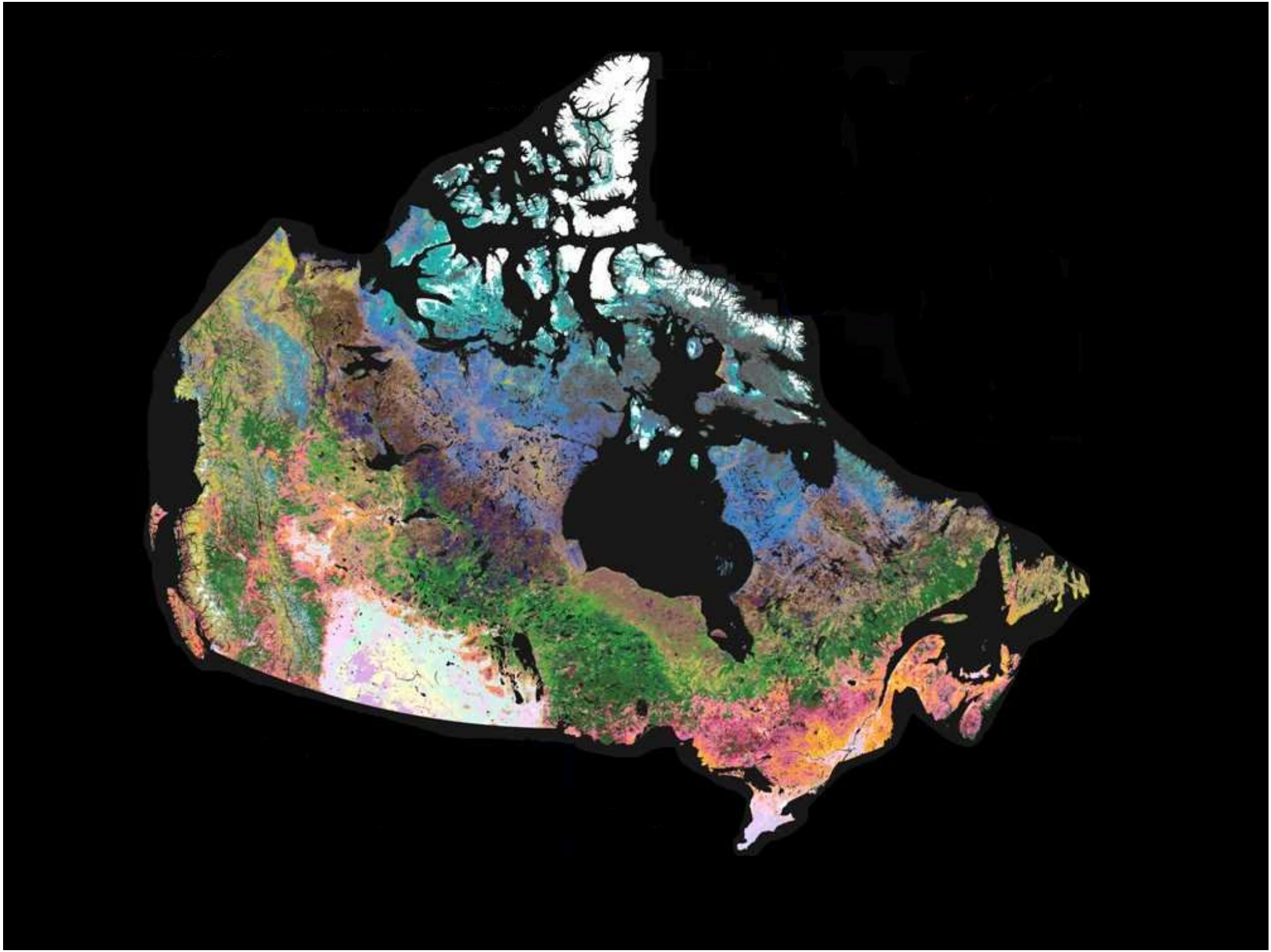
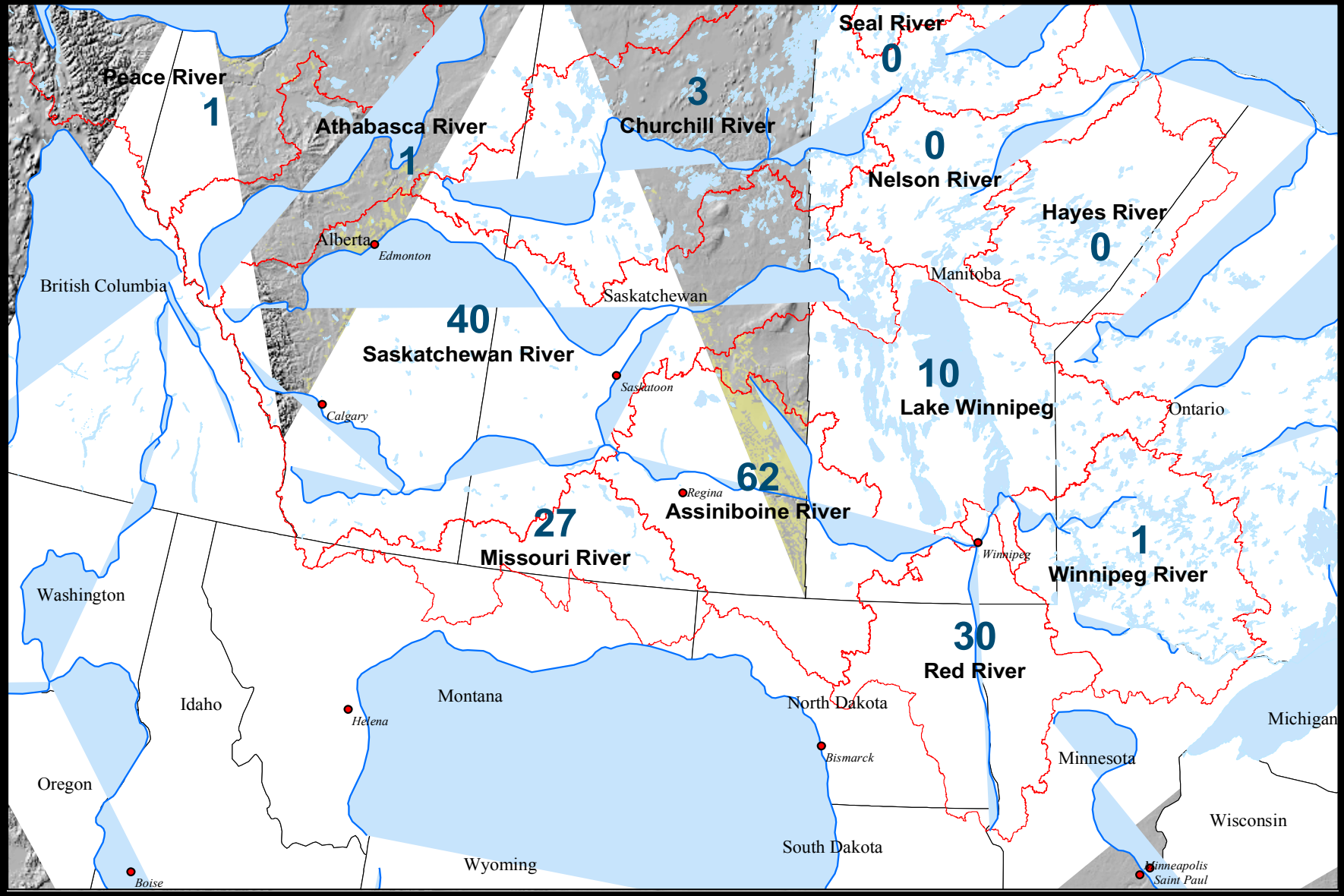
Climate Change Impacts and Adaptation Science

