

Tree-ring records of prolonged drought from Canada's western interior

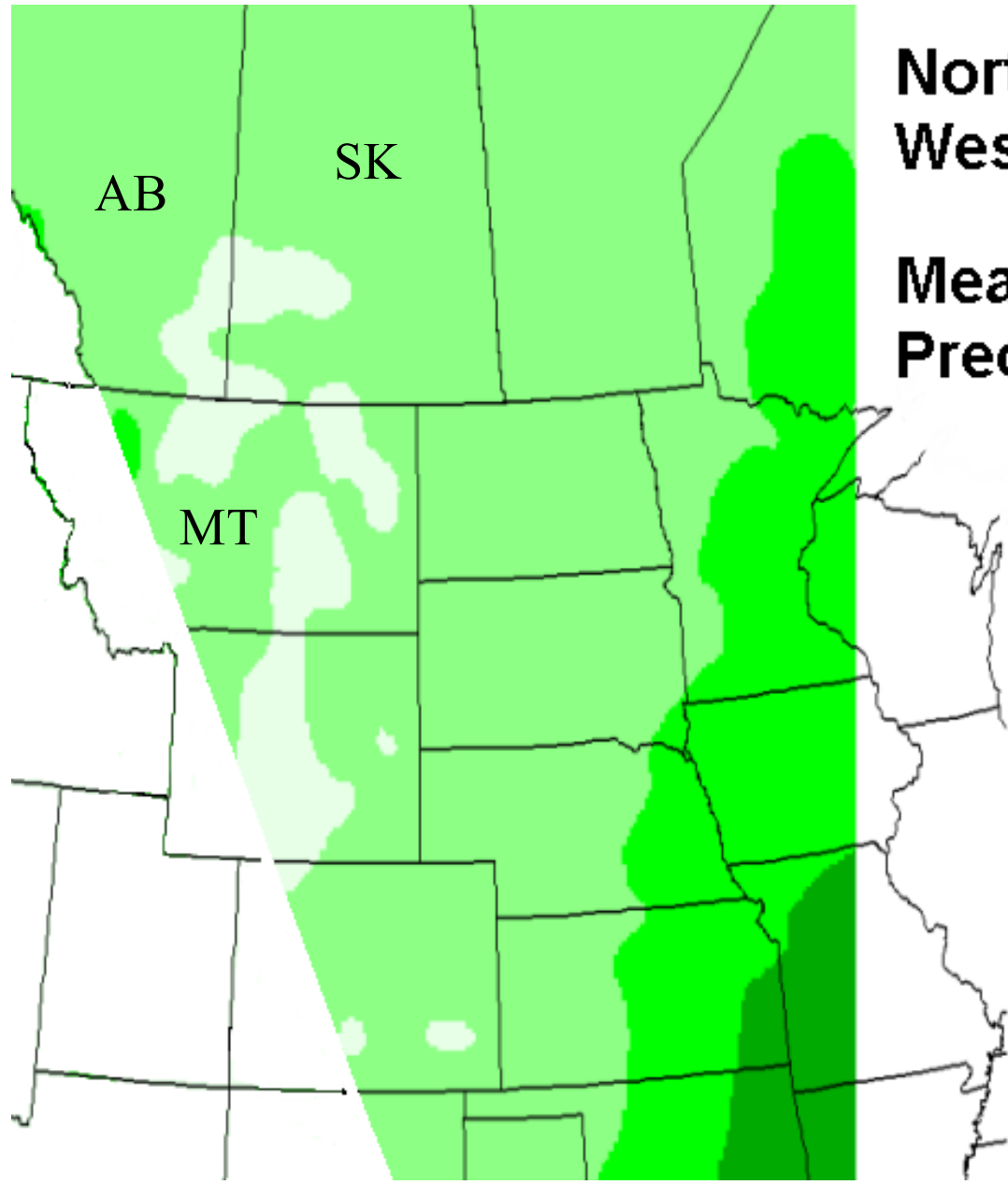


Dave Sauchyn
Prairie Adaptation Research
Collaborative, University of Regina

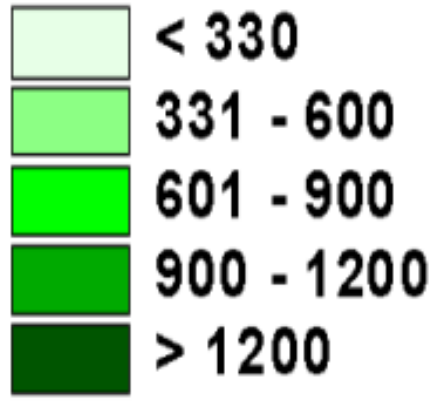


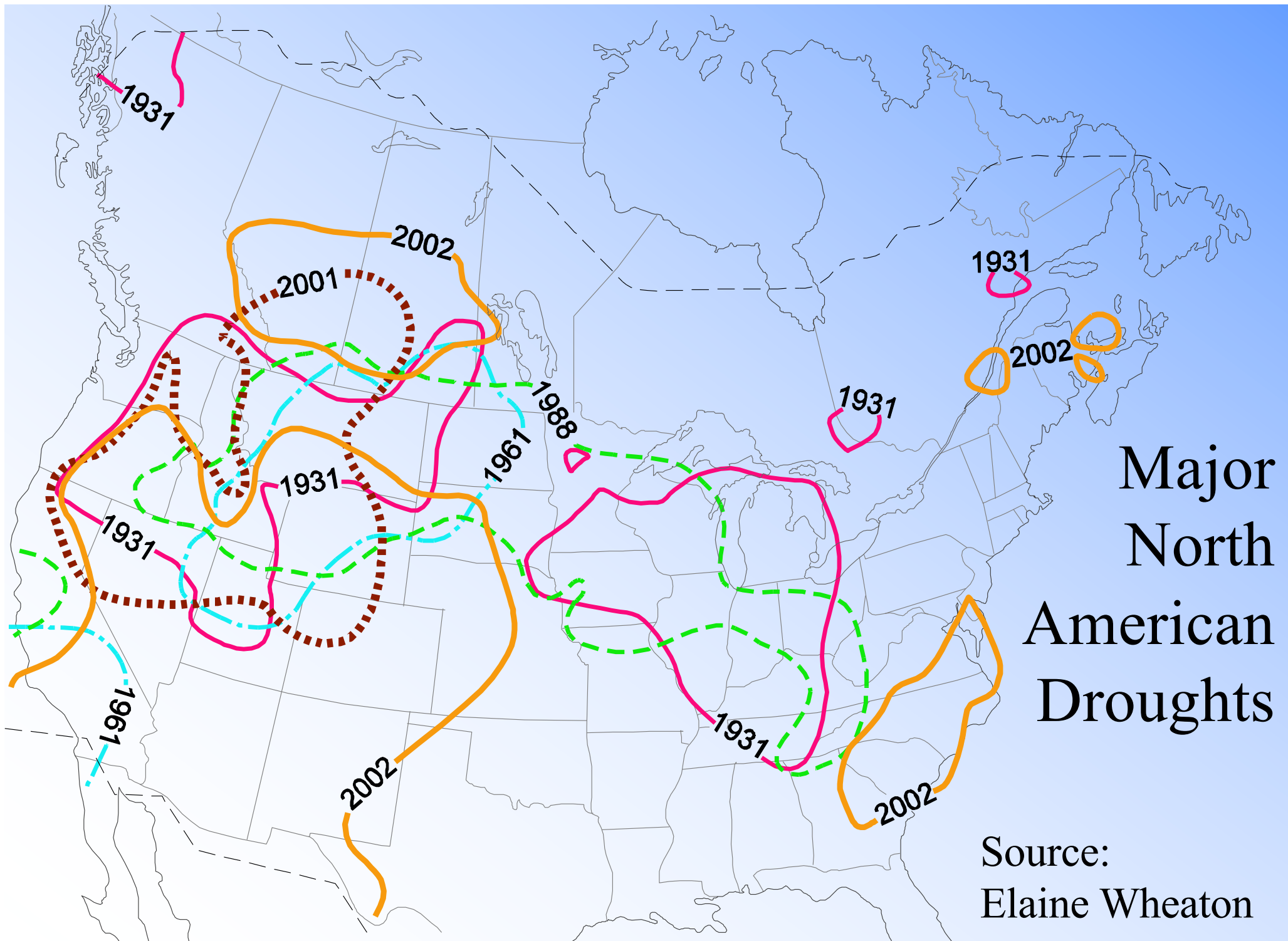
*Predicting Drought on Seasonal to Decadal
Time Scales*

