



# WATER SECURITY AND RESILIENCE IN THE PRAIRIE PROVINCES



**PRAIRIE WATER**  
GLOBAL WATER FUTURES



Colin Whitfield (University of Saskatchewan)  
colin.whitfield@usask.ca

## Contributors

- Helen Baulch
- Grant Ferguson
- Balew Mekonnen
- Kevin Shook
- Chris Spence
- Jared Wolfe

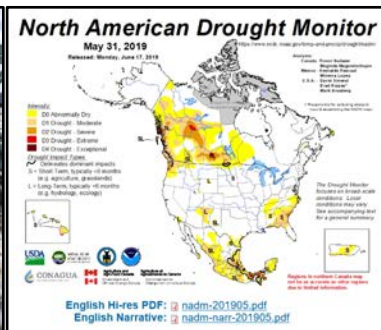


## Water security defined

- Water security can be defined as the availability of an **acceptable quantity** and **quality** of water for health, livelihoods, ecosystems and production, coupled with an acceptable level of water-related risks to people, environments and economies (Gray and Sadoff, 2007).



Ottawa Citizen May, 2019

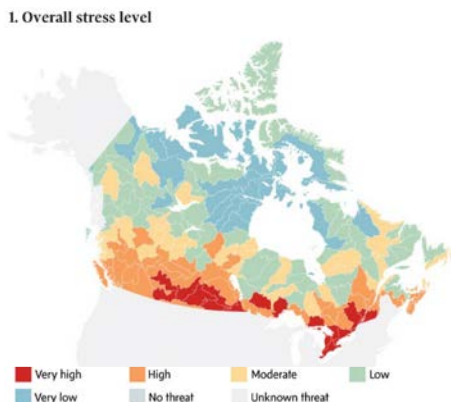


NOAA August 2017

## Is the Prairie water secure?



AGCanada.com  
Daily news Crops Livestock Markets Weather



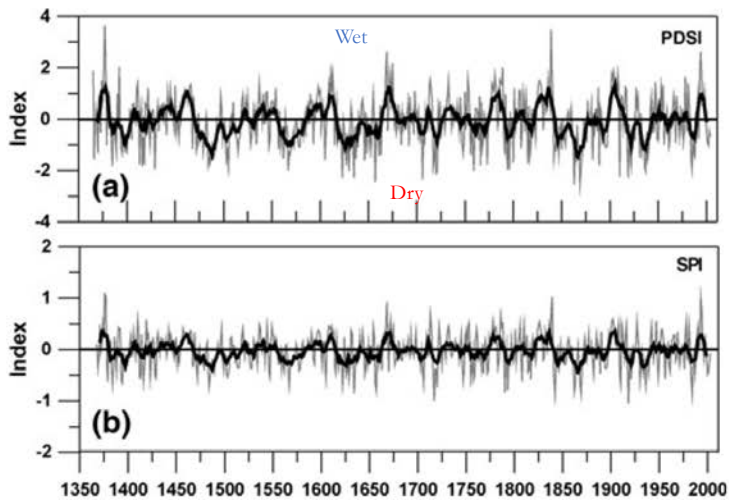
A national assessment of Canada's freshwater watersheds (WWF 2017)

