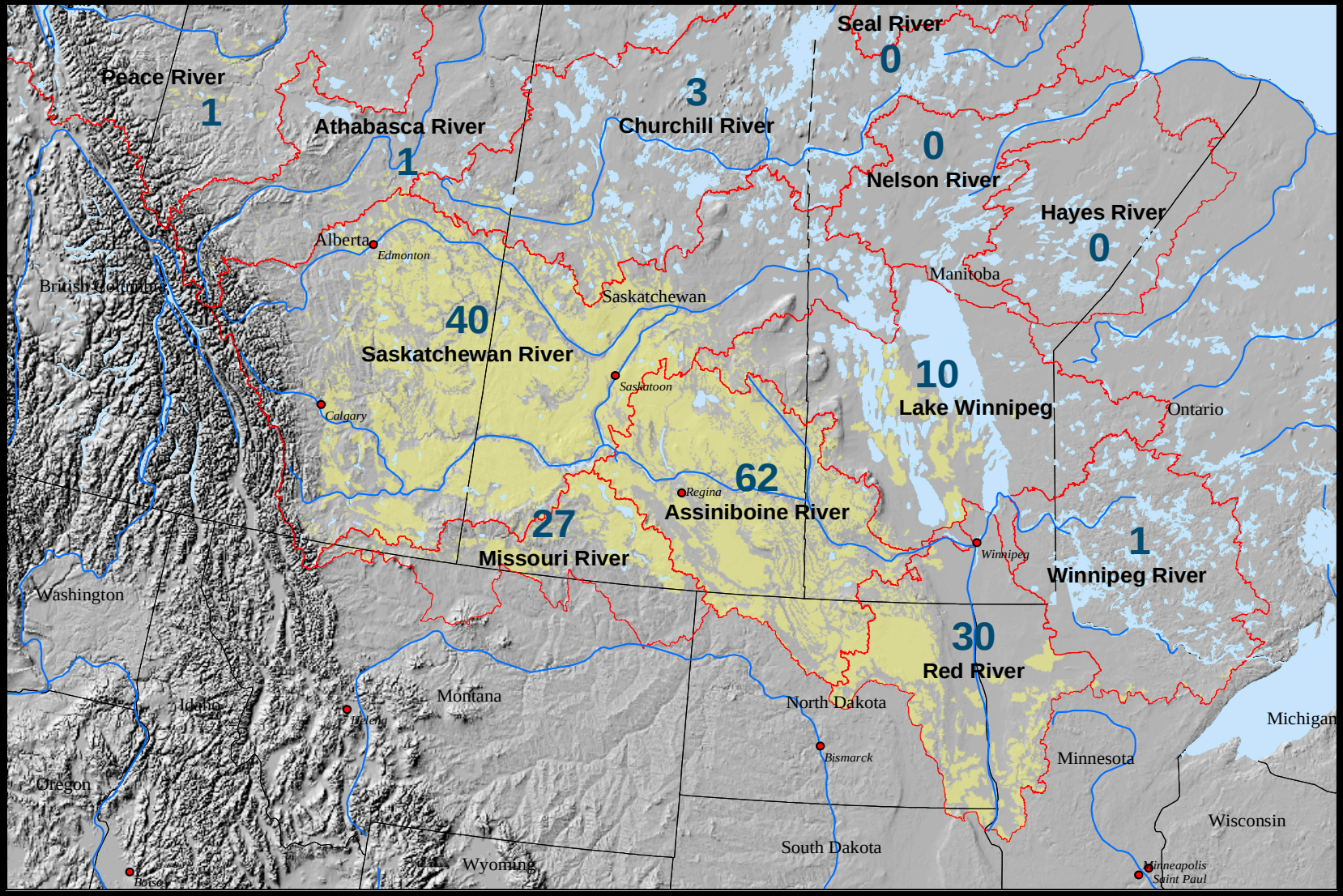
Water Security on the Prairies

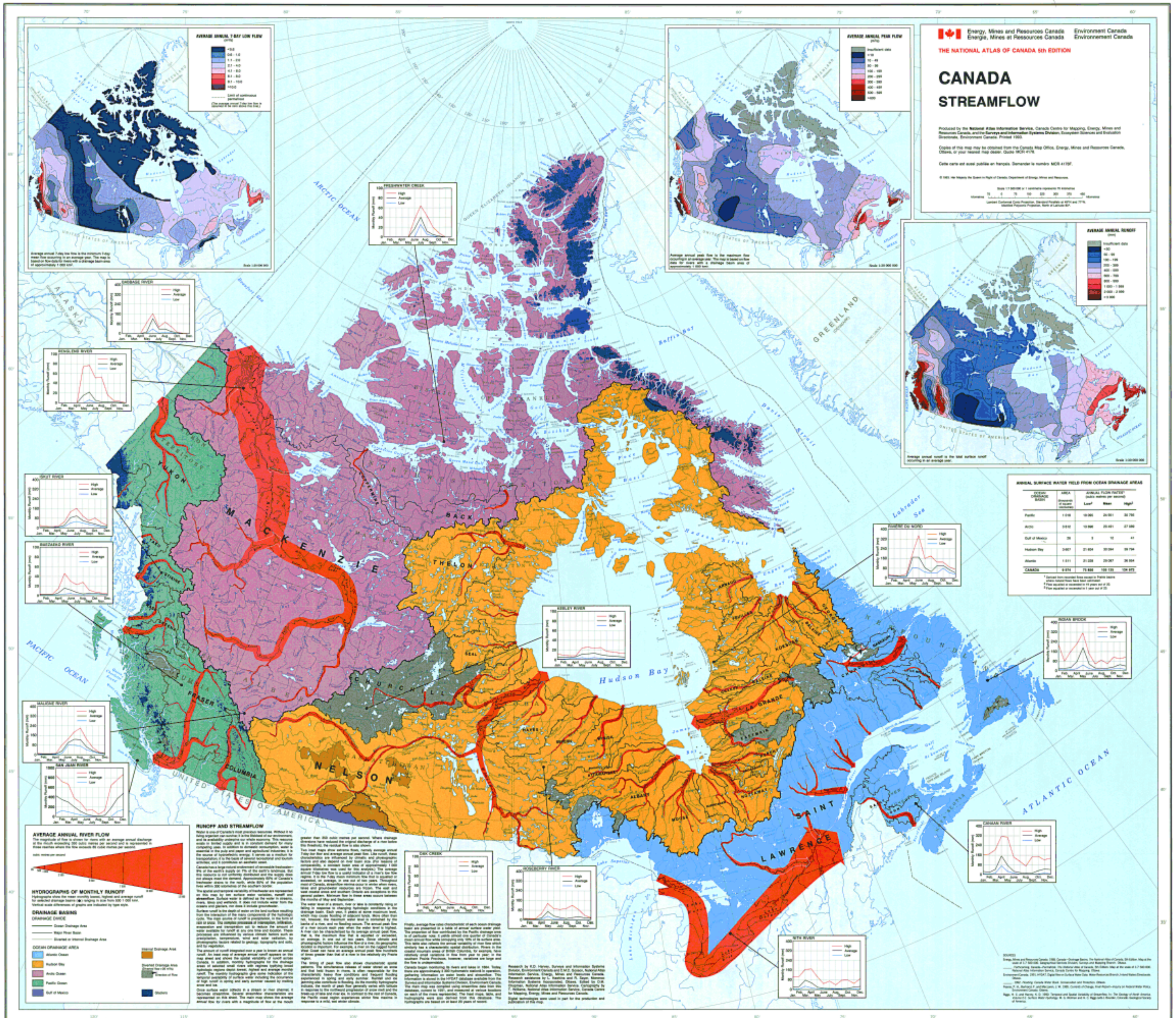
Dave Sauchyn,
Prairie Adaptation Research Collaborative
University of Regina

Water Round Table
Regina, March 17, 2010

Prairie Drainage Basins



source: AESB (formerly PFRA)


