

Edward/Kolety-Wakool system Environmental Flows Newsletter

Issue Number 10 | 1 October – 31 December 2021

Edward/Kolety-Wakool Monitoring, Evaluation and Research Program



Junction of Tumudgery Creek and Colligen Creek, October 2021 (Photo: R Watts)

What's in Issue #10

The highs and lows of river flows - July to Dec 2021

The beauty of Werai Forest in flood

Update on inundation modelling of Werai Forest

Monitoring water quality to evaluate the outcomes of environmental water delivered from irrigation escapes

Thank you to ILWS Business Team

Dr Julia Howitt Legacy Scholarship Fund

Welcome to Issue 10 of the Edward/Kolety-Wakool Environmental Flows Newsletter - a quarterly newsletter that provides an update on our progress as we monitor and undertake research on the ecosystem outcomes of Commonwealth environmental watering actions in the Edward/Kolety-Wakool system.

The Edward/Kolety-Wakool Monitoring, Evaluation and Research Program (Flow-MER) is a collaboration between universities, state government agencies, consultants and local community organisations.

More information on the program can be found at:
<https://flow-mer.org.au/selected-area-edward-kolety-wakool/>
<https://www.csu.edu.au/research/ilws/research/environmental-water>



The high and lows of river flows – July to December 2021

In the second half of 2021 there was above average or very much above average rainfall in the upper Murray River catchment (Figure 1). This resulted in several flow events in the Murray River system, with periods of unregulated flow between Hume Dam and the South Australian border.

In the Edward/Kolety-Wakool system a sequence of flow events occurred between August and December 2021. These events were observed in all of the tributaries, including Wakool River, Yallakool Creek, and the Colligen-Niemur system. Several flow events exceeded 2700 ML/day downstream of Stevens Weir (Figure 2), resulting in a sequence of inundation events in Werai Forest.

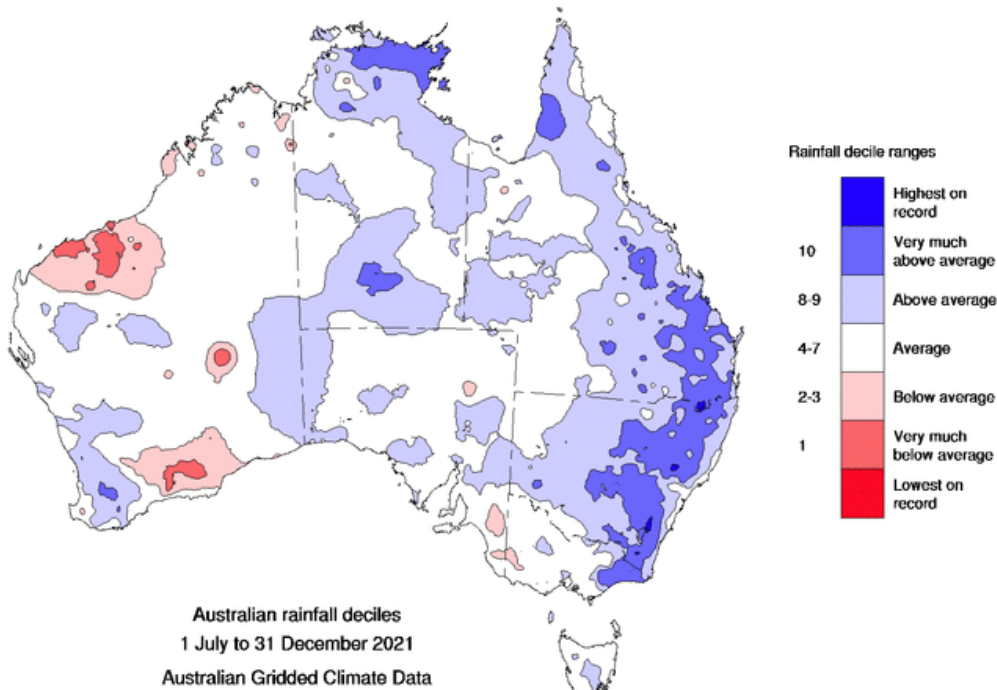


Figure 1: Six month rainfall deciles 1/7/2021-31/12/2021 (Source Bureau of Meteorology)