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SECONDS

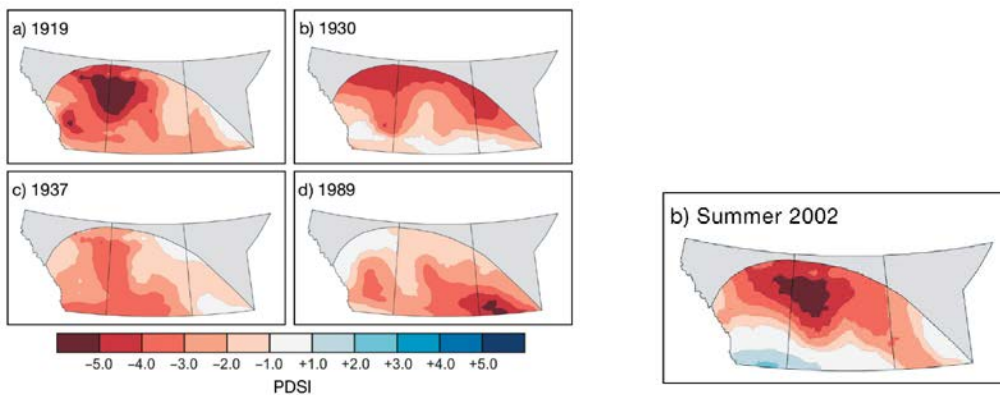
Advisories for Manitoba

# Climate



Bonsal et al., 2013

# Climate



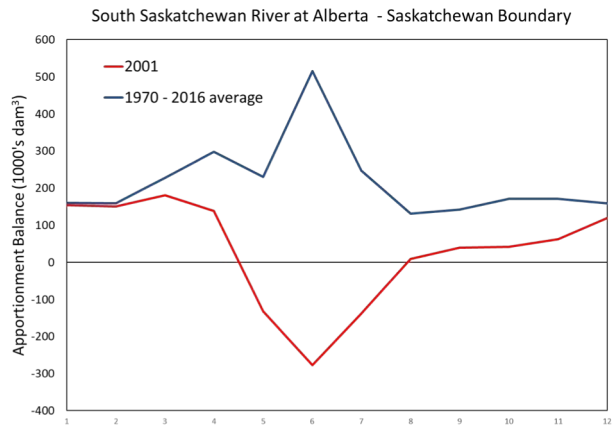
Bonsal and Regier, 2007

# Climate

**Table 2**  
Summary of agricultural losses due to the 2001 and 2002 drought in Canada, by province (Kulshrestha 2005)

Province	Reduction* in value of production in 2001 (000\$)	Reduction* in value of production in 2002 (000\$)
British Columbia	\$0	\$30,001
Alberta	\$271,060	\$1,008,500
Saskatchewan	\$654,940	\$1,000,980
Manitoba	\$6,980	\$27,770
Western Canada	\$932,980	\$2,067,251
Ontario	\$294,730	\$139,690
Québec	\$34,080	\$20,550
Nova Scotia	\$27,510	\$16,510
Prince Edward Island	\$50,230	\$0
Eastern Canada	\$406,550	\$176,750
Total Canada	\$1,339,530	\$2,244,001