Energy, Mines and Resources Canada
Énergie, Mines et Ressources Canada
Environment Canada
Environnement Canada
THE NATIONAL ATLAS OF CANADA 5th EDITION
CANADA
STREAMFLOW
ARCTIC OCEAN
PACIFIC OCEAN
ATLANTIC OCEAN
Hudson Bay
GREENLAND
ALASKA
MACKENZIE
NELSON
SAINT LAWRENCE
YUKON
FRASER
COLUMBIA
CHURCHILL
BACK
THELON
UNITED STATES OF AMERICA
AVERAGE ANNUAL RIVER FLOW
HYDROGRAPHS OF MONTHLY RUNOFF
DRAINAGE BASINS
RUNOFF AND STREAMFLOW
AVERAGE ANNUAL RUNOFF
ANNUAL SURFACE WATER YIELD FROM OCEAN DRAINAGE AREAS
Canada

“we see the world as we want to see it, not as it is”

Gerald Butts
President / CEO
WWF – Canada
Globe and Mail, February 10, 2010

6-9 Heavy Oil Upgraders planned for the Edmonton Industrial Heartland

Each upgrader would require **20-30,000 cubic metres per day** for evaporative cooling

Water Sources

- The **North Saskatchewan River** (new licences)
- Under-utilized existing licences
- Recycled Wastewater
- Produced water in the area

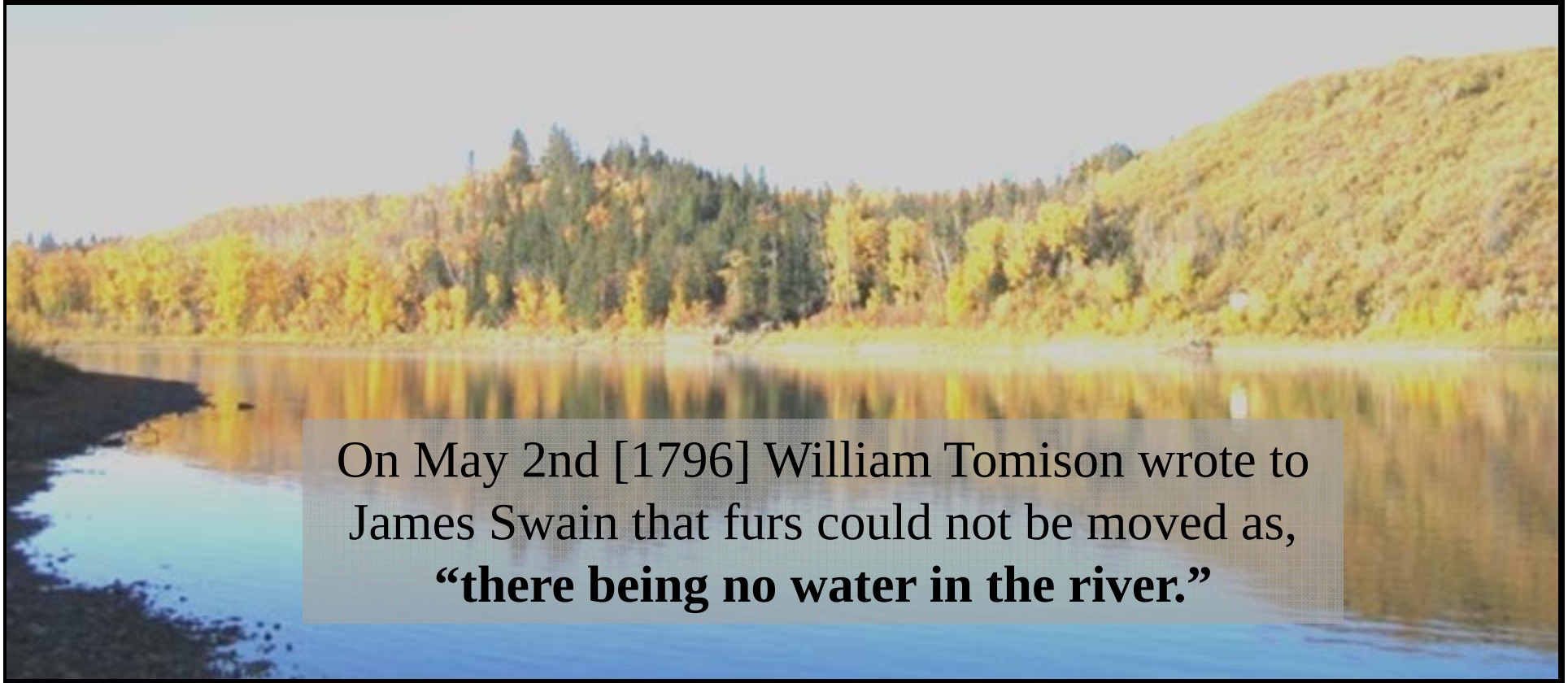
From - WATER: Alberta's Next Big Economic and Social Challenge, P. Kim Sturgess, P.Eng. FCAE - *www.apegga.org/Members/Events/.../APEGGAPDApr17-2008.ppt*

Bruce Power study eyes northwest Saskatchewan for new nuclear power plant

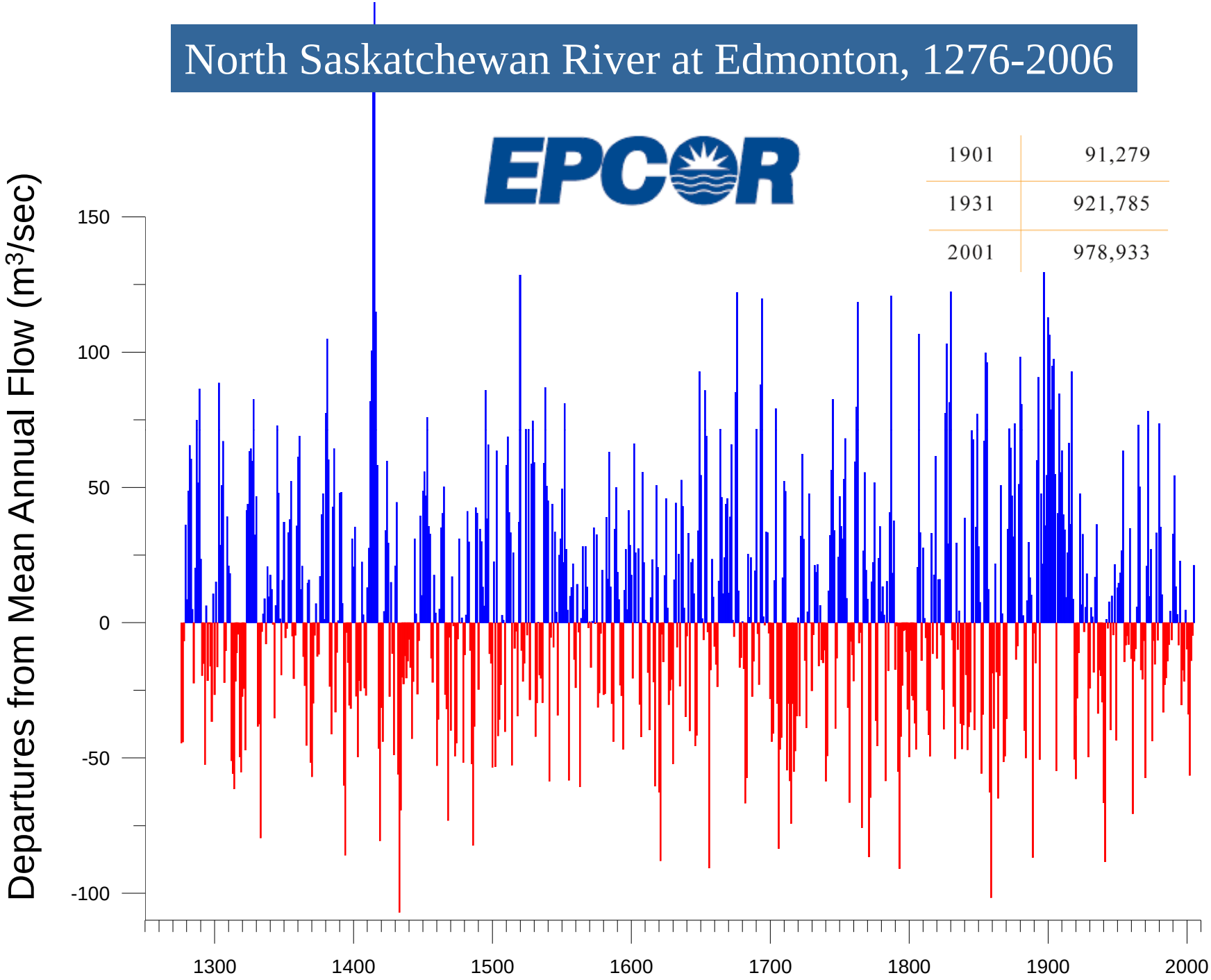
"the area on the **North Saskatchewan River** meets a lot of the criteria to support a nuclear power plant. "**It's got a good water source"**

