



A stream of scientific research

MARGRIT BEEMSTER FROM CHARLES STURT UNIVERSITY HIGHLIGHTS NEW RESEARCH WHICH IS ASSESSING ECOSYSTEM RESPONSES TO ENVIRONMENTAL WATERING IN THE MURRAY-DARLING BASIN.

“Each organisation brings different skills and experience to the monitoring and evaluation of the water. It works very well in informing us how we can get the best environmental outcomes from the use of the water.”

Dr Simon Banks, Assistant Secretary, Environmental Water Delivery, CEWO

Innovative research monitoring ecosystem responses to large-scale environmental flows will help water managers throughout Australia make informed decisions and improve the delivery of environmental water.

Over the past few decades in Australia there have been significant developments in environmental flow management, and we have reached a stage where governments are starting to implement large-scale environmental watering programs. Australia is now a world leader in delivering environmental water to sustain river and wetland environments. The effective assessment of these watering actions is vital.

Researchers from Charles Sturt University (CSU)'s Institute for Land, Water and Society (ILWS), in collaboration with partner organisations, are leading two major projects monitoring and evaluating the ecosystem responses to environmental water flows in two Murray-Darling Basin catchments; the Edward-Wakool and Murrumbidgee River systems. The projects are funded by the Commonwealth Environmental Water Office (CEWO) with in-kind contributions from all partner organisations.

The knowledge generated by these projects will help water managers in Australia to improve the delivery of environmental water in the Edward-Wakool and Murrumbidgee River systems and will assist other environmental watering programs in Australia and across the world. The projects will also inform the Australian community about what is being achieved for the environment with environmental water.

Edward-Wakool River system

The Edward-Wakool system comprises multiple rivers, creeks and wetlands intersected by a network of irrigation channels. It is recognised as a significant breeding and recruitment ground for many aquatic species and supports a number of endangered and vulnerable native species including fishes, frogs, mammals and riparian plants. In the Edward-Wakool system, environmental water is delivered as pulsed flows that remain within the river channels. The focus of assessment is on fish, in-stream ecosystem health and food webs.

During 2010-11 a number of projects were undertaken that monitored responses to environmental water in this system. These included:

- A project by CSU in collaboration with the Murray Catchment Management Authority (Murray CMA) investigating natural flow pulses that triggered blackwater events. (A blackwater event occurs when carbon from the floodplain and river banks triggers bacterial activity which severely reduces oxygen levels in the water.)
- Monitoring of blackwater by other organisations and the community.
- A study of fish movement by Murray CMA and the New South Wales Department of Primary Industries (NSW DPI) Fisheries.
- A CSU honours study on frog responses to in-channel flow pulses.

In 2010-11 some of the environmental water for the Edward-Wakool was delivered through the irrigation escape infrastructure to provide refuge habitats (containing higher levels of dissolved oxygen) for fish populations, particularly Murray Cod. The research showed environmental watering was effective. Outside the refuges the Murray CMA, NSW DPI Fisheries and local community reported fish kills.

In the following year, monitoring of environmental water in the Edward-Wakool was further expanded with CSU collaborating with the Murray CMA and Monash University to monitor water chemistry, algae, micro crustaceans (zooplankton), invertebrates (water bugs), frogs and fish and ecosystem processes such as whole river metabolism and leaf litter decomposition. The Murray CMA and NSW DPI Fisheries continued their fish movement studies.

The current monitoring of environmental watering in the Edward-Wakool system has taken a coordinated approach, consolidating a range of assessment methods into the one ecosystem-based monitoring program. For 2012-13 the monitoring of ecosystem responses to environmental watering is assessing a broad suite of indicators under the one project, being led by Associate Professor Watts from CSU. Project partners are CSU, NSW DPI Fisheries, Murray CMA, Monash University, the Wakool River Association and the NSW Office of Environment and Heritage (OEH).

Collectively the team is monitoring water chemistry (such as carbon, nutrients), algae, phytoplankton (from which estimates of whole-stream metabolism can be made), zooplankton, frogs, fish spawning, recruitment and diversity as well as fish movement and habitat assessment.

In the Edward-Wakool system there are multiple rivers of similar size geographically close to each other. As all of the rivers can be regulated, some are receiving environmental water, while others are not. This means the benefits of environmental water can be evaluated by comparison with control rivers.



CARING FOR CONTENT OF THE ARRC

At Curate Bee we know the amount of content you are exposed to every single day and we are taking the necessary steps to ensure that when we communicate with you, we provide only relevant content so you do not need to spend time filtering through clutter.

