g. Canada Water Agency).
    - The additional issues that could be addressed (e.g. pollution, climate change) are low impact and urgency relative to other opportunities.
10. Support the Canada Water Agency:
    - Understand that discussions are preliminary so the impact and urgency now are low.

Other discussion points:

- The matrix does not address feasibility of opportunities.
- Water departments in the Manitoba government were split into three areas. There is potential for the water groups to become even more fragmented over time. There was a lot of worry about the structure of the government after the 2011 floods.

5.4.4 Category: Water demand and access

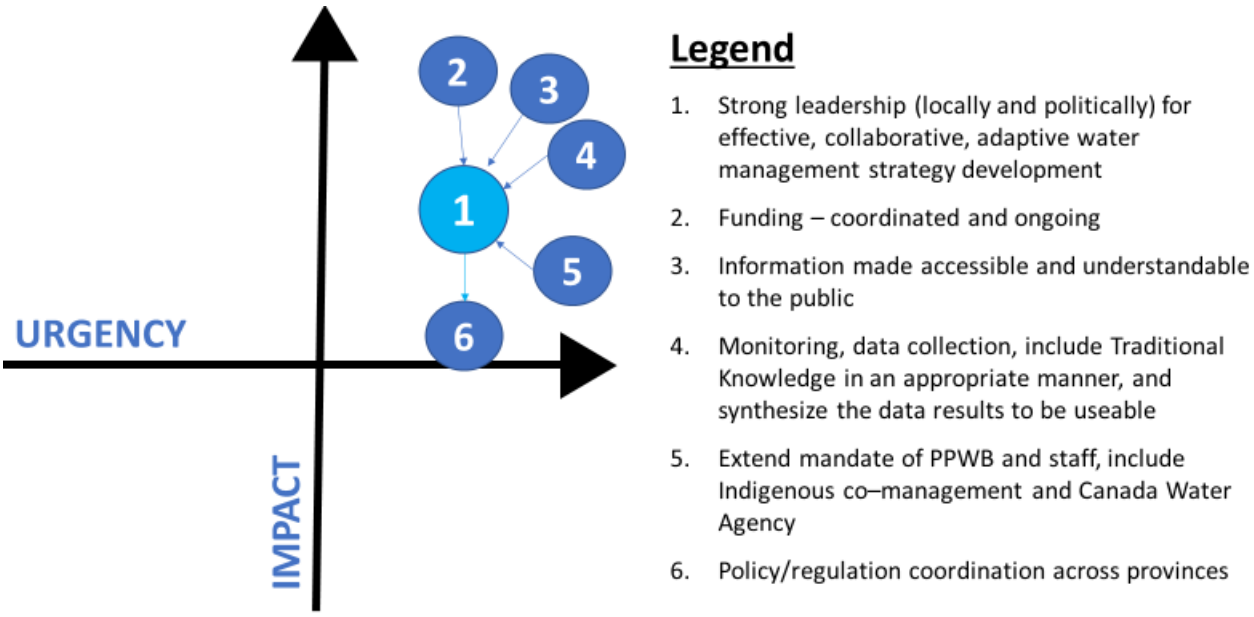


Figure 13. Priorities matrix for water demand and access in Manitoba.

1. Strong leadership to develop and implement an effective, collaborative, adaptive water management strategy:
    - Strong leadership and mandate are needed (locally and politically).
    - The water management strategy is placed at the center of all other opportunities because everything stems off of a strategy. The location on the matrix is not the important part. The leadership and development of a water management strategy is the highest priority: other opportunities identified are part of it and are reliant on it.
        - Need an effective, collaborative, adaptive strategy that is well funded.
        - Also need other funding for initiatives related to water management and coordination with the strategy and each other (i.e. a Board where members continually meet and have staff to do research. This could also be a department.)
        - Strategy development is an ongoing and changing/evolving process that continues to adapt. The strategy should identify and consider the issues carefully before attempting to resolve.
        - Ensure delivery is thought-through and planned.
2. Coordinated and ongoing funding is needed.
3. Information is needed that is accessible and understandable to the public.
4. Monitoring and data collection are lacking:
    - Hydrometric monitoring stations are disappearing (being reduced). Some gauges were given to MB Hydro.
    - Include data and consultation once data are collected.

    - Identify the questions being asked to identify the gaps in information that need answering.
5. Extend the mandate of PPWB to include Indigenous co-management and the Canada Water Agency.
6. Policy/regulation and coordination across the provinces is needed.

Other points:

- We need a multidimensional team with the expertise, the science, and planning to get things done. This could be like PFRA 2.0, a federal organization with authority (not just service).
- There was a lot of support for PFRA and even now it is still highly regarded for its good work.
- The strategy needs to be adaptive because of inputs, problems, and land use changes.
- Economic development is huge for the province and the region (i.e. Simplot expansion and water allocations).
- A super-provincial board will need funding and resources to do research, put a strategy together, and make it useful.
- What is primary data? Examples are flow data, flood data, and water quality data. Understanding what this data says helps prioritize government action:
    - i.e. buffer strips are valuable for some places but not others.
    - i.e. MB is behind in LIDAR data compared to the US.
- Collecting data into a report takes time (i.e. the City of Winnipeg report took 10 years).