

# Climate Change and Water Supplies in the SSRB

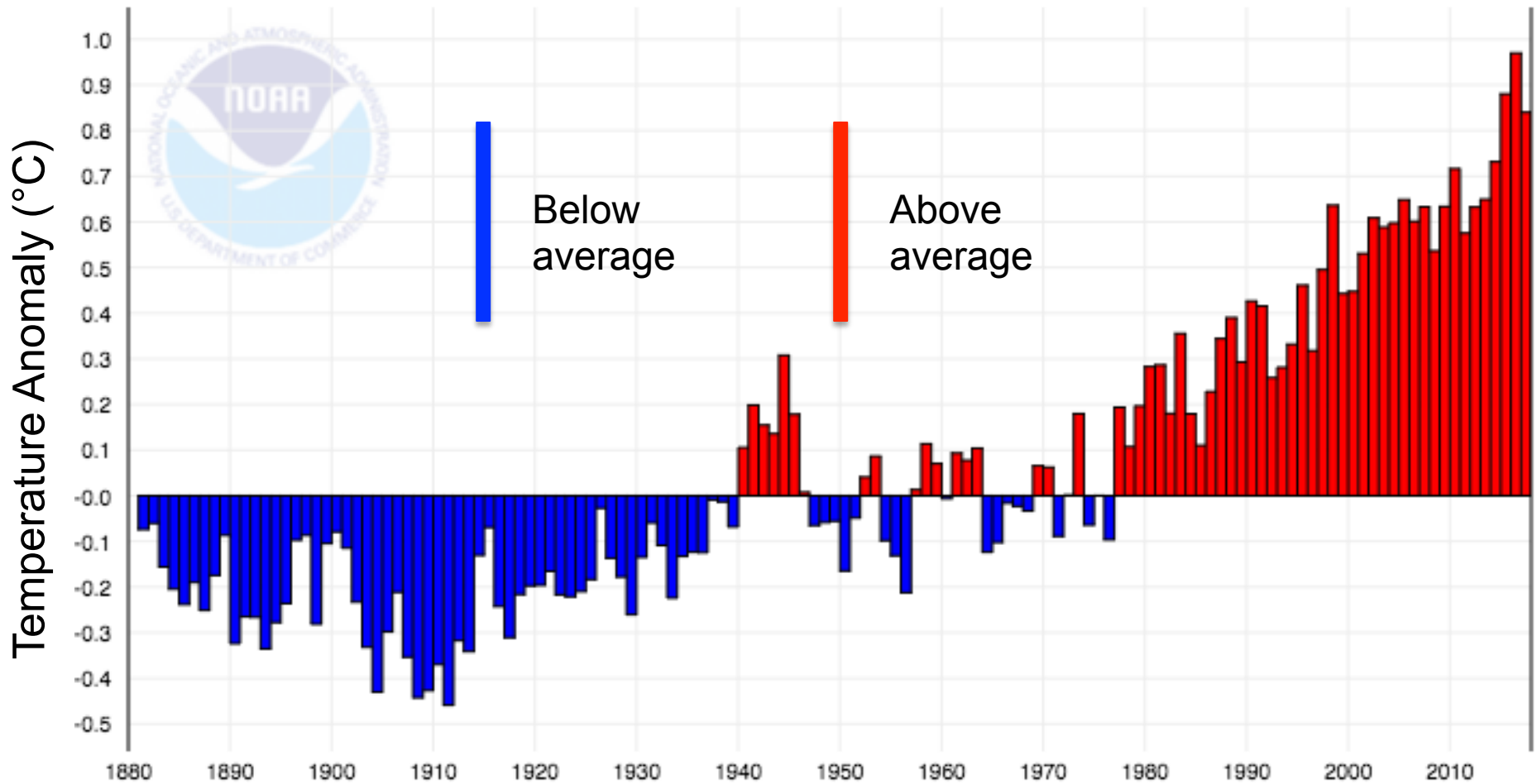
David Sauchyn, PhD, PGeo

Director, Prairie Adaptation Research Collaborative, University of Regina



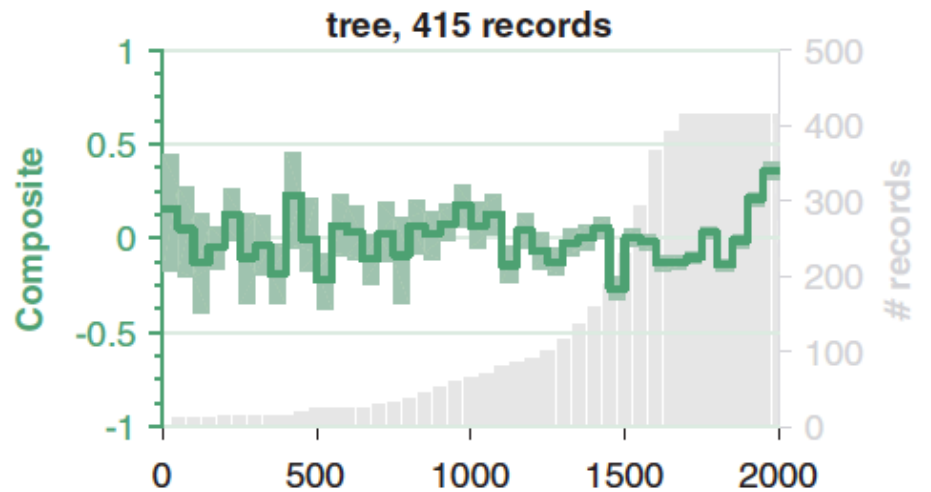
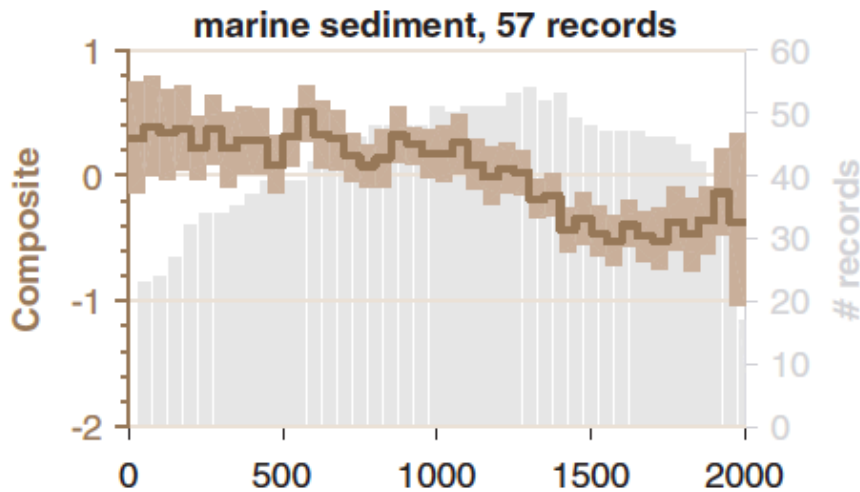
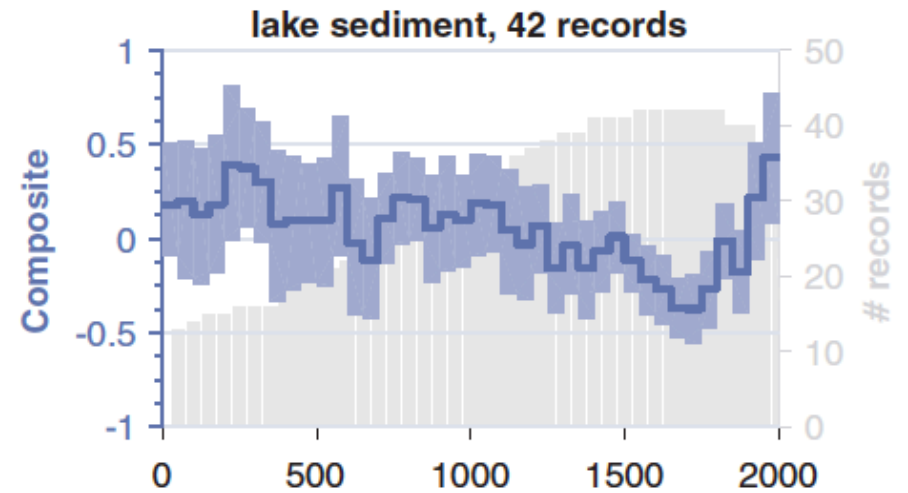
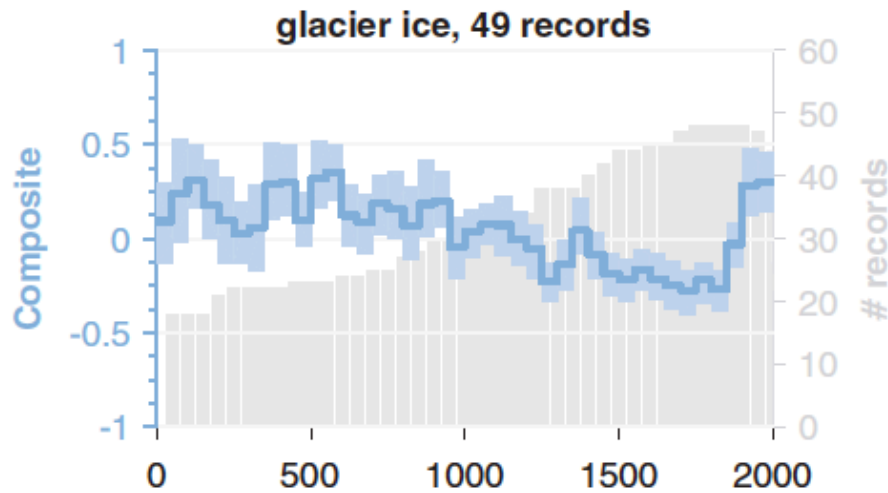
SEAWA Community Educational Forum 05 April 2019, Medicine Hat

