

Climate Change and the Protection of Wilderness

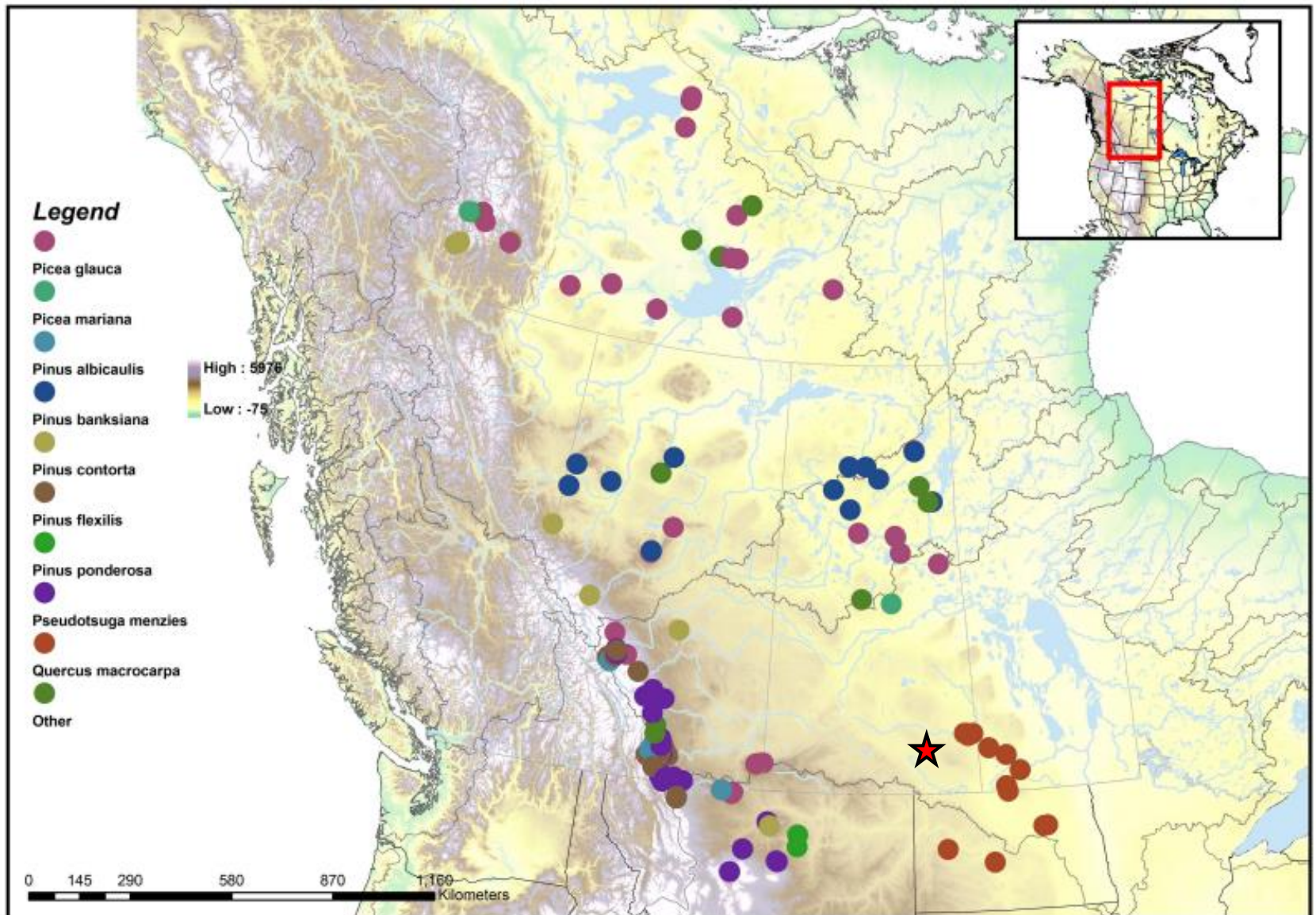
Dave Sauchyn, Prairie Adaptation Research Collaborative, University of Regina



CPAWS SAB AGM, 10 September 2013



University of Regina PARC Tree-Ring Lab Network



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Alberta ranchers reach deal to protect historic landscape