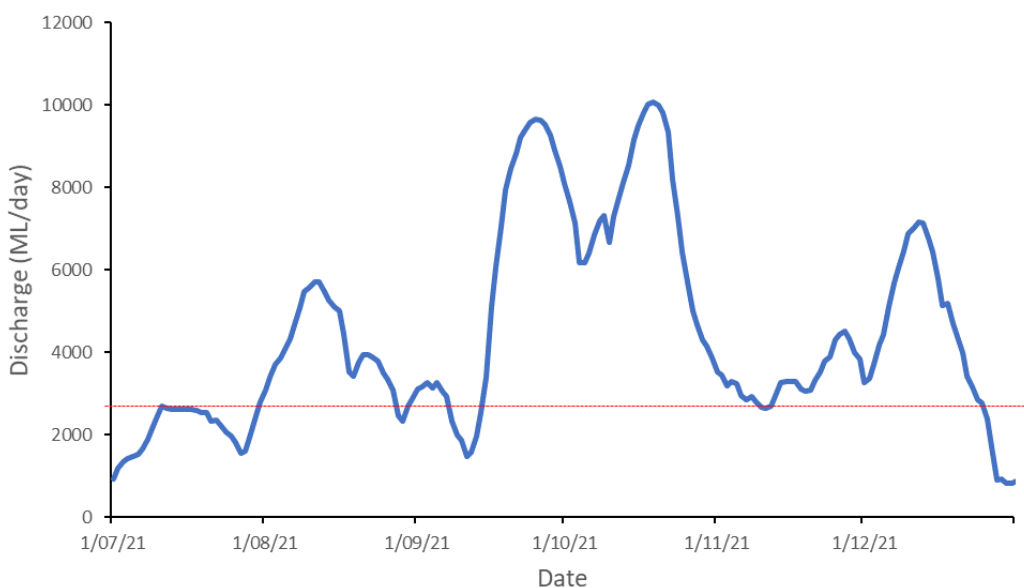


Figure 2: Hydrograph from 1/7/2021 to 31 Dec 2021 at the gauge downstream of Stevens Weir on the Edward/Kolety River (Gauge 409023). Red line at 2700 ML/day indicates the discharge at which water flows into Werai Forest.

The beauty of Werai Forest in flood

After watching the gauge at Stevens Weir on the WaterNSW website and seeing that Werai Forest had been inundated several times since July, the CSU monitoring team were curious to see what the forest looked like after flooding. So in mid-October we took a trip to Werai Forest to monitor water quality and view the forest. The front gate to the forest was locked (access restricted due to flooding), so we sought permission to walk or ride our push bikes through the forest to access monitoring sites (Figures 3 to 5). What a delight it was to see plants emerging and responding to the flooding!



Figure 3: Left: Shasha Liu and Nicole McCasker enjoying lunch on the bank of Colligen Creek. Right: Many of the tracks in the forest were flooded, but it was well worth the effort to see ground plants responding to the inundation (Photos: R Watts).



Figure 4: Plants responding following flooding of Werai Forest (Photos: J Trethewie).



Figure 5: Werai Forest (Photo: CSU).

Update on inundation modelling of Werai Forest

In newsletter 9 (September 2021) we introduced a new integrated project that will examine the relationship between river flows, inundation of the forest, and forest ecosystem responses to inundation. The first part of the project is being undertaken by 2Rog Consultants to understand the relationship between river flows and inundation of Werai Forest. To undertake this project, we are using a range of high-quality data including river flow (hydrological) data, rainfall data, and Sentinel-2 satellite imagery.

We examined the hydrology at the gauge downstream Stevens Weir from 2016 to present, and the available Sentinel-2 imagery over that period, and then selected a number of key flow events that we could evaluate. We were able to acquire 31 quality Sentinel 2 images linked to key flow events and have analysed them to determine where the water is on each of the images. This enables us to link the river flow to the wetland inundation extent. To demonstrate, below are two images from a flow event that occurred in late 2019. The flow took place from 13 September to 23 October 2019, with an estimated volume flowing into the wetlands of about 23,000 ML. The two Sentinel 2 images (Figure 6) show the water starting to move in to Werai Forest on 13/9/19 and filling low lying areas on 28/10/19.