University of Maryland , May 17-19, 2005



**North America
Western Interior
Mean Annual
Precipitation (mm)**





Major North American Droughts

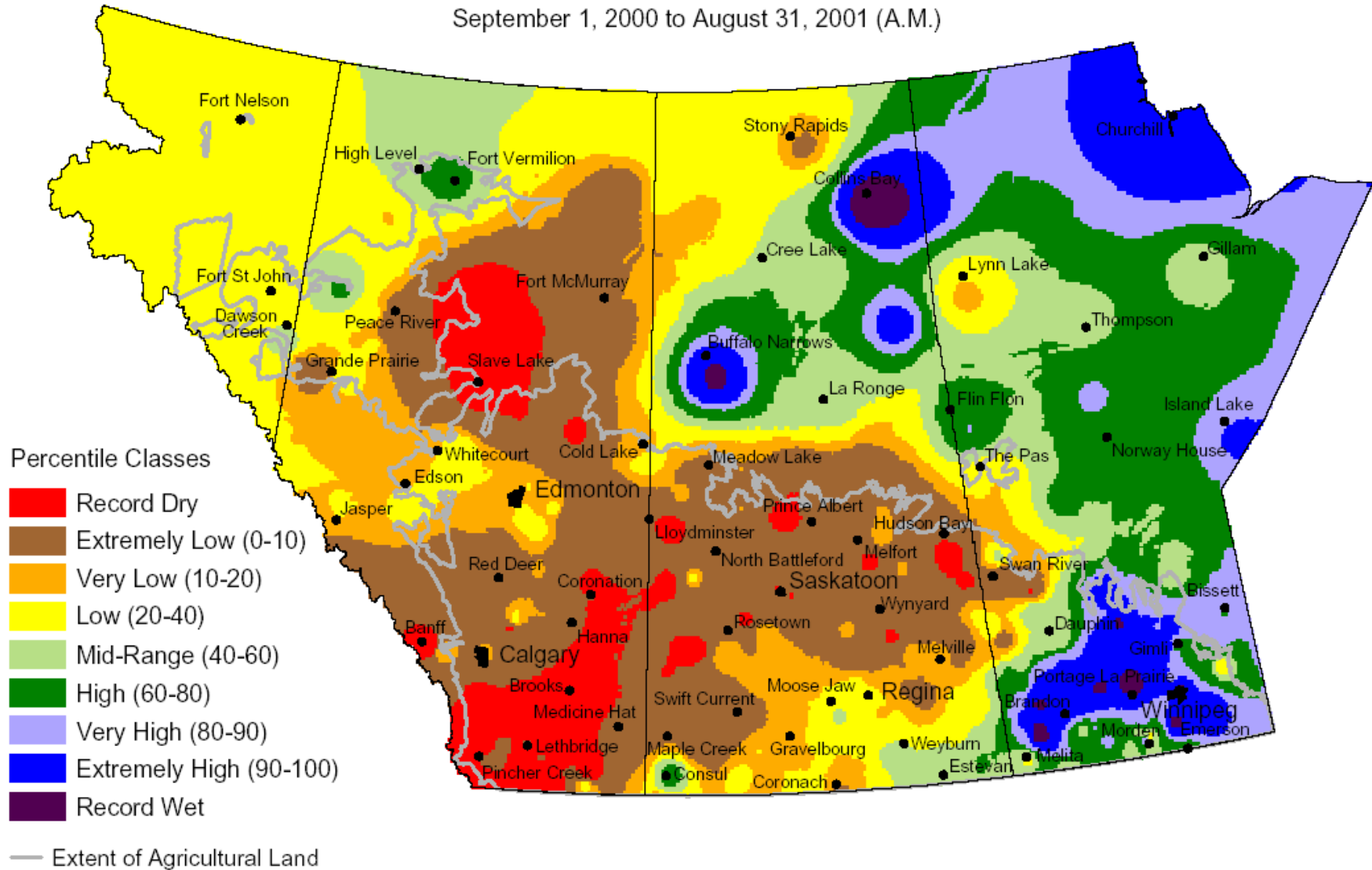
Source:
Elaine Wheaton

Palmer Drought Severity Index of -3 and less— Summer – JJA Data : Skinner 2003



Current Precipitation Compared to Historical Distribution

September 1, 2000 to August 31, 2001 (A.M.)