Duncan Hawthorne,
President and CEO
Bruce Power
The Canadian Press *27/11/08*

North Saskatchewan River at Edmonton



North Saskatchewan River at Edmonton, 1276-2006



Old Wood
Headwaters, NSRB

Actual and Natural Flow, South Saskatchewan River

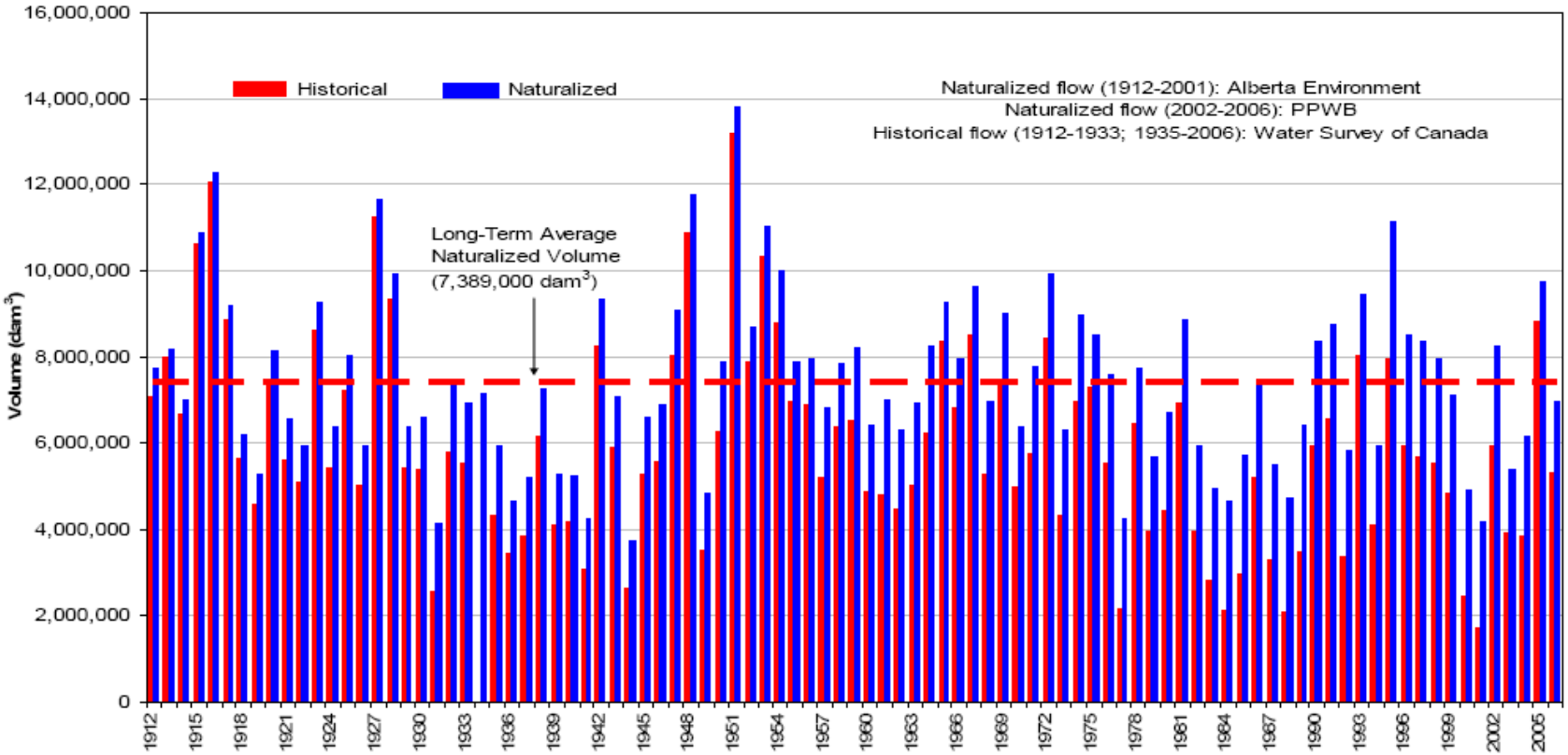


Figure 3.5 South Saskatchewan River at Medicine Hat Annual Historical and Naturalized Flow Volumes

AMEC. 2009. South Saskatchewan River Basin in Alberta: Water Supply Study. Alberta Agriculture and Rural Development.

FROM IMPACTS to ADAPTATION

Canada in a Changing Climate 2007

VIVRE AVEC LES CHANGEMENTS

climatiques au Canada : édition 2007

Government of Canada Gouvernement du Canada

Canada

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.

UNIVERSITY OF REGINA

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CHAPTER 7
Prairies

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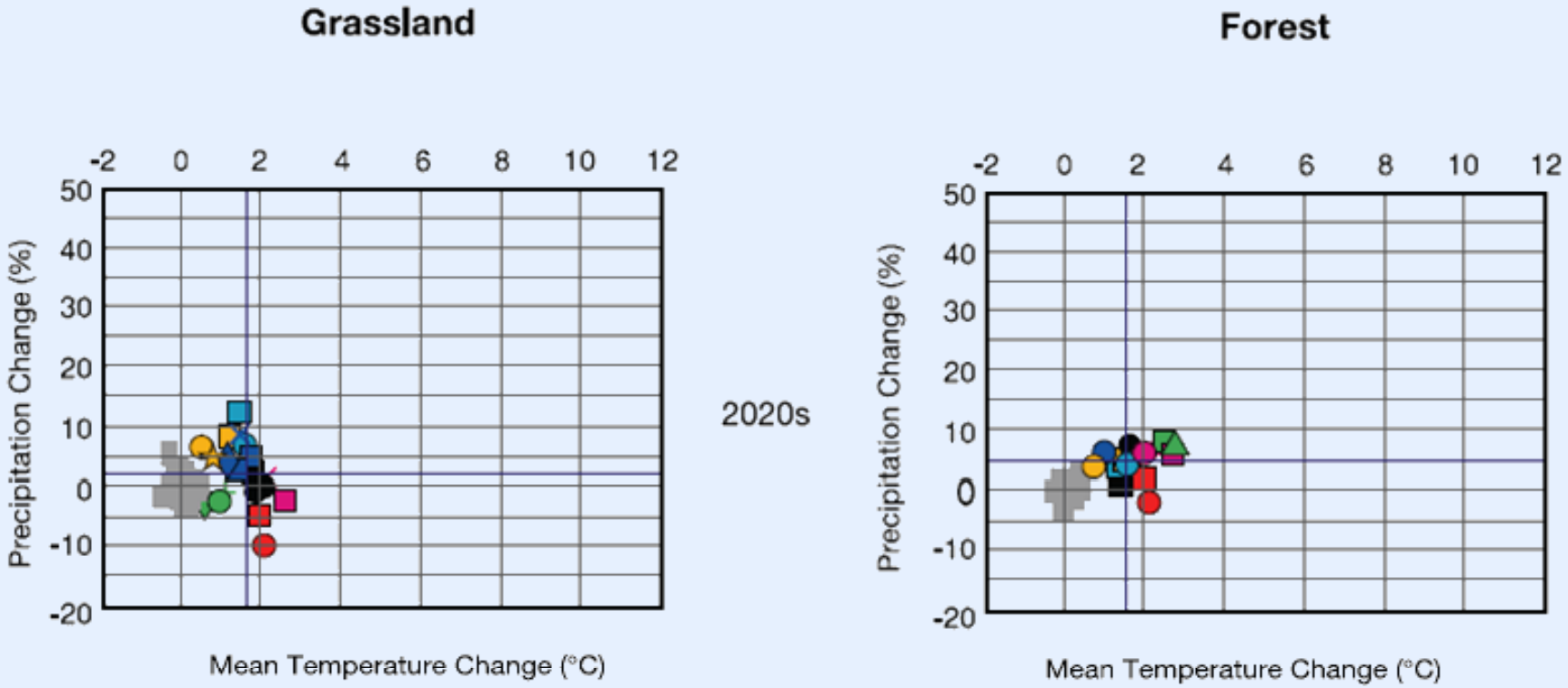
Projected changes in mean annual temperature and precipitation



