Need for Paleo Research Manitoba Hydro

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Manitoba Hydro

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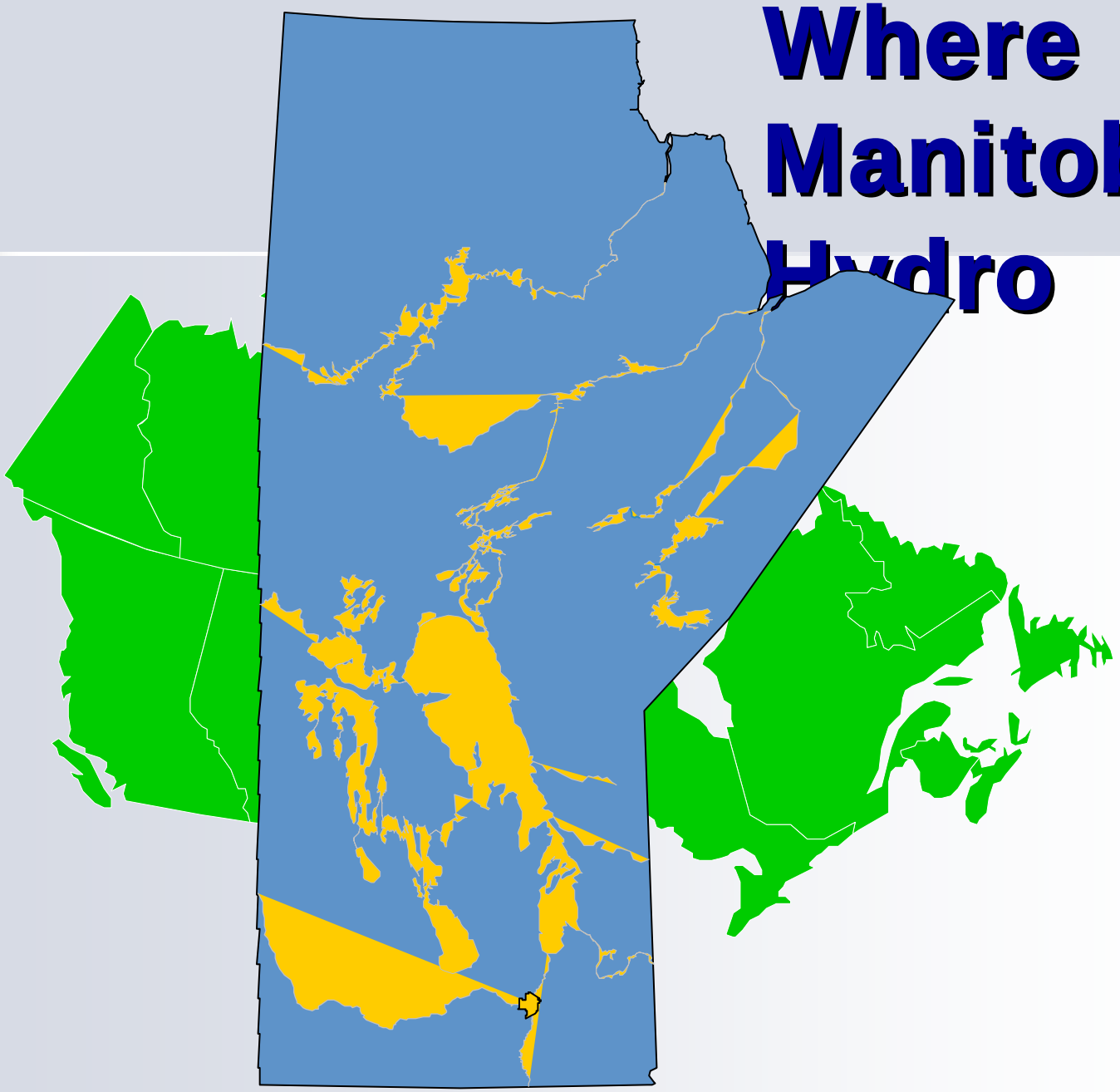
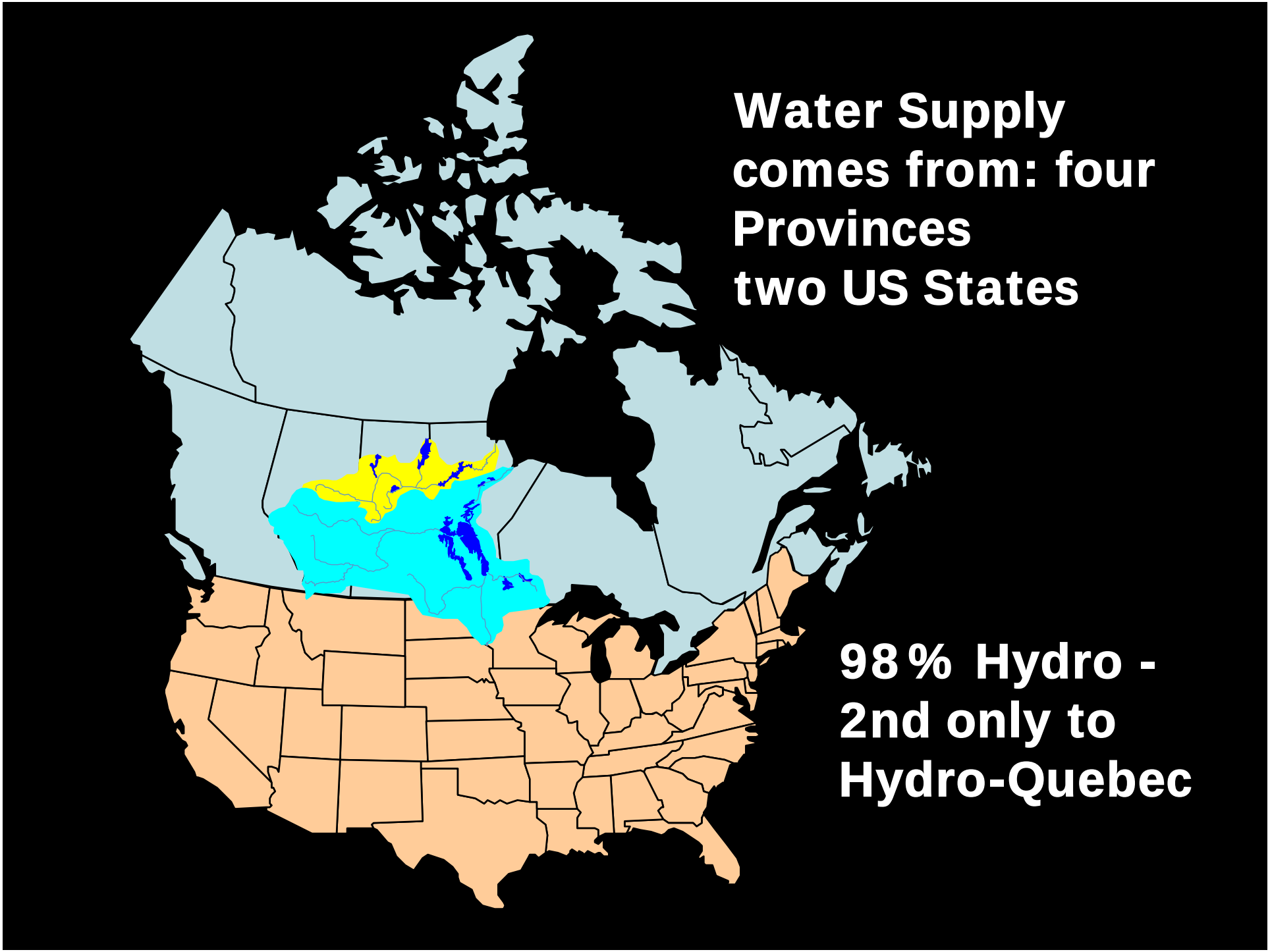
Outline

