Future proofing through the CWMS

Mōtātou, ā, mō kā uri a muri ake nei

For us and our children after us

Dr Brett Painter

The Conception of the CWMS

During 1972 over 100,000 brown trout/fry were rescued from the drying Selwyn River system (NCAS)

The 1997–99 drought in Canterbury cost $230 million at the farm gate alone (NIWA, 2005)

By the 2080s severe droughts (currently 1 in 20 year) are projected to occur 2 to 4 times as often. Droughts are also expected to get longer (NIWA, 2005)

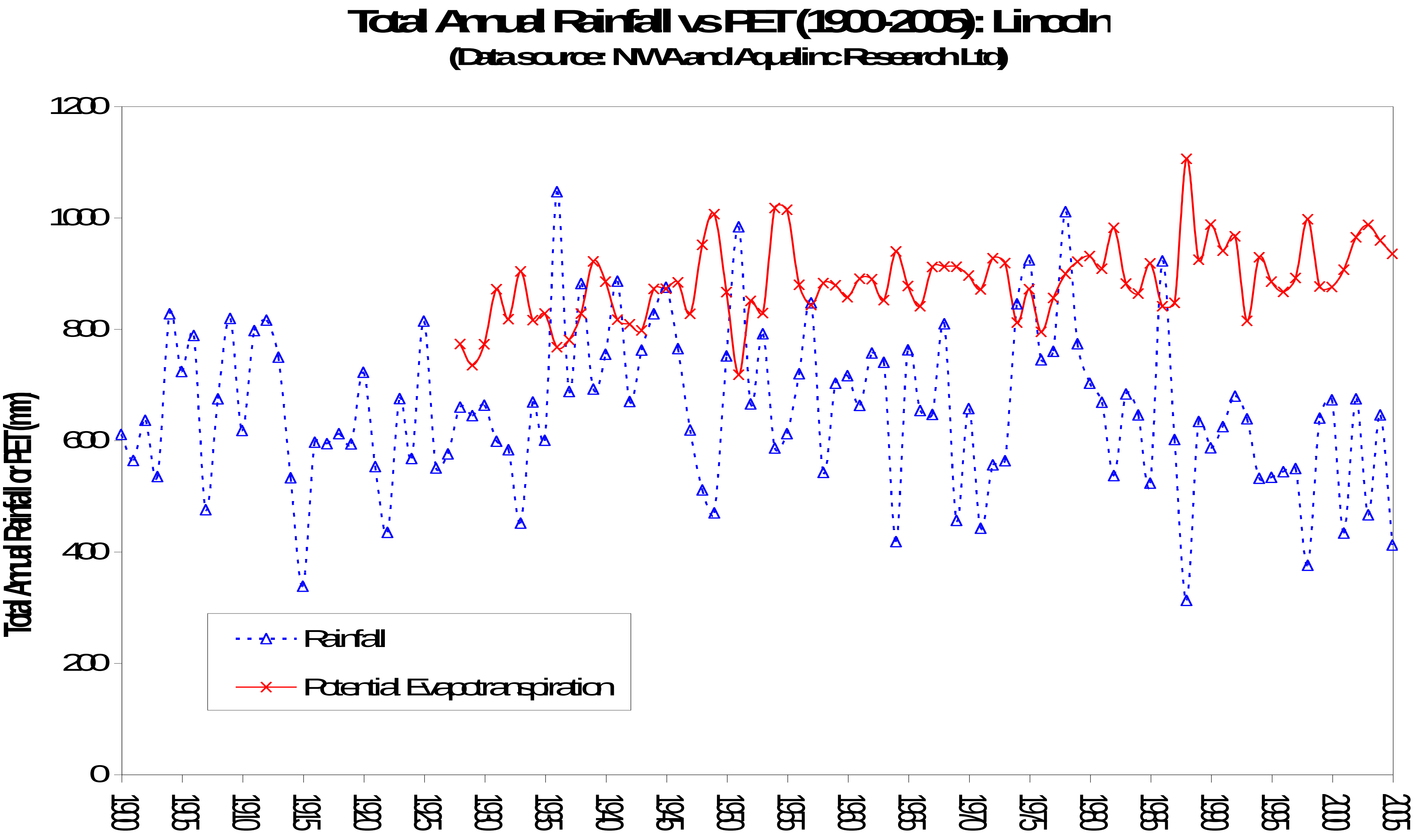
To feed 9 billion people by 2050, the world needs 60-70% more food, including doubling current grain/forage crop production (Jacobs, 2011)

