

Status of Drought Research in Manitoba Hydro

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Resource Planning & Market Analysis

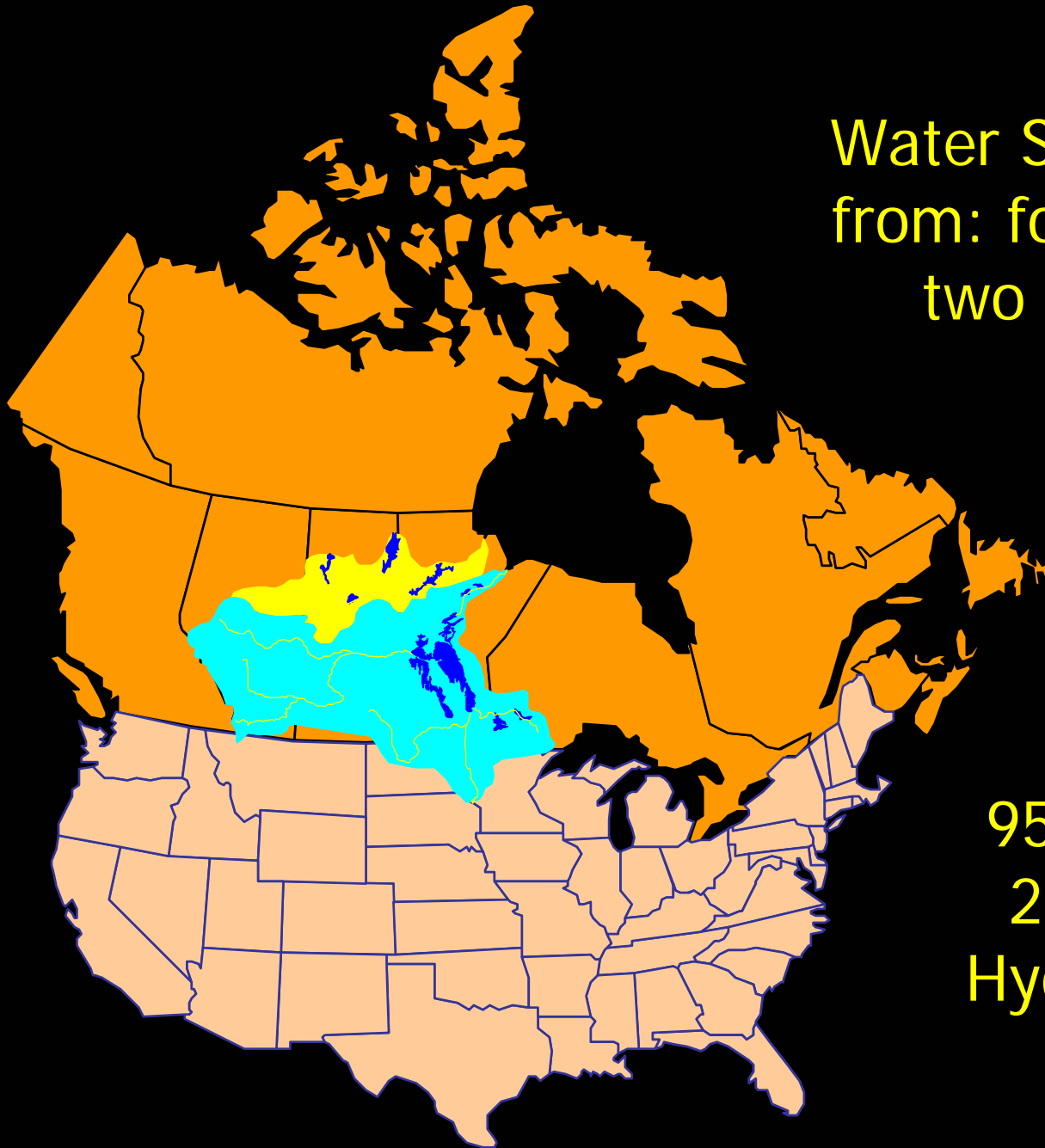
Manitoba Hydro

DRI Workshop Saskatoon