Agreement with Nature Conservancy will protect Waldron Ranch from development

CBC News Posted: Sep 9, 2013 12:24 PM MT | Last Updated: Sep 9, 2013 1:49 PM MT











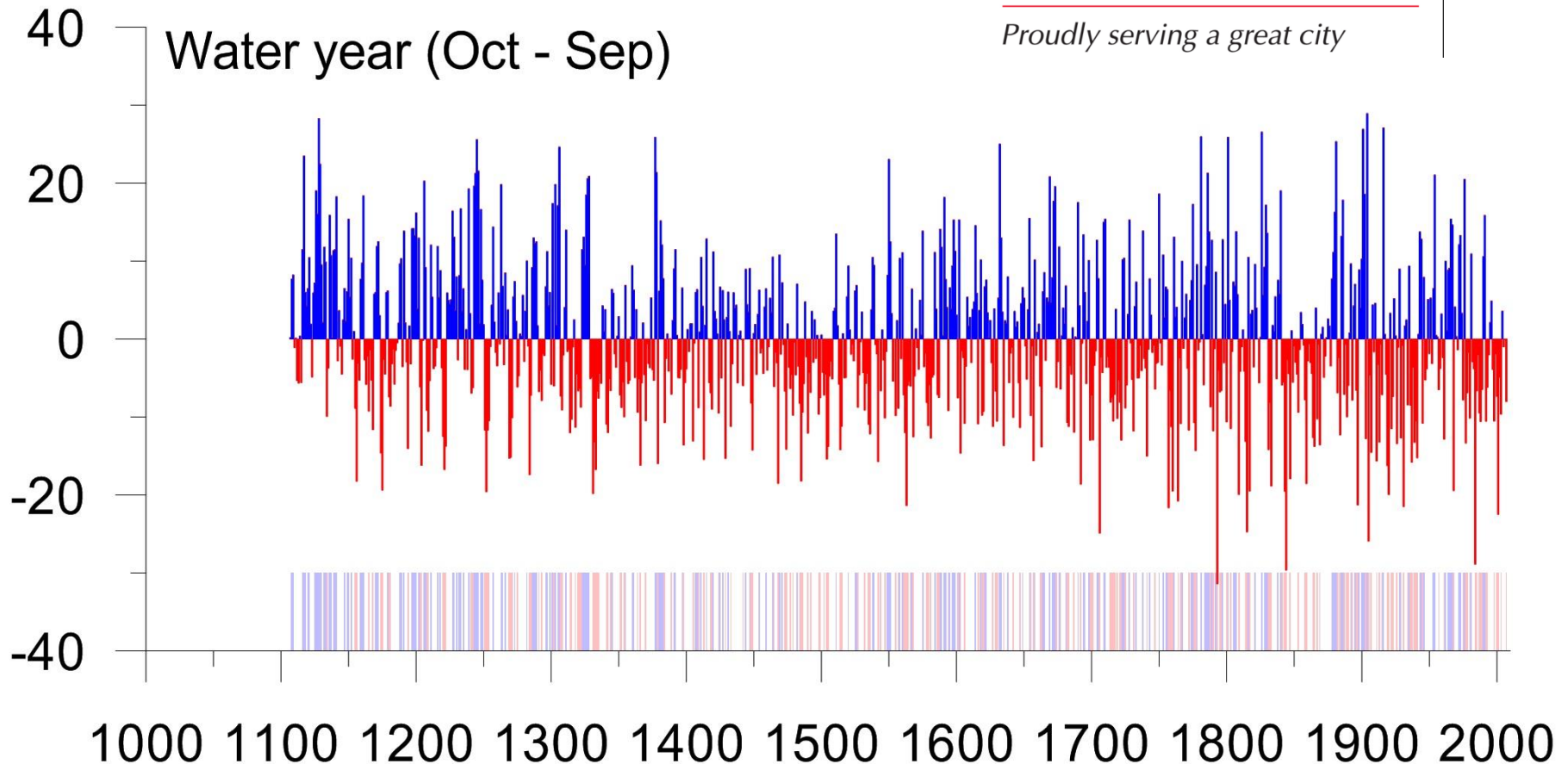




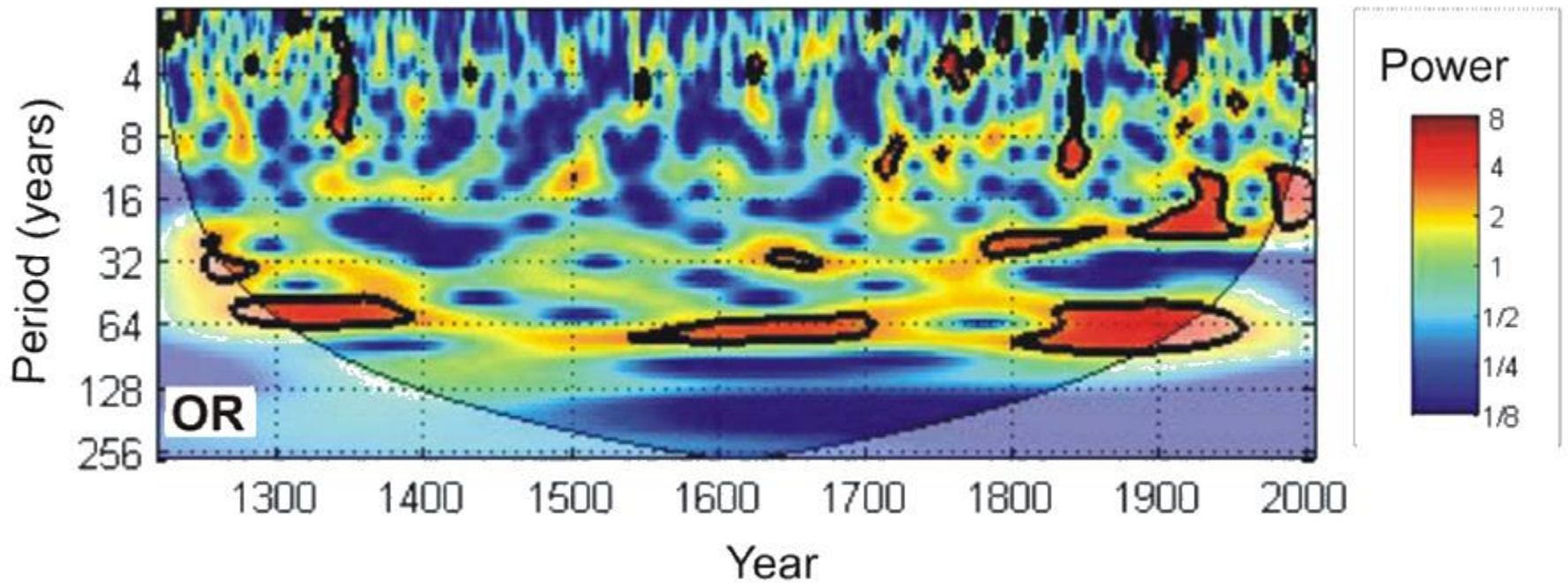
Mean annual flow (m³/s), Bow River at Calgary, 1107-2007