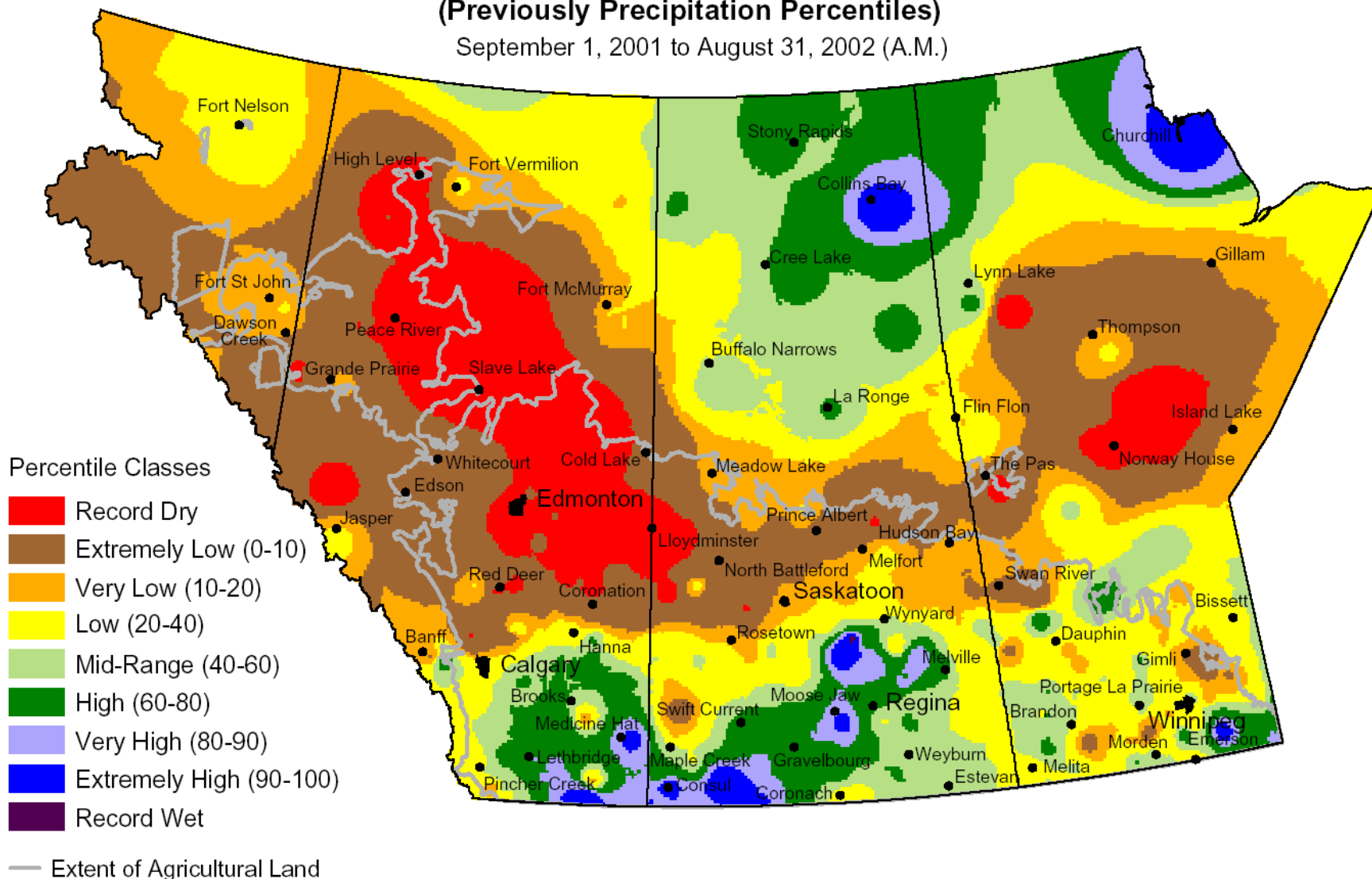
Prepared by PFRA (Prairie Farm Rehabilitation Administration) using data from the Timely Climate Monitoring Network and the many federal and provincial agencies and volunteers that support it.



Current Precipitation Compared to Historical Distribution

(Previously Precipitation Percentiles)

September 1, 2001 to August 31, 2002 (A.M.)



Soil drifting near Oyen, Alberta, May 5, 2002



Near Outlook, Saskatchewan, May 2, 2002



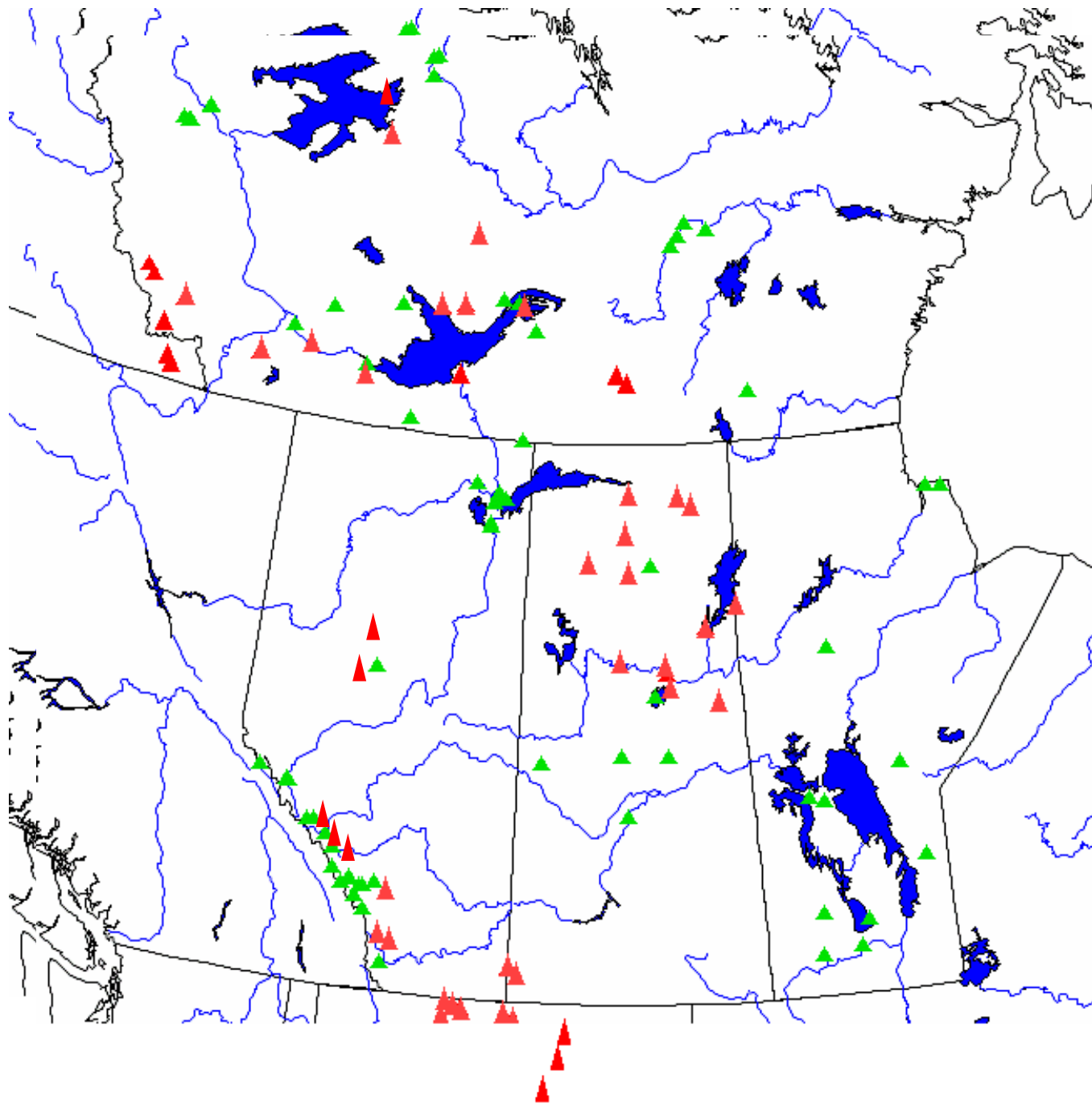
Saskatoon (1908-2002)

| <i>1-yr</i> | <i>2-yrs</i> | <i>3-yrs</i> |
|-------------|----------------|----------------|
| 2001 | 2001-02 | 2000-02 |
| 1952 | 2000-01 | 1951-53 |
| 1987 | 1987-88 | 1987-89 |
| 1960 | 1952-3 | 1999-01 |
| 1941 | 1964-65 | 1986-88 |

Edmonton (1883-2002)

| <i>1-yr</i> | <i>2-yrs</i> | <i>3-yrs</i> |
|-------------|----------------|----------------|
| 1889 | 2001-02 | 1883-85 |
| 1883 | 1883-84 | 1896-98 |
| 2002 | 1897-98 | 1887-89 |
| 1898 | 1886-87 | 1885-87 |
| 1961 | 1949-50 | 2000-02 |

