


# Climate Change Impacts and Adaptation in Saskatchewan

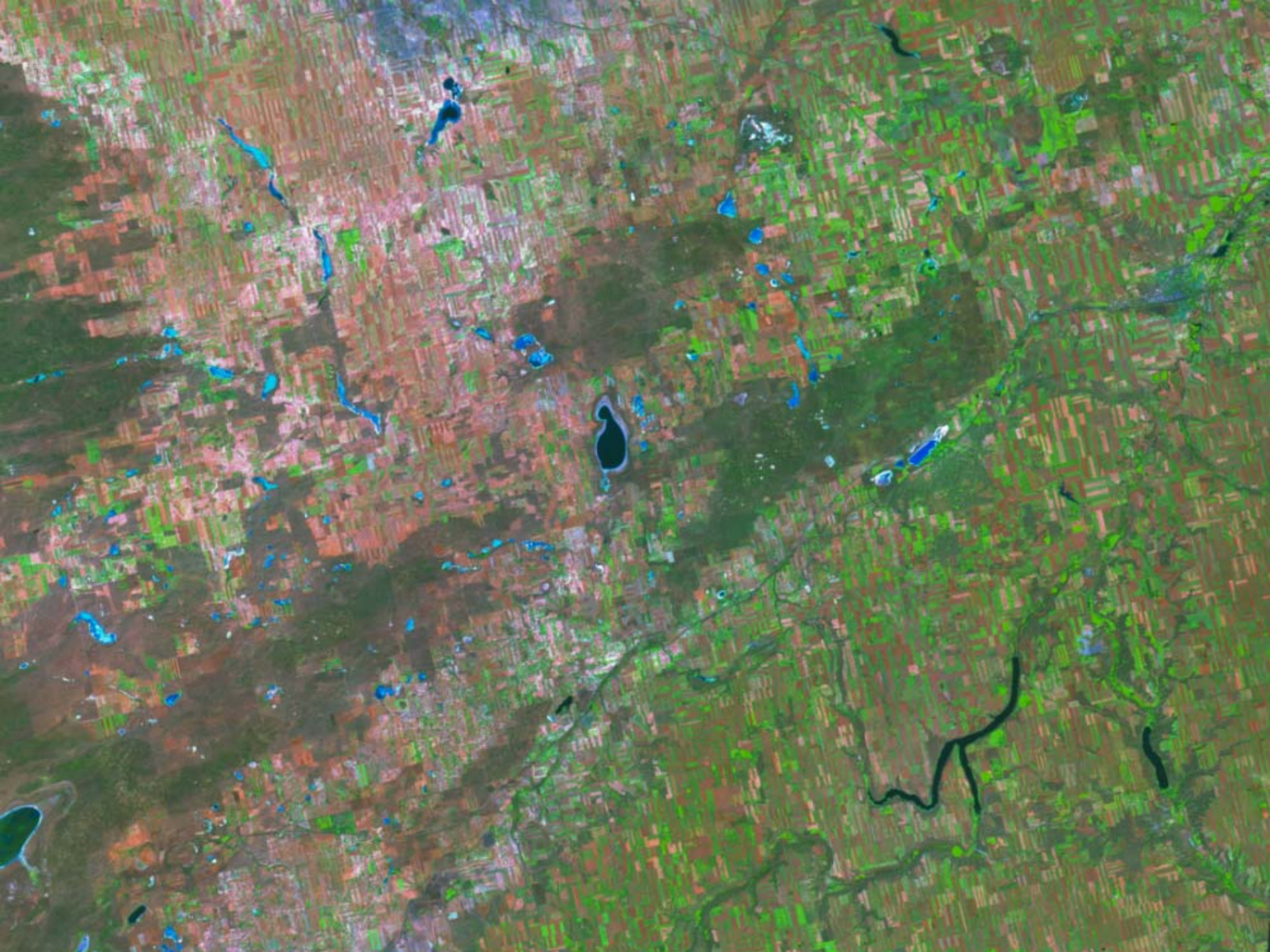
**Dave Sauchyn**

Prairie Adaptation  
Research Collaborative,  
University of Regina



**Premier's Forum on  
Climate Change  
June 1, 2007, Regina**







SASKATCHEWAN

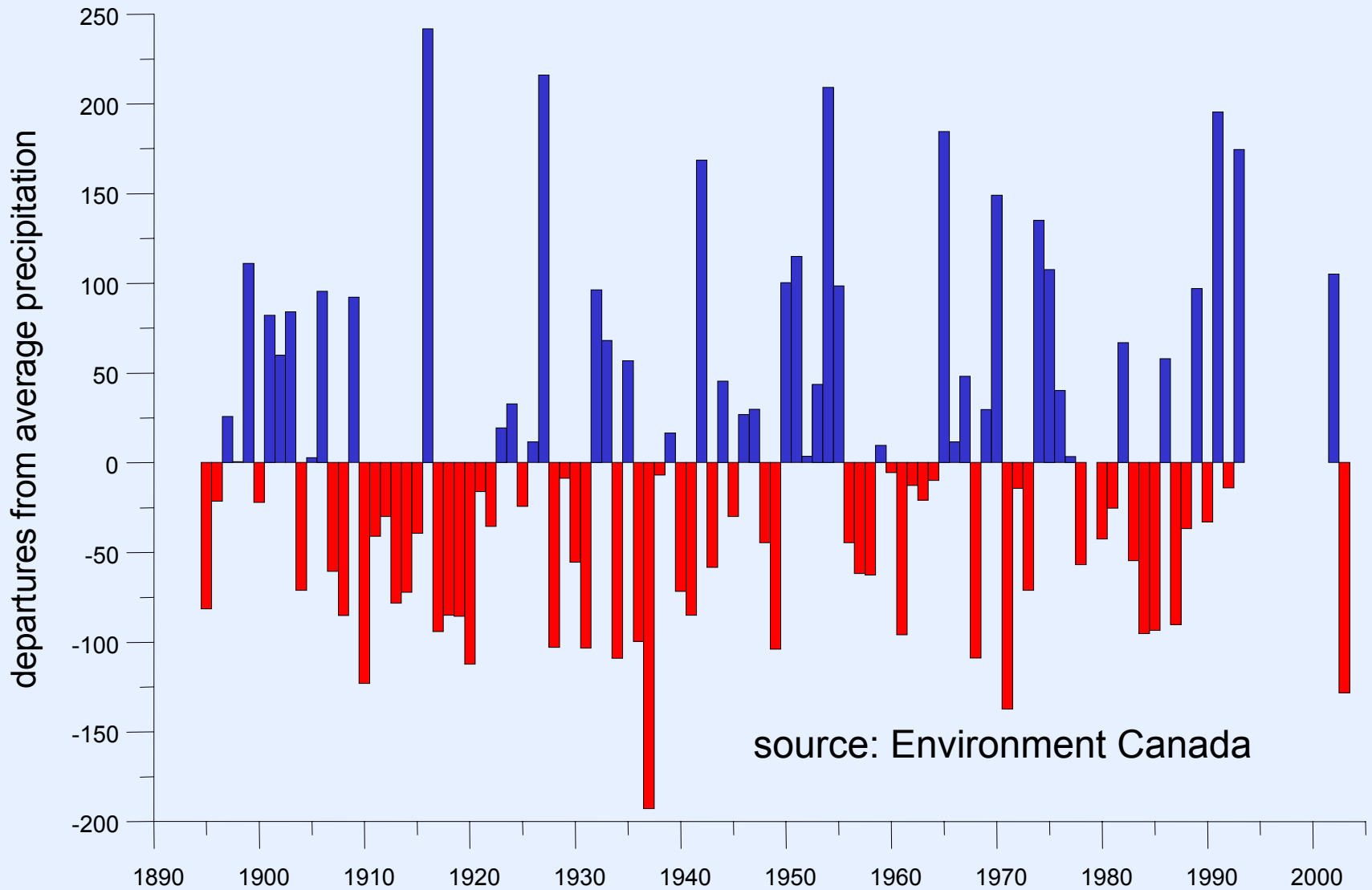


VANGUARD

C

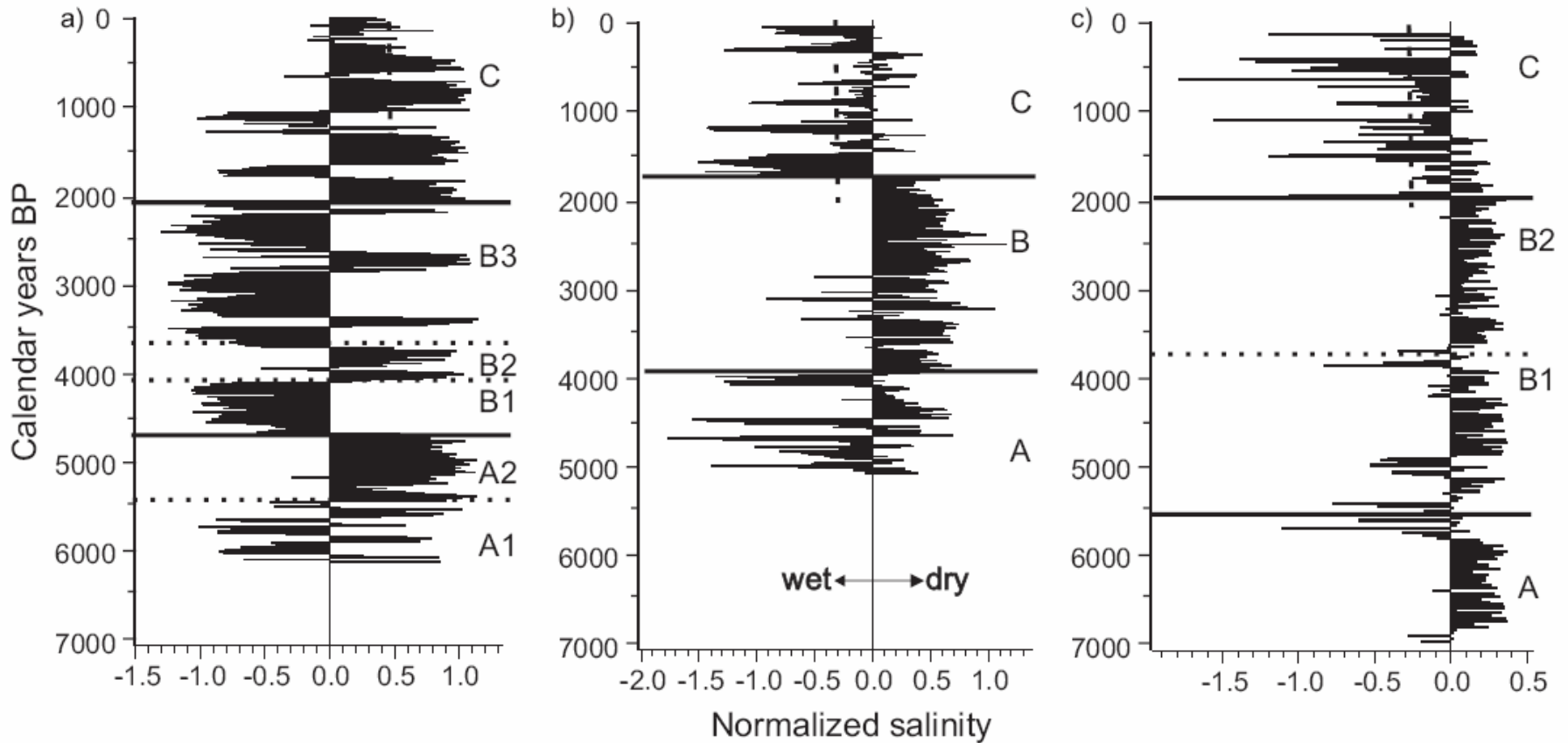
VANGUARD CONSUMERS  
CO-OP

# Annual Precipitation, Swift Current, 1895-2003



source: Environment Canada

# Diatom-inferred salinity of a) Chauvin, b) Humboldt, and c) Oro lakes



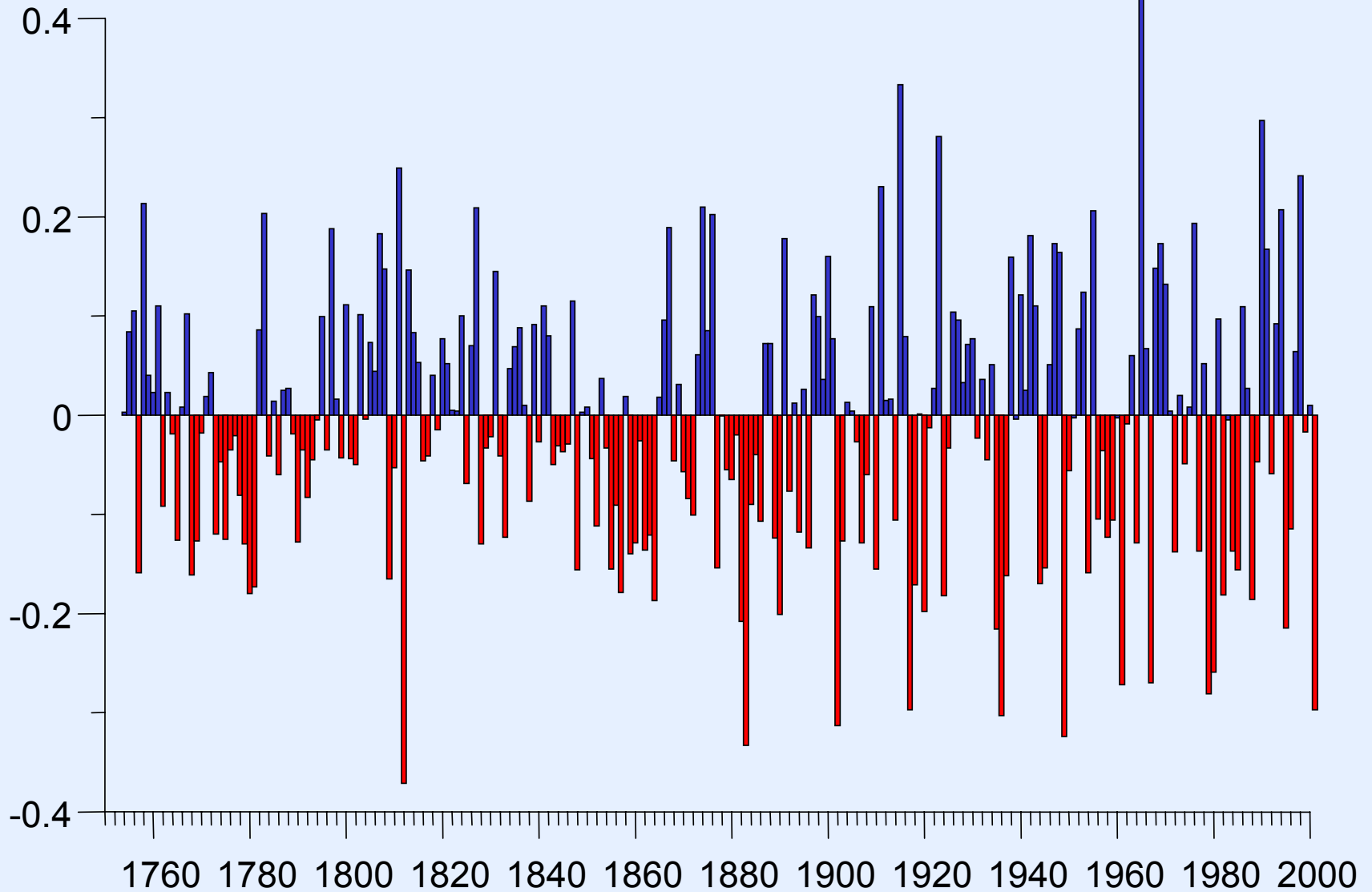
(Michels *et al.*, 2007)