THE CITY OF
CALGARY

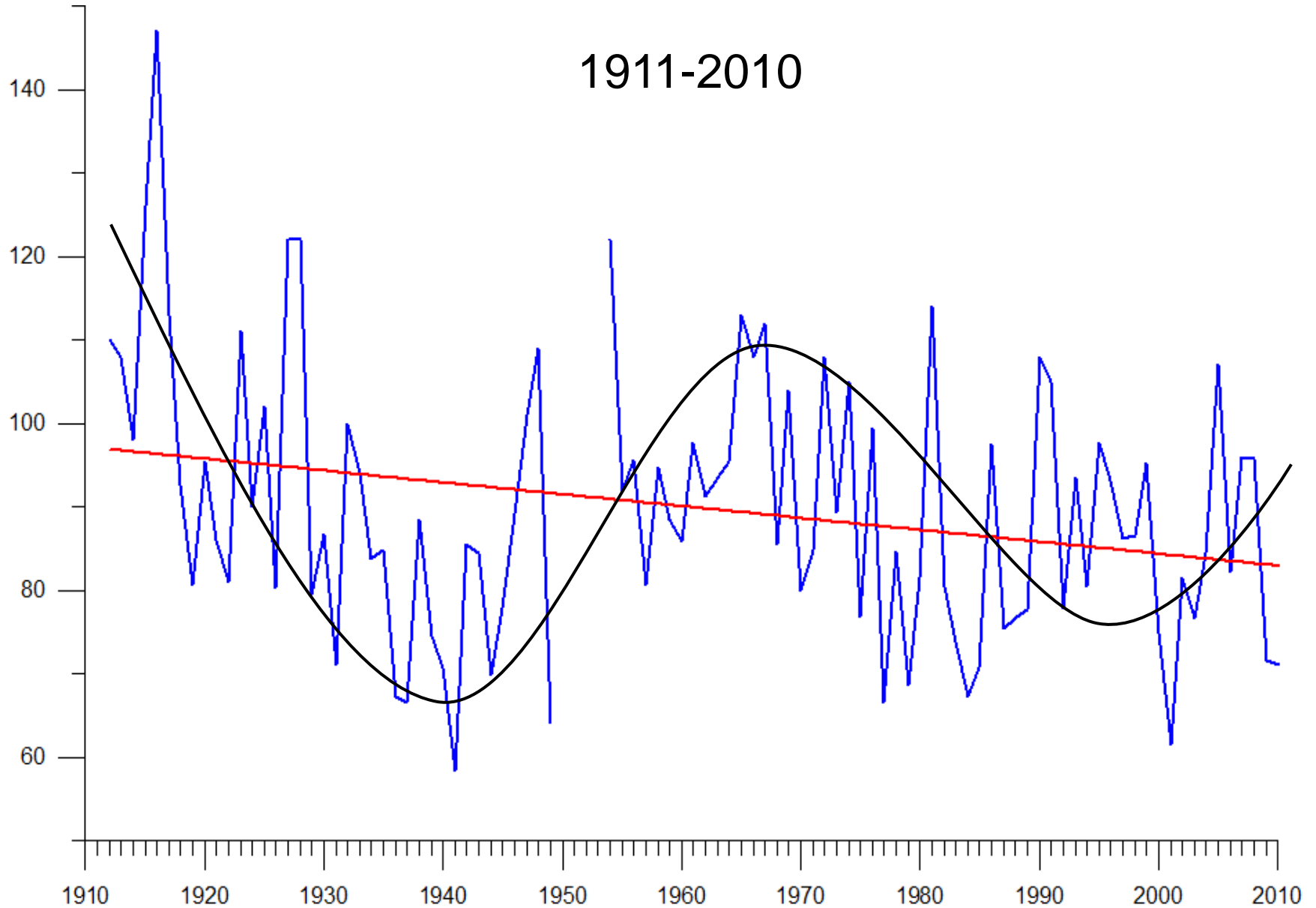
Proudly serving a great city



Cycles in the tree rings



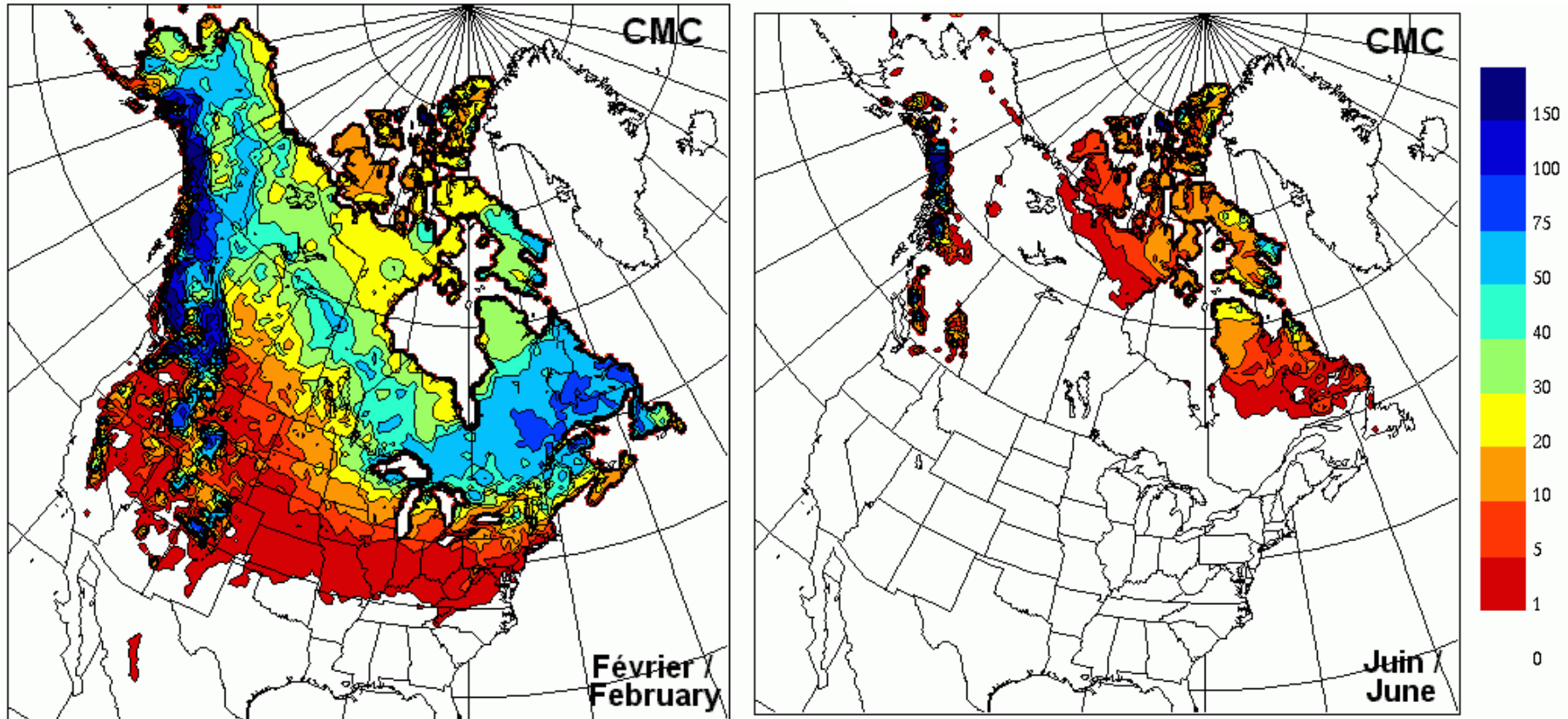
Mean Annual Flow ($\text{m}^3 \text{sec}^{-1}$), Bow River at Calgary



We are losing the advantage of a cold winter



Mean Snow Depth, 1979-96



Brown et al. 2003; www.ccin.ca/cms/en/socc/snow/snowAtlas.aspx



