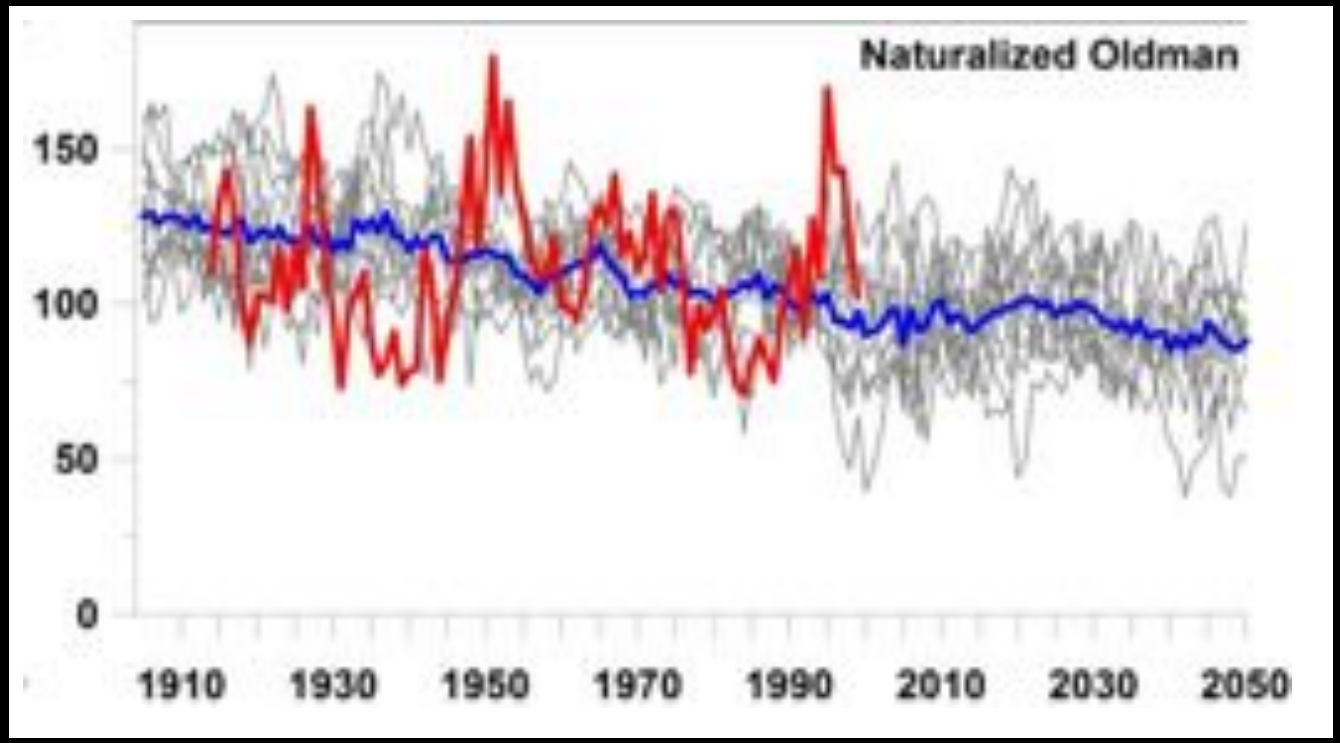
Climate Change and Rocky Mountain Watersheds

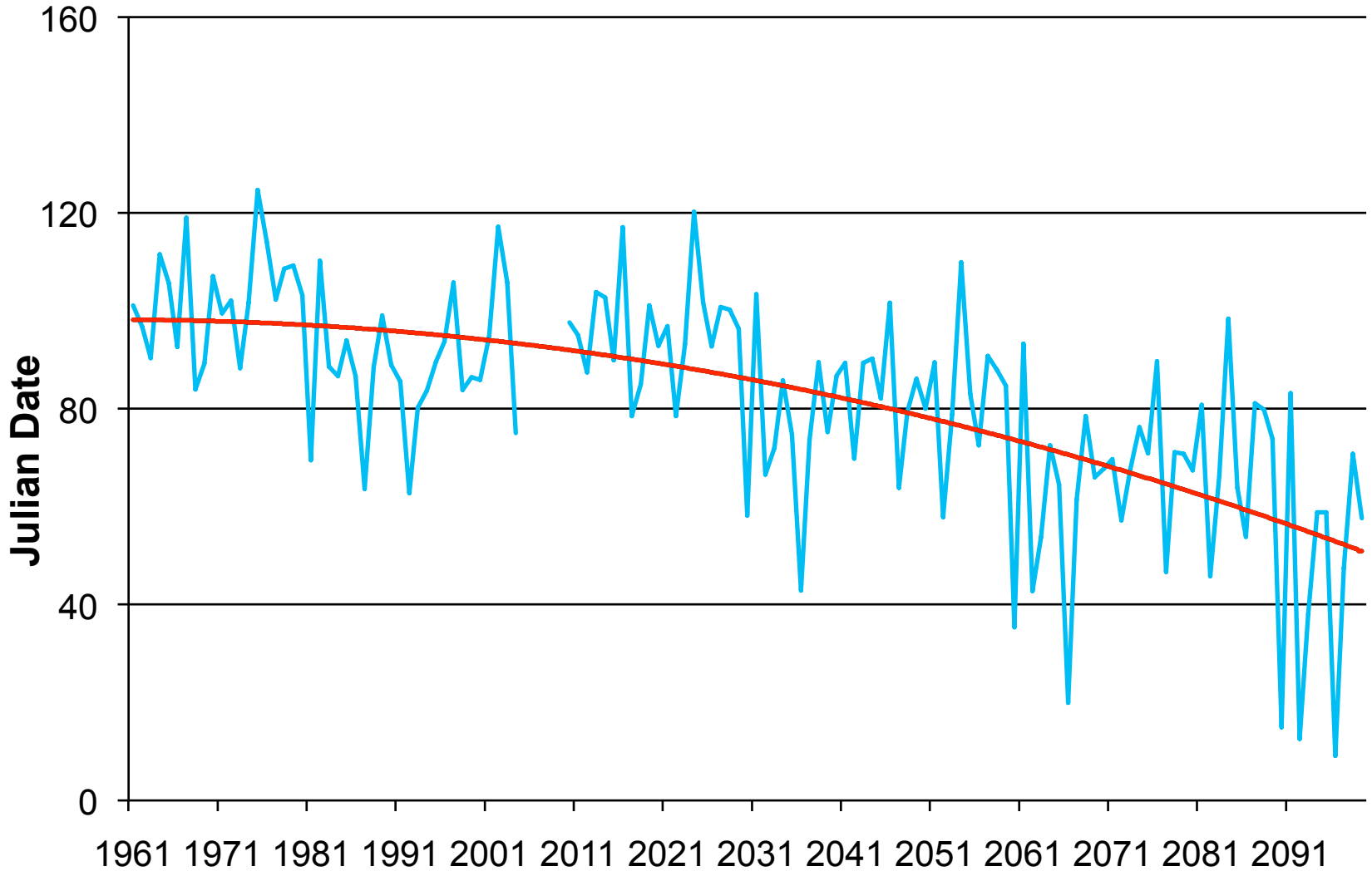
Dave Sauchyn, Prairie Adaptation Research Collaborative



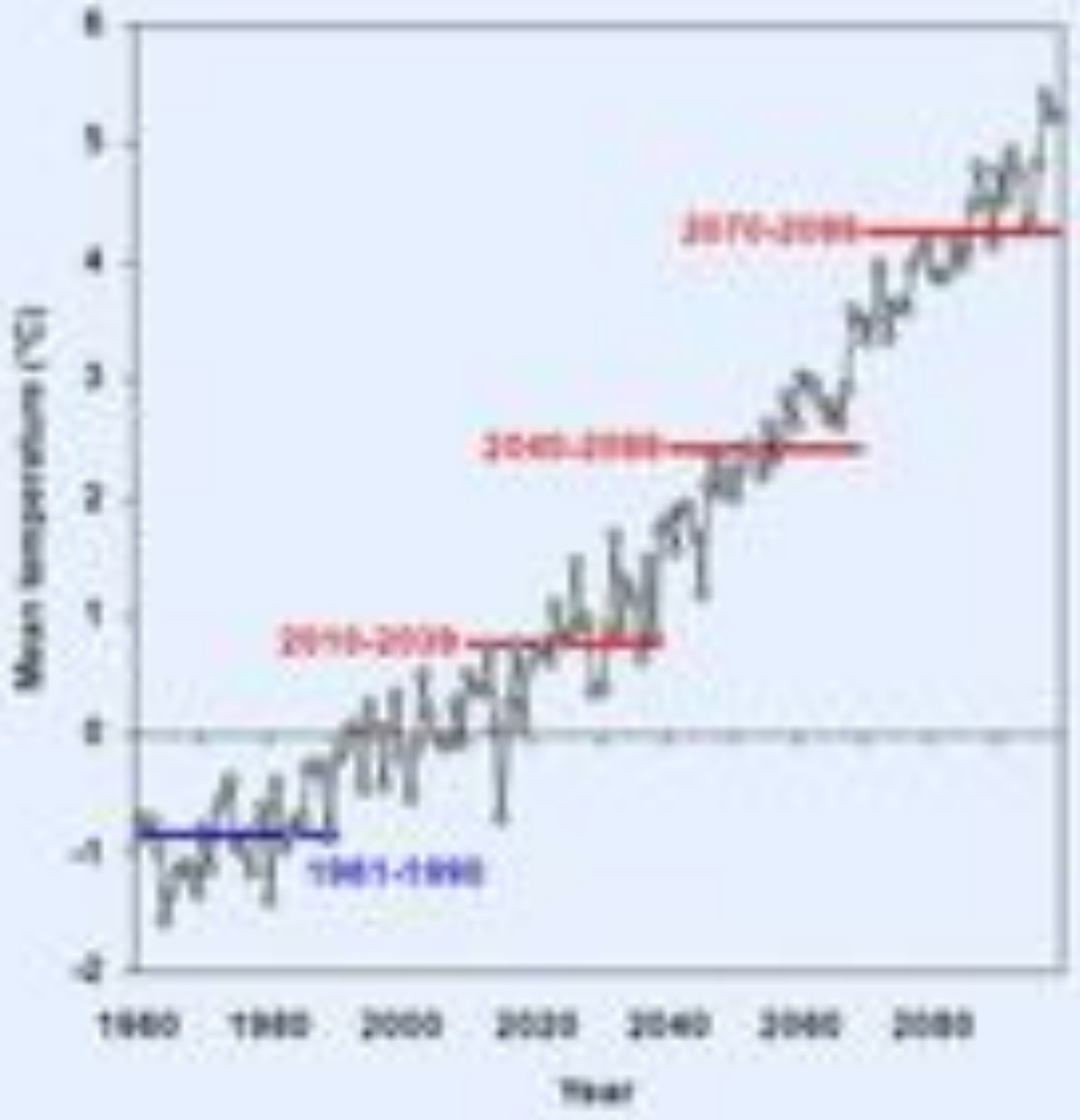
***Crown Managers Forum,* Fernie, BC, April 14, 2010**

