

Spatiotemporal variability and periodicities in moisture-sensitive tree-ring chronologies in the western interior (47-66° N)

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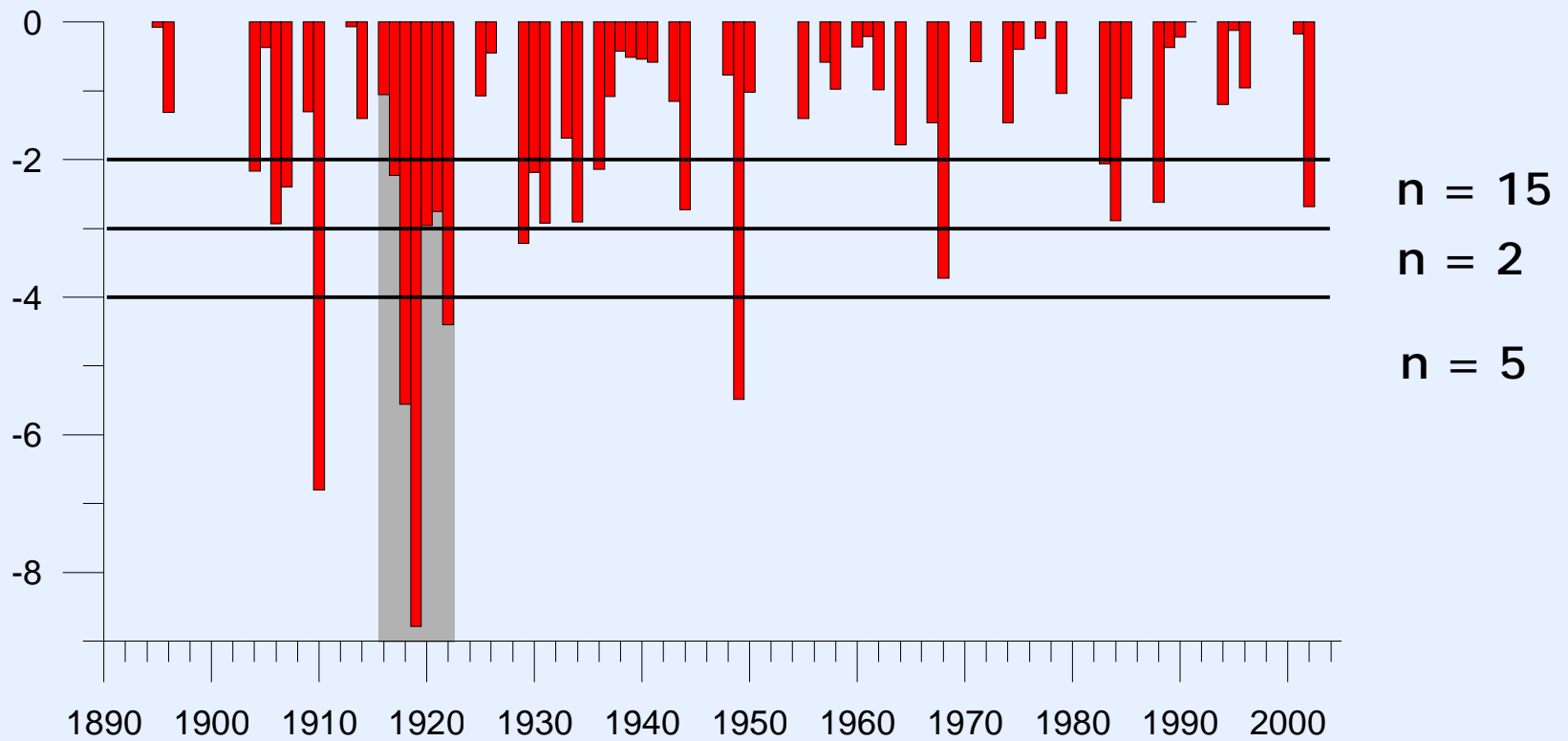
Jonathan Barichivich

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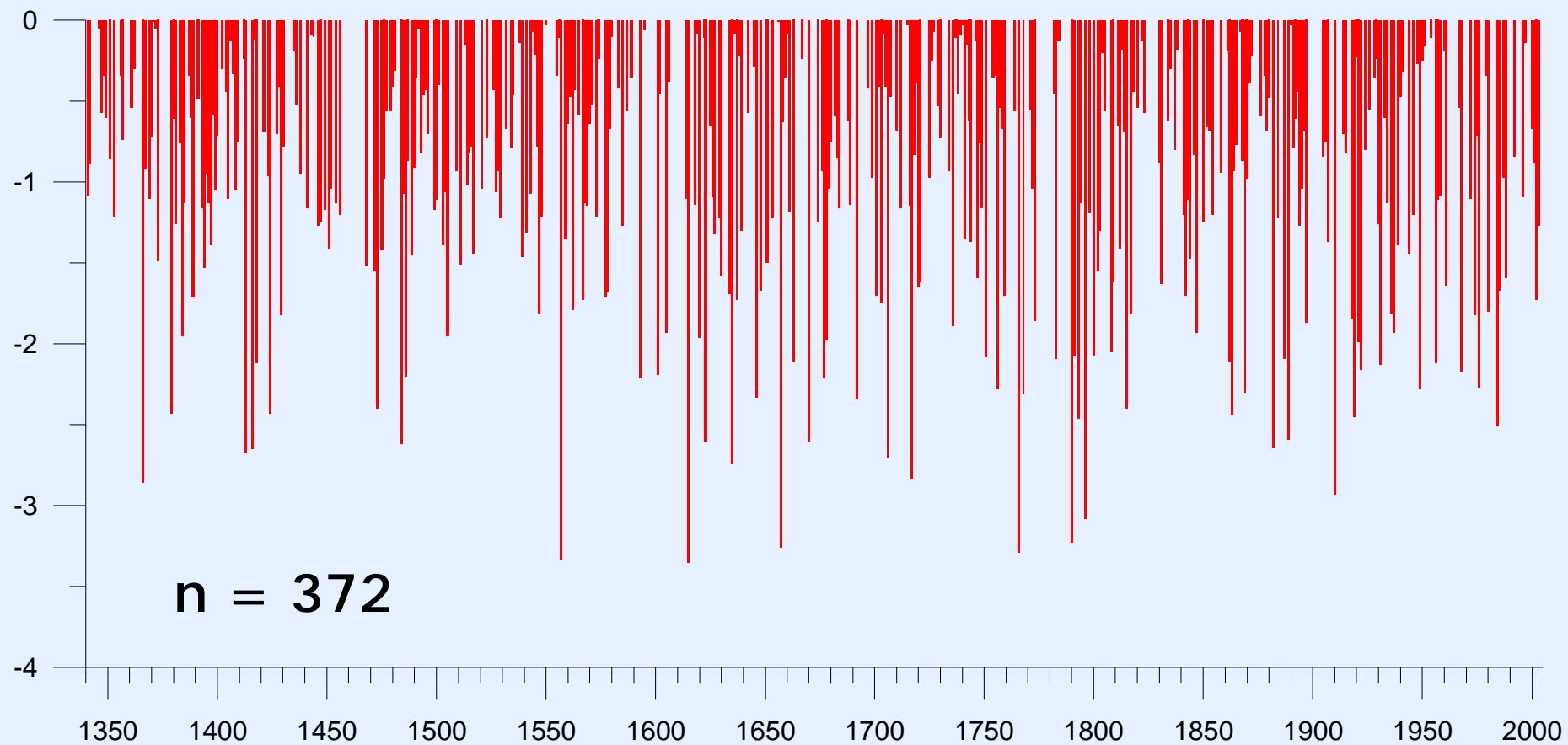