CWMS – Gestation & Birth

Canterbury Strategic Water Study	
Stage 1 (1998-2002)	Sub-regional water balance (current and potential future)
Stage 2 (2002-2008)	Potential water storage options and their hydrological feasibility
Stage 3 (2006-2008)	Multi-stakeholder evaluation (environmental, social, cultural & economic) of Stage 2 water storage options
Stage 4 (2008 -)	Canterbury Water Management Strategy

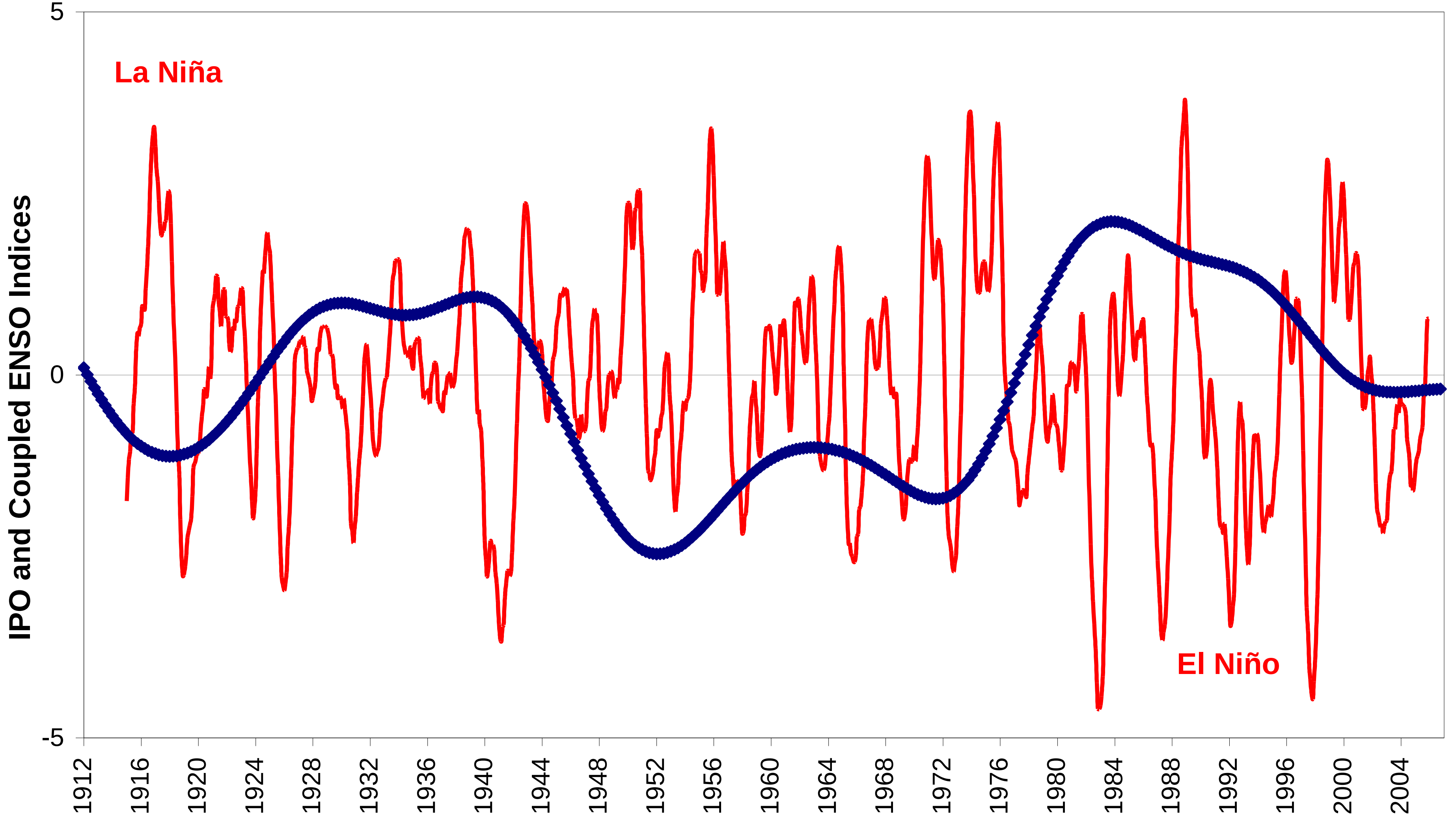
CWMS Fundamental Principles

1. Sustainable management
2. Regional approach
3. Kaitiakitanga
4. Natural character
5. Indigenous biodiversity
6. Access
7. Quality drinking water
8. Recreational and amenity opportunities
9. Community and commercial use