St Mary's Basin Max SWE Date

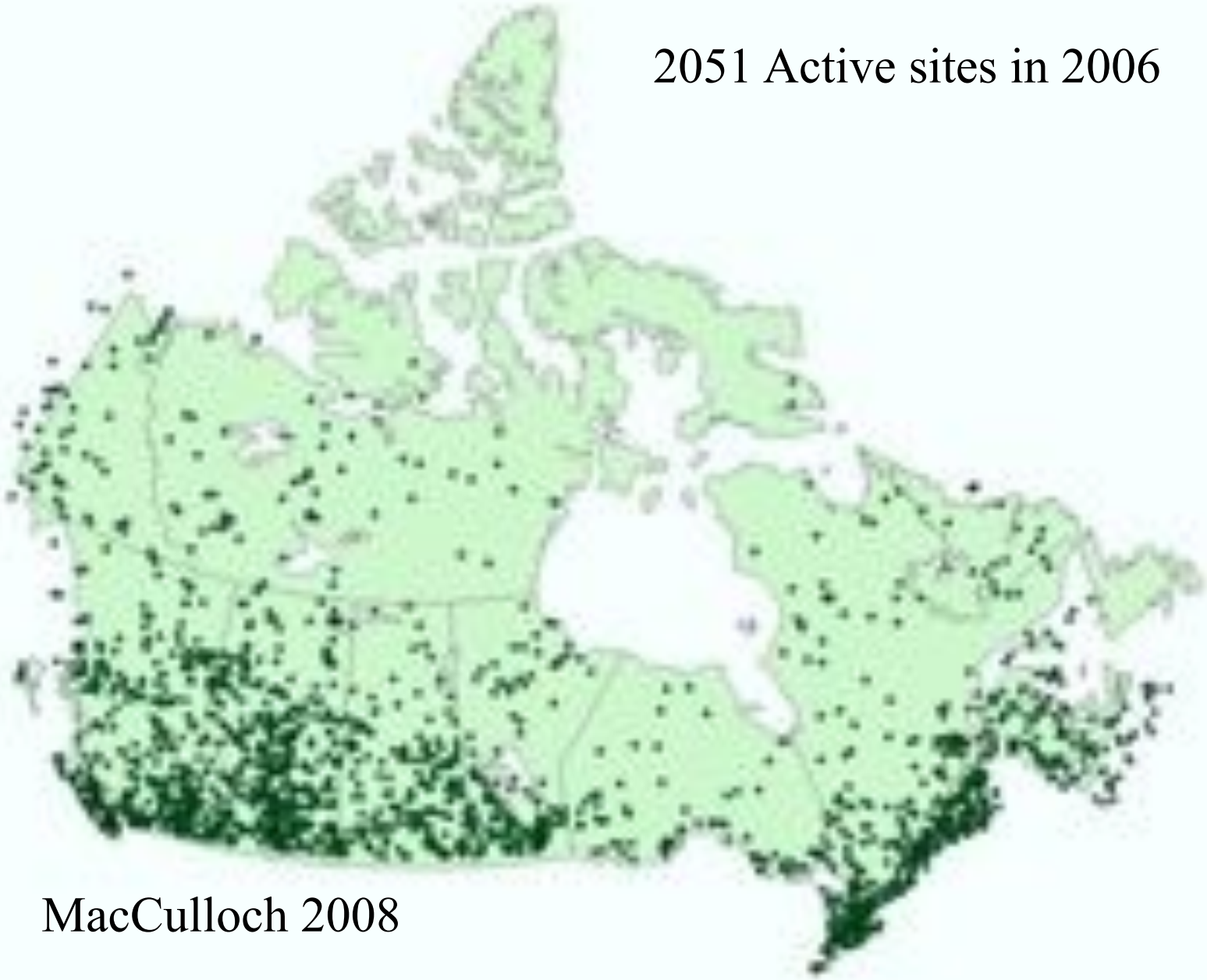
(Larson 2008)



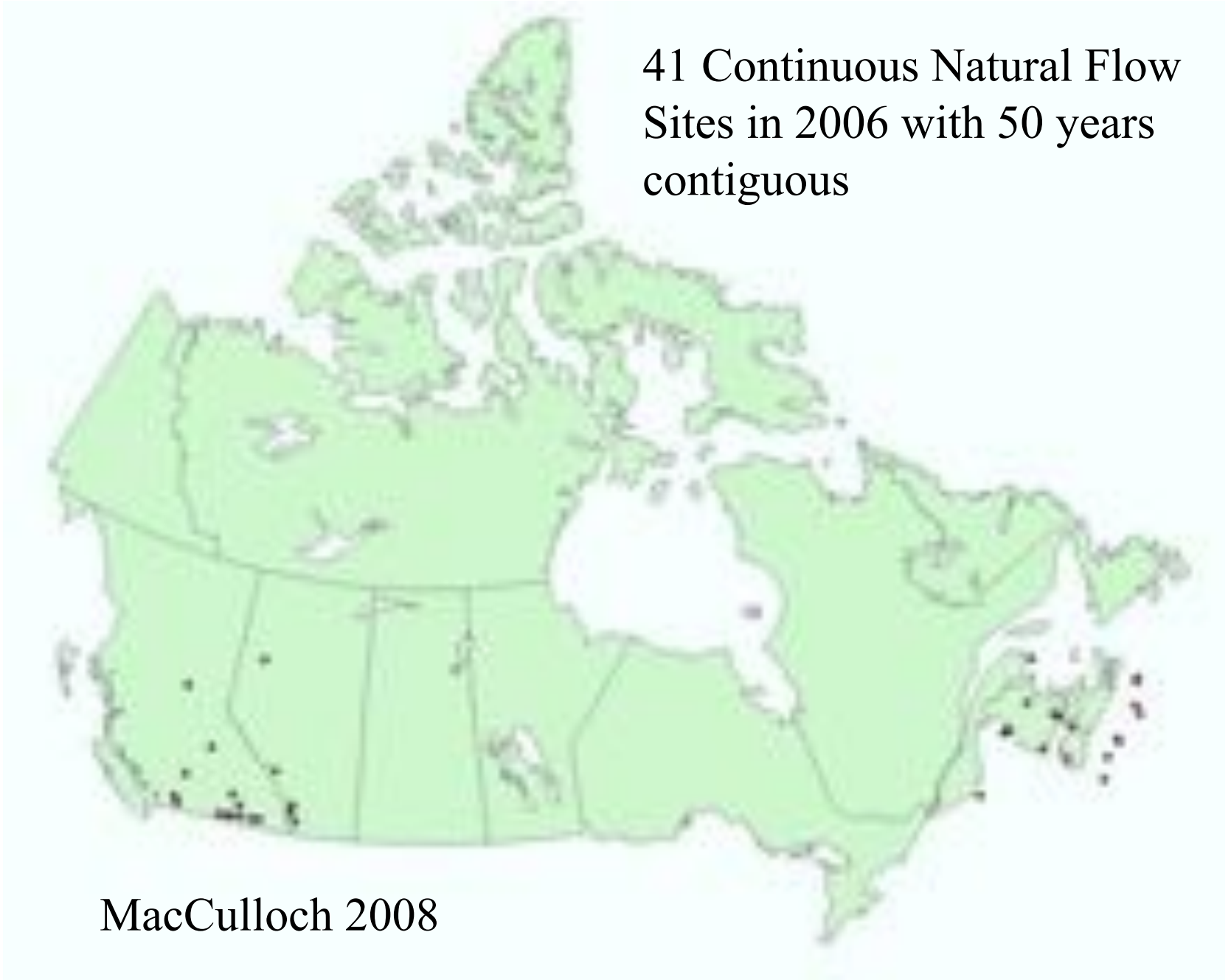
Standard Climate Change Scenarios from GCM output