- Overview of Manitoba Hydro's System
- Ongoing & Future Research projects
- Need for Paleo research

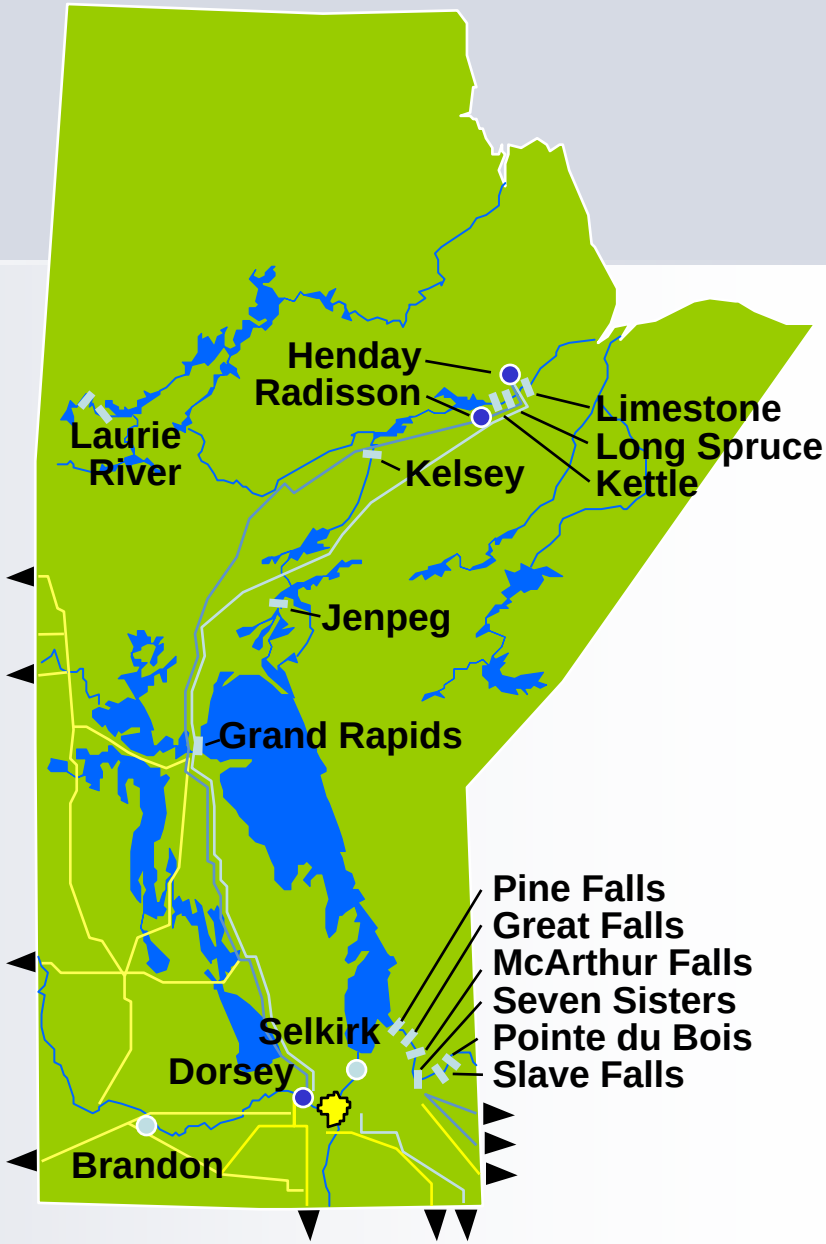
Where is Manitoba Hydro?

Where Is Manitoba Hydro




Water Supply comes from: four Provinces two US States
98% Hydro - 2nd only to Hydro-Quebec

