

Western Economic
Diversification Canada
(WD-DEO) and
WaterSMART Solutions



Welcome to the Prairie Water Workshop

- Welcome
- Fire exits & washrooms
- WiFi
- Introductions

Chatham House Rule

"When a meeting, or part thereof, is held under the Chatham House Rule, participants are free to use the information received, but neither the identity nor the affiliation of the speaker(s), nor that of any other participant, may be revealed."



Be bold, be innovative, speak openly.....focus on addressing the challenge, not the blame.

Keep in mind...

- Slides and summary will be sent out after today's meeting
- Please ask questions as we go through the slides and during the breakout sessions

Today's agenda

Time	Session	Session Leader
9:00 – 9:15	Welcome	Laura Corbeil (WS)
9:15 – 9:30	Overview of the work and WD-DEO's mandate	Western Economic Diversification
9:30 – 9:45	Vision for a Prairie Land and Water Management Strategy	Claire Jackson (WS)
9:45 – 10:15	Baseline hydrology for the Prairies	Laura Corbeil (WS)
10:15 – 10:30	Break	
10:30 – 11:25	Breakout: What is the current water story of the Prairies and for AB/SK/MB?	All
11:25 – 12:00	Plenary discussion: water management challenges, Prairie-wide and for AB/SK/MB	All
12:00 – 12:45	Lunch	
12:45 – 1:45	Breakout: What are the opportunities in response to water management challenges for the Prairies	All
1:45 – 2:00	Break	
2:00 – 3:00	Breakout: What are the priorities for water management for the Prairies from a AB/SK/MB perspective? Priorities for AB/SK/MB?	All
3:00 – 3:15	Next steps, thank you and close	Laura Corbeil (WS)

Prairie Water and Land Management Strategy

Western Economic Diversification Canada

Prairie Water Management Workshop
Calgary January 28, 2020
Saskatoon February 4, 2020
Winnipeg February 6, 2020





Western Economic Diversification Canada (WD)

WD's mandate is to promote the development and diversification of Western Canada's economy and advance the interests of the West in national economic policy, programs and projects.



Federal Budget 2019



The Government of Canada set aside up to \$1 M for WD to develop a strategy to sustainably manage water and land in the Prairies.



Two Interrelated Components

- Work with partners and stakeholders to identify issues, challenges, opportunities and priorities related to water (and land) management across the Prairies
- Assess the feasibility of a potential pilot infrastructure project to expand irrigation potential in Saskatchewan*

^{*} The purpose of studying a potential infrastructure project (2) is to inform the broader strategy (1), using a real-world test case. This could also inform the development of important water infrastructure elsewhere.



Long term goals

- Enhance resilience for Prairie communities
 - Economic growth and diversification
 - Increased water security and adaptability
 - Environmental sustainability
- Prosperity for future generations



Global Context

- Volatility in major food producing areas around the world (water scarcity) - declining aquifers and groundwater
- Increasing demand to feed a growing world population, and increasing consumer demand for agri-food products that are produced sustainably (e.g. plant- and animal-based proteins)

Significant opportunity for the Prairies



How can the Prairies capitalize on this opportunity?

- Responsible and sustainable water and land management strategies and critical infrastructure to prepare for changing environmental conditions (opportunities and challenges)
- Community planning
- Increase production of higher-value, high demand crops
- Support value-added food processing



Our work to date

 Based on three types of activities: engagement, research and raising awareness.

Engagement

- Water Summit
- Government of Saskatchewan through the Water Security Agency
- Meetings/workshops with partners and stakeholders

Research

- Baseline hydrology report
- Possible infrastructure projects & funding models
- Irrigation impacts and benefits





Where WD is going

 Team will prepare a report and recommendations for consideration by March 31, 2020





What we're looking for from workshop participants

 Identification of issues, challenges, opportunities, and priorities related to water management in the Prairies





WD Water team contacts

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Today's agenda

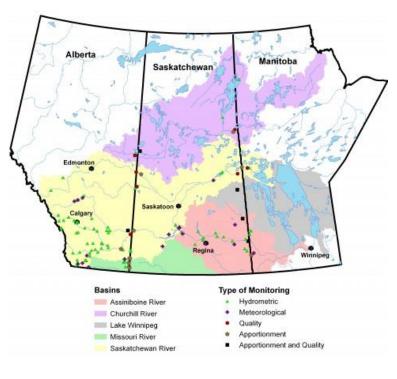
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In watershed management, scale is critical...

Think globally

Charting Our Water Future Research: humanowich to inform decision, making

Plan regionally



Act locally



June 20, 2013 Colpitts Ranch established circa 1890

How did we get here?