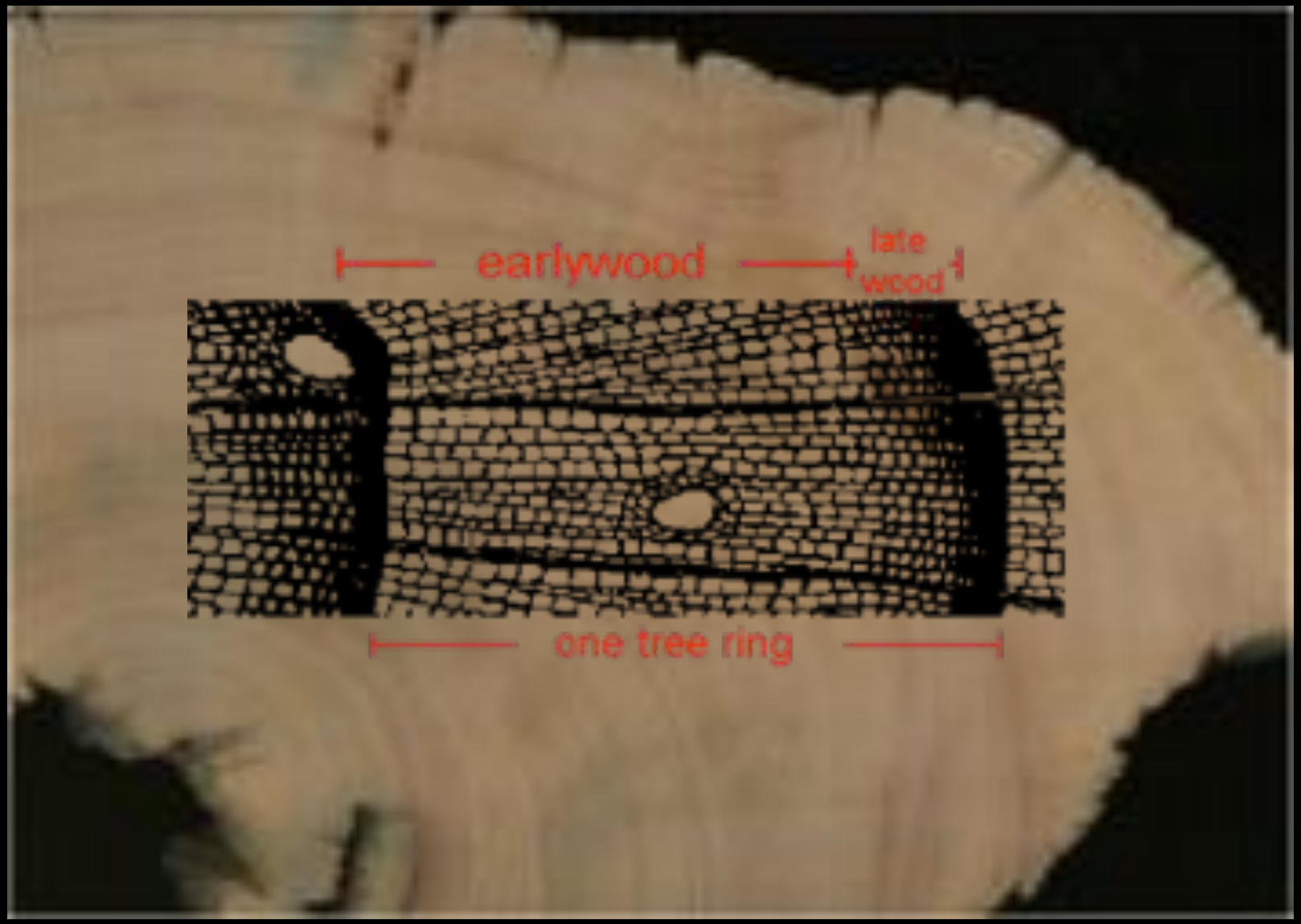


2051 Active sites in 2006



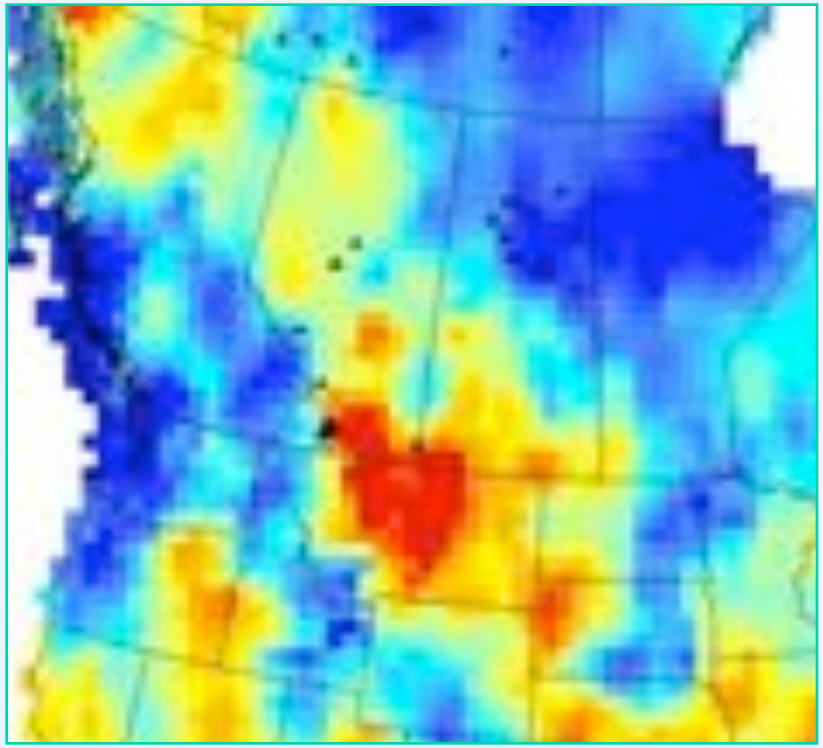
MacCulloch 2008


41 Continuous Natural Flow Sites in 2006 with 50 years contiguous
MacCulloch 2008

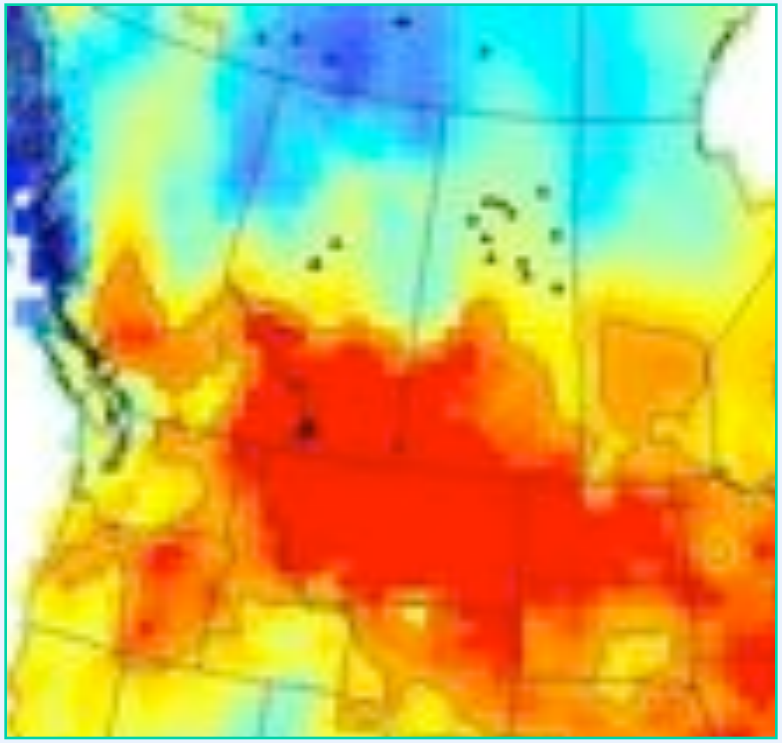

earlywood
late wood
one tree ring

Tree-Ring Sampling Sites

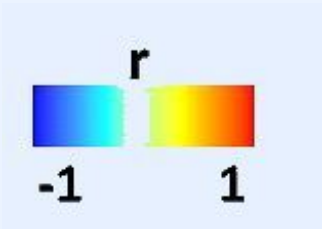
Spatial correlation: tree ring (PC1) and precipitation data,1901-2000



