

Cowichan Lake Runoff Forecast Modelling

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Model Concepts

- The River Forecast Centre uses volume runoff forecast models to forecast summer runoff.
- Used for water-supply planning purposes
- They are statistical models using variables such as:
 - Snow pack
 - Antecedent discharge
 - Precipitation, temperature
 - Climate forcings (ENSO, Pacific Decadal Oscillation)
 - Others
- Model developed for Cowichan to assist Cowichan Roundtable with fisheries management

Available Data for Cowichan

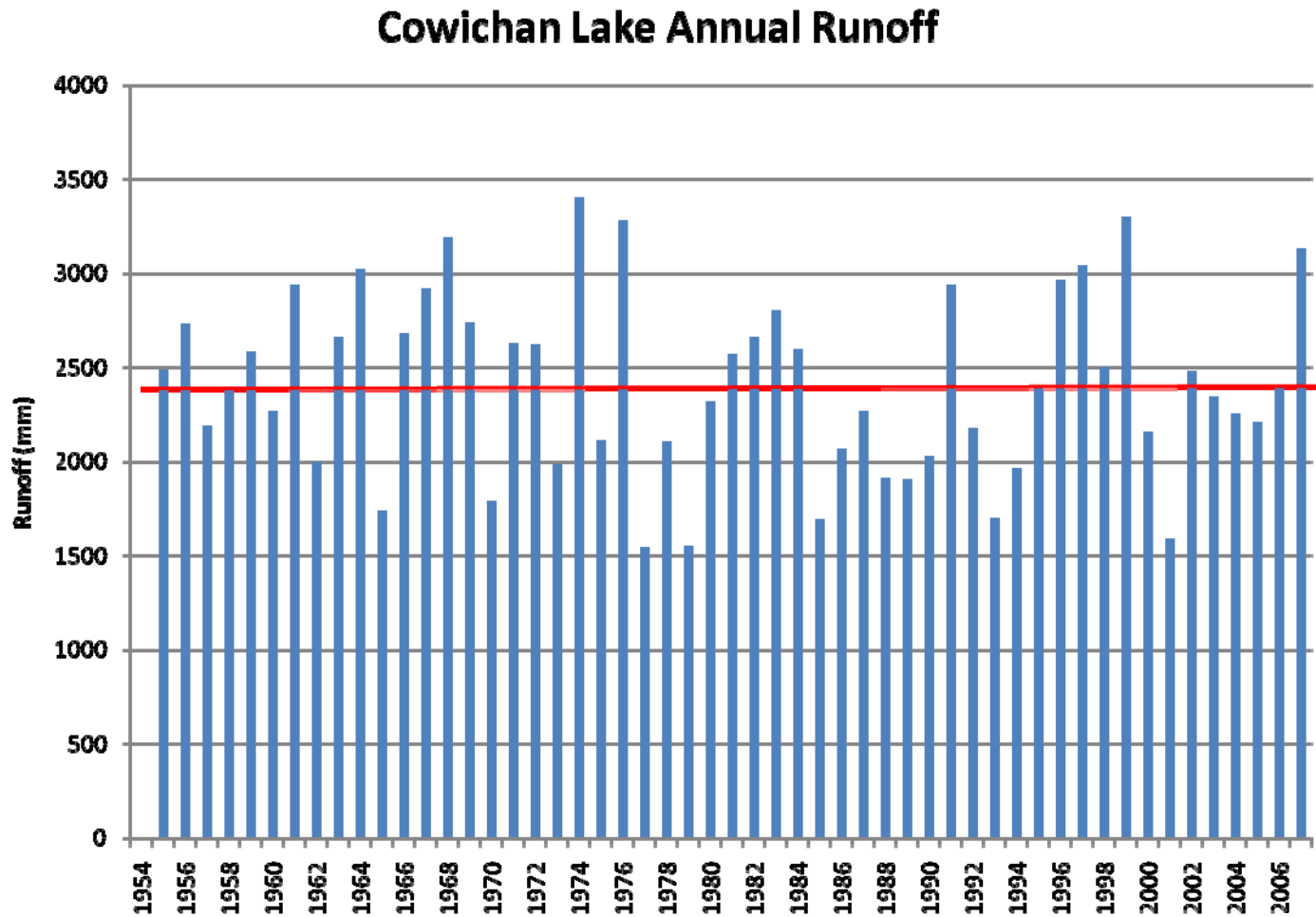
- Inflows calculated from Water Survey of Canada gauges:
 - 08HA002 – Cowichan River at Lake Cowichan (outflows from the lake) (1954-current)
 - 08HA009 – Cowichan Lake near Lake Cowichan (lake level)
- Snow Data:
 - Jump Creek Snow Pillow (1995-current)
 - Heather Mountain Snow Course (1966-1999), and others
- Climate Data
 - Cowichan Lake climate station (1961-current)
 - Cowichan Lake Forestry climate station (1950-current)
- ENSO & PDO (1950-current)

Cowichan Lake Annual Runoff

Very Wet!!