The grey squares indicate the ‘natural’ climate variability simulated by a long control run of the CGCM2.

Global warming -- it's not all bad

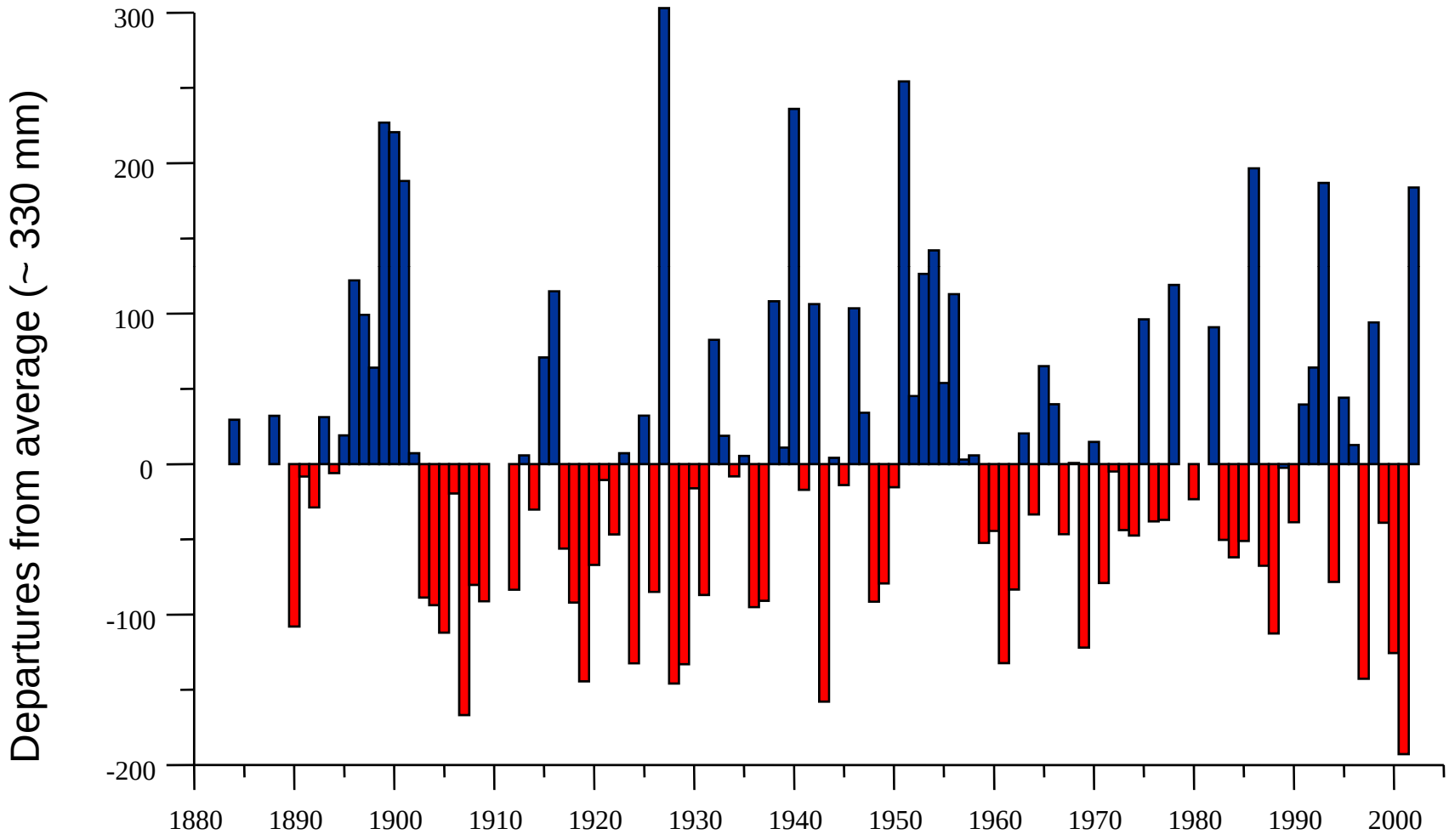
In fact, for people living in places like Edmonton, a warmer climate has plenty of benefits

David Staples, The Edmonton Journal
Sunday, November 23, 2008

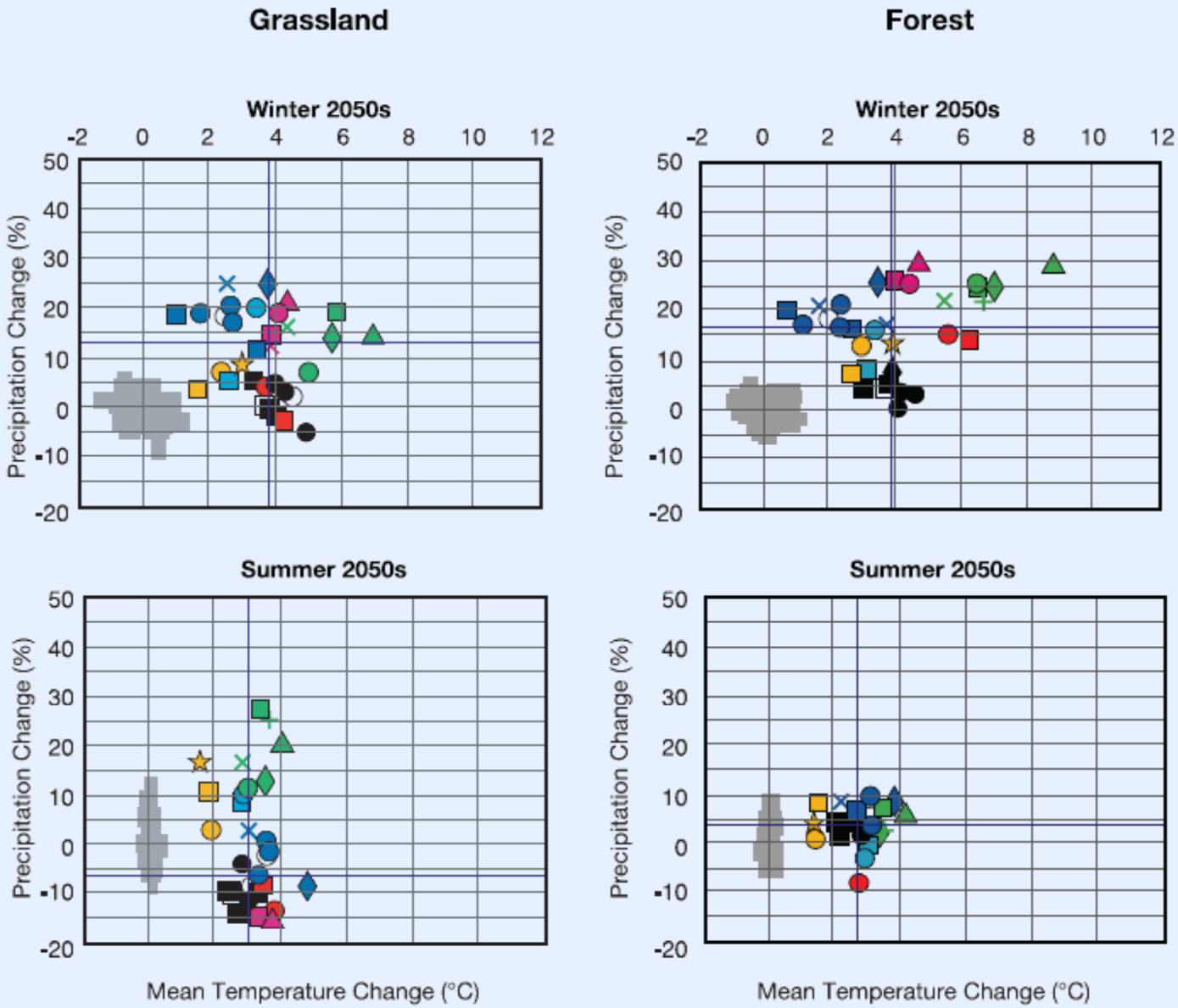
Robert Mendelsohn, an economics professor at Yale University, who says the benefits of global warming for Canada will be substantial and will outweigh the negative effects. "You're lucky because you're a northern latitude country, Mendelsohn says. **"If you add it all up, it's a good thing for Canada.“**