Dave Sauchyn, PARC, University of Regina

Canada-Ukraine Symposium, 21-22, 2009, Saskatoon



Prairie Drainage Basins (source: PFRA)



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

PARC

www.parc.ca

Climate change impacts, adaptation and mitigation

T. Barker / Global Environmental Change 13 (2003) 1–6

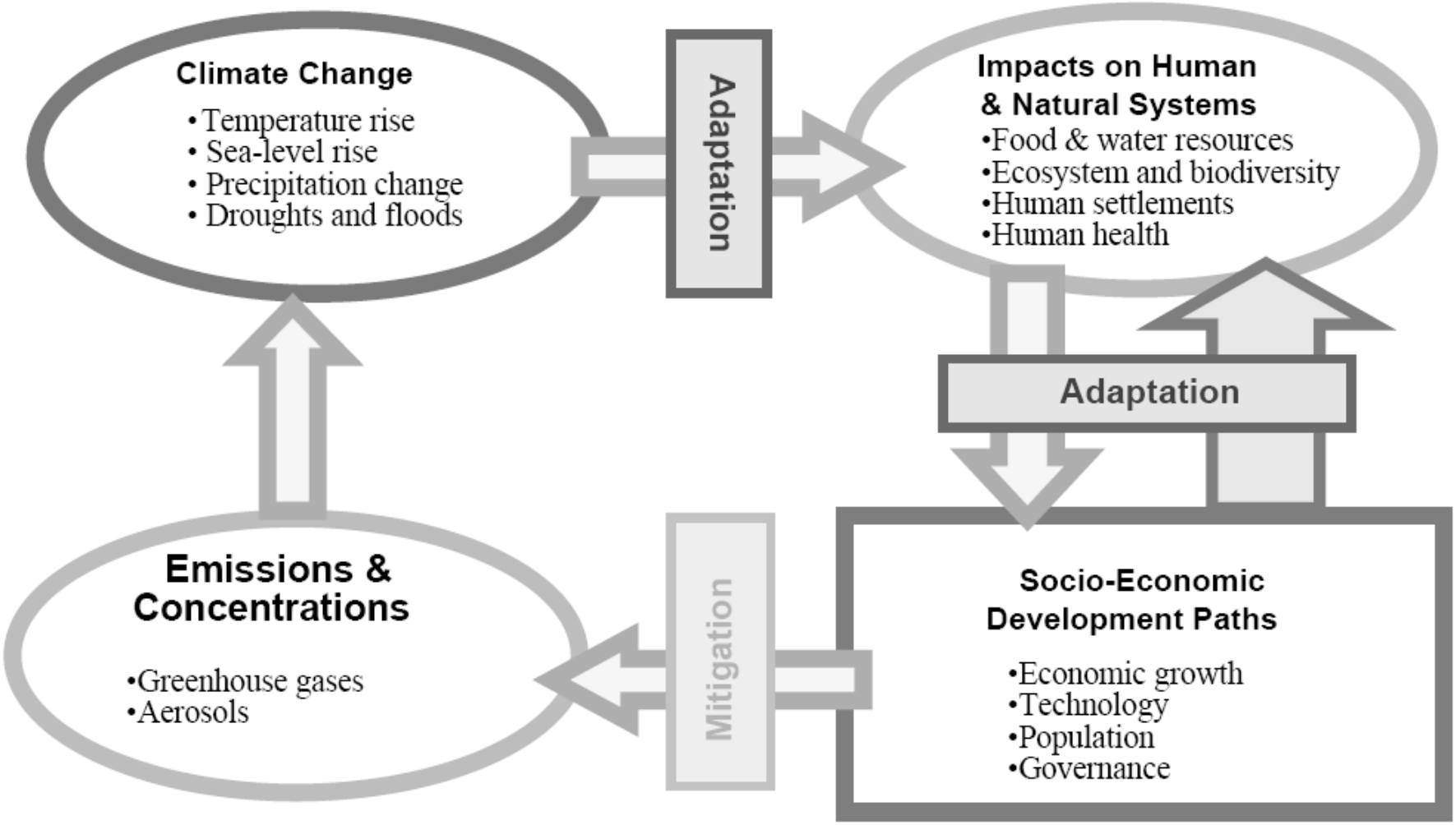
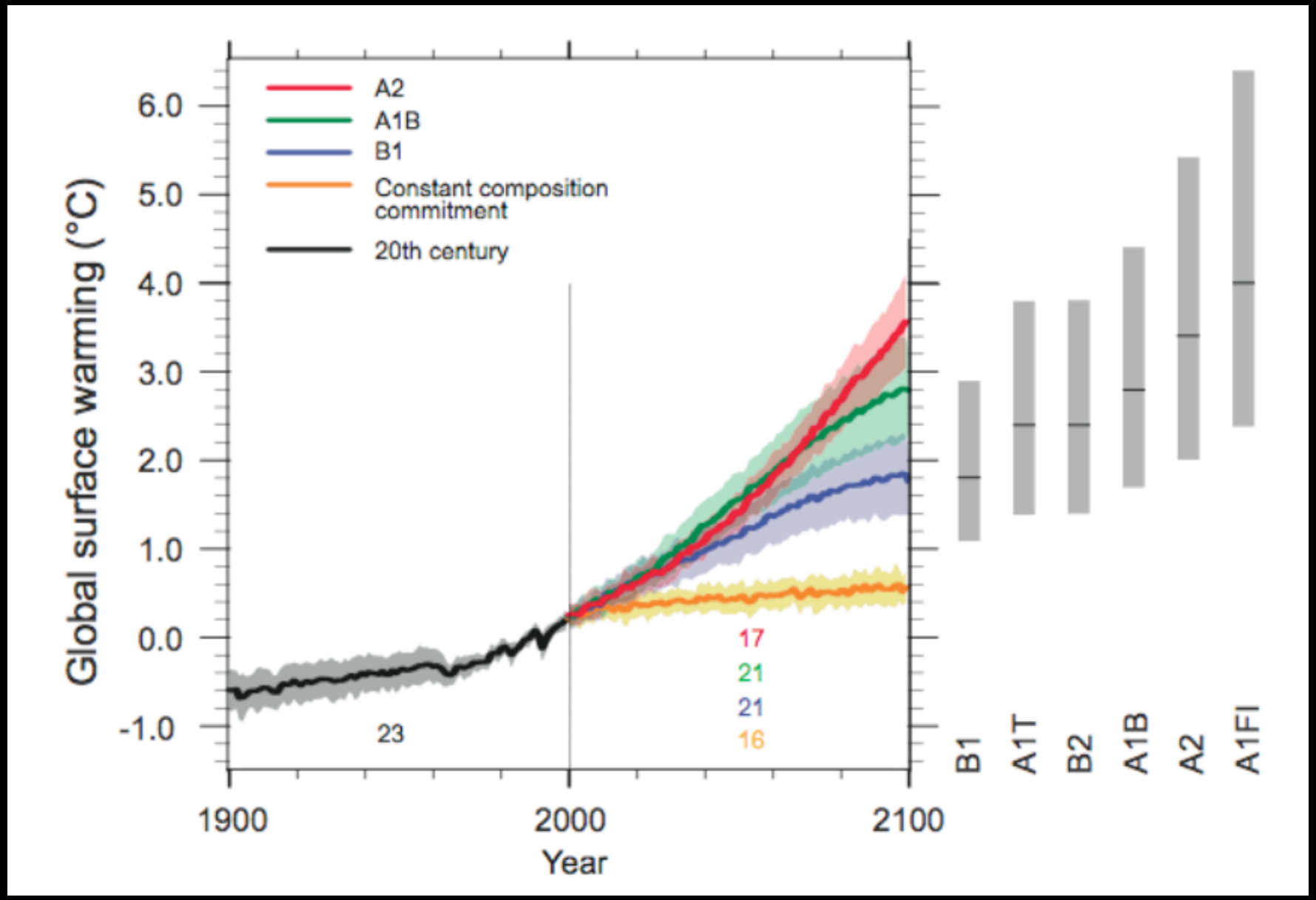