Average Runoff in basin = 2,400 mm

Average Precip. approx. 3,000 mm

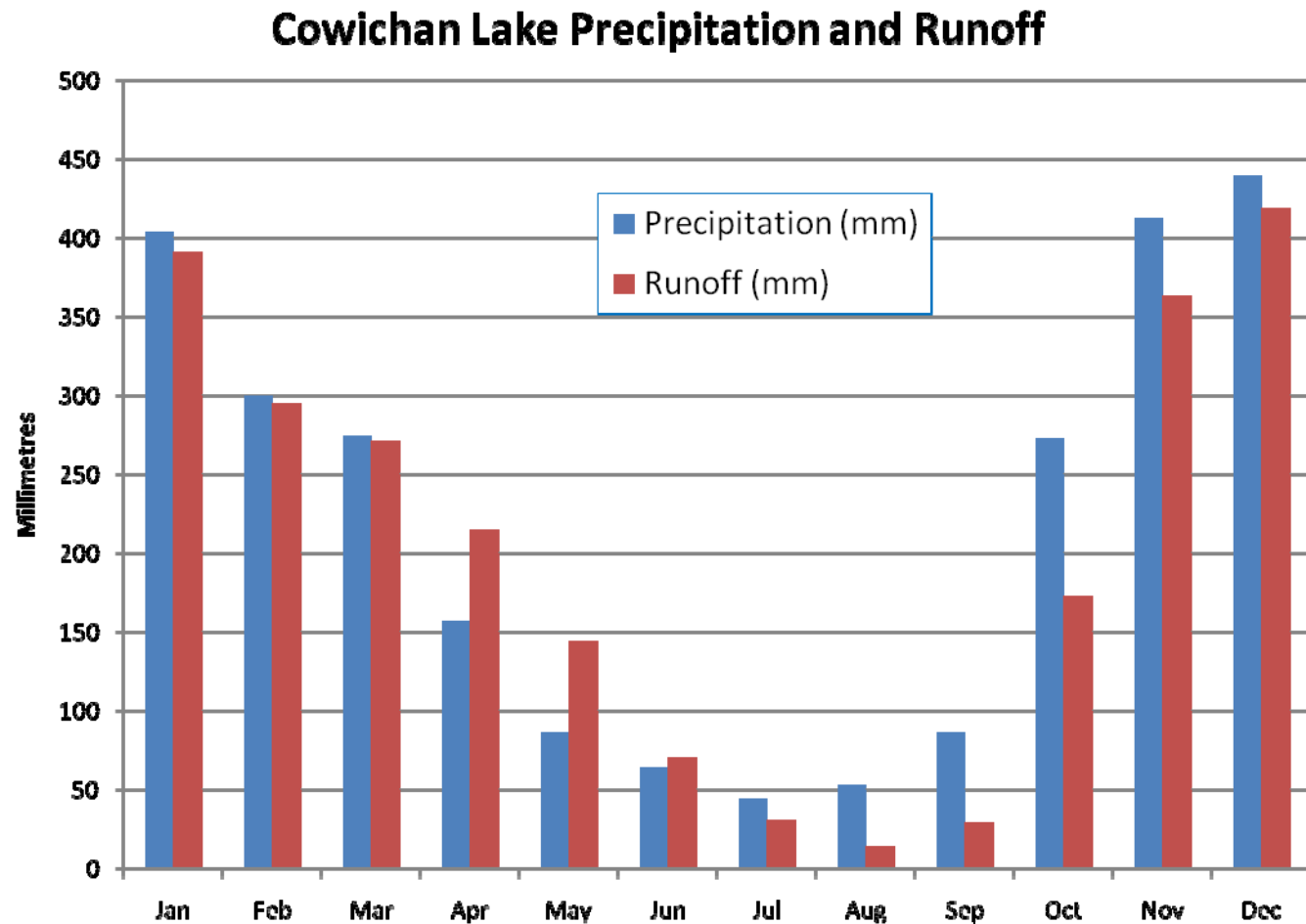


Cowichan Lake Monthly Runoff

Winter is wet.
Summer is dry.