January 11th, 2006

Outline

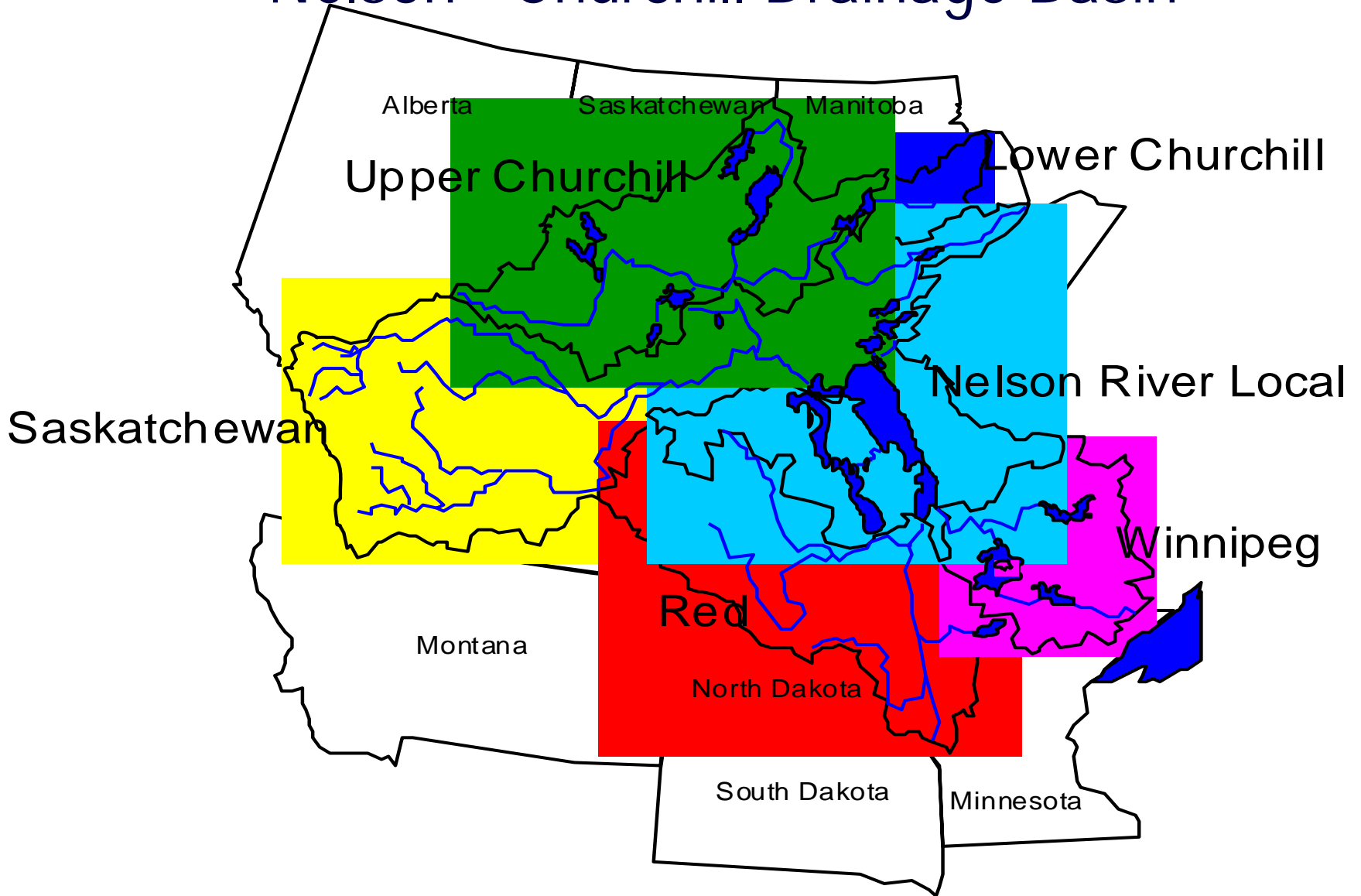
- Why Manitoba Hydro is funding drought research
- Ongoing & future drought research
- Increased variability 2002-03 drought
- Manitoba Hydro's role in DRI