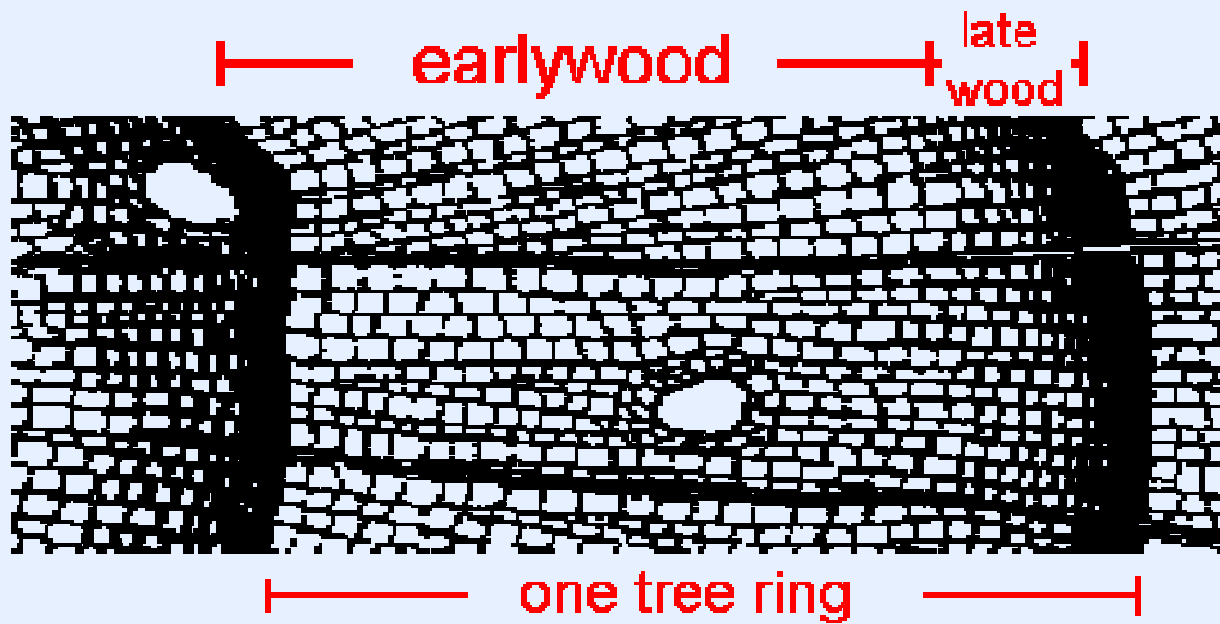
DRI Workshop, January
11-13 2007, Winnipeg

Summer (JJA) PDSI < 0, Calgary, 1895-2002



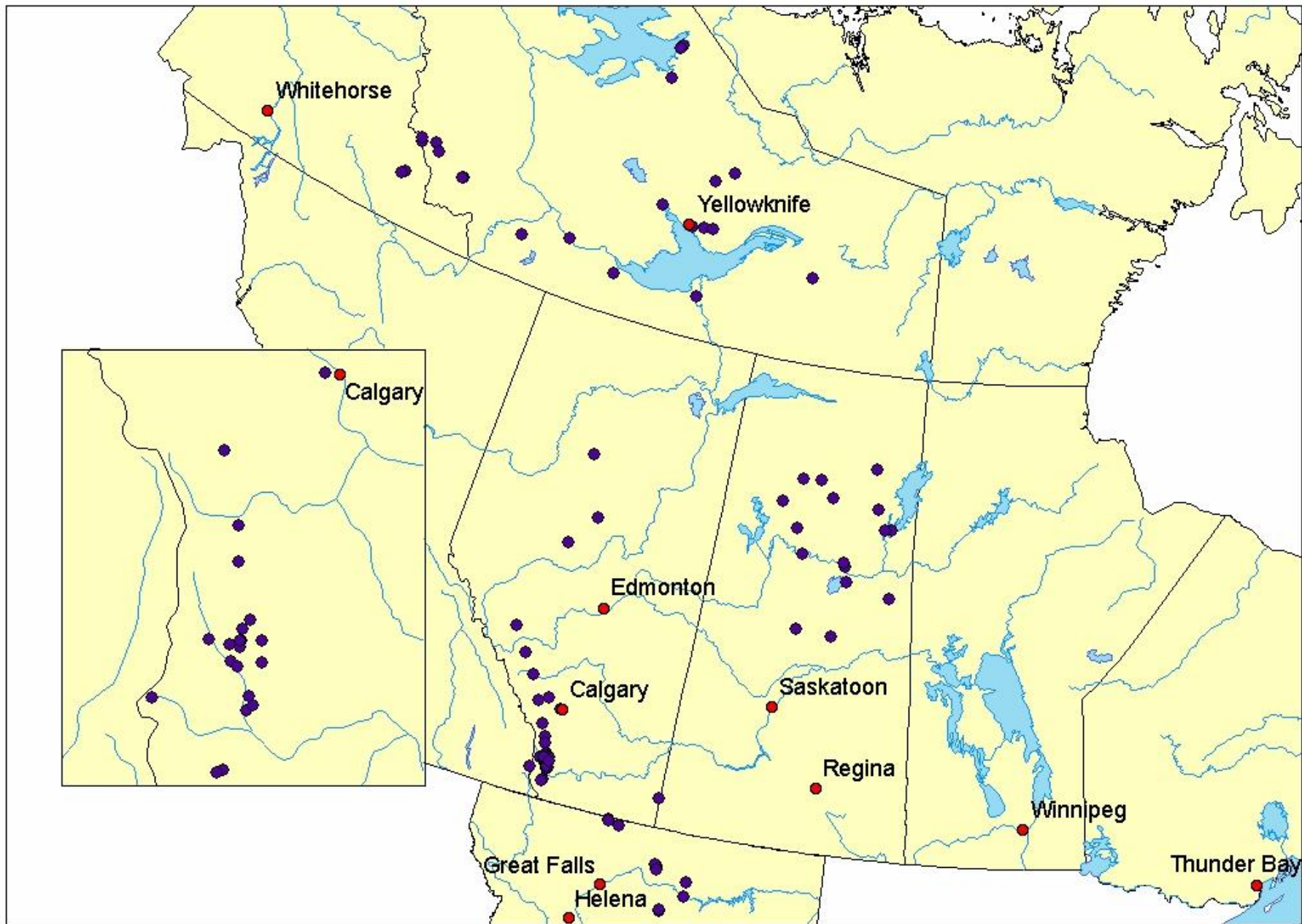
Summer (JJA) PDSI < 0, Calgary, 1341-2004