**March 2018** marks was the **411th consecutive month** with temperatures above the 20th century average

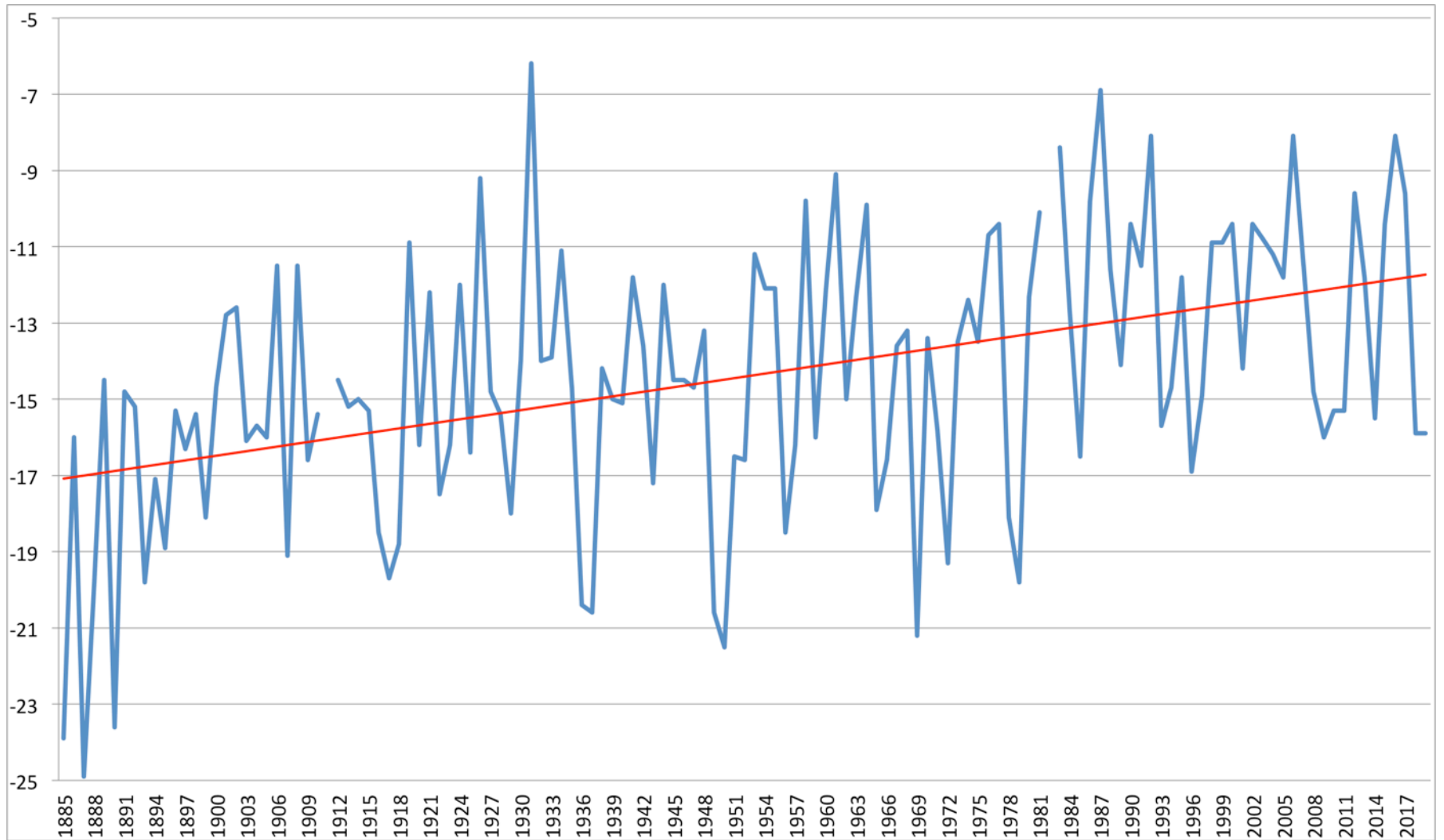




PAGES2k Consortium. 2017. A global multi-proxy database for temperature reconstructions of the Common Era, *Nature Scientific Data*



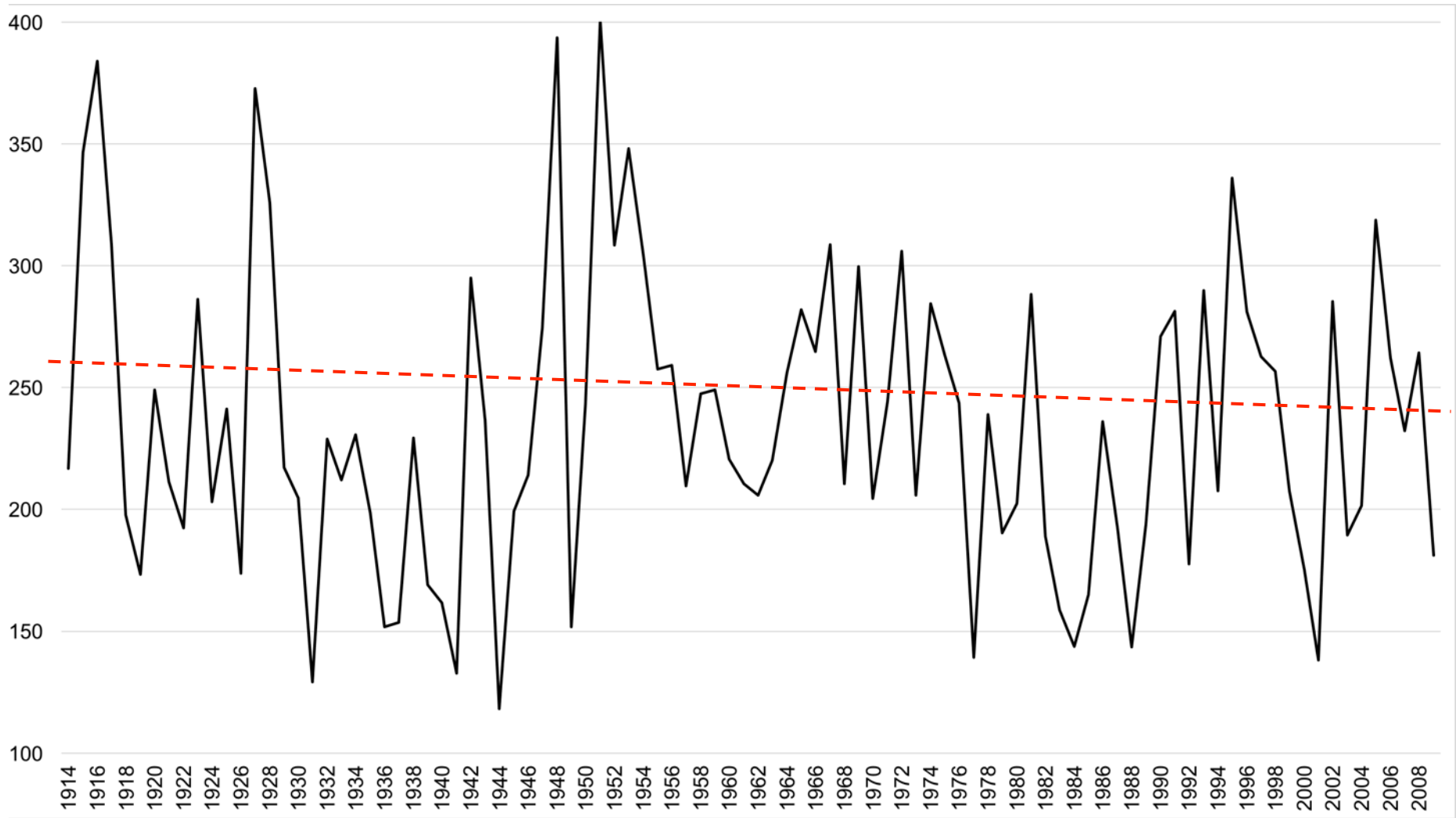
# Minimum Daily Winter Temperature (°C) Medicine Hat, 1885-2019



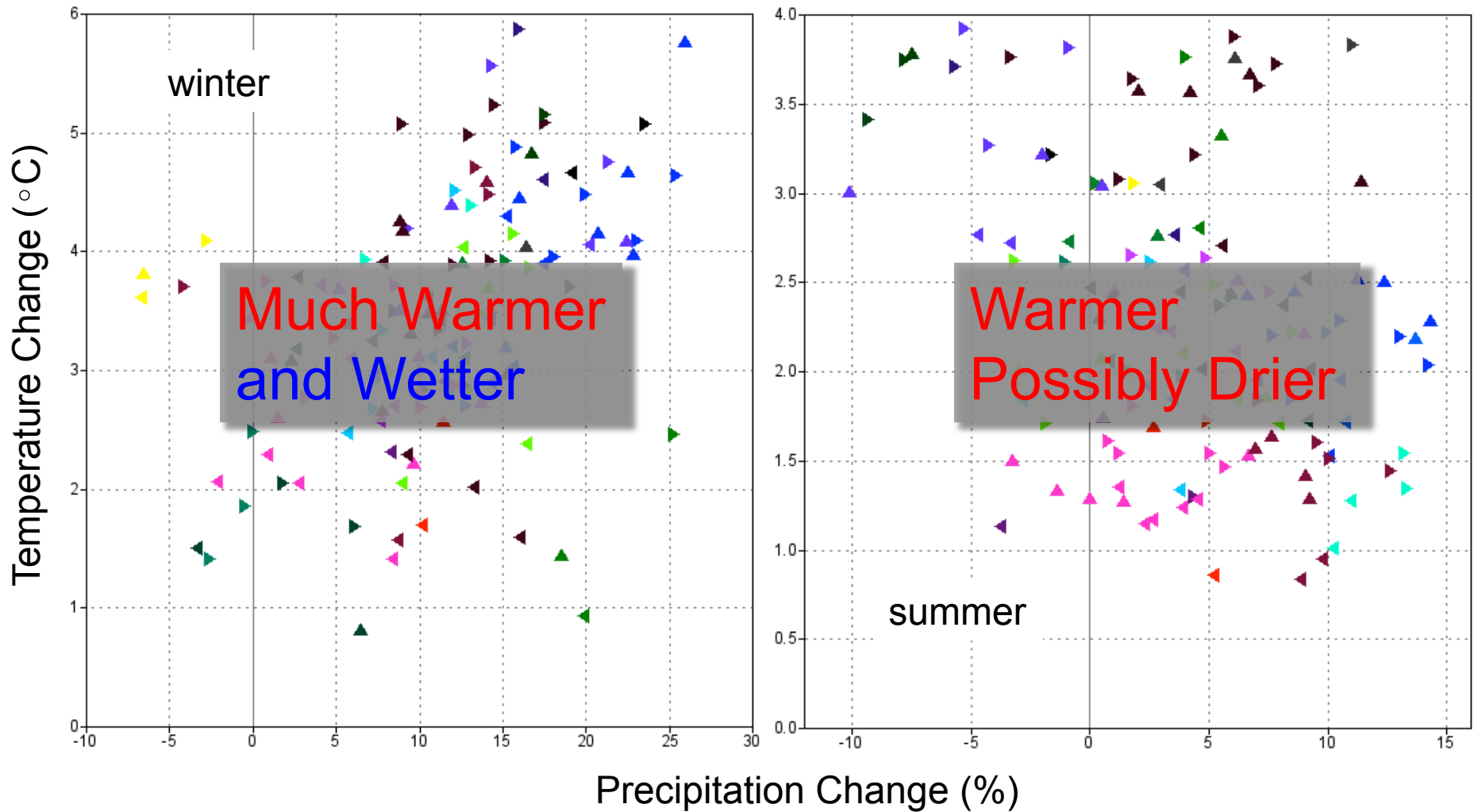
We are losing the advantage of a cold winter