# West Block, Cypress Hills Provincial Park





# Tree-ring record, Lodgepole pine, Cypress Hills, 1754-2001

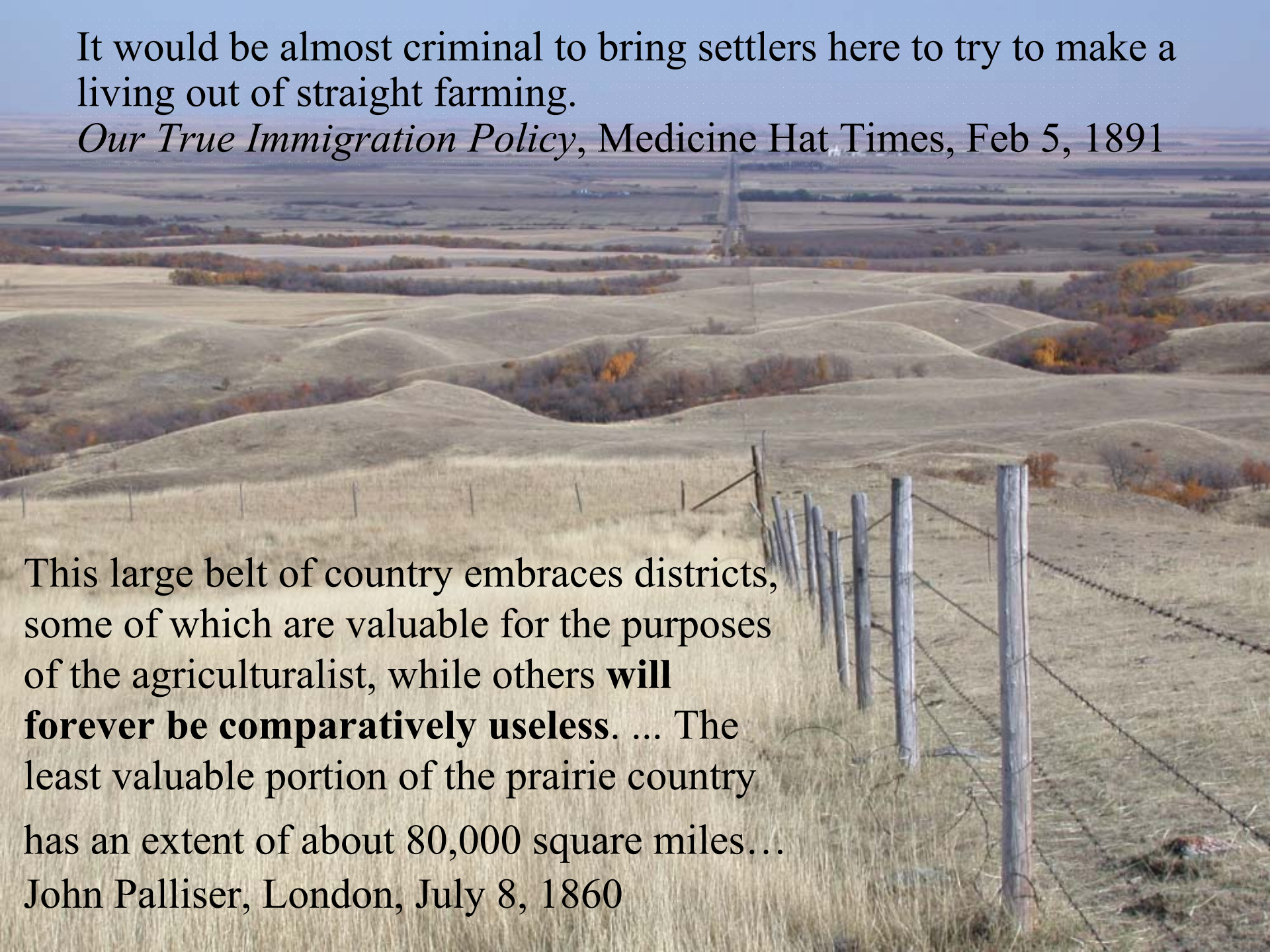


Widespread late 18th century sand dune activity (Wolfe, *et al.* 2001)



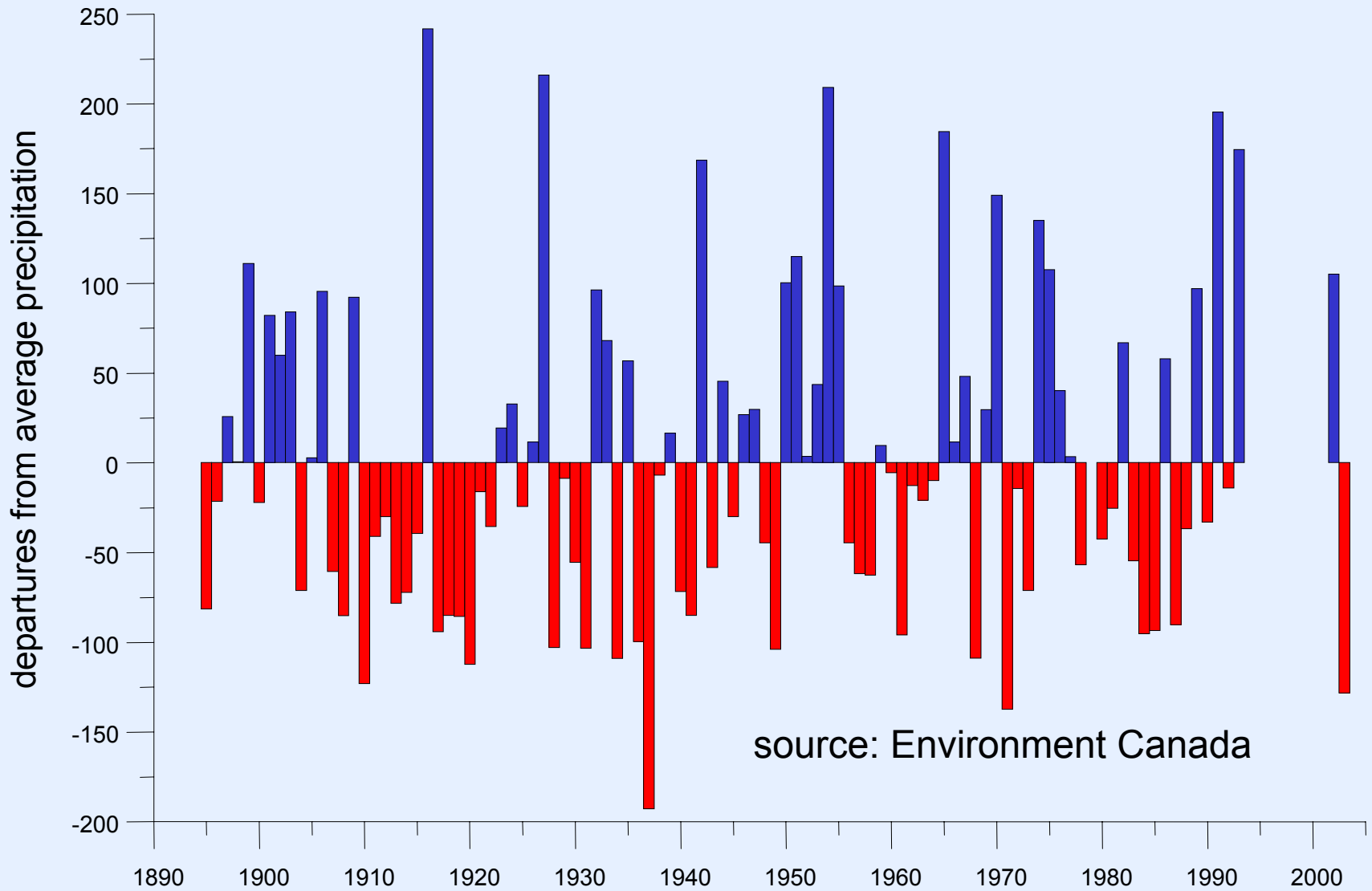
It would be almost criminal to bring settlers here to try to make a living out of straight farming.

*Our True Immigration Policy*, Medicine Hat Times, Feb 5, 1891

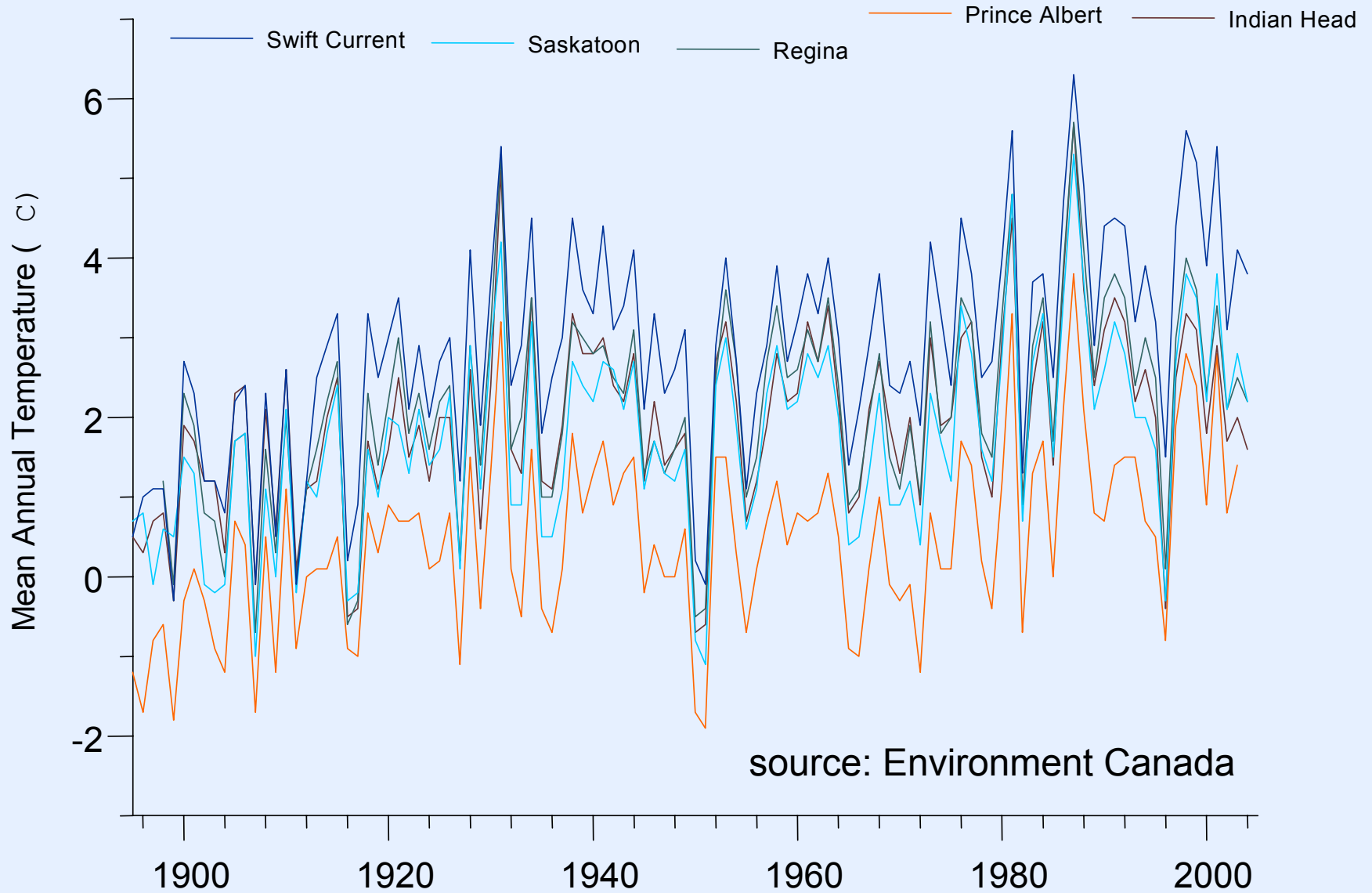
A photograph of a vast, open landscape featuring rolling hills covered in dry, yellowish-brown grass. In the foreground, a rustic wooden fence with several vertical posts and horizontal rails runs across the frame. The background shows a flat horizon under a clear sky, with a few scattered trees and a distant structure visible on the horizon.

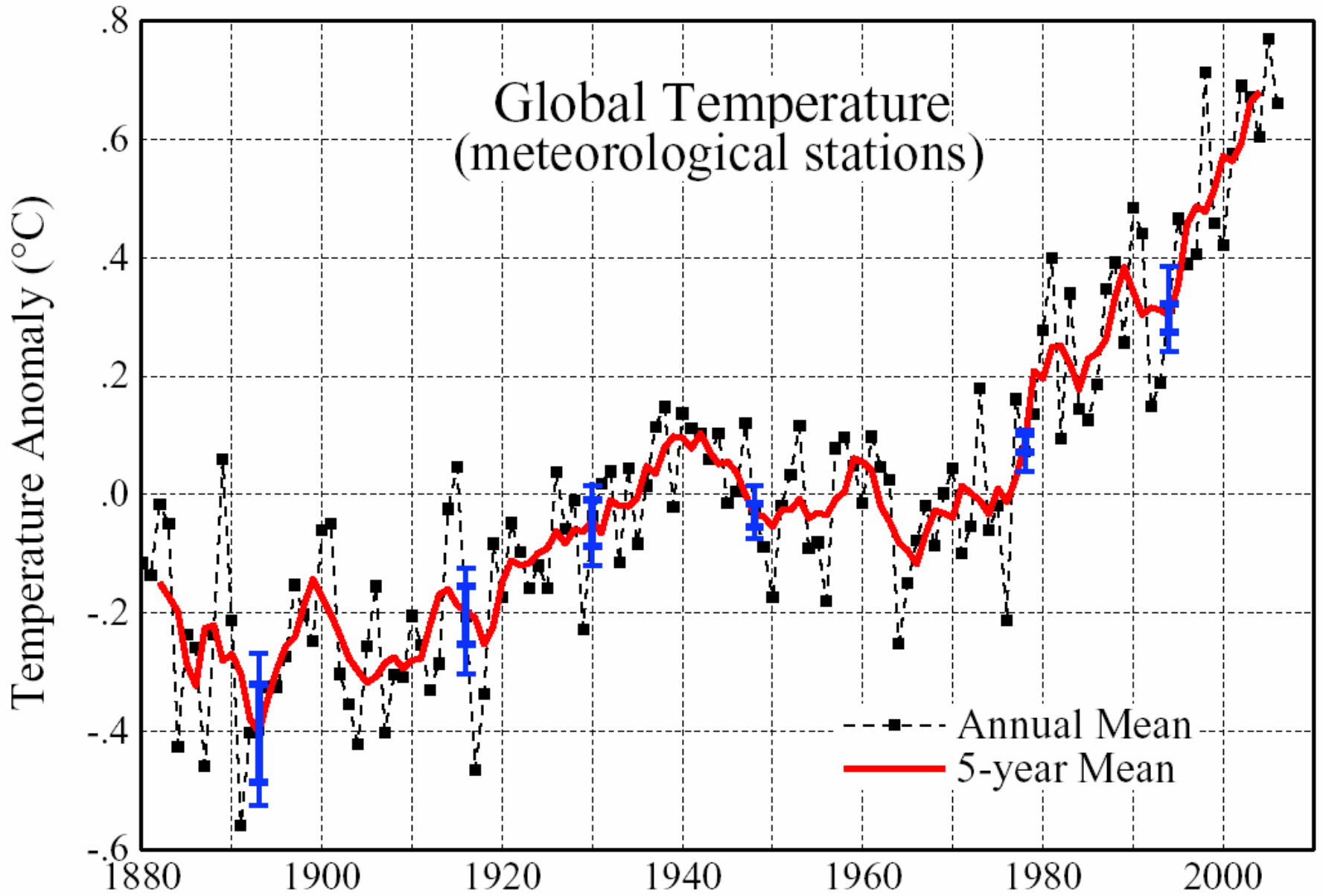
This large belt of country embraces districts, some of which are valuable for the purposes of the agriculturalist, while others **will forever be comparatively useless**. ... The least valuable portion of the prairie country has an extent of about 80,000 square miles...  
John Palliser, London, July 8, 1860