- Water is fundamental to community sustainability and growth
- Environmental changes are affecting Canada's land and water resources
- Experts predict increased climate volatility more extreme weather, longer droughts, and more severe localized flooding
- Prairie communities are subject to extreme climate variability
- Water resources in Prairie basins are currently being managed with limited coordination
- Current and past water management initiatives demonstrate there is capacity and commitment to address these challenges
- Global context demonstrates a significant opportunity for the Prairies

A Prairie water strategy can bring the Prairies together to capitalize on these opportunities and guide us toward a shared vision

Vision for a Prairie water and land management strategy

Framework to support informed water management decisions that promote economic prosperity, community resilience and environmental sustainability across the Prairies.

Principles of the vision*:

- Water is managed across the Prairies using the best information available
- Prairie Provinces follow a coordinated approach to effectively prepare for climate change impacts
- Stakeholders across the Prairies work collaboratively to protect water supplies and quality
- Potential conflicts are avoided and/or resolved
- Water is allocated to protect the riverine and aquatic environments

^{*}Key principles were adapted from the PPWB and SSRB Adaptation project

How do we achieve the vision?

- Collaboratively develop a strategy for Prairie land and water management that guides us toward the vision
- The strategy will build on existing data, tools, capacity and knowledge across the Prairies
- Begin with focus on surface water quantity management
- Observe boundary agreements and existing water law
- Engage in coordinated, collaborative and proactive water management across the Prairie basins

How do we achieve the vision?

challenges, opportunities and priorities in the context of current and projected Prairie hydrology • Engage with partners and stakeholders to identify challenges, opportunities and priorities • Summarize baseline hydrology and climate change impacts implementation of specific actions that meet priority needs for the Prairies • Basin-wide working groups using collaborative modelling and dialogue • Cumulative development with from upstream to downstream (AB→ SK→MB) • Synthesis of top priorities	Project Implementation Ork with Prairie provinces to eccute actions identified in the badmap	Evaluate progress for continuous improvement Evaluate effectiveness of actions being implemented and review the Strategy for updates
Priorities Identification Development Figure 1 Figure 2 Figure 2 Figure 2 Figure 3 Figure 3 Figure 3 Figure 4 Figure 3 Figure 4 Figure 4	ork with Prairie provinces to ecute actions identified in the badmap	Evaluate effectiveness of actions being implemented and review the Strategy for
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 Assess feasibility of potential pilot project in SK Focus of this work from each province into actionable Prairie-wide Roadmap Develop metrics to support evaluation of effectiveness of actions 	Execute actions from the Prairie-wide Roadmap Collect data to inform metrics Potential pilot infrastructure project in Saskatchewan	 Measure effectiveness of actions based on Roadmap metrics Review Roadmap and identify any shifts in challenges, opportunities and priorities Update Roadmap to reflect progress toward the Prairie Water Strategy Vision: Framework to suppoinformed water management decisions that promote econo

Our work today...

- "Gather and understand" Prairie-wide hydrology and priorities
- Use what has been done before, what is being done now, and the knowledge in the room to identify water management priorities across the Prairies
- Consider the context of other changing socio-economic factors such as population growth projections and increasing demand for food



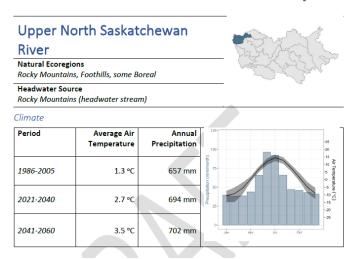
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Baseline Prairie Hydrology

Objective: create a common understanding of the Prairie watersheds in a changing climate

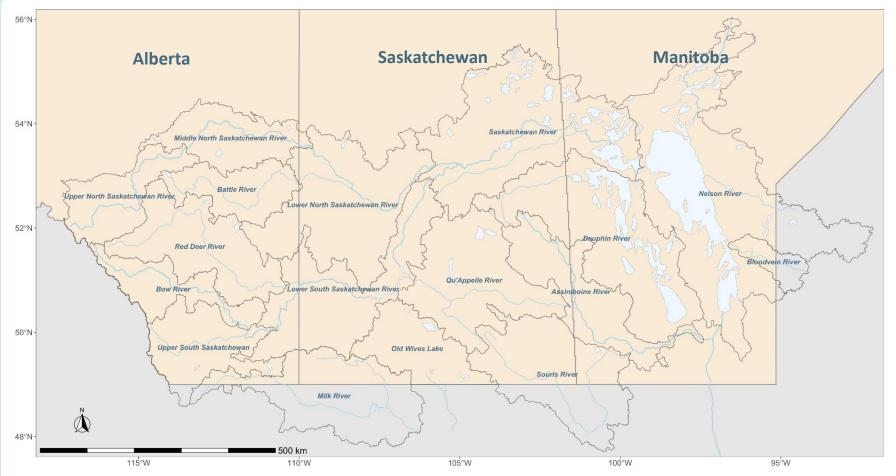
- Baseline hydrology analyses were done to support these workshops
- Intent was to provide a high-level overview of defining features, characteristics, and considerations for the future
- The watershed summaries provided in advance of the workshop were part of the outcomes of the analyses



Baseline Prairie Hydrology – Study area

The Prairie region for this study consists of the Saskatchewan, Missouri, Assiniboine River and Lake Winnipeg watersheds.