# South Saskatchewan River at Medicine Hat Naturalized Water Year Flow (m<sup>3</sup>/s) , 1914-2009



# Projected Climate Changes, Western Canada 1971-2000 versus 2040-2069



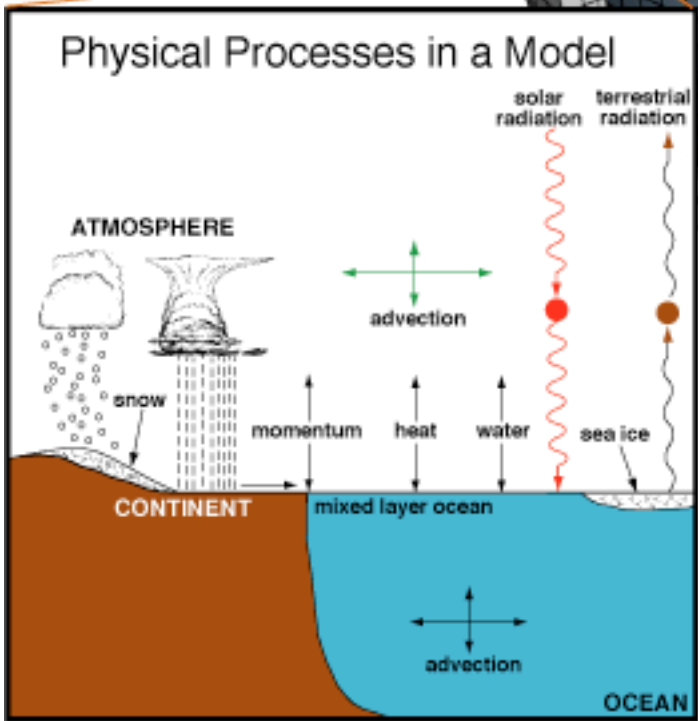
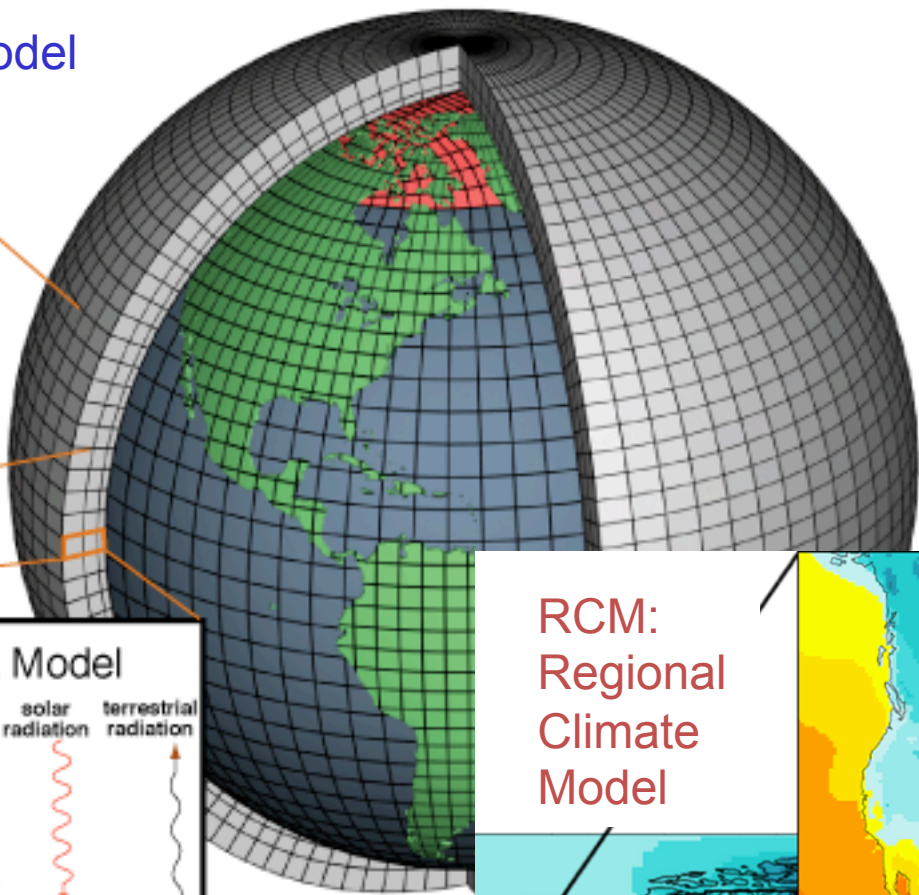
Source: PCIC



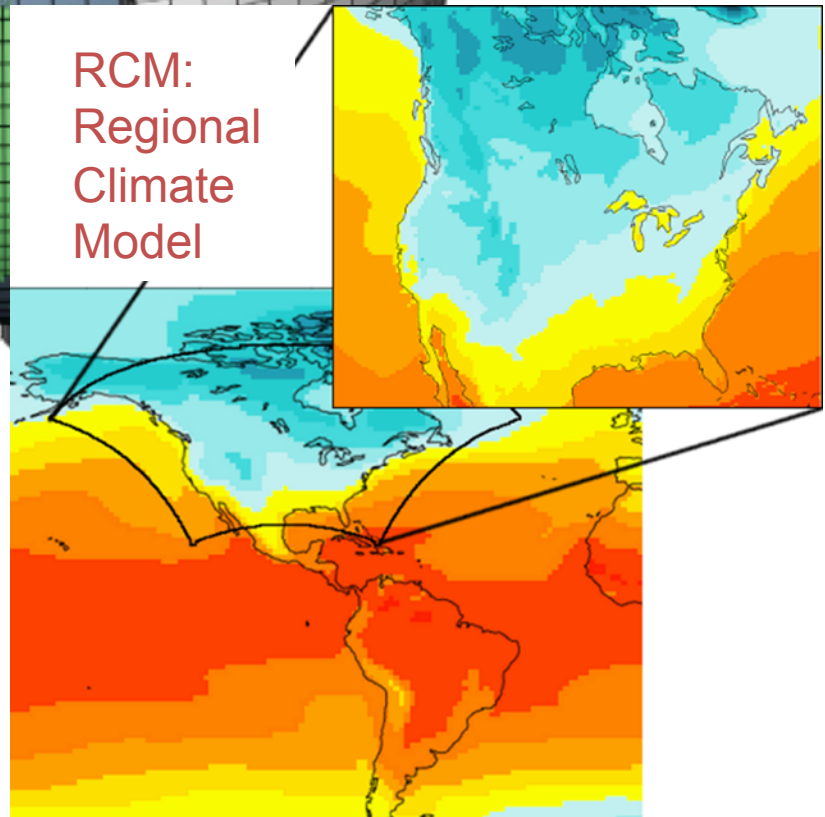
# GCM: Global Climate Model

Horizontal Grid  
(Latitude-Longitude)

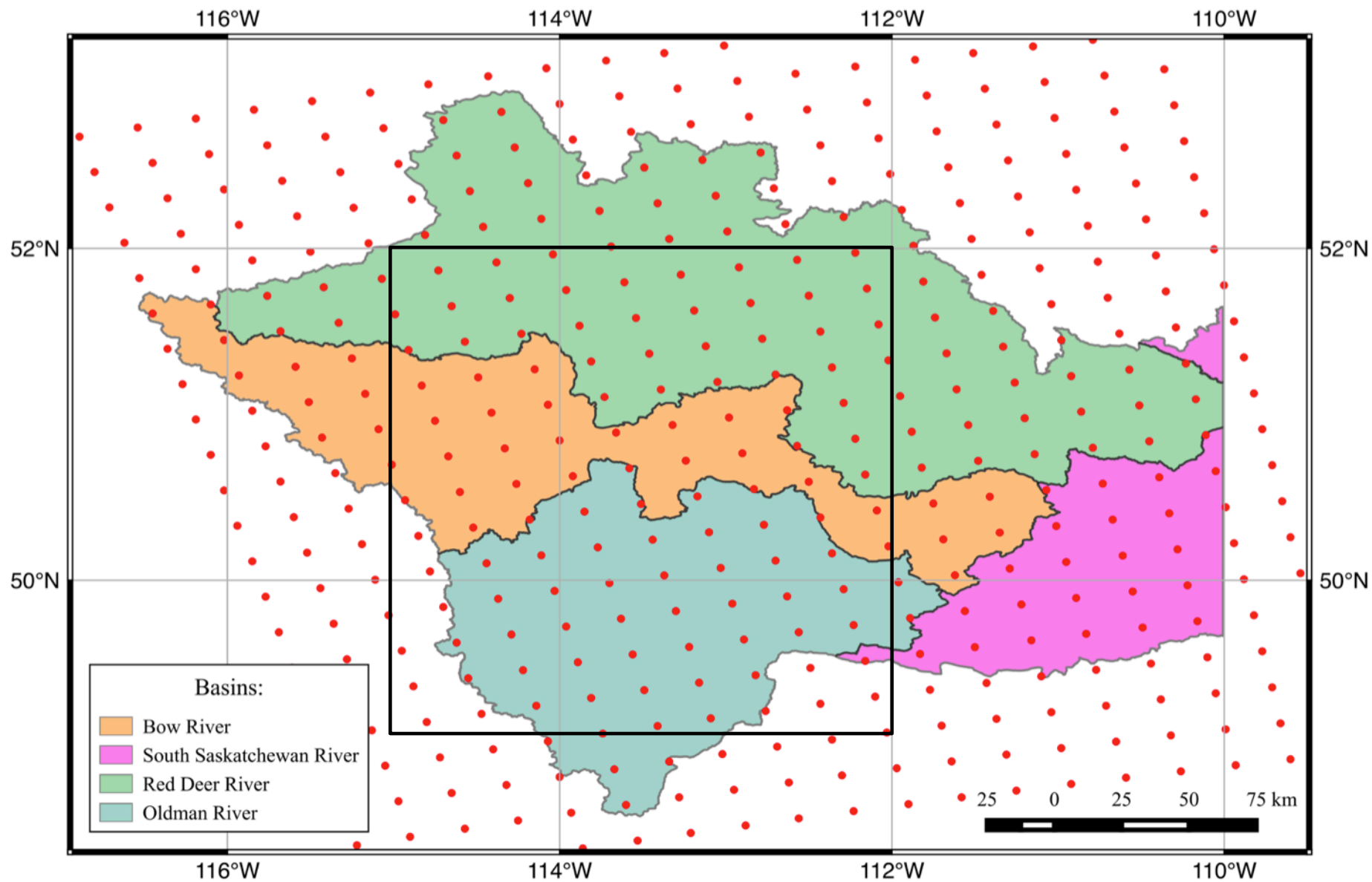
Vertical Grid  
(Height or Pressure)