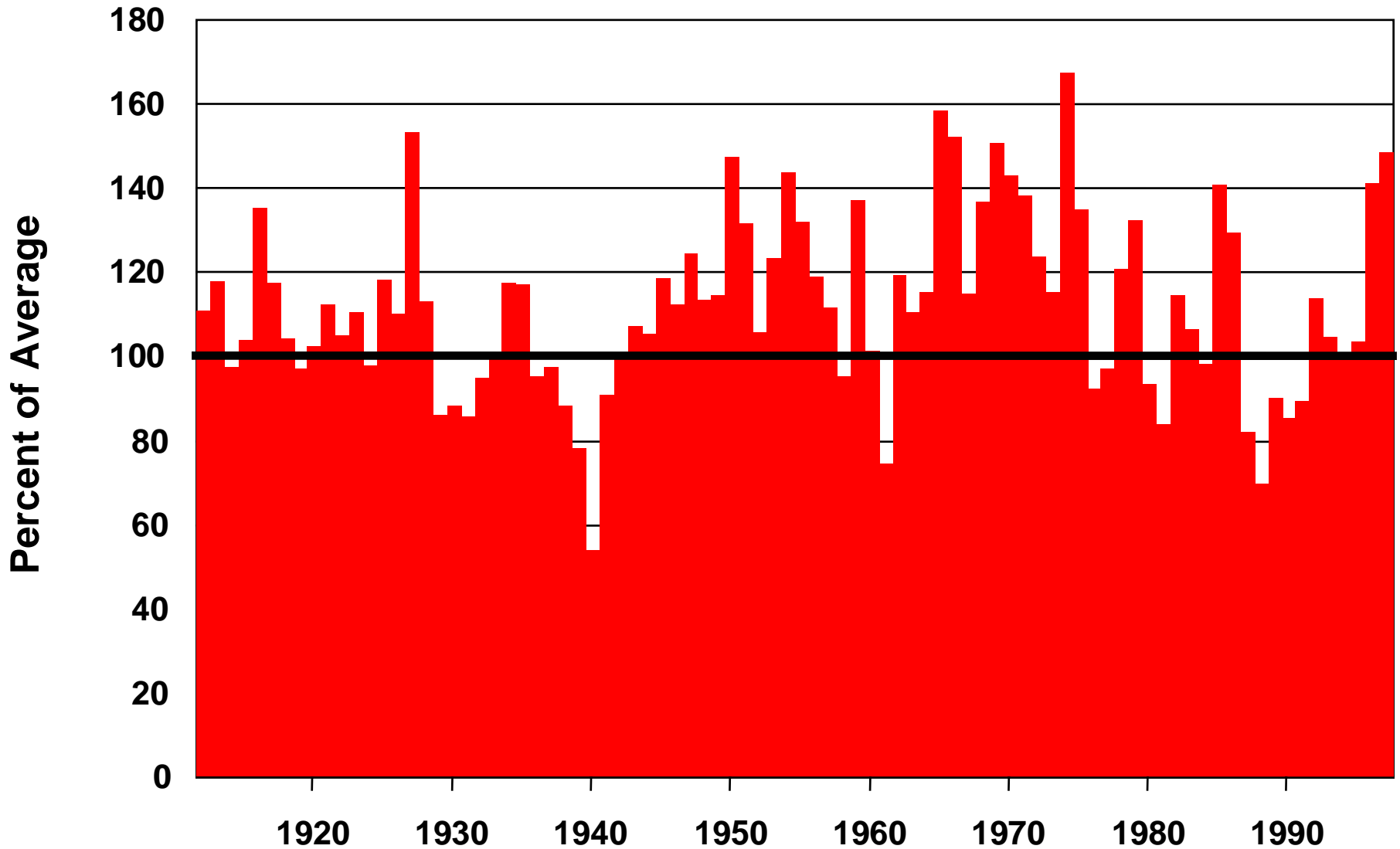
Water Supply comes
from: four Provinces
two US States