NOAA

National Climatic Data Center
National Oceanic And Atmospheric Administration



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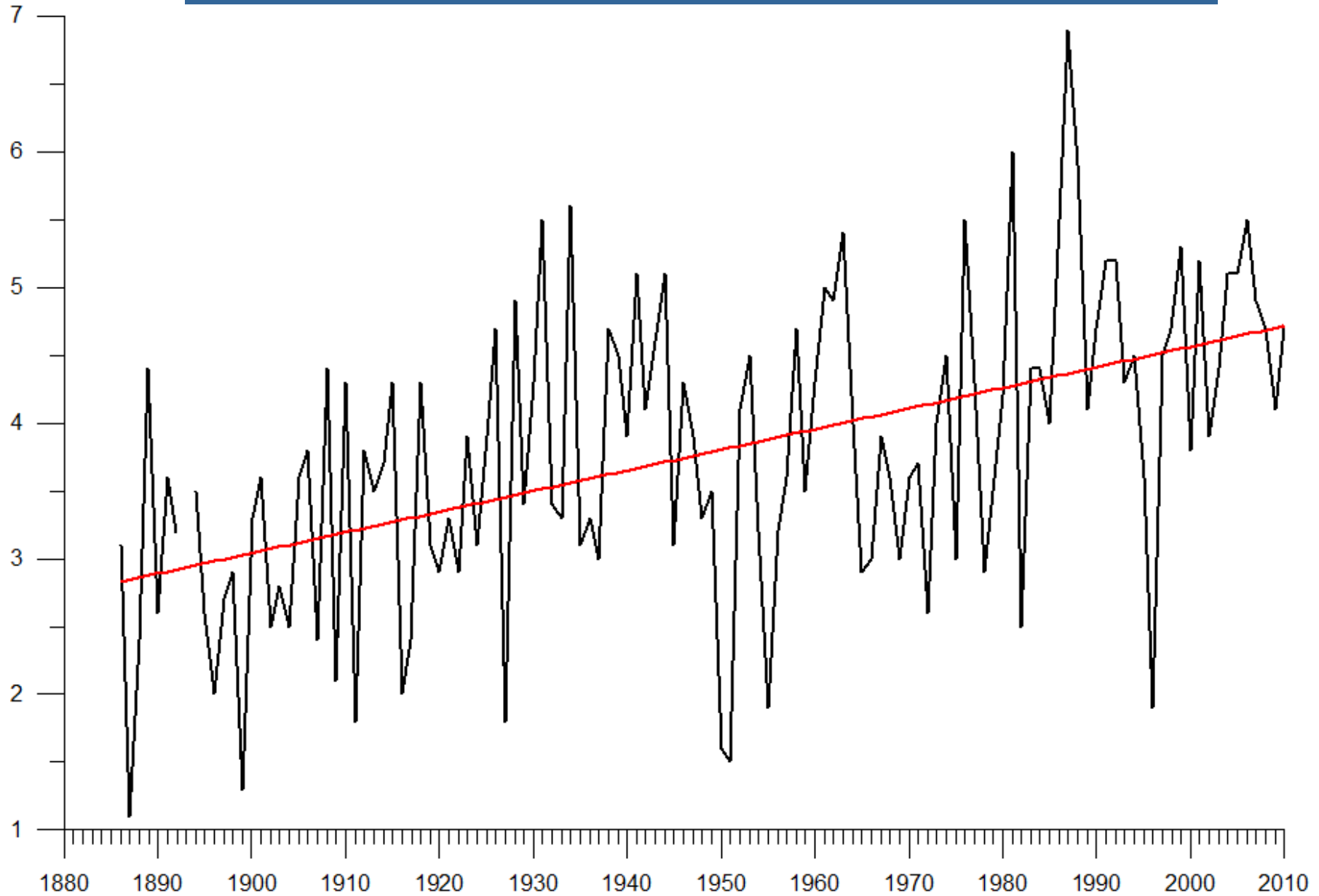
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July 2013 was the 341st consecutive month (more than 28 years) with a **global** temperature above the 20th century average.