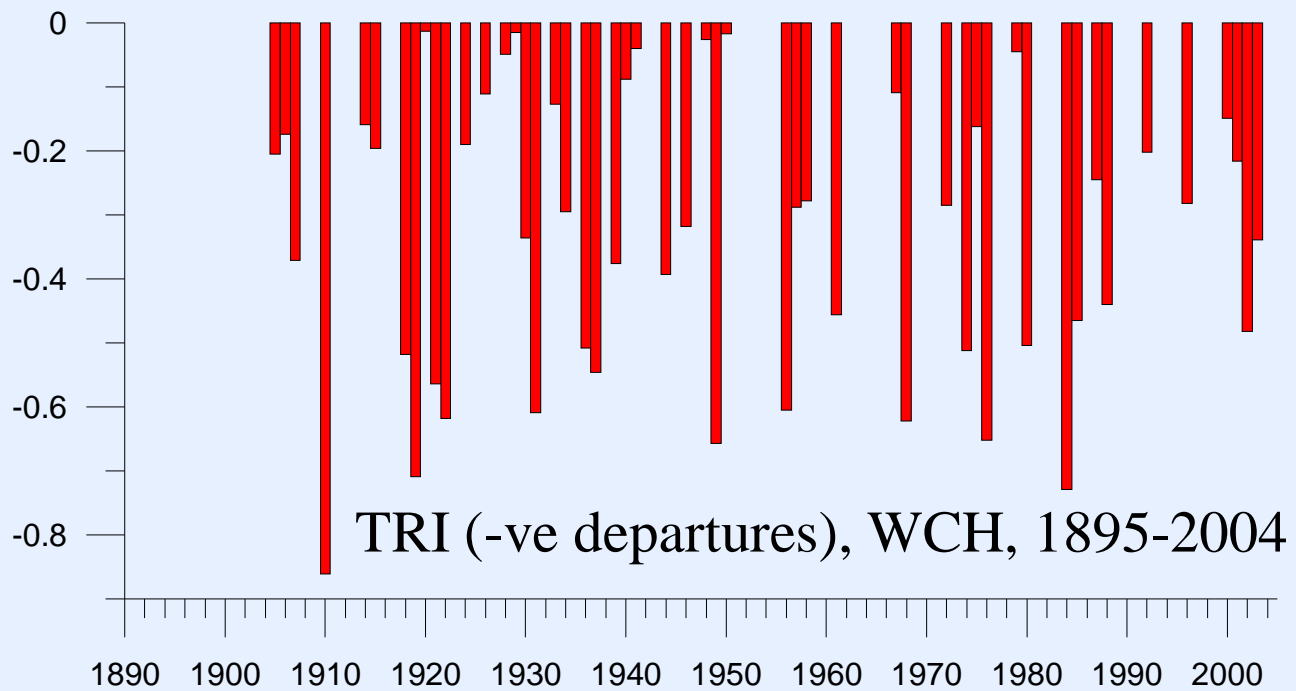
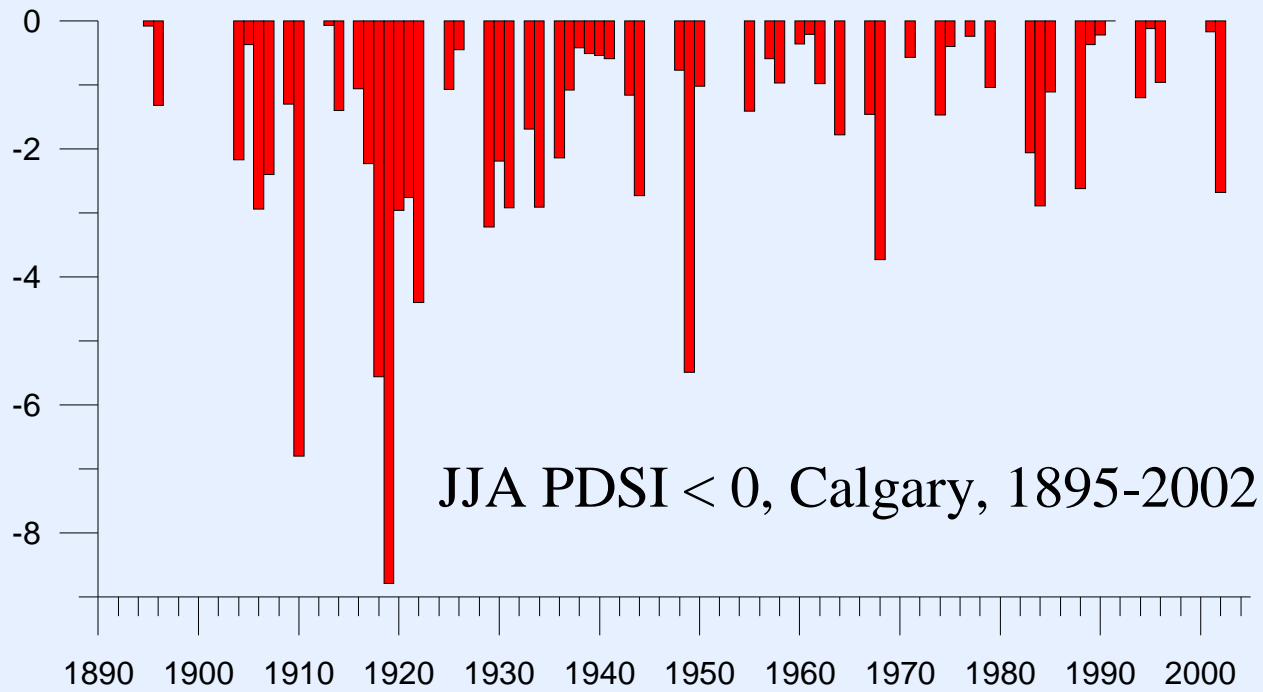




