EPCOR's Source Water Protection Plan: Managing Key Risks

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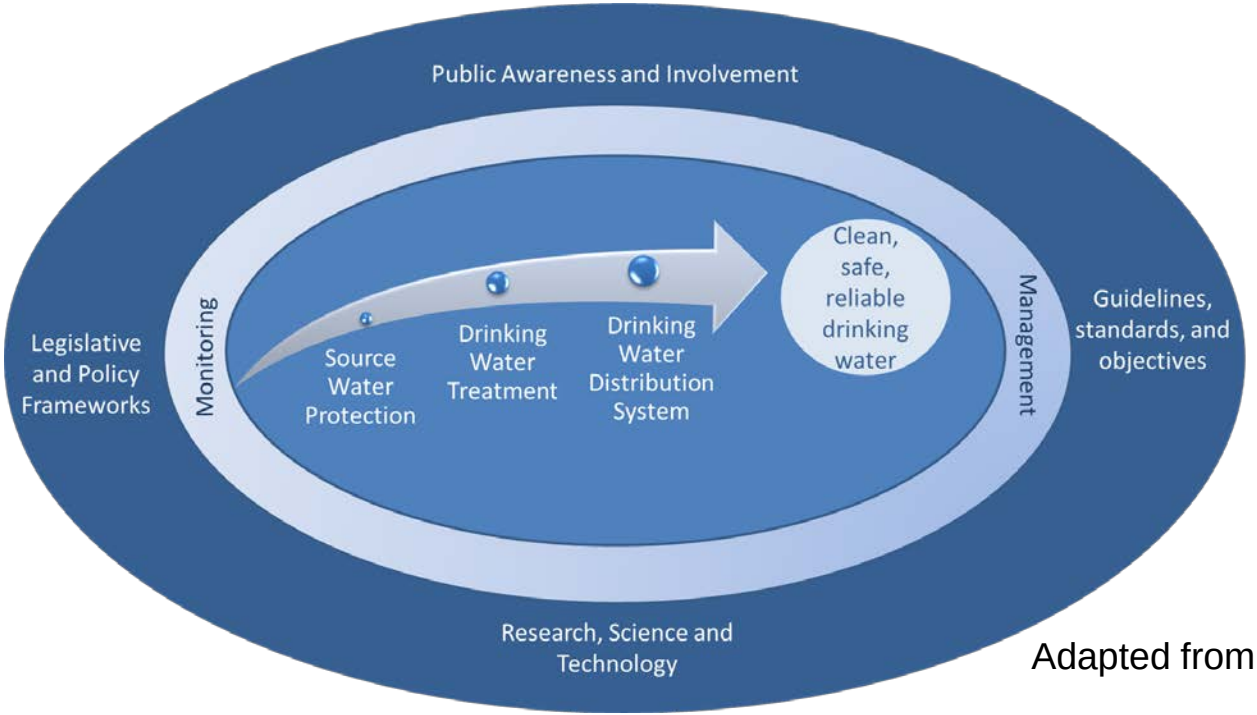
Outline

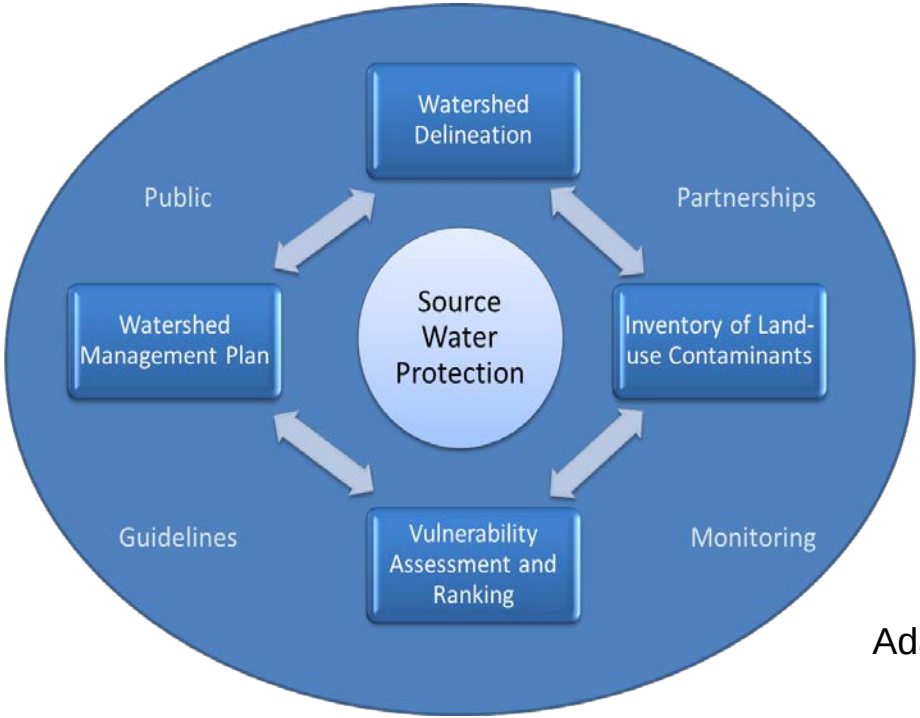
- Overview of source water protection
- EPCOR's Source Water Protection Plan
- Key risks to source water