Every month has been warmer than average since May, 1985.

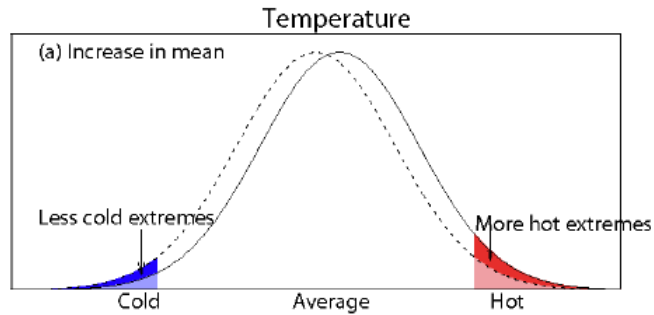
Mean Annual Temperature ($^{\circ}$ C), Calgary, 1885-2010



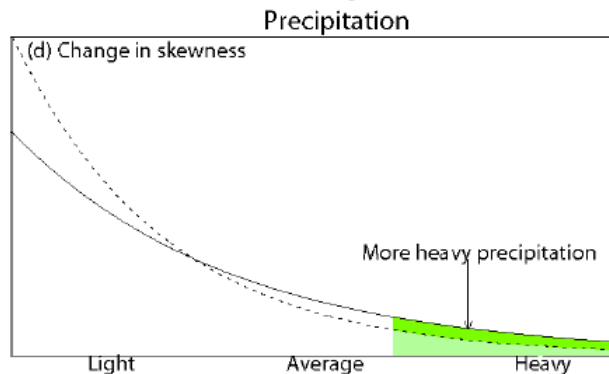
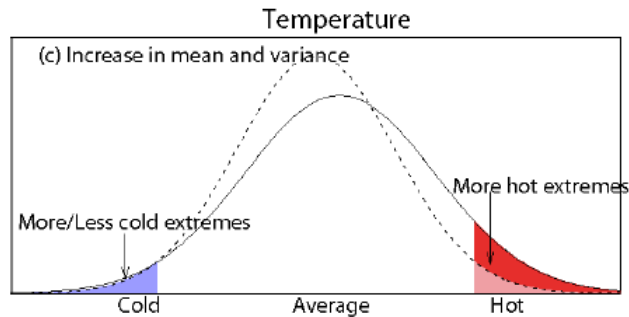
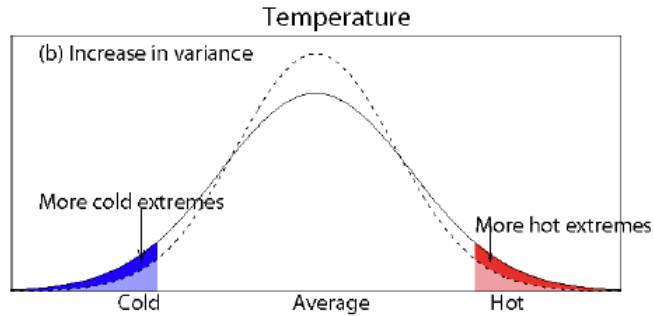


Climate is the statistics of weather

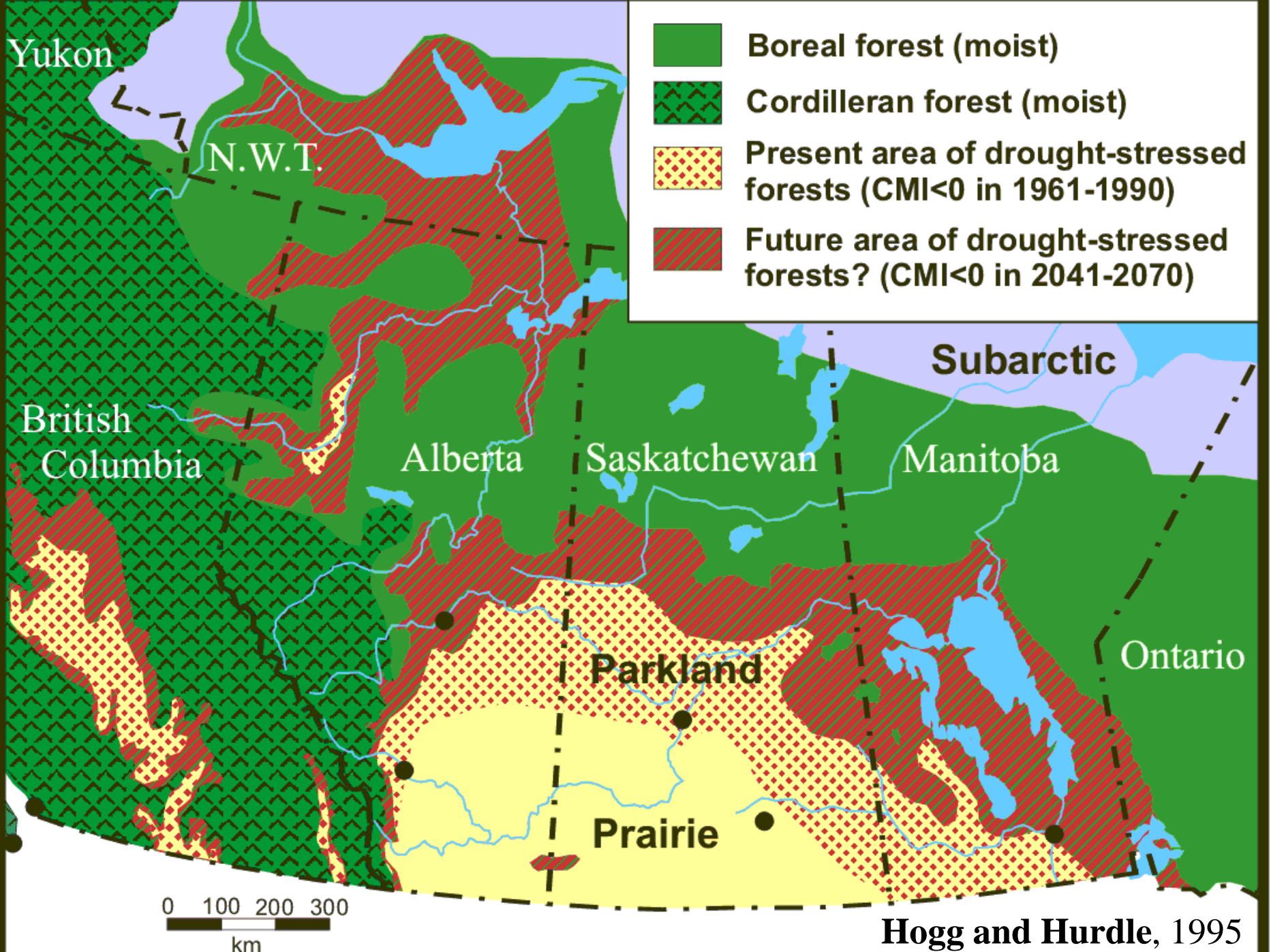
Therefore **climate change** is a shift in the statistics: the average and/or the variability