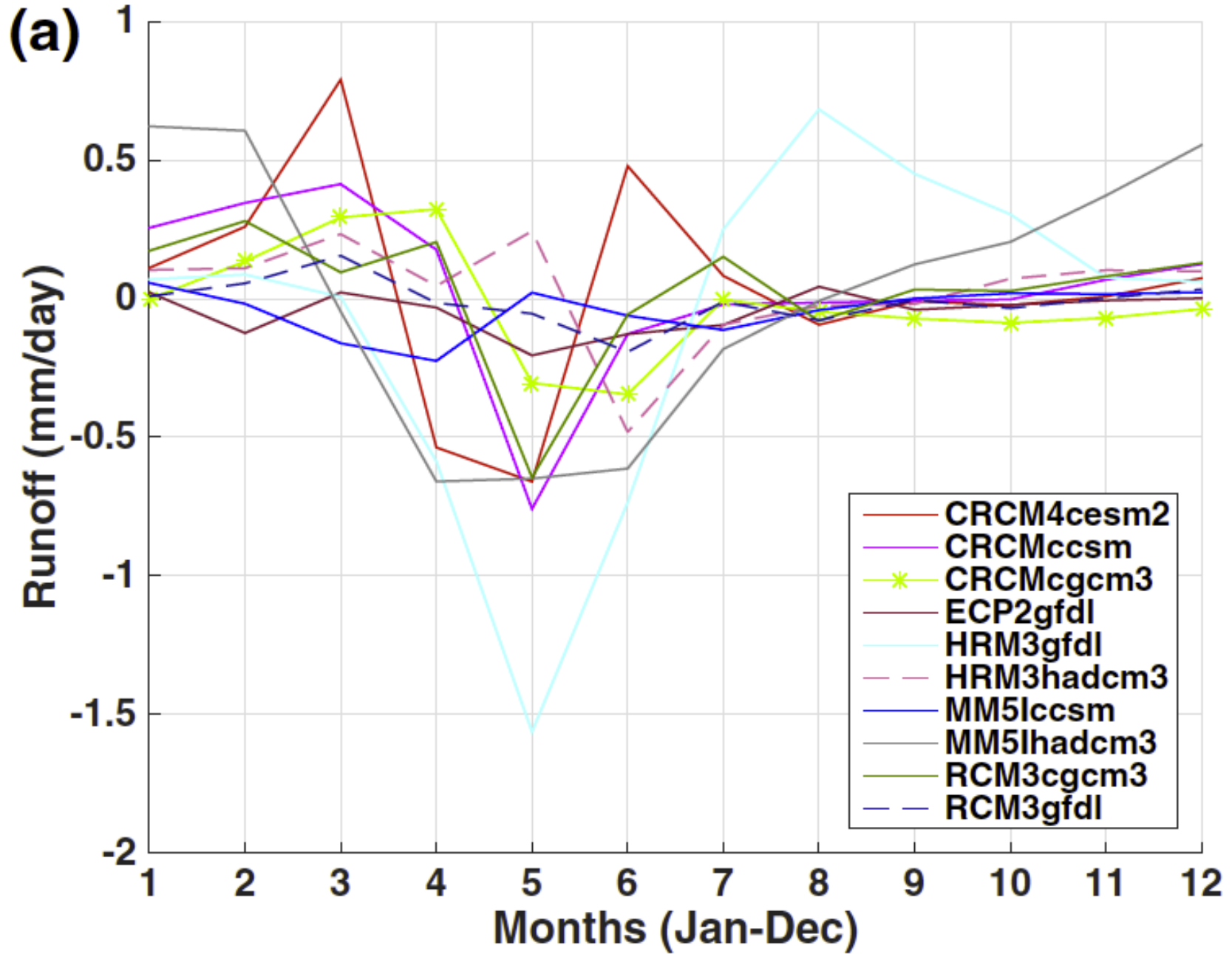
RCM:  
Regional  
Climate  
Model



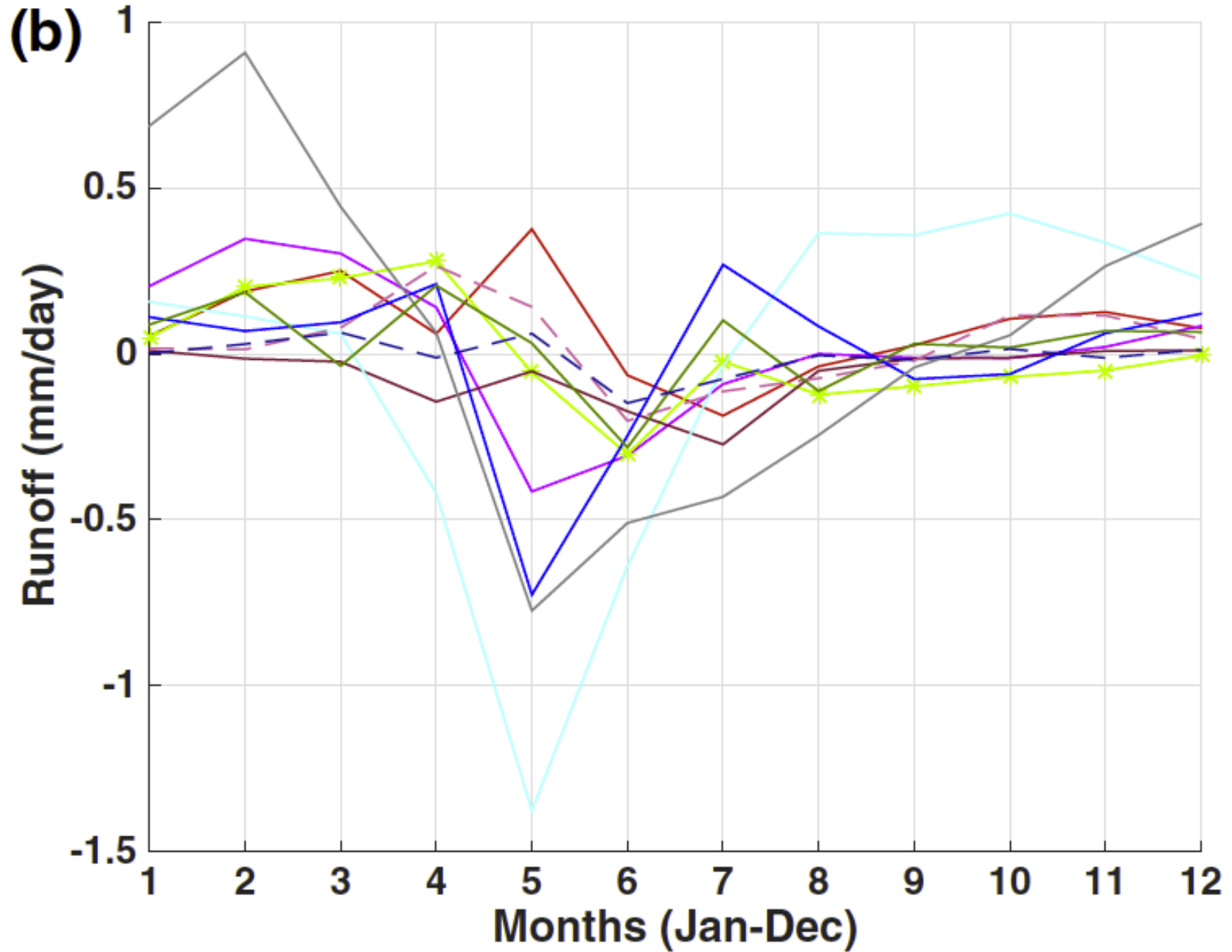
# SSRB: GCM grid cell and RCM grid



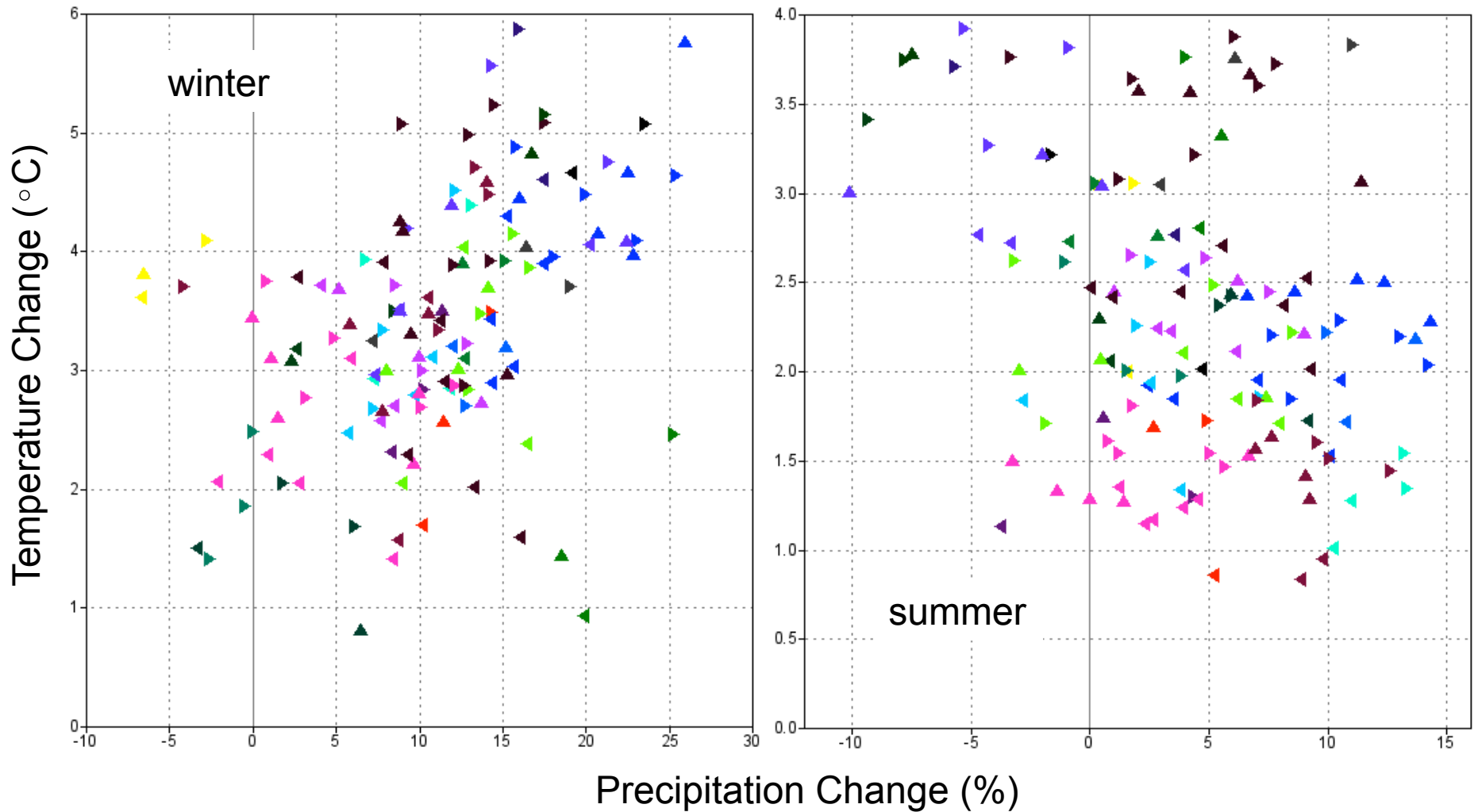
# Oldman



# Bow



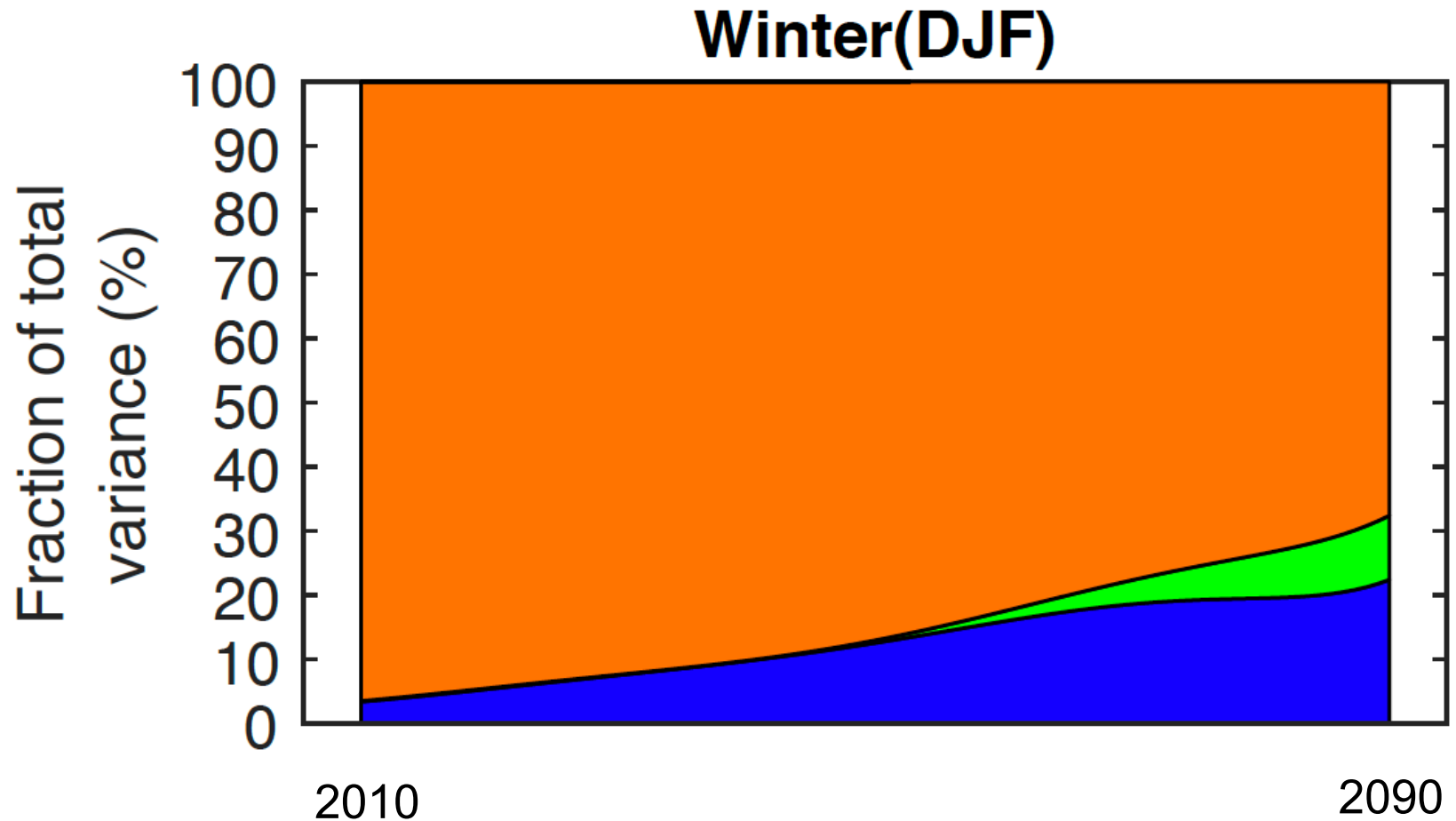
# Projected Climate Changes, Western Canada 1971-2000 versus 2040-2069