Tree-Ring Sampling Sites





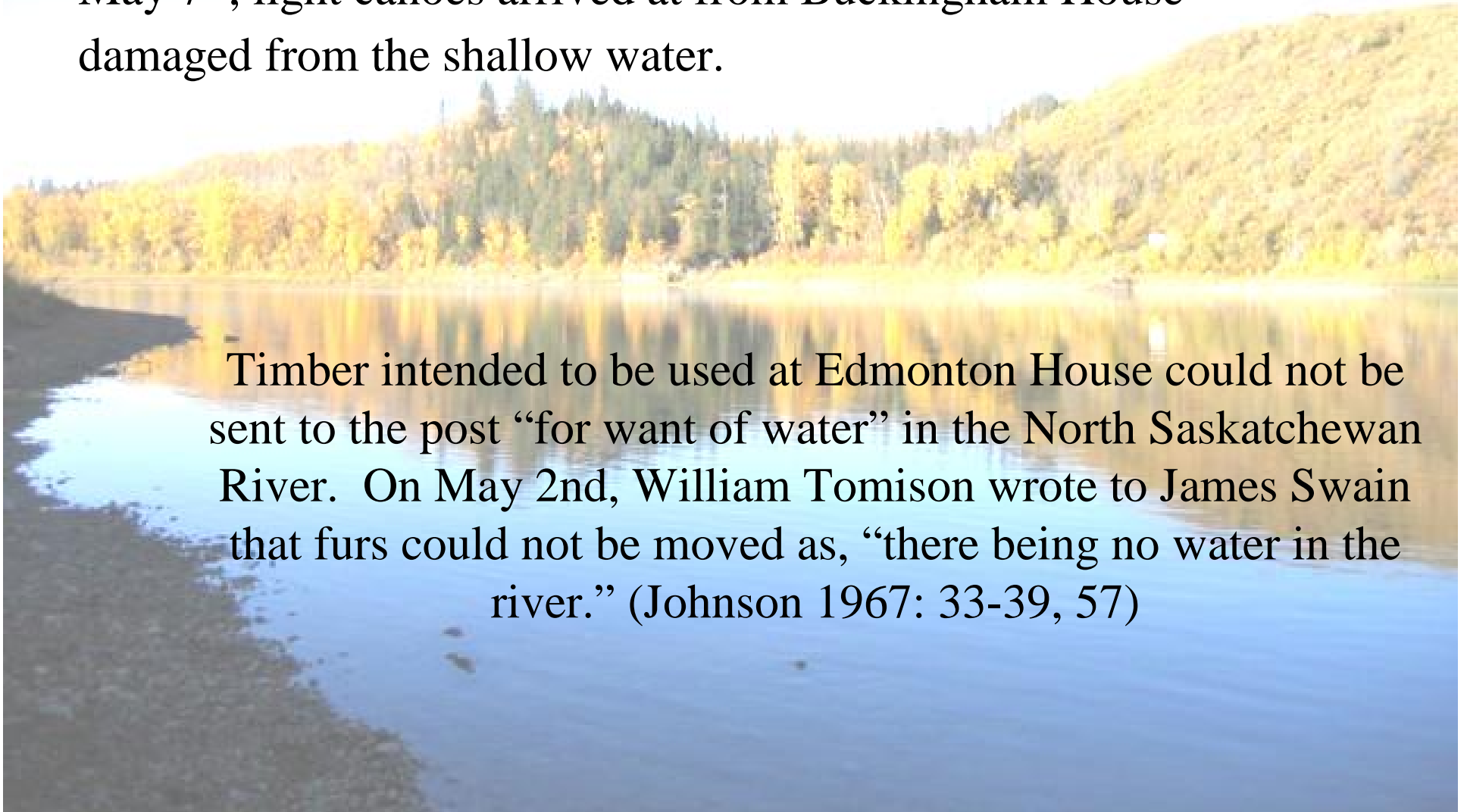


$r = 0.628$

Spring 1796, Edmonton House

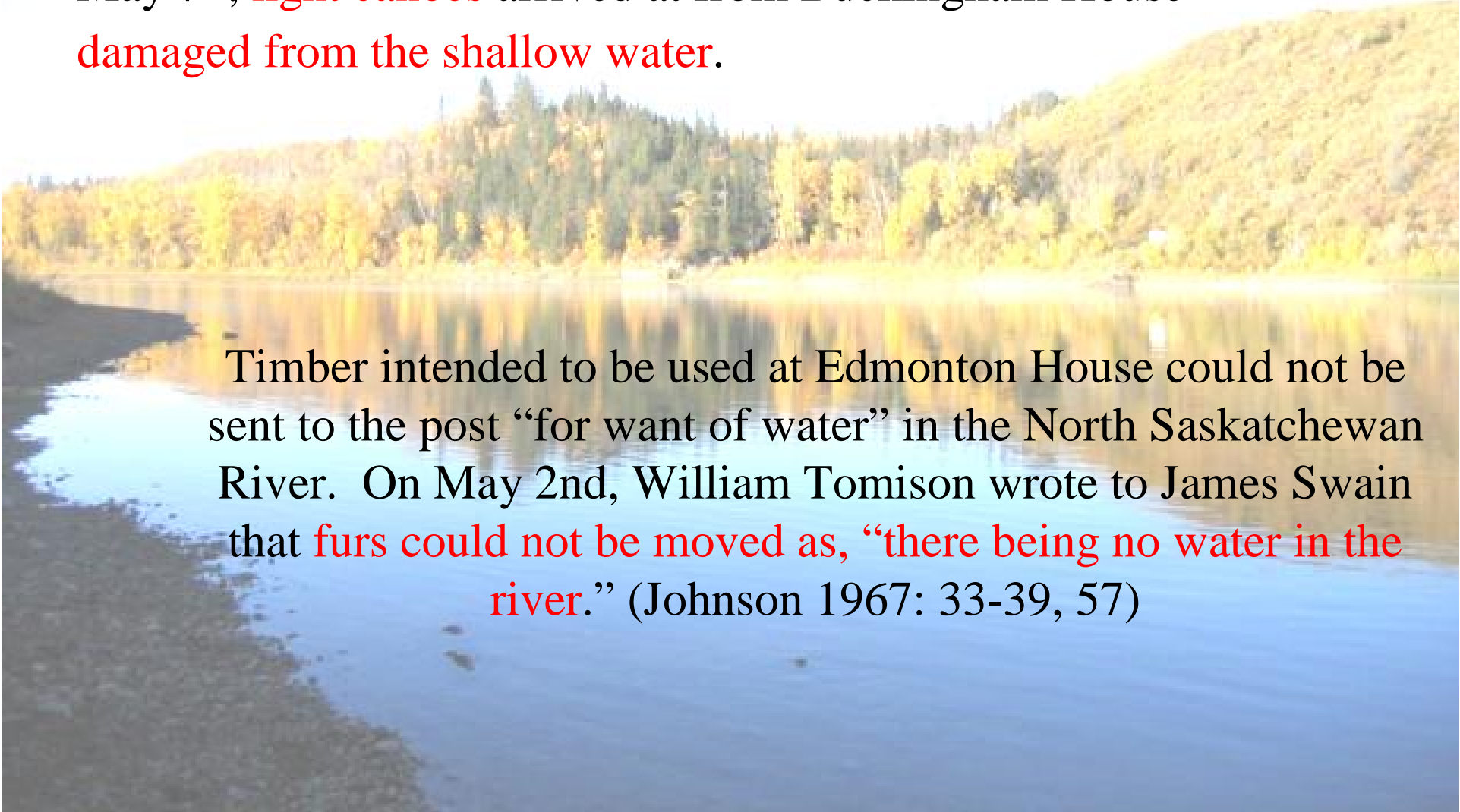
At Edmonton House, a large fire burned “all around us” on April 27th (1796) and burned on both sides of the river. On May 7th, light canoes arrived at from Buckingham House damaged from the shallow water.