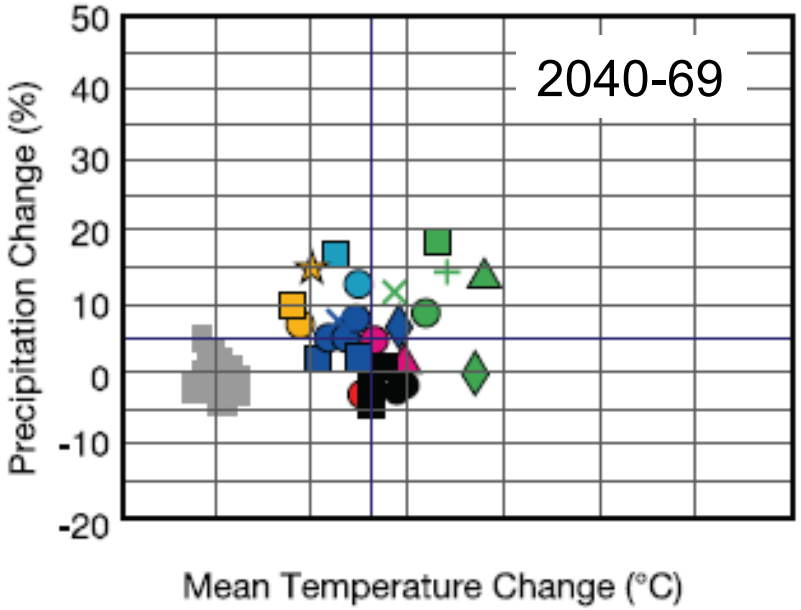
Fig. 1. A "Cause and Effect" integrated assessment framework for climate change with adaptation and migration.

