

Edward/Kolety-Wakool system Environmental Flows Newsletter

Issue Number 3 | March 2020

Edward/Kolety-Wakool Monitoring, Evaluation and Research Program



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Welcome to the issue 3 of the Edward/Kolety-Wakool Environmental Flows Newsletter - a quarterly newsletter that will provide updates 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 MER Program 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>



Update on monitoring

Hydrology

We use data from flow gauges and information from water accounts to determine the contribution of environmental water to changes in flow and water level in the river system. In January 2020 flows were considerably lower throughout the system due to low water demand and there was also heatwave conditions in the region. Water quality in Yallakool Creek, the upper Wakool River and the Niemur River was observed to deteriorate (see below). At the end of January and in early February 2020 environmental water was delivered to maintain flow at 250ML/day in Yallakool Creek and 40ML/day in the upper Wakool River until the end of the heatwave conditions.

Water quality and ecosystem metabolism

We monitor water quality once per month at 18 sites throughout the river system to inform us about water quality under different flows. We monitor algae (measured as the concentration of chlorophyll in water), nutrients, and the concentration of dissolved organic carbon in the water and compare the water quality during environmental watering actions with results from operational flows. Through continuous monitoring of dissolved oxygen at 10 sites we calculate daily production of oxygen (photosynthesis) by plants and algae, and consumption of oxygen (respiration) by bacteria and other organisms.

Towards the end of January 2020 very hot weather and lower operational flows in the system were causing water temperatures to rise (many sites above 25° C) and dissolved oxygen levels were decreasing. The colour of water in some creeks was visibly darker than usual and there was a lot more algal growth than usual. Water managers and the community were concerned that this could potentially result in fish deaths. Additional contingency water quality monitoring was undertaken at ten sites once per week over four weeks between the end of January and late February to help inform the environmental watering action.



Poor water quality was observed at Bolton Rd Bridge (left) and Niemur-Barham Rd (right) during the contingency water quality monitoring at the end of January and late February 2020. (Photo: Xiaoying Liu)

Riverbank and aquatic vegetation

We monitor the cover and species richness of riverbank and aquatic vegetation, which provides food and habitat for aquatic animals and can help to stabilise riverbanks and reduce erosion. In January 2020 low flows and heatwave conditions caused the riverbanks to be very dry and there was very low cover of riverbank vegetation present. There was filamentous algae present in the water at all monitoring sites and ribbonweed (*Vallisneria australis*) was abundant at some sites in the upper and mid Wakool River.



Filamentous algae observed in the Wakool River in January and February 2020 (Photo Sascha Healy)

Fish

We monitor fish spawning, fish recruitment and adult fish populations in the Edward/Kooley-Wakool system.

- Fish spawning is monitored at twenty sites using light traps and drift nets that are deployed once a fortnight during spring and summer.
- Recruitment of Murray cod, silver perch and golden perch is monitored in February each year to assess the survival of larvae hatched that year (young-of-year) or in the previous year (1+ individuals).
- We monitor fish populations through an annual survey in the mid-Wakool River. We will monitor fish at 20 sites throughout the system in year 3 (2022) of the project. These sites have been monitored 7 times since 2009 and the project will contribute to this long-term dataset.