# Annual Precipitation, Swift Current, 1895-2003

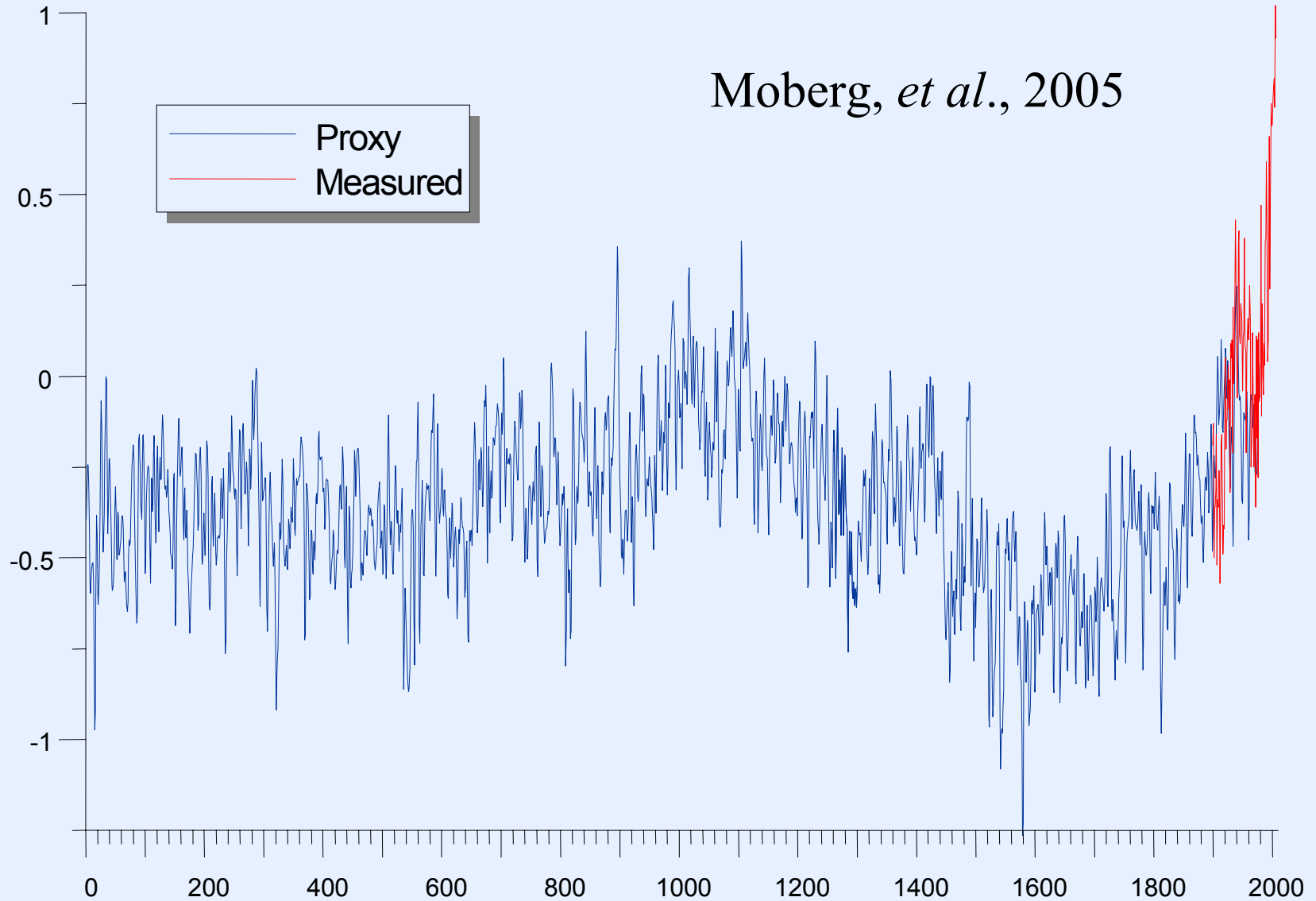


# Saskatchewan Mean Annual Temperatures, 1895-2005

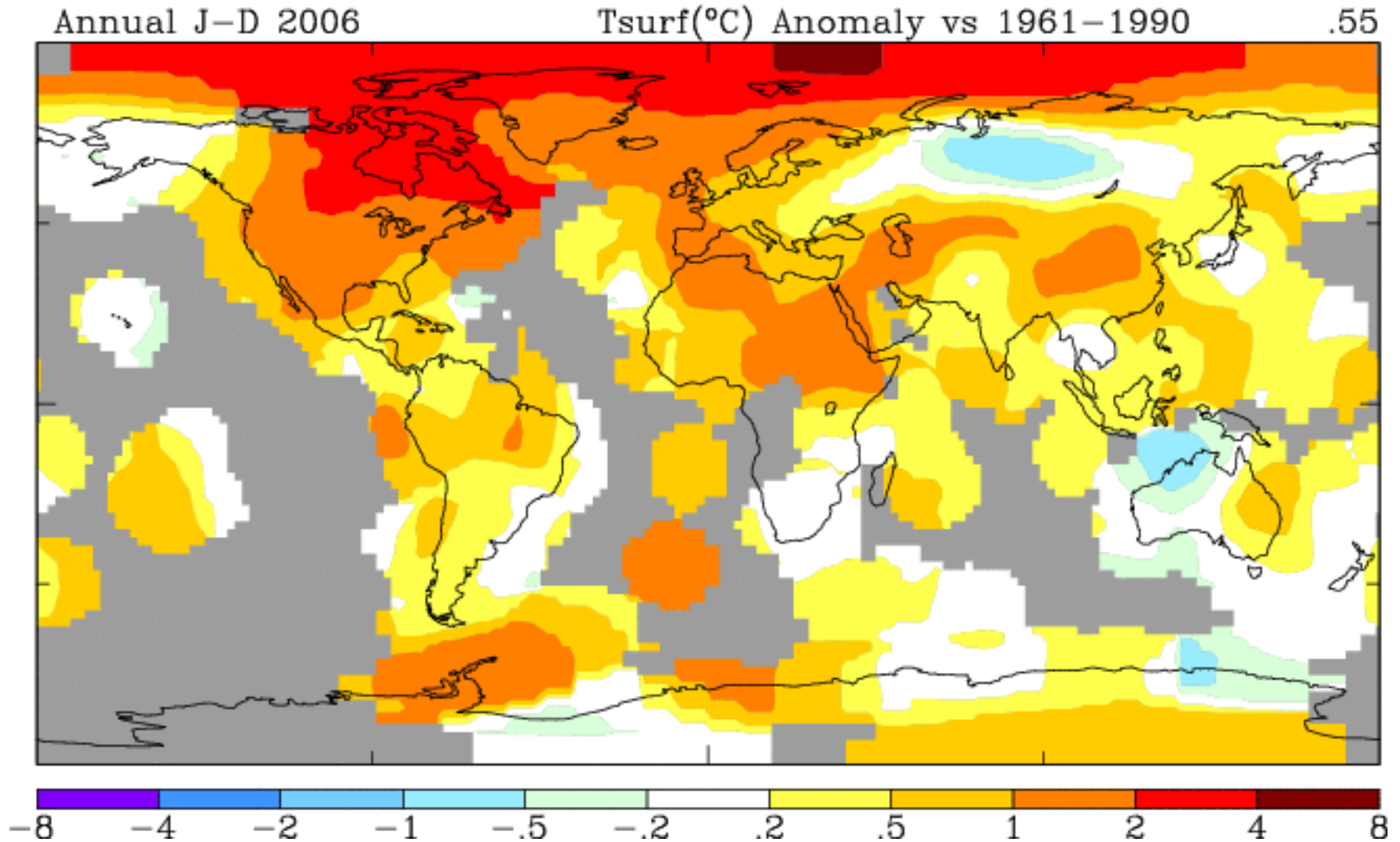




# Northern Hemisphere temperature, past 2000 years



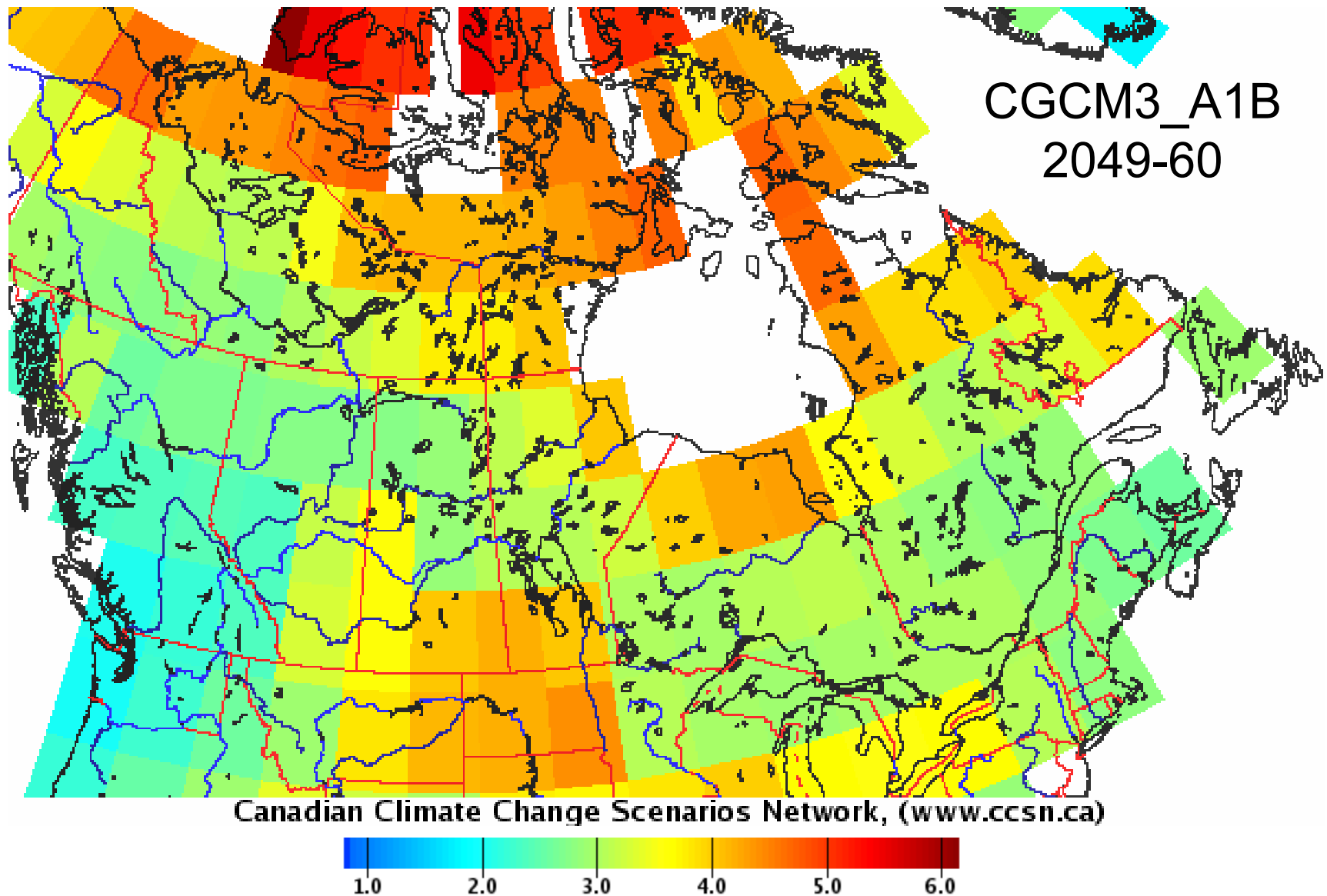
# 2006 Temperatures: Departures from Normal (1961-90)