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)



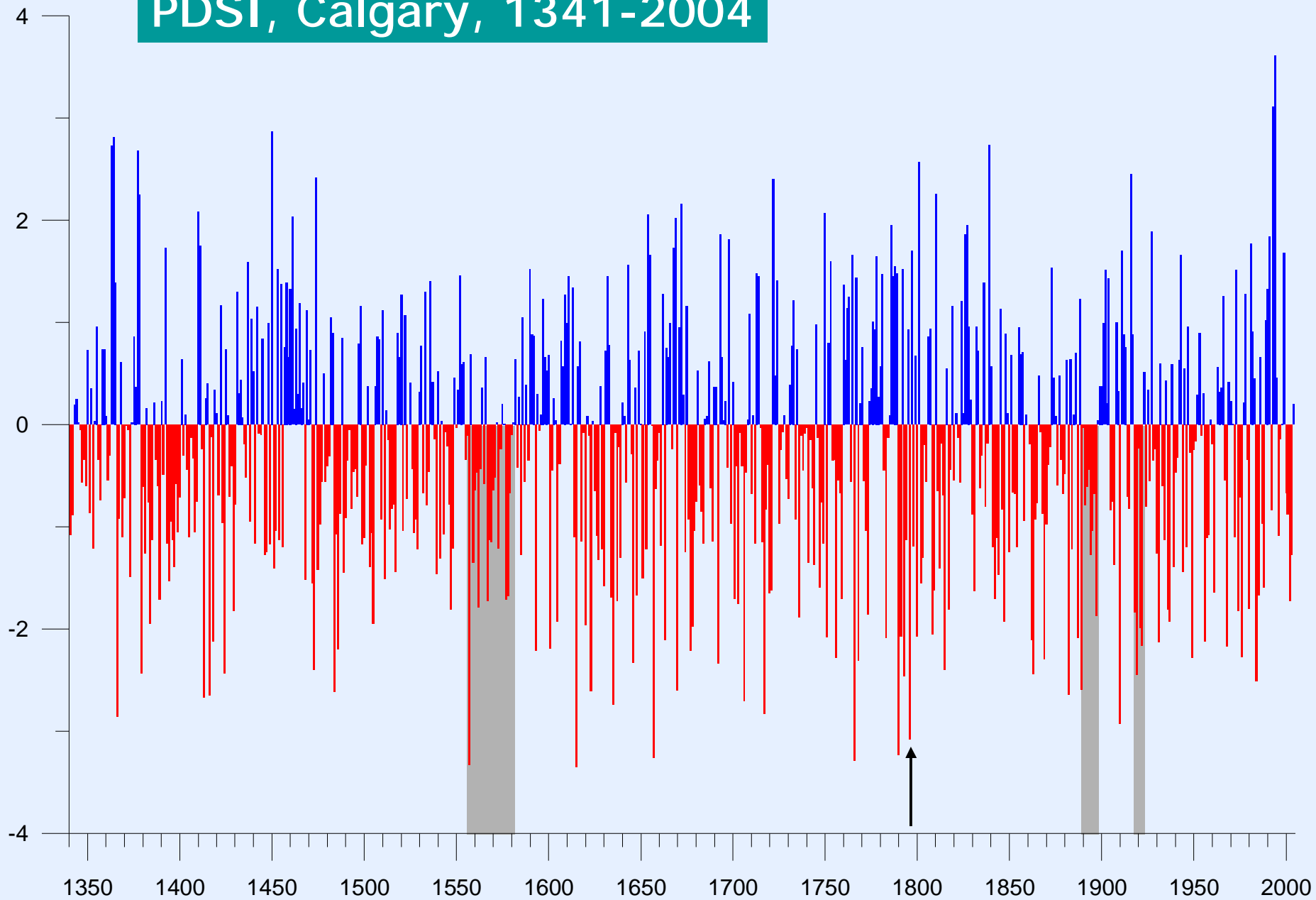
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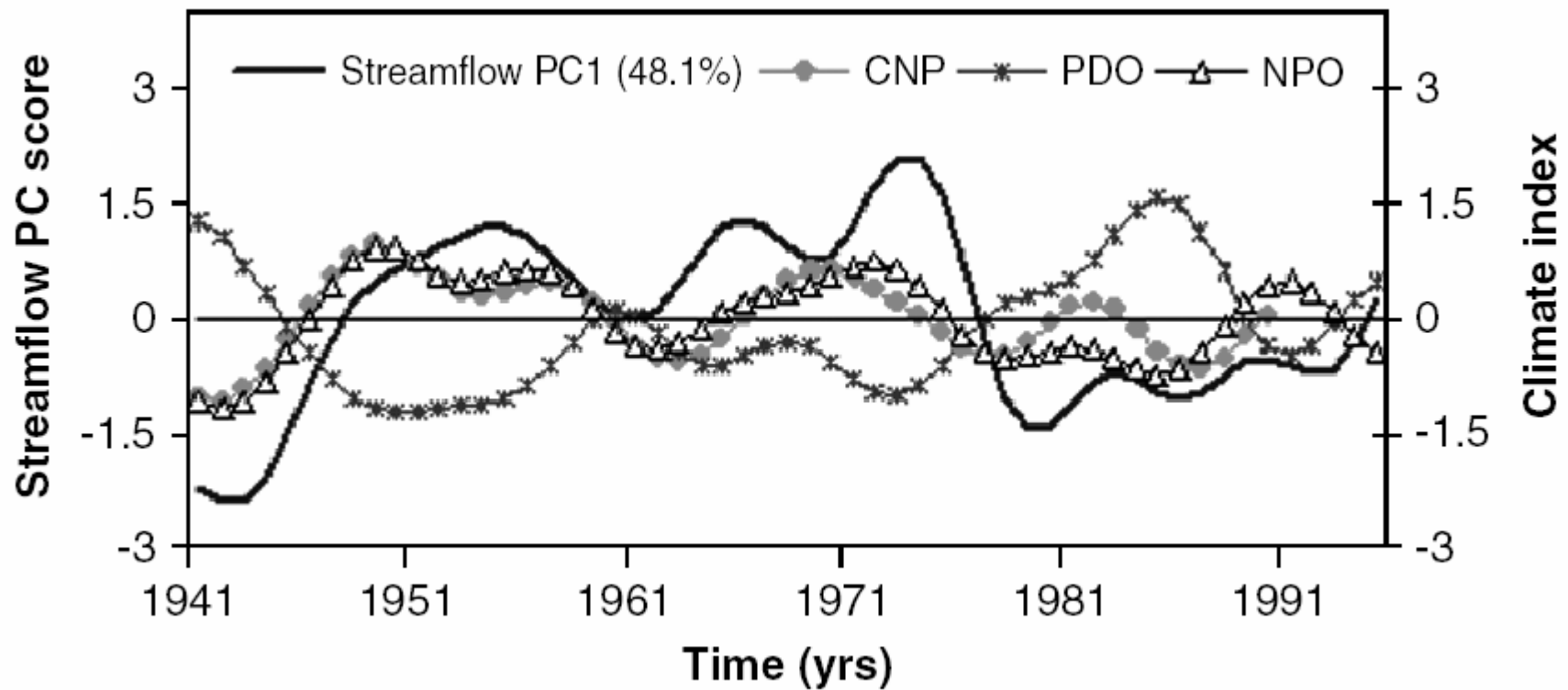


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PDSI, Calgary, 1341-2004



Interdecadal variability in western hydroclimate



Gobena and Gan, 2006, *Int. Journal of Climatology*

Hydroclimatic forcing, northern Chile



Interannual to Multidecadal Climate Forcing

Climate index description	Period	Data source	Reference
Atlantic Multidecadal Oscillation (AMO) Mean monthly Atlantic SST anomalies north of the equator.	1856-2006	CDC, NOAA-CIRES http://www.cdc.noaa.gov/Timeseries/AMO/	Enfield <i>et al.</i> 2001
Pacific Decadal Oscillation (PDO) Leading Principal Component of monthly SST anomalies in the north Pacific Ocean, poleward of 20°N.	1900-2004	JISAO http://jisao.washington.edu/pdo/PDO.latest	Mantua <i>et al.</i> 1997
Niño 3.4 Index Mean monthly SST anomalies for the Niño 3.4 Region, east central Tropical Pacific (5N-5S, 170-120W).	1871-1999	CPC, NOAA-NCEP http://www.cpc.ncep.noaa.gov/data/indices/	Trenberth 1997

Growth Response to Climate Forcing

Table 4. Influences of climate forcings based on the spatial correlation patterns between the tree-growth PCs and global SST and SLP (Figs. 17-22).