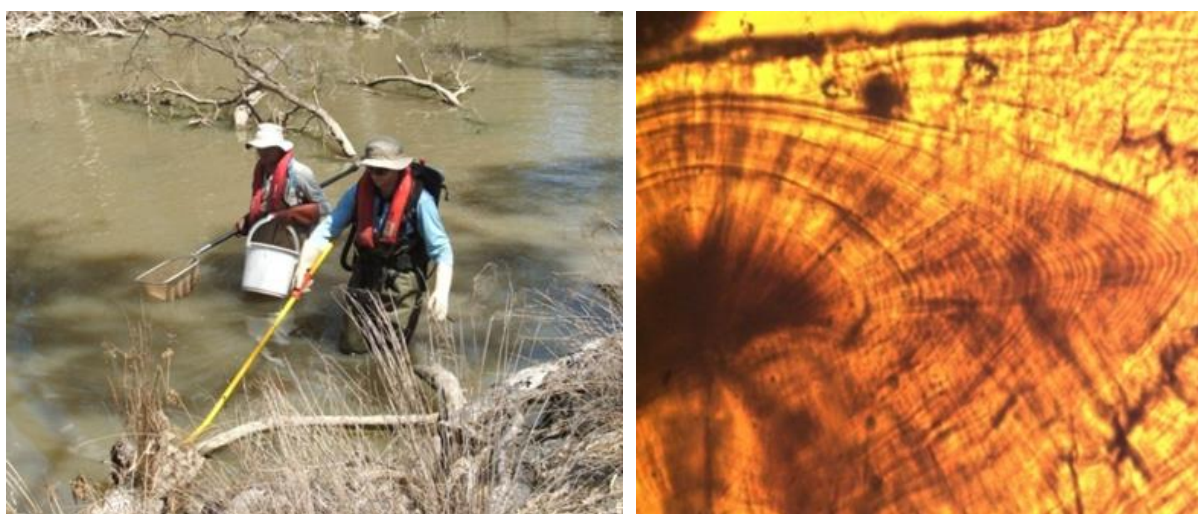
Focus on fish recruitment monitoring

The early stage of the life of a fish is when the highest mortality occurs. Recruitment (survival of eggs/larvae to young-of-year life-history stage) is a fundamental process required to sustain fish populations.

Monitoring of fish recruitment is undertaken between February and March each year to target fish hatched that year (young-of-year, YOY) or the previous year (1+ individuals). In 2019-20 Murray cod 1+ individuals were detected in highest numbers since the LTIM monitoring program commenced in 2015. Along with the presence of 1+ silver perch in the system, this suggests that the Edward Wakool fish assemblage is showing positive signs of recovery post the 2016-17 hypoxic blackwater event that resulted in large scale fish kills in the southern Murray-Darling Basin.



Left; Juvenile river blackfish (*Gadopsis marmoratus*) Right; Juvenile Murray cod (*Maccullochella peelii*) from Yallakool Creek. (Photo: John Trethewie, Charles Sturt University)



Left; Backpack electrofishing for fish recruits. Right; Otolith (ear bone) of juvenile Murray cod showing growth rings

Focus on riverbank condition research

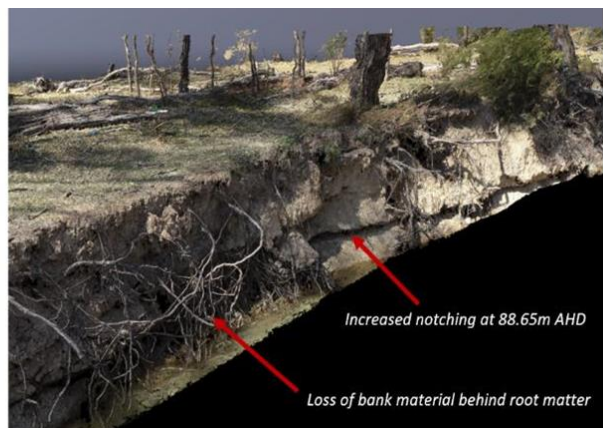
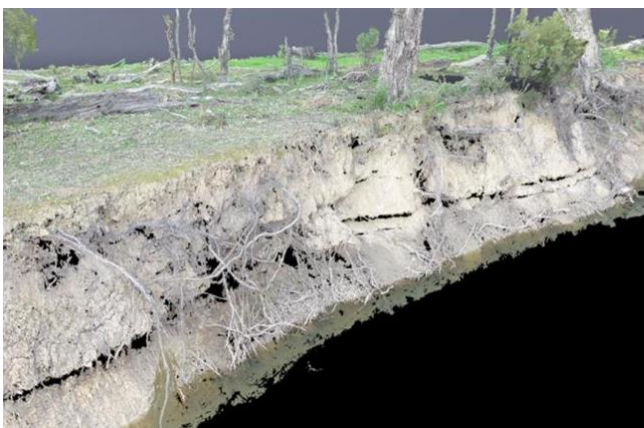
Riverbanks influence the velocity of flow, depth of water and provide sediment and habitat for flora and fauna. River bank condition is influenced by the flow regime, including unregulated flows and the regulated delivery of operational and environmental water. Quantifying the relationship between flows and bank condition can help water managers deliver flows that enhance ecological objectives (e.g. river bank vegetation establishment) and minimise any potential unintended consequences.