<http://data.giss.nasa.gov/gistemp/>

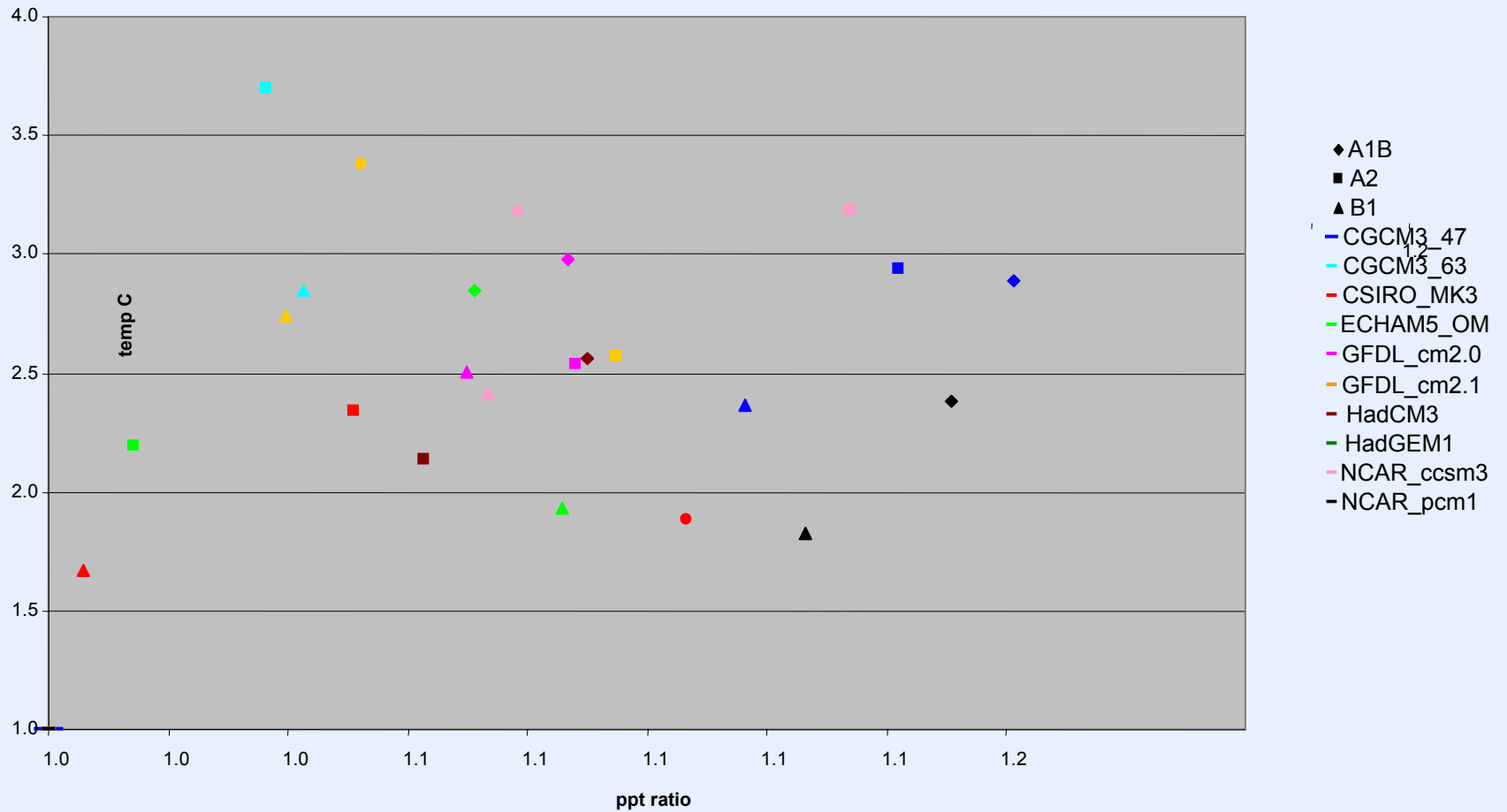


# Mean annual temperature (° C) 2049-60 vs 1961-90

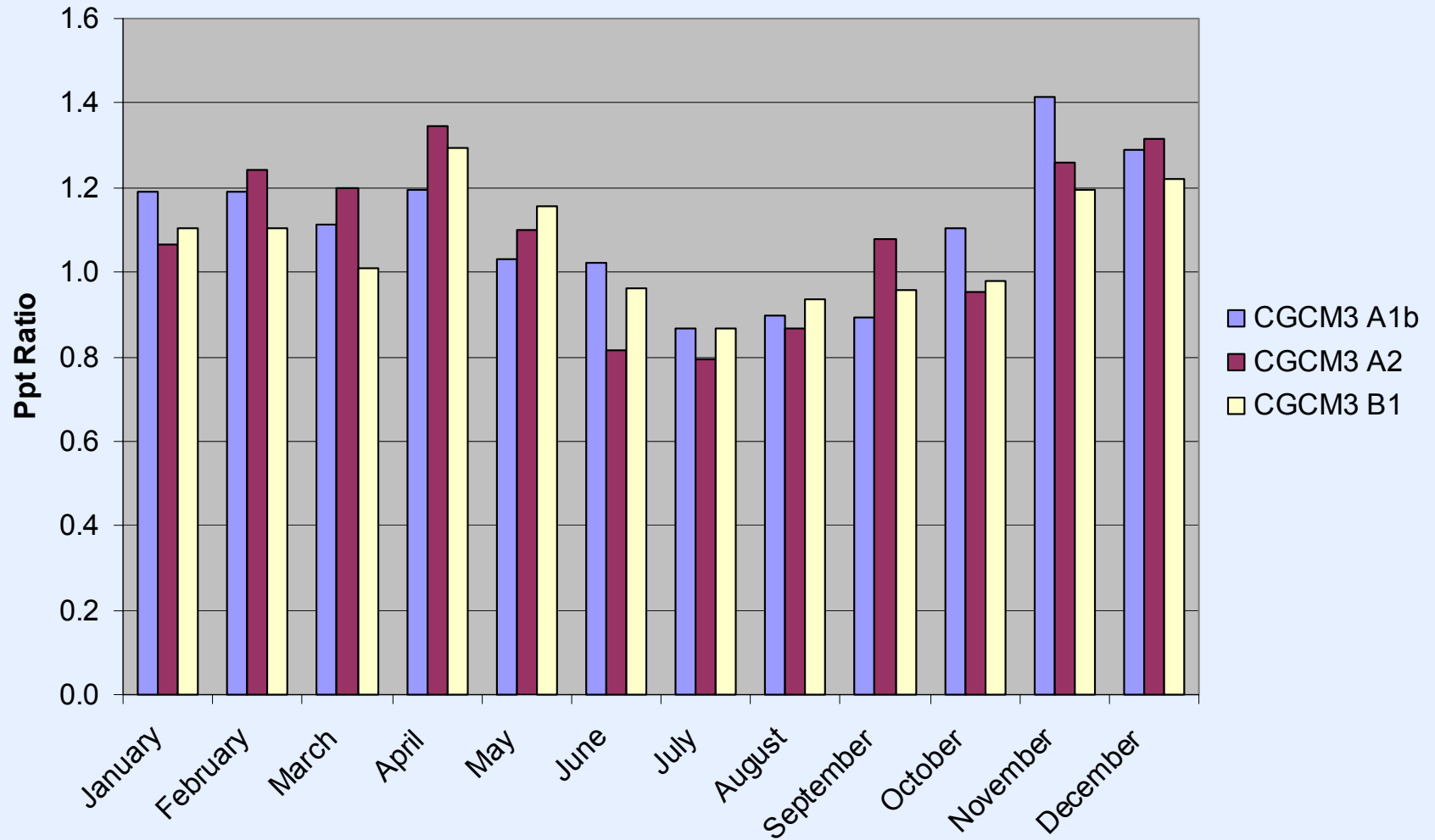


# Temperature and Precipitation, Saskatoon, 2040-69 versus 1961-90

Saskatoon 2050



# Precipitation Ratio: 2040-69 to 1961-90, Saskatoon





Canadian Climate Impacts and Adaptation Research Network

**The Prairie Adaptation Research Collaborative** is a partnership of the governments of Canada, Alberta, Saskatchewan and Manitoba mandated to pursue climate change impacts and adaptation research in the Prairie Provinces.



# Canada's National Assessment of Climate Change – fall, 2007

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## Canadian Climate Change Impacts and Adaptation Assessment The Assessment Outline

The key sections of the Assessment are described below:

### Synthesis Report

A concise overview of what climate change means for Canada. The report will highlight key findings, and discuss commonalities and differences among the regions. It will serve as both an executive summary and a value-added synthesis of the entire Assessment.

### Section 1: Introduction/Overview

An introduction to the Assessment, emphasizing its goals and purposes, as well as the importance of understanding vulnerability.

### Section 2: Climate and Climate Change in Canada

An overview of the importance of climate and climate change to Canada, with discussion of climatic, social and economic trends that affect exposure to climate. Will also outline future projections for Canada.

### Section 3: Regional Chapters

The main content of the Assessment, these chapters will focus on current regional sensitivities and future vulnerabilities to climate and climate change. Case studies will be an important component of these chapters.

The regional chapters are:

- Atlantic Canada
- Quebec
- Ontario
- Prairies ←
- British Columbia
- The North

### Section 4: Canada in an International Context

A broader perspective on climate change impacts and adaptation, which discusses climate change impacts and adaptation with respect to continental effects, oceans, global issues, and Canada's international obligations.

### Section 5: Impacts and Adaptation Research- Capacity, Tools and Moving Forward

An examination of the present state of impacts and adaptation research in Canada, future directions and needs, and moving research to action.

[http://www.adaptation.nrcan.gc.ca/assess\\_e.php](http://www.adaptation.nrcan.gc.ca/assess_e.php)

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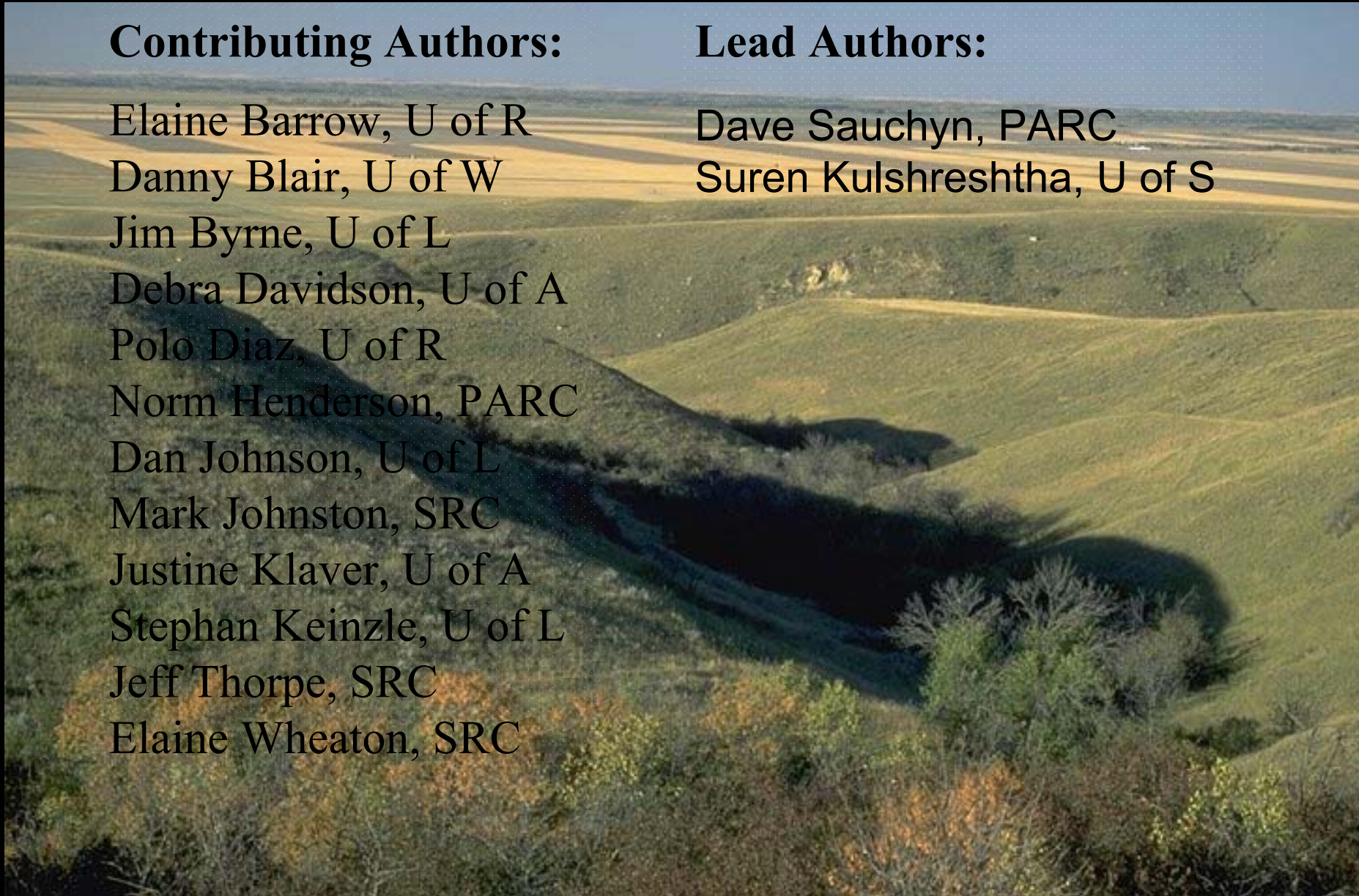
# National Assessment - Prairies Chapter

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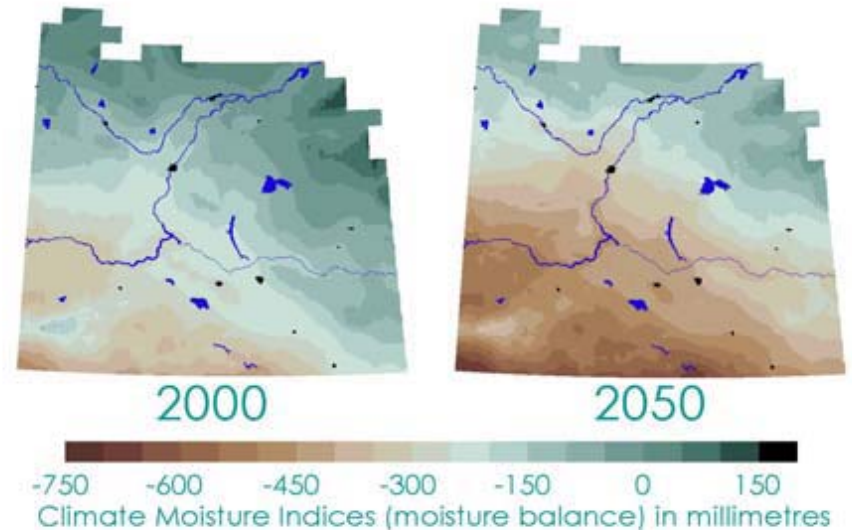
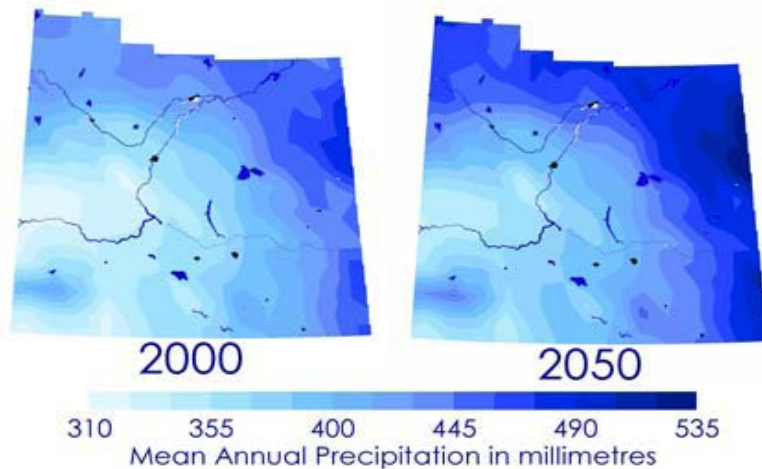
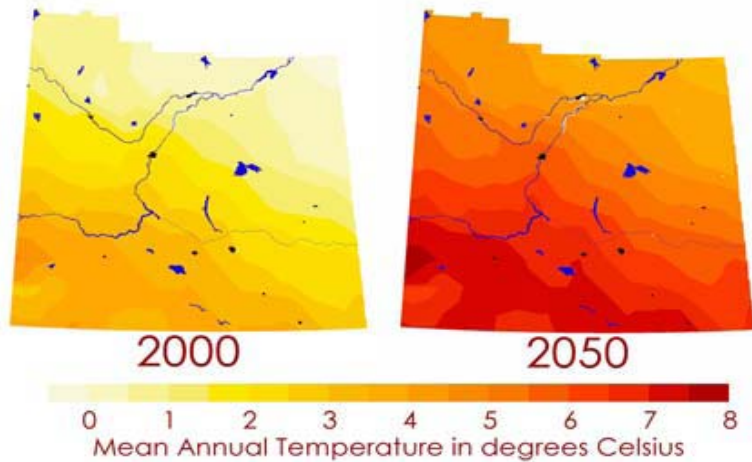


Major ecosystem shifts are expected

They will be most visible at the margins of grassland and forest



# The effects of climate change in the prairie ecosystem

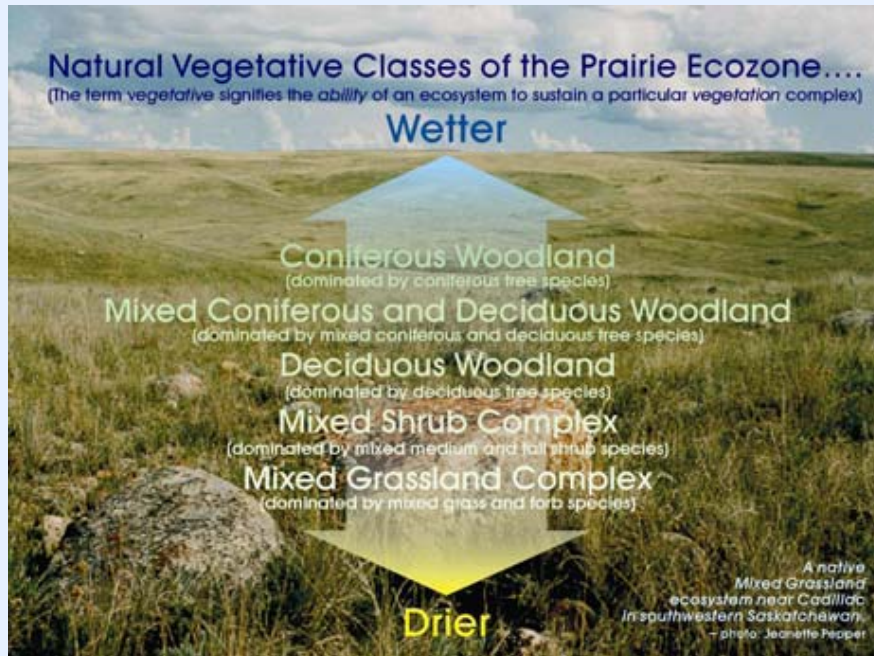


- CMI data: Dr. Ted Hogg, Canadian Forestry Service

Saskatchewan Environment  
CPRC/U of R

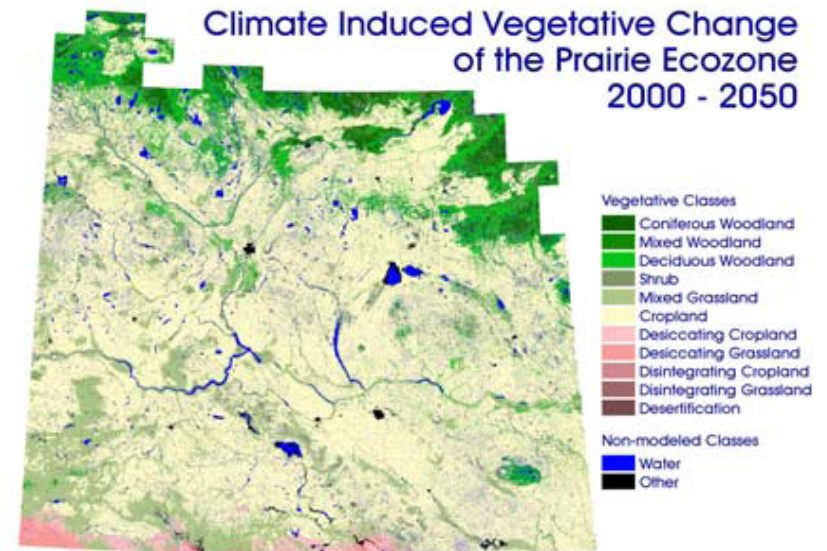
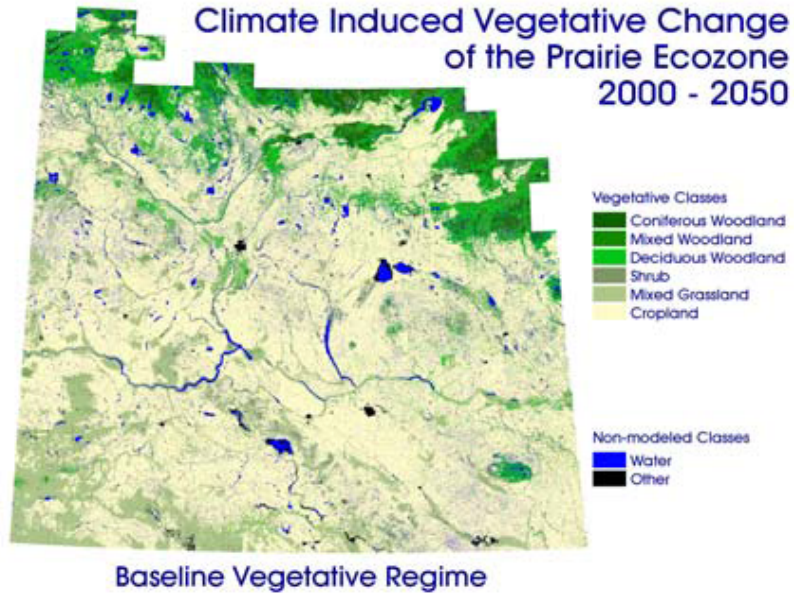