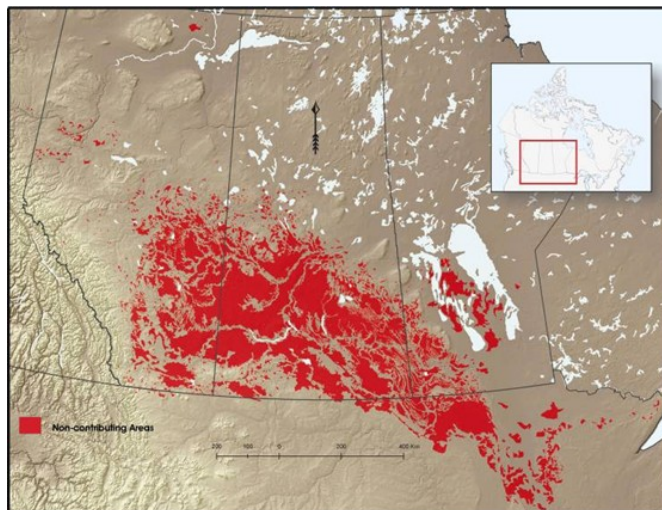
Wheaton et al., 2008



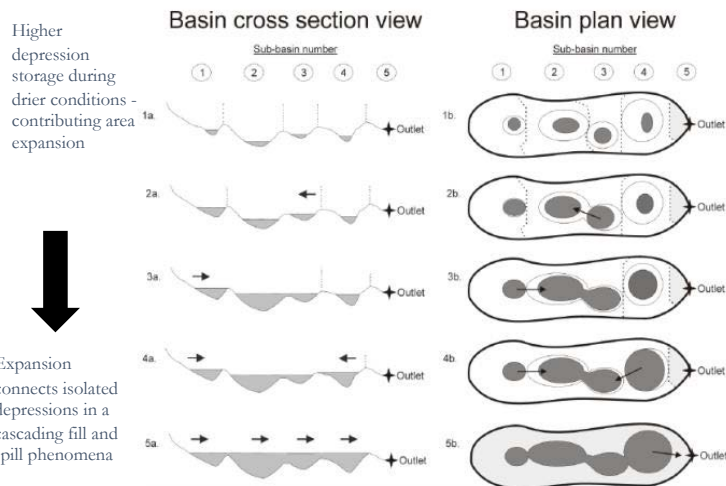
# Landscape



# Landscape

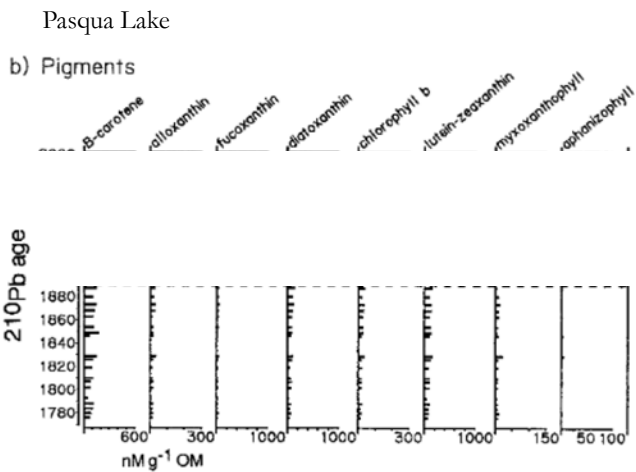


# Landscape



Shaw et al., 2012

# Landscape



The landscape is naturally nutrient rich

Hall et al., 1999

# Human activity (landscape modification)

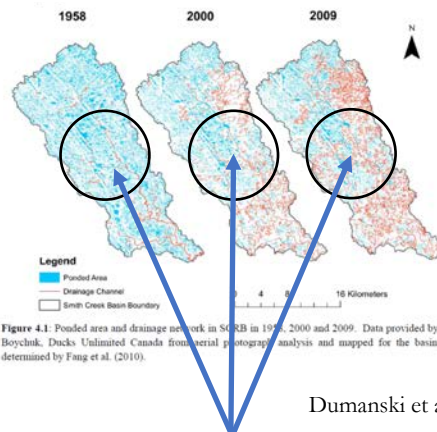
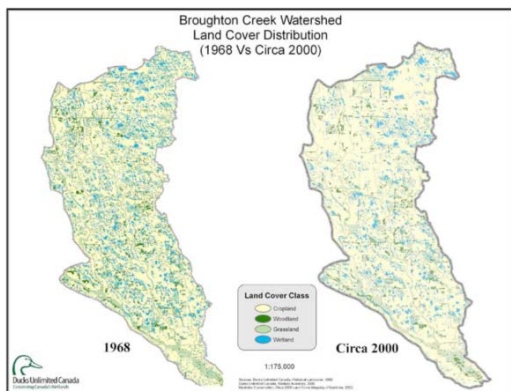
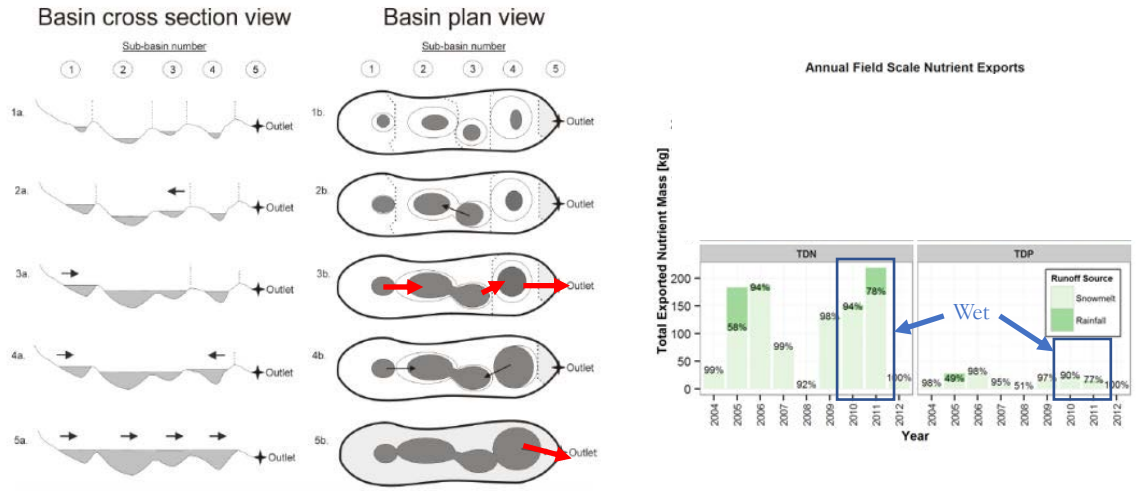


Figure 4.1: Ponded area and drainage network in SCRB in 1958, 2000 and 2009. Data provided by Lyle Boychuk, Ducks Unlimited Canada from aerial photograph analysis and mapped for the basin area determined by Fang et al. (2010).