Effect of snow
melt evident in
April-July runoff

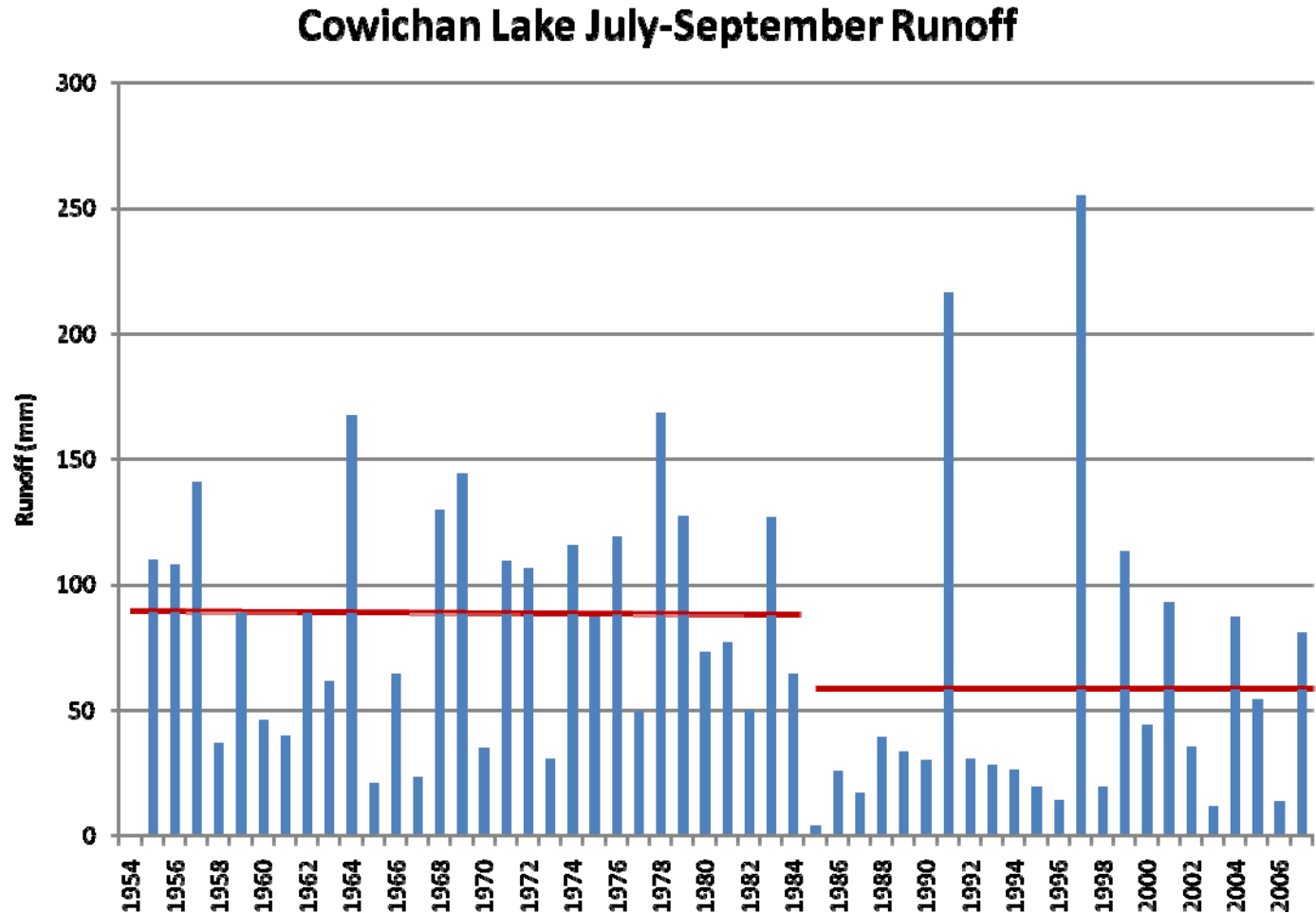
Aug & Sept runoff
mostly a function
of summer rainfall
and temperature.



Cowichan Lake Summer Runoff

Summer runoff mostly a function of summer rainfall and temperature.