95% Hydro -
2nd only to
Hydro-Quebec

Nelson - Churchill Drainage Basin

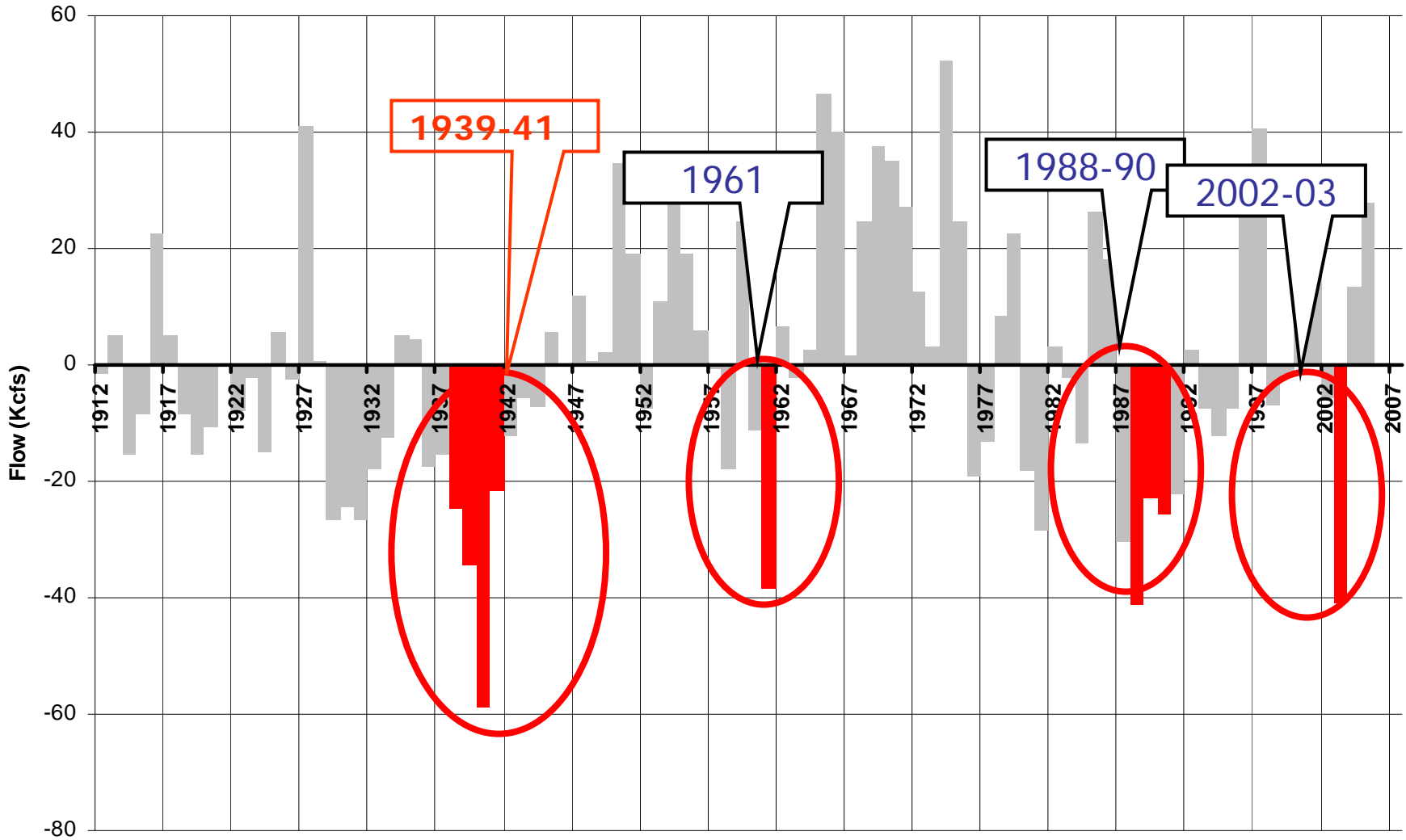


Nelson-Churchill Water Supply



Historical Drought of Record

Nelson-Churchill System Inflow



Planning Criteria for Supplying Load

Firm Capacity - minimum of 12% reserve capacity required over forecast peak load demand

Dependable Energy - have adequate energy resources to supply the firm energy demand in the event that the lowest recorded coincident river flow conditions are repeated.

Need for Drought Research

- Probability of current drought-of-record
- Probability of a system-wide drought of greater severity and frequency than the current drought-of-record.
- Impact of climate change on the severity and frequency of system-wide drought.

Ongoing Research

MH has provided over \$300K for research on drought probability and paleo research

- Statistical modelling of frequency of drought
- Paleo-climatic data (tree-rings & lake sediments) as proxy for climate of past centuries

Statistical Drought Research

Stochastic Model (SPIGOT)

- Generates multiple synthetic flow sequences from historical streamflow data.
- Computes energy potential using flow-to-power factors.
- Identifies *energy droughts* by computing energy deficits in synthetic series.
- Probabilistic analysis of synthetic vs. historical droughts.