Tree-Ring Chronologies





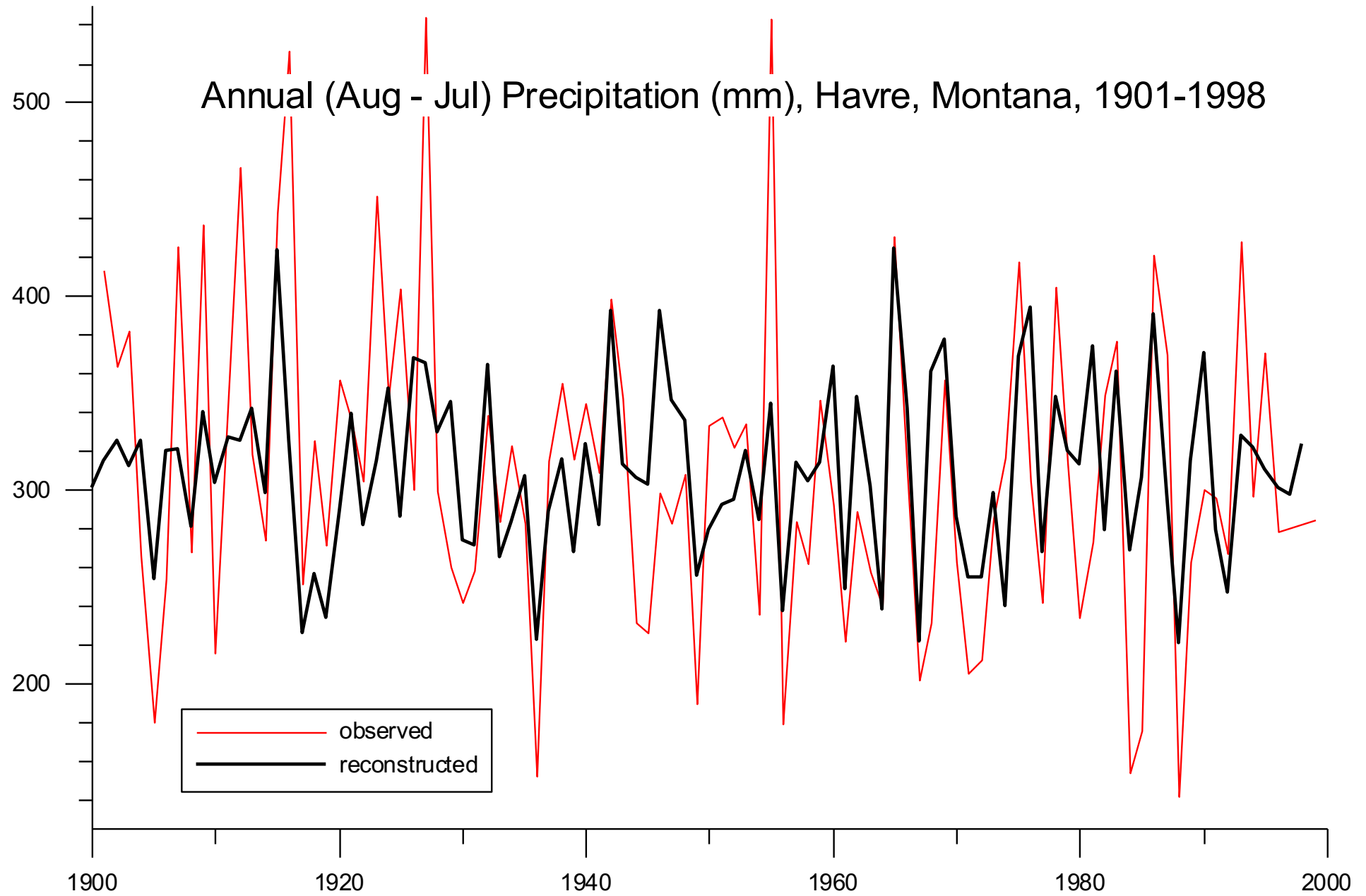


Landsat 7, July, 2000

Bearspaw Mountains, Montana



Annual (Aug - Jul) Precipitation (mm), Havre, Montana, 1901-1998