There will be opportunities for Canadian farmers going forward, **Sauchyn says** … "The most challenging impact of climate change is not going to be a shift in average conditions …”

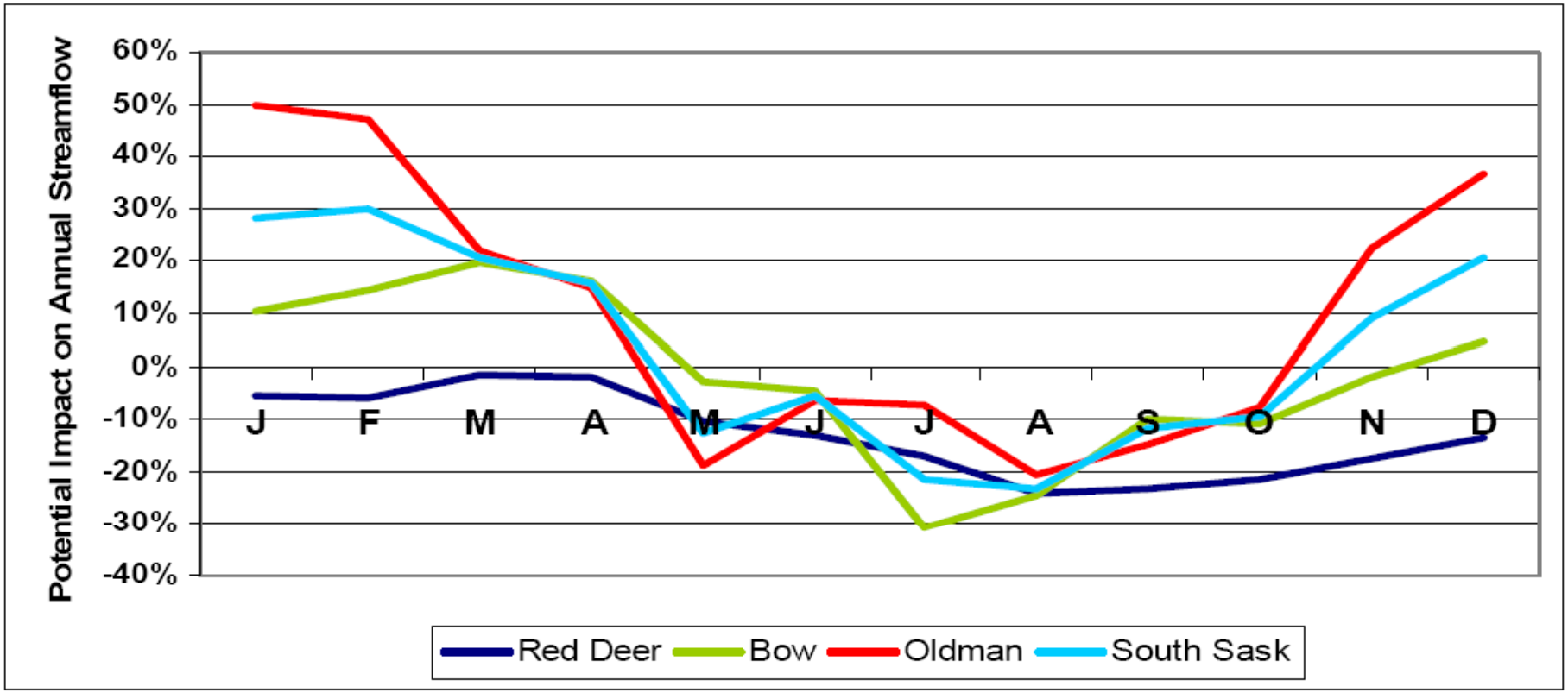
Precipitation at Medicine Hat,1884-2002



Seasonal Scenarios

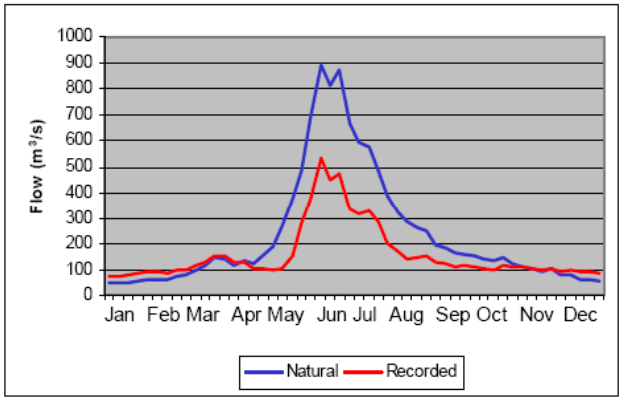


Potential Climate Change (%) Impacts on Natural Flows in the SSRB



Martz et al. (2007)

AMEC. 2009. South Saskatchewan River Basin in Alberta: Water Supply Study. Alberta Agriculture and Rural Development.