But: Significant reduction (36%) in summer runoff since 1984



Cowichan Lake Summer Rainfall

Summer's are drier since 1984

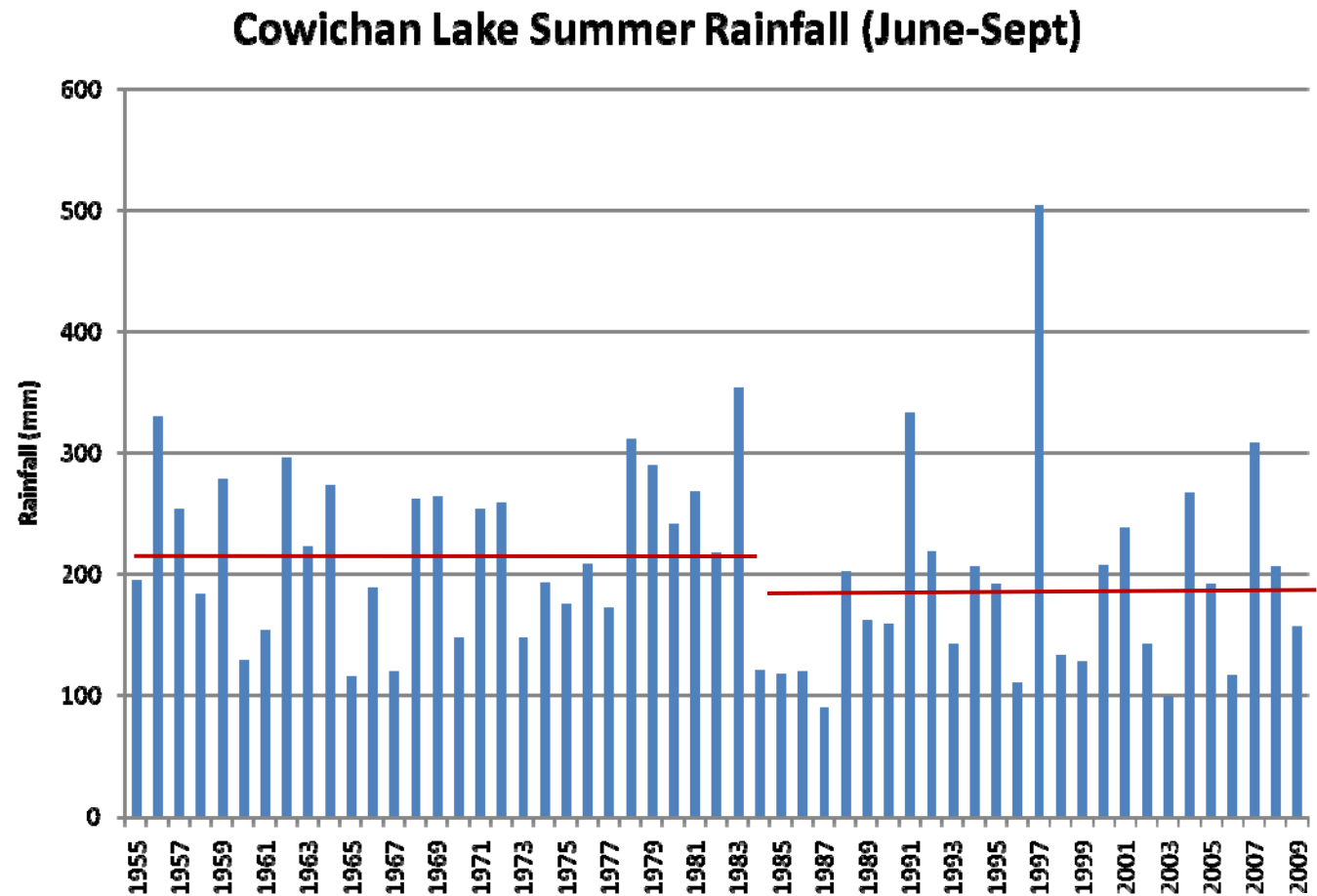
For June-Sept:

- 1955-1983 = 224 mm

- 1984-2007 = 187 mm

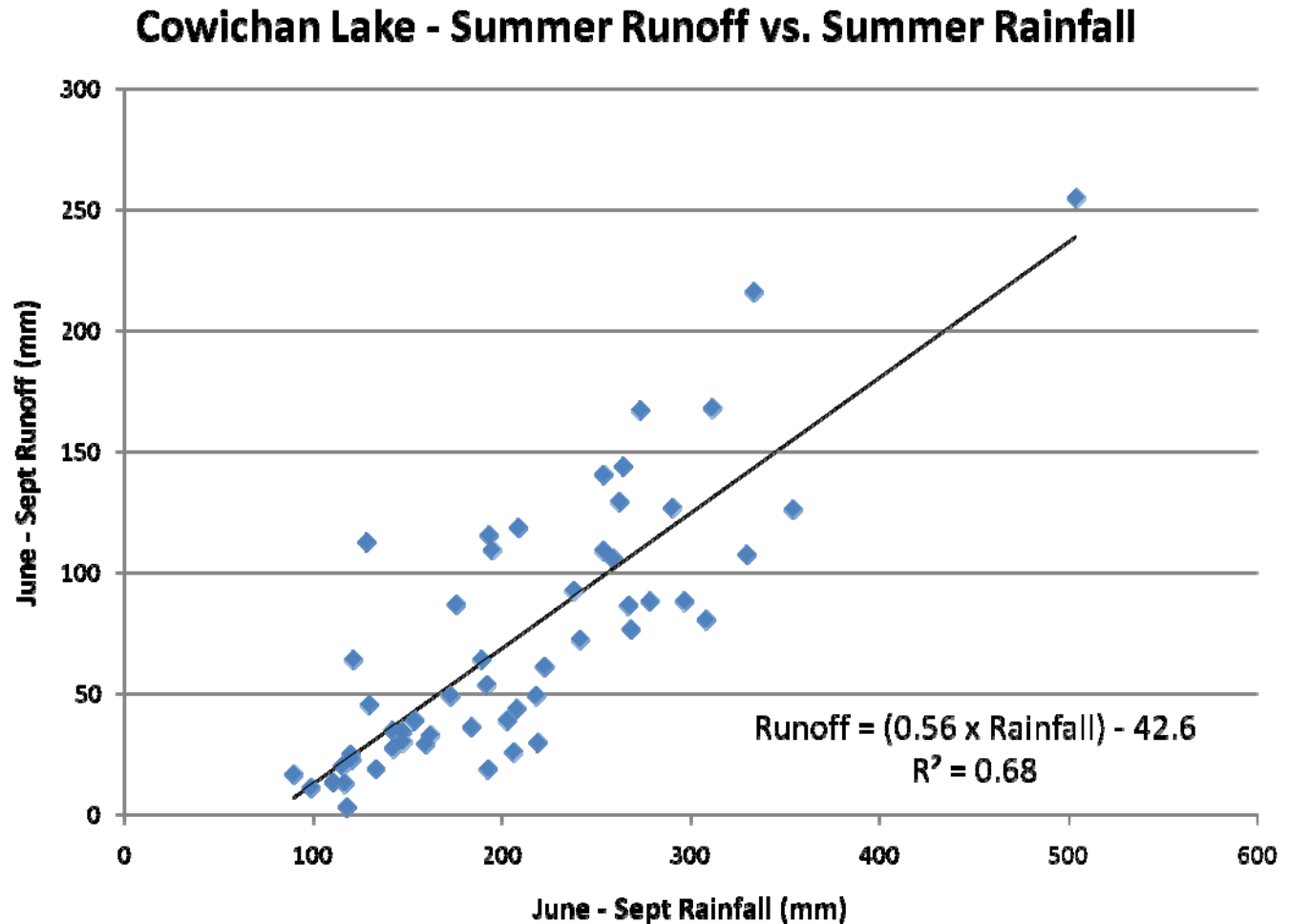
Difference =

16.5% less rain



Cowichan Lake Runoff vs. Rainfall

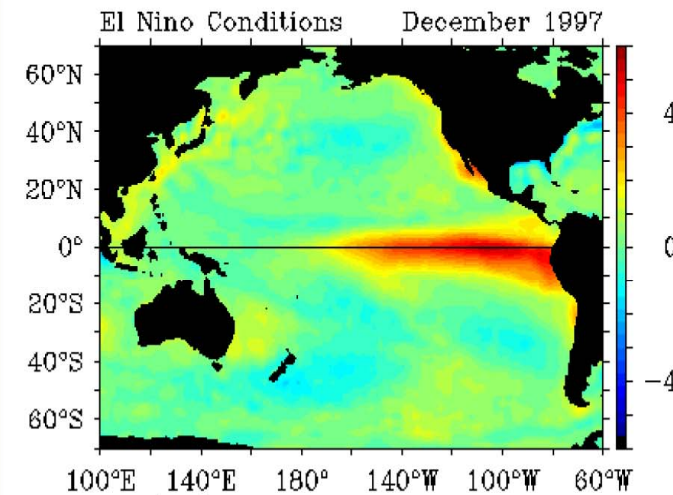
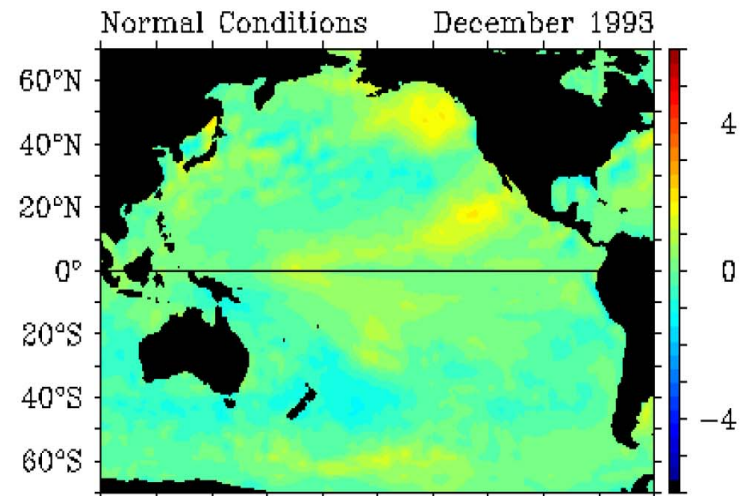
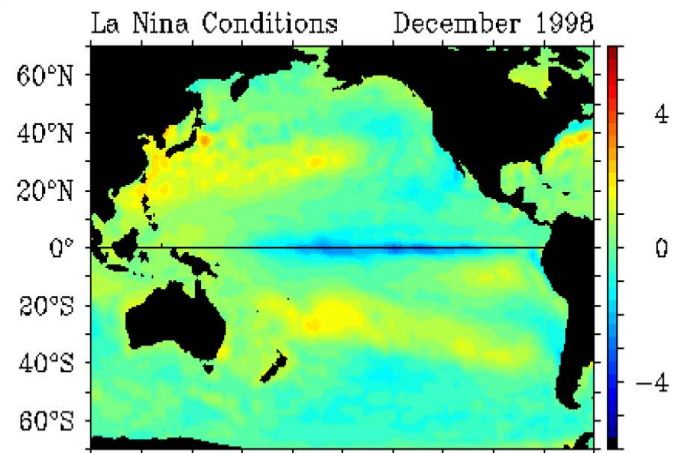
Summer runoff mostly a function of summer rainfall and temperature.