Species	Region associated to each PC	Climate forcing	Season
PC1			
<i>Picea glauca</i>	North	AMO (−)	Spring-summer
<i>Pinus banksiana</i>	East	PDO (−)	Winter
<i>Pseudotsuga menziesii</i>	South	ENSO (+)#	Winter-spring
<i>Pinus contorta</i>	North	AMO (−)	Spring-summer
<i>Picea mariana</i>	North	ENSO (−)	Winter-spring
PC2			
<i>Picea glauca</i>	East	PDO (−)	Winter-spring
<i>Pinus banksiana</i>	South	AMO (+)#	Winter
<i>Pseudotsuga menziesii</i>	South	AMO (−)	Winter-spring
<i>Pinus contorta</i>	South	No clear pattern	
<i>Picea mariana</i>	East	PDO (−) and AMO (−)	Winter-summer
<i>Pinus flexilis</i>	South	ENSO (+)	Winter-spring

#: not coherent with the correlation results between PCs and the forcing indices.

ENSO vs. TRI, Psme and Pifl

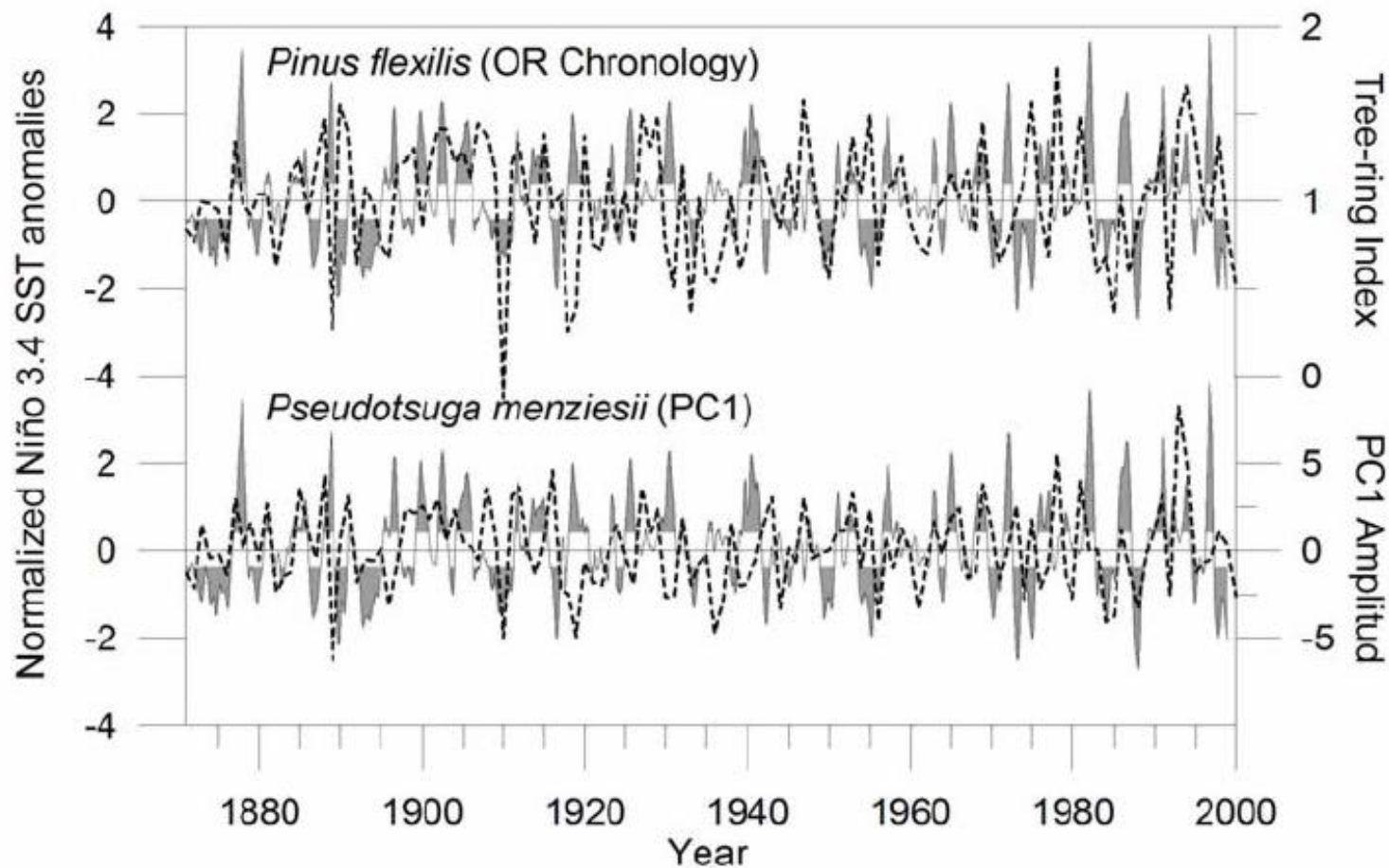
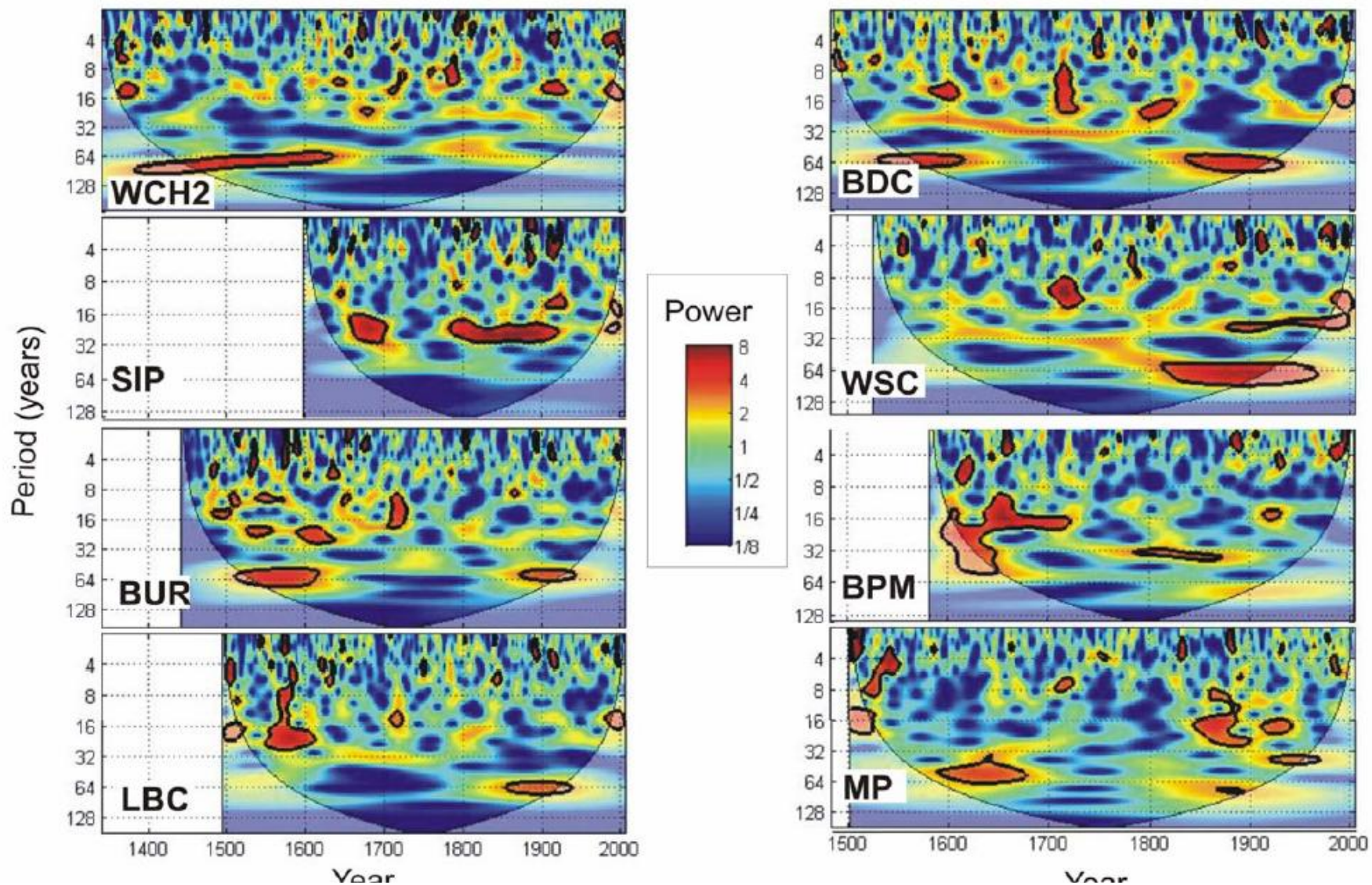