Source: PCIC

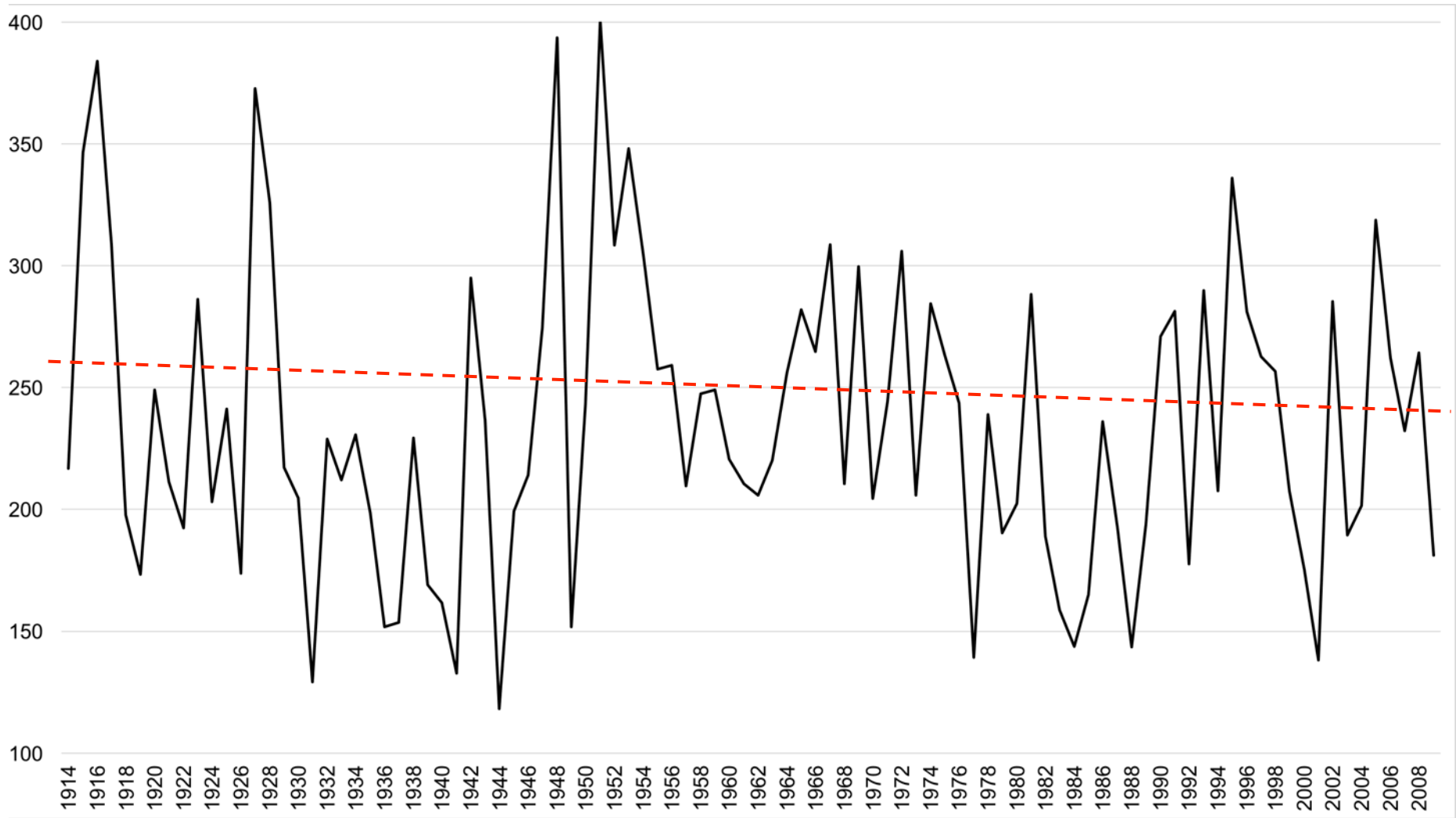
# Sources of Uncertainty - Future Winter Precipitation

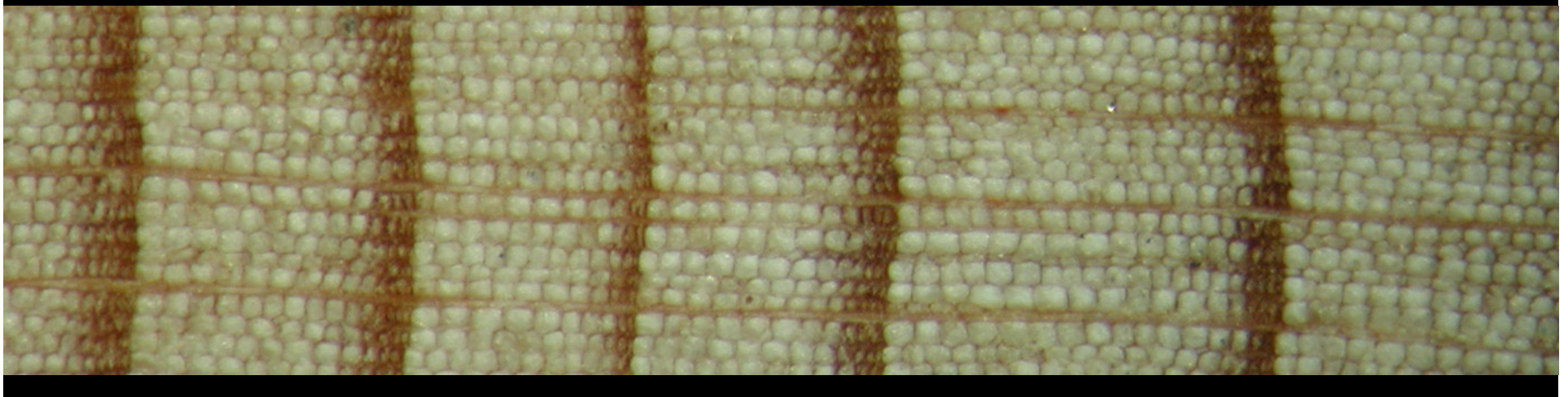
■ natural variability   ■ climate models   ■ GHG scenarios



Barrow and Sauchyn, 2019, *IJC*

# South Saskatchewan River at Medicine Hat Naturalized Water Year Flow (m<sup>3</sup>/s) , 1914-2009

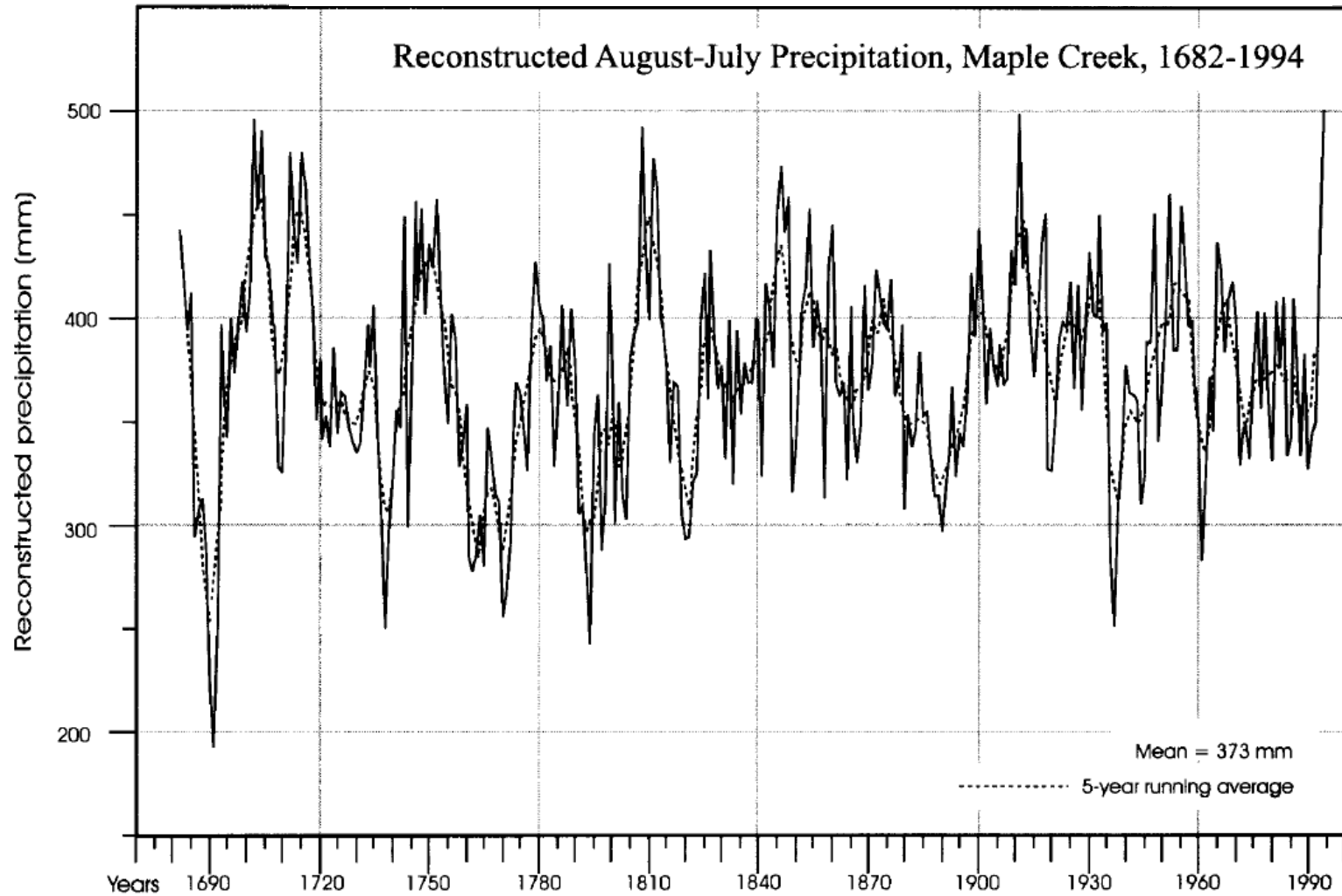








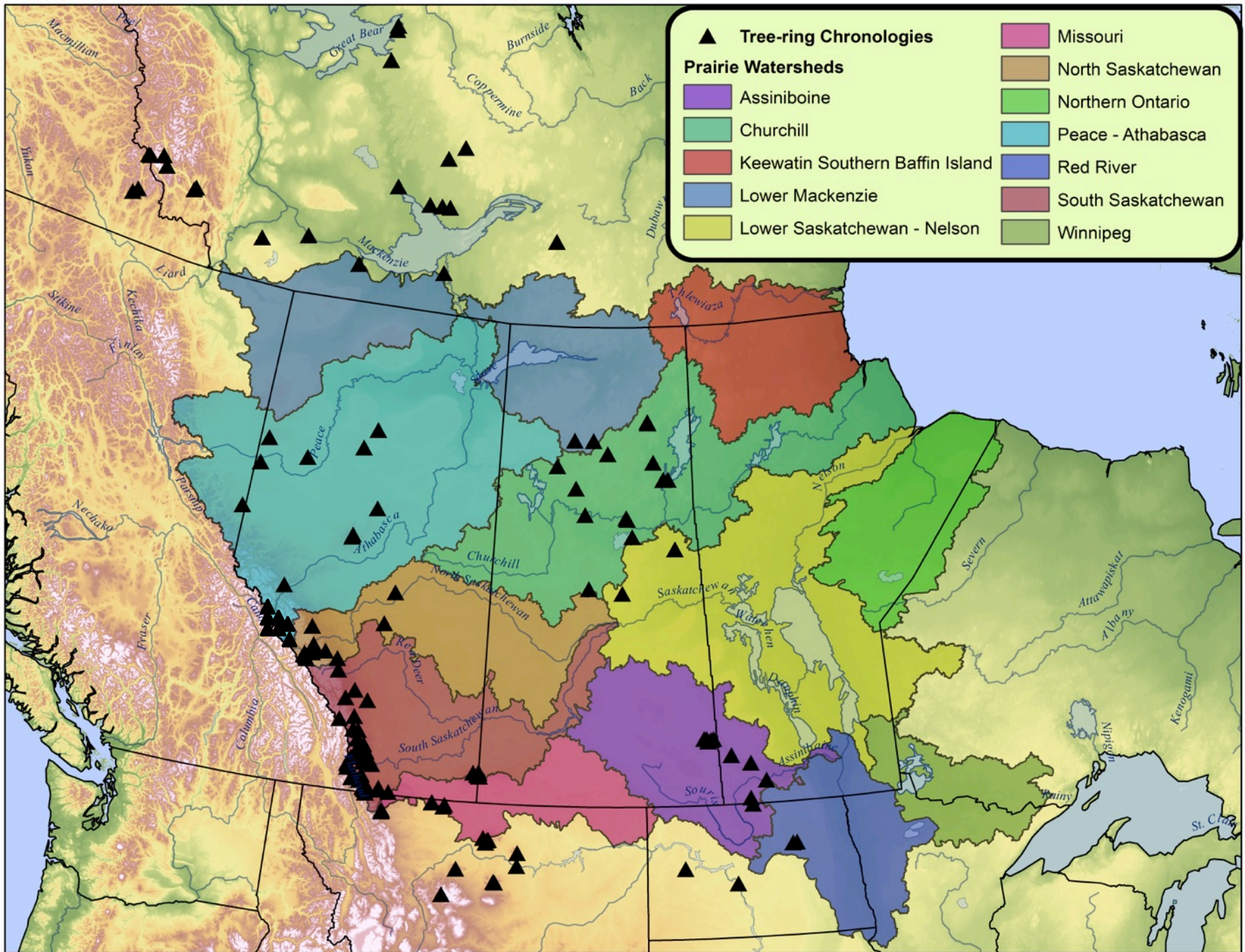
# Annual Precipitation, Maple Creek, 1682-1994