Our curators have been sourcing content from hundreds of news sites to get the most valuable news, stories and media to you. A dedicated channel that curates content specific for ARRC readers and followers will soon be available on a 'top of the market' news curation service known as Newzsocial.

Newzsocial is a next generation iPad social news magazine and is at the intersection of mainstream media, social streaming and content curation. What this means for our followers, who often find themselves short on time, is that they will have the opportunity to catch up on all ARRC updates together with other news updates and content that directly relates to you.

By following a number of channels including the ARRC channel on Newzsocial, the items of interest you receive will be completely tailored, therefore minimising irrelevant content exposure. For more information on when the ARRC channel will be available on Newzsocial, like the ARRC and Curate Bee on Facebook and follow us on Twitter.

<http://curatebee.com.au/>



CURATE BEE

“When you think about knowledge giving us power, really it is the sharing of knowledge that gives us power; by sharing knowledge across different organisations and groups, and by drawing on historical data we are going to get better outcomes for the wetlands and river.”

Dr Skye Wassens, CSU

Murrumbidgee River system

The Murrumbidgee River system is a major river system in the MDB of high economic, social and ecological importance. It begins as a fast-flowing cobble system in a high rainfall area and ends as a large inland delta system in the semi-arid parts of New South Wales.

The Murrumbidgee River channel delivers irrigation water to the Murrumbidgee and Coleambally Irrigation Areas as well as to the towns along its length including Wagga Wagga and Hay. Although it has been highly regulated, it still has populations of endangered species such as Trout Cod and Silver Perch. The mid-Murrumbidgee and the Lowbidgee wetlands are listed as nationally significant wetlands with critical habitat for waterbird breeding, and endangered frogs such as the Southern Bell Frog.

Leader of the current monitoring project Dr Skye Wassens (CSU) first started researching frogs in the semi-arid parts of New South Wales, including the Lowbidgee in 2000. In 2007 she helped develop an emergency watering strategy to save the endangered Southern Bell Frog at risk of extinction due to altered flooding regimes in the Lowbidgee floodplains. Continued monitoring has proven this strategy was effective. Since then, the NSW OEH funded further research identifying the relationships between the response of fish, waterbirds and frogs following environmental flows and natural flood events in the Lowbidgee. In 2011–12, CEWO provided funding to continue and expand the monitoring in response to environmental watering to include a wider range of indicators.

Further CEWO funding for 2012–13 has broadened the mid-Murrumbidgee project to include monitoring of the response to environmental watering in the Lowbidgee wetlands, as well as the Western Lakes, and the Murrumbidgee River itself from below Burrinjuck and Blowering Dams to its end. Partners in the Murrumbidgee project are the CSU, NSW OEH, University of New South Wales, Murrumbidgee CMA and the NSW DPI Fisheries.

The researchers are monitoring the responses of larval fish and recruitment, water quality, zooplankton, carbon nutrients in the Murrumbidgee River channel; and vegetation, frogs, waterbirds, carbon, nutrients, tadpoles and fish, zooplankton, and water quality in the connected wetlands.

The project is the first in Australia to assess wetland and in-stream responses across an entire river system. This large integrated project enables the researchers to look at a broader range of ecosystem responses. As it builds on past projects, the research team is able to consider long-term responses to individual flows with data collected throughout the year, rather than just spring and summer. This is important because short-term responses following environmental releases can often appear idiosyncratic, especially in systems that have experienced high levels of modification and disturbance. By collecting data across all seasons, over repeat years and considering multiple levels of the food chain the findings will inform a more detailed management approach.

Informed river management

Monitoring and evaluation are vital for informing decision making and environmental water delivery. The projects in the Edward–Wakool and Murrumbidgee systems have already helped managers make better decisions on the delivery of environmental water. For example, in 2011–12, when there was a blackwater event in the Edward–Wakool system, researchers, landholders and regional government agency staff were able to provide information to the water managers who were able to maintain oxygen levels above critical thresholds in part of the river system by delivering environmental water through irrigation escapes. In 2012–13, fortnightly updates on the extent and timing of cod spawning have contributed to decisions relating to the duration of an environmental flow pulse.



FOR FURTHER INFORMATION

Margrit Beemster, Communications Coordinator ILWS — mbeemster@csu.edu.au

Associate Professor Robyn Watts — rwatts@csu.edu.au

Dr Skye Wassens — swassens@csu.edu.au

www.environment.gov.au/ewater/publications/ecosystem-response-monitoring-natural-edward-wakool.html

www.environment.gov.au/ewater/southern/murray/fish-monitoring-project.html

www.environment.gov.au/ewater/publications/index.html#monitoring