Sub-regions used for the analyses are shown in the map below



Baseline Prairie Hydrology – Data sources and methods

Hydrometric data source

- Daily streamflow data were obtained from Water Survey of Canada for all hydrometric stations used in this study
- All hydrometric indicators were calculated using streamflow observations since 1980

Climate data sources

- Projected monthly air temperature and precipitation data were obtained from Environment and Climate Change Canada's (ECCC) Coupled Model Intercomparison Project Phase 5 (CMIP5)
- The analysis for this workshop used the median values from the CMIP5 ensemble
- Future climate data were obtained for periods 2021-2040 and 2041-2060 under the Radiative Concentration Pathway (RCP) 4.5, representing relatively conservative estimates of potential future changes

Climate models are not predictions, they provide projections of possible futures based on underlying input factors "All models are wrong; some models are useful"

Baseline Prairie Hydrology – Data sources and methods

Allocation data

- Water allocation data were obtained from provincial government agencies for Alberta and Saskatchewan
- Expired licences were filtered out
- Data were summed for each sub-region
- No allocation data was obtained for Montana, North Dakota, or Ontario
- Manitoba provided commentary regarding demand intensity for each sub-region
- Water allocation volumes will typically be much higher than actual water use
- Allocated volumes do not consider mandated return flows
- These estimates represent an uppermost bound on water use

Master Agreement on Apportionment (MAA)

- Signed in 1969 by each of the Prairie Provinces (Alberta, Saskatchewan and Manitoba) as well as the Government of Canada
- Outlines how transboundary water is to be shared between the three provinces
- Includes provisions regarding water storage and water quality
- Schedule A states generally that half of the natural annual flow of each watercourse be permitted to flow to Saskatchewan
- Schedule B states generally that for each watercourse, half of the natural flow of water each year entering Saskatchewan from Alberta must be permitted to flow to Manitoba
- As well, half of the natural flow of water arising in Saskatchewan each year must continue to Manitoba.

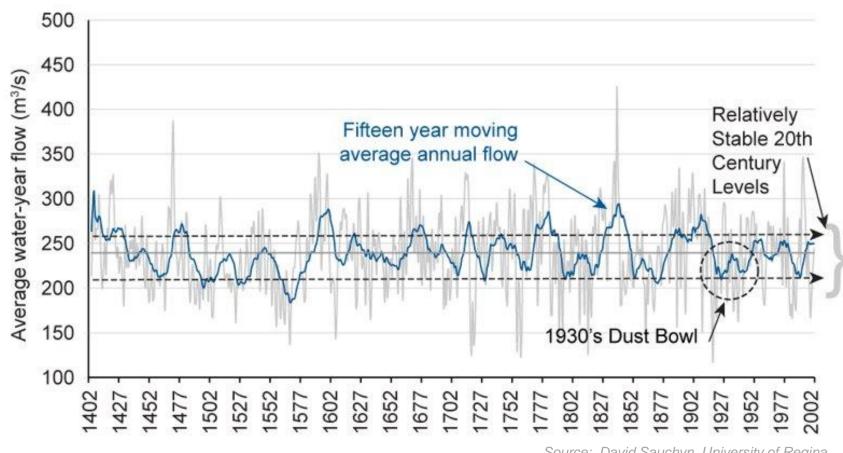
Cooperation across Prairie Provinces

- MAA has been successful at ensuring equitable sharing of interprovincial water resources, protecting water users, and avoiding conflict
- It facilitates communication and water management planning
- Trust built through years of successful cooperation is a pillar to its endurance
- Schedules to the MAA have been added and updated over time,
 e.g. water quality and aquifer apportionment
- The PPWB continues to renew and update the methods for determining apportioned flow volumes

Historical hydrology

History Demonstrates Extreme Climate Variability

South Saskatchewan River Basin Flows (Bow + Oldman)