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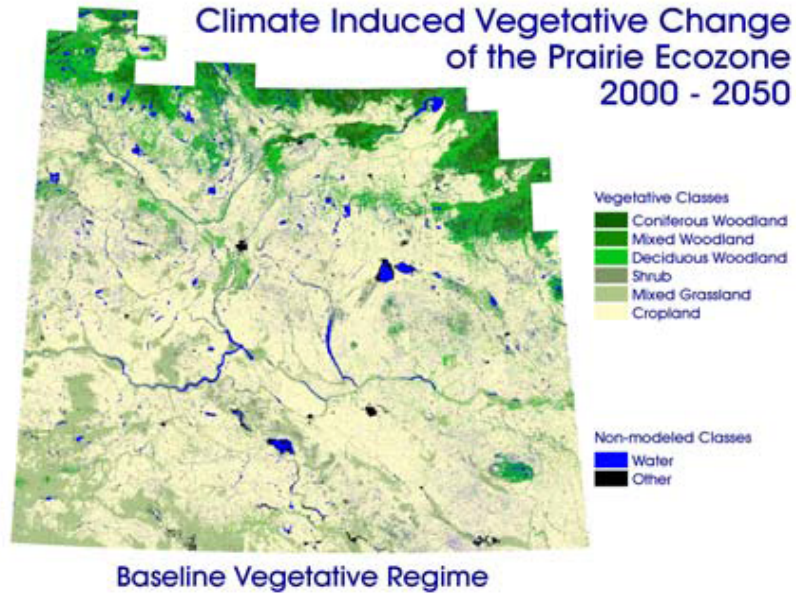


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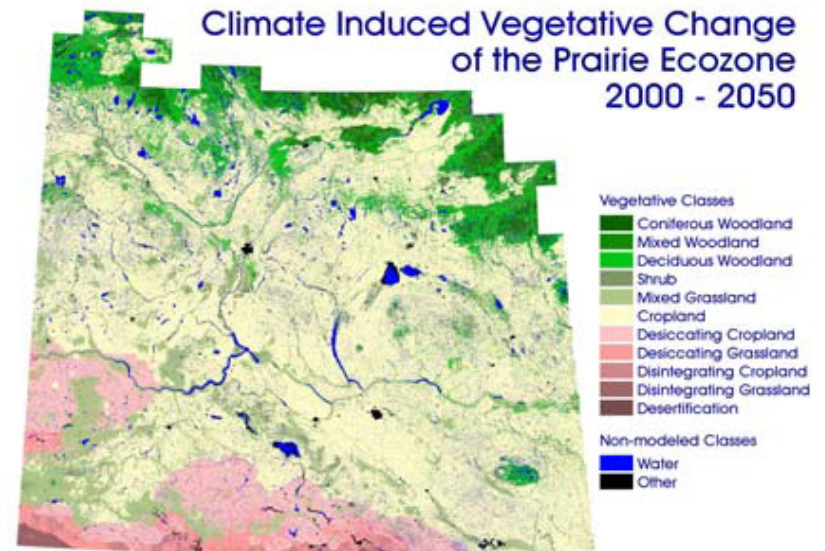
2001



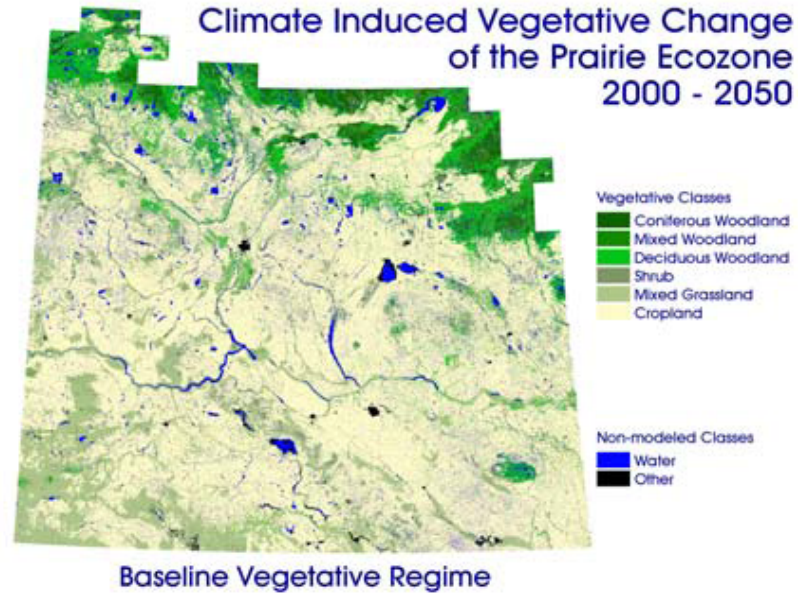
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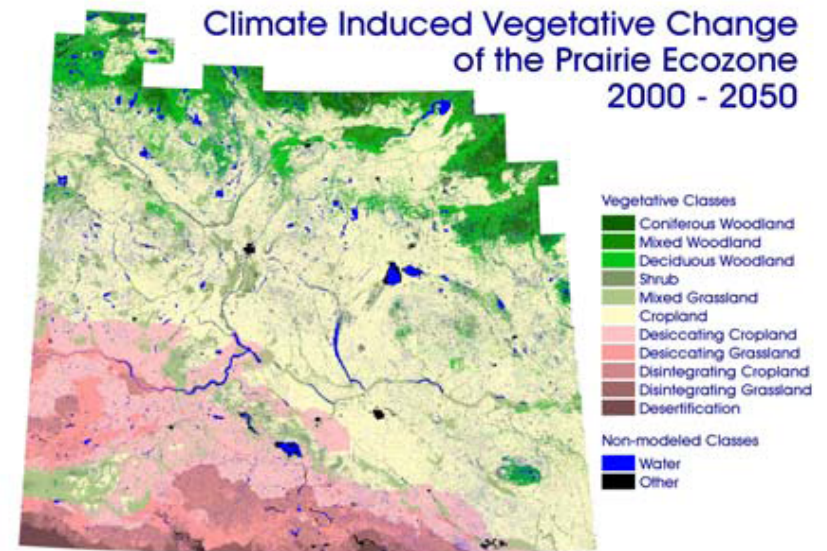
2015



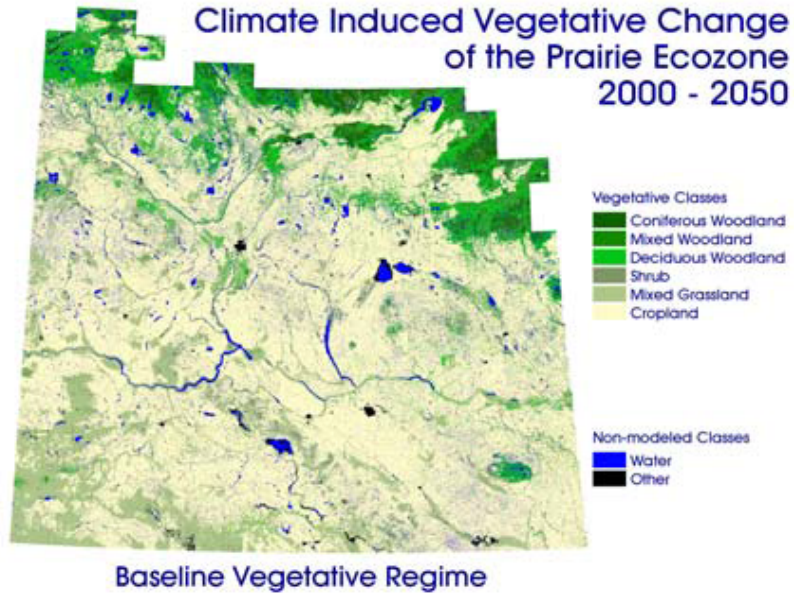
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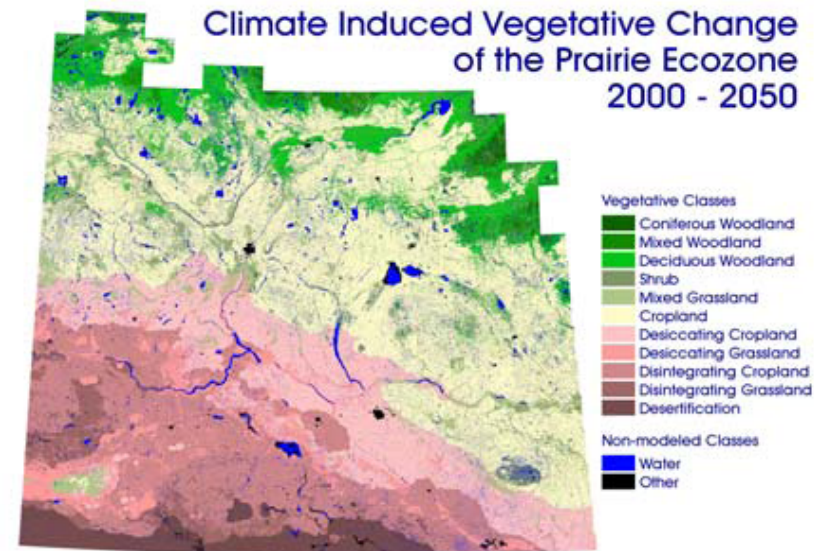
2030



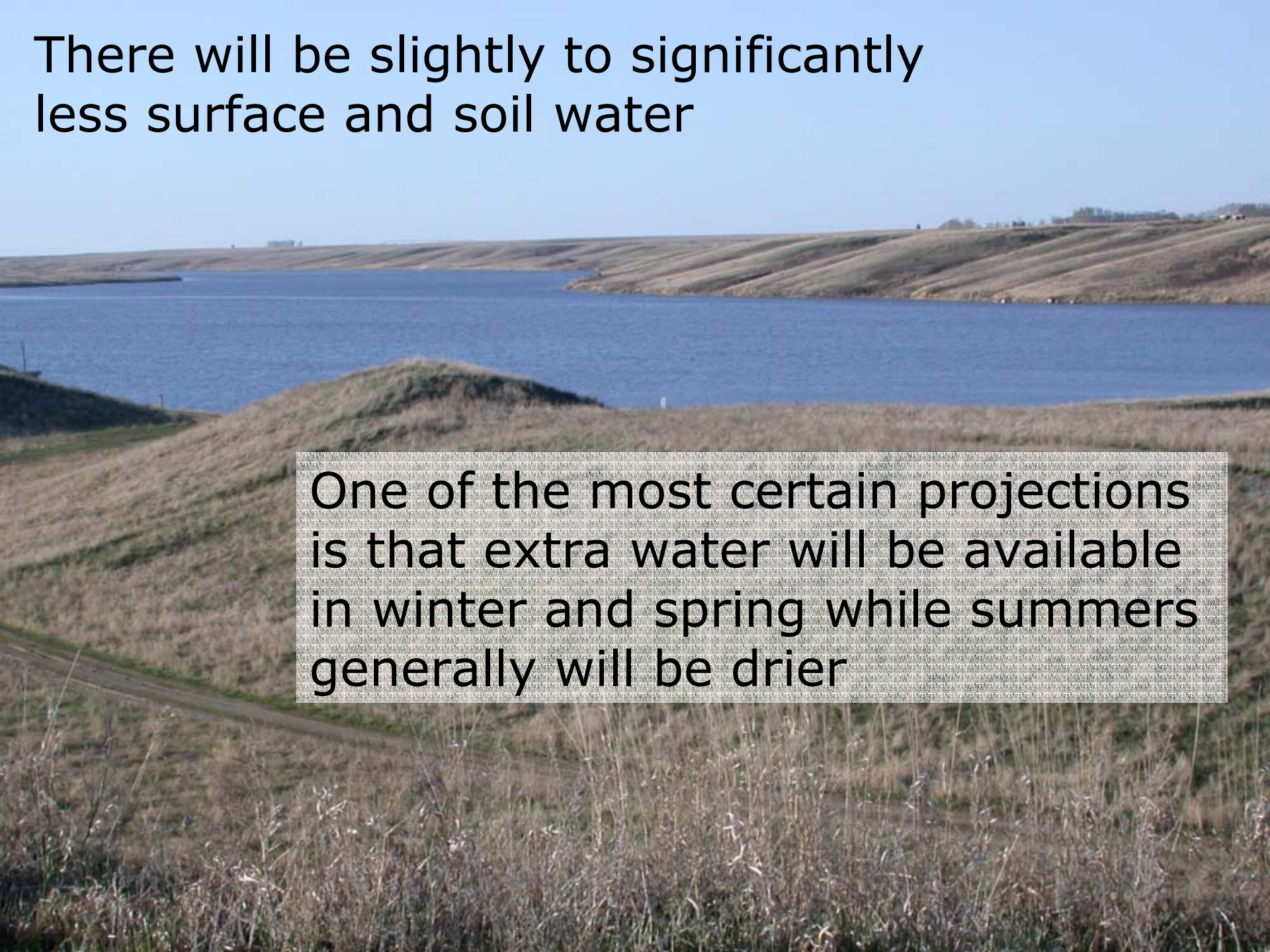
# The effects of climate change in the prairie ecosystem