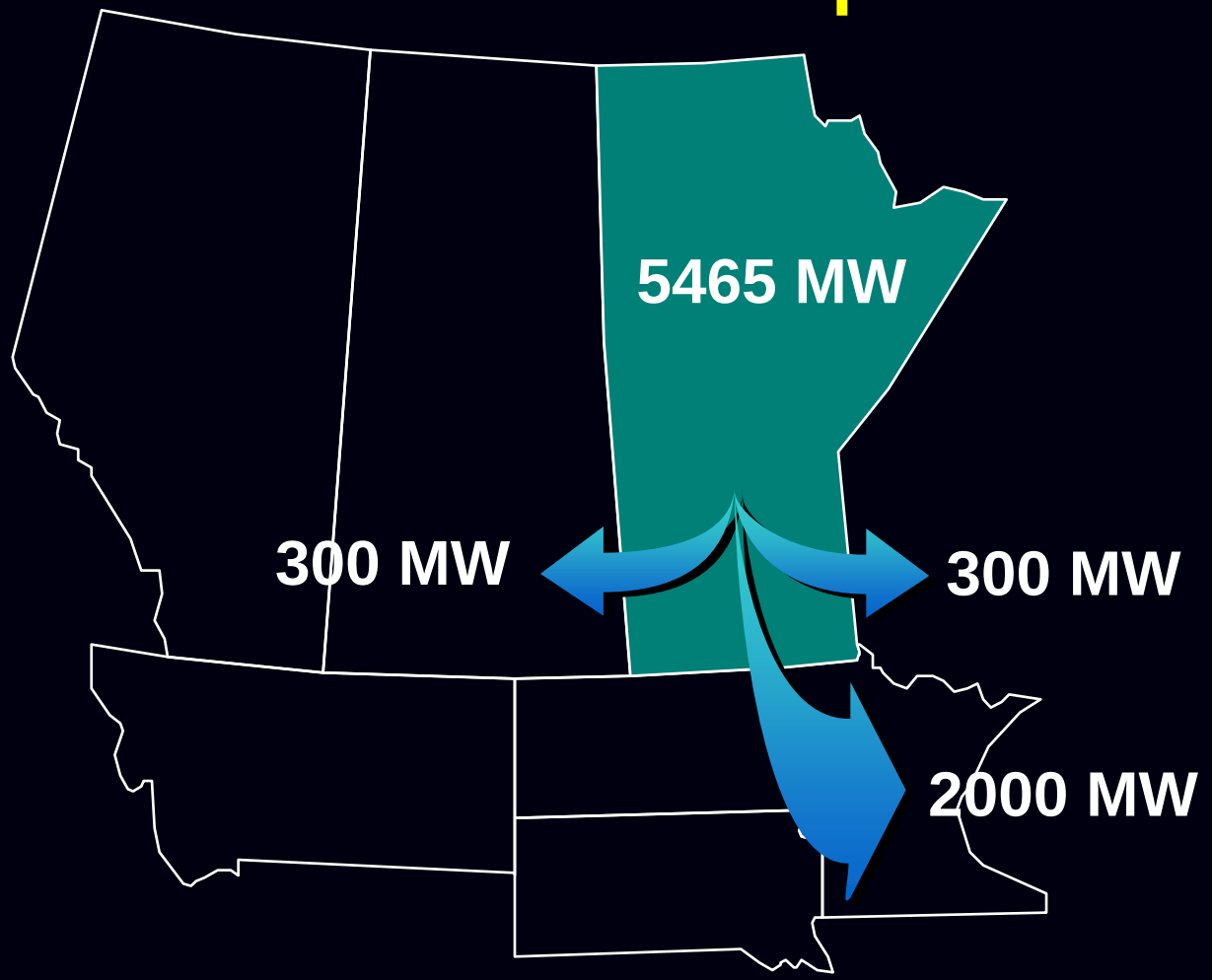
Manitoba Hydro Generating System



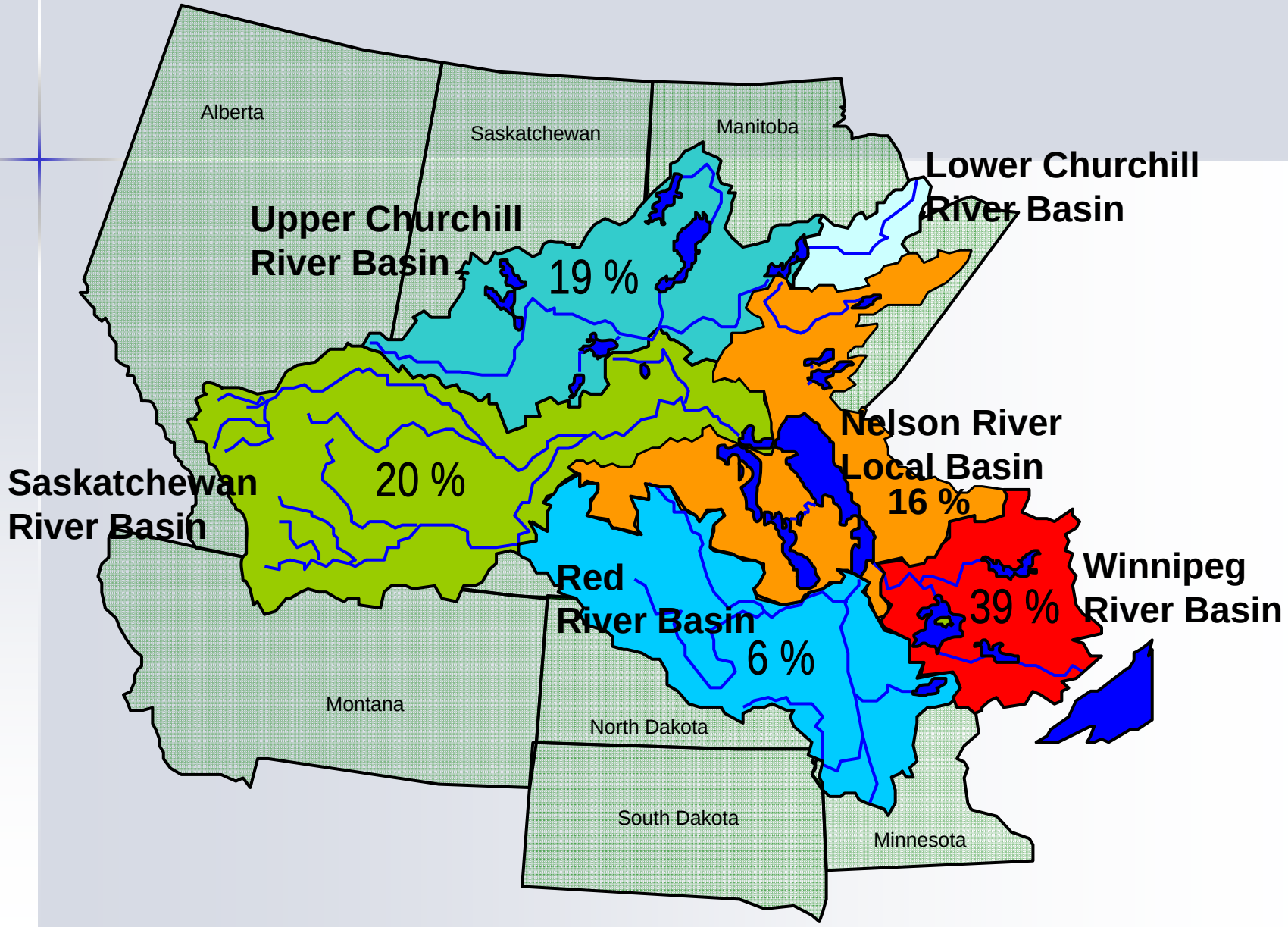
Manitoba Hydro System Capacity - 2005

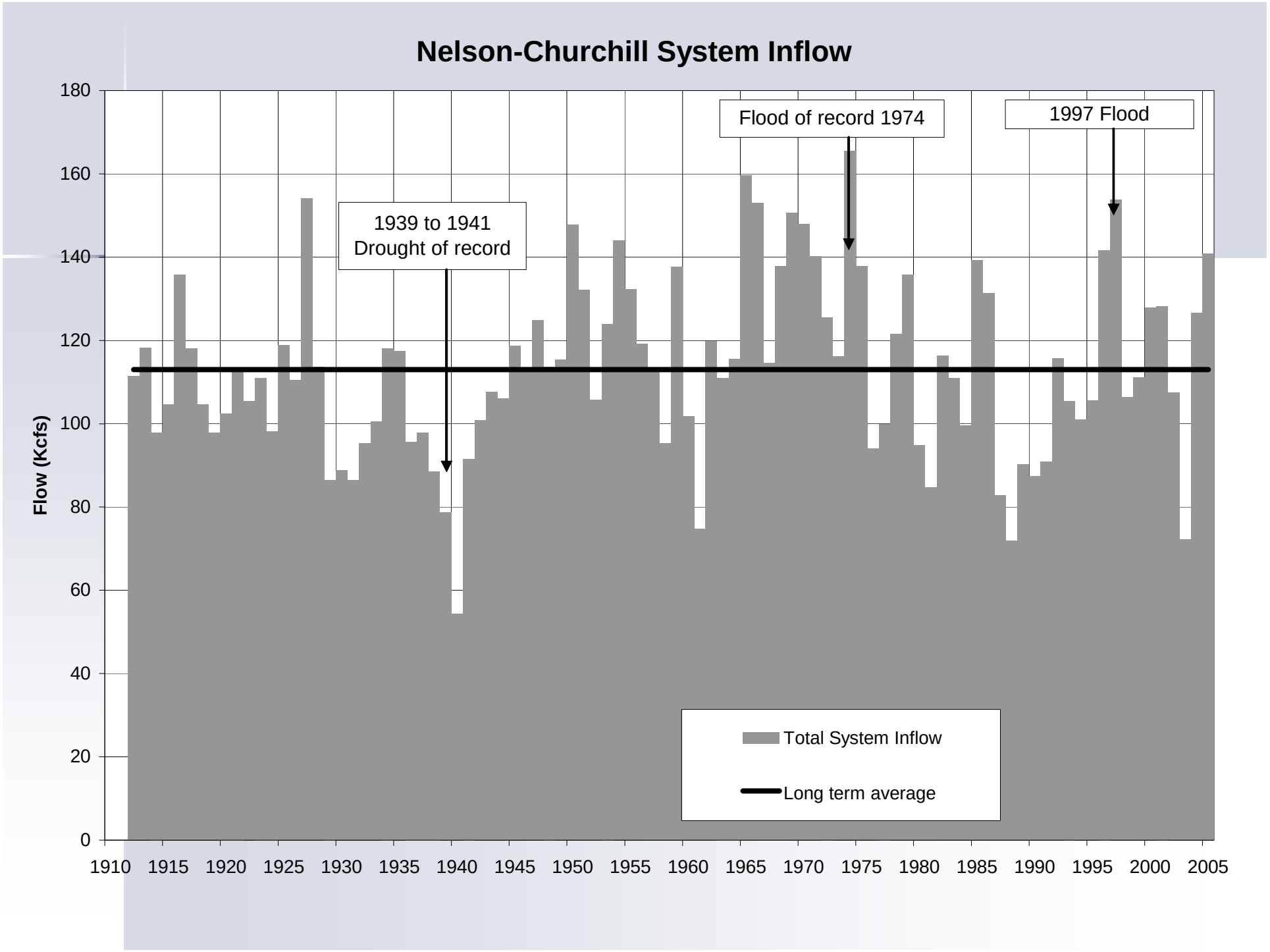
Source of Capacity	Capacity (MW)
Hydro-Electric Capacity	**4828**
Thermal Capacity	**535**
Demand Side Management - Incremental	**74**
(Cumulative DSM to 2005)	**(240)**
Diversity Import	**550**
Total System Capacity	**5987**