Multi-barrier Approach to Clean, Safe, Reliable Drinking Water



Adapted from CCME 2004

Components of Source Water Protection



Adapted from CCME 2004

EPCOR's Source Water Protection Plan

2017 SOURCE WATER PROTECTION PLAN
EDMONTON'S DRINKING WATER SYSTEM

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- First created in 2008
- Fourth update completed in 2017

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EPCOR's Source Water Protection Plan: Vision

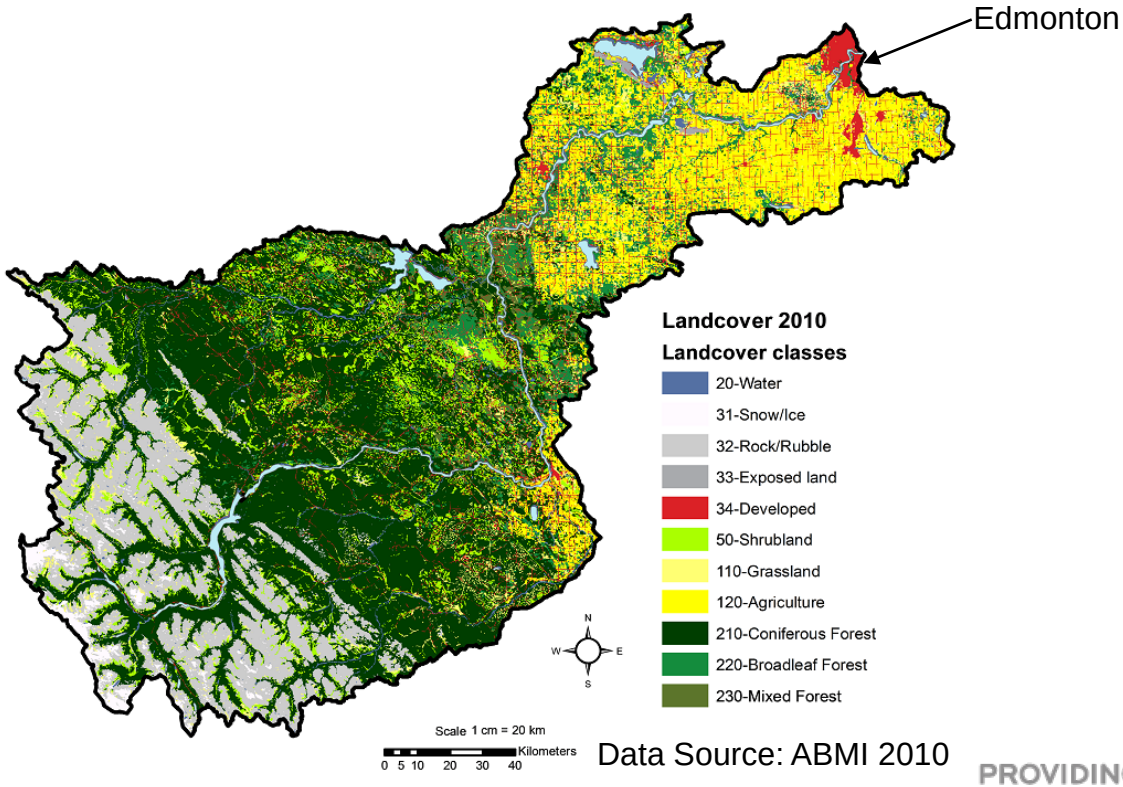
EPCOR is committed to ensuring clean and abundant water supplies for Edmonton's water treatment plants through application of a source water protection program

EPCOR's Source Water Protection Plan: Vision

EPCOR recognizes:

- Source water protection is part of a multi-barrier approach
- EPCOR does not own the watershed in which it operates; therefore it is committed to working with stakeholders
- Sufficient resources are required to implement source water protection
- Source water protection plans require improvement and renewal