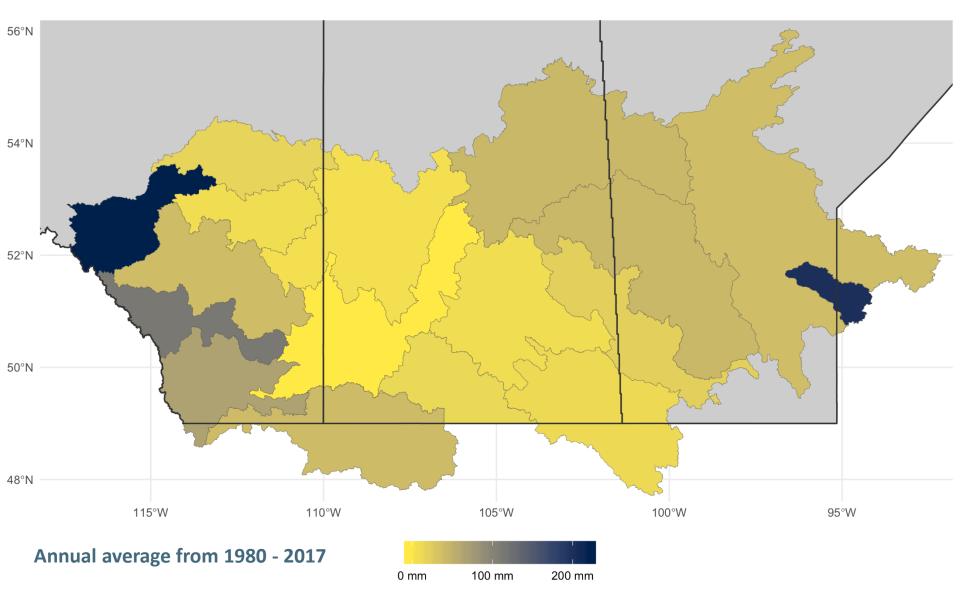
Source: David Sauchyn, University of Regina

Historic and tree ring data indicate future flood/drought events could be far more severe than recent record

Baseline Prairie Hydrology Current state

Incremental Run-off

Incremental Runoff (mm/year): The annual volume of streamflow in a year generated within the sub-region (i.e. subtracting upstream inputs) divided by the nested gross drainage area of the sub-region.

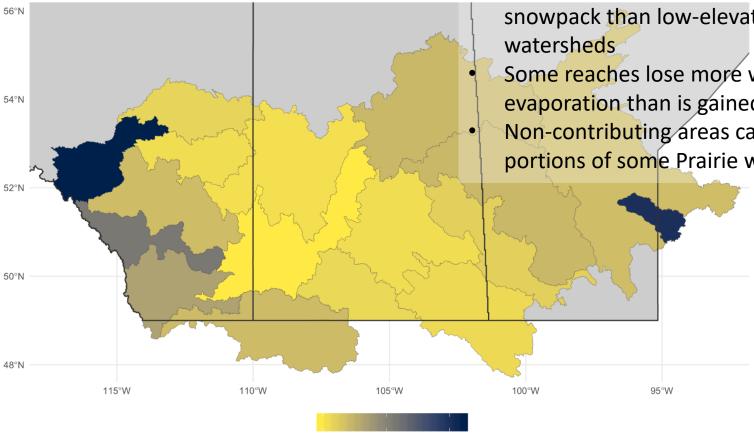


Baseline Prairie Hydrology Current state

Incremental Run-off

Incremental Runoff (mm/year): The annual volume of streamflow in a year generated within the sub-region (i.e. subtracting upstream inputs) divided by the nested gross drainage area of the sub-region.

Incremental Runoff (1980-2017)



100 mm

0 mm

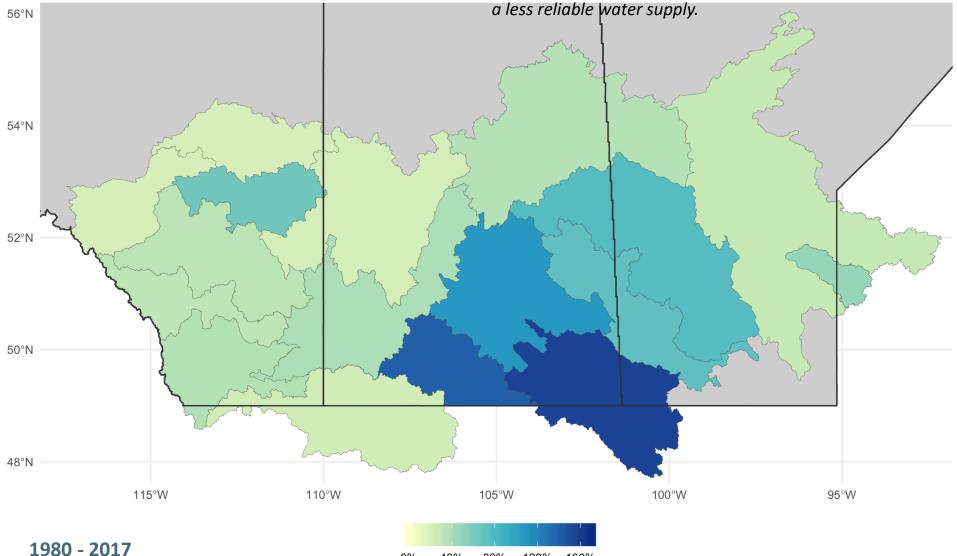
200 mm

Highlights

- Highly spatially variable across the Prairies
- Specific sub-regions generate large amounts of runoff, others very little or none
- Higher elevations in the Rocky Mountain headwaters receive much higher precipitation and have a deeper winter snowpack than low-elevation Prairie
 - Some reaches lose more water to evaporation than is gained from runoff Non-contributing areas can make up large portions of some Prairie watersheds

