Australian continent takes a big drink

May 14 2013

(Phys.org) —Devastating at the time, the major floods of 2011 have since brought a vital benefit by recharging Australia's depleted reserves of underground water.

Scientists from Australia's National Centre for Groundwater Research and Training (NCGRT) say they have been impressed with recharge rates of groundwater following the 2011 floods in Queensland and Victoria.

"Prior to the floods, water levels in the Lockyer Valley were becoming perilously low in this prime agricultural region of southeast Queensland," says Dr Matthias Raiber, postdoctoral research fellow at the NCGRT and Queensland University of Technology and now with CSIRO.

"Although the response of groundwater was highly variable owing to the complexity of the Lockyer Valley, in some regions we saw levels rise as much as ten metres. This kind of response is overwhelmingly positive from the perspective of water availability in the region."

As a dry continent without glaciers, or large and abundant permanent lakes, groundwater is a critical resource for large parts of Australia. Its importance is only likely to increase in a future where rainfall patterns are expected to become less predictable, while surface supplies may become ever more stressed due to competing pressures from evaporation, population growth, industry and agriculture.

The Lockyer Valley is a major food bowl for Queensland, with recent

council figures in January showing that annual turnover for agriculture, forestry and fishing in the region was $230 million in 2010/11.

"Given the importance of our groundwater reserves, it is crucial that we better understand how our aquifers recharge and at what rate. Even within the Lockyer Valley, there are many different processes for recharge which depend on the hydrology and geology of a location," says Dr Raiber.

"Using a variety of complementary techniques, my colleagues and I are building a picture of the ways in which our groundwater reserves are replenished, something that has been 'out-of-sight and out-of-mind' for too long, especially given its importance in Australia's past, present and future."

Sanjeeva Manamperi, another researcher at NCGRT and PhD candidate at LaTrobe University, is studying recharge rates in a different part of Australia, the Loddon River catchment in Northern Victoria. His results show a similar response followed the flooding in early 2011.

"In most places that I have examined, groundwater levels recovered by about seventy per cent in early 2011. This is quite remarkable when you think that this region suffered a thirteen year drought from 1997 to 2010," says Mr Manamperi.

"A smaller flooding event in 2010 improved the rate at which recharge could occur in 2011 because the surface layers were already saturated when the floods arrived.

"However it was the intensity of the rainfall during the 2011 event that resulted in such spectacular recharge of many of these aquifers. The large volume that accumulated in such a relatively short period of time meant that recharge occurred immediately through fractures in the rocky

regions, but also seeped through the soil in other areas.

"Obviously flooding events cause serious problems on the surface - but underground they help replenish stores of water that are running out. For the time being, the 2011 floods have taken the immediate pressure off water use in northern Victoria.

"Nevertheless, we cannot be complacent in our conservation of water resources as the long-term availability of groundwater will depend on the frequency of flooding events in Australia, something that is difficult to predict."

Researchers at the NCGRT are making estimates of Australian groundwater availability in the future based on what they are learning about the processes of recharge during floods. In doing so they hope to provide State and federal water authorities with a clearer picture of the demands that can be sustainably placed on Australia's underground reserves.

NCGRT director Prof. Craig Simmons says most countries do not know the extent of their groundwater resources when they begin extracting them, or how long they take to recharge. Without this vital knowledge they cannot manage them.

"Reliable water supply is not only a fundamental element of economic prosperity for any country, but also vital for national security. Research being conducted at the NCGRT is therefore key in providing Australia with the know-how to sustainably exploit its precious underground reserves of freshwater, which are literally Australia's 'buried treasure'," he says.

Provided by National Centre for Groundwater Research & Training