Characterization of Source Water Area



Data Source: ABMI 2010

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Source Water Risks

Source	Land-Uses / Potential Contaminant Source/Activity	Inherent Risk	Residual Risk
POINT	Small urban waste water discharges	H	L
	Pipeline break	M-H	M-L
NON-POINT	Livestock waste excretion	H	L
	Livestock physical alteration of watershed	M-H	L
	Agricultural cropping activities	M-H	L
	Agricultural land cover and use	M-H	L
	Wildlife activity in watershed.	M-H	L
	Rural septic fields	M-H	L
	Small urban stormwater runoff	M-H	L
	Forest harvesting activities	M-H	L
	Pine beetle infestation	M-H	L
	Forest fires	M-H	M-L
	Waste disposal sites	M-L	L
	Alteration in climate (natural and anthropogenic)	M-H	M-L
	City of Edmonton stormwater runoff	H	L
	Contamination of pet fecal matter in urban areas	M-H	L
	Proximity to transportation corridor	M-H	L
	Chemical spill on a bridge	M-H	M-L
	Recreational activities	M-L	L
	Ground water contamination from airport	M-L	L
	Gravel extraction activities	M-L	L
	Coal surface mining	L	L
	Disposal of animal remains within watershed	M-L	L
	Dam operation and management	M-L	L
	Contamination of shallow aquifers	M-H	M-L
	Industrial land spillage	M-H	M-L
OTHER	Intentional contamination at critical source intakes	M-H	M-L
	Insufficient raw water quantity	M-L	L
	Catastrophic failure of dams	M-H	L
	Contamination of raw water due to intentional dumping or release of chemicals from industries	M-H	M-L
	Construction activities on the River – Walterdale Bridge	M-H	M-L
	Lack of integration among watershed and other land and water planning initiatives	M-H	L

Key Source Water Risks:

- Climate Change
- Wildfires
- Spills

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Climate Change Predictions for the NSR

Variable	Projection
Annual temperature	Increase by 1.3 to 4.5 °C by 2050
Annual precipitation	Increase 4.3 to 12.5 % by 2050
Timing of precipitation	Increase in winter and spring, decreases in summer and fall
Storm events	Increase of frequency intensity of short duration storms
Snow pack in headwaters	Increase of precipitation as rain, earlier spring melt, decreases of water storage in snow pack
Soil moisture	Increase in winter and spring, decreases in summer and fall
Landscape changes	Increase of forest fires, decrease of forested areas, increase of grasslands, agricultural changes, decreased wetlands

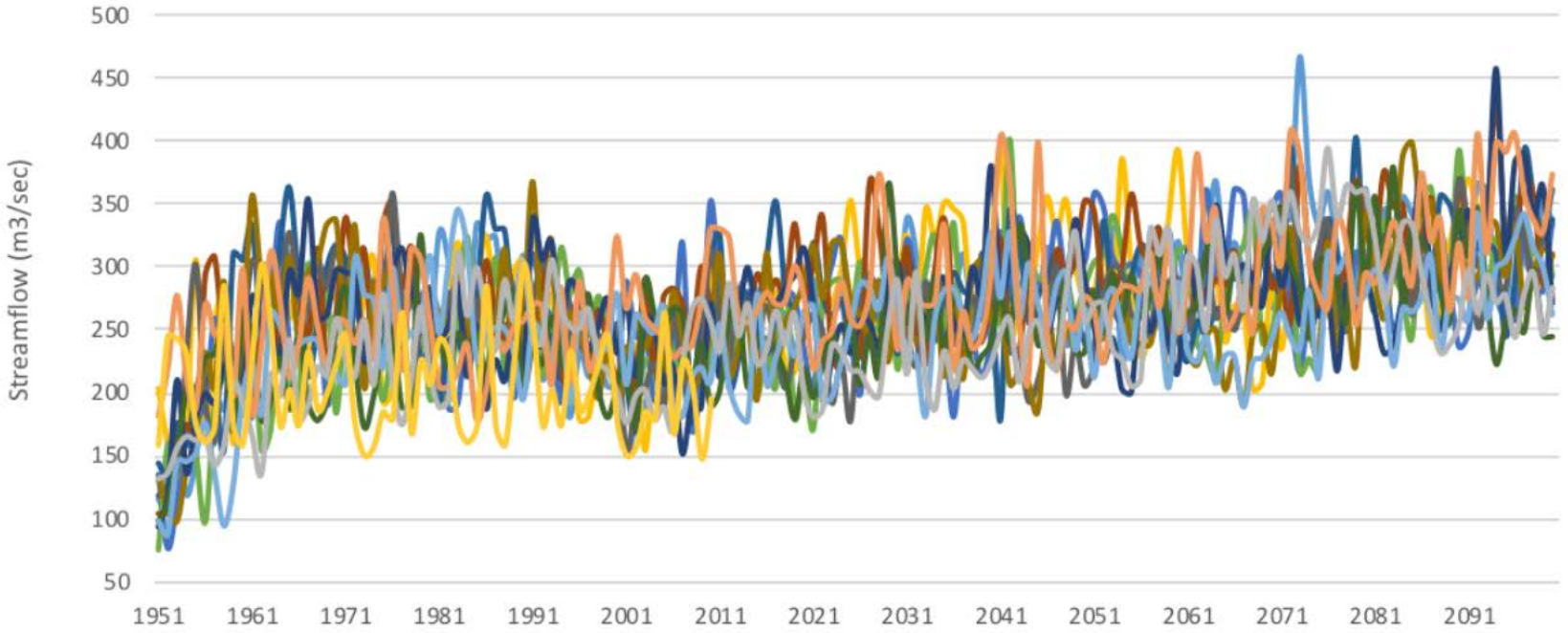
Sources: Vance et al. (1995), Barrow and Yu (2005), Golder (2008), Kienzle et al. (2012), Weaver (2017), Schneider (2013)