Exports

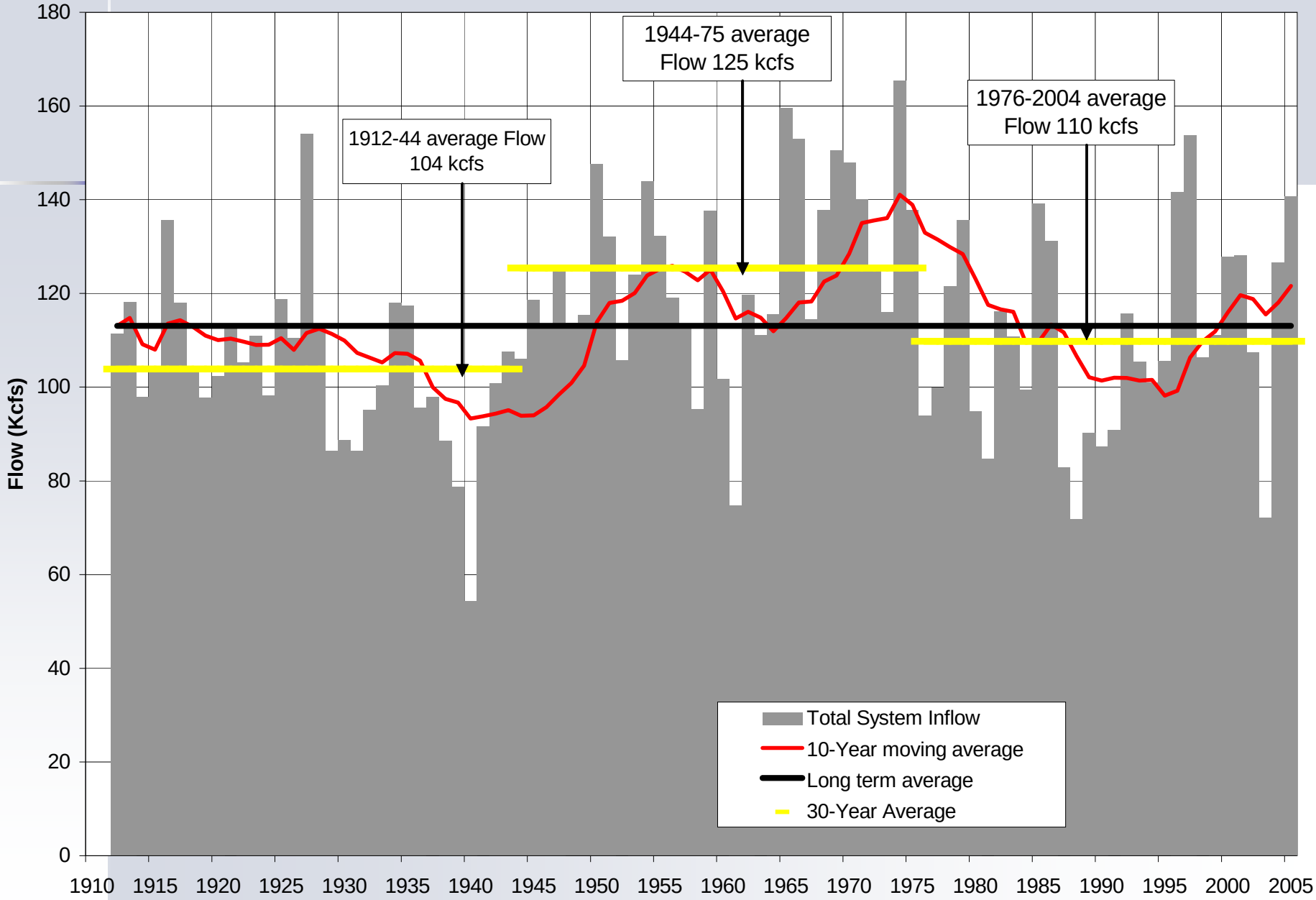


Nelson-Churchill Watershed




Nelson-Churchill System Inflow
Flow (Kcfs)
180
160
140
120
100
80
60
40
20
0
1910
1915
1920
1925
1930
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
1939 to 1941
Drought of record
Flood of record 1974
1997 Flood
Total System Inflow
Long term average

Nelson-Churchill System Inflow



Potential Impacts of Climate Change

- Long term water supply
  - higher evaporation, reduced reservoir storage
  - changing precipitation/runoff patterns
- Extreme weather impact on system operation, major transmission
- Impact on energy supply/demand balance
- **Extended Drought**

Planning Criteria for Supplying Load

Firm Capacity

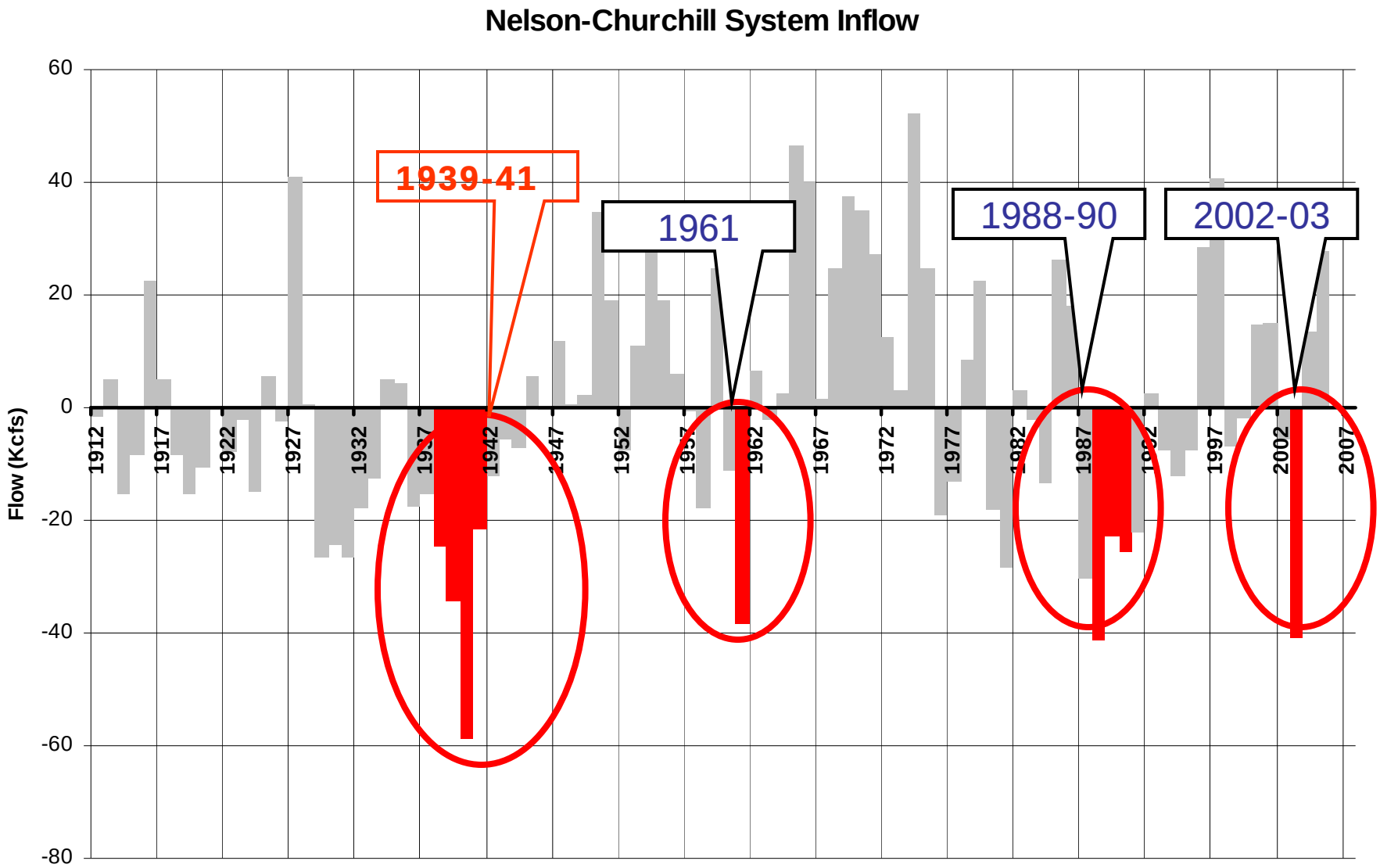
- **minimum of 12% reserve capacity required over forecast peak load demand**