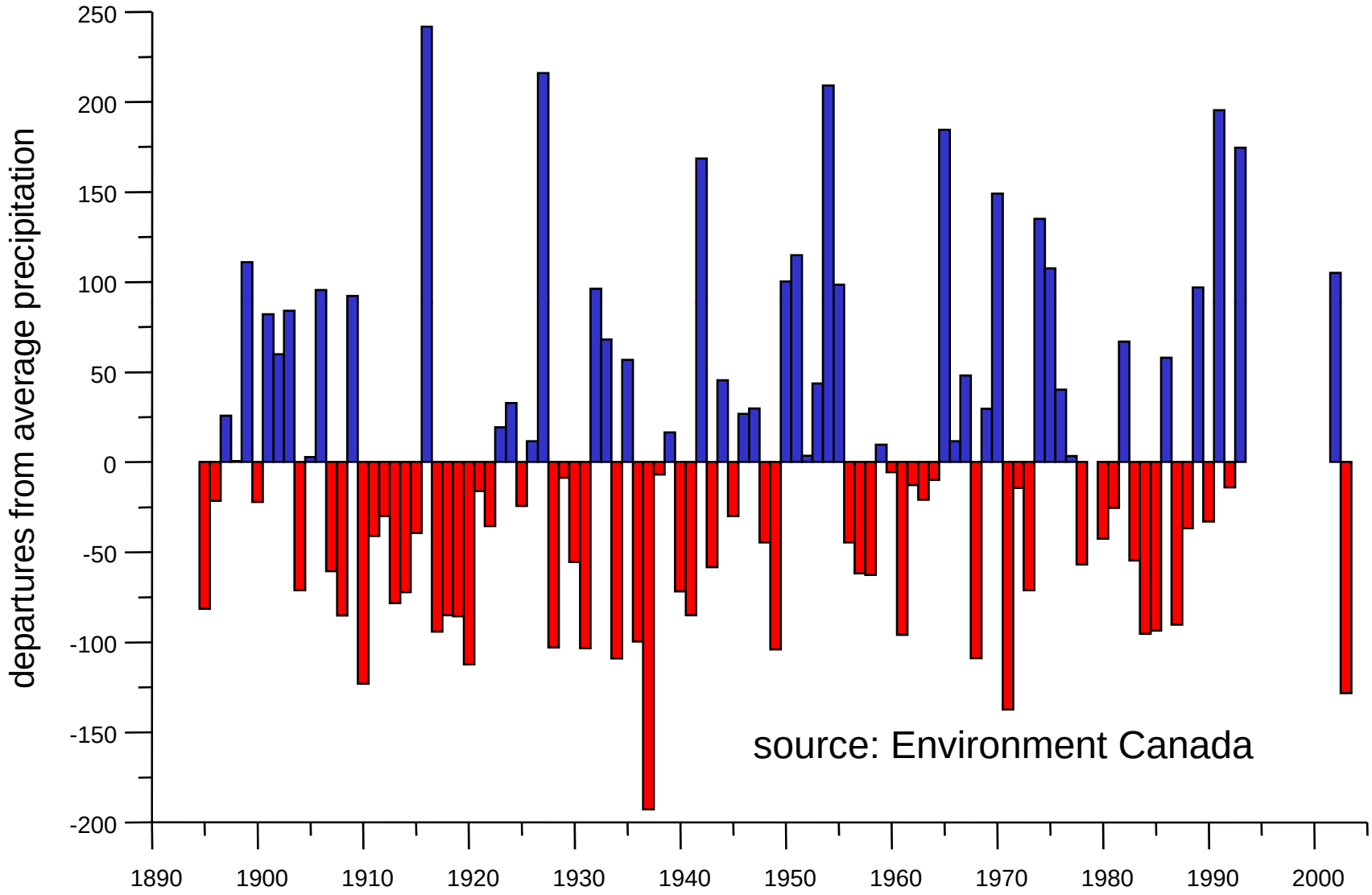
We are losing the advantage of a cold winter

Tompkins, SK, March 11, 2010

There will be greater variation in water and climate

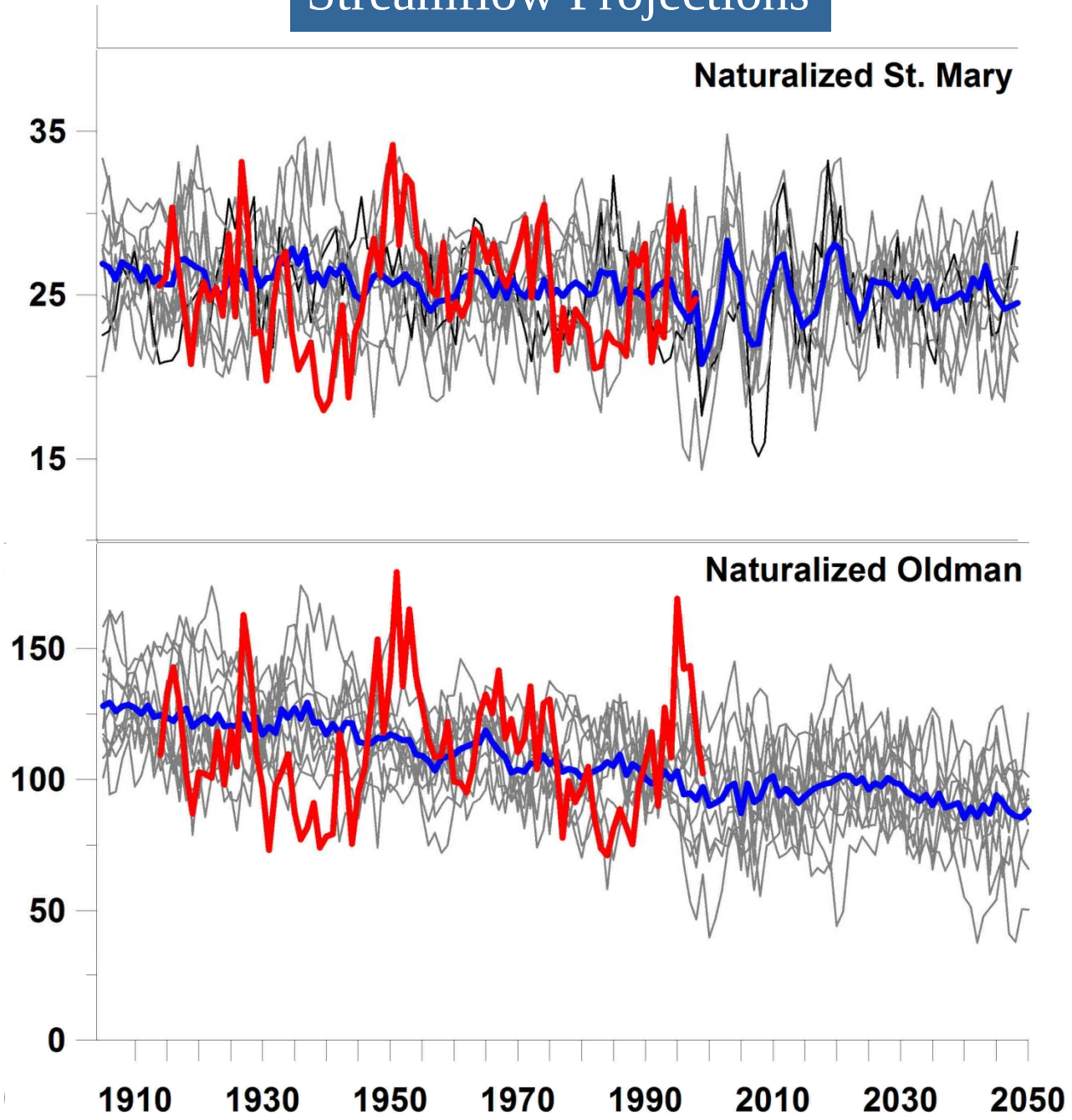
Both drought and unusually wet years could occur with greater frequency and severity

Annual Precipitation, Swift Current, 1895-2003



Global Warming Amplifies Hydro-Climatic Variability

Streamflow Projections



Our responsibilities
- Emergency management
- National security
- Crime prevention
- Law enforcement policy
- Corrections policy

The Department
- Our Minister
- About us
- Newsroom
- Publications

Services
- RSS Feeds
- Cyber warnings
- Daily Infrastructure Report

- Proactive disclosure

Canadian Disaster Database

The Canadian Disaster Database contains detailed disaster information on over 700 natural, technological and conflict events (excluding war) that have directly affected Canadians over the past century. The database helps citizens and government to better assess and manage risks. As well, it's a valuable resource for researchers and students to see how disasters and our vulnerability to them have changed over time.