Climate Change Predictions for Flows in NSR

- Annual flows in increase
- Increased flow during winter and spring
- Earlier spring melts
- Decreased flows during summer and fall

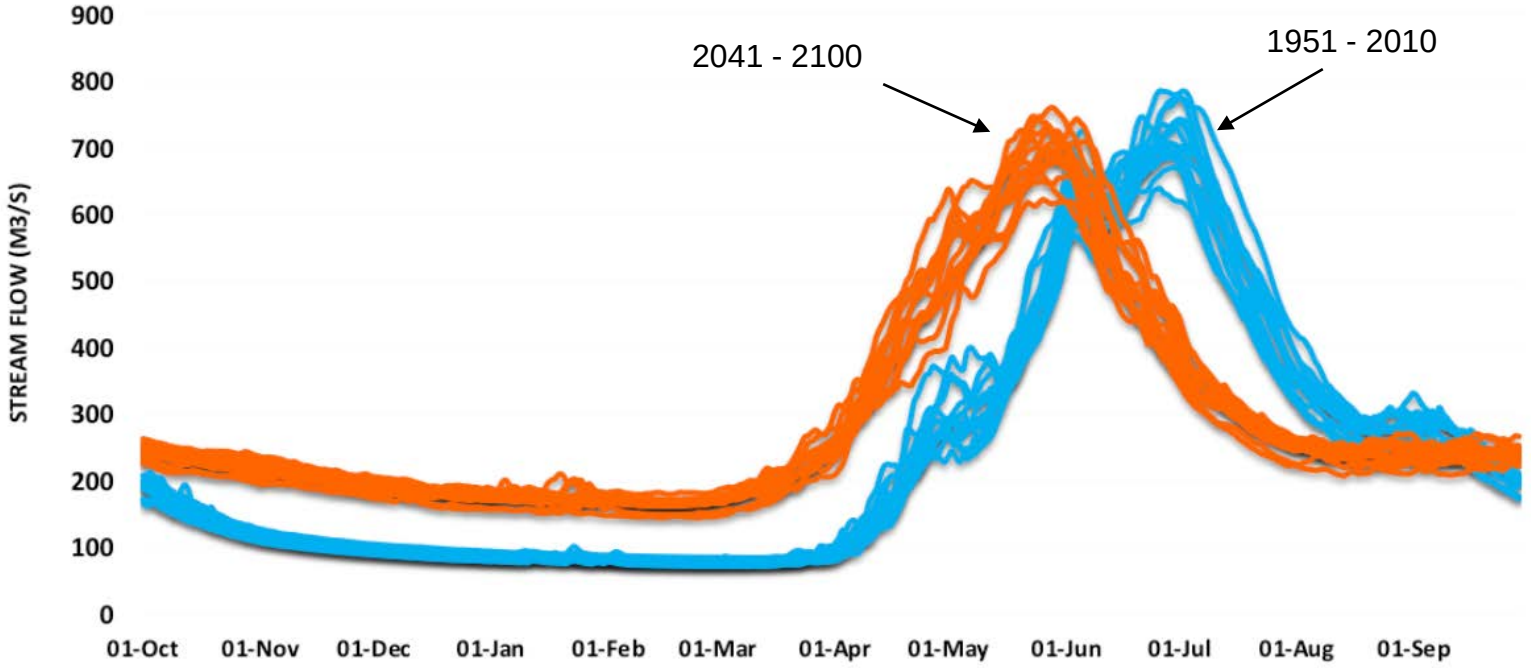
(Golder 2008 and Kienzle et al. 2012)