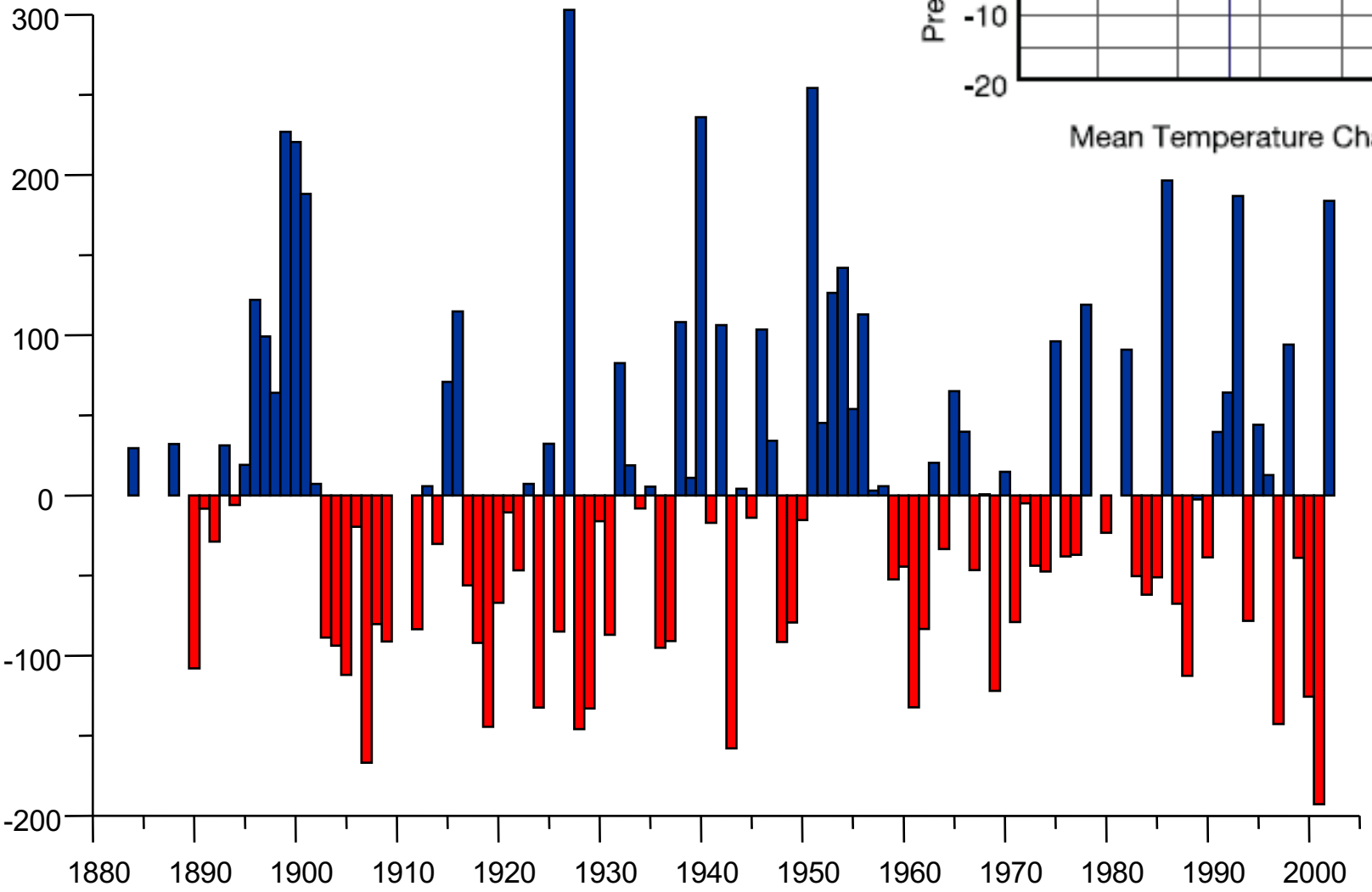
Climate Projections (IPCC 2007)

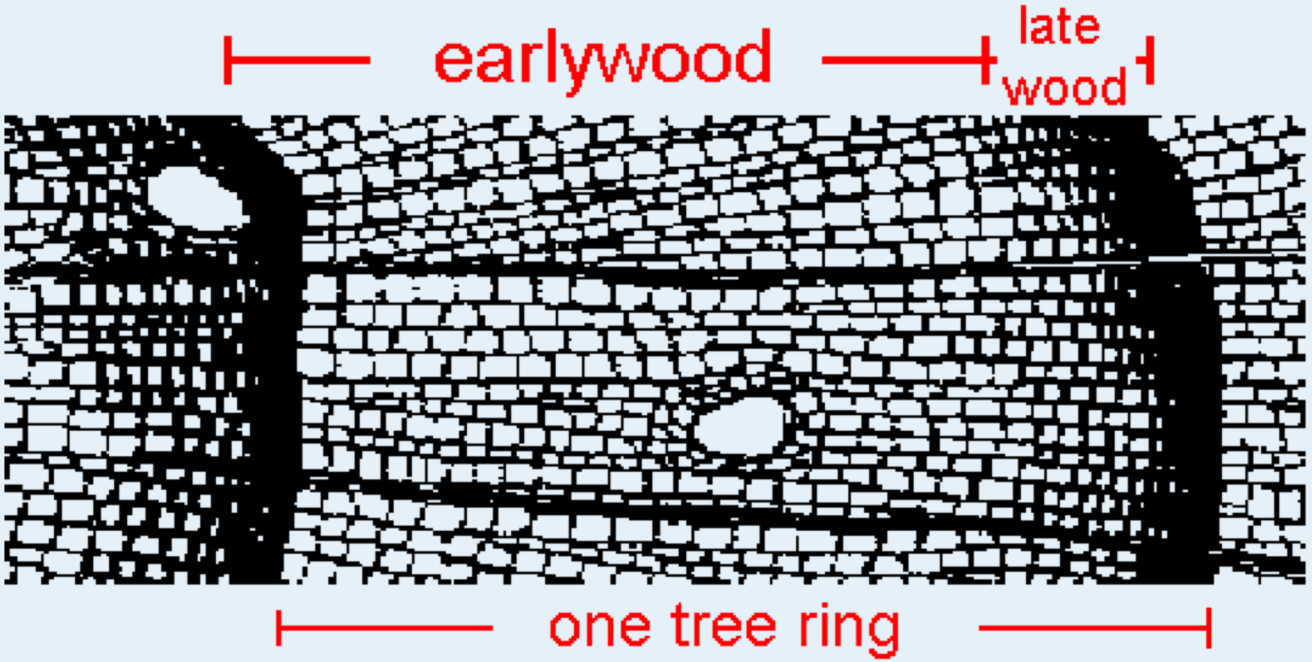


Anthropogenic warming and sea level rise would continue for centuries, even if greenhouse gas concentrations were to be stabilized.