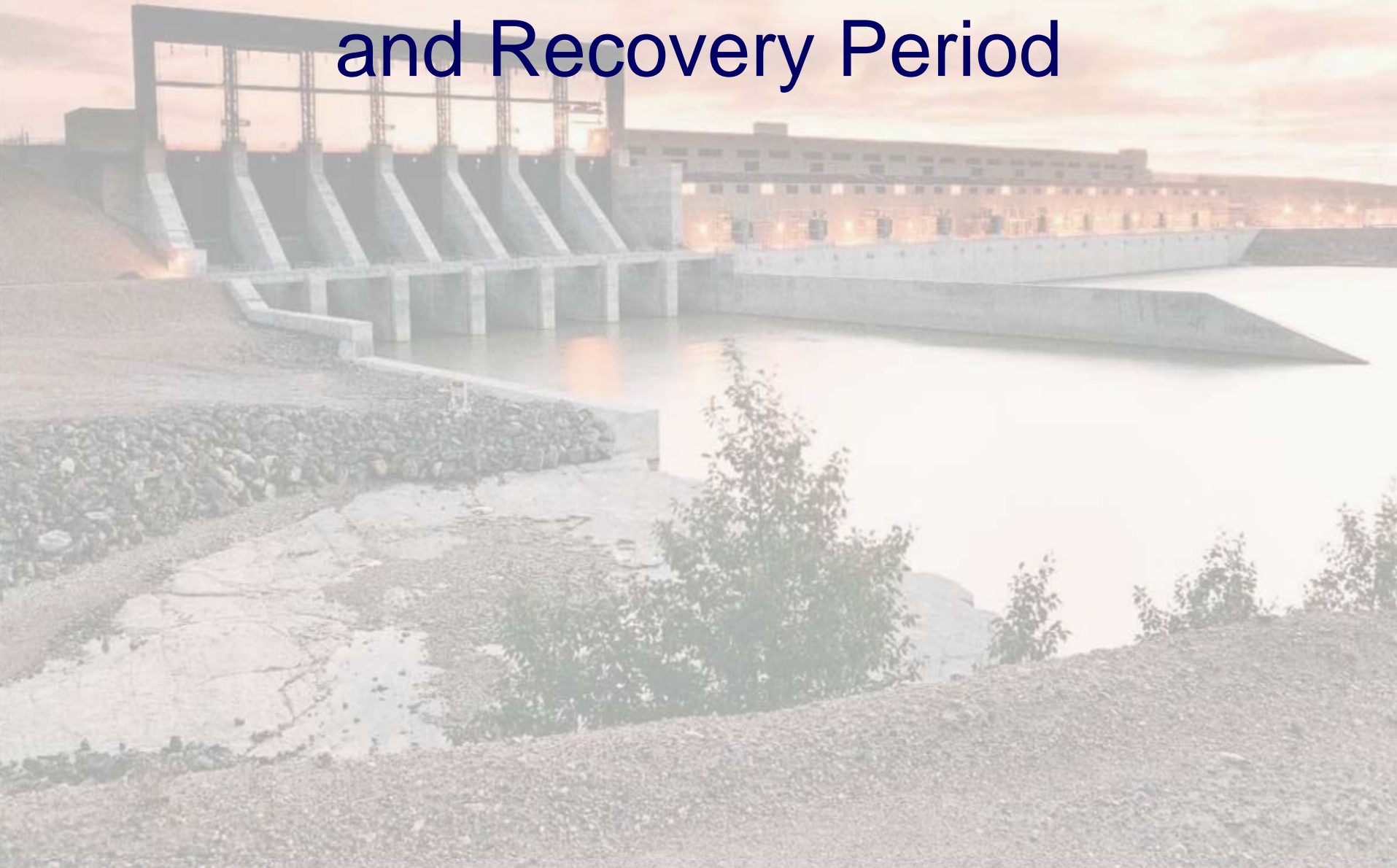
Paleo-Environmental Research

- Ongoing R&D Projects (add picture links
 - Tree-ring analysis- Churchill R (Sauchyn)
 - Tree-ring analysis- Wpg.R (St. George)
 - Isotope analysis of paleo data (Buhay)