Inter-Annual Flow Variability

Inter-Annual Flow Variability (%): The variability in annual flow volume between years, calculated as the standard deviation divided by the mean and expressed as a percent. Higher numbers indicate more volatile annual flow volumes, a greater likelihood of flood and/or drought conditions, and



40%

80%

120%

160%

0%

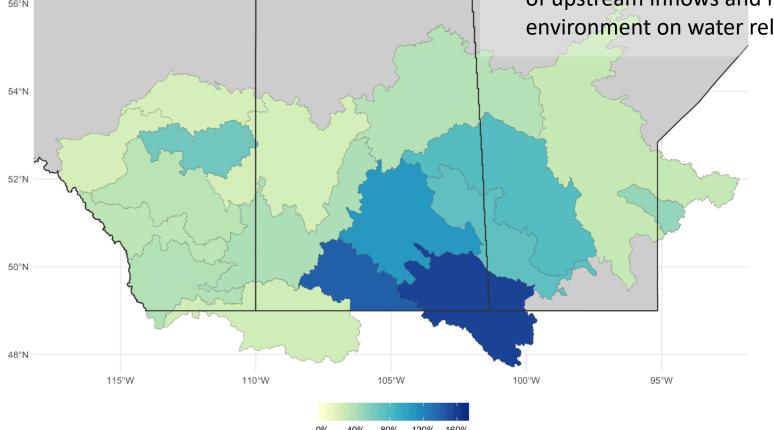
Baseline Prairie Hydrology Current state

Inter-Annual Flow Variability

Inter-Annual Flow Variability (%): The variability in annual flow volume between years, calculated as the standard deviation divided by the mean and expressed as a percent. Higher numbers indicate more volatile annual flow volumes, a greater likelihood of flood and/or drought conditions, and a less reliable water supply.

Highlights

- Mountainous headwaters tend to increase reliability of annual river flow
- Prairie sub-regions which lack a reliable mountain snowpack upstream have the highest percentage of inter-annual flow variability
- This dynamic emphasizes the importance of upstream inflows and headwaters environment on water reliability



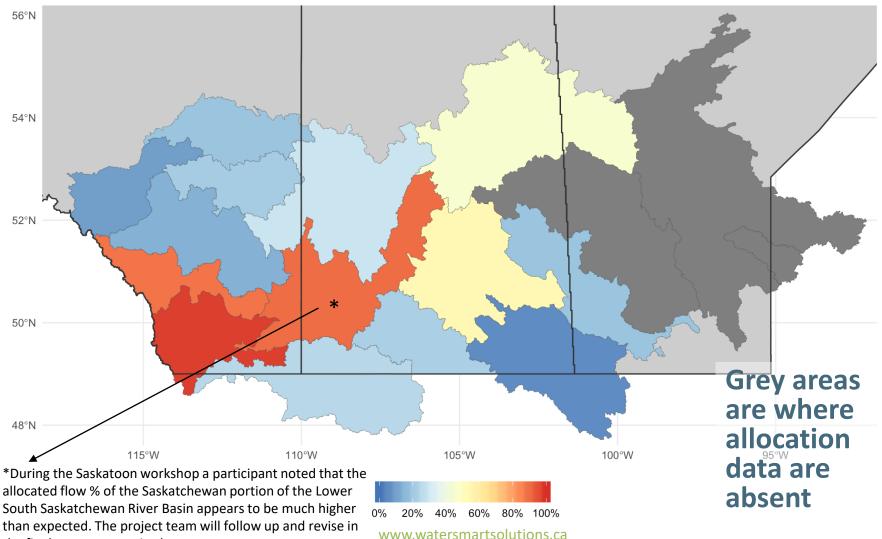
Baseline Prairie Hydrology Current state

Allocated Flow

the final report as required.

Current Allocations and Average Flow from 1980-2017

Allocated Flow (%): The volume of water allocated by surface water licenses as a percentage of the annual flow volume in the river. This indicator is derived by calculating the ratio of water volume licensed to the volume of water flowing through the sub-region mainstem on an annual basis. The statistic is based on an average of the last 30 years of streamflow observations and current water allocations.