Dumanski et al. 2015.

Increasing effective area

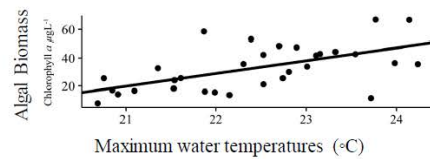
## Human activity (landscape modification)



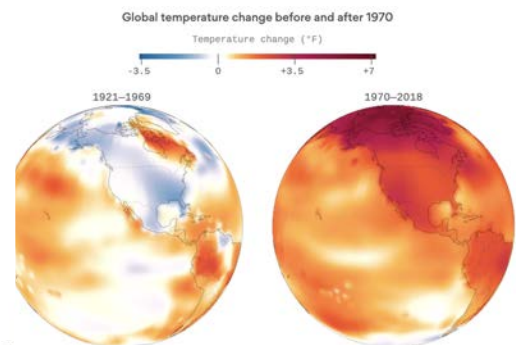
Roste and Elliott

## Human activity (climate change)

- Algae respond to light, temperature, nutrients

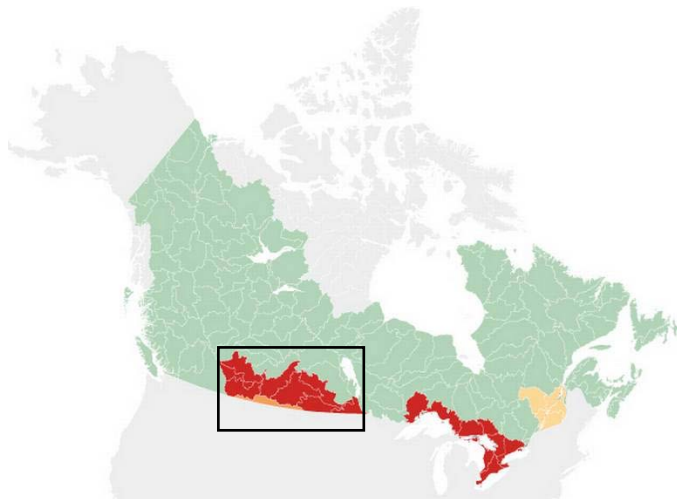


Kehoe et al.



Data: NASA GISS Graphic: Harry Stevens/Axios

## Human activity (water use)



A national assessment of Canada's freshwater watersheds (WWF 2017)

## Prairie Water

CANADIAN WATER RESOURCES JOURNAL / REVUE CANADIENNE DES RESSOURCES HYDRIQUES  
<https://doi.org/10.1080/07172429.2018.1527256>

Taylor & Francis  
 Taylor & Francis Group

COMMENTARY

**Prairie water: a global water futures project to enhance the resilience of prairie communities through sustainable water management**

Christopher Spence<sup>a</sup>, Jared D. Wolfe<sup>b</sup>, Colin J. Whitfield<sup>c</sup>, Helen Margaret Bauk<sup>d</sup>, Nandita B. Basu<sup>e</sup>, Angela K. Bedard-Haughin<sup>f</sup>, Ken W. Belcher<sup>g</sup>, Robert G. Clark<sup>h</sup>, Grant A. Ferguson<sup>i</sup>, Masaki Hayashi<sup>j</sup>, Karsten Liber<sup>k</sup>, Jeff J. McDonnell<sup>l</sup>, Christy A. Morrissey<sup>m</sup>, John W. Pomeroy<sup>n</sup>, Maureen G. Reed<sup>o</sup> and Graham Strickert<sup>p</sup>