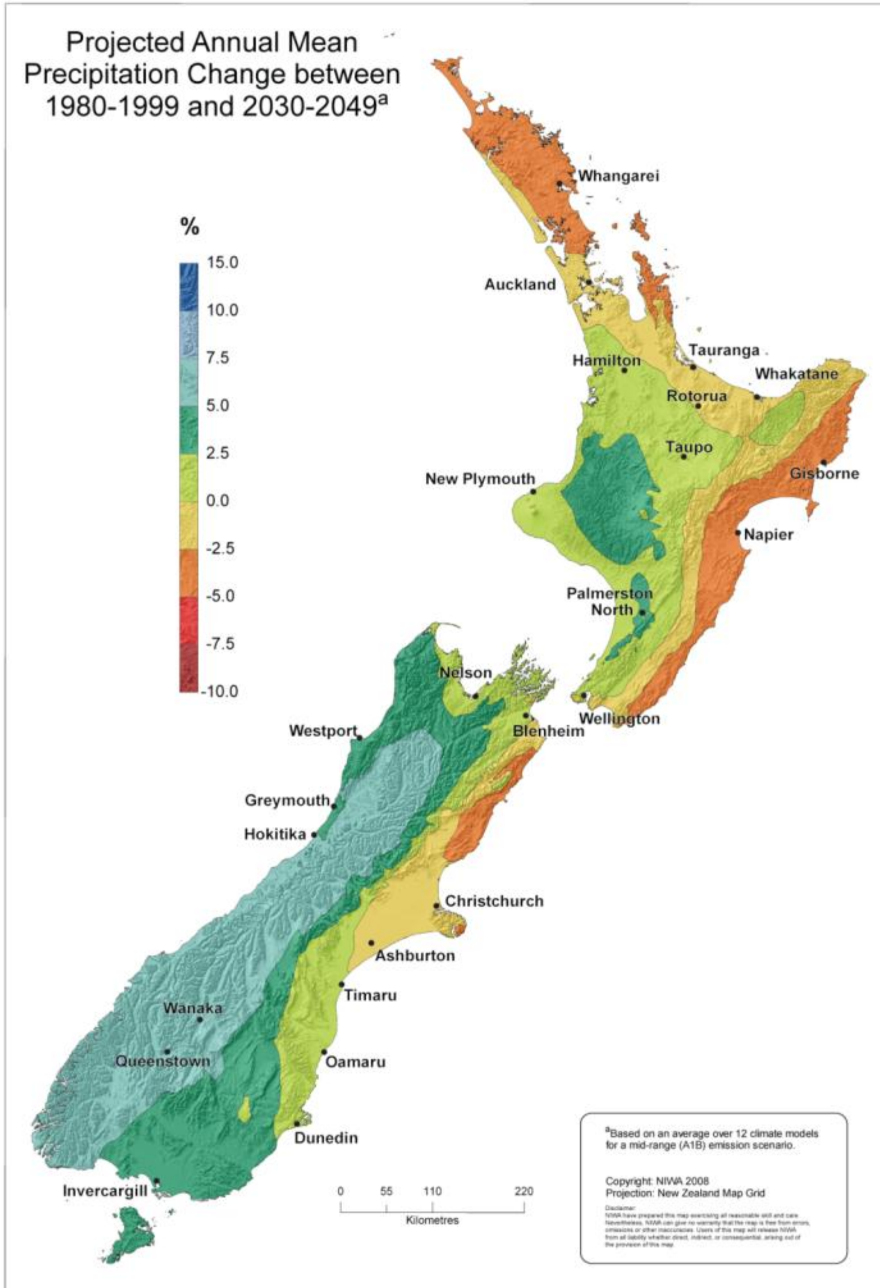


Total Annual Rainfall vs PET (1900-2005): Lincoln
(Data source: NIWA and Aqualinc Research Ltd)
Total Annual Rainfall or PET (mm)
0
200
400
600
800
1000
1200
1900
1905
1910
1915
1920
1925
1930
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