Streamology is undertaking a research project that is exploring the effectiveness of drone-based methods to detect changes in the river banks. Imagery collected by the drone will be compared between different flow events (including unregulated flows, operational flows and environmental flows) and will be used to measure the change of riverbank physical condition over time. Drone technology and a whole lot of computing power provide the opportunity to detect changes in riverbanks that was not previously possible using manual survey techniques.

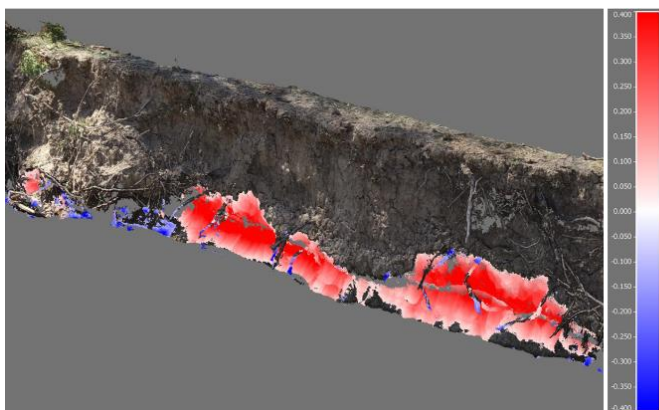
The research is being undertaken in three reaches:

- the upper Edward/Kolety River in the Murray Valley National Park – Millewa
- the Edward/Kolety River downstream of Stevens Weir in Werai Forest
- Colligen Creek

Below are two images (before and after a flow event) showing the increase in bank notching in response to flows downstream of Stevens Weir. Monitoring bank condition over the next few months will follow the changes in riverbank form to help predict how banks respond to flow. This bird’s eye view is excellent for describing the larger-scale macro changes occurring in the waterway, allowing managers to understand which banks are likely to be most affected from future flows. A more detailed 3-dimensional view provides great insights into the micro-scale activity occurring on the steep banks, identifying notches and increasing our understanding of the influence of prolonged transfer flows on physical form.



Increasing notch severity between August (left) and October 2019 (right) in the Edward/Kolety River downstream of Stevens Weir



Riverbank changes measured by drone modelling



The drone on a flight (Photo: Streamology)

Focus on Edward/Kolety River fish spawning research

Fish larvae have been monitored in Yallakool Creek and the Wakool River for over 5 years as part of the LTIM program and the data have been used to inform water management and promote and support native fish breeding. Between 2014 and 2019 there was limited evidence of silver perch spawning and no evidence of golden perch spawning in the Wakool River and Yallakool Creek. Local fishers have observed fish, including golden and silver perch, congregating downstream of Stevens Weir during late spring, suggesting the Edward/Kolety River may be a spawning area for this species. A collaborative research project on fish spawning in the Edward/Kolety River involving Charles Sturt University and the Edward-Wakool Angling Association (EWAA) was initiated as a result of these observations.

Each week from October 2019 through to the end of February 2020 members of EWAA set drift nets at three locations in late afternoon and then retrieved the nets and collected the samples the following morning. The monitoring program commenced in October and has been conducted by Anthony Jones, Warren Parsons, Alec Buckley and Zak McCulloch. They detected the first Murray cod larvae in the samples before Christmas. The samples are being processed through microscopy at Charles Sturt University to identify the very small eggs or fish larvae in the samples.

Local EWAA member Dan Hutton, who coordinated the EWAA field work, said that “employing locals with appropriate skills and knowledge to undertake the field work ensures multiple successful outcomes. The collaboration has provided local employment and training, program cost savings and ensures monitoring results and findings are quickly communicated to the local community. This research provides an important platform for valuable local input into management of the local waterways”.



Fish spawning research in the Edward/Kolety River near Werai Forest. Left: Anthony Jones and Dan Hutton from the Edward-Wakool Angling Association. Right: Anthony Jones (EWAA) and John Trethewie (CSU) setting larval fish nets.

More information

To join the newsletter mailing list please contact Professor Robyn Watts, Institute for Land, Water and Society, Charles Sturt University, Albury NSW. rwatts@csu.edu.au or ilws@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., Healy S., Trethewie J., Vietz G., Sutton N. and Hutton D. (2020) Edward/Kolety-Wakool System Environmental Flows Newsletter, Issue 3. Charles Sturt University.