<sup>a</sup>Environment and Climate Change Canada, Saskatoon, Canada; <sup>b</sup>School of Environment and Sustainability, University of Saskatchewan, Saskatoon, Canada; <sup>c</sup>Earth and Environmental Sciences, University of Waterloo, Waterloo, Canada; <sup>d</sup>College of Agriculture and Biosciences, University of Saskatchewan, Saskatoon, Canada; <sup>e</sup>College of Engineering, University of Saskatchewan, Saskatoon, Canada; <sup>f</sup>Department of Geoscience, University of Calgary, Calgary, Canada; <sup>g</sup>Toxicology Centre, University of Saskatchewan, Saskatoon, Saskatchewan, Canada; <sup>h</sup>College of Arts and Sciences, University of Saskatchewan, Saskatoon, Saskatchewan, Canada; <sup>i</sup>Department of Geography and Planning, University of Saskatchewan, Saskatoon, Canada

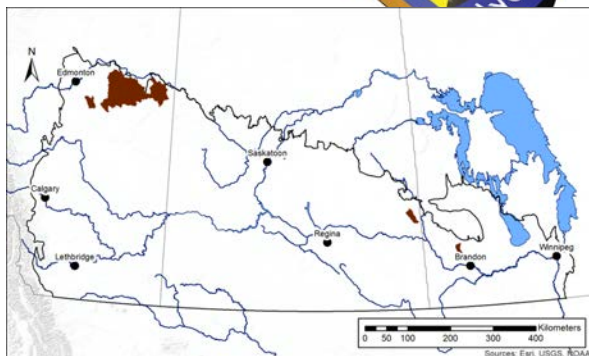
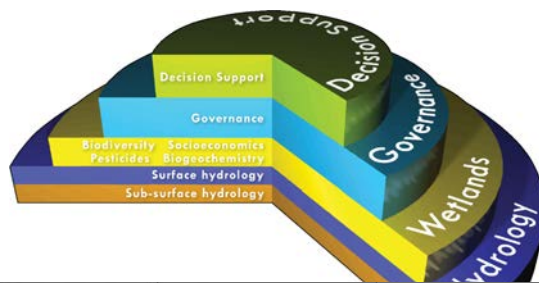
**ARTICLE HISTORY**  
 Received 24 May 2018  
 Accepted 19 September 2018

I would walk to the end of the street and out over the prairie with the clickety grasshoppers binging in arcs ahead of me and I could hear the hum and twang of the wind in the great prairie harp of telephone wires..... Standing there with the total thrust of prairie sun on my vulnerable head, I guess I learned – at a very young age – that I was mortal!

W.O. Mitchell, *Who Has Seen the Wind*

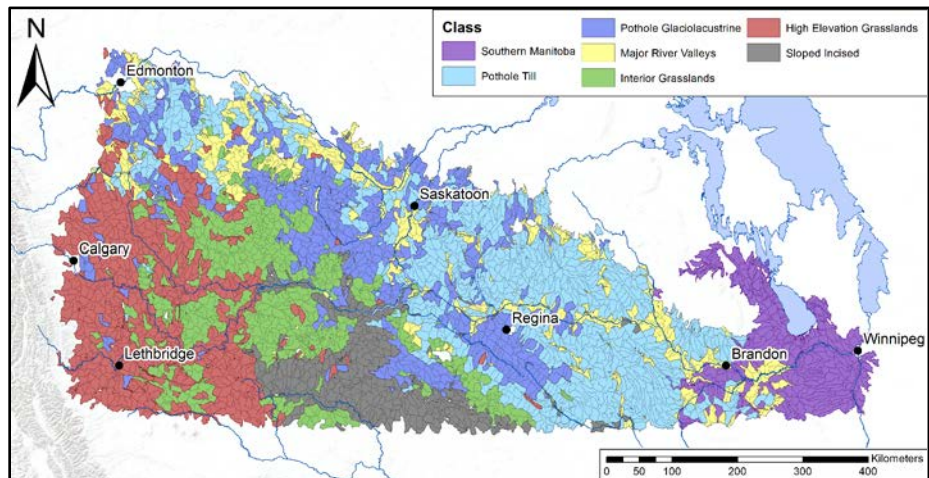
**Introduction**  
 The prairie region of Canada (the Canadian Prairie) lies in the southern part of the provinces of Alberta,

of the Canadian Prairie is challenging. To date, there has not been an integrated approach taken to improve understanding of how the region functions hydrologically and how this functioning influences those physical, chemical, ecological, economic, cultural and social systems of concern to the region's residents. This commentary introduces and describes the new Global Water Futures programme *Prairie Water*. This commentary is meant to permit engagement with the Canadian water community and build collaboration with the programme. Herein, information on the distinct conditions, challenges, vulnerabilities and stressors that influence current water issues on the Prairie