Climate Change Predictions for Flows in NSR



Prairie Adaptation Research Council (2019)

Climate Change Predictions for Flows in NSR



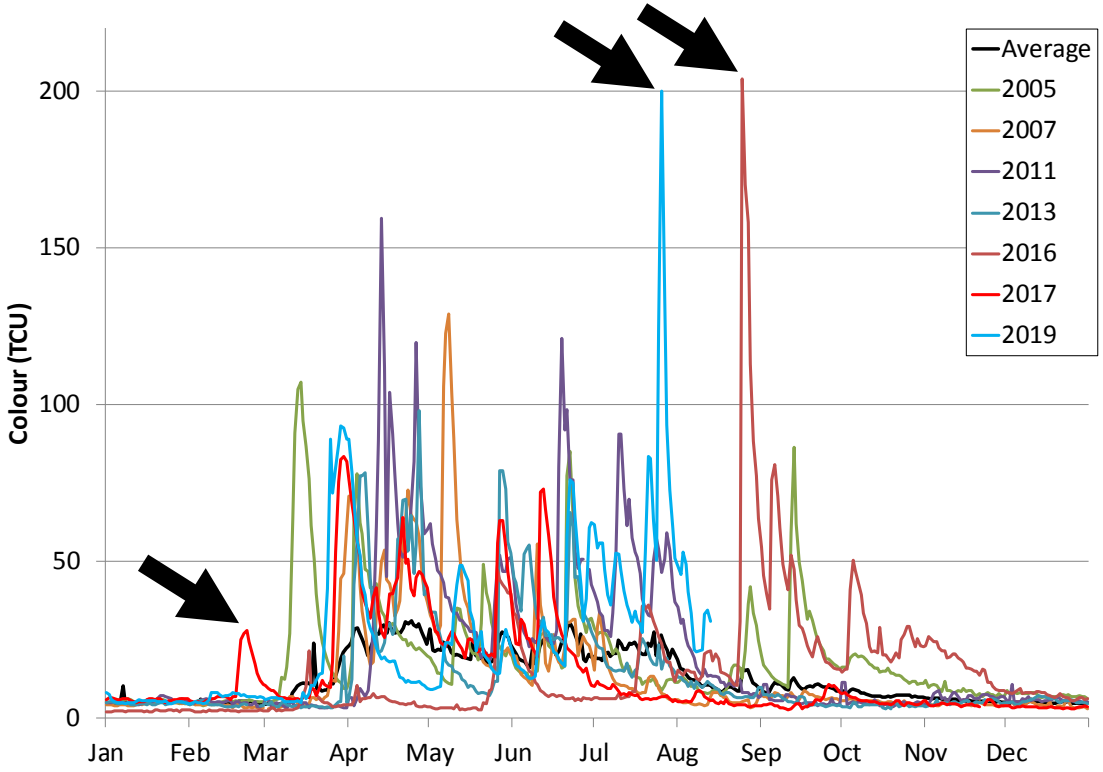
Prairie Adaptation Research Council (2019)

Climate Change Impacts to NSR Water Quality

Climate event	Resulting Impact in Water Quality
Increased precipitation and higher intensity events	Increased erosion resulting in increased turbidity, colour and nutrients
Higher flows in the NSR	Increased resuspension of material, increased turbidity
Lower flows in the NSR	Initially reduced turbidity, but large reductions of flows could increase nutrients and other parameters
Droughts	Initially reduced turbidity and colour, but large increases when precipitation returns
Forest fires	Initial large pulse and extended increase of colour, turbidity and nutrients
Warmer temperatures	Increased growth rates of algae?