- Enter the Database
- Data criteria and disclaimer

1. **Drought: Prairie provinces, 1980**
Prairie provinces, 1980. Poor wheat yield due to cereal crop drought that occurred in parts of the Prairies (drought continued from 1979); severe and widespread... more information.
Dead: 0 **Injured:** 0 **Evacuated:** 0

3. **Drought: Prairie Provinces to ON, 1988**
Prairie provinces and Central and Southern ON, Jul 5-11 1988. . Drought caused damage to Ontario corn. Drought caused dust storm frequency to increase; duck... more information.
Dead: 0 **Injured:** 0 **Evacuated:** 0

4. **Drought: Prairie provinces, 1979**
Prairie provinces, 1979. Poor wheat yield due to cereal crop drought that occurred in parts of the Prairies (drought continued into 1980)... more information.
Dead: 0 **Injured:** 0 **Evacuated:** 0

5. **Drought: Prairie provinces, 1984**
Prairie provinces, 1984. The worst agricultural drought since the 1930s to occur in the Prairies; severe and widespread surface water droughts reported on the Prairies... more information.
Dead: 0 **Injured:** 0 **Evacuated:** 0

9. **Drought: Prairie provinces, 1931**
Prairie provinces, 1931-1938. The "dirty thirties"; dust storms, plant rust, heat waves, grasshopper plagues and water shortages plagued western Canada for almost... more information.
Dead: 0 **Injured:** 0 **Evacuated:** 0

10. **Drought: Prairie provinces, 1989**
Prairie provinces, 1989. Cereal crop drought occurred in parts of the Prairies; severe and widespread surface water droughts reported on the Prairies... more information.
Dead: 0 **Injured:** 0 **Evacuated:** 0

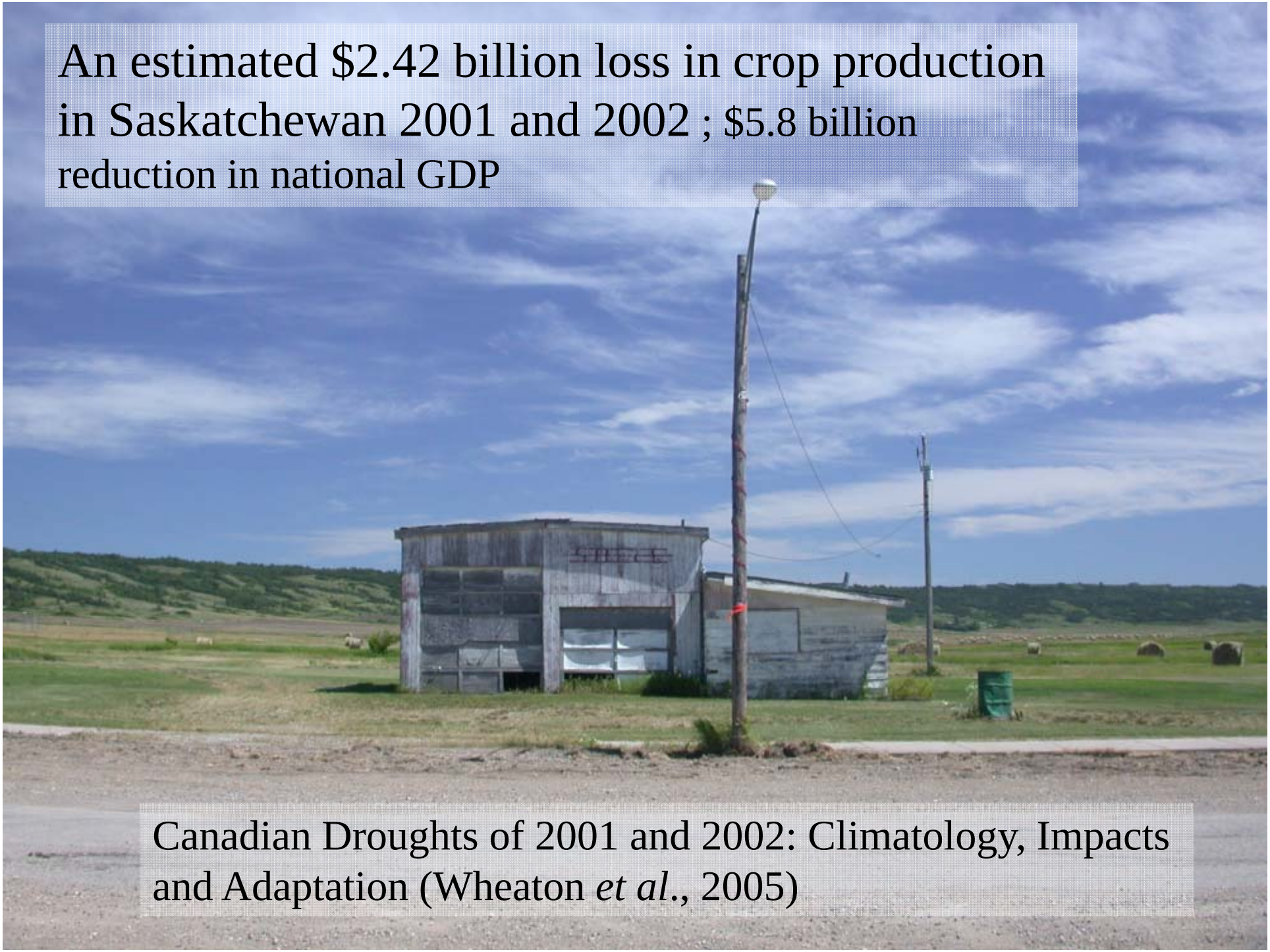
12. **Drought: Prairie provinces, 1961**
Prairie provinces, 1961. One of the worst agricultural droughts to occur in the Prairies; among the most severe and widespread surface water droughts ever to occur... more information.
Dead: 0 **Injured:** 0 **Evacuated:** 0

14. **Drought: Western Canada, 1985**
Western Canada, 1985. Second drought year in a row; one of the worst agricultural droughts to occur in the Prairies; insect infestations. On June 8, there was... more information.
Dead: 0 **Injured:** 0 **Evacuated:** 0

16. **Drought: Prairie provinces, 1977**
Prairie provinces, 1977. Cereal crop drought occurred in parts of the Prairies; among the most severe and widespread surface water droughts ever to occur on the... more information.
Dead: 0 **Injured:** 0 **Evacuated:** 0

17. **Drought: Prairie provinces, 1990**
Prairie provinces, 1990. Cereal crop drought occurred in parts of the Prairies... more information.
Dead: 0 **Injured:** 0 **Evacuated:** 0

18. **Drought: Prairie provinces, 1992**
Prairie provinces, 1992. Livestock yields were low in northern Alberta and Saskatchewan due to dry conditions; severe and widespread surface water droughts reported... more information.