 - Lake sediment analysis (Cumming)
- Climate Change Research Professorship at U Regina/ U of W

Future Work

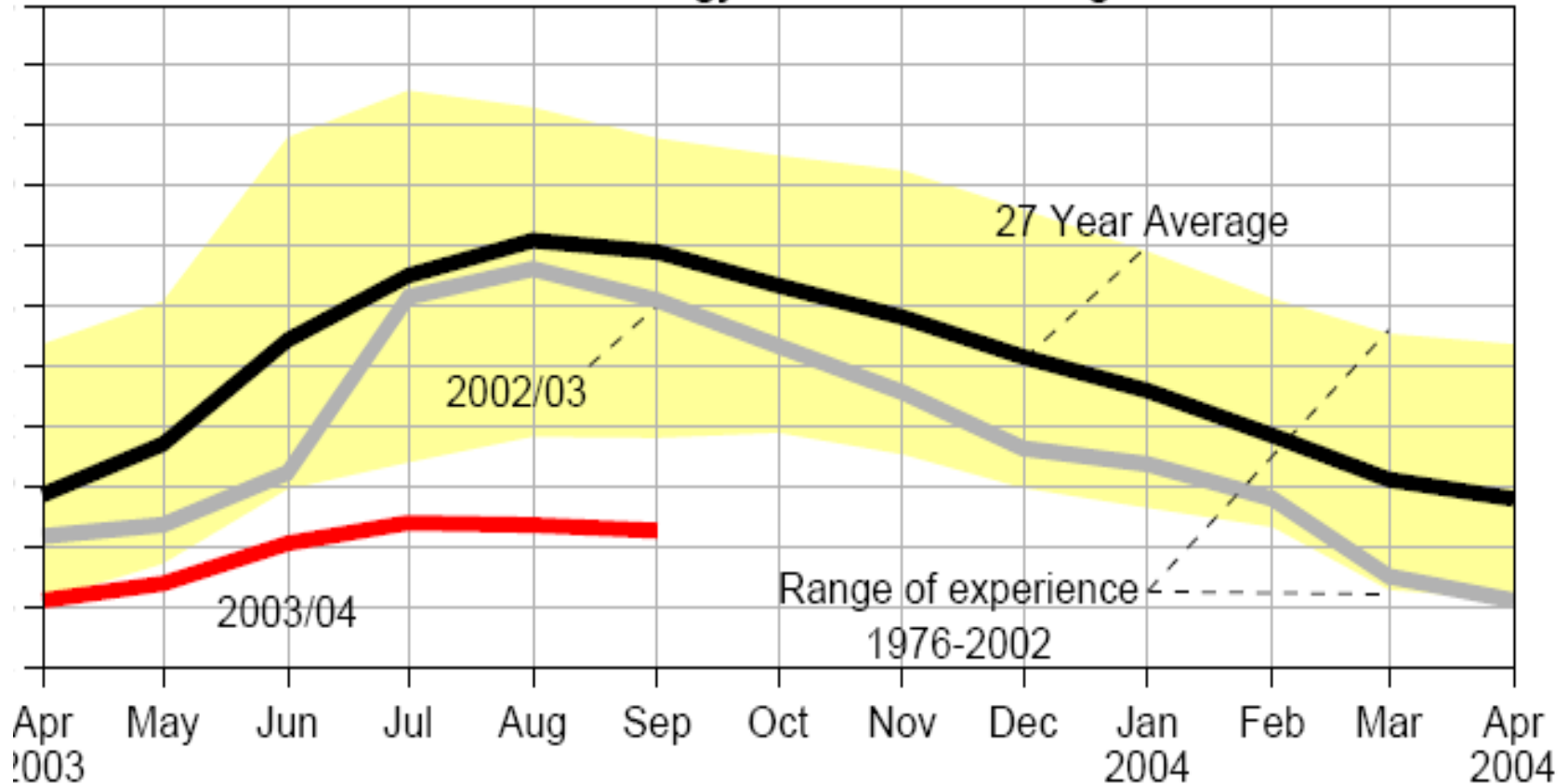
- Internal risk assessment & sensitivity analyses of more severe drought