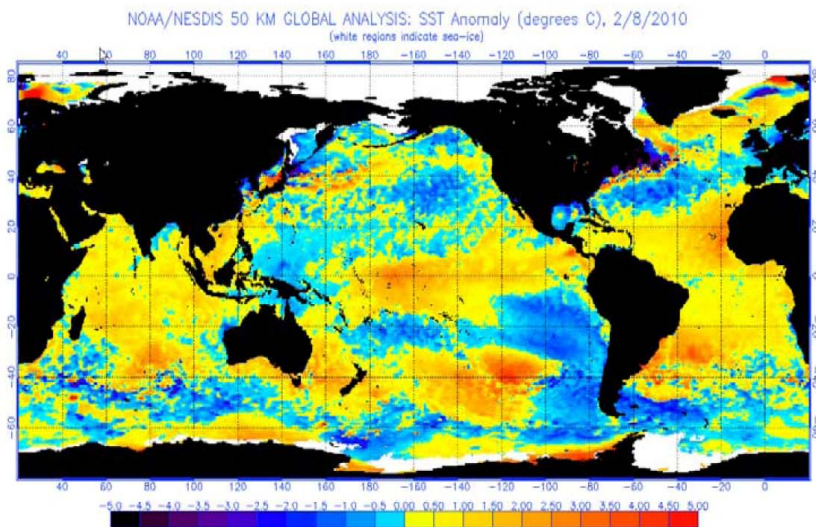
Teleconnections

- There are a bunch that affect Vancouver Island weather and streamflow:
 - **ENSO – El Niño Southern Oscillation**
 - **PDO – Pacific Decadal Oscillation**
 - AO – Arctic Oscillation
 - PNA – Pacific / North American
 - NPGO – North Pacific Gyre Oscillation

El Nino-Southern Oscillation (ENSO)