Precipitation, Medicine Hat,1884-2002
Departures from the mean (~ 330 mm)






earlywood
late wood
one tree ring




University of Regina Tree Ring Lab

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- Presentations
- Press
- Publications
- Sites

INTRODUCTION

The PARC U of R Tree-Ring Lab is housed with the Prairie Adaptation Research Collaborative (PARC), a climate change research center at the University of Regina (U of R). Researchers in our lab have built a network of tree-ring chronologies that span the montane, boreal and island forests of Alberta, Saskatchewan, and the Northwest Territories and northern Montana and North Dakota. In this predominantly sub-humid region, in the rainshadow of the Rocky Mountains, annual tree growth is limited mostly by available soil moisture. Thus our moisture-sensitive tree-ring chronologies are proxies of seasonal and annual hydroclimate and hydrology. They have been applied to the reconstruction of precipitation, drought indices, stream flow, and groundwater levels. The inter-annual to multi-decadal variability in hydroclimate recorded by the tree rings informs our understanding of the climate of the western interior, projections of future climate, reference hydrology and climate derived from instrumental records, and conventional water management and planning that assumes a sufficient and stationary water supply.

Prairie Adaptation Research Collaborative

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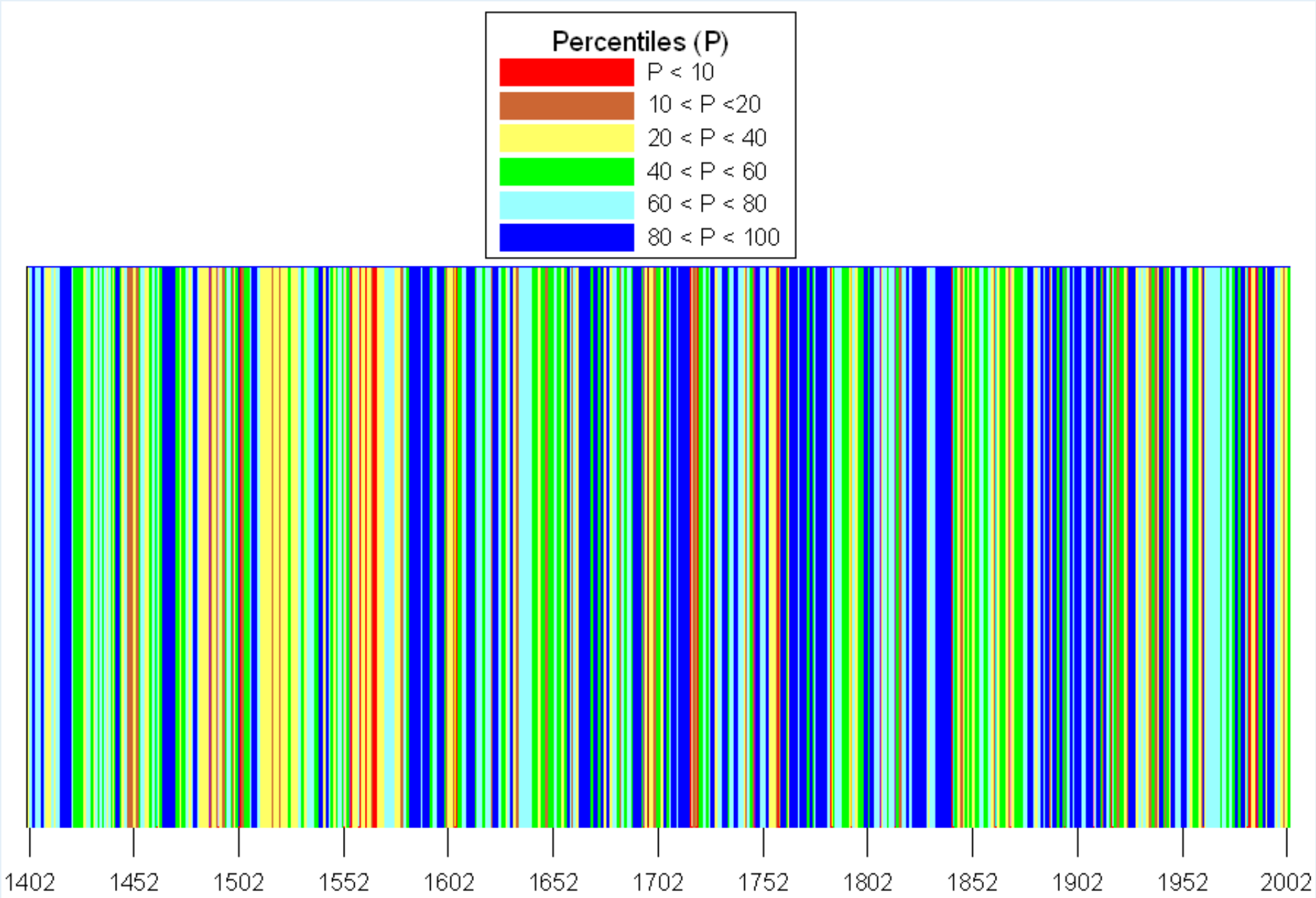
PRAIRIE ADAPTATION RESEARCH COLLABORATIVE