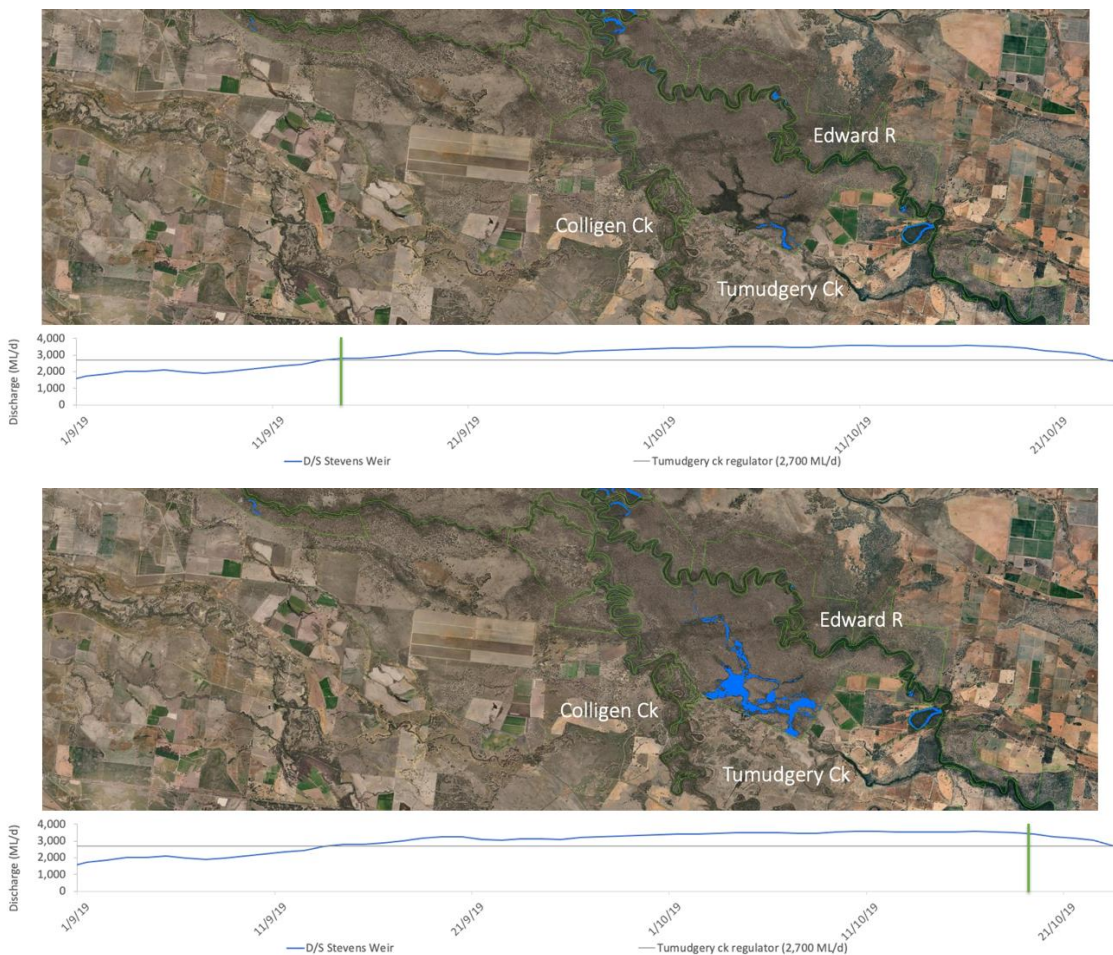


Figure 6: Sentinel images showing water inundating Werai Forest. Top - 13/9/19 water starting to move into the forest. Bottom- 28/10/19 water filling low lying areas in Werai Forest. Underneath each image is a hydrograph of the flow event, with the green line showing the date the Sentinel image was collected during the flow event.

We are tracking the current inundation events in Werai Forest in 2021, and will include those results in our study. Our next steps are to look further into the relationship between flow volumes and inundation extent. We will then link our inundation knowledge to other information on the forest topography and ecological datasets. We hope to then work with Traditional Owners to link the inundation knowledge to cultural knowledge.

Monitoring water quality to evaluate the outcomes of environmental water delivered from irrigation escapes

The wet conditions in the Murray valley during the spring and early summer of 2021 resulted in higher river flows for the first time in several years. Floodplains and low-lying wetlands were inundated, introducing carbon-rich water that is critically important to support river food webs. However, as we head into summer and water temperatures increase there is a potential risk for this carbon-rich water to become hypoxic (low oxygen concentration), which would be detrimental for fish and other aquatic animals. Over this time water managers were watching the water quality closely and were considering what actions they could take to mitigate hypoxic conditions developing.