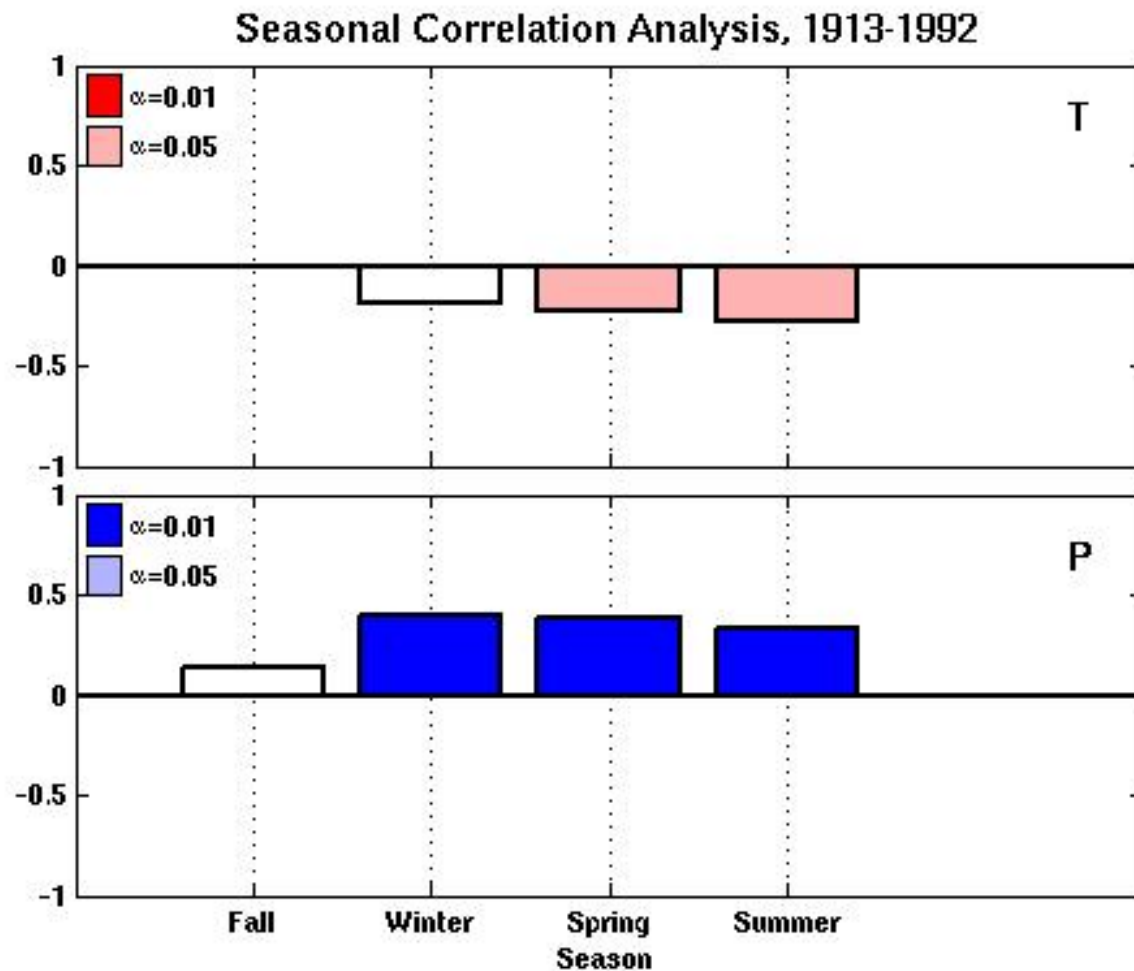


Porcupine Hills, Alberta

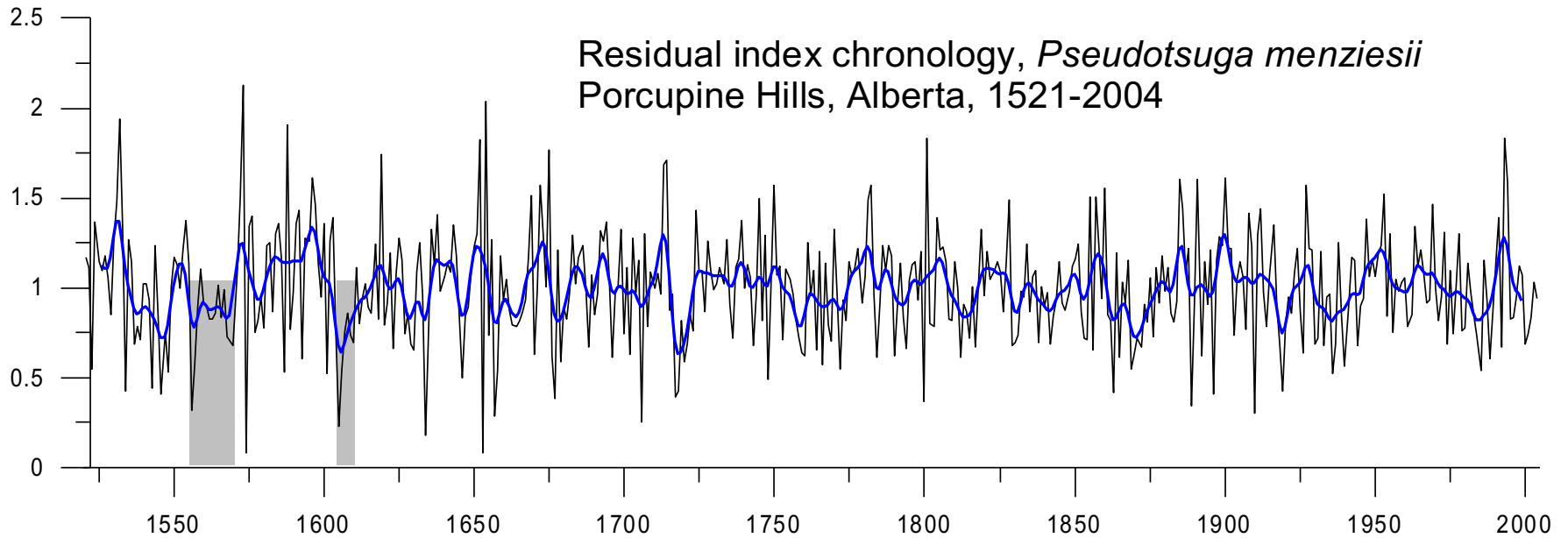
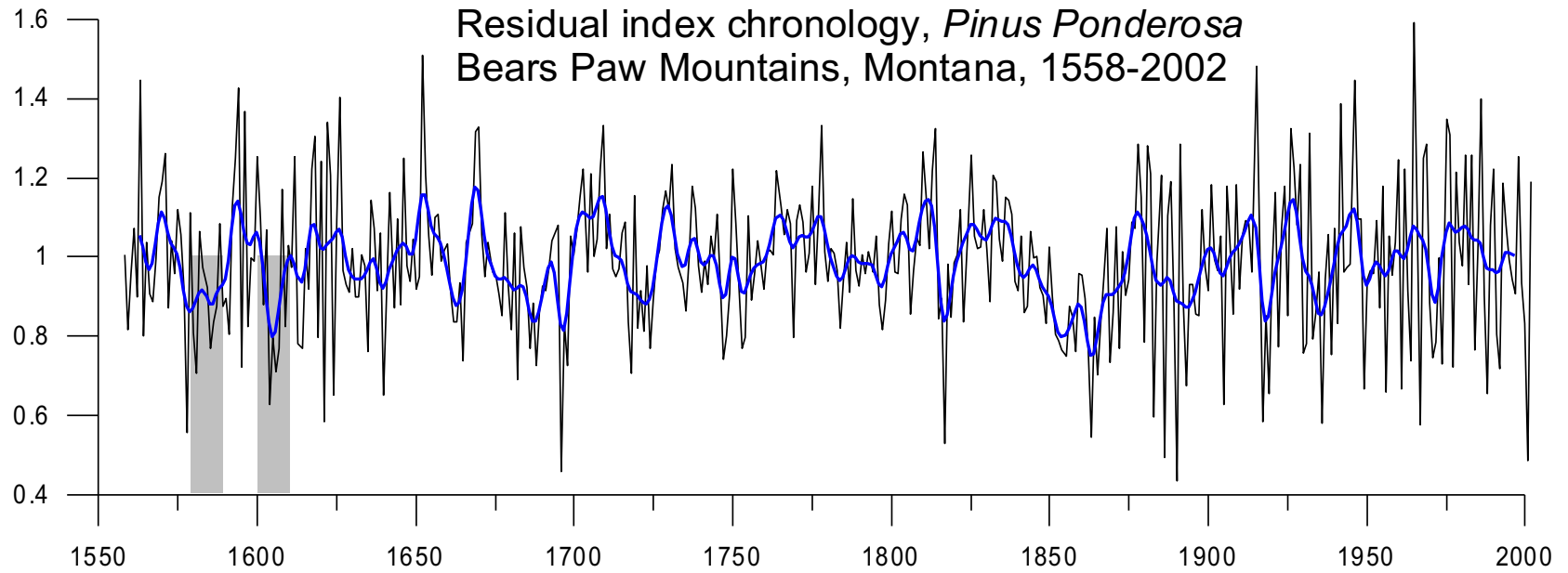
Response Function Analysis