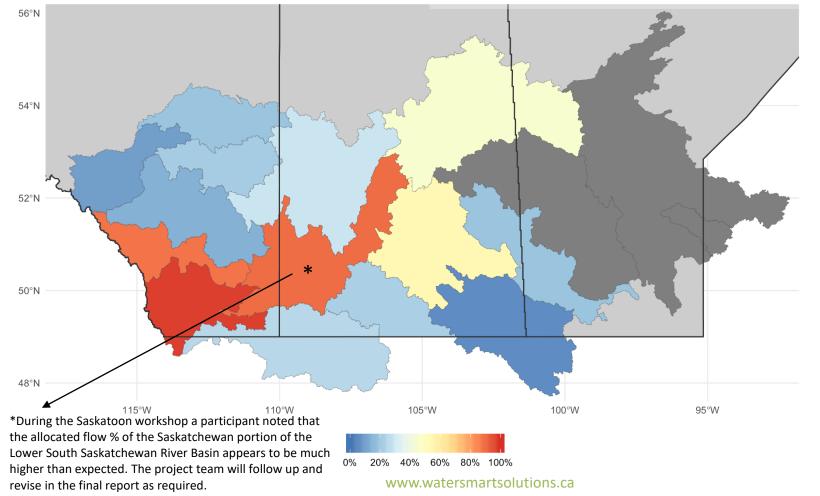
Baseline Prairie Hydrology Current state

Allocated Flow

Current Allocations and Average Flow from 1980-2017

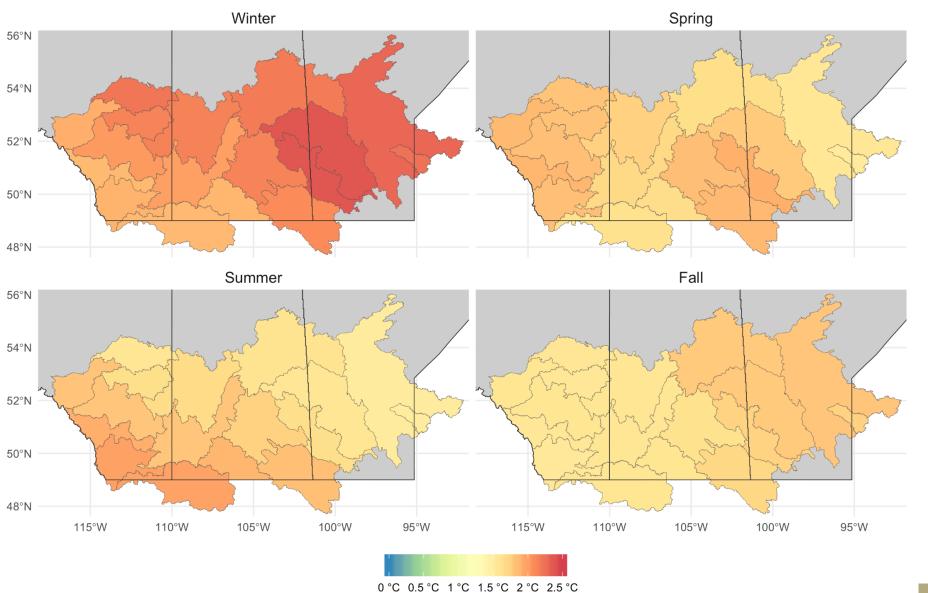
Highlights

- The amount of water allocated in water licences varies greatly across sub-regions
- Although not representative of water use, or water consumption, total allocation volume can be compared to total annual flow to provide a measure of demand