Dependable Energy

- **adequate energy resources to supply forecast load energy under a repeat of the lowest historic flows**

Drought

Historical Drought Events



Why does Manitoba Hydro fund Drought Research?

- System-Wide Energy Drought is complex:
  - extensive geographic region
  - can’t transpose severe drought
- More severe droughts occurred before historical record
- Regional diversity of Hydrologic Extremes
- Need probabilistic forecasting of drought

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

How can Manitoba Hydro use Paleo Research?

- Enhance statistical predictions of frequency & severity of drought:
  - Currently 100-yr record for drought probability analysis
  - Identification of more severe droughts before historical record
- Reconstruct past streamflow records

What is needed for Paleo Data to be useful to Manitoba Hydro?

- Link Paleo data with current climate
  - Indication of cyclic patterns
  - Develop regional estimates of past climate & hydrology
  - Link past extremes to climate drivers
- Is past an appropriate analogue of the future?

Future Work

- Internal risk assessment
  - Sensitivity analyses of more severe drought
  - Variability of long term water supply

Manitoba Hydro

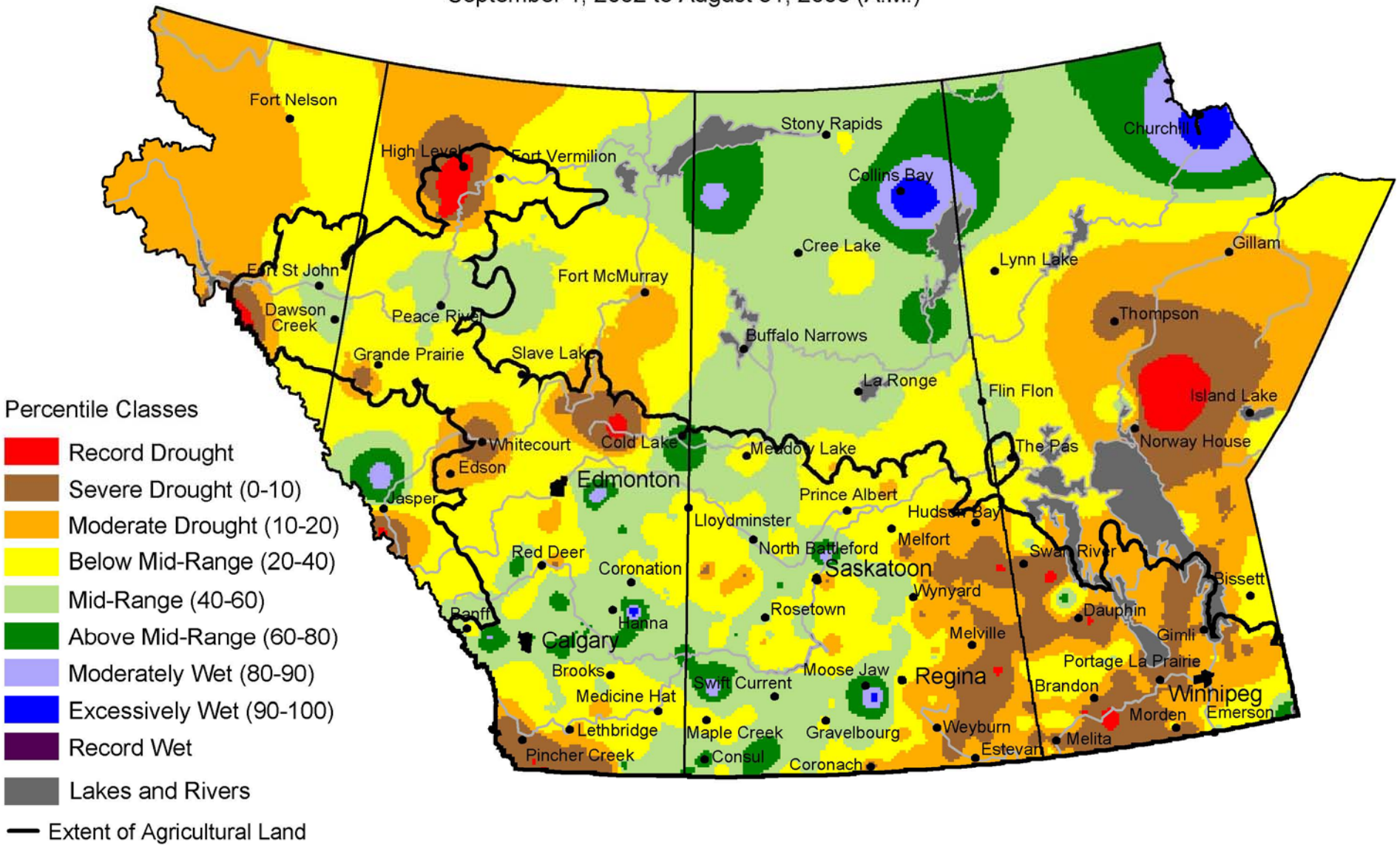
Questions?

Extra Slides

Variability 2003/04 to 2006/07

Current Precipitation Compared to Historical Distribution

September 1, 2002 to August 31, 2003 (A.M.)