PC1 vs Jan-Feb ppt



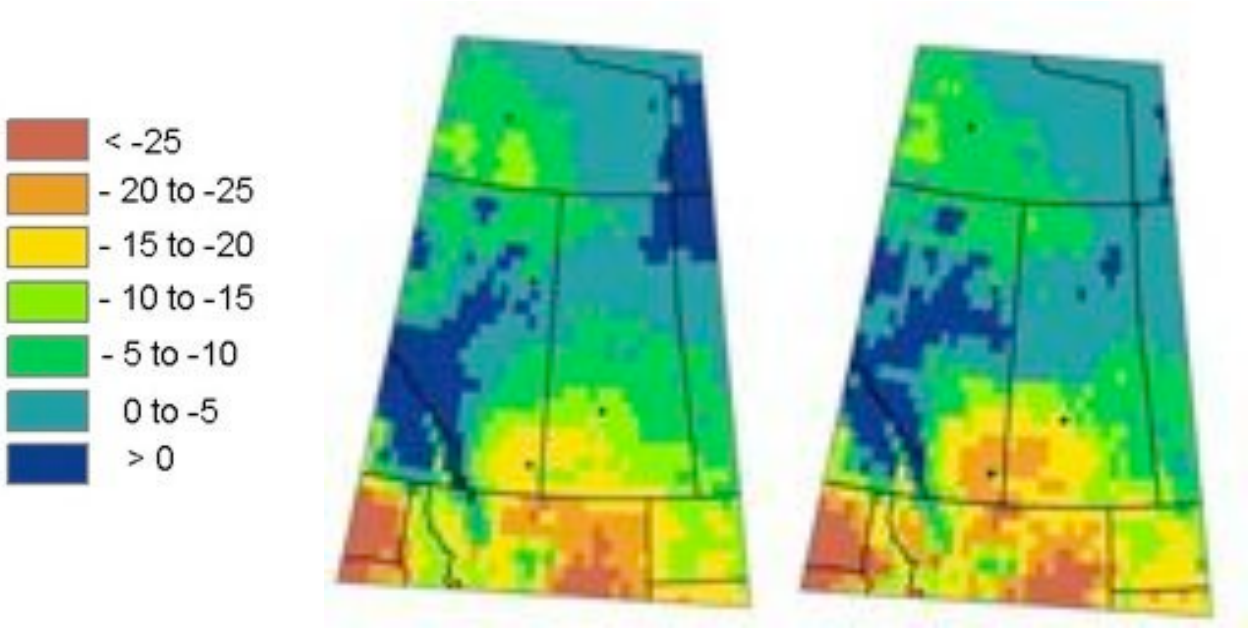
PC1 vs May-July ppt

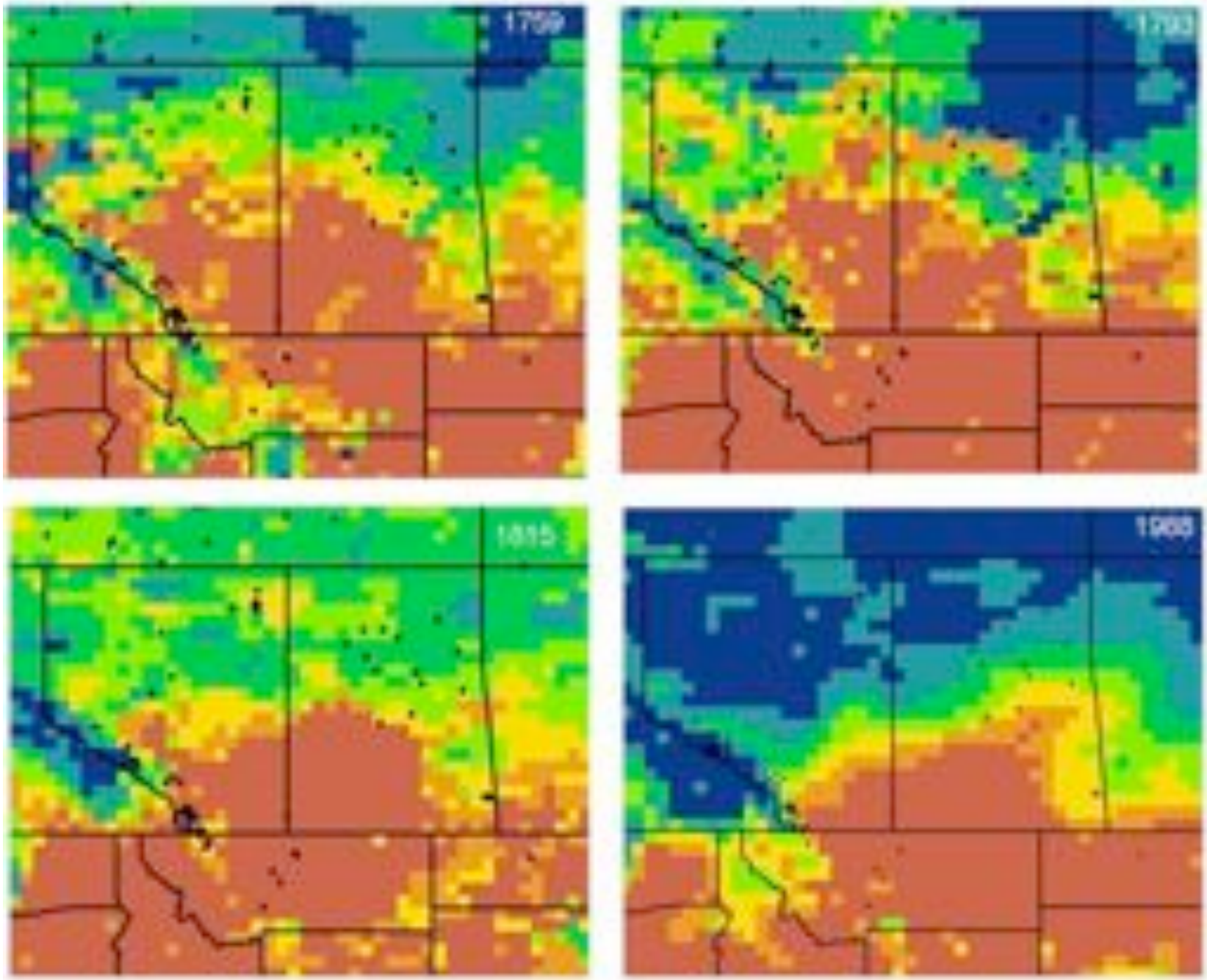


CMI 1961-90: recorded versus inferred

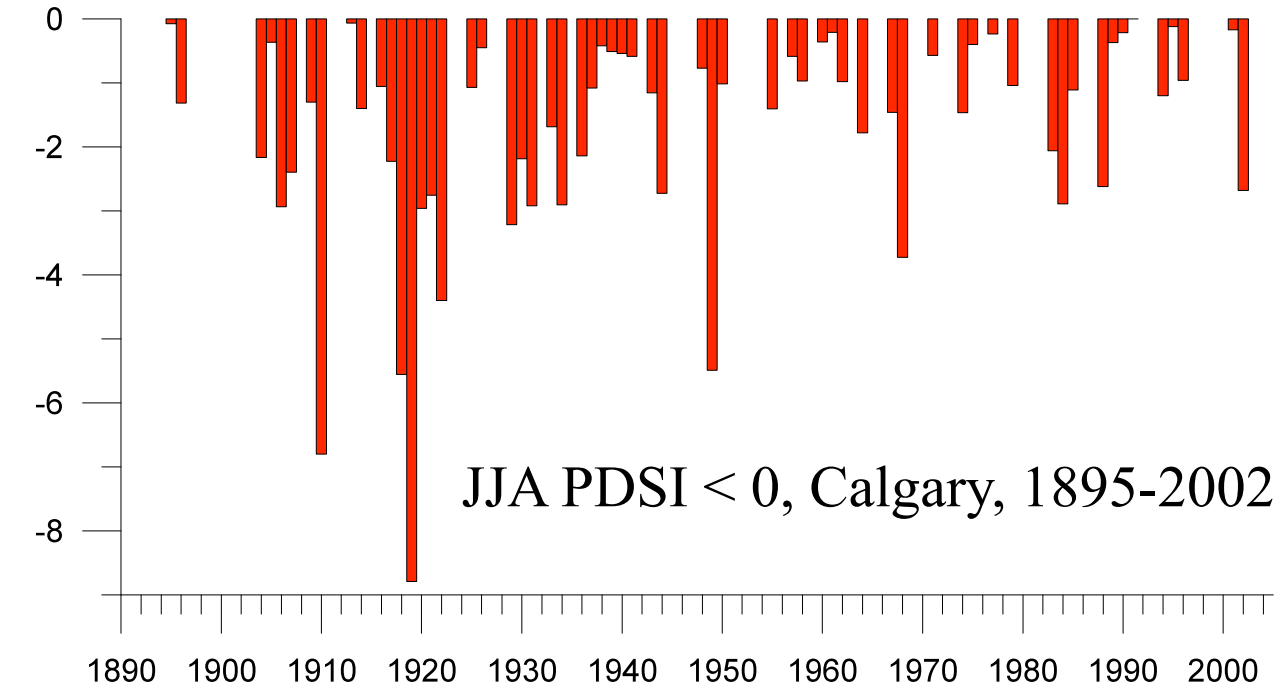
Climate Moisture Index (CMI) = P-PET

PET: simplified Penman-Monteith (Hogg, 1994, 1997)