Figure 24. Temporal evolution of 5-month running mean of normalized anomalies of SST in the Niño 3.4 region as indicator of El Niño-La Niña and growth responses of the high correlated *Pinus flexilis* and *Pseudotsuga menziesii* growth. An El Niño or La Niña event occurs if the 5-month running mean of normalized SST anomalies (relative to the period 1871-2000) exceed 0.57 SD (+0.4° C) or -0.57 SD (-0.4° C), respectively (Trenberth, 1997). The dotted line represents the tree growth.

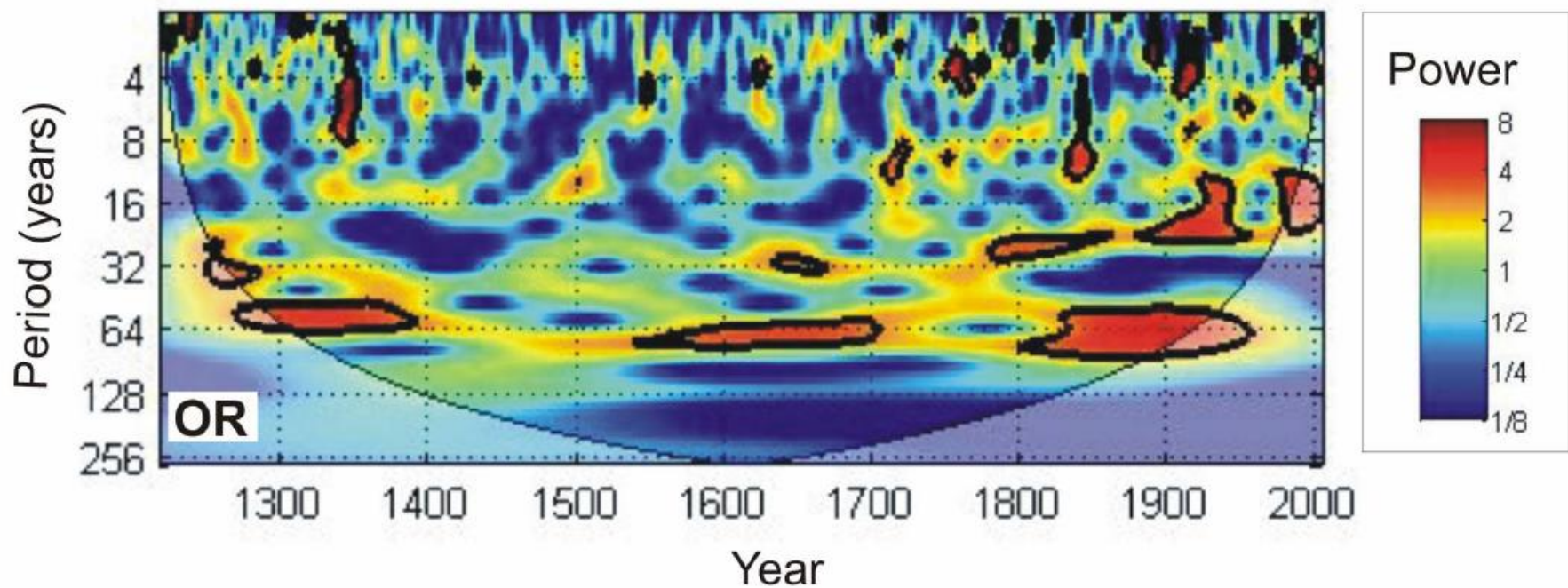
Wavelet power spectra