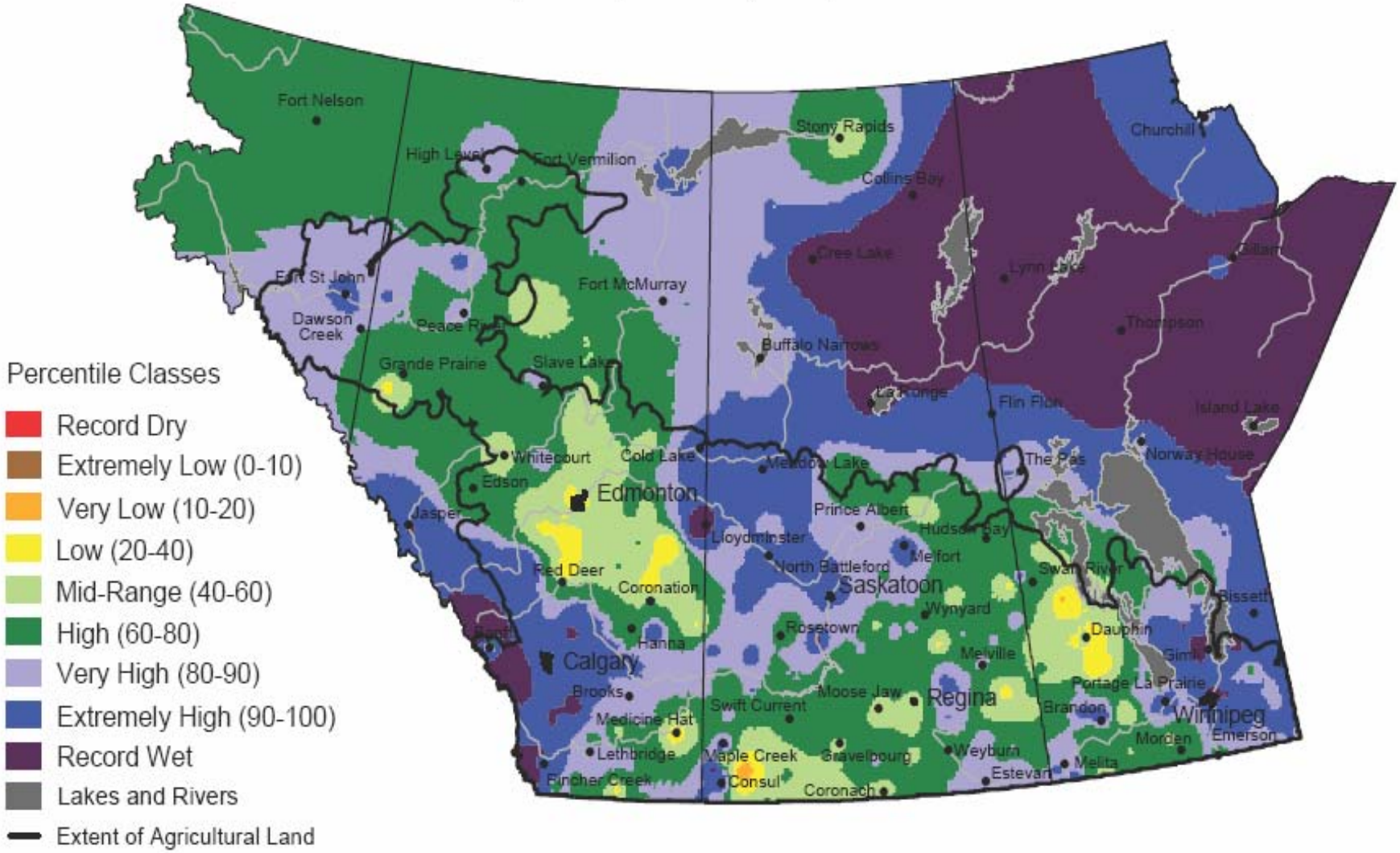


Prepared by PFRA (Prairie Farm Rehabilitation Administration) using data from the Timely Climate Monitoring Network and the many federal and provincial agencies and volunteers that support it.

Canada

Current Precipitation Compared to Historical Distribution

September 1, 2004 to August 31, 2005



www.agr.gc.ca/pfra/drought

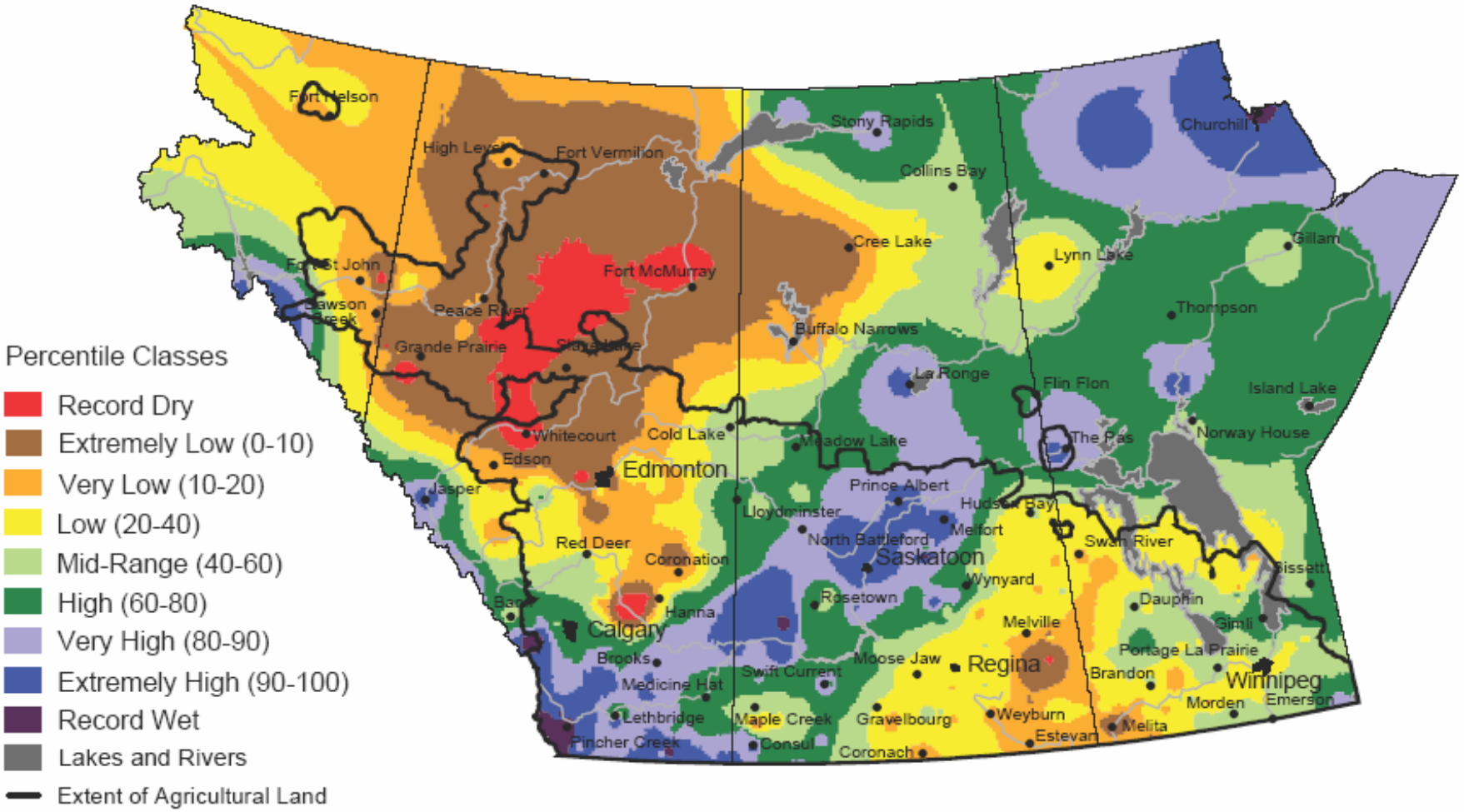
Prepared by Agriculture and Agri-Food Canada (PFRA) using data from the Timely Climate Monitoring Network and the many federal and provincial agencies and volunteers that support it.