South Saskatchewan River at Medicine Hat, 1402-2004



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

CHAPTER 7
Prairies

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Canadian Disaster Database

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

2. **Freezing rain: Ontario to New Brunswick, 1998**
   Ontario to New Brunswick, Jan 6-10 1998. Freezing rain (50 to >100mm) fell in a corridor extending from Kingston-to Ottawa-to Montréal to the Monteregie area south... more information.
   Dead: 28 Injured: 945 Evacuated: 600000

3. **Drought: Prairie Provinces to ON, 1988**
   Prairie provinces and Central and Southern ON, Jul 5-11 1988. . Drough 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

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

13. **Flood: Southern MB, 1997**
    Assiniboine, Red and Winnipeg Rivers MB, May 1997. Over 7000 military personnel were employed for 36 days to assist in preventing flood damage and in relocating... more information.
    Dead: 0 Injured: 0 Evacuated: 25447

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

15. **Tornado: Edmonton AB, 1987**
    Edmonton AB, Jul 31 1987. 27 dead, 600 injured, 1700 homeless; widespread heavy rainfall from a powerful tornado hit Edmonton on July 31,1987; 300 mm of rain fell... more information.
    Dead: 27 Injured: 600 Evacuated: 1700

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.
    Dead: 0 Injured: 0 Evacuated: 0

http://www.publicsafety.gc.ca/res/em/cdd/index-eng.aspx

Adaptive Capacity

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

Institutional Adaptation to Climate Change: A comparative study of dryland river basins in Chile and Canada

SSHRC MCRI Project, 2004-09, $2.54 M
Principal Investigator: Dr. Harry Diaz, Regina

Prairie Drought and Community Adaptation
SSHRC Canadian Environmental Issues Program
Principal Investigator: Dr. Harry Diaz, Regina

George & Dora Sowchyn were old-timers of the Dutch Settlement when this was taken in 1965, two years before their deaths. They had seen a life of hard work: he in the mines, and she with their nine children.

Adaptation:
adjustments in practices, processes, or structures of systems to projected or actual changes of climate (IPCC, 2001).

- EPCOR Water Services Inc. (EWSI) provides water, wastewater, and distribution services to over one million people in more than 50 communities across Western Canada.

- EWSI utilizes an Integrated Resource Planning (IRP) approach for the development of capital and operational plans for the Edmonton water system.

- Traditional planning would **consider flow characteristics of the raw water streams as "knowns"** in the system.

Source: Climate Change – Potential IRP Impact areas

6-9 Heavy Oil Upgraders planning to locate in the [Edmonton] Industrial Heartland

20-30,000 cubic metres per day each (assuming evaporative cooling)

Water Sources

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

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 CANADIAN PRESS *27/11/08*

Saskatchewan could see a nuclear power plant on its sweeping horizon after a new study by Bruce Power identified a region in the province's northwest as a good spot to build. Duncan Hawthorne, Bruce Power's president and chief executive officer, said 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 …

On May 2nd [1796] William Tomison wrote to James Swain that furs could not be moved as **“there being no water in the river.”**

North Saskatchewan River at Edmonton

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

Past and Future Hydroclimatic Variability: Applications to Water Resource Management in the Prairie Provinces

Canmore, Alberta
16 – 18 March 2008
Radisson Hotel and Conference Center

Government of Canada's Climate Change Impacts and Adaptation Program

Canada

PARC

WWCRC
Understanding Climate Change

Agriculture and Agri-Food Canada

Agriculture et Agroalimentaire Canada

Manitoba Hydro

Alberta Environment

Prairies Regional Adaptation Collaborative

Name of proposed Regional Adaptation Collaborative: Prairies Regional Adaptation Collaborative

Designated point of contact: Norm Henderson, Executive Director, Prairie Adaptation Research Collaborative (PARC), University of Regina

On behalf of the co-proponents, the Governments of Alberta, Saskatchewan and Manitoba