# Forage Yield (kg/ha), Onefour, AB, 1930-2014

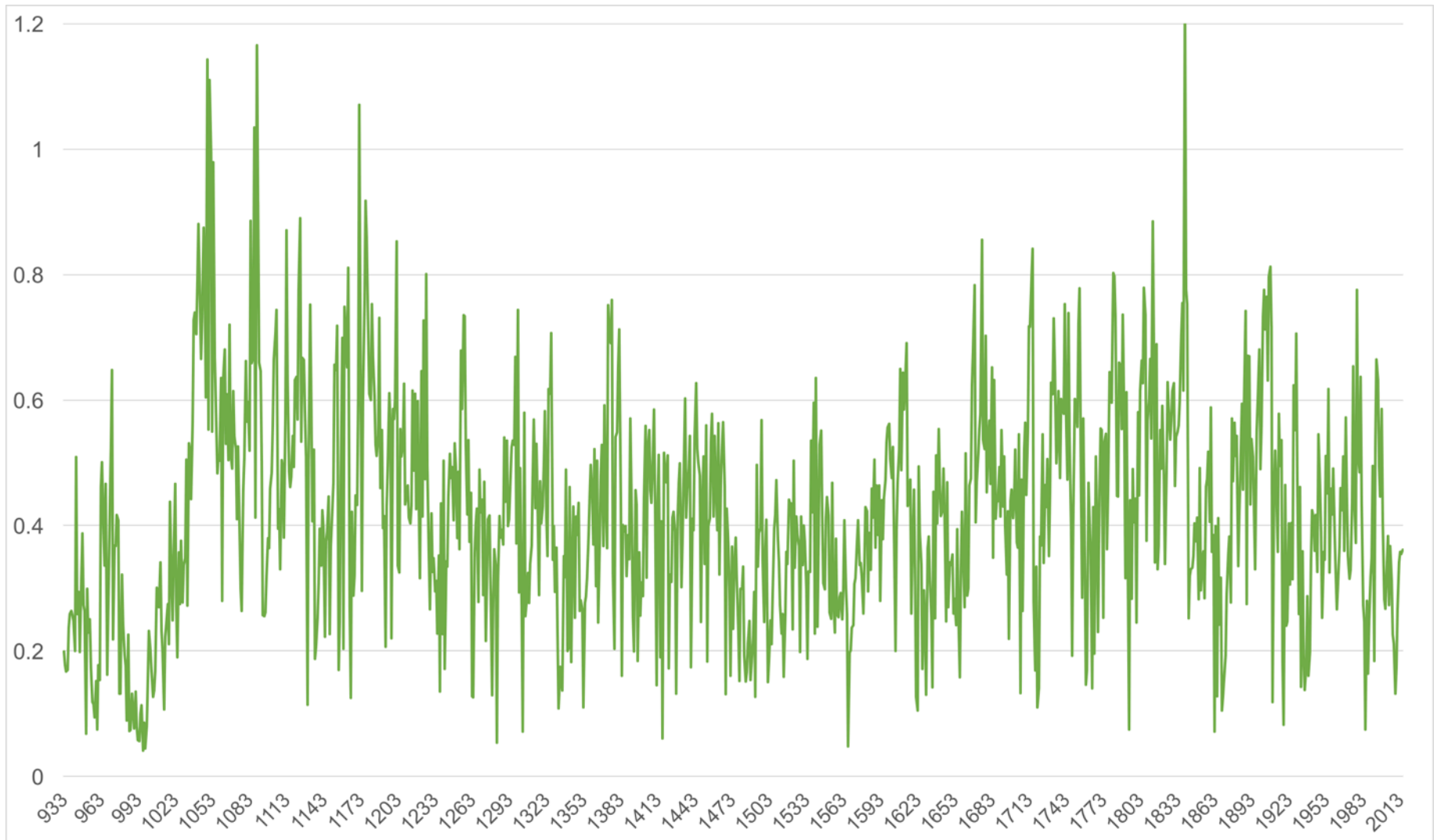


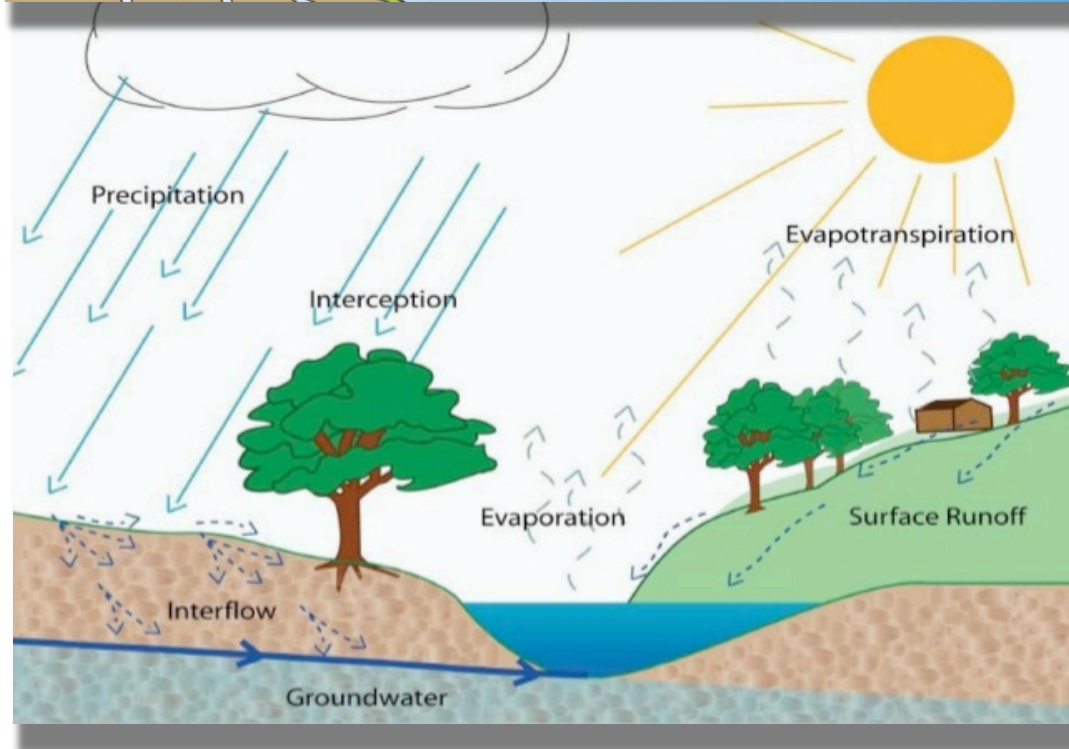
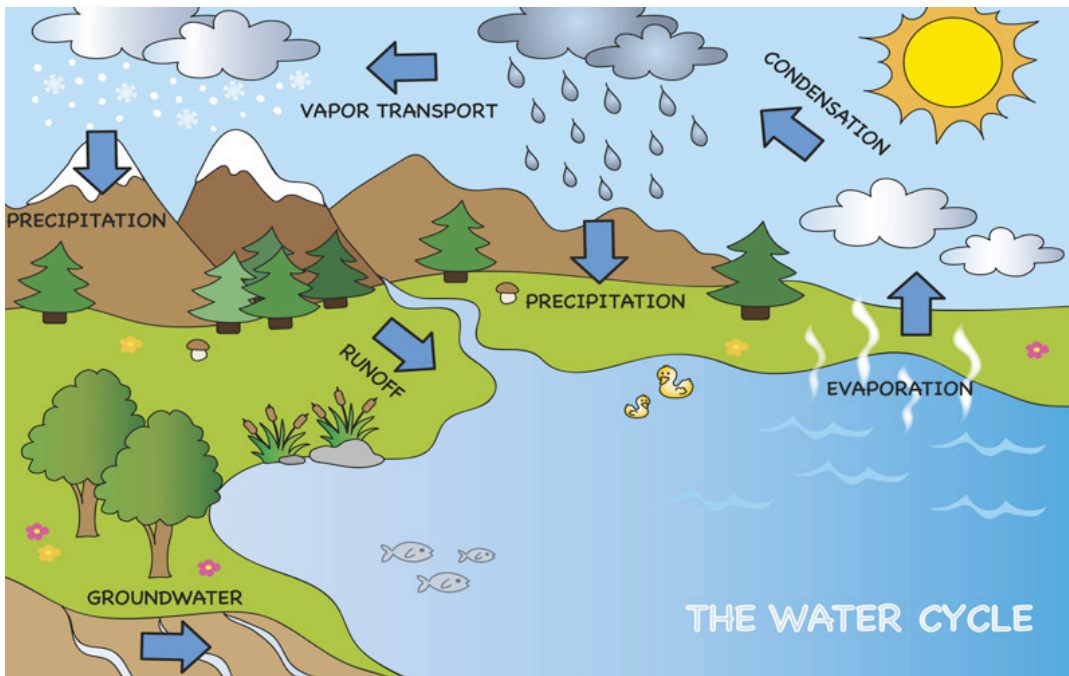