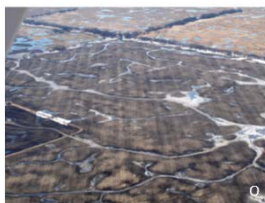


# Prairie Water

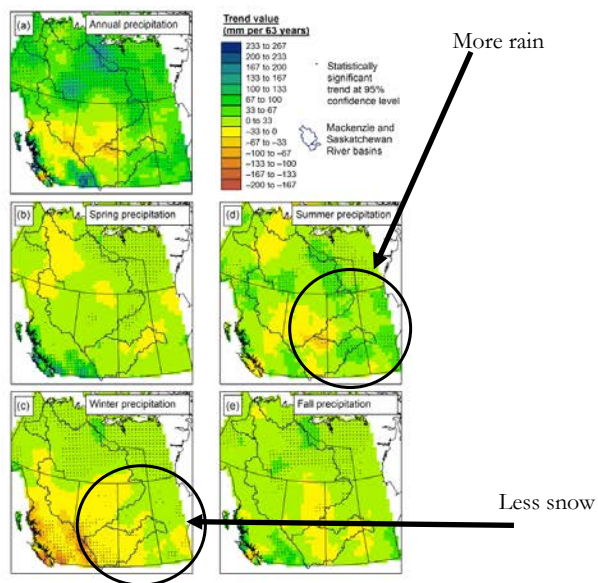


Wolfe et al. 2019

# Future stressors

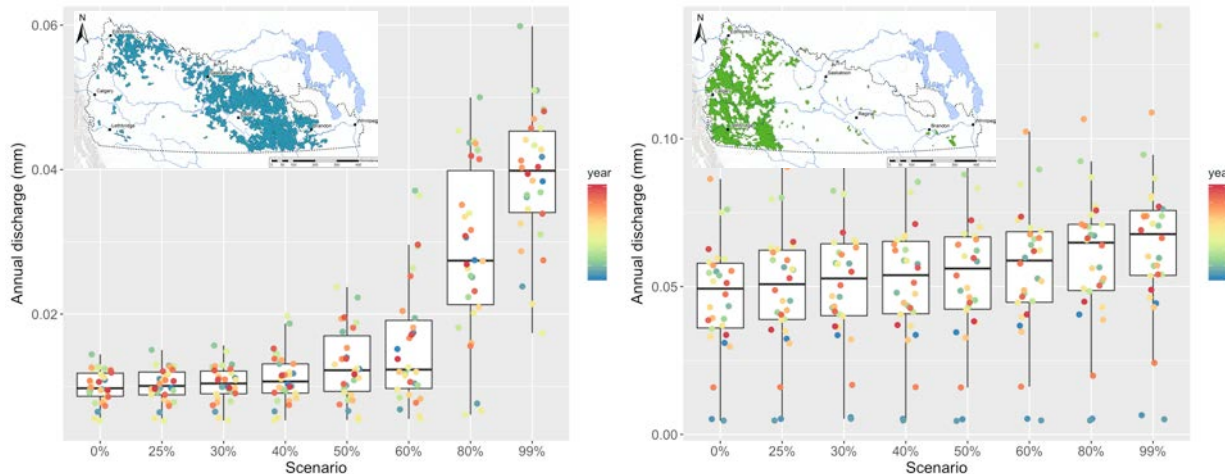


Smith Creek Watershed, SK (Photo credit DUC)

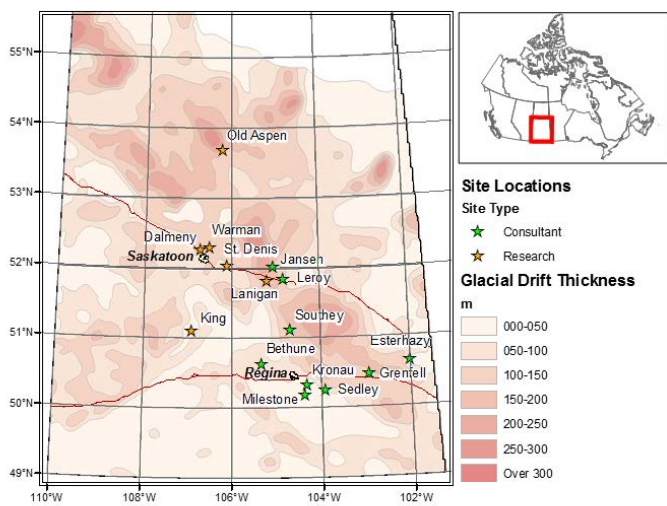


De Beer et al. 2016 Hydrol. Earth Syst. Sci.