Rainfall
Potential Evapotranspiration

Interdecadal Pacific Oscillation and Coupled El Niño Southern Oscillation Indices



NIWA
Taihoro Nukurangi



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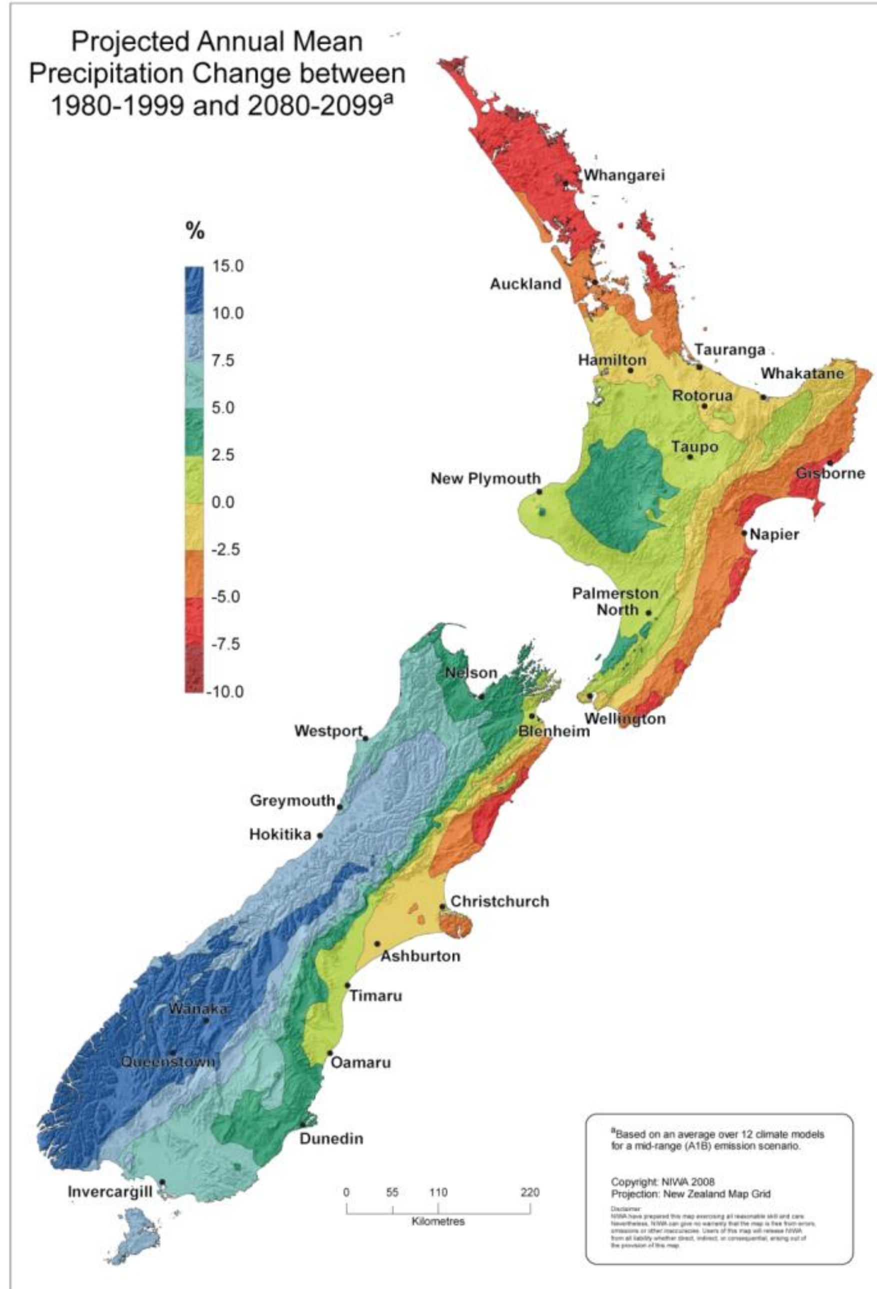

