



THE UNIVERSITY OF
MELBOURNE

Reconstructing the historical streamflow of the River Murray

The Murray–Darling Basin

The Murray–Darling Basin (MDB) spans over one million square kilometres, providing one-third of Australia's food supply. As such, it is vital that we increase our understanding of the climatic variability in such a socially and economically important region.

Palaeoclimate Reconstructions

In Australia, the Bureau of Meteorology's digitized climate observations extend back to the late 19th century. Using data derived from natural archives like tree rings, coral, ice cores and cave formations allows us to assemble reconstructions that extend back centuries before instrumental weather records are available.

Palaeoclimate reconstructions can help define the bounds of climate variability that are needed for long-term management of natural resources. Most importantly palaeoclimate records allow us to isolate the fraction of climate variation that is being forced by natural variability and human activities.



Photo: Annual growth bands recorded in tree rings (Joelle Gergis)



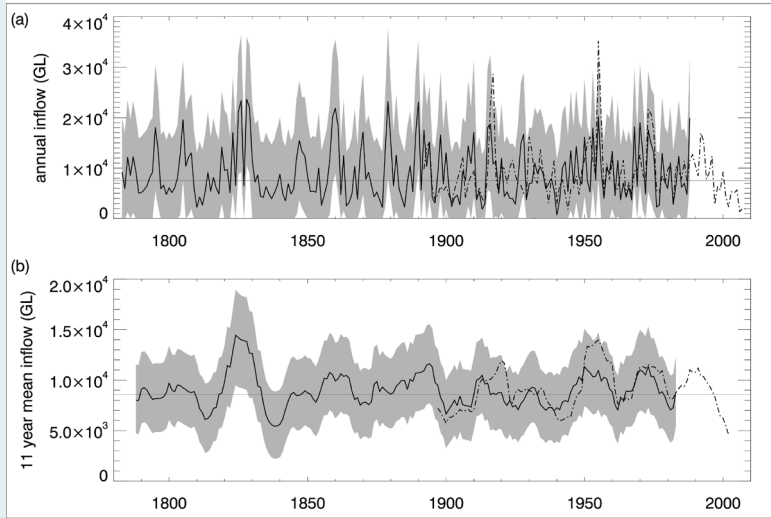
Artwork: *Koondrook on the River Murray 1894*.
Image provided courtesy of State Library of Victoria.

The SEARCH Project

The South Eastern Australian Recent Climate History (SEARCH) project is an Australian Research Council funded investigation based in School of Earth Sciences at the University of Melbourne. The project brings together a team of palaeoclimatologists, meteorologists, hydrologists and historians with the goal of reconstructing south-eastern Australia's climate history. Our recent work includes a streamflow reconstruction for the River Murray back to 1783.

Key Findings

- There has been considerable variation in the River Murray streamflow since 1783
- There is only a 2.3% chance that the record low streamflow set during 1998–2008 has been exceeded since European settlement.
- Simulations based on the reconstruction indicate a 1 in 1500-year return period for the deficit seen in the decade 1998–2008.
- Remote palaeoclimate proxies can be used to infer variations in local hydroclimates



Source: Gallant and Gergis, 2011

High and Low River Flow

- The highest streamflow on record occurred during 1947–1958, the lowest was 1998–2008.
- The most striking feature of the reconstruction was the switch from very high to very low streamflows during the 1820–1840s.
- There is a 98% chance that the streamflow deficit experienced between 1998–2008 is the worst since first European settlement.

Reconstructing the River Murray streamflow

As the Murray–Darling Basin currently lacks annually resolved palaeoclimate records, we must source records from the broader Australasian region for climate research.

We selected tree ring records from Australia, New Zealand and Indonesia and coral records from the Great Barrier Reef, Bali and Fiji. Modern instrumental measurements helped to confirm that a significant proportion of River Murray streamflow variability could be reconstructed based on climate data from these locations.

We developed annual and decadal reconstructions that skillfully reproduced 23% and 50% of the variations in River Murray streamflow respectively. These promising reconstructions demonstrate that if local records are unavailable, we can still glean useful information from remote locations. More palaeoclimate records from the MDB are needed to extend the region’s climate record.

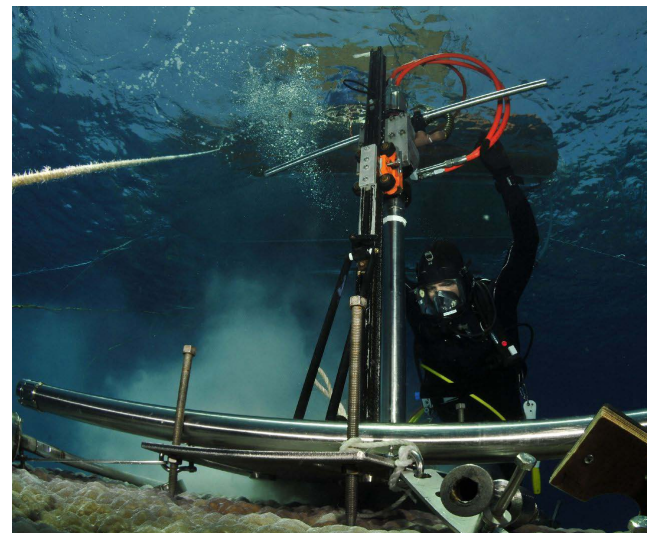


Photo: Drilling for coral samples (Eric Matson, AIMS)

Further information

Gallant, A. J. E., and Gergis, J. (2011). An experimental streamflow reconstruction for the River Murray, Australia, 1783–1988, *Water Resources Research* 47, WooGo4, doi:10.1029/2010WR009832.

For more information on the SEARCH project please visit:

www.climatehistory.com.au