2050

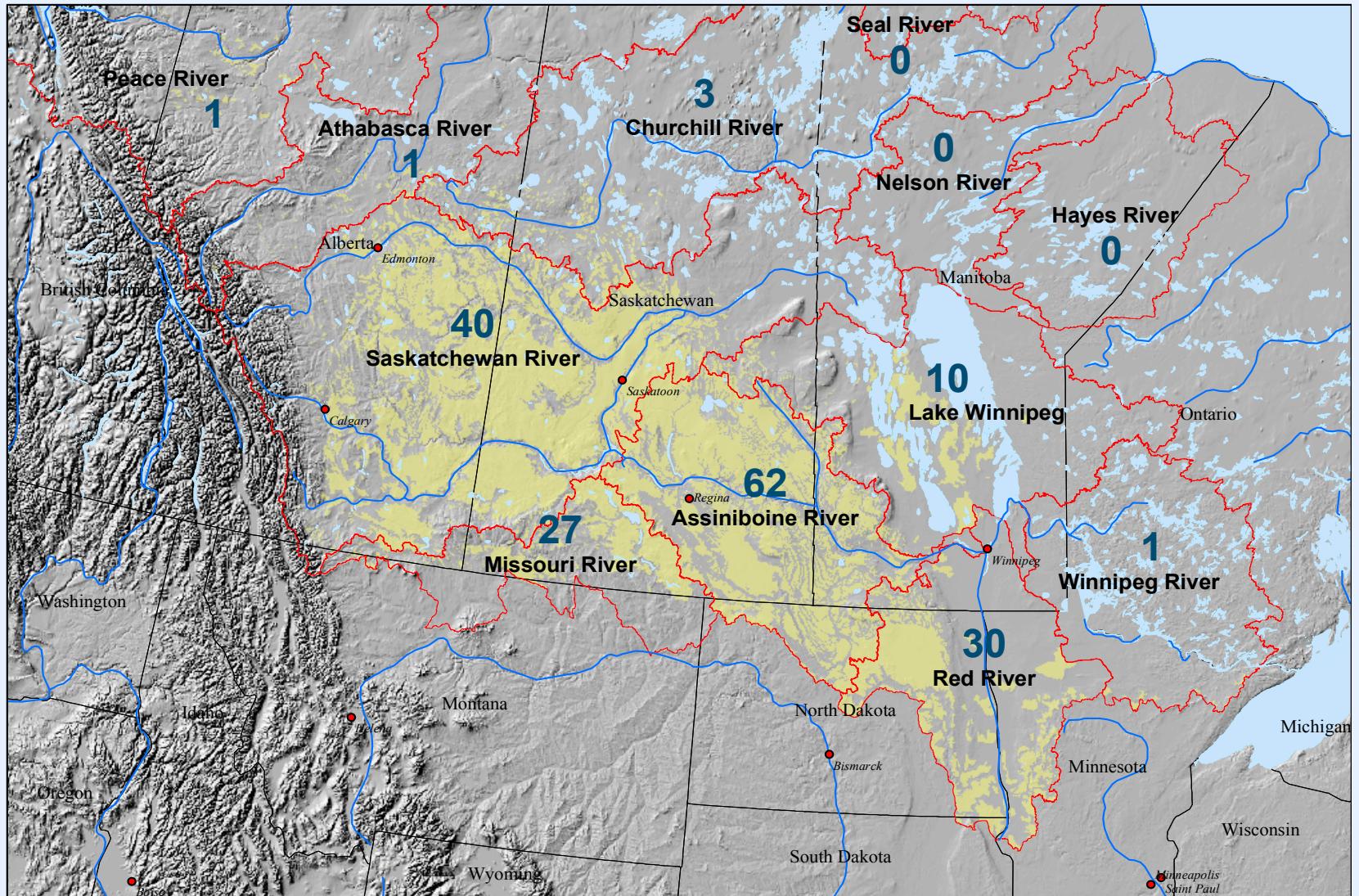


There will be slightly to significantly less surface and soil water

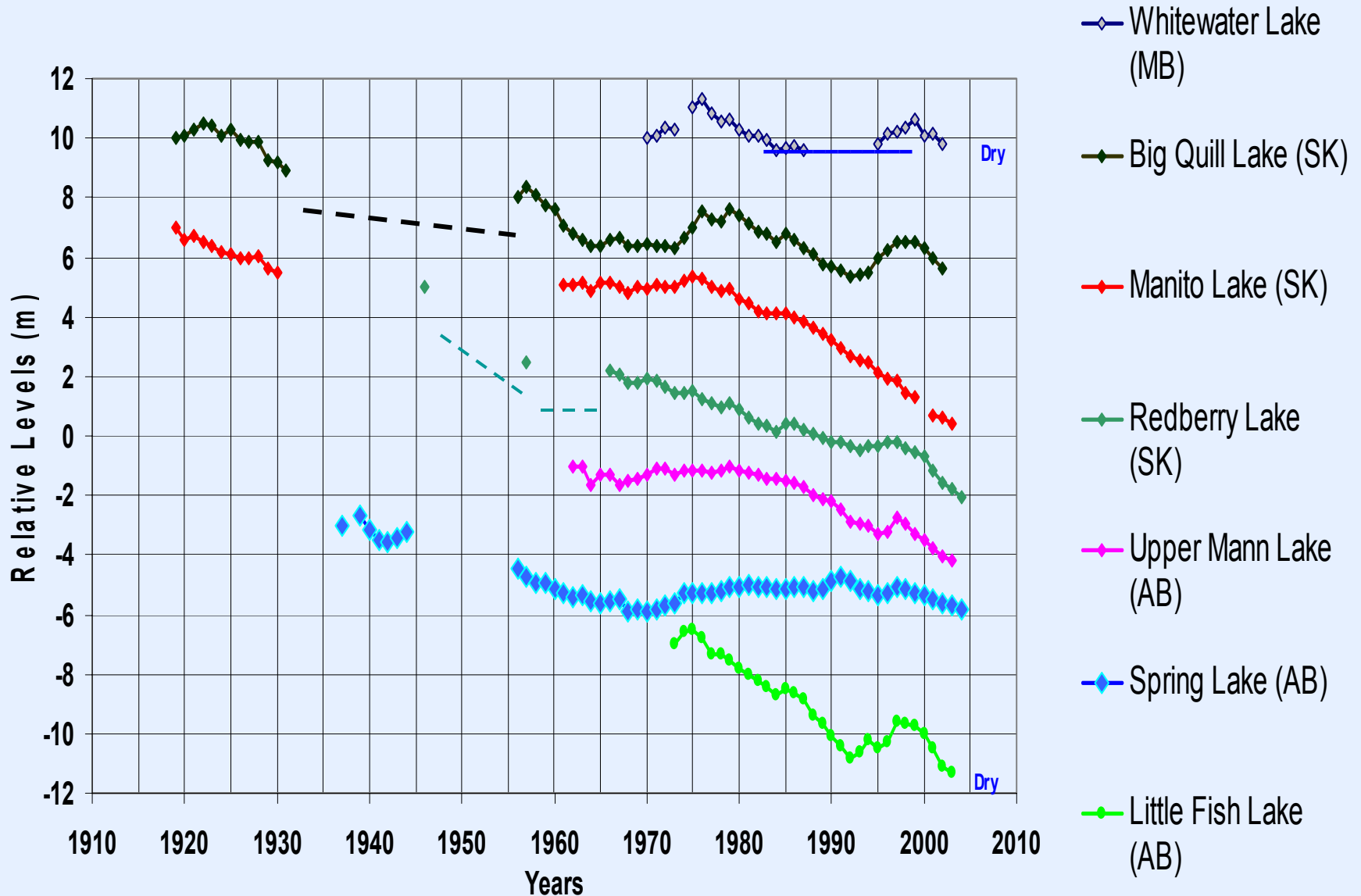


One of the most certain projections is that extra water will be available in winter and spring while summers generally will be drier

# Prairie Drainage Basins (source: PFRA)



# Closed-basin lake level changes, 1918-2004 (van der Kamp *et al.*)

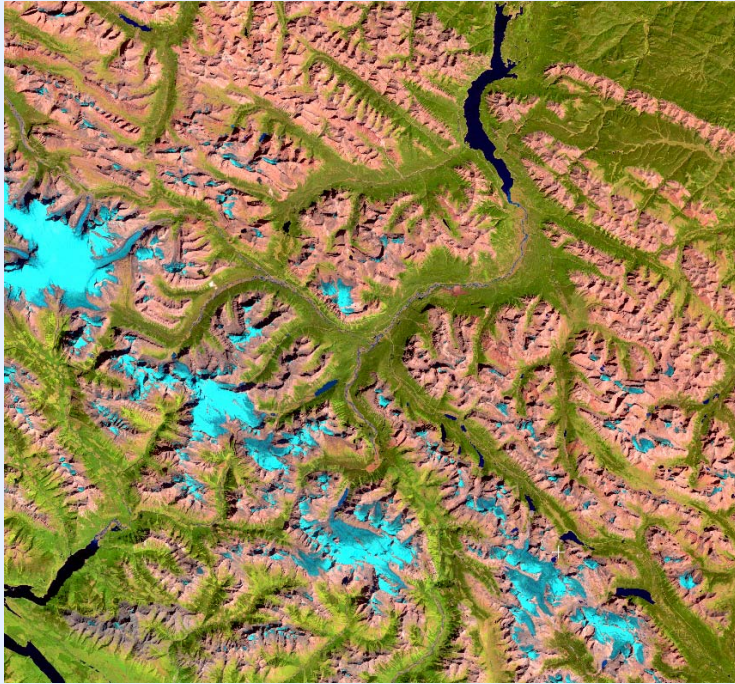




# Climate Change Impacts on Rocky Mountain glaciers

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Demuth and Pietroniro, 2001



Glacier cover has decreased rapidly in recent years; it now approaches the least extent in the past 10,000 years

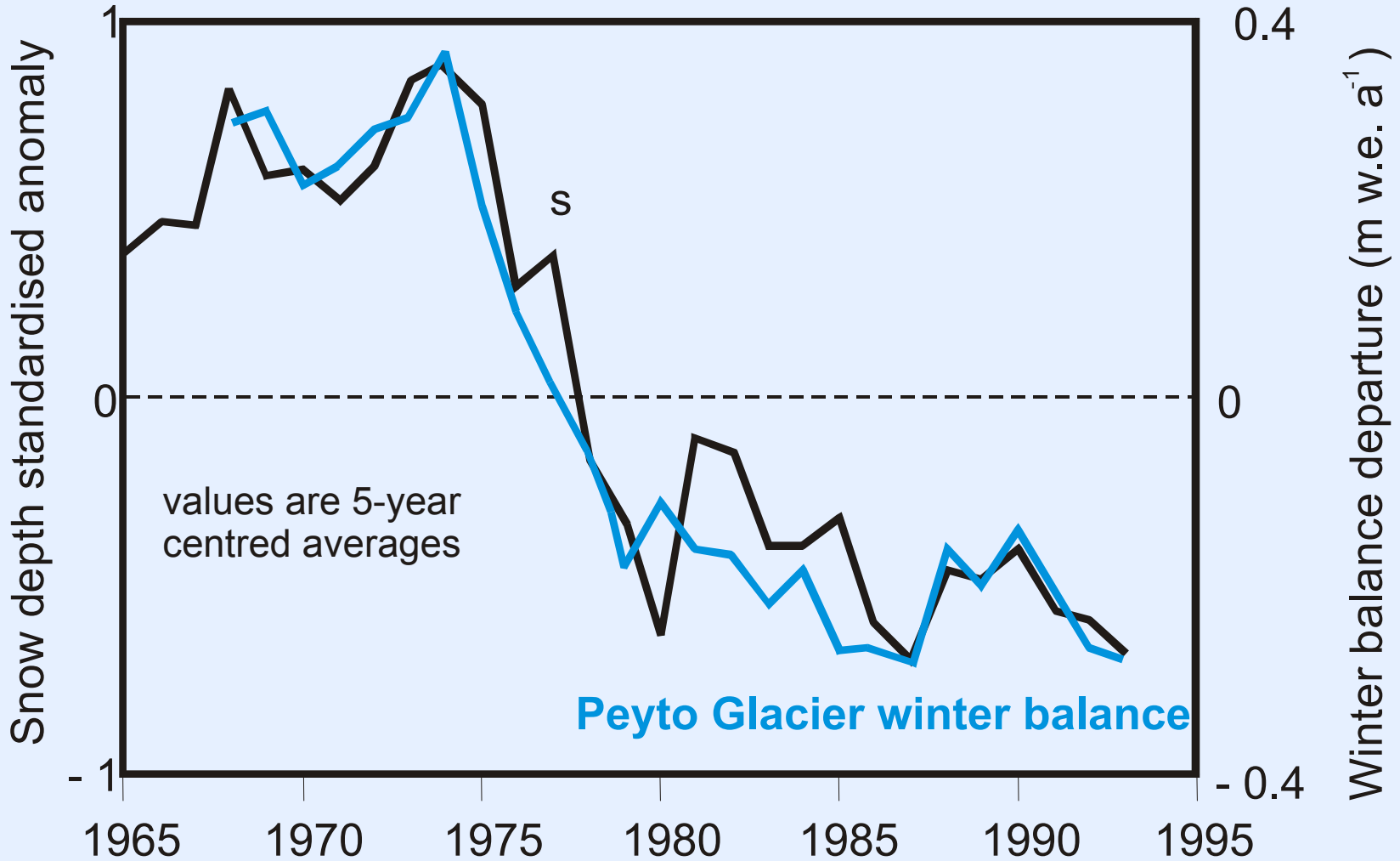
A phase of increased stream flow has past ... basins have entered a potentially long-term trend of declining flows

Declining glacier runoff has serious implications for the adaptive capacity of downstream surface water systems and trans-boundary water allocation

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# Eastern slopes/western prairie March snow depth