Porcupine Hills Tree-Ring Chronology

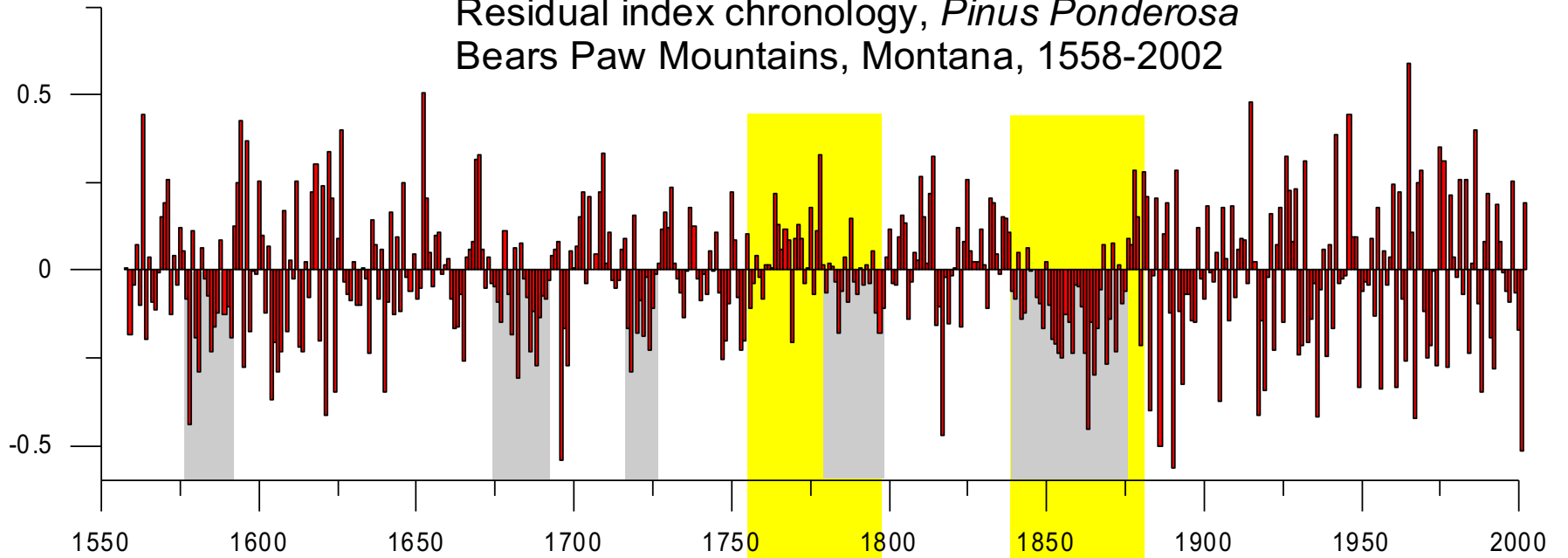
Pekisko meteorological station



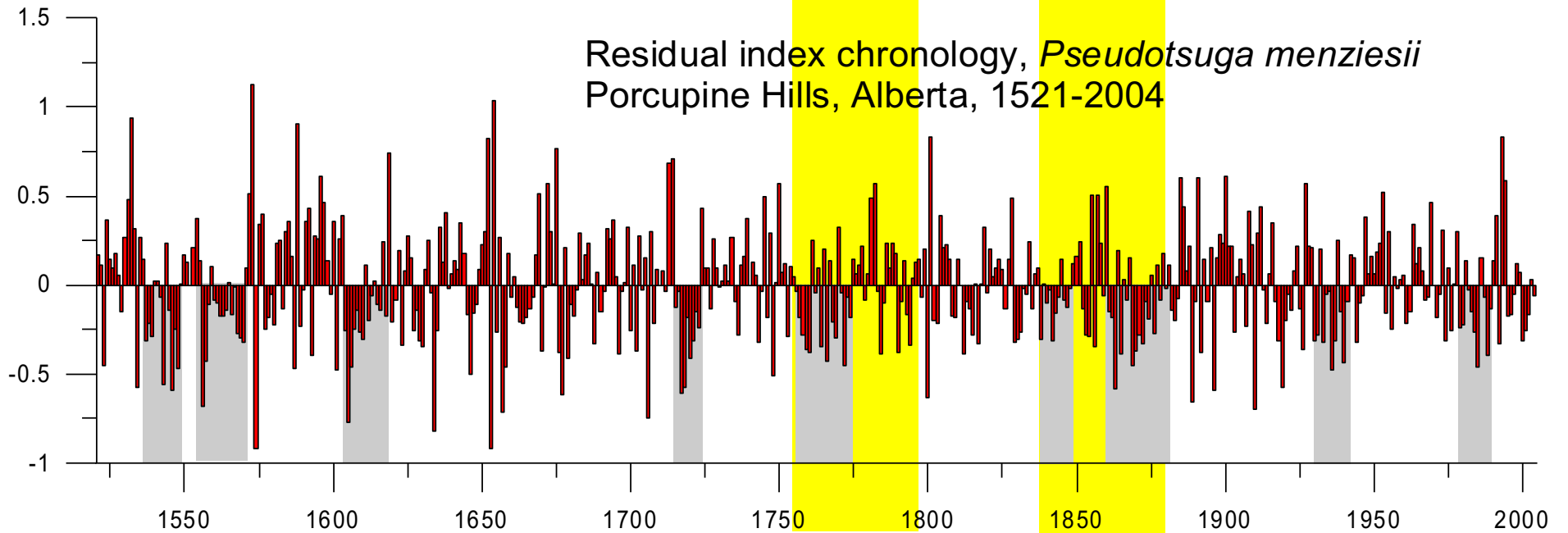
Stahle *et al.* droughts?



Residual index chronology, *Pinus Ponderosa*
Bears Paw Mountains, Montana, 1558-2002



Residual index chronology, *Pseudotsuga menziesii*
Porcupine Hills, Alberta, 1521-2004



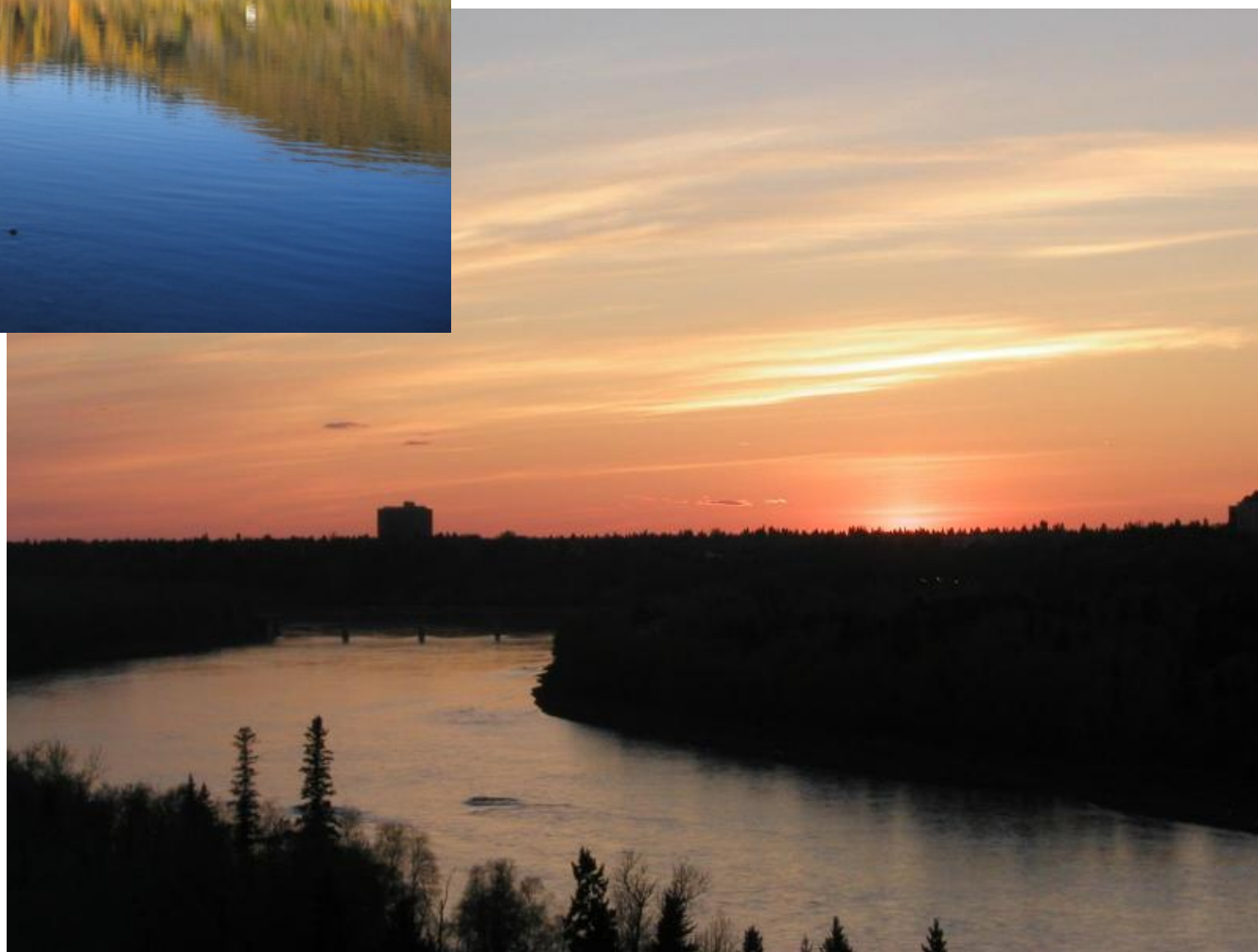
widespread dune activity induced by late 18th century dryness
Wolfe, *et al.* 2001