Pseudotsuga menziesii



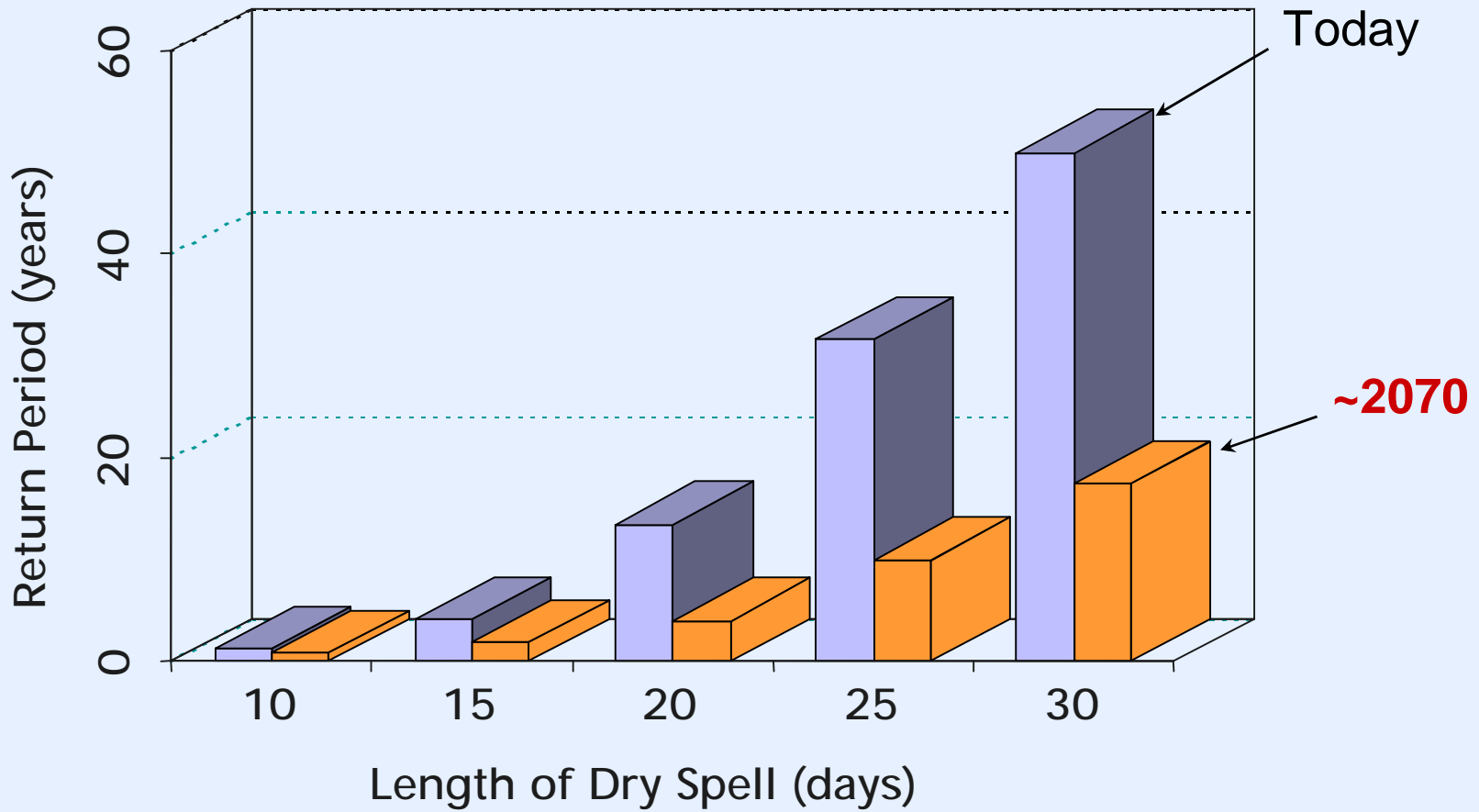
Wavelet power spectrum

Pinus flexilis



Increasing Drought Frequency

Central North America



Kharin and Zwiers, 2000

Drought Drought scenarios using dendroclimatic, historical and GCM based precipitation records

S. Lapp and D. Sauchyn

a. Calgary Annual PPT

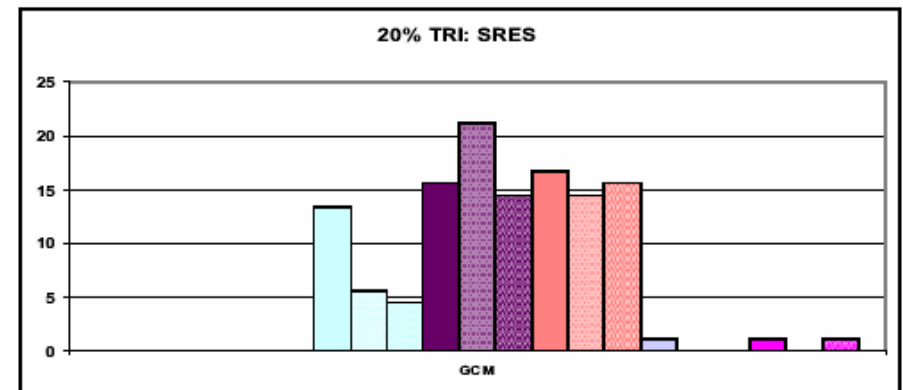
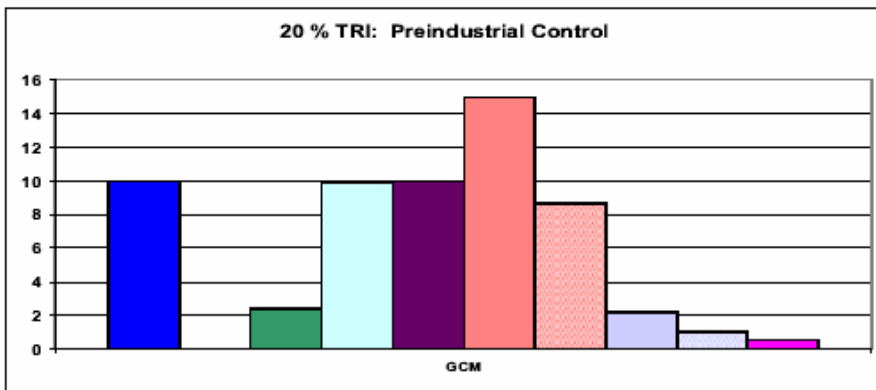
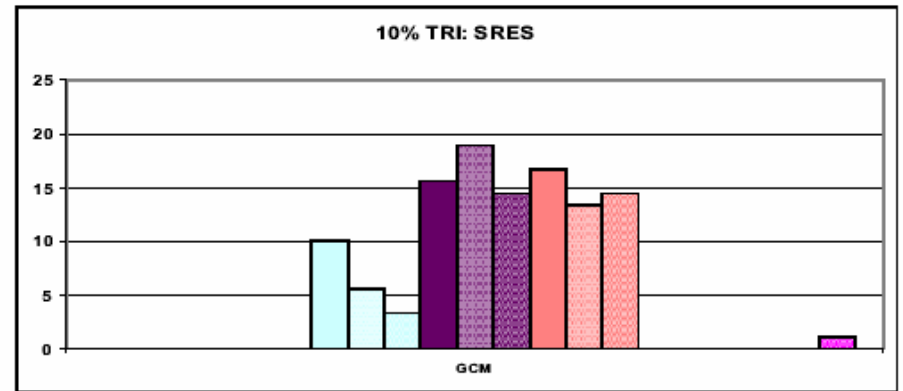
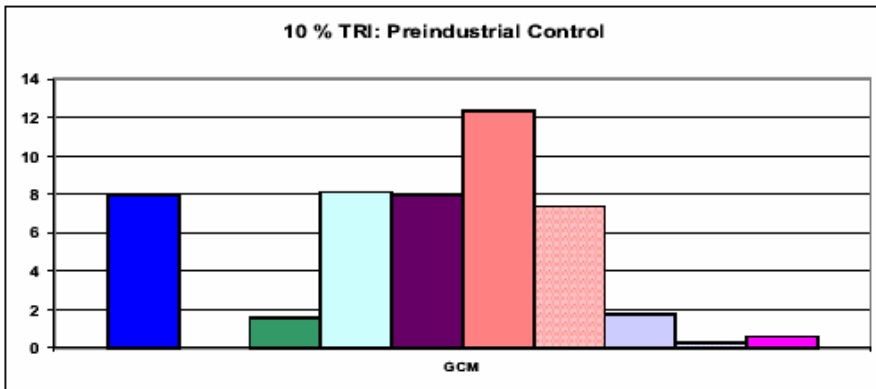


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