Demuth and Pietroniro, 2001

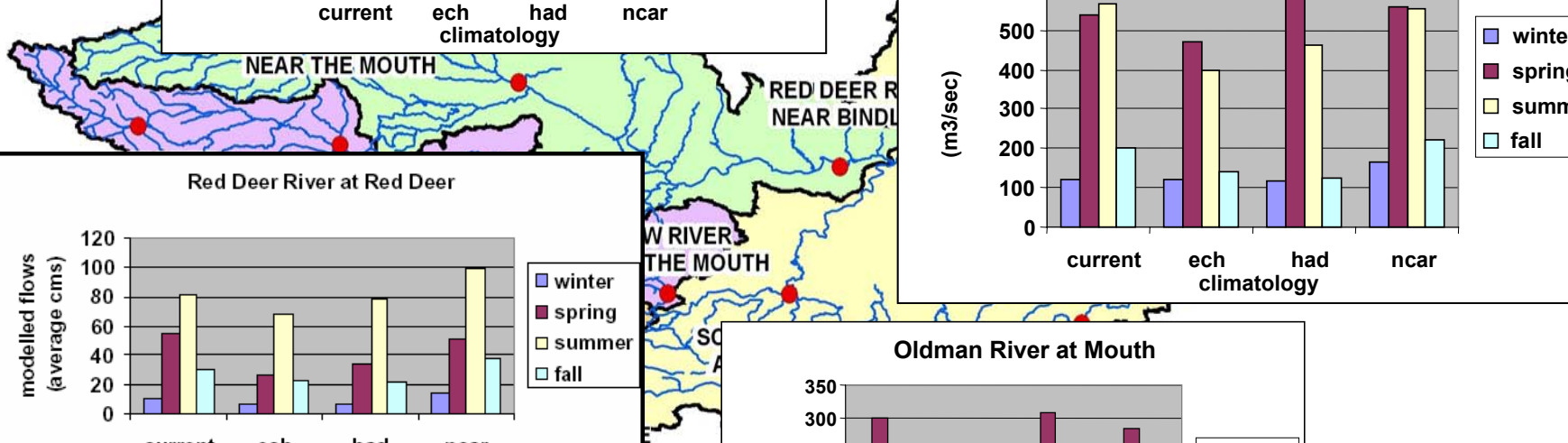
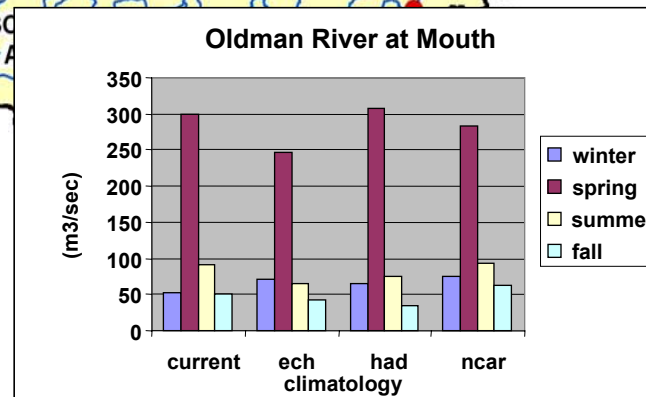
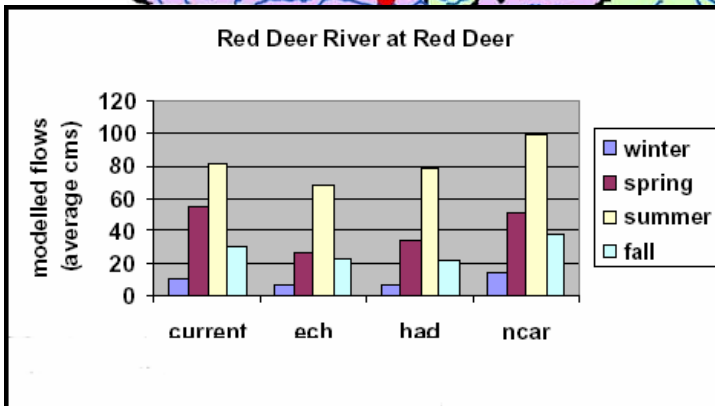
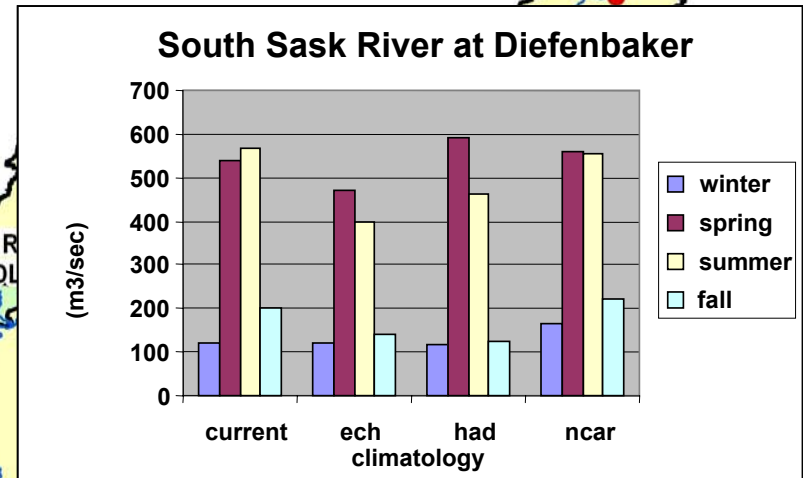
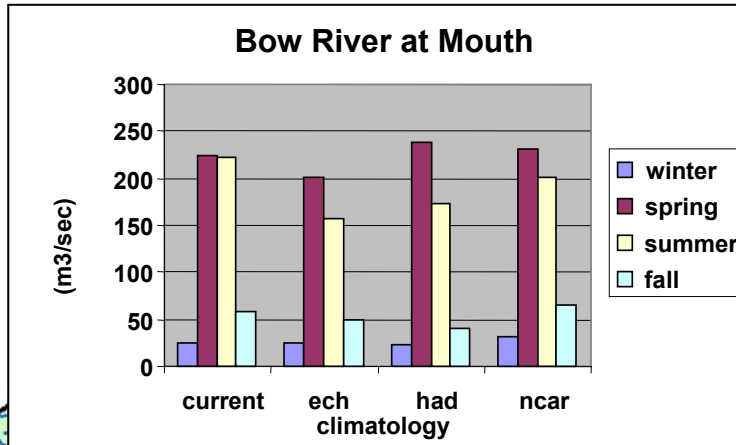


We are losing the advantage of a cold winter

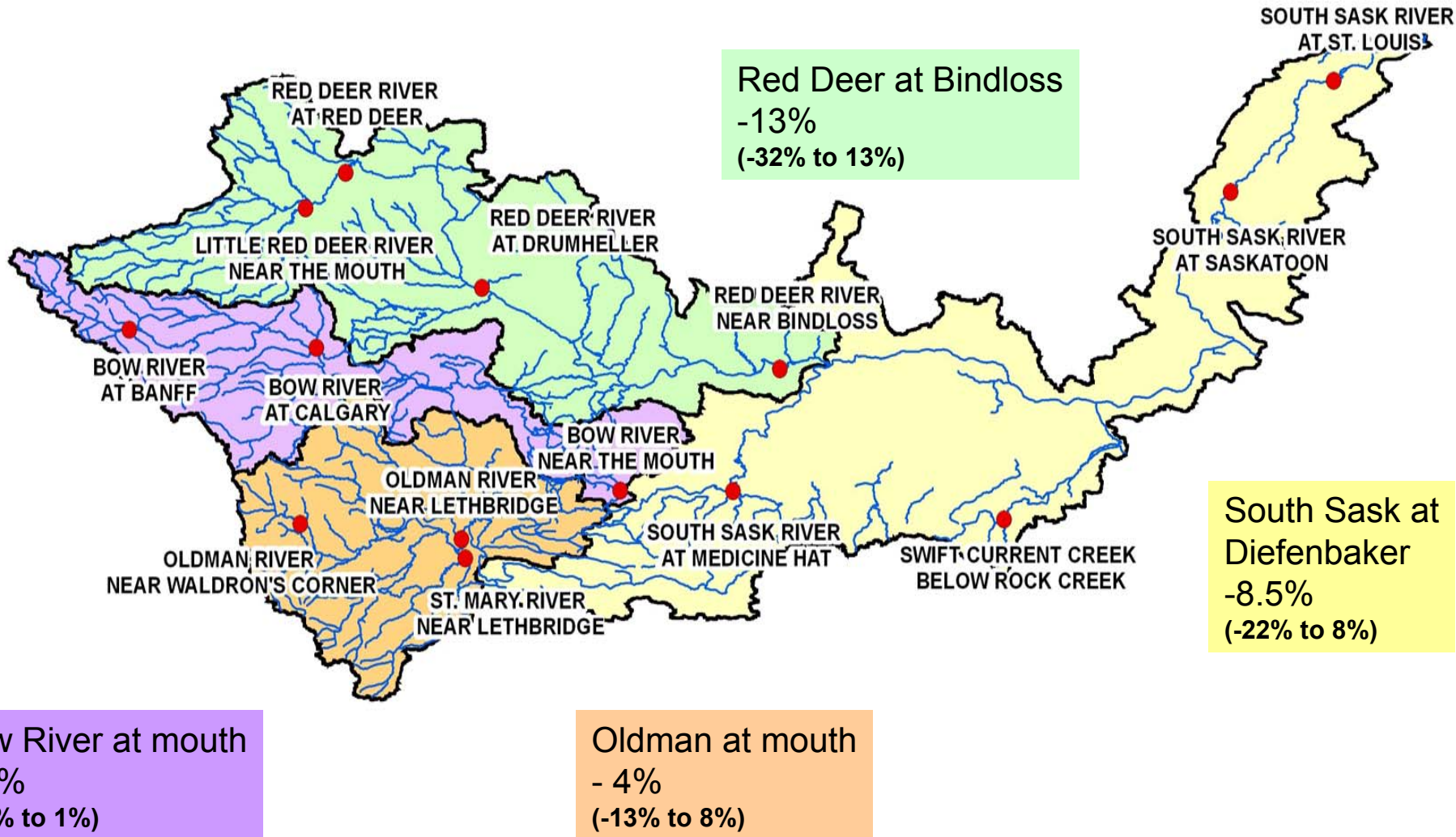


# Seasonal flows, SSRB, 2039-2070 (Pietroniro *et al.*, 2006)

GCM	%Precip	+Temp	Description
echa21	-3.8	2.8	driest, warmest
echb21	-2.0	2.8	
hada21	6.4	2.3	moderately wet and warm
hadb21	0.2	2.1	
ncara21	11.5	1.7	wettest and least warm
ncarb21	9.1	1.5	



# Annual flows, SSRB, 2039 – 2070 (Pietroniro *et al.*, 2006)

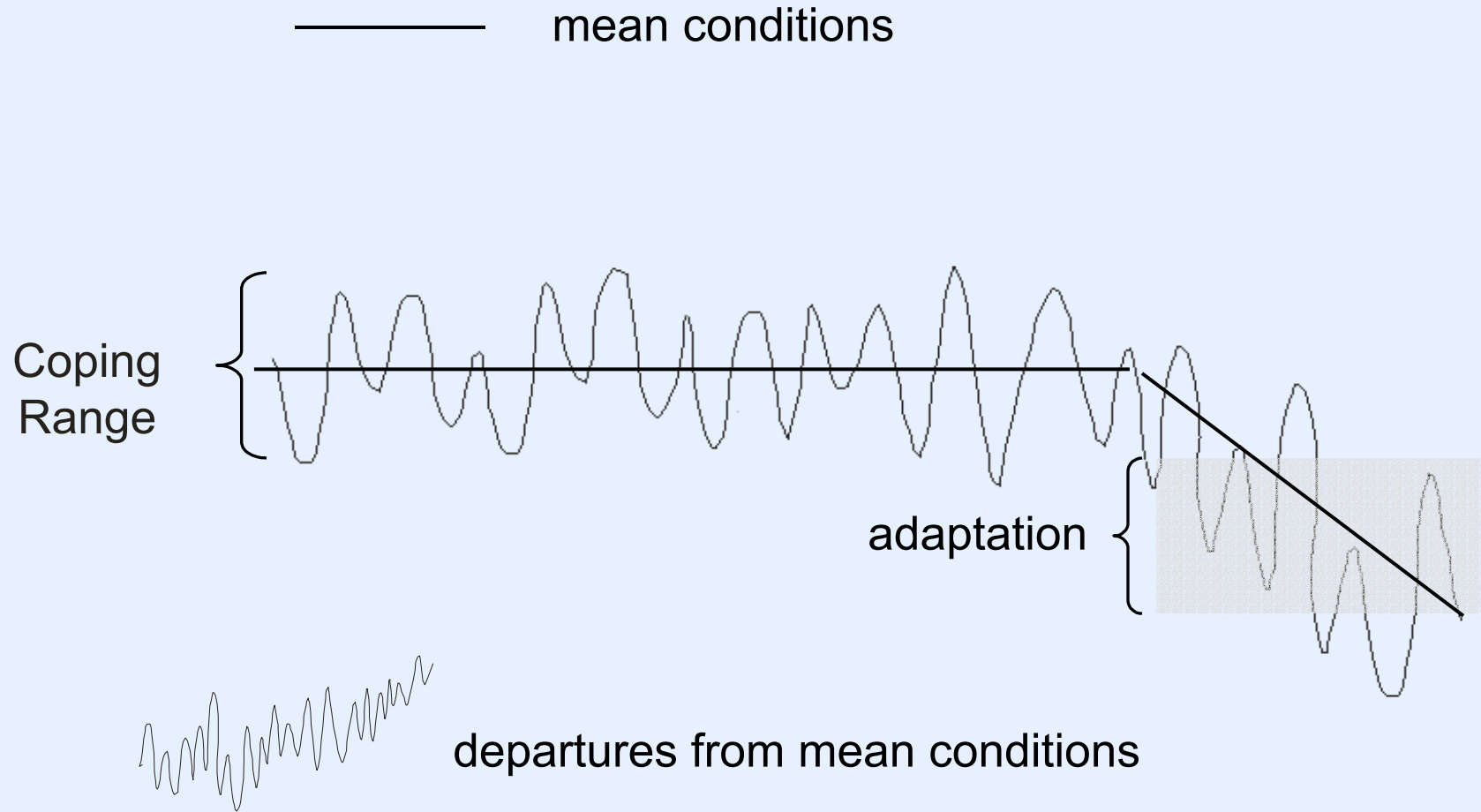


There will be greater variation from season to season and year to year



Both drought and unusually wet years could occur with greater frequency and severity

# Climate change and variability



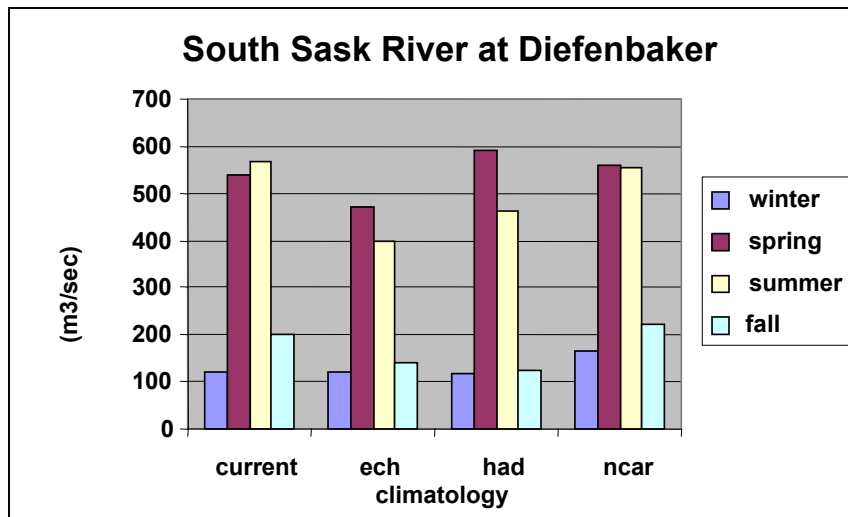
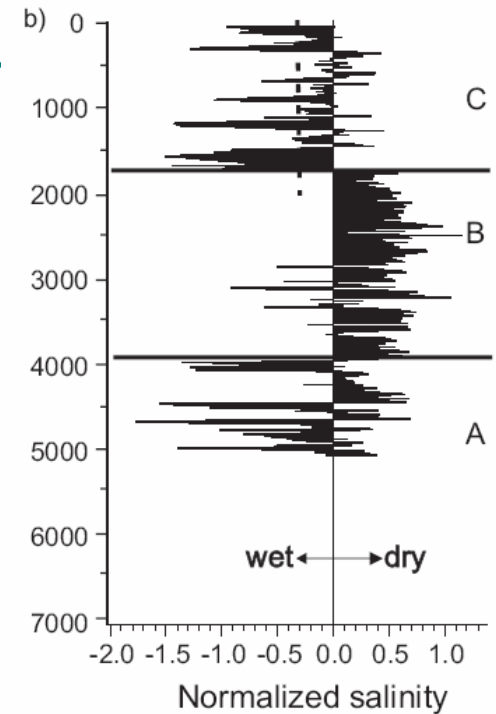
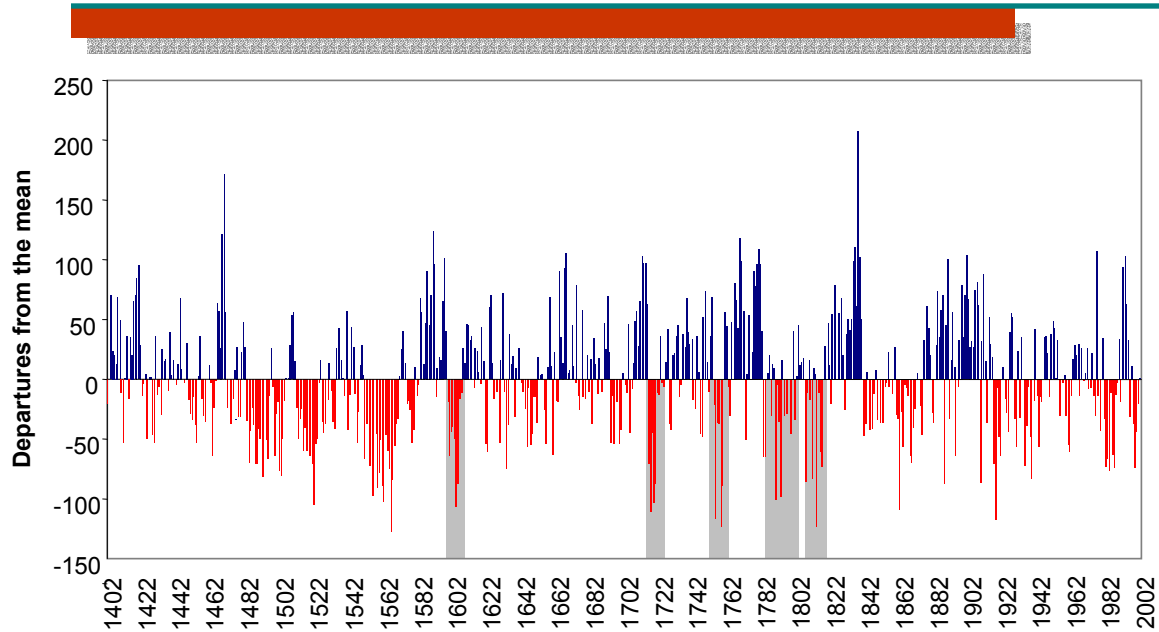
An estimated \$2.42 billion loss in crop production  
in Saskatchewan 2001 and 2002



Canadian Droughts of 2001 and 2002: Climatology, Impacts  
and Adaptation (Wheaton *et al.*, 2005)



# A drier past ... and a drier future?



A “myth of abundance” and an assumption that “the hydrological regime is stationary and will continue to be stationary in the future”.