Canada

Agriculture and Agri-Food Canada | Agriculture et Agroalimentaire Canada

Current Precipitation Compared to Historical Distribution

September 1, 2005 to March 29, 2006



Percentile Classes

- 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
- Lakes and Rivers
- Extent of Agricultural Land

www.agr.gc.ca/pfra/drought

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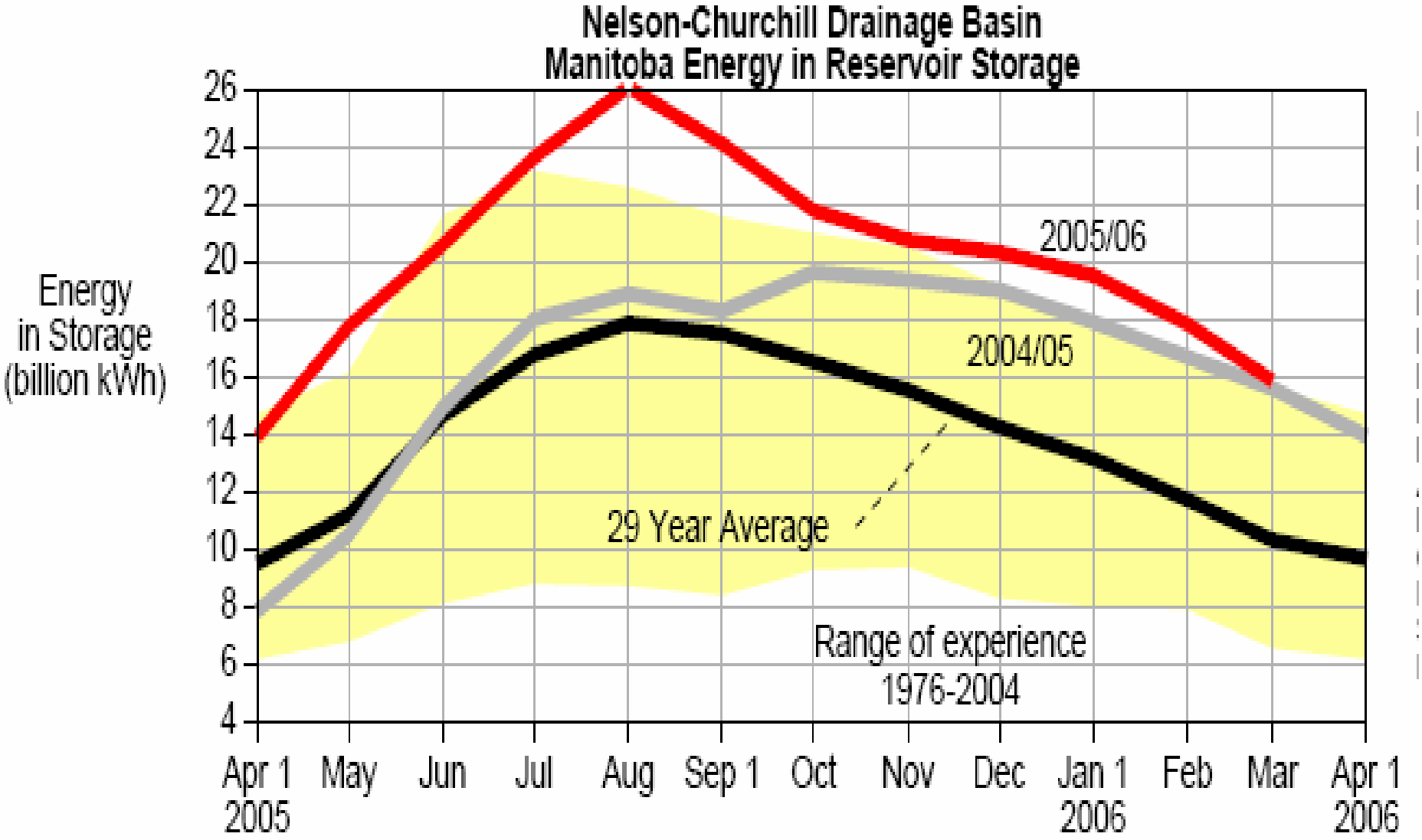
Energy in Storage 2004-05 to 2005-06



Energy in Storage 2006/07