..... past
—— future



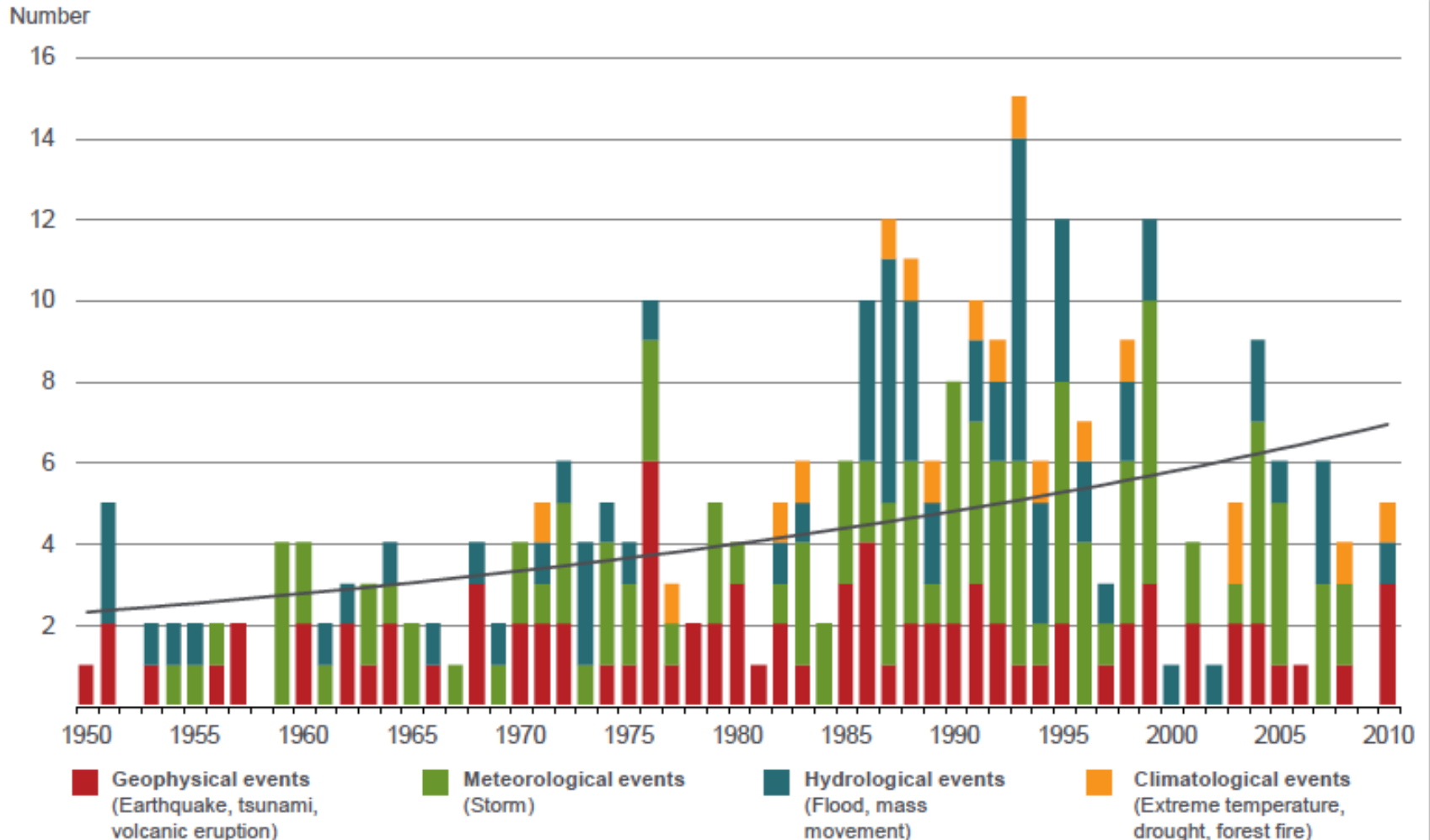
Source: IPCC



Hogg and Hurdle, 1995

Great natural catastrophes worldwide 1950 – 2010

Number of events with trend

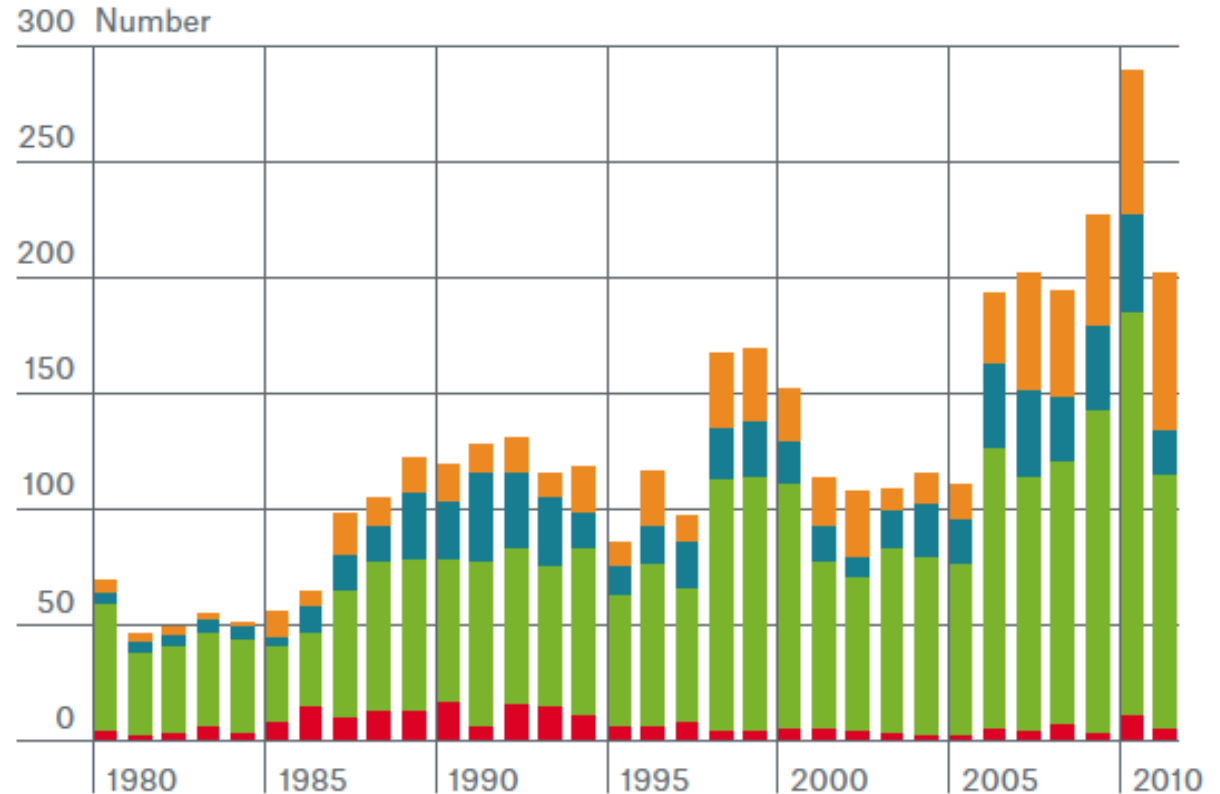


Munich Reinsurance (2012) Severe weather in North America

Natural catastrophes in North America 1980-2011: Number of events

- Geophysical events
- Meteorological events
- Hydrological events
- Climatological events

Source: Munich Re, NatCatSERVICE



Vulnerability and Adaptation to Climate Extremes in the Americas (VACEA)

Vulnerabilidad y Adaptación a los Extremos
Climáticos en las Américas

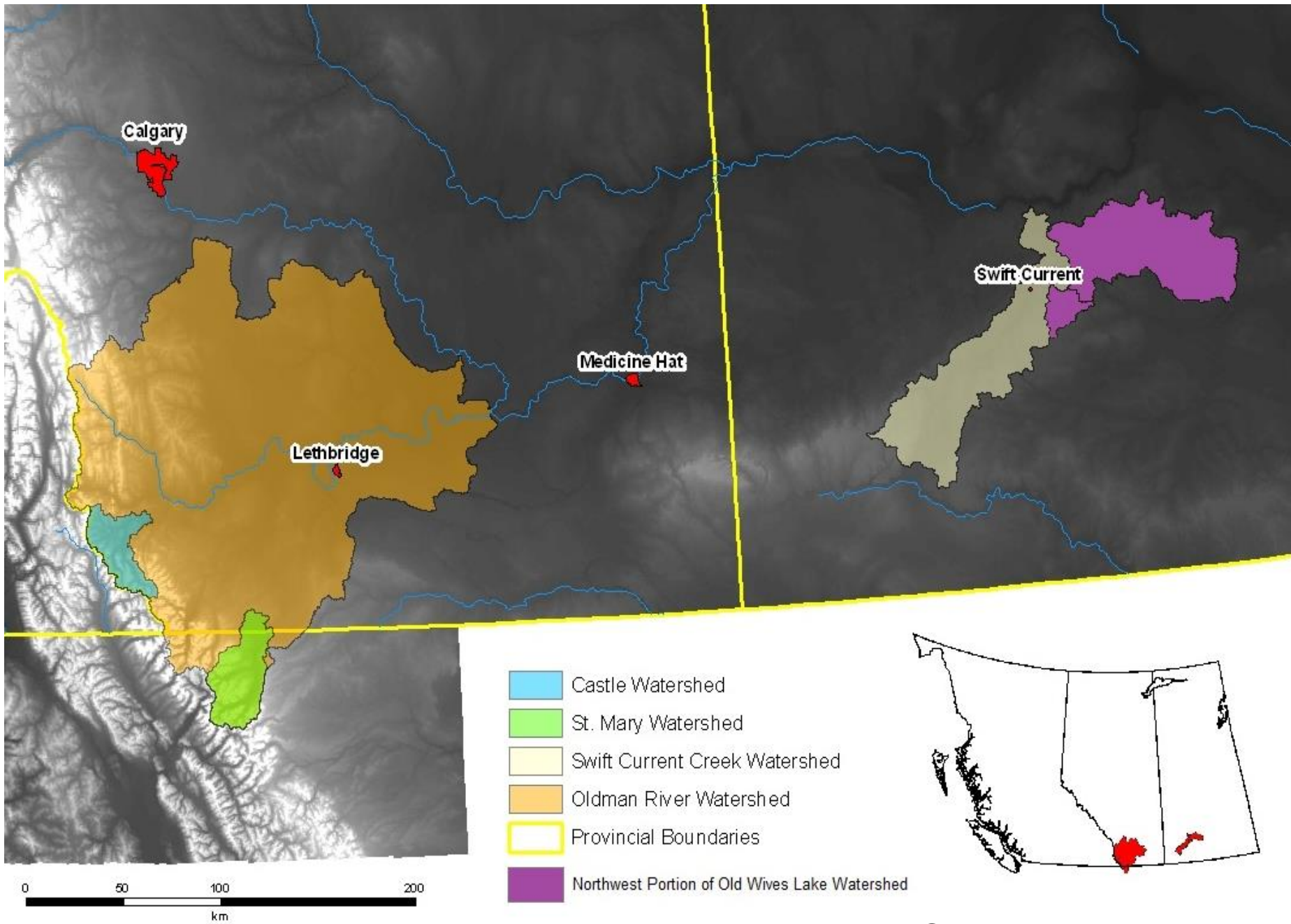


Principal Investigators:

Los investigadores principales

Dr. Dave Sauchyn, University of Regina, Canada
Dr. Fernando Santibañez, Universidad de Chile, Santiago