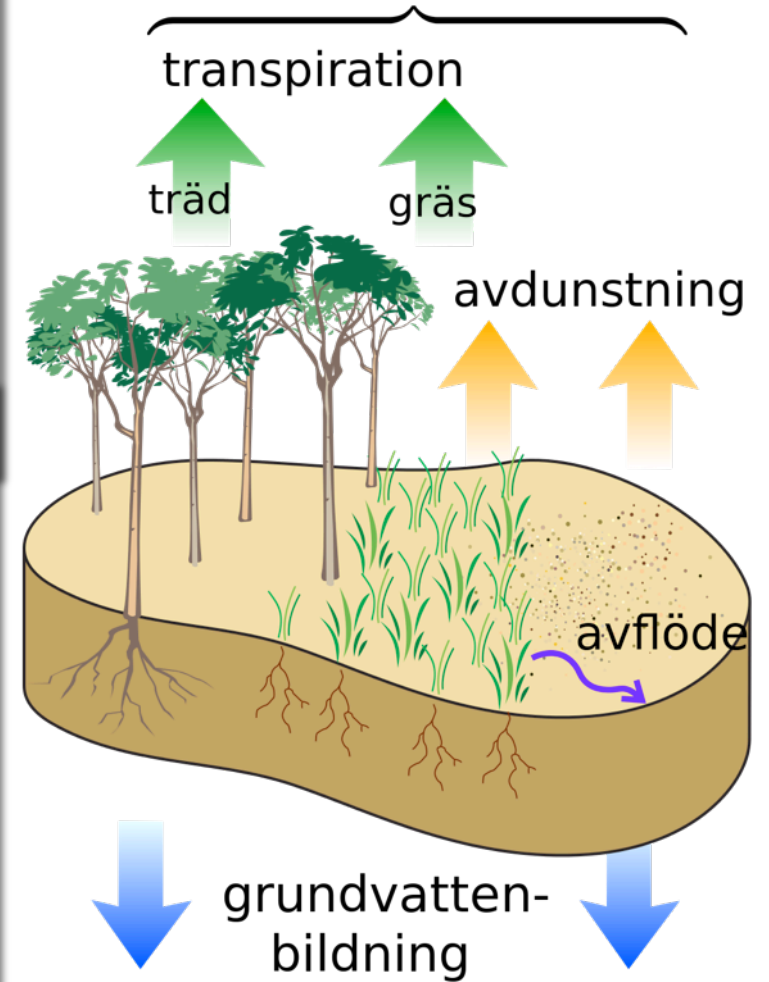


# Oldman River, Limber Pine, Standardized Ring-Width Chronology, 933-2015





evapotranspiration =  
transpiration + avdunstning

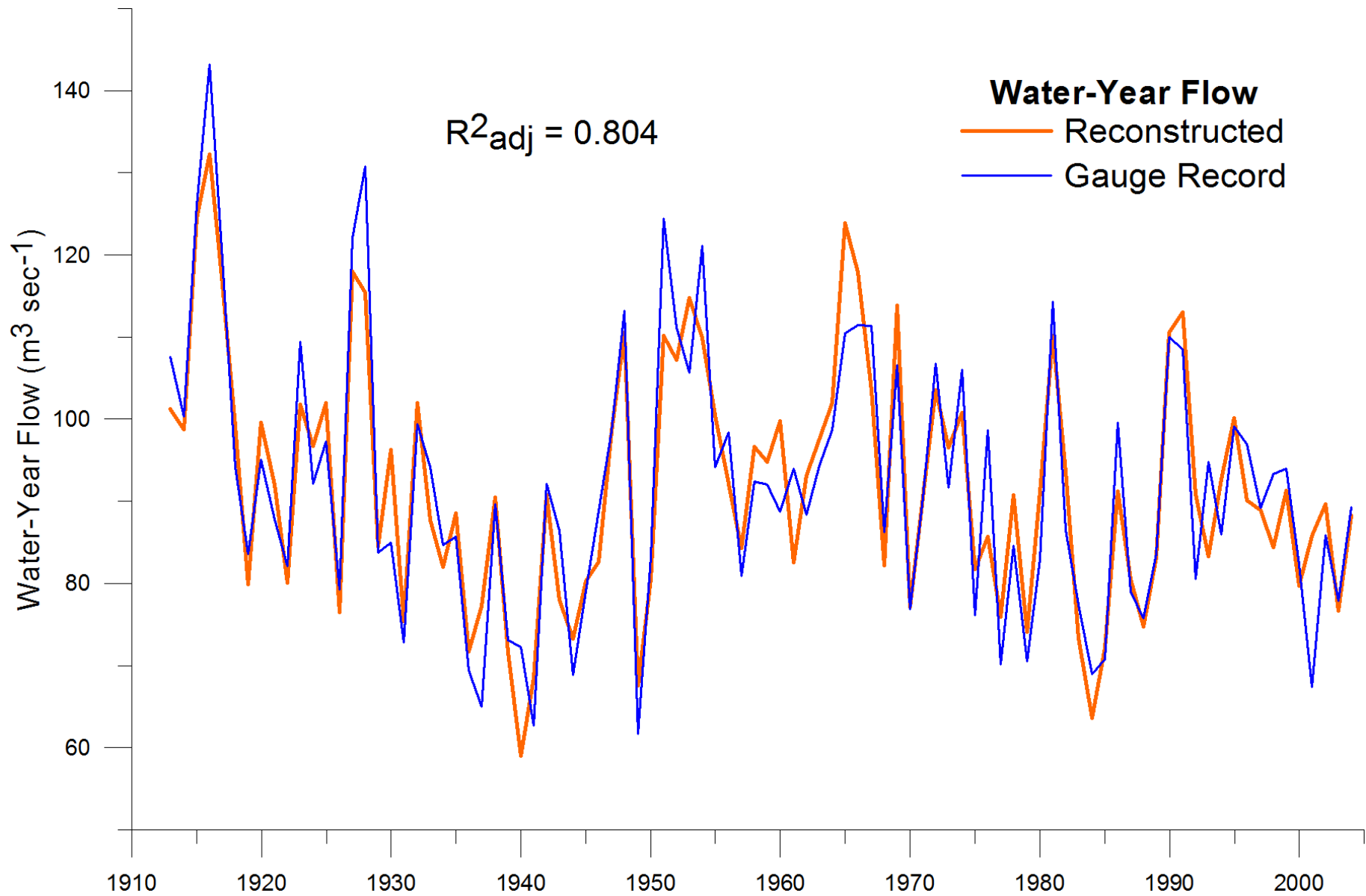




# Bow River at Stoney Trail, Calgary

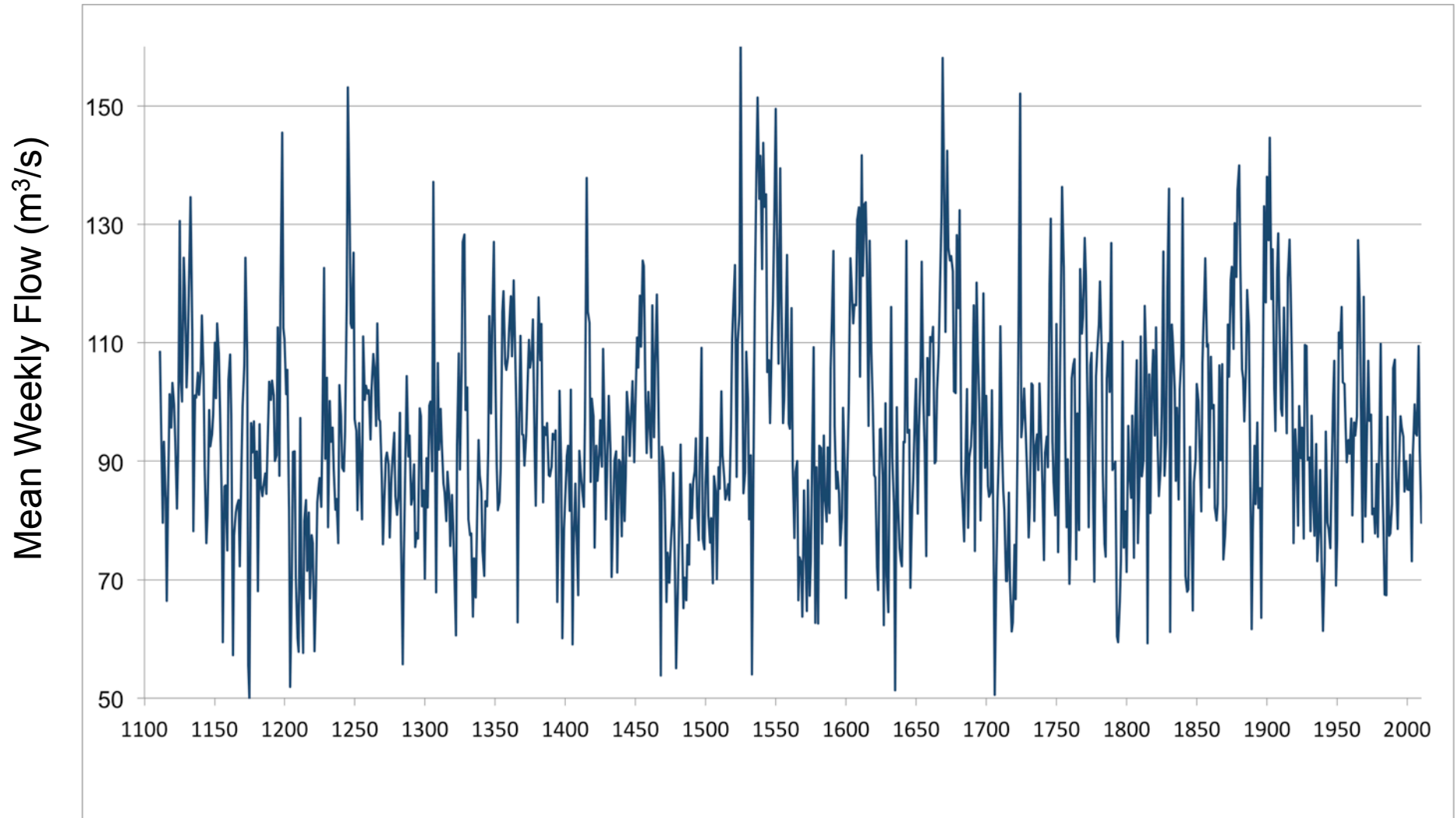


# Reconstructed and Recorded Flow, Bow River

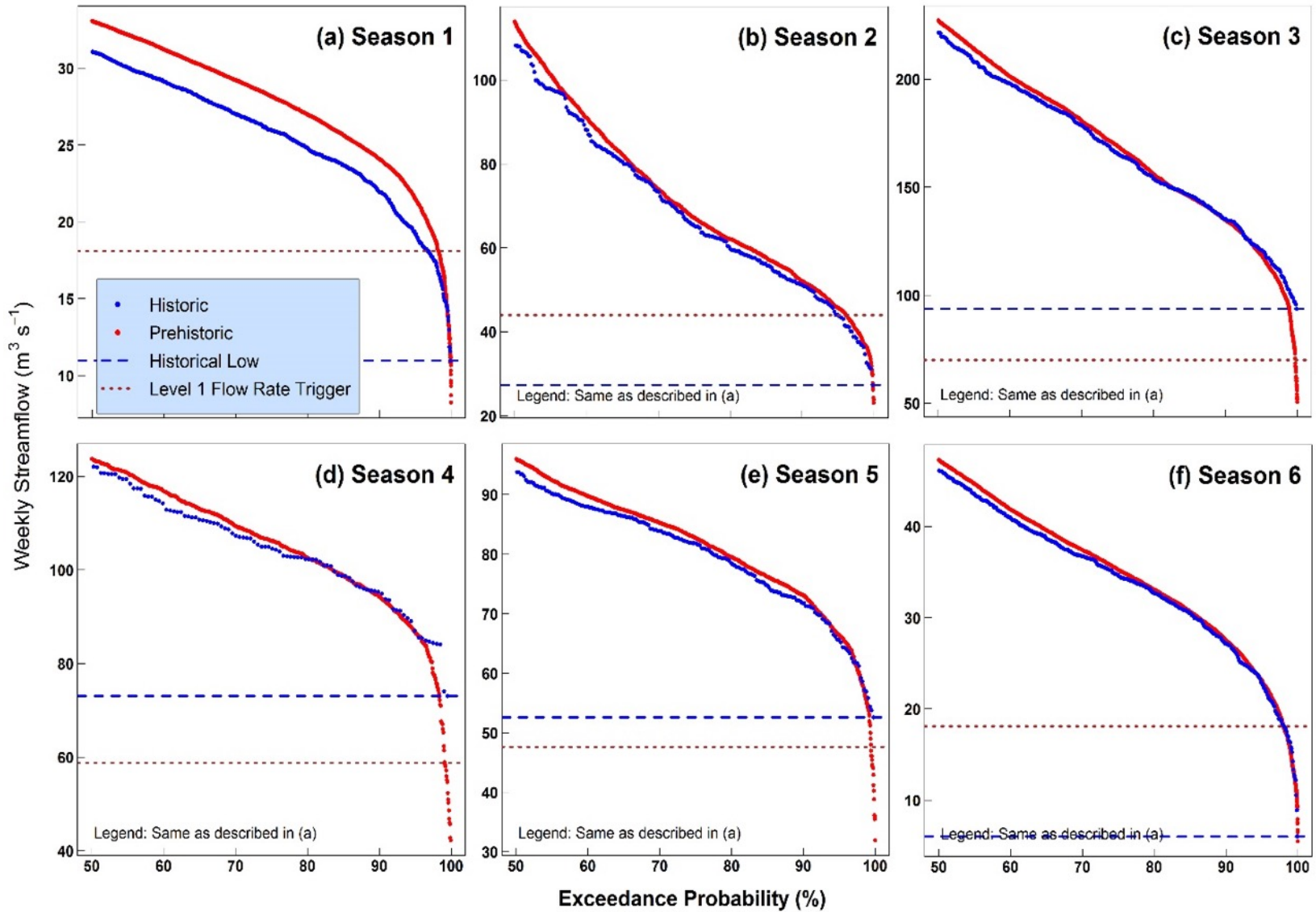


# 900 Years of Weekly Flows, Bow River at Calgary

Sauchyn and Ilich, 2017, *WRR*

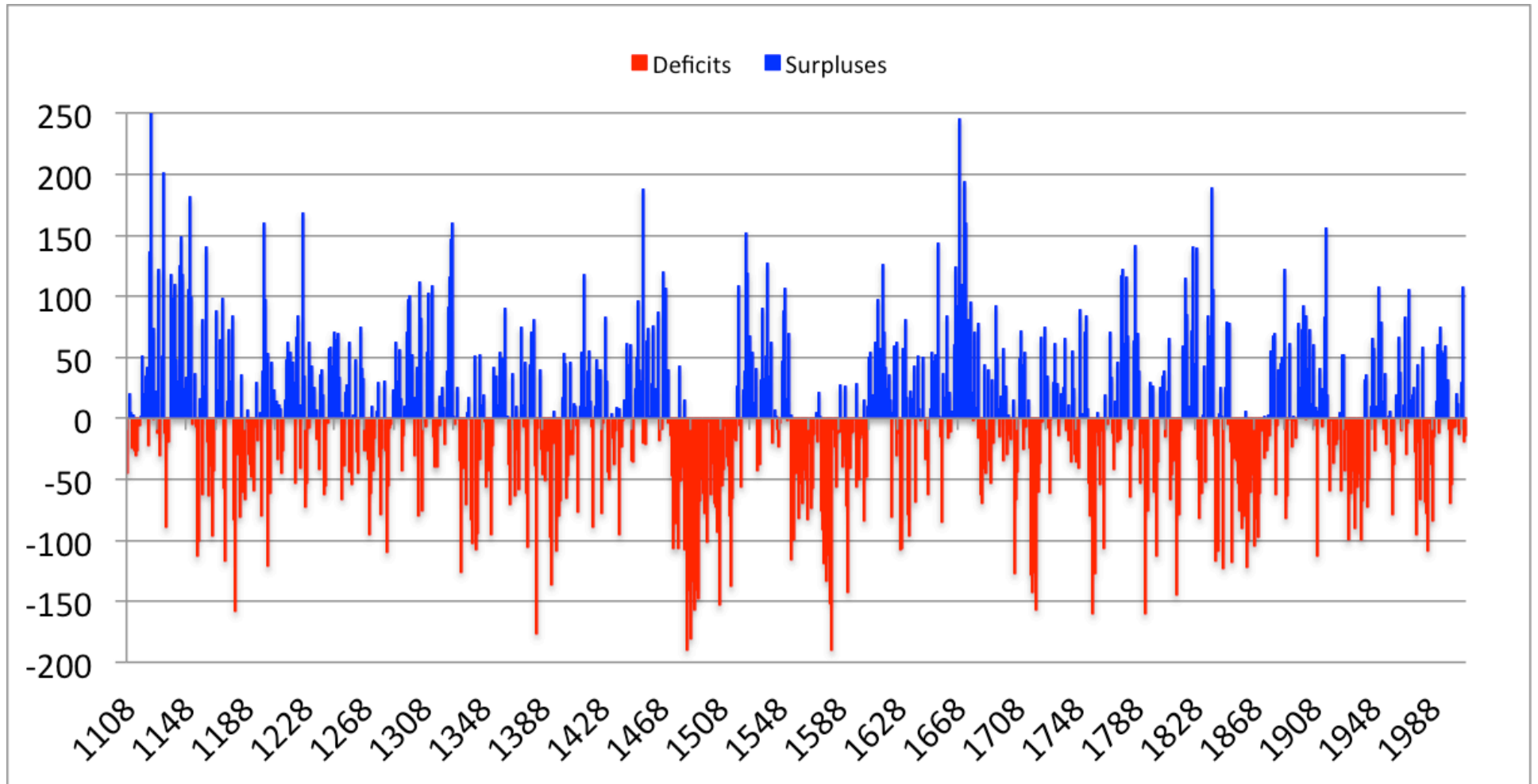