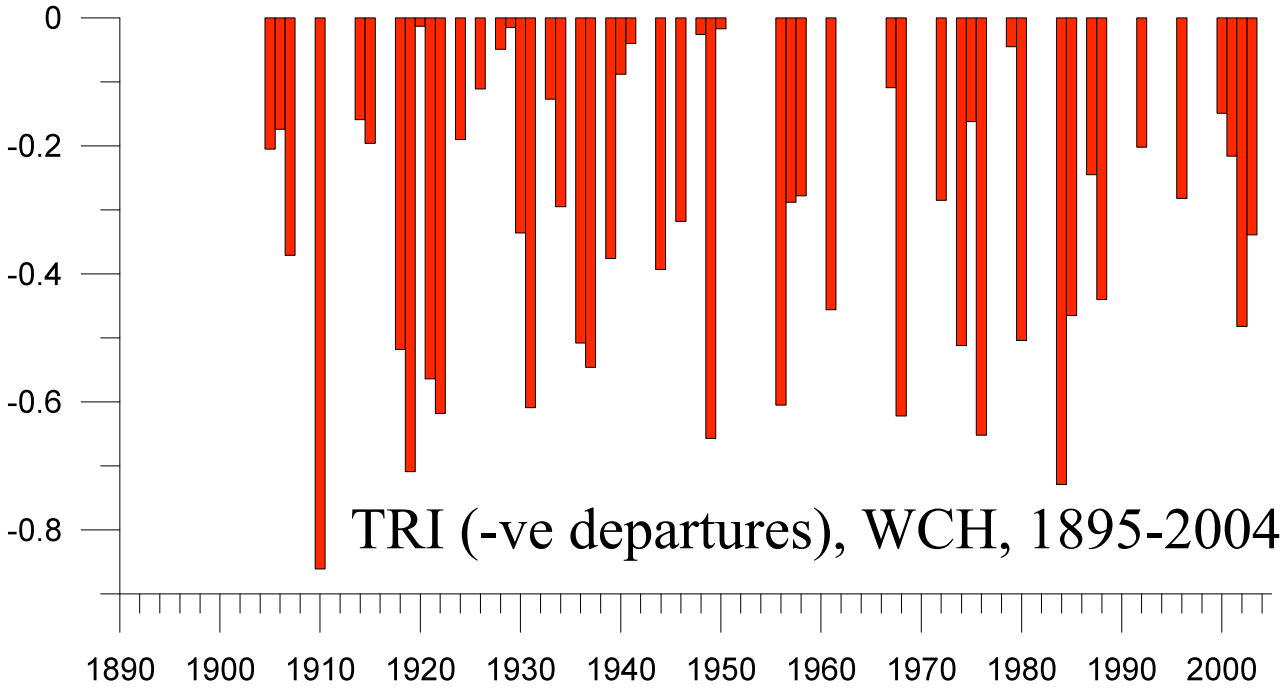



1709
1793
1815
1965

Tree-Ring Sampling Sites

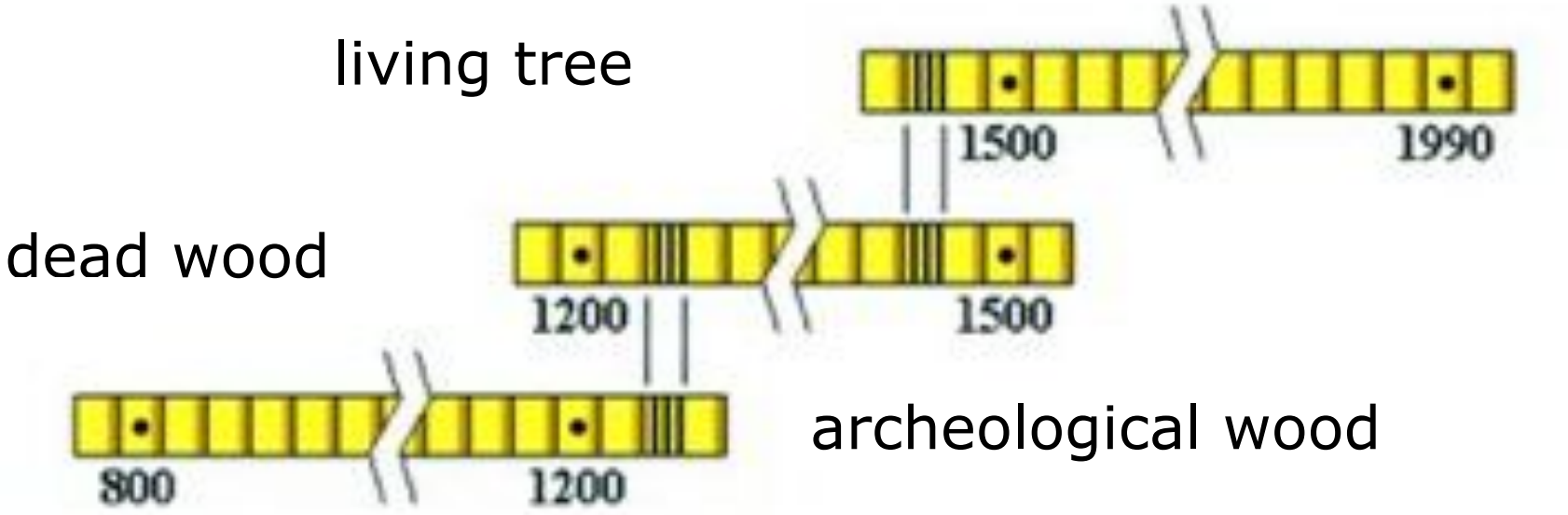

0
-2
-4
-6
-8
JJA PDSI < 0, Calgary, 1895-2002
1890
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000

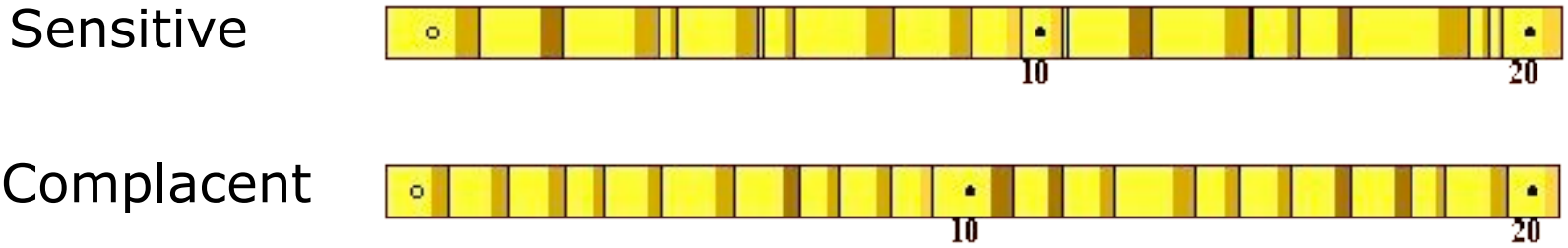
r = 0.628


0
-0.2
-0.4
-0.6
-0.8
TRI (-ve departures), WCH, 1895-2004
1890
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000