## Threshold response to drainage



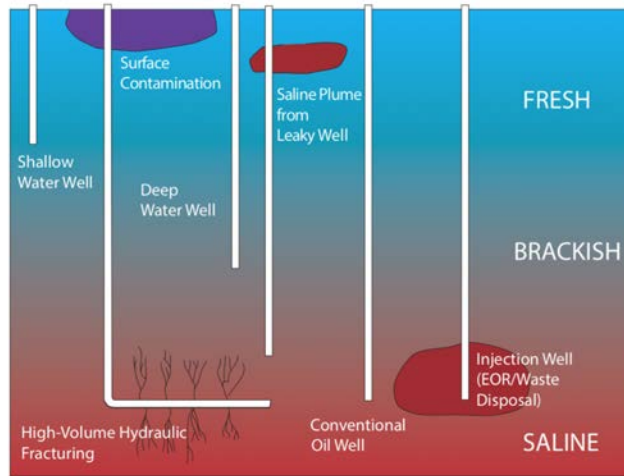
## Groundwater resources



Glacial sediments limit recharge and protect underlying groundwater in Saskatchewan.

## Groundwater resources

Groundwater quality is threatened by a number of factors



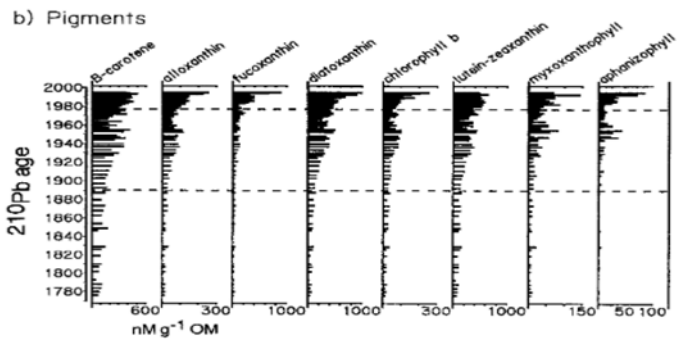
*"Top down" contamination from the surface and "bottom up" stress from the oil and gas industry threaten groundwater resources in Western Canada.*

Ferguson et al. 2018

## Water quality



Image: Greenpeace Canada  
<http://www.greenpeace.org/canada/en/Blog/beyond-factory-farming-hog-farms-and-friendly/blog/3761>



Pasqua Lake

Hall et al., 1999



## Summary comments

- Canada urgently needs a water strategy
- Look at this as a multi-generational problem
- Success comes when people work together
- Broader stakeholder involvement in water governance

Synopsis

### Deafness to Global Water Crisis: Causes and Risks

#### GLOBAL WATER CRISIS

There is a slow realization at present that the world is about to face a major crisis in terms of water availability (1-5). The crisis already exists for many countries, and is highly likely to confront many other arid and semiarid countries within the next one or two decades. It appears that when the world was pre-occupied with other crises like energy, food, environment, and debt, another important crisis, that on water, was in the making, but for a variety of reasons it did not attract global attention. Thus, it is not surprising to find that for all practical purposes, water disappeared as a topic of any significant discussion by the leaders of the world at the United Nations Conference on Environment and Devel-

decades, it is now evident that nearly all developing countries will have insufficient water to satisfy the demands for all the different uses, at least in the medium-term. Under this competing situation, the percentage share of water that will be available for irrigation will start to decline steadily in the coming decades. Domestic and industrial uses will receive an increasing share of the

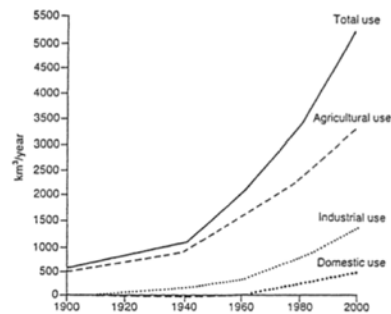


Figure 1. Increase in global water use, 1900-2000.



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