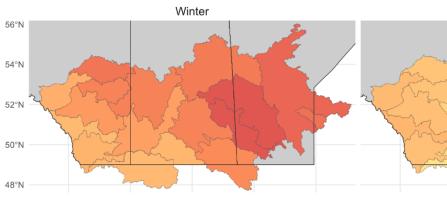
Projections

Change in Air Temperature by 2040s



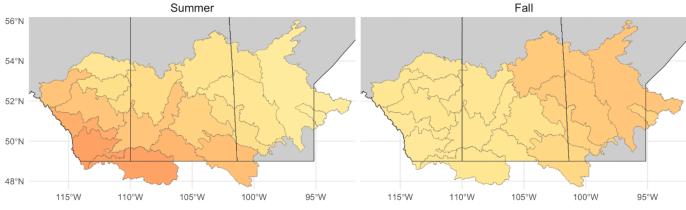
Air Temperature

Change in Air Temperature by 2040s

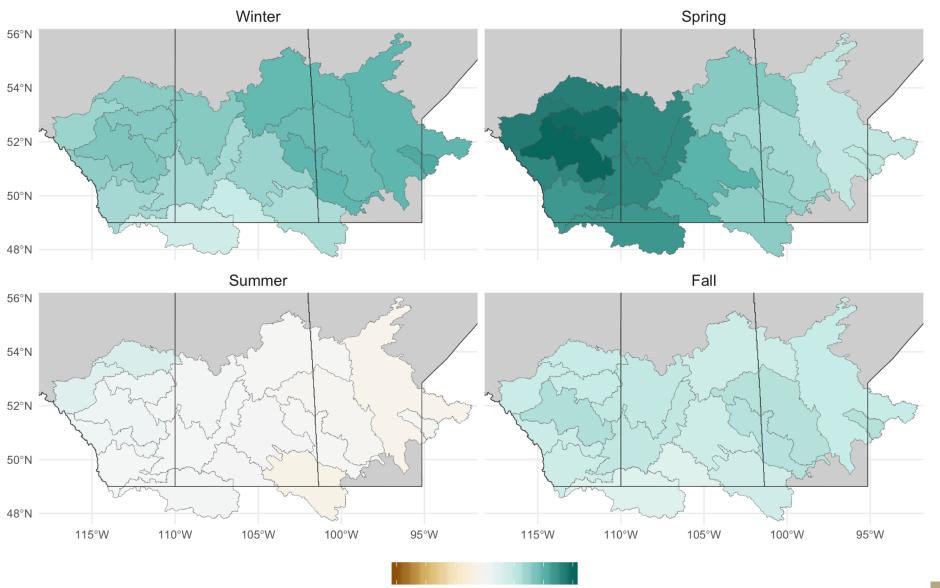


Highlights

- Air temperatures are expected to increase further in the coming decades, particularly during the winter and spring seasons
- This seasonal variability will likely lead to earlier snowmelt and increases in the sproumber of growing days and evaporation rates, among other important hydrologic processes as well as an increase in the frequency of extreme temperatures (Zhang et al. 2019).

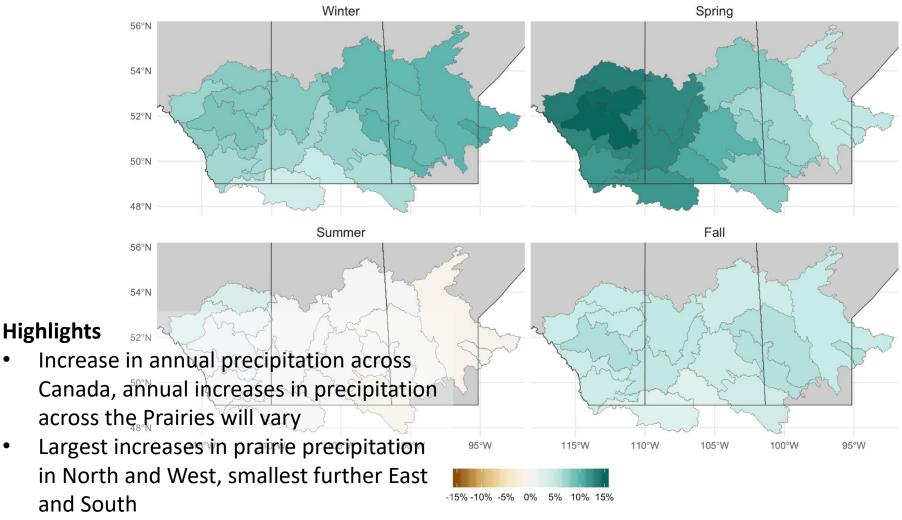


Change in Precipitation by 2040s



-15% -10% -5% 0% 5% 10% 15%

Change in Precipitation by 2040s



 Highest projected increase in precipitation during the spring

Implications

Baseline Prairie Hydrology – Future projection

Recap of hydrology highlights

- 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 Sask 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 summer.

Baseline Prairie Hydrology – Future projection

Implications

- 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, shifting 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

Next up – AB/SK/MB & Prairie-wide water story

- First breakout session will be a discussion of the Prairie water story
- Consider...
 - the hydrology, both current and future, and everything you know today
 - the context of other changing socio-economic factors including population growth projections and increasing demand for food



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9:45 – 10:15	Baseline hydrology for the Prairies	Laura Corbeil (WS)
10:15 – 10:30	Break	
10:30 - 11:10	Breakout: What is the current water story of the Prairies and for AB/SK/MB?	All
11:10-11:25	Plenary readout from breakouts	All
11:25 – 12:00	Plenary discussion: water management challenges, Prairie-wide and for AB/SK/MB	All
12:00 – 12:45	Lunch	
12:45 – 1:45	Breakout: What are the opportunities in response to water management challenges for the prairies	All
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2:00 – 3:00	Breakout: What are the priorities for water management for the Prairies from a AB/SK/MB perspective? Priorities for AB/SK/MB?	All
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Breakout: What is the current water story for AB/SK/MB and the prairies?

Breakout group discussion (35 mins)

- Break into 4 tables (2 in this room, 1 on 4th floor, 1 on 5th floor)
- Nominate plenary speaker
- Maps available to mark up
- Meet back in this room at 11:10am

Discuss: What is the current water story of the Prairies and AB/SK/MB? Is there any more information needed to fill in the water story?

Plenary readout: Table representative shares their version of the water story (3 minutes per table)

Plenary discussion: Water management challenges, prairie-wide and for AB/SK/MB

Discuss: What are the water management challenges in AB/SK/MB and for the prairies as a whole? Consider:

- Water quantity, supply, and availability
- Water quality and watershed health
- Water demand and access
- Regulatory and governance

Challenges identified here will be the basis for discussion in the next session on opportunities to address the challenge.

Lunch

Enjoy your lunch!