On 15th September the Commonwealth Environmental Water Office (CEWO) commenced the early delivery of environmental water via Murray Irrigation Limited (MIL) escapes to create refuges of higher dissolved oxygen concentration (DO) to support native fish, crayfish, and other aquatic animals. The CEWO decided to take this early precautionary management action, because there was a risk that DO concentrations may decrease in the water flowing into the Edward/Kolety-Wakool system from Barmah-Millewa Forest and other low-lying areas of forest and farmlands, as water temperature increases during summer.

In late November 2021 (Figure 7), the mean water temperature was higher than 20 °C at Toonalook gauge on the Edward/Kolety River, and by early December 2021 the mean concentration of DO was reducing rapidly and was below 4 mg/L, which is a critical point of concern for fish populations.

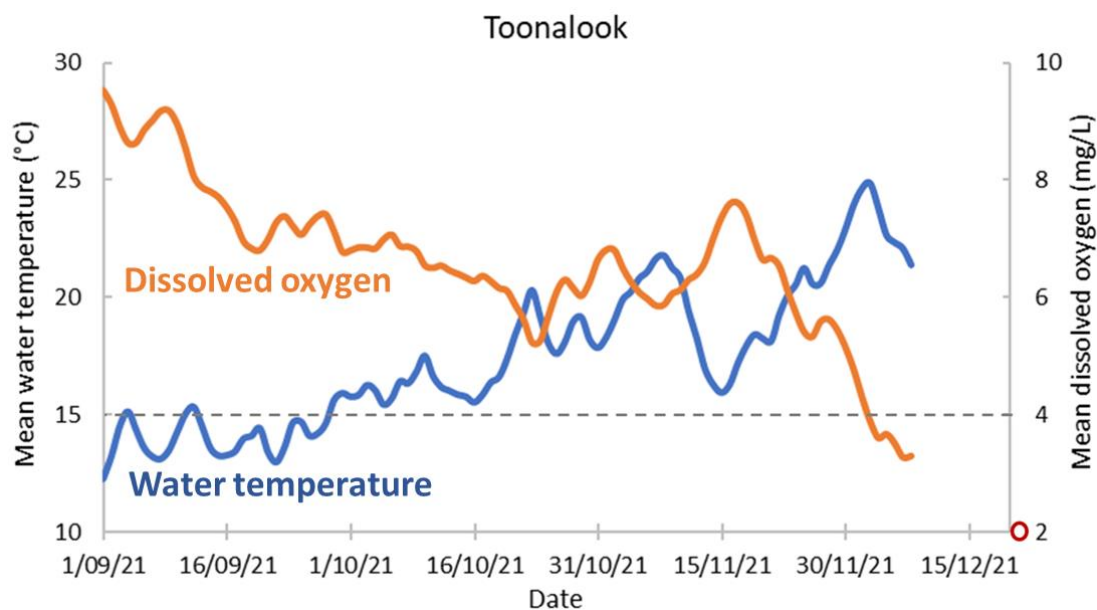


Figure 7. Mean water temperature (°C) and mean dissolved oxygen (DO, mg/L) at Toonalook gauge (409047) on the Edward/Kolety River. Red open circle indicates the DO concentration of lethal threshold (2 mg/L) to fish populations and grey dashed line indicates the DO concentration of sublethal threshold (4 mg/L) to fish populations. Data sourced from WaterNSW.

Due to the decreasing DO levels, the CEWO re-commenced the delivery of environmental water at Edward Escape, Wakool Escape and Niemur Escape from the beginning of December 2021 to create refuges of better water quality. The science team from Charles Sturt University monitored water quality upstream and downstream of these MIL escapes each fortnight. We also monitored the DO in the Mulwala canal and in the Northern Branch Canal near the Niemur escape, and the DO was consistently higher in these canals than in the adjacent rivers. In figure 8 the turbid water that is high in DO being released from Northern Branch Canal can be seen to be mixing with the dark brown organic rich water in the Niemur River.

Over the summer of 2021-22 the science team from Charles Sturt University will continue to monitor the water quality throughout the Edward/Kolety river system and will assess the outcome of the delivery of environmental water from the MIL escapes. For more information read the [media release](#) about the early delivery of CEW from irrigation escapes to create refuge.