2002-2003 Drought and Recovery Period



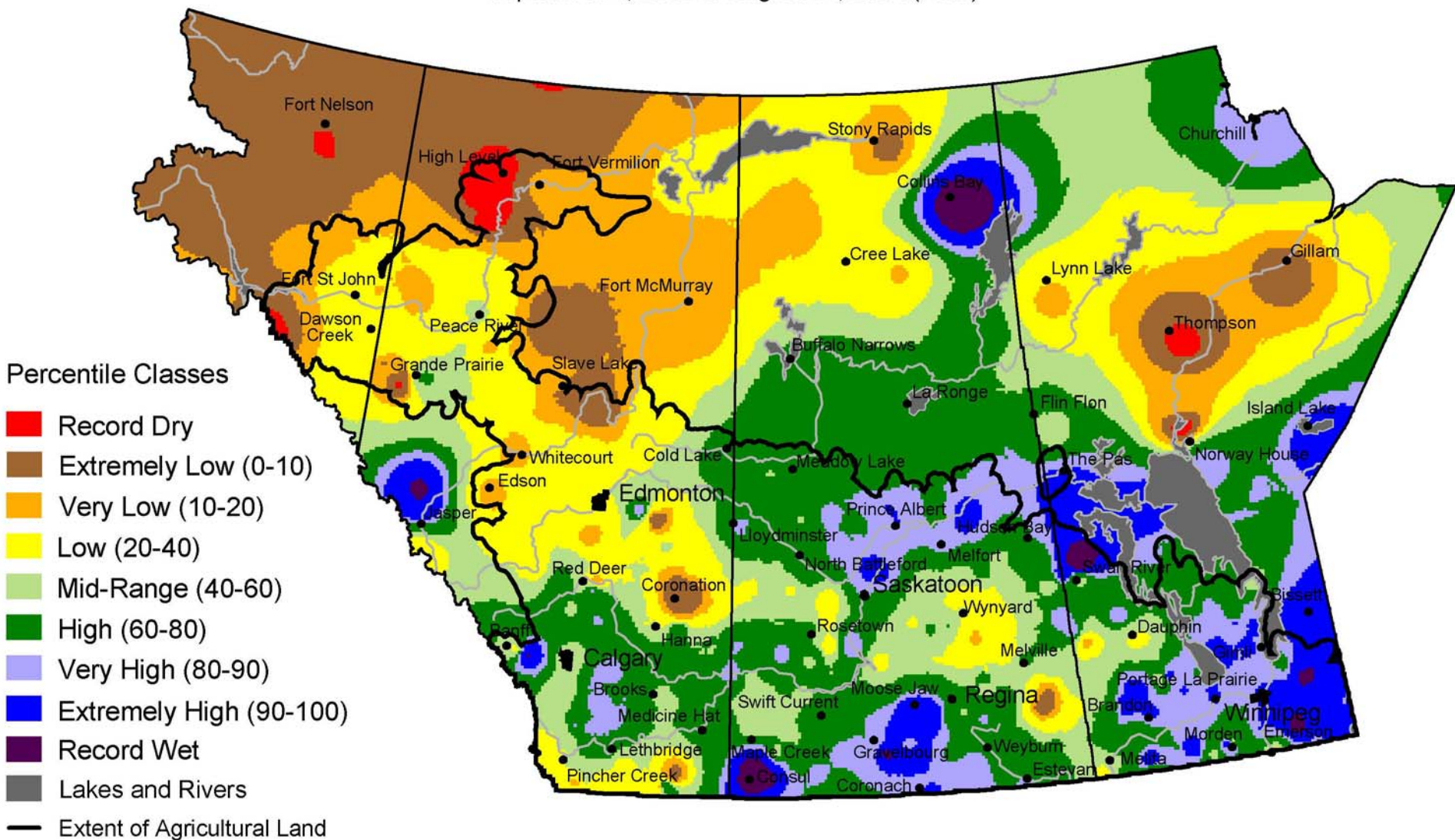
Energy in Storage 2003

Nelson-Churchill Drainage Basin
Manitoba Energy in Reservoir Storage



Current Precipitation Compared to Historical Distribution

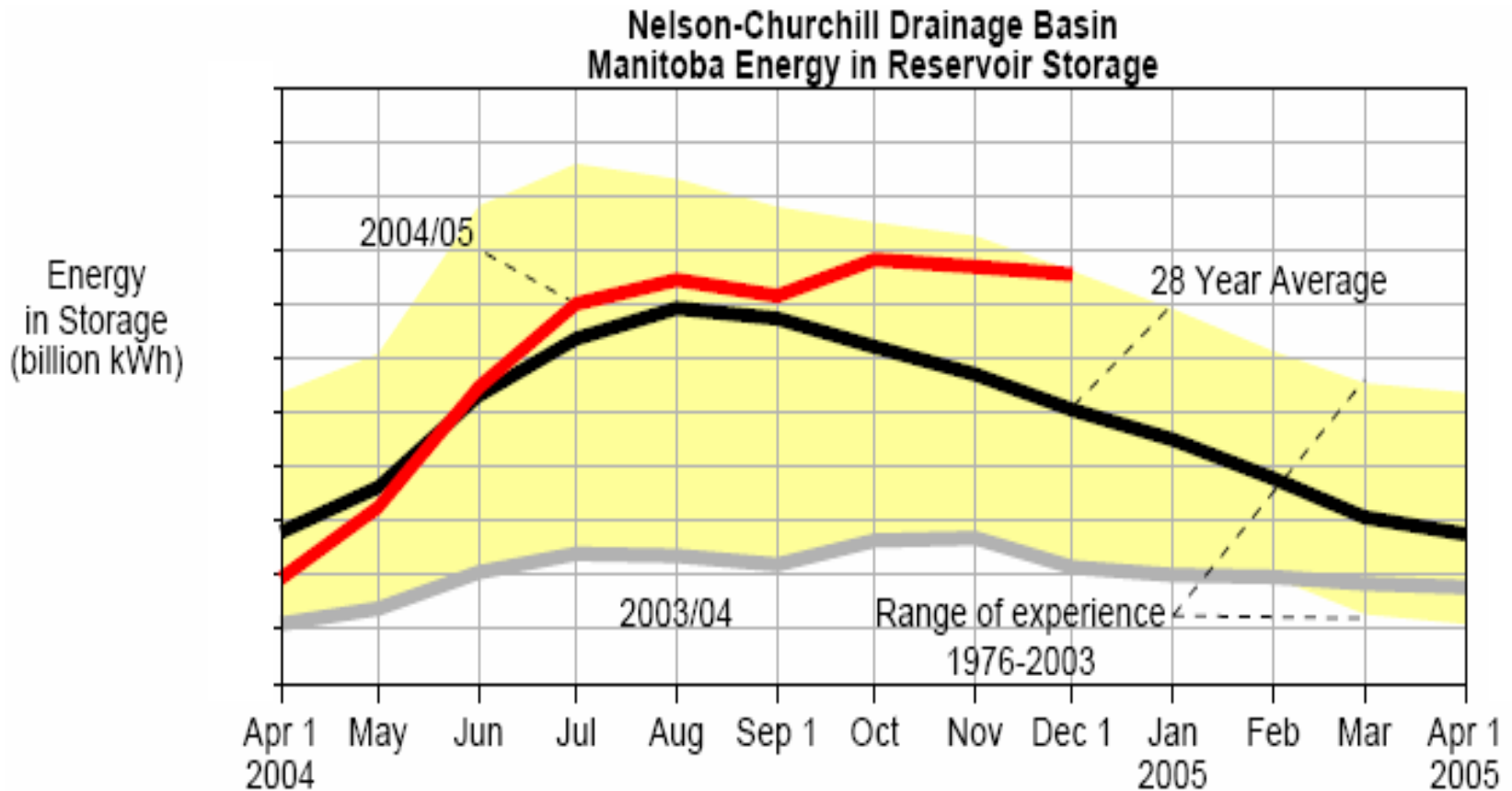
September 1, 2003 to August 31, 2004 (A.M.)