Source: EPCOR 2018

Colour: A Key Parameter for Water Treatment



Adaptation Strategy and Action Plan

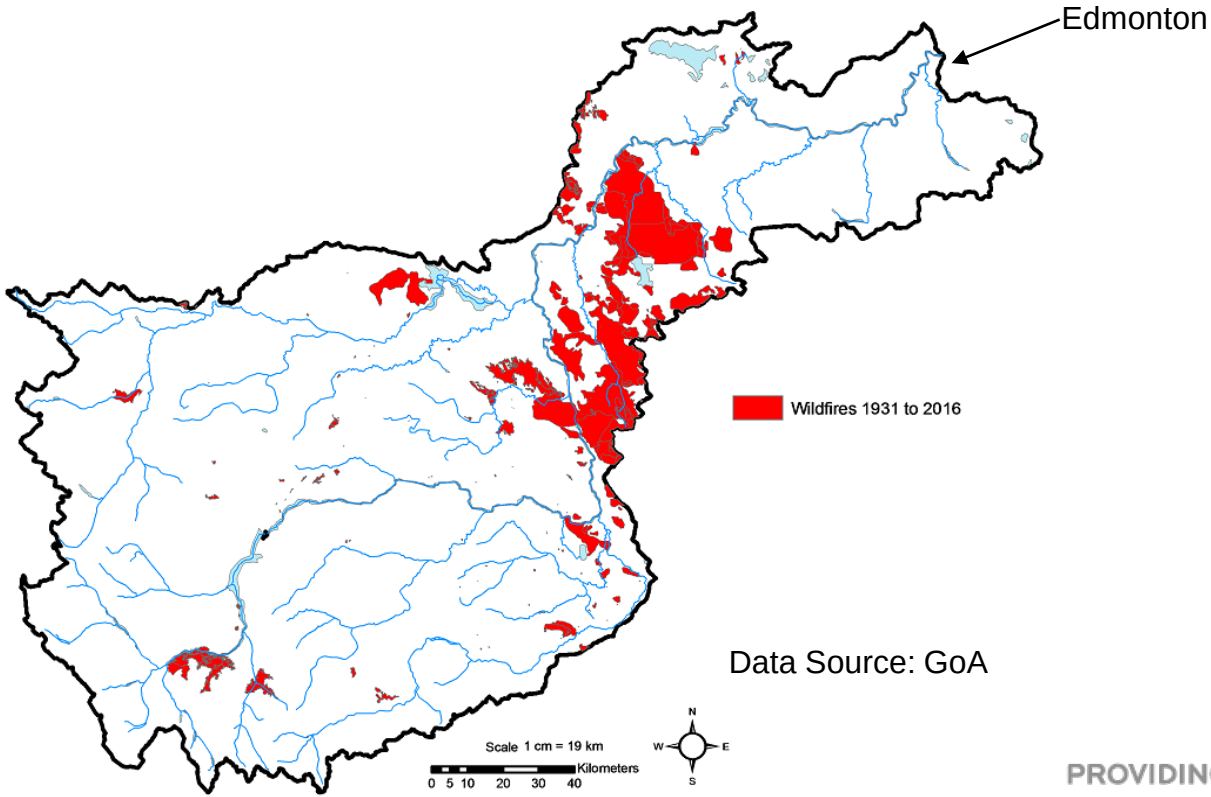
- EPCOR is developing a Climate Change Adaptation Strategy and Action Plan
- Outlines risk mitigation strategies that EPCOR is currently undertaking and planning to undertake in the future to address operational risks.
  - Increase knowledge and ability to predict impacts
  - Risk management
  - Long-term planning
  - Alignment with City of Edmonton Climate Change Adaptation and Resiliency Action Plan

Wildfire Risks to Source Water

Photo Credit: Amanda Nand, Huffington Post.

- Altered hydrology
- Erosion
- Increases in colour, nutrients and turbidity
- Increased algae growth

Historical Wildfires in the NSR



Data Source: GoA

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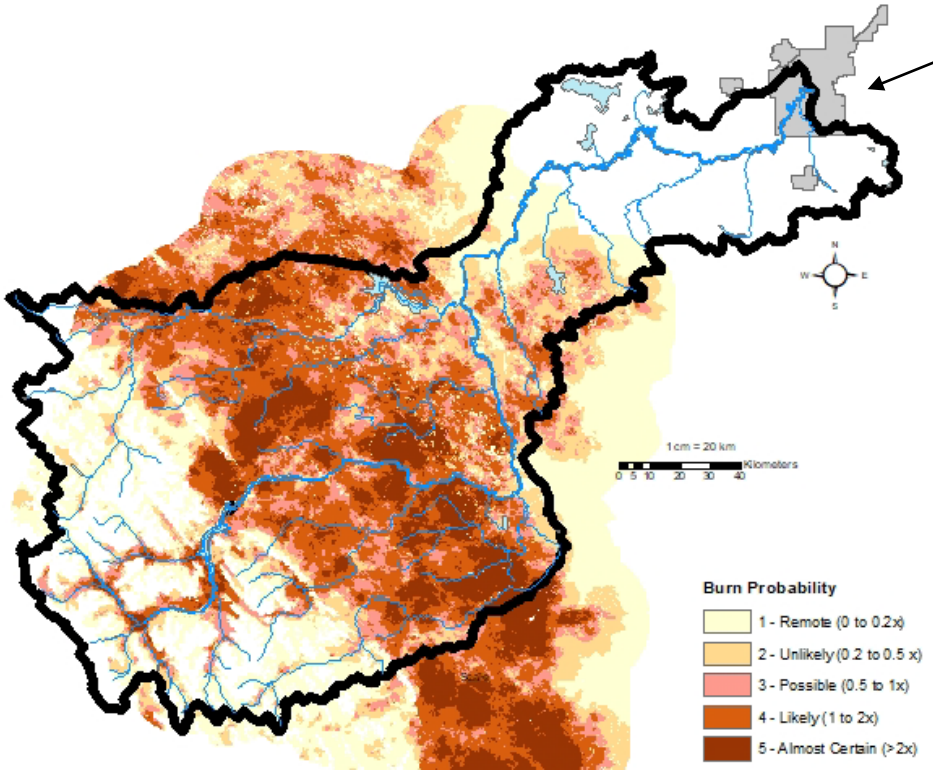
Burn Probability in the NSR