Spring 1796, Edmonton House

At Edmonton House, a large fire burned “all around us” on April 27th (1796) and burned on both sides of the river. On May 7th, light canoes arrived at from Buckingham House damaged from the shallow water. Timber intended to be used at Edmonton House could not be sent to the post “for want of water” in the North Saskatchewan River. On May 2nd, William Tomison wrote to James Swain that furs could not be moved as, “there being no water in the river.” (Johnson 1967: 33-39, 57)

North Saskatchewan River at Edmonton



This large belt of country embraces districts, some of which are valuable for the purposes of the agriculturalist, while others will for ever be comparatively useless. ... The least valuable portion of the prairie country has an extent of about 80,000 square miles...

CAPTN. JOHN PALLISER, London, July 8, 1860

It would be almost criminal to bring settlers here to try to make a living out of straight farming.

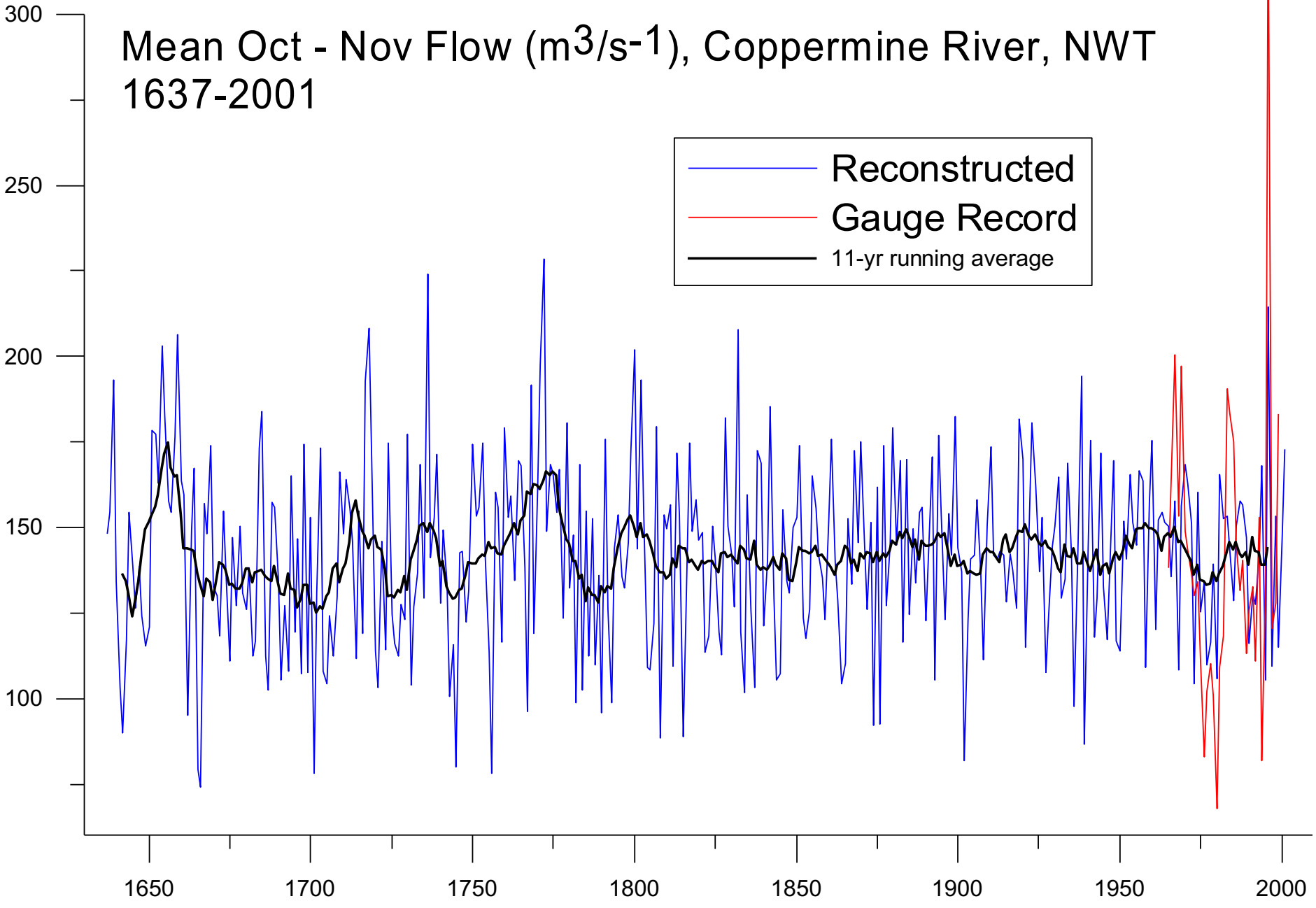
The Medicine Hat Times, February 5, 1891