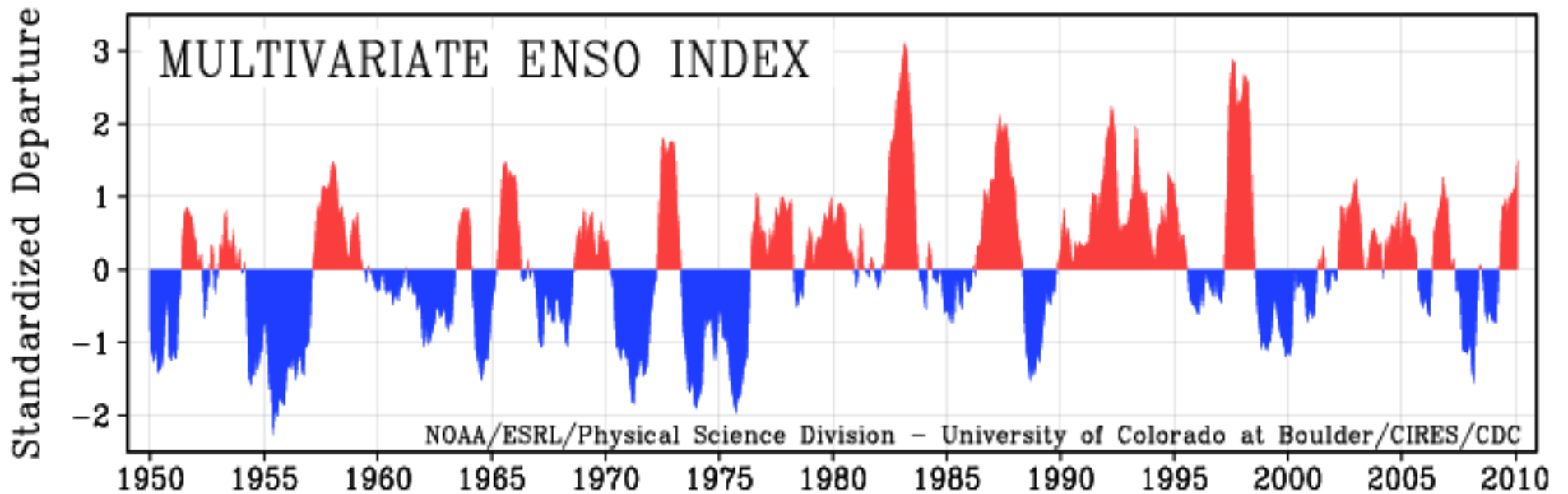


TAO Project Office/PMEL/NOAA
FOR GENERATIONS



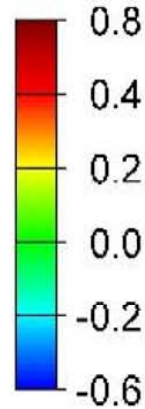
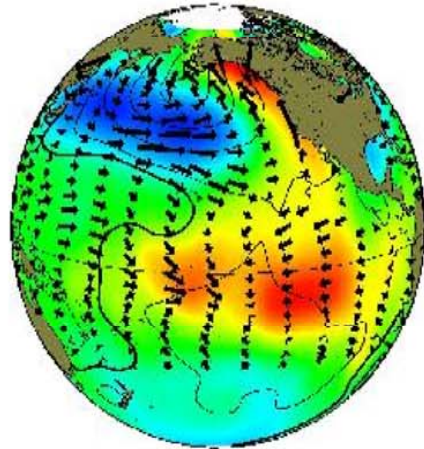
Current ENSO

Strongest El Nino since 1998

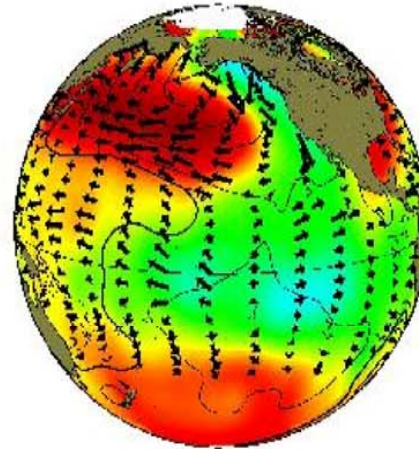


Pacific Decadal Oscillation (PDO)

Warm phase

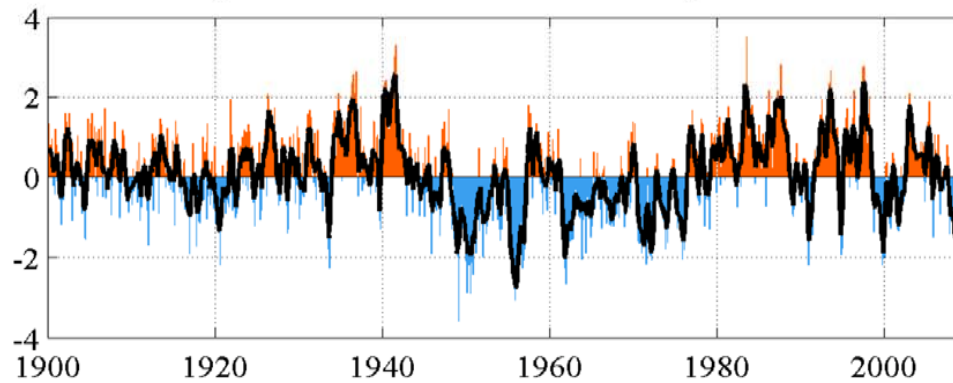


Cool phase



Mantua et al, 1997

monthly values for the PDO index: 1900-September 2009



Current(Oct-Jan) PDO = 0.19
"neutral"

How Do ENSO and PDO Affect Cowichan Water Supply?