We will start the next session at 12:45 pm

Next up – breakout table themes:

- Water quantity, supply, and availability (Claire)
 - Water quality and watershed health (Laura)
 - Water demand and access (Brie)
 - Regulatory and governance (Alec)

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Vision for a prairie water and land management strategy

Framework to support informed water management decisions that promote economic prosperity, community resilience and environmental sustainability across the prairies.

Principles of the vision:

- Stakeholders across the Prairies work collaboratively to protect water supplies and quality
- Prairie Provinces follow a coordinated approach to effectively prepare for climate change impacts
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How do we achieve the vision?

of actions informed water managen	Gather and understand	Plan and commit	Implement	Review and update
Development Development	March 2020	Short term	Medium term	Long term, ongoing
implementation of specific actions that meet priority needs for the prairies • Engage with partners and stakeholders to identify challenges, opportunities and priorities • Summarize baseline hydrology and climate change impacts • Assess feasibility of potential pilot project in SK Focus of this work implementation of specific actions being implemented and review the Strategy for updates • Execute actions from the prairie-wide Roadmap • Execute actions from the prairie-wide Roadmap • Collect data to inform metrics • Potential pilot infrastructure project in Saskatchewan • Synthesis of top priorities from each province into actionable Prairie-wide Roadmap • Develop metrics to support evaluation of effectiveness of actions. • Weasure effectiveness of actions based on Roadmap metrics • Review Roadmap and identify any shifts in challenges, opportunities and priorities • Update Roadmap to reflect progress toward the Prairie Water Strategy • Measure effectiveness of actions based on Roadmap metrics • Review Roadmap and identify and province into actionable Prairie-wide Roadmap • Update Roadmap to reflect progress toward to support evaluation of effectiveness of actions.		-	Project Implementation	
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Breakout: What are the opportunities in response to water management challenges for the prairies?

Breakout group discussion (40 mins)

- Opportunity to change discussion tables
- 4 table categories are the same as the "challenges" breakout
 - Water quantity, supply, and availability (Claire)
 - Water quality and watershed health (Laura)
 - Water demand and access (Brie)
 - Regulatory and governance (Alec)
- Nominate a plenary speaker
- Meet back in this room at 1:30pm

Discuss: What are opportunities to respond to or address challenges and achieve the **vision state**?

Plenary readout: 3 opportunities from each table (3 mins per table)

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Breakout: What are the priorities for water management for the prairies from a AB/SK/MB perspective? Priorities for AB/SK/MB?

Breakout group discussion (40 mins)

Sort priorities by urgency and impact (~15 mins)



- How should we prioritize and what does success look like? (~20 mins)
- 3. Feedback on next steps (~5 min)

Plenary readout: 3 points from each table (3 mins per table)

What we heard (AB)

Baseline Prairie hydrology

- Increasing air temperature and increasing spring precipitation will impact water resources, especially timing
- Winter temperatures are predicted to increase and more precipitation is expected to fall as rain
- Streamflow in the Prairie region generally is projected to shift from snow-melt dominated pattern to one that is more mixed with higher input from rainfall events

The water story in AB & Prairie-wide

- Future won't look like the past, need for adaptation
- Increase education and understanding around water management and the current system
- Holistic view considers all aspects, and cumulative impacts

Key challenges, opportunities and priorities

- Opportunity to understand and communicate economics around ecosystem services and cost benefit analyses of all options
- Water reuse as an opportunity for many categories
- Data: collection, accuracy, transparency
- Demand increases but supply constant

What we heard (SK)

Baseline Prairie hydrology

- Increasing air temperature and increasing spring precipitation will impact water resources, especially timing
- Winter temperatures are predicted to increase and more precipitation is expected to fall as rain
- More and/or less water at inconvenient times

Key challenges, opportunities and priorities

- Water quality and maintaining landscapes to improve water quality
- Revisit drainage policy including discussion of incentives, disincentives and enforcement
- Opportunity to intentionally bring together diverse perspectives to the conversation and planning process from the beginning
- There are many initiatives and groups, need coordination and integration of the information by a body that has the mandate to provide advice to decision makers

What we heard (MB)

Manitoba hydrology and water story

- Manitoba story is unique
- Averaging data over large areas can mask local experiences/conditions
- More and/or less water at inconvenient times (extreme inter and intra-annual variability)
- Red River and Winnipeg Basins are critical to the water story

Key challenges, opportunities and priorities

- Collaboration between all levels of government, including First Nations, Federal, Provincial Municipal is critical
- Pan-prairie entity with decision making authority/influence
- Education and awareness on how water is managed
- Access to data and information, as well as synthesis
- Multi-jurisdictional water management

Next steps

- ✓ Complete workshop evaluation form
- ✓ Distribute workshop summaries to participants
- ✓ WaterSMART will submit report with hydrology summary and workshop findings to WD-DEO
- ✓ WD-DEO will prepare recommendations to Government of Canada for next steps to develop the strategy by March 31, 2020

Thank you!



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