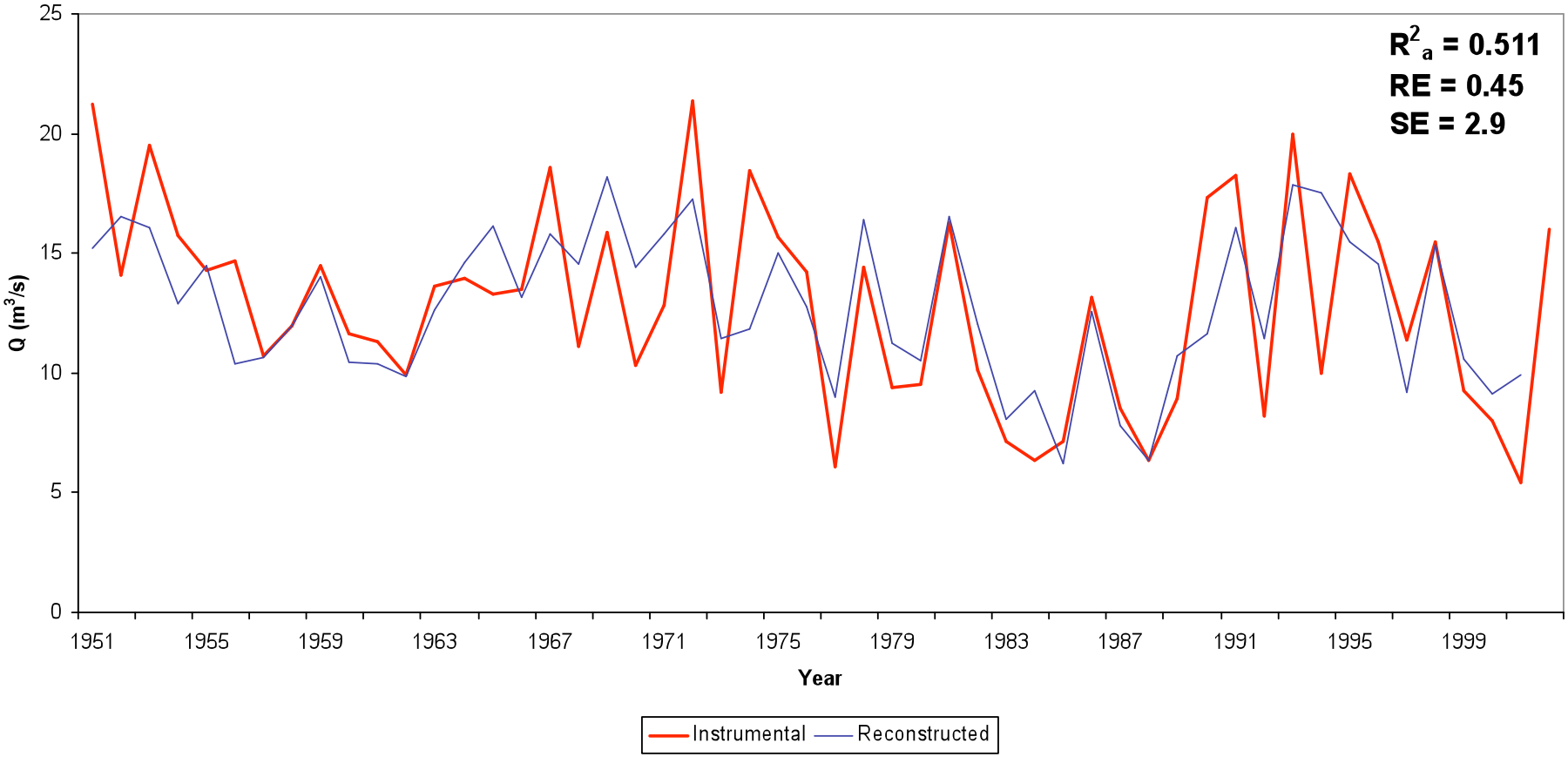
Crossdating – Pattern Matching

The outer growth of dead trees crossdates with inner portions of living trees

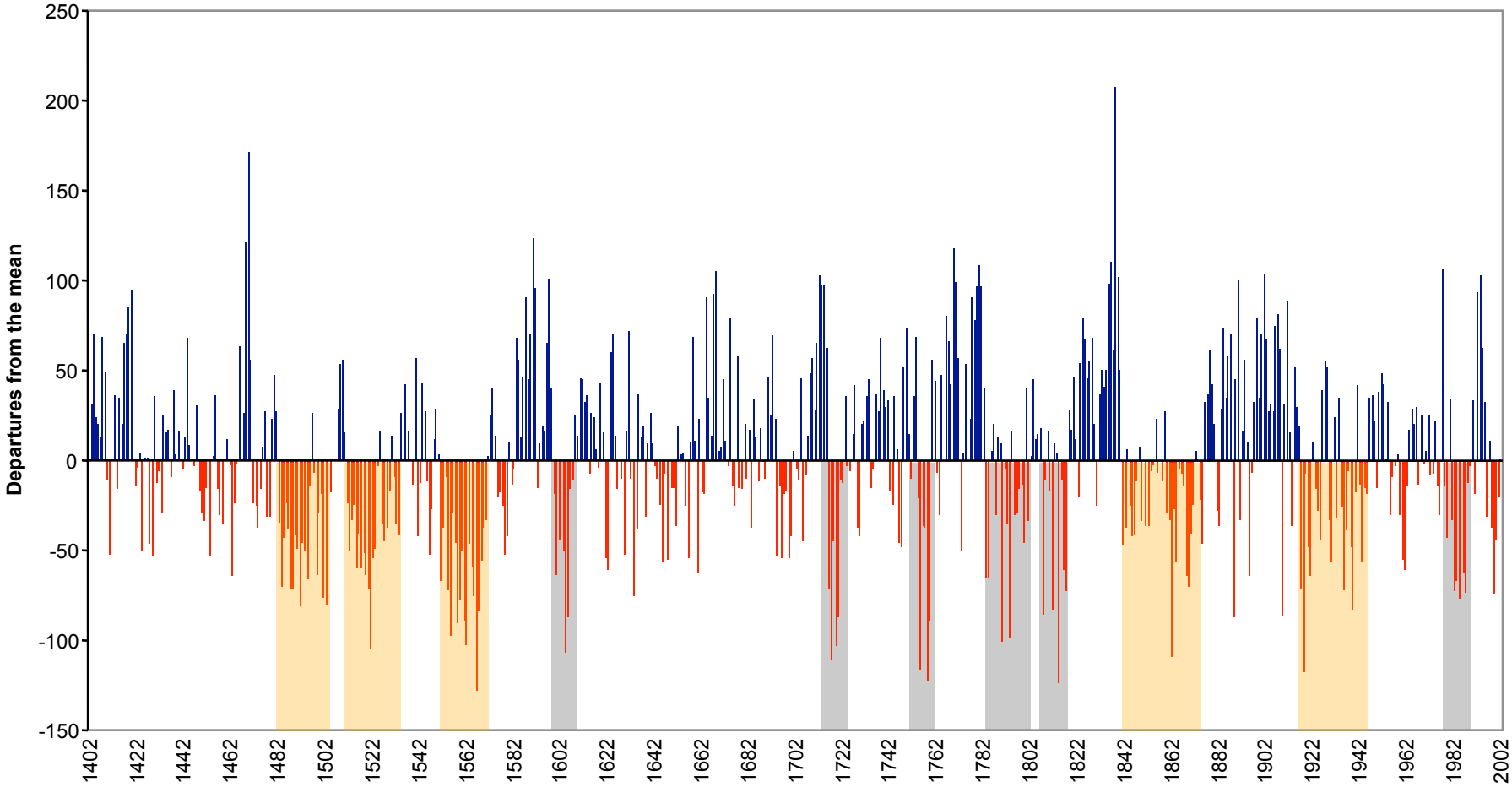




Oldman River at Waldron's Corner, calibration period (1951-2004)



South Saskatchewan River at Medicine Hat, 1402-2004



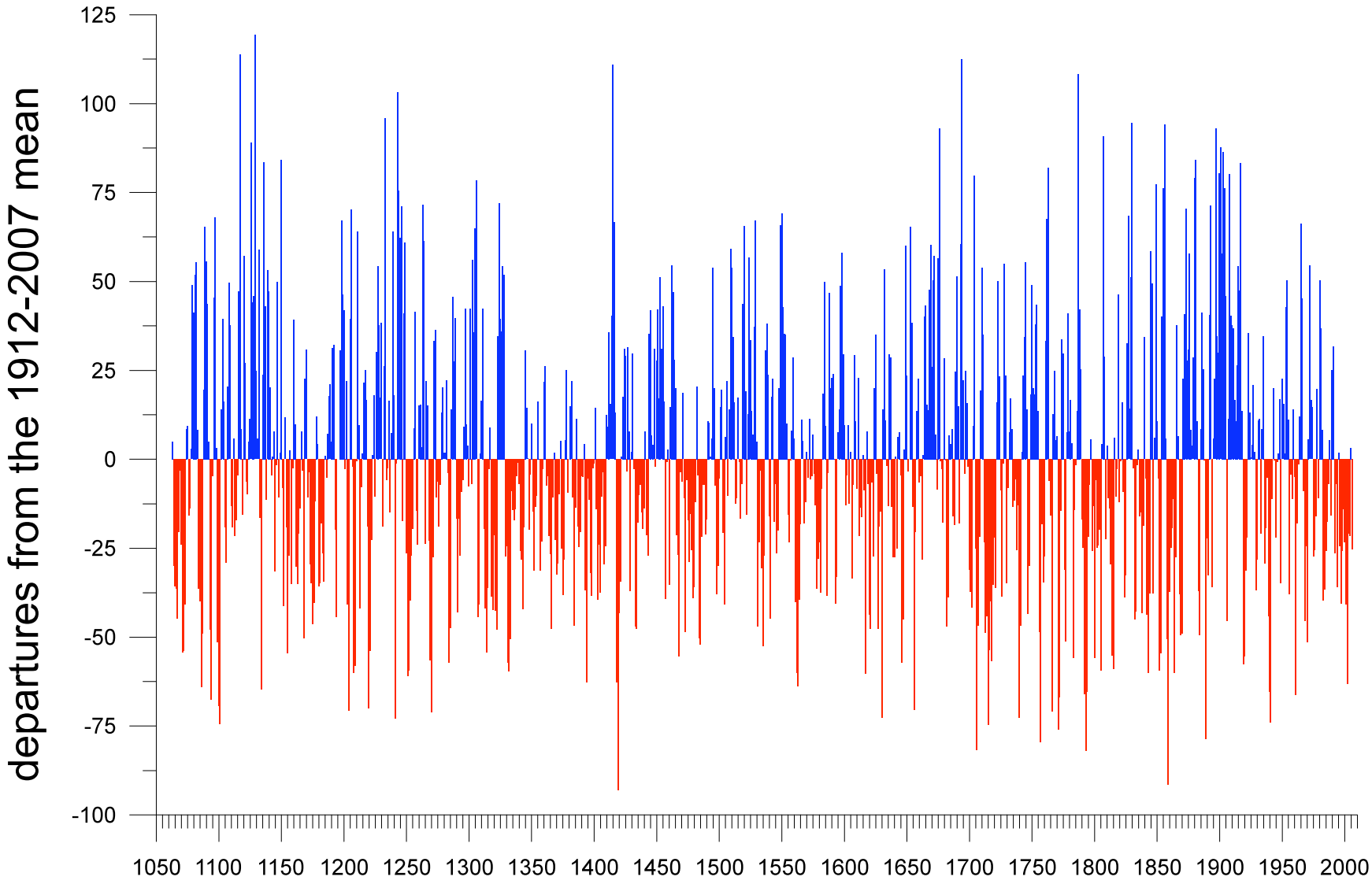
Axelson, Sauchyn and Barichivich, 2009

North Saskatchewan River

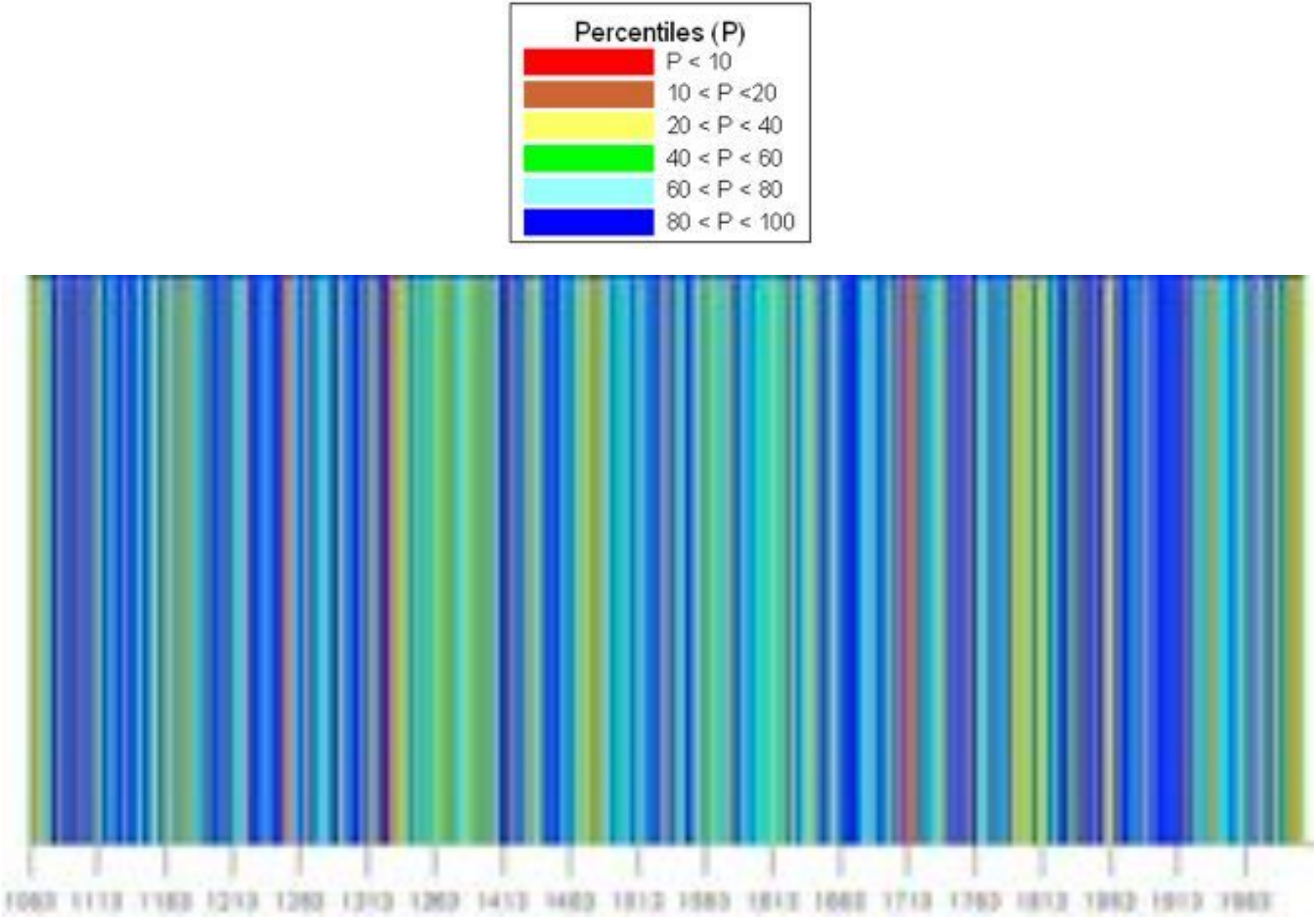
At Edmonton House, a large fire burned “all around us” on April 27th (1796) and burned on both sides of the river. On May 2nd [1796] William Tomison wrote to James Swain that furs could not be moved as, **“there being no water in the river.”**