Our True Immigration Policy

Northwest Territories



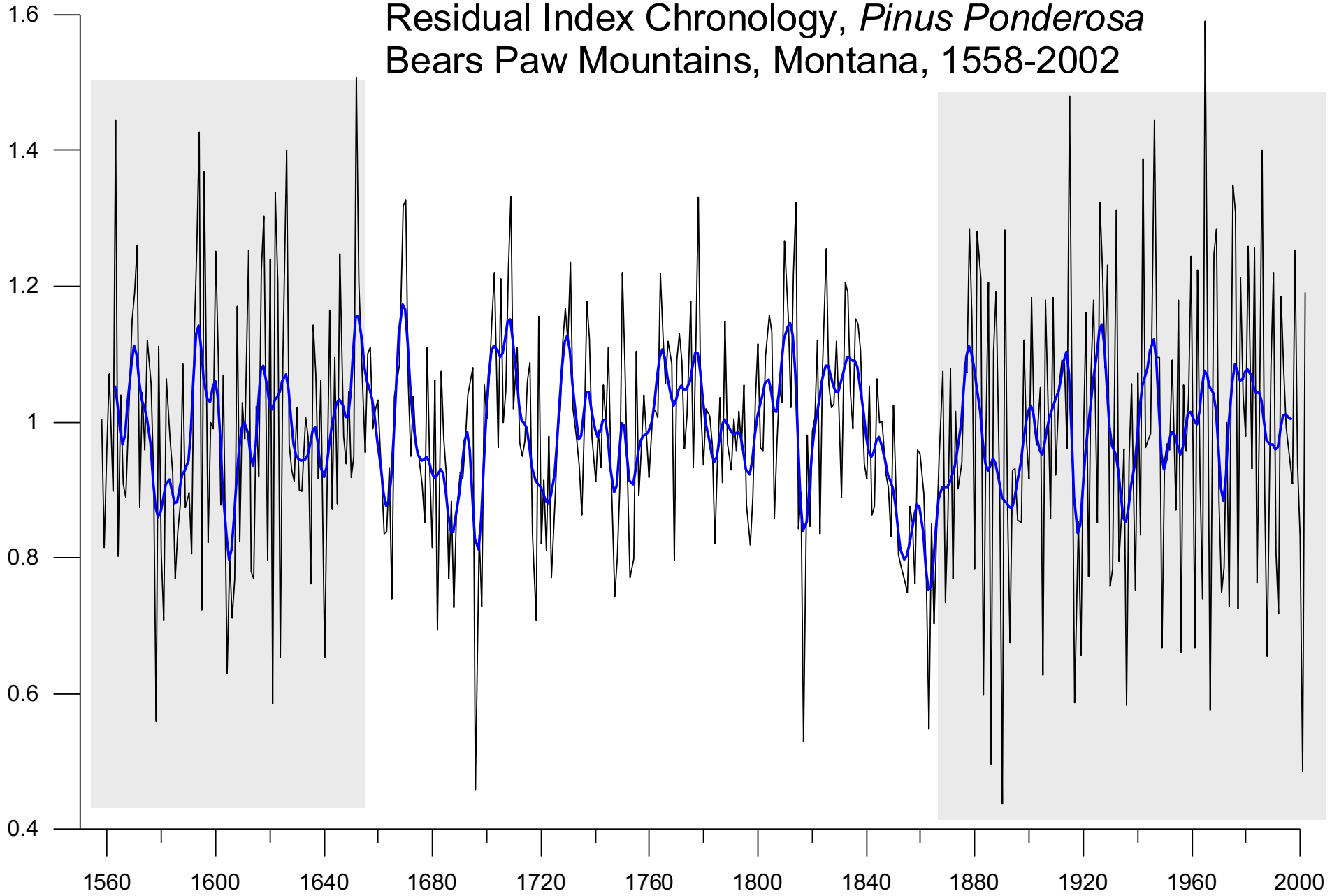
Mean Oct - Nov Flow (m³/s-1), Coppermine River, NWT 1637-2001

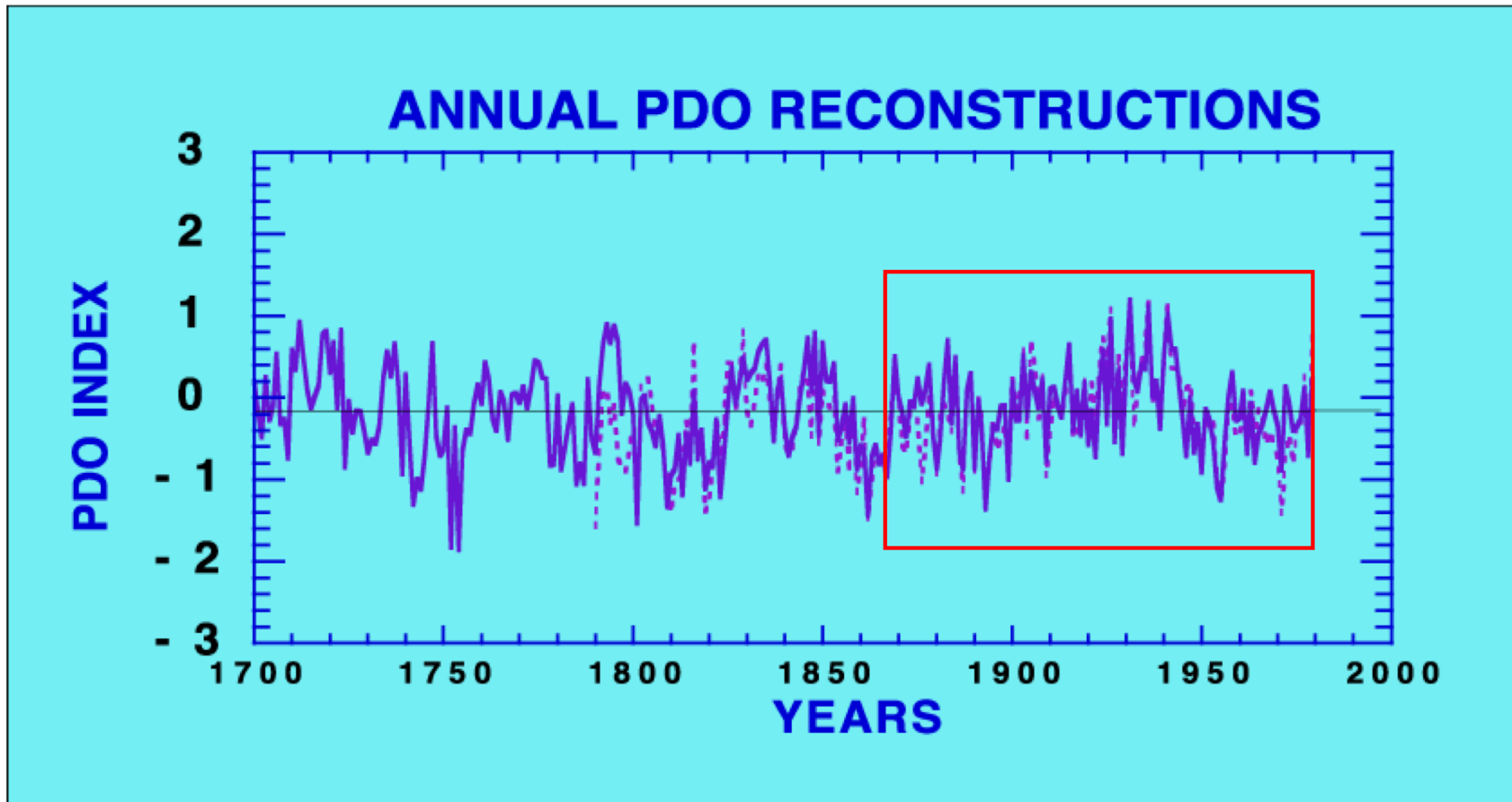


Conclusions

- For impacts on ecosystems and human populations, the critical characteristic of drought is duration.
- 10-20 year periods of dominately below average annual precipitation occurred in the 19th and 18th shortly before settlement of the northern plains.
- A significant research topic is the cause of prolonged drought and multi-decadal shifts in aridity, which are evident only in paleoclimatic records.

Residual Index Chronology, *Pinus Ponderosa*
Bears Paw Mountains, Montana, 1558-2002





<http://www.ldeo.columbia.edu/res/fac/trl/northpacific/pdorecon.html>

“a shift towards **less pronounced interdecadal variability ... after about the middle 1800s**” (D'Arrigo, *et al.*, 2001. Tree-ring estimates of Pacific decadal climate variability. Climate Dynamics)