- Principally by:
 - **Affecting winter snow accumulation.** Warm phase PDO and ENSO are drier than “normal”.
 - **Affecting winter and spring temperatures.** Warm phase PDO and ENSO are warmer than “normal”. During warm winters, low and mid elevation snowpacks can be significantly reduced.

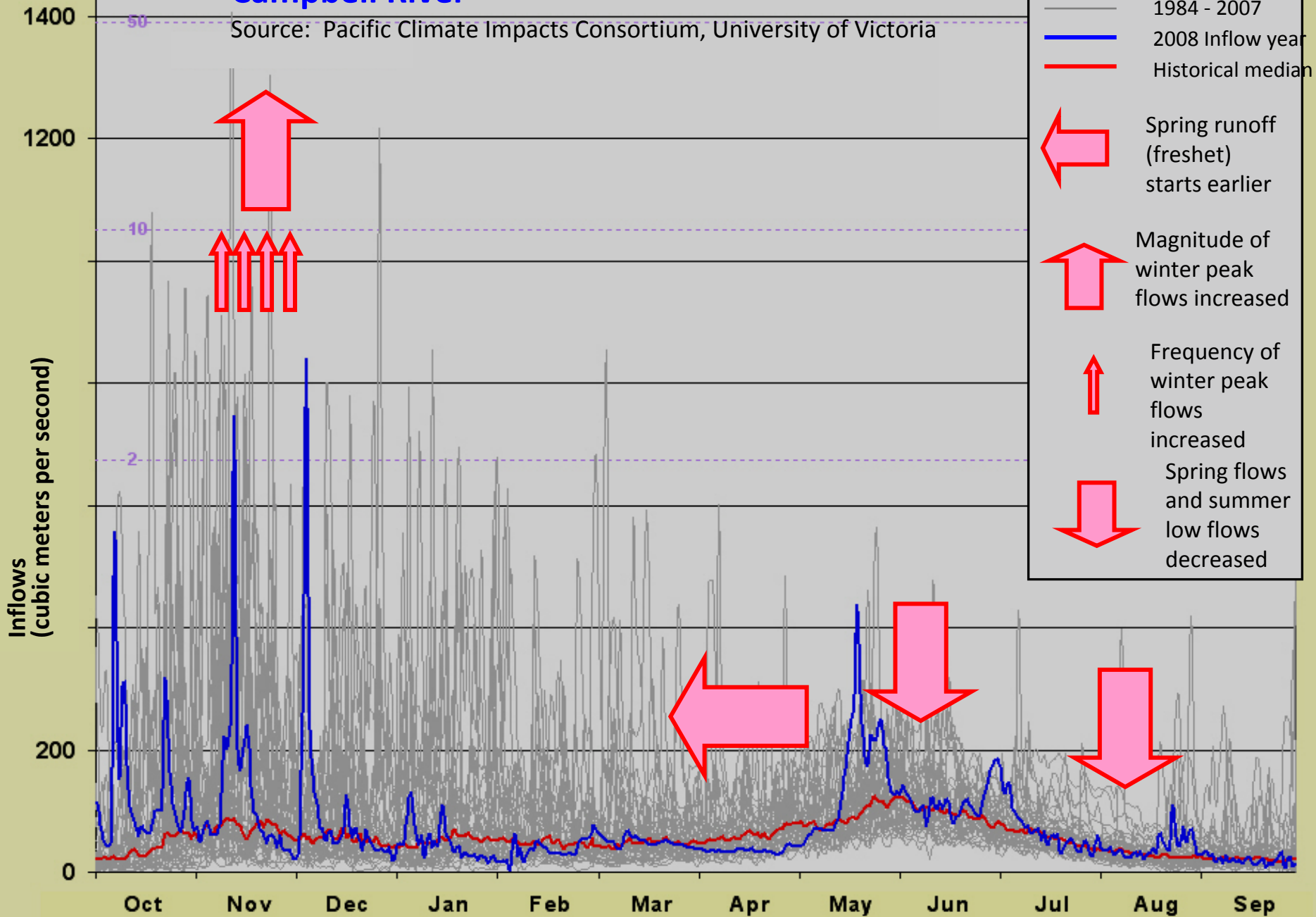
Climate Change Impacts

No climate change modelling yet done for the Cowichan. But, modelling by Pacific Climate Impacts Consortium (Uvic) for the Campbell River basin suggest (by 2050-2070):

- Average summer and winter temperatures **approx. 3° warmer**
- Drier summers, wetter winters, but:
- Substantially **reduced** winter snow accumulation
- Increased frequency and magnitude of winter storms
- Reduced June – September runoff

Campbell River

Source: Pacific Climate Impacts Consortium, University of Victoria





THANKS !

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