Old Wood
Headwaters, NSRB

North Saskatchewan River at Edmonton, 1063-2006



North Saskatchewan River at Edmonton, 1063-2006



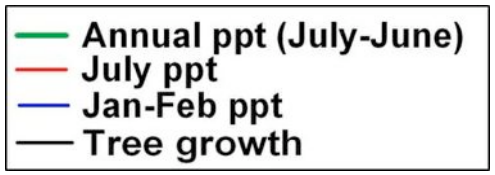
Seasonal precipitation, ENSO and tree growth

El Niño → winter (-); summer (+)

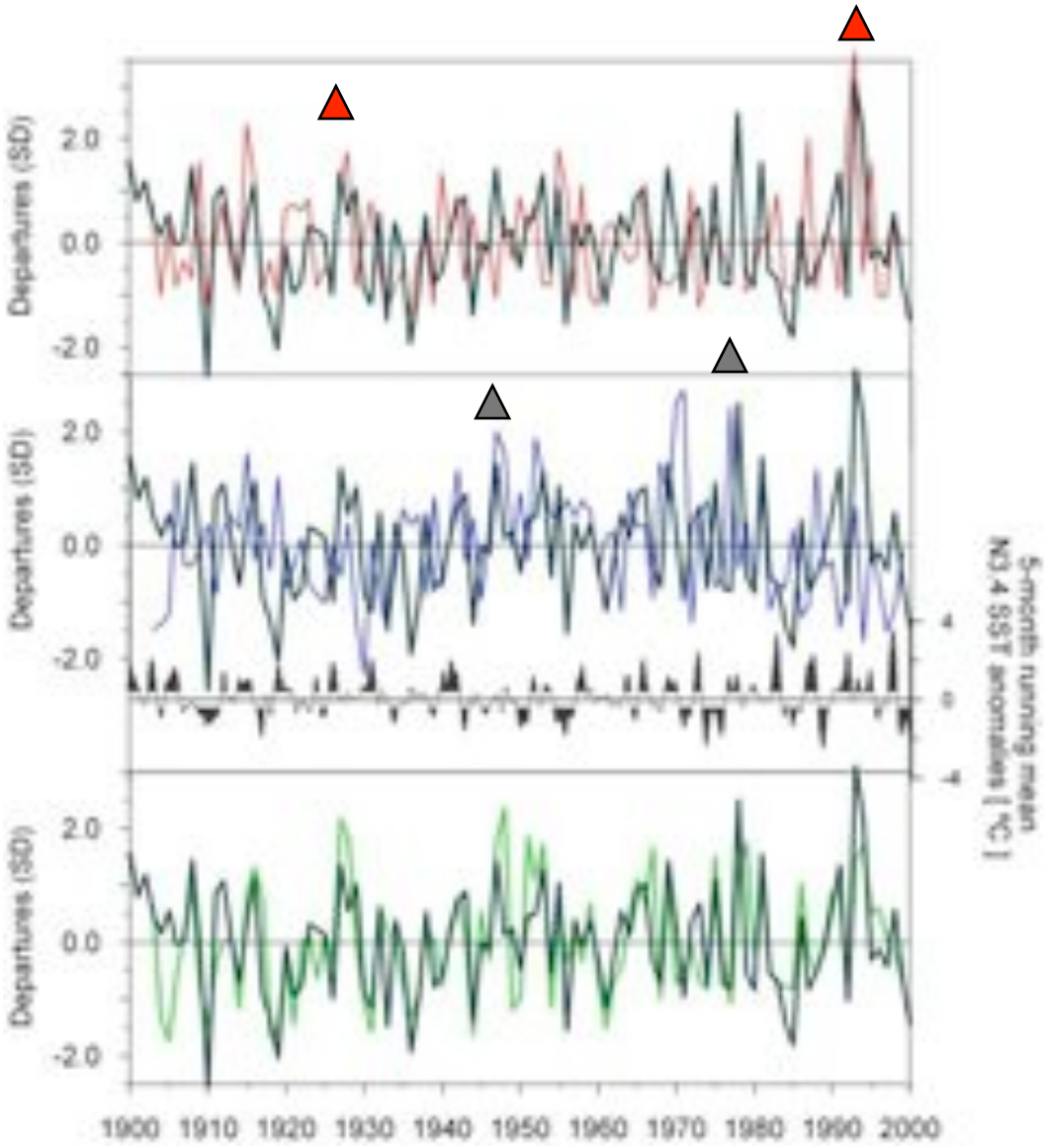
La Niña → winter (+); summer (-)