- Burn Probability = “Relative Likelihood of Fire”

Data Source: GoA

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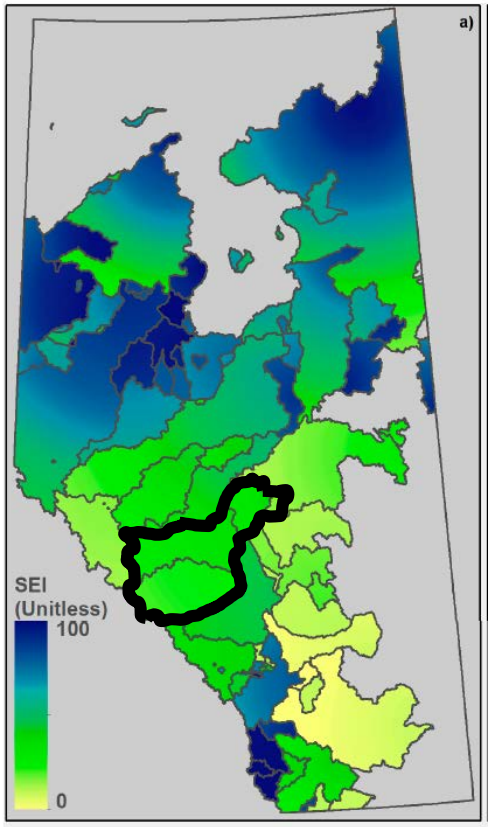
Exposure of Source Water to Wildfires



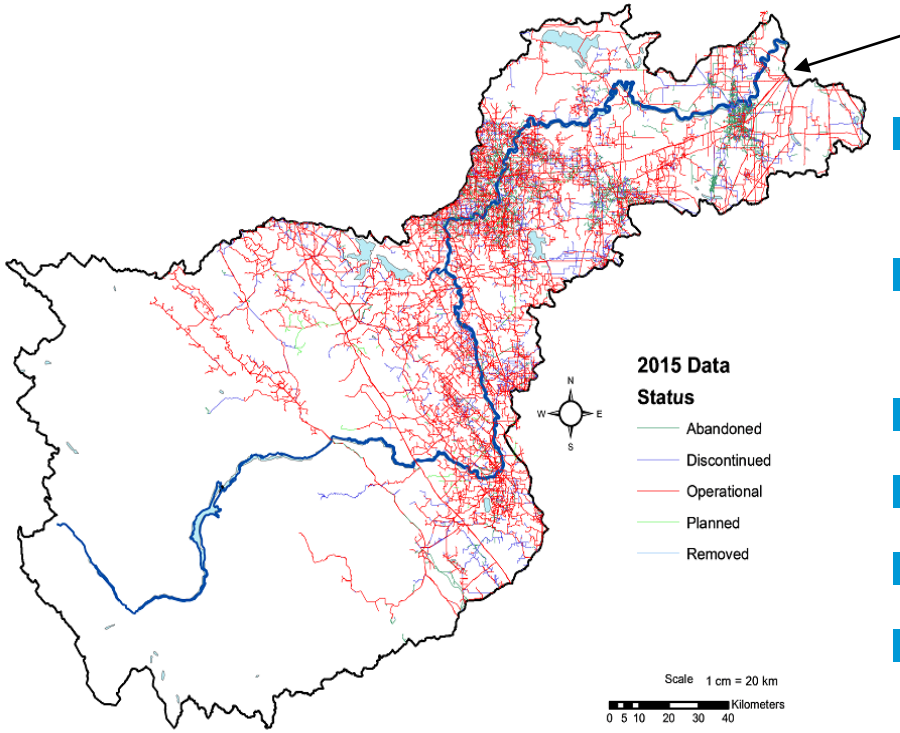
- “Source Exposure Index” (SEI) a metric to assess to exposure of source water to wildfire
- Headwaters of NSR has notably less “fire danger” than watersheds to the north and south

Robinne et al. (2019)