www.parc.ca/vacea/

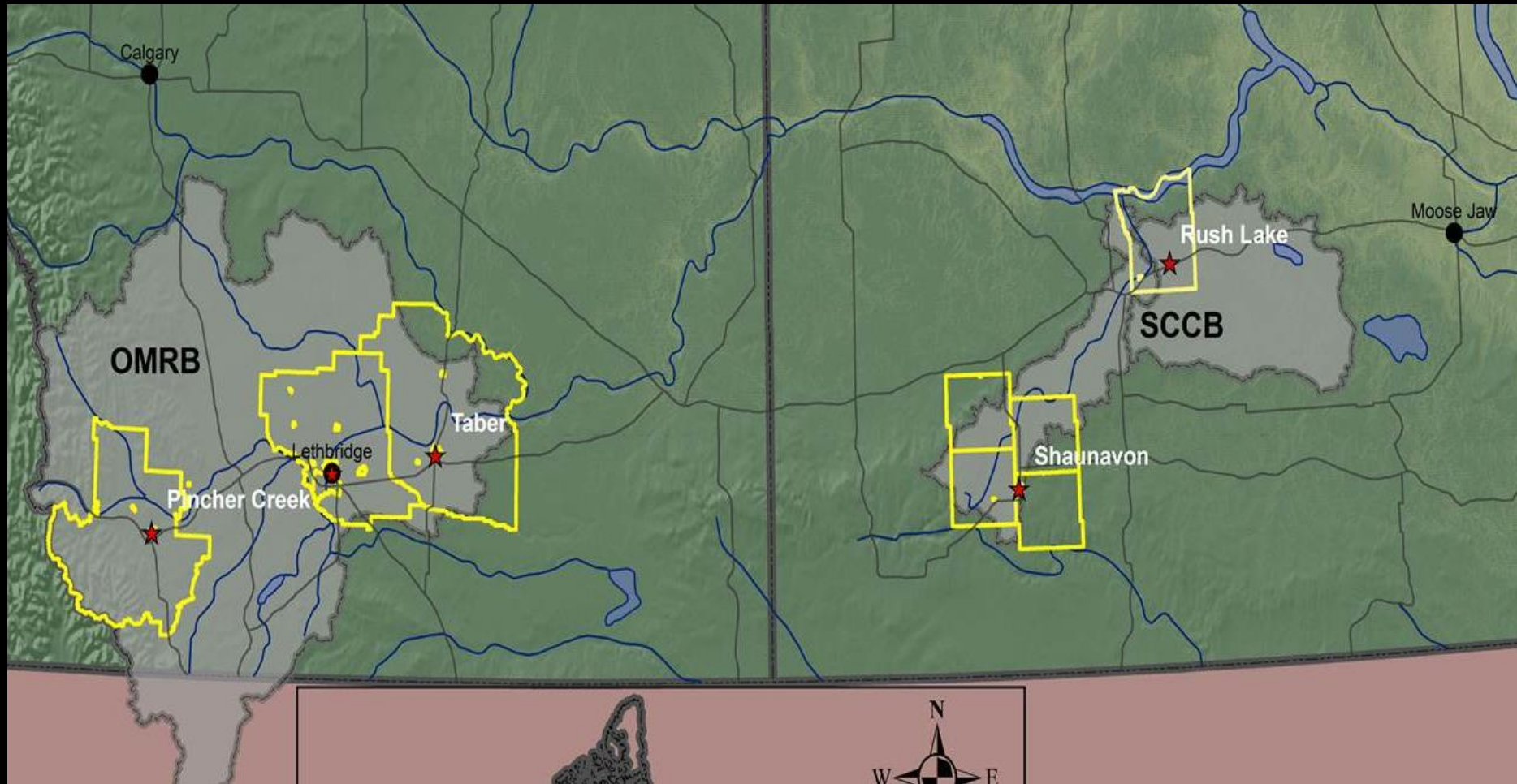


Source: Kienzle 2011

Research Sites (Watersheds)

	River basin	Location	Size (km ²)	Extreme climate events	Agricultural production
Brazil	Ararangua	southern Brazil	3,020	hurricanes, hail and tornadoes, heat stress	rice, fruits, vegetables, cattle
Colombia	Chinchiná	central Andes	1,135	droughts, floods, storms, avalanches	coffee, sorghum, maize, rice, cattle
Argentina	Mendoza	eastern Andes	17,821	droughts, hailstorms, heat stress	fruits, horticulture, goats
Chile	Choapa	northern Chile	8,124	droughts, floods, mudslides, frost, heat	fruits, horticulture, flowers, goats
Canada	Oldman	southern Alberta	26,700	droughts , floods,	grains, pulses, forage, vegetables, cattle
	Swift Current	southern Saskatchewan	5,592	droughts , floods	grains, pulses, forage, , cattle

Study “Communities”



Community Vulnerability Assessment – 170 Interviews

Rush Lake, SK	<p>Concerns about PFRA divestiture in dams</p> <p>“Scattered” community (Swift Current / Herbert)</p>
Shaunavon, SK	<p>Oil industry: generally positive perception (e.g. \$, assist with emergency response)</p> <p>Concern re: lack of health care providers</p>
Pincher Creek, AB	<p>Environmental awareness, debate over industrial development</p>
Taber, AB / Lethbridge, AB	<p>Strong individualism</p> <p>Role of religion</p> <p>Drought 2001-2 led to local-level co-operation on water rights; government presence</p> <p>Continuous improvement of irrigation technology</p> <p>Strong County of Lethbridge involvement in agri-environmental practices</p>
Blood Tribe	<p>?</p>

VACEA - Objective

The overall objective is to improve the understanding of the **vulnerability of rural agricultural and indigenous communities** to shifts in climate variability and to the frequency and intensity of extreme climate events, and to **engage governance institutions** in Canada, Argentina, Brazil, Chile and Colombia in enhancing their adaptive capacity **to reduce rural community vulnerability.**





Increasing the resilience of natural systems is a standard goal of **conservation**; intact ecosystems have more resources for withstanding stresses.

BUYING TIME :

A User's Manual for Building Resistance and Resilience to
Climate Change in Natural Systems
(*WWF 2003*)

1. PROTECT ADEQUATE AND APPROPRIATE SPACE

Ecosystems with high biodiversity and those that maintain crucial structural components are thought to recover more easily from climatic disturbances. Traditional conservation methods such as **creating protected areas** will thus have another justification in the next several decades.

... Planning reserves will now require an eye for potentially dramatic future changes in protected areas; **thinking about not only current but future configurations** of habitats, communities, and ecosystems.

2. LIMIT ALL NON-CLIMATE STRESSES

To support ecosystem resilience you must **reduce the number of simultaneous insults** faced by that ecosystem. [Climate change tends to amplify adverse impacts of other stressors.]

3. USE ACTIVE ADAPTIVE MANAGEMENT AND STRATEGY TESTING

Given uncertainty about the exact nature of ecosystem impacts of and responses to climate change, effective management will require a responsive and flexible approach. ... In instances where impacts are relatively clear, **active intervention to increase adaptive capacity** coupled with monitoring is necessary. Such intervention may include **assisted migration or reintroduction of species**, non-chemical control of pest or disease outbreaks, prescribed burning or other fire management strategies, ... controlling invasive species and decreasing nutrient-enhanced run-off ...

OR ... Let Nature Take its Course?

Does the **Anthropocene** deserve formal recognition as a subdivision of the Quaternary?