# Exceedance Probabilities by Season, Bow River



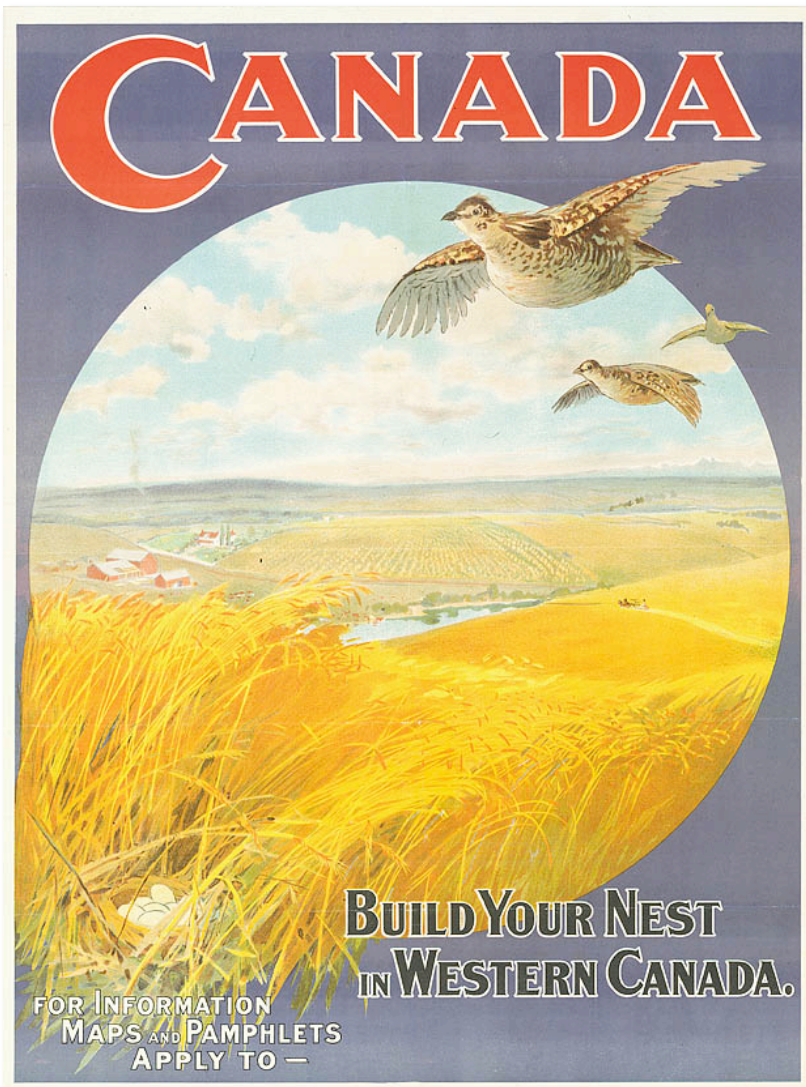
Gurrapu, In Progress

# South Saskatchewan River at Medicine Hat Annual Flow (m<sup>3</sup>/s), 1108-2010



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

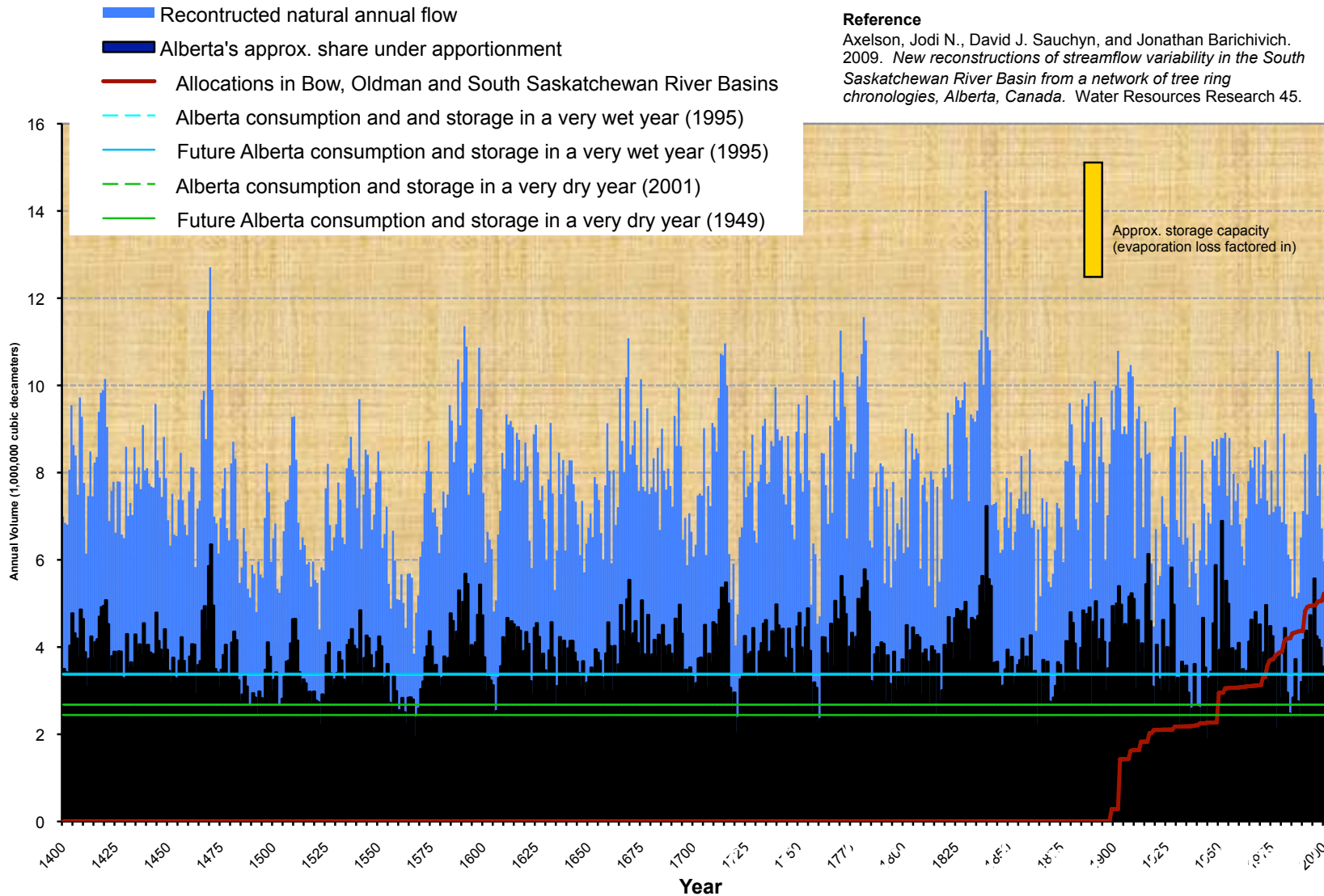
*Our True Immigration Policy,*  
Medicine Hat Times, Feb 5, 1891







Since August 2006, the **Alberta government no longer accepts applications for new allocations of water in the Oldman, Bow, and South Saskatchewan sub-basins.**





# Winter Precipitation (mm) from CRCM5, 1980-2100