How is EPCOR Addressing Wildfires

- Connecting with experts to better understand the risk
  - Funding the *for*Water Network
  - Meeting with GoA, industry and academic researchers
- Better understand treatability of wildfire affected water

Pipelines in the NSR



Data Source: Alberta Energy Regular

- 380 pipelines cross the NSR or major tributaries
- 70% - low-risk products (i.e., natural gas, water)
- 13% - Fuel Gas
- 11% - Oil-well effluent
- 6% - crude oil
- 1% - low vapour products

Other Sources of Spills

- 2 rail crossings of the NSR
- 6 highway and 5 bridges in Edmonton cross the NSR
- Numerous industrial facilities
- Construction activities of the NSR

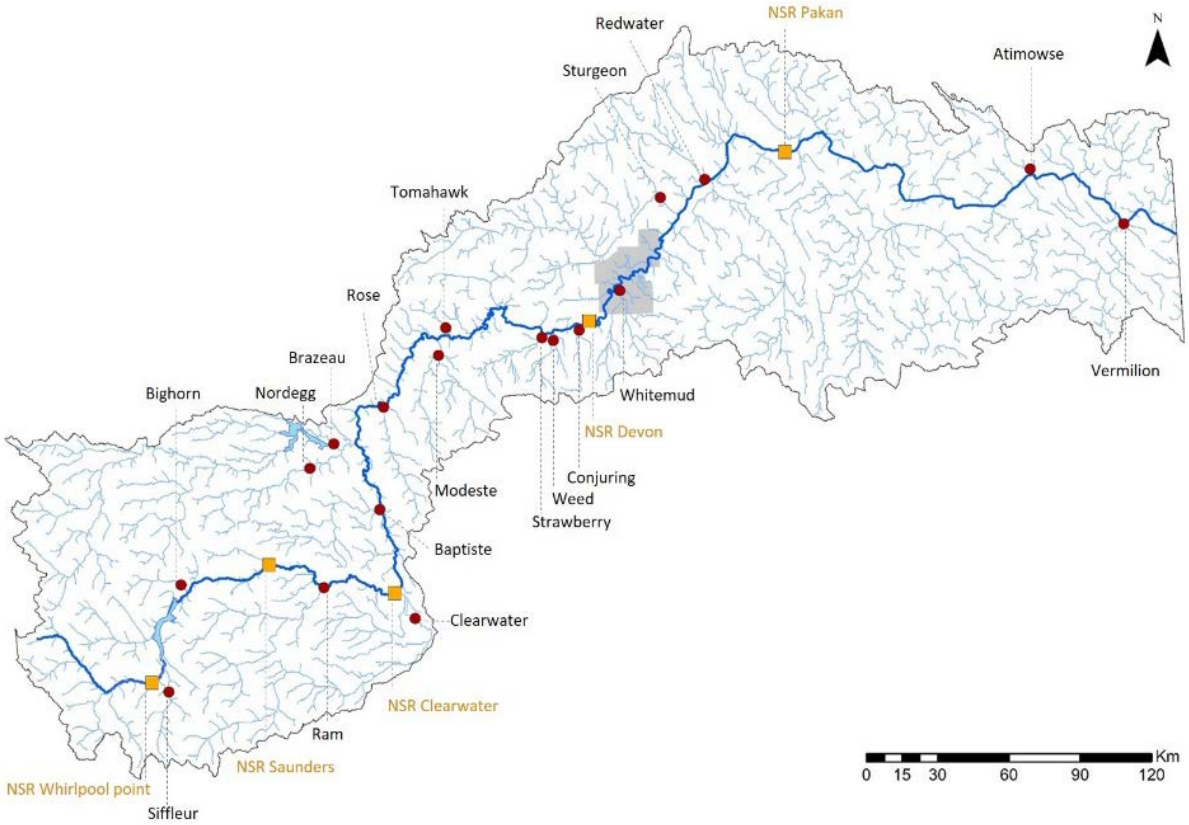
Efforts to Mitigate the Effects of Spills

- VOC online analyzers being installed
- Confirmation with pipeline companies and authorities that EPCOR will be notified in the event of a spill
- Conducted treatability tests
- Proposal to model spill behavior in NSR under various conditions
- Emergency water distribution plan

WaterSHED Monitoring Program

- 4 year program (2018 – 2021) for enhanced monitoring program to improve understanding of North Saskatchewan River watershed
- Steering Committee has members from AEP, EPCOR, NSWA and City of Edmonton
- Network of monitoring stations on 19 tributaries
- Goal is to determine how landuse in the watershed impacts water quality in the NSR

WaterSHED Monitoring Program



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Thank You
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Questions?