Response to summer

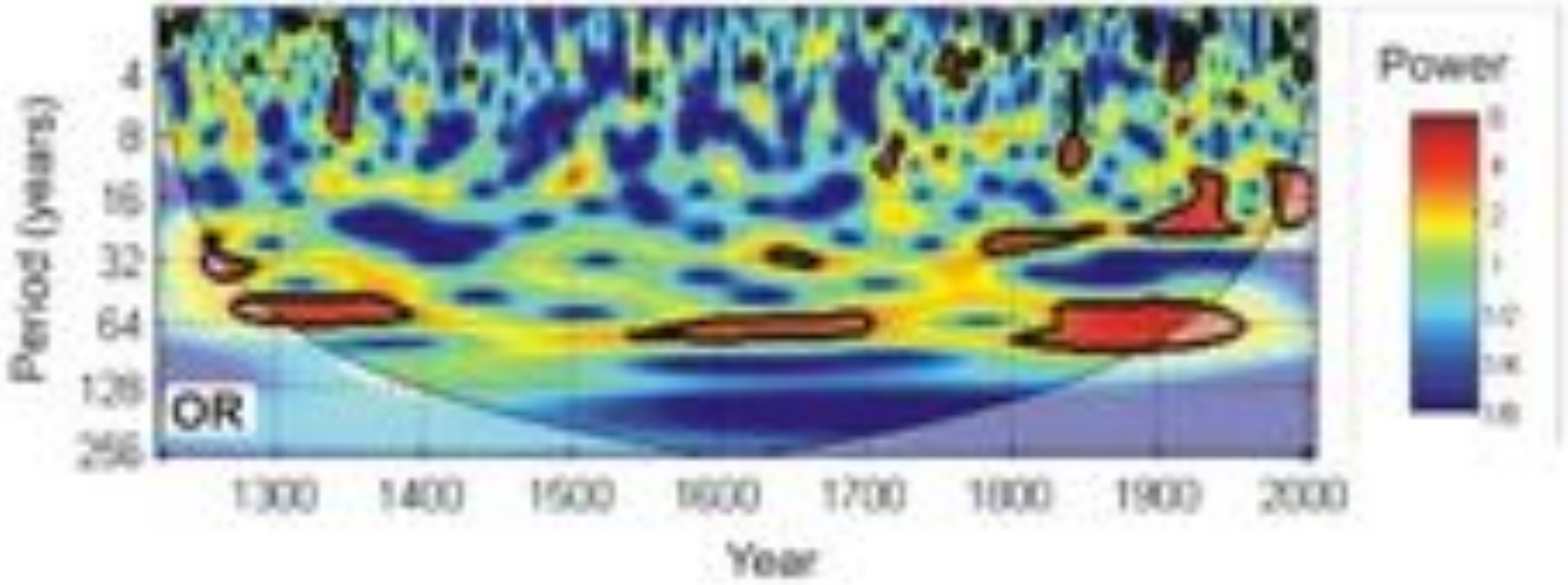
Response to winter



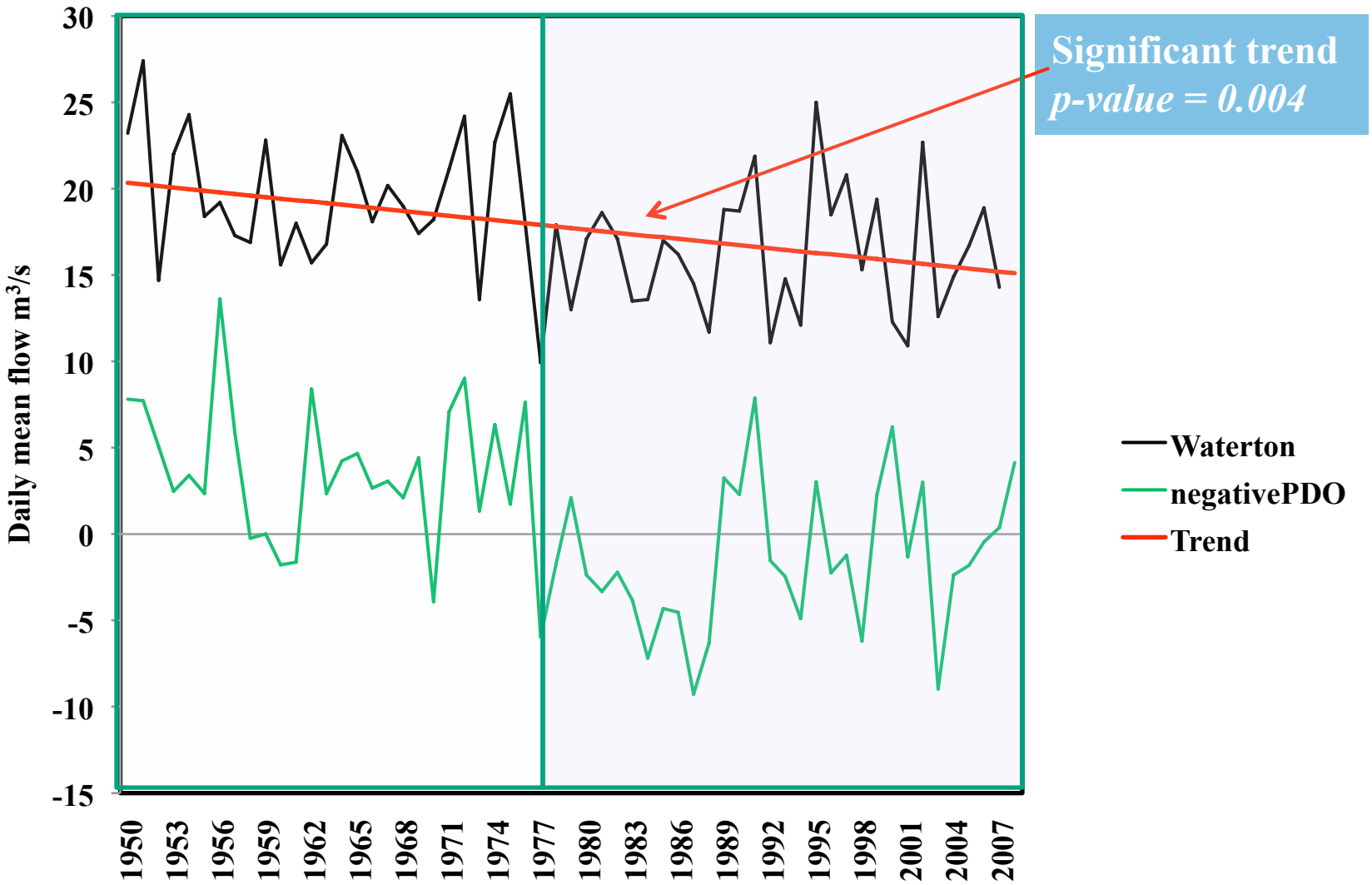
r = .67



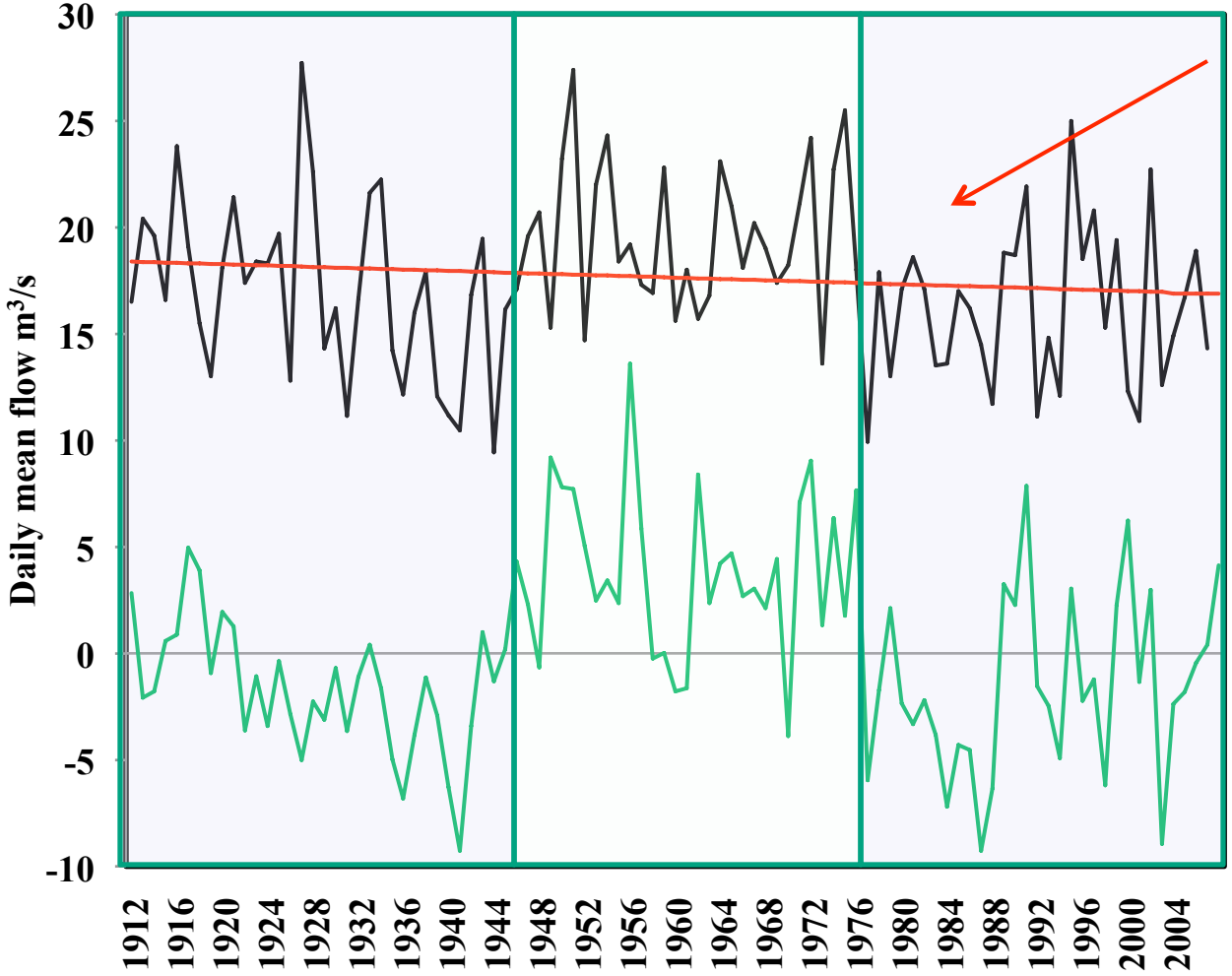
Cycles in the tree rings



Waterton River near Waterton 1950-2007



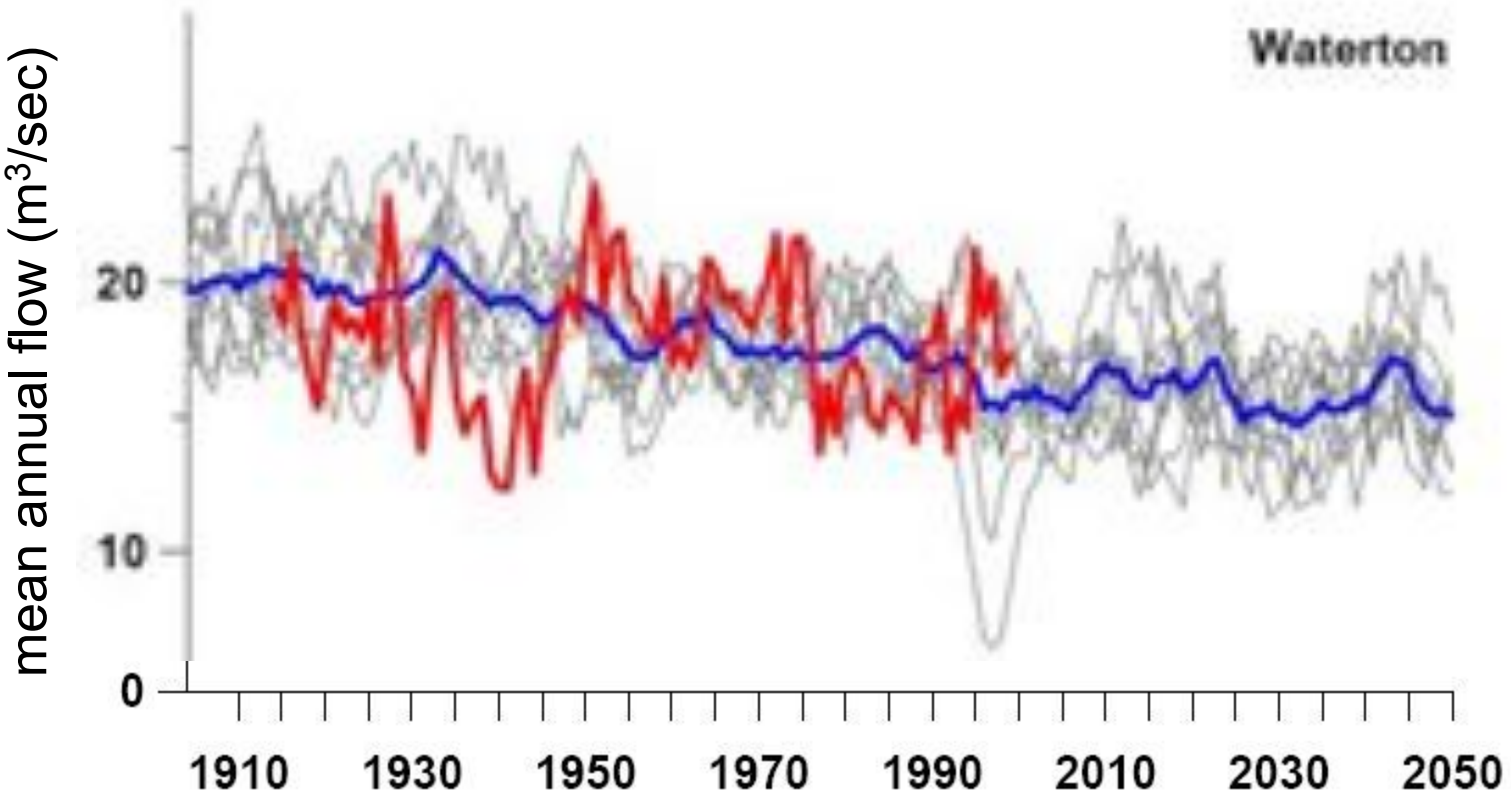
Whole Waterton record 1912-2007



Trend not significant

p-value = 0.290

Observed (red) and modeled variability, Waterton River, AB



Jacques et al., 2010; Lapp et al., in review

University of Regina Tree Ring Lab

www.parc.ca/urtreelab

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INTRODUCTION

The University of Regina Tree-Ring Lab was established in 1998. Since then we have built a network of 60 tree-ring chronologies encompassing the mixed forests of eastern Montana, and the foothills and boreal forests of Alberta, Saskatchewan and the NWT. Our tree-ring processing and measuring facility is located in the Department of Geography. The researchers and our data processing lab are based at the Prairie Adaptation Research Collaborative (PARC), a climate change research center. At PARC our tree-ring records are applied to providing a better understanding of the climate of the western interior, a context for forecasts of future climate change, high-resolution climate records for investigating the climate forcing of biophysical systems, and providing resource managers and planners with a longer view of precipitation and streamflow in this region.

This website is hosted by the Prairie Adaptation Research Collaborative