Waimakariri River catchment
Climate Forecast (NIWA, ARL)

Water supply & demand: 2030-50 vs 1980-2000

- On average +1^{o}C, rainfall -20mm/y on plains & +350mm/y in alps
- Potential Evaporation +140mm/y on plains & +60mm/y in alps
- Waimakariri River +6 to 7% on average but 50-70% in early spring
- Water demand +10% on average
- Drainage -8% from surface water fed irrigated land, -22% from un-irrigated land and -115% from groundwater fed irrigated land.

For 2080-2100 period, double most numbers for 2030-50.

2010 International Climate Adaptation Conference

- Rainfall is expected to continue to fall in the ‘wrong’ place at the ‘wrong’ time. Evapotranspiration is expected to continue to rise in many places (eg, South Island’s East Coast).

- Over the medium term, flows in many South Island alpine rivers are expected to be at or above their current levels (especially late winter). Flows in the lower catchments are expected to be at or below current levels.

- We can and must reduce, reuse and recycle.

- The ideal place to store water is close to where it falls and where evaporation losses & other negative effects are minimised. Income from hydro generation makes the supply of water to multiple uses more affordable.

ANCOLD 2011
“The Future of Dams”

Canterbury Water

- Increased attention and investment in medium/large storage infrastructure
  - food security in a changing climate
  - push back on nuclear energy and fossil fuels

- Improved irrigation technologies and furrow design – “more crop per drop”

- Global geotechnical success
  - No large concrete dam has failed from earthquake shaking, though a section of the Shih Kang dam sheared off in 1999.

- Unsolved challenge of sediment transport for mainstem/on-line dams.

Future proofing Te Waihora /Lake Ellesmere?

...to achieve improved water quality (reduced nutrient and phytoplankton concentrations) in a future climate with increased air temperatures, the external nutrient loading to the three New Zealand lakes must be reduced considerably more than would be necessary under current climate conditions (Trolle et al, 2010).

Future proofing the Selwyn-Waihora Zone?

- Integrated water and nutrient management at source is essential. Riparian management & lake edge/level/nutrient management can assist.
- Efficient water management requires a high reliability of water supply.
- Run-of-river and groundwater supply will most likely become less reliable during many future summers. In-stream and coastal processes are also vulnerable to forecasted summer conditions.
- Affordable but acceptable off line storage and re-distribution of surface water and groundwater allocations may be required to deliver CWMS targets.
- Some lower catchment drinking water may need to be taken from the deeper aquifers.