Figure 8. Environmental water from the Northern Branch Canal delivered via the Niemur Escape (milky-coloured water on left) mixing with the darker water in the Niemur River (Photos: James Dyer, Shasha Liu)

Thank you to ILWS Business Team

The Edward/Kolety-Wakool Monitoring, Evaluation and Research Program (Flow-MER) is a collaboration between universities, state government agencies, consultants and local community organisations. For the past 10 years the Flow-MER program and its predecessor programs (Long-Term Intervention Monitoring project, and the Short-term Intervention Monitoring projects) have been supported by the Business Team in the Institute for Land Water and Society (ILWS) at Charles Sturt University.

At the end of 2021 the ILWS will be disestablished, and the Flow-MER research program will transition to a new Agricultural, Water and Environment Institute at CSU. An event was held in November 2021 to celebrate the Institutes 15 years and say thank you to Institute Director A/Prof Andrew Hall, and Business Team Kris Gibbs, Margrit Beemster, Simone Engdahl, Deb Noy, Kylee Imlach and Sarah Talbot (Figure 9). The Edward/Kolety-Wakool Flow-MER team would like to acknowledge the amazing work done by the ILWS Business team and say a huge thank you to all of them for their hard work and friendship over the years. We wish them all the best for the future.



Figure 9: Farewell to the Institute for Land Water and Society Business Team. Left to right Dr Sarah Talbot, Margrit Beemster, Kris Gibbs, Andrew Hall, Deb Noy, Kylee Imlach, at an event in November 2021 to celebrate the Institutes 15 years.

Dr Julia Howitt Legacy Scholarship Fund

Many readers of this newsletter will remember Dr Julia Howitt (figure 10) as an enthusiastic environmental scientist who was leader of the water quality theme of the Edward/Kolety-Wakool environmental flows team for 10 years. Julia's extensive knowledge of chemistry complemented that of other members of the team who are ecologists, hydrologists, geomorphologists and social scientists. As a member of the of the Edward/Kolety-Wakool environmental flows team Julia co-authored numerous reports on monitoring of environmental flows in the Edward/Kolety-Wakool system, and her work has contributed to adaptive water management.

Many people from the Deniliquin area may also remember Julia as a high achieving student who, after graduating from Deniliquin High School, went on to follow her passion for science at university. As part of her PhD Julia undertook research on blackwater modelling, and her work has made a key contribution to our understanding of the chemistry of hypoxic blackwater. Julia's academic excellence translated well to her passion as a highly respected Senior Lecturer in Chemistry. Julia began lecturing at the CSU Wagga Wagga Campus in 2008 through to her passing in 2020 at age 43, after battling breast cancer.

Julia was an extremely dedicated scientist, knowledgeable, meticulous, and passionate about her work. Her research covered diverse areas including solar energy, land and water conservation, aquatic chemistry, environmental contamination, monitoring environmental flows and more. In addition to being an outstanding scientist Julia was a very special person - friendly, loyal, caring, thoughtful and always positive in her outlook. She was such a joy to be around and is deeply missed by everyone that had the pleasure of knowing her.

Charles Sturt University has established a scholarship fund in honour of Dr Julia Howitt. The goal is to create a perpetual \$3,000 scholarship that will support students who choose to study a science degree at Charles Sturt University. If you would like to contribute to this fund, through the generosity of your donation CSU will be able to improve the outcomes of our students and communities - both in regional Australia and around the world.

<https://www.csu.edu.au/office/advancement/giving-to-csu/active-funds/dr-julia-howitt-scholarship-fund>



Figure 10: Left: Dr Julia Howitt Right: Members of the Edward/Kolety-Wakool environmental flows team with Julia in 2019.

More information

To join the newsletter mailing list please subscribe [here](#) or contact Professor Robyn Watts, Institute for Land, Water and Society, Charles Sturt University, Albury NSW. rwatts@csu.edu.au

We respectfully acknowledge the Wamba Wamba (or Wemba Wemba), and Perrepa Perrepa (or Barapa Barapa) peoples, traditional owners of the land on which the Edward/Kolety-Wakool program is focussed. We recognise their unique ability to care for Country and their deep spiritual connection to it. We honour Elders past, present and emerging whose knowledge and wisdom has ensured the continuation of culture and traditional practices. The Edward/Kolety-Wakool team would also like to acknowledge the local landholders with whom we work and thank them for their contribution to the monitoring and research.

Watts R.J., Liu X., Trethewie J., Frazier P., Winkle S. (2021) Edward/Kolety-Wakool System Environmental Flows Newsletter, Issue 10. Charles Sturt University.