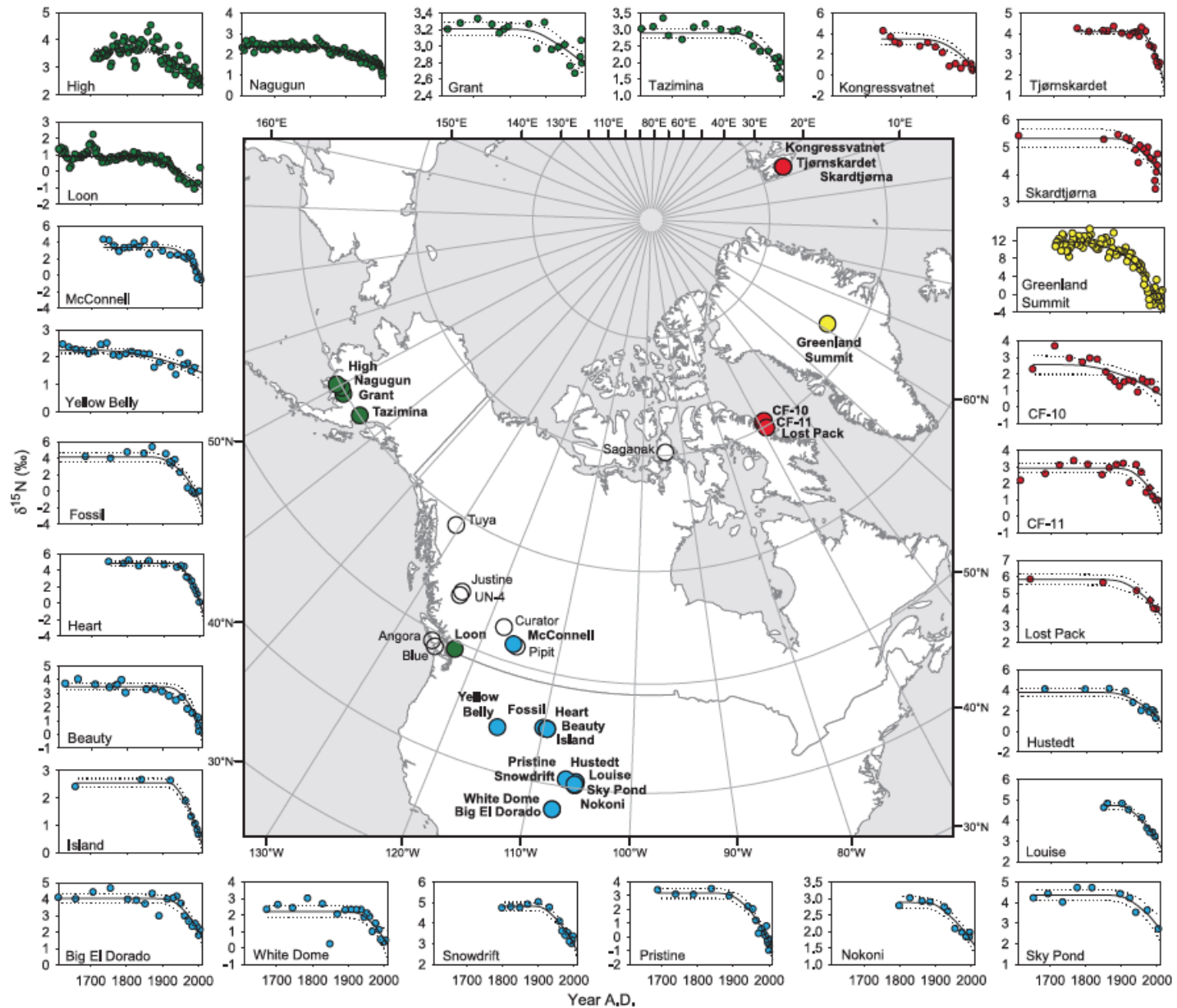
Alexander Wolfe, Professor of Earth and Atmospheric Sciences, University of Alberta

CANQUA Biennial Conference, August 22, 2013, Edmonton

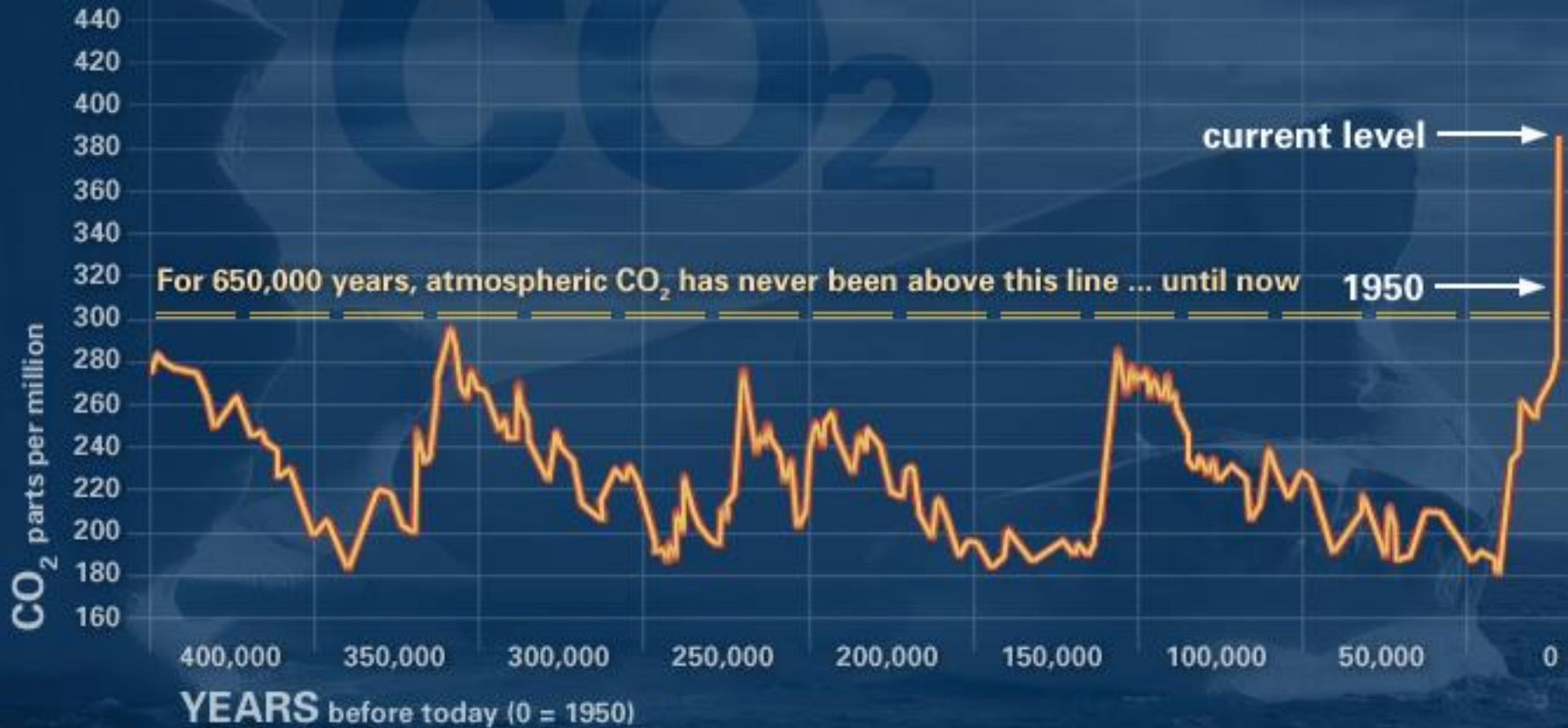
Abstract: A strong case can be made that **the Anthropocene** concept ... deserves formal recognition as **a new subdivision of geological time** within the Quaternary. While globally expressed stratigraphic fingerprints of the Anthropocene begin to appear in the geological record soon after the Industrial Revolution, they accelerate markedly in the latter half of the 20th century. This is precisely when **humanity's collective influence** becomes prominent through enhancement of the greenhouse effect, and other key biogeochemical cycles, become more firmly modulated by humans than the sum of natural processes.



Holtgrieve et al. (2011) A Coherent Signature of Anthropogenic Nitrogen Deposition to Remote Watersheds of the Northern Hemisphere



Atmospheric Carbon Dioxide



Source: NASA <climate.nasa.gov/evidence>



EARTH SCIENCE

Carbon dioxide hits levels not seen for three million years

JUSTIN GILLIS

The New York Times News Service

Published Friday, May. 10 2013, 7:32 PM EDT

Last updated Friday, May. 10 2013, 7:32 PM EDT

The level of the most important heat-trapping gas in the atmosphere, carbon dioxide, has passed **a long-feared milestone**, scientists reported Friday, reaching **a concentration not seen on the Earth for millions of years**.

Scientific monitors reported that the gas had reached an average daily level that **surpassed 400 parts per million** – just an odometer moment in one sense, but also a sobering reminder that decades of efforts to bring human-produced emissions under control are faltering.