- **Alberta** – Harry Archibald, Senior Advisor, Adaptation; Climate Change, Air and Land Policy Branch, Alberta Environment
- **Saskatchewan** - Wayne Gosselin, Senior Advisor, Climate Change Adaptation, Corporate Policy and Planning Branch, Ministry of Environment
- **Manitoba** - Randall Shymko, Project Officer, Climate Change & Green Strategy Initiatives; Science, Technology, Energy and Mines

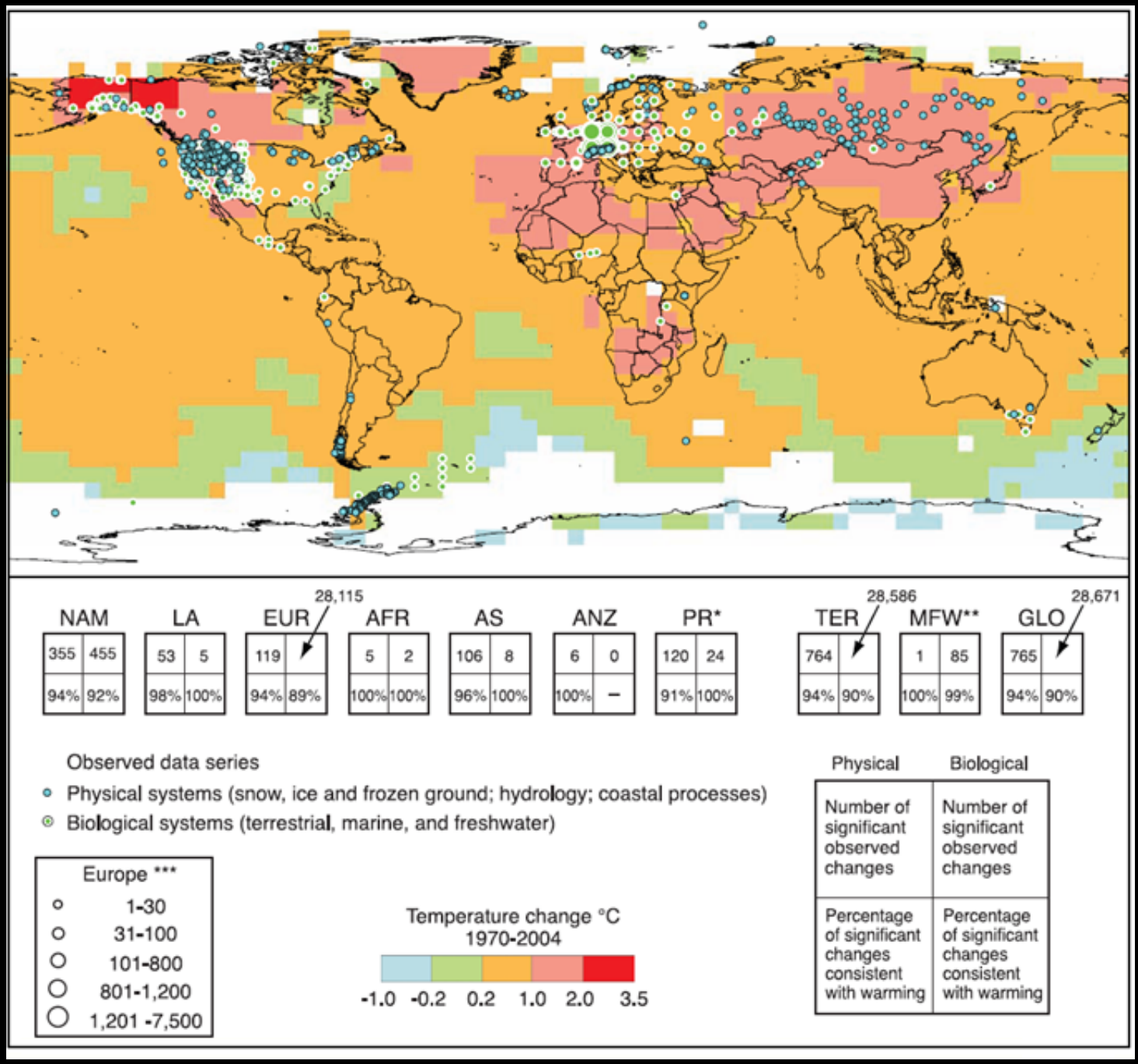
Water Security & Community Solutions Network (WSCSNet): Proposed NCE

science in the service of community and governance

interdisciplinary teams of researchers, in partnership with community decision makers and local industries, to develop solutions to community challenges as they attempt to address future water demands

Proposed Prairies Node: PARC

Observed changes in physical and biological systems (IPCC 2007)



Time to Tap Climate Change-Combating Potential of the World's Ecosystems

Nature's Mitigation and Adaptation Engine

http://www.unep.org/greeneconomy/

Changes in the distribution to water supplies

Future climates are outside the range of natural variability

We are losing the advantage of a cold winter