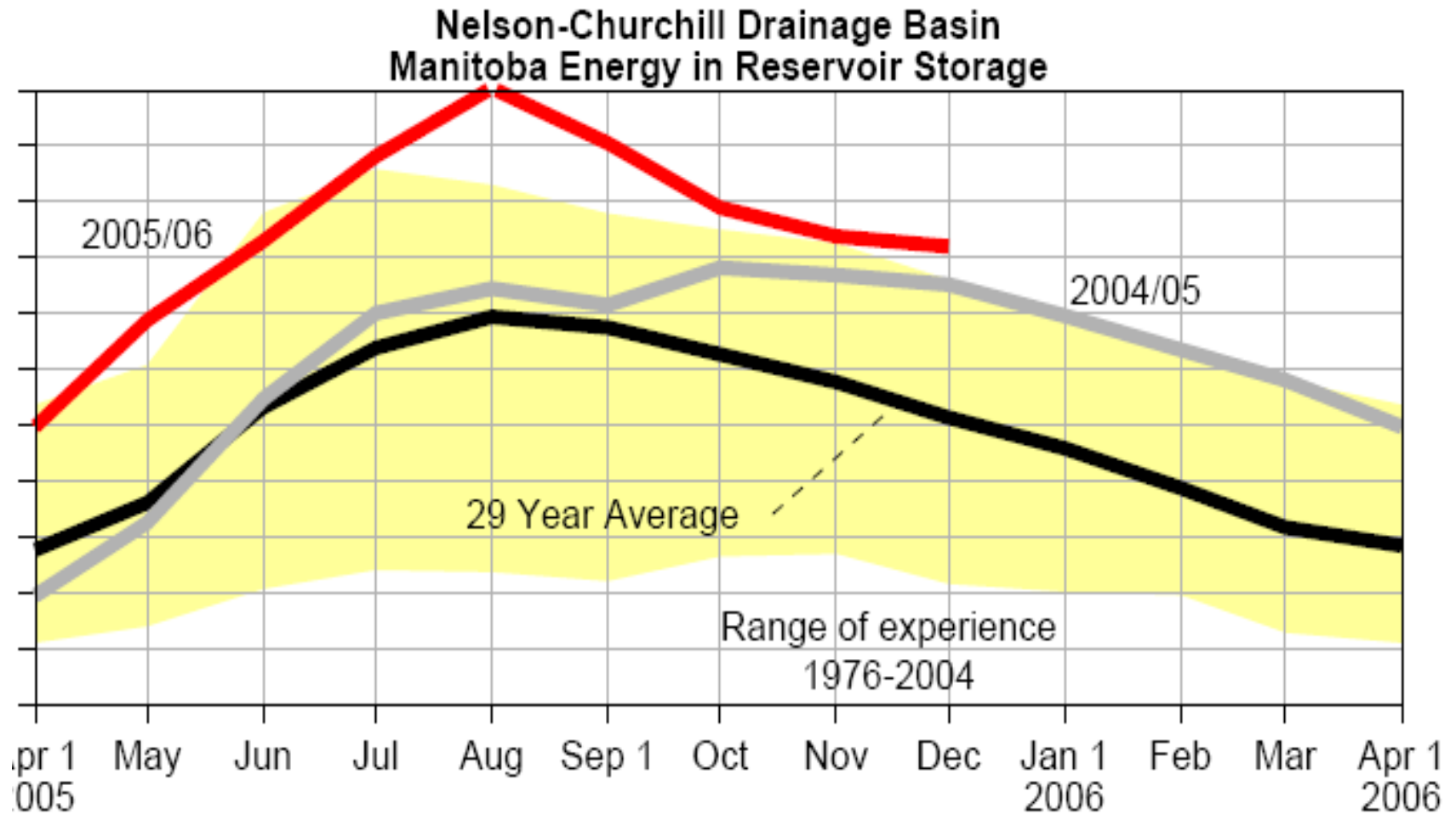
www.agr.gc.ca/pfra/drought

Prepared by Agriculture and Agri-Food Canada (PFRA) using data from the Timely Climate

Energy in Storage 2004



Energy in Storage 2005



The 2003 to 2005 period represents the single most significant transition from system-wide drought to flood in history.

Is there a linkage to climate change or variability?

Manitoba Hydro requirements from the Drought Research Initiative

- Enhanced statistical predictions of frequency & severity of drought
- Identification of more severe droughts before historical record for Nelson basin.
- Climate Drivers of major system-wide droughts in Nelson-Churchill basin
 - Cyclic patterns of major Prairie drought
 - Linkage to climate change



Questions?