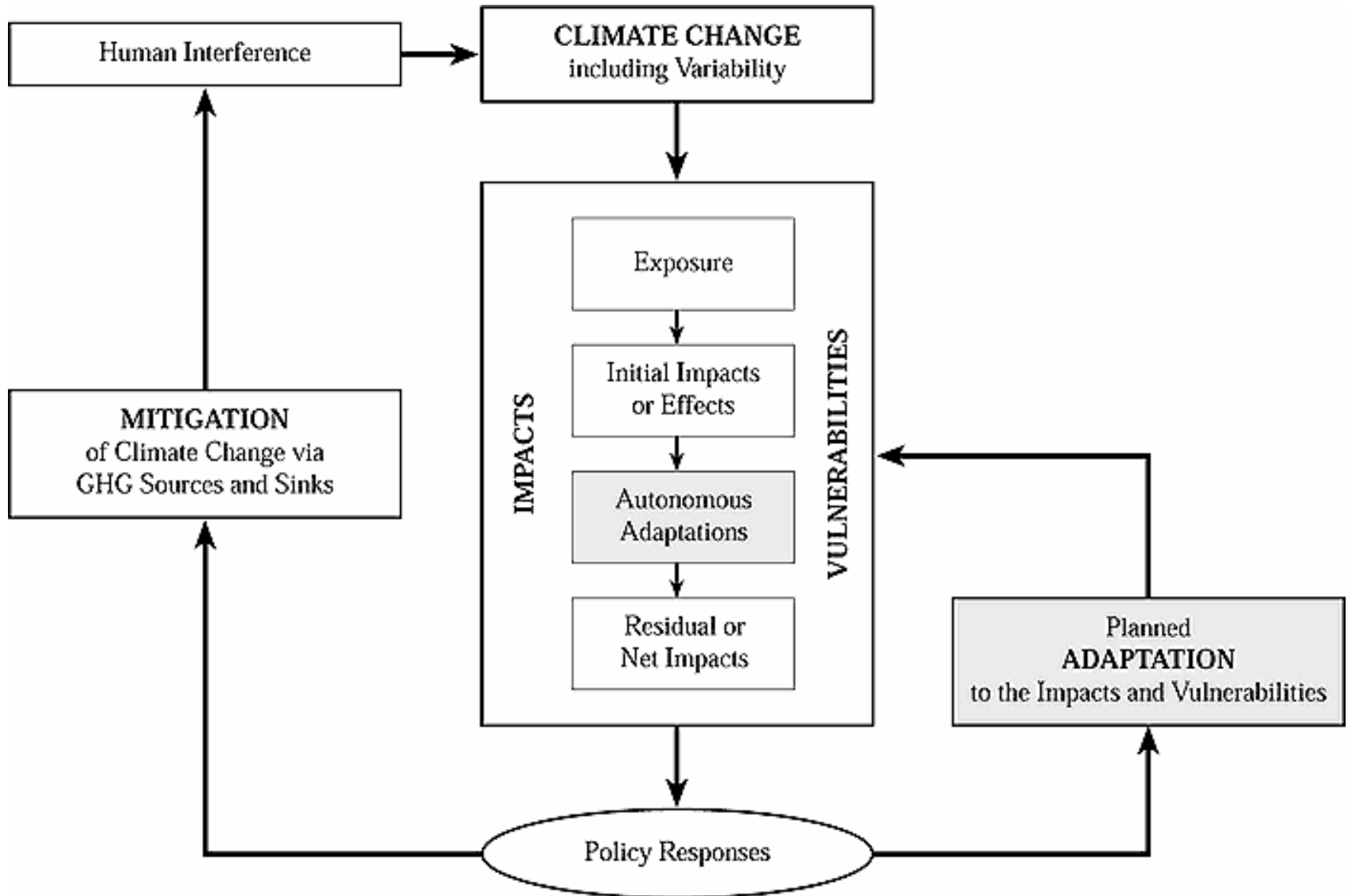
Most impacts are adverse because economies and activities are not well adapted to climate variability



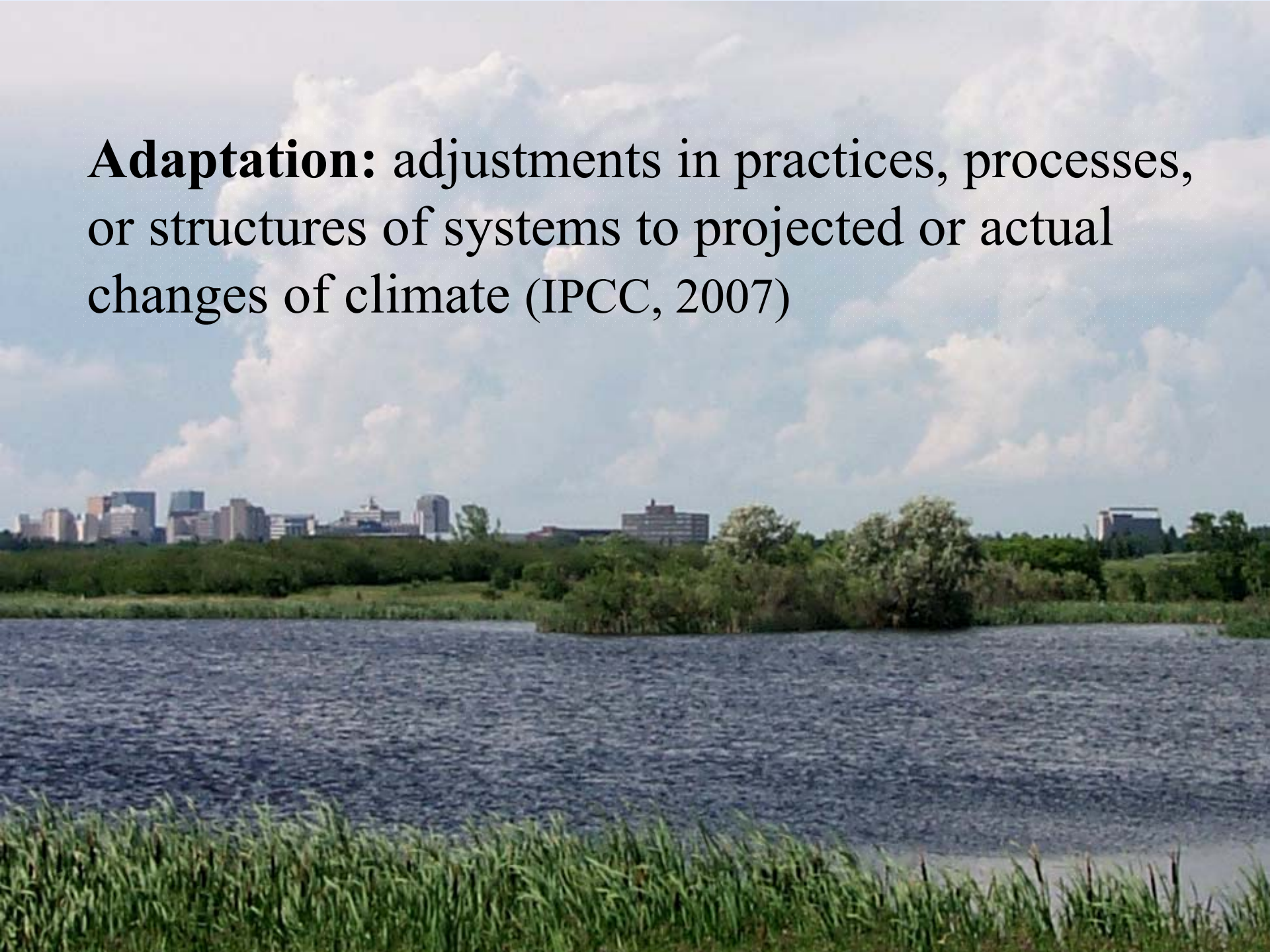
The impacts of climate change will depend on how well we adapt and how much adaptation is required



# Policy Options

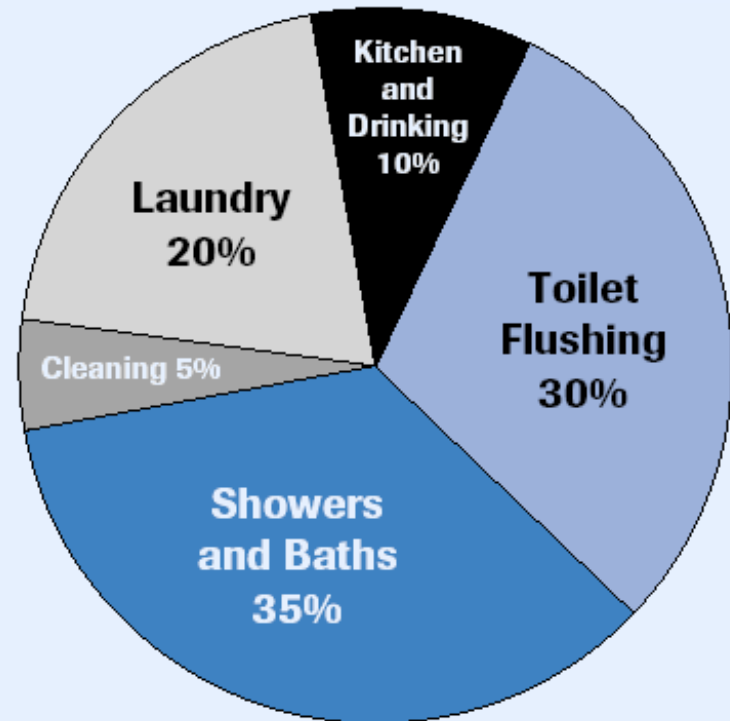
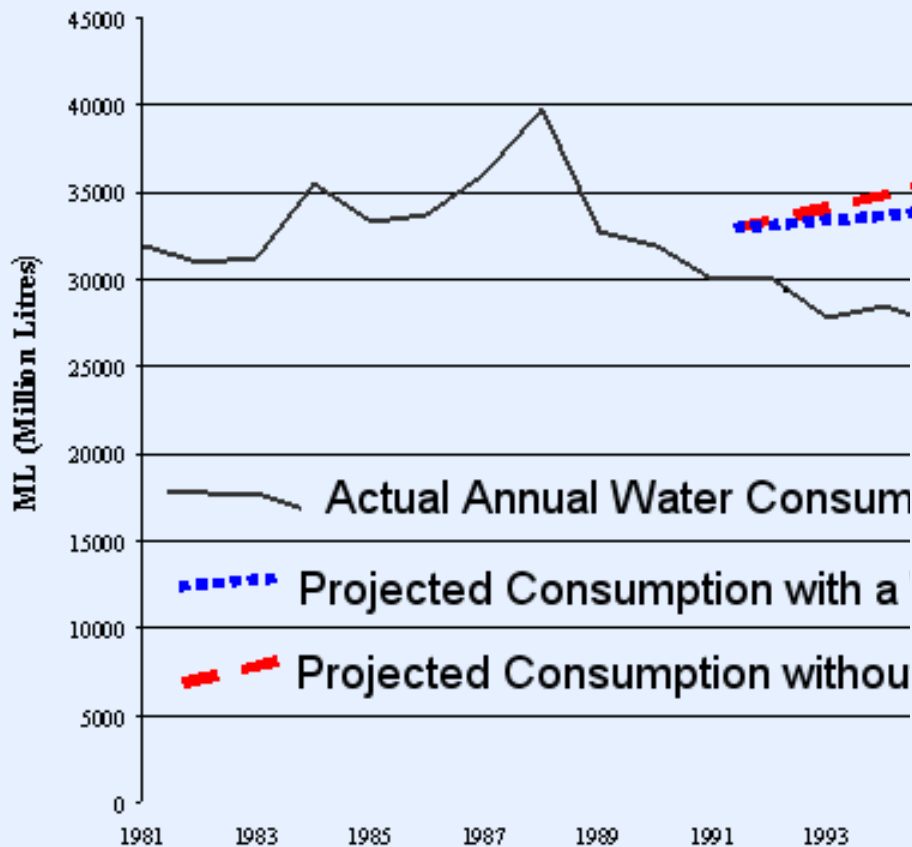


**Adaptation:** adjustments in practices, processes, or structures of systems to projected or actual changes of climate (IPCC, 2007)



# City of Regina Water Consumption

(Ken Wiens, P.Eng., May, 2007)



# Centre for Young Farmers and Sustainable Agriculture

## Sustainable Agriculture

Sustainable agriculture refers to an agricultural production and distribution system that:

- Achieves the **integration** of natural biological cycles and controls,
- Protects and renews **soil** fertility and the natural resource base,
- Optimizes the management and use of **on-farm** resources,
- **Reduces** the use of nonrenewable resources and purchased production inputs,
- Provides an adequate and dependable farm **income**,
- Promotes **opportunity** in family farming and farm communities, and
- **Minimizes** adverse impacts on health, safety, wildlife, water quality and the environment

To achieve sustainable agriculture we must deal both with issues involving environmental impacts as well as productivity of the land. Any program to successfully develop a system of sustainable agriculture must have farmer involvement at all stages of its development, and must look at a farming system as a whole, not just at individual elements.

# Adaptive Capacity

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Determinant	Explanation
Economic resources	Greater economic resources increase adaptive capacity Lack of financial resources limits adaptation options
Technology	Lack of technology limits range of potential adaptation options Less technologically advanced regions are less likely to develop and/or implement technological adaptations
Information and skills	Lack of informed, skilled and trained personnel reduces adaptive capacity Greater access to information increases likelihood of timely and appropriate adaptation
Infrastructure	Greater variety of infrastructure can enhance adaptive capacity, since it provides more options Characteristics and location of infrastructure also affect adaptive capacity
Institutions	Well-developed social institutions help to reduce impacts of climate-related risks, and therefore increase adaptive capacity
Equity	Equitable distribution of resources increases adaptive capacity Both availability of, and access to, resources is important

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# Take Home Messages - 1

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Climate is more variable than our recent experience

An expanded range of departures from climate norms may present greater risk than a shift in mean conditions; drought will limit opportunities provided by a warmer climate

Water supplies will be increasingly dependent on rainfall with less of a buffer from ice and snow

Abandon the assumption of a stationary environment

Our communities and economies should be adapted to wider range of climate and water supply

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## Take Home Messages - 2

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“warming would continue for centuries, even if greenhouse gas concentrations were to be stabilized”  
(IPCC, 2007)

Give Saskatchewan **THE ADAPTATION ADVANTAGE**  
- a competitive advantage as the climate changes

Our relatively high adaptive capacity is unevenly distributed, it must be mobilized and enhanced

Government must enable individuals, communities, industry and its own agencies to to build resilience to climate change and variability

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~~Dealing with climate change with devastate  
the economy~~

**adaptation**

If you think ~~education~~ is expensive,  
try the alternative

**CHANGE PAYS**

Climate change presents an opportunity to develop new and better policies, technology, institutions, infrastructure, and practices

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Thanks