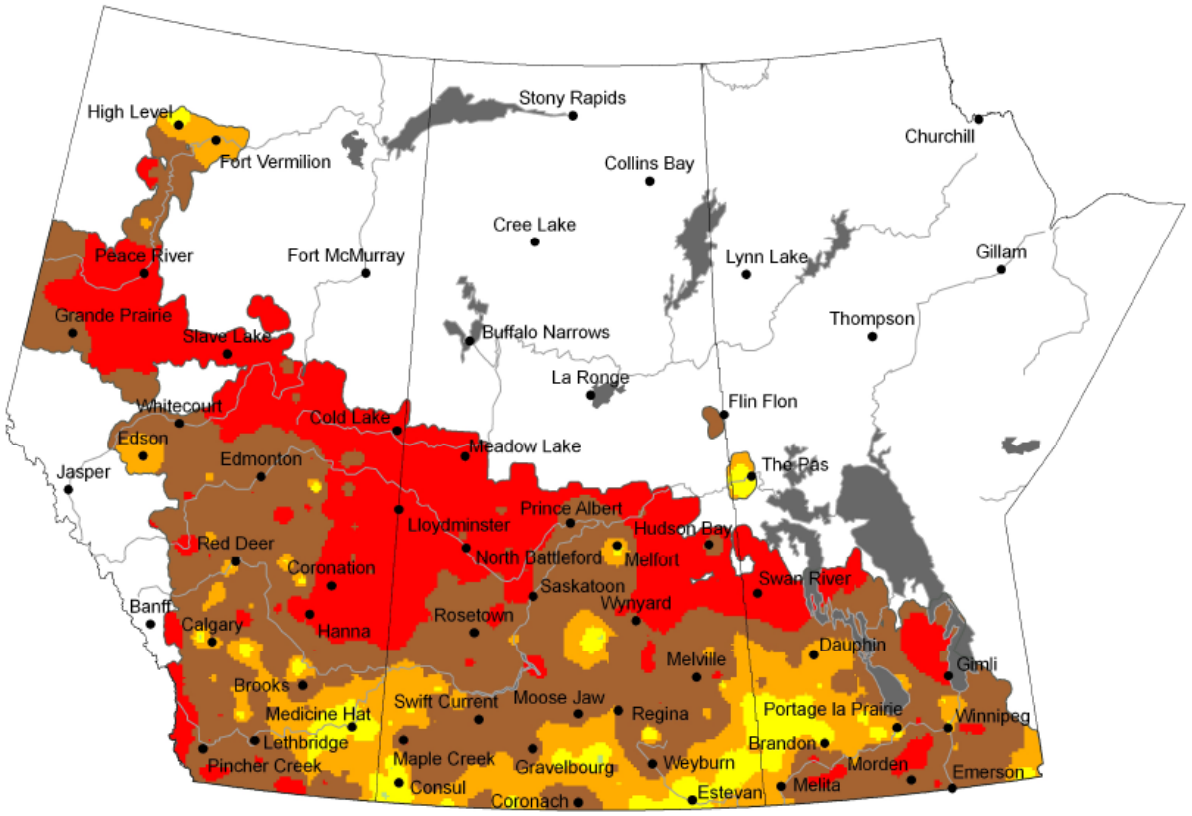

An estimated $2.42 billion loss in crop production in Saskatchewan 2001 and 2002 ; $5.8 billion reduction in national GDP
Canadian Droughts of 2001 and 2002: Climatology, Impacts and Adaptation (Wheaton *et al*., 2005)

Agriculture and Agri-Food Canada | Agriculture et Agroalimentaire Canada

Canada

Precipitation Compared to Historical Distribution (Prairie Region)

November 1, 2009 to March 11, 2010



- Record Dry
- Extremely Low (0-10)
- Very Low (10-20)
- Low (20-40)
- Mid-Range (40-60)
- High (60-80)
- Very High (80-90)
- Extremely High (90-100)
- Record Wet
- Extent of Agricultural Land
- Lakes and Rivers

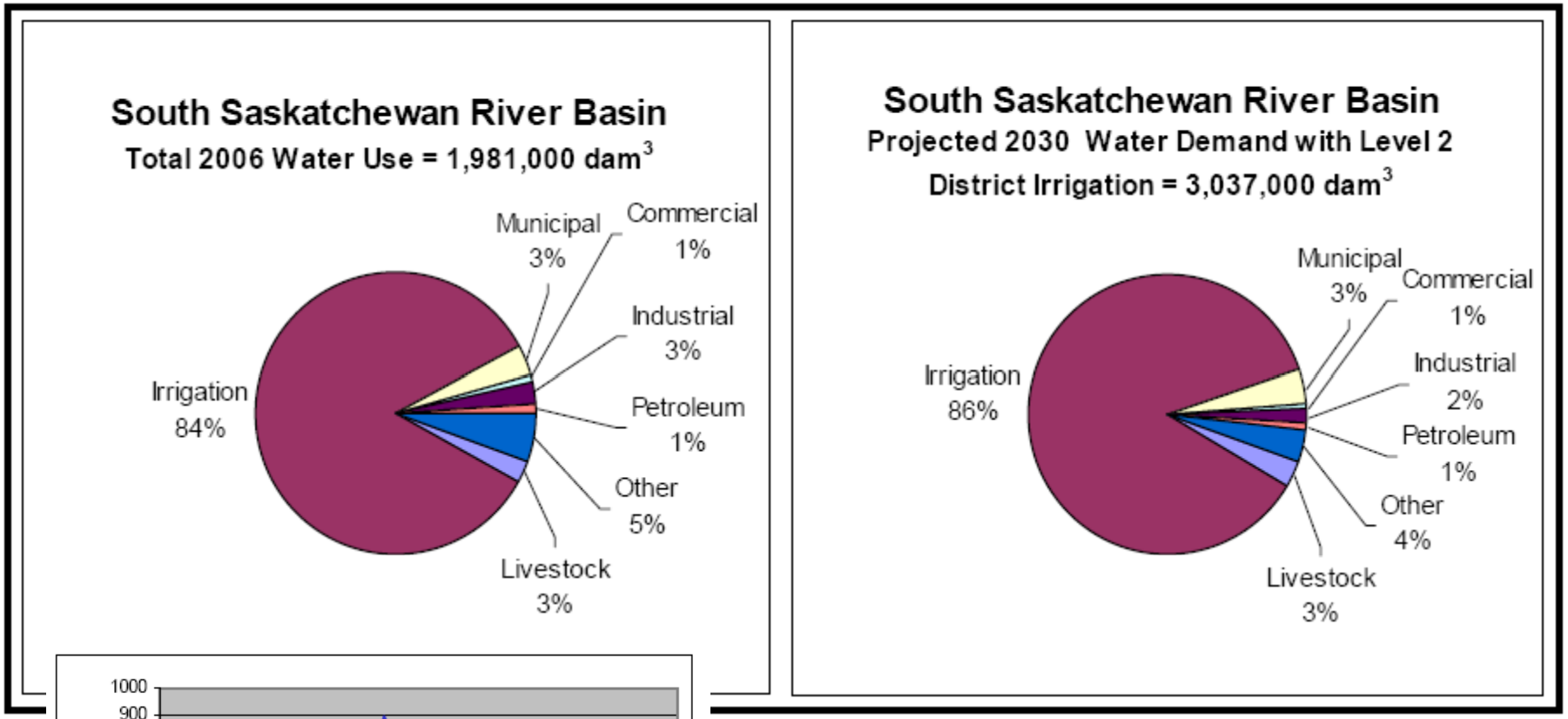
Produced using near real-time data that has undergone initial quality control. The map may not be accurate for all regions due to data availability and data errors.

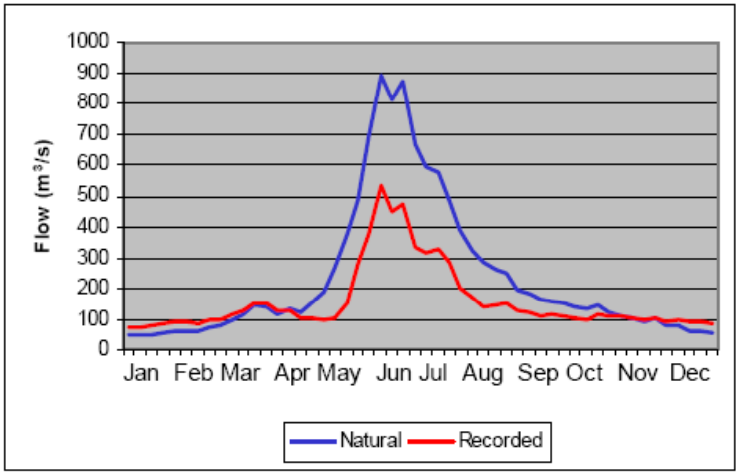
Prepared by Agriculture and Agri-Food Canada's National Agroclimate Information Service (NAIS). Data provided through partnership with Environment Canada, Natural Resources Canada, and many Provincial agencies.

Created: 03/12/10
www.agr.gc.ca/drought

The longer summer periods will result in drier soils for a longer period, so while streamflows might be reduced or even increase, water needs for agriculture will likely increase and so will pressure for irrigation of farmland using river water. (Pomeroy et al. 2009)

Current (2206) and projected (2030) water use, SSRB





AMEC. 2009. South Saskatchewan River Basin in Alberta: Water Supply Study. Alberta Agriculture and Rural Development.

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

On average, there will be slightly to significantly less surface and soil water

North Saskatchewan River Basin Council

Source Water Protection

There are steps we can take to ensure our activities do not have negative impacts on our water sources. Then we are not only protecting water for ourselves and each other but for future generations.

- Water Conservation
- Environmental Farm Plan
- Canada-Saskatchewan Farm Stewardship Program.
- Healthy riparian areas
- Lakes and forests

<www.nsrbc.ca>

Beaver Creek Watershed Group

"We are really the ones who manage the land every day and the positive actions we take today will ensure that our children have healthy riparian areas and clean water. Hopefully they will grow up understanding what it seemed to take us forever to learn."

Dixon Hammond