



Lower Murray Newsletter

Issue 4 - July 2020

Welcome to Issue 4 of the Lower Murray newsletter where we will provide updates on our work monitoring the outcomes of Commonwealth environmental water delivery in the Lower Murray system.

In this issue

- Project updates - including insight on what the Lower Murray research team has been up to in the lab.
- Climate - recent conditions and outlook, and what these mean for proposed work in spring.
- Electrofishing - what is it, and how is it helping us learn about Lower Murray fish communities?
- Engagement & Communication updates - including how we managed to perform our work during COVID-19 tight restrictions
- What's next?



River Murray near Swan Reach (Photo credit: SARDI)

Project Updates

Despite COVID-19 restrictions, the Lower Murray team managed to complete all planned fieldwork. There was an enormous effort by all to accommodate the “new normal”. Our team developed a COVID-19 risk management plan that included risk assessments for each sampling trip and changes to the way we operate for the safety of our team members and regional communities of the Lower Murray. **Great effort everyone!**



Photo Above: SARDI staff relaxing on the Lower Murray River bank. (Photo credit: SARDI)

There was a brief moment to relax before starting sample processing and data crunching for analyses. Here are the updates for individual indicator investigations.

Stream Metabolism – the data collected from our water quality loggers, during the last season (September-2019 to February-2020), have been prepared for analyses. Soon we will find out how the delivery of water for the environment in 2019/20 has influenced levels of primary production and ecosystem respiration in the main channel of the Lower Murray River.

Microinvertebrates – all microinvertebrates samples collected by our field team, during the last season (October-2019 to January-2020), have been sorted and most species identified. Our microinvertebrate task leader Deborah Furst was well organised and processed samples as soon as they arrived from the field, so she could later on concentrate on having her first baby son (Congratulations Deb!). While Deborah is on maternity leave, Russel Shiel will continue working on identifying the microinvertebrates present inside stomachs of Murray cod larvae.

Vegetation – Data collected during the vegetation monitoring trip (December 2019) on species composition, abundance and biomass have been entered and analyses will commence soon.

Photo: Littoral zone vegetation monitoring (Photo credit: SARDI)



Murray cod sampling – Between November 2019 and May 2020, our team went out four times to sample newly hatched (larvae) and small (less than 150 mm) juvenile Murray cod. We used light traps during the first trip and boat electrofishing (more details about electrofishing below) for the other trips. In total, we caught 28 larvae and over 100 juvenile Murray cod downstream of Locks 3 and 4. We brought back a subsample for further laboratory processing, including the removal of the ear stone (otoliths) for age determination and assessment of growth rate, and the removal of guts for diet assessment.

Our team has finished preparing otoliths on microscope slides and has started counting daily rings. Similar to trees, fish otoliths lay down growth rings (daily and annual), which allow for age determination and assigning date of birth (in case of daily rings for small/young fish). We will soon be able to say when the Murray cod we kept were born and how well they grew in relation to flow conditions in the Lower Murray River.



SARDI staff ageing Murray cod larvae collected in Nov-Dec 2019 in the Lower Murray River. (Photo credit: SARDI)



Photo: Otolith from a 12 day old Murray cod larvae. Black marks represent daily rings. (Photo credit: SARDI)

General fish sampling – Fish sampling in the Lower Murray River extended beyond Murray cod. Our team sampled the whole fish assemblage, using basin-wide standard (Category 1) methods involving boat electrofishing and small-meshed fyke nets, between March-April 2020, to look at changes in the fish assemblage through time. This component aims to provide relevant information to the Basin-scale evaluation.

A subset of Golden perch collected through this general sampling, and targeted electrofishing in May 2020, was retained for age determination through otolith analysis to assess recruitment of Golden perch. Otoliths from these fish have been prepared and ageing is underway.

Additionally, Bony herring samples (otoliths and fin clips) were collected on 30 June 2020 for a Basin-scale research project investigating movement using a combined genetics and otolith microchemistry approach.

From primary productivity to Murray cod recruitment – The current research project aims to investigate the influence of the source, pathways and quality of energy transfer through the Lower Murray food web on the recruitment of Murray cod, and how this process is affected by flow. To do this, basal food items (algae, aquatic plants, tree leaves, etc.), as well as Murray cod and shrimp muscle tissue, were collected, freeze-dried and ground to a fine powder, for future isotope and fatty acid analyses. These are complex chemical analyses that researchers use to study aquatic food webs. Furthermore, the diet of juvenile Murray cod will be directly investigated by identifying food items in the gut, under the microscope and using DNA. These analyses will commence soon. The results of this study will allow us to assess diet in relation to what is available in the ambient environment, and additional analyses will describe how the composition and nutritional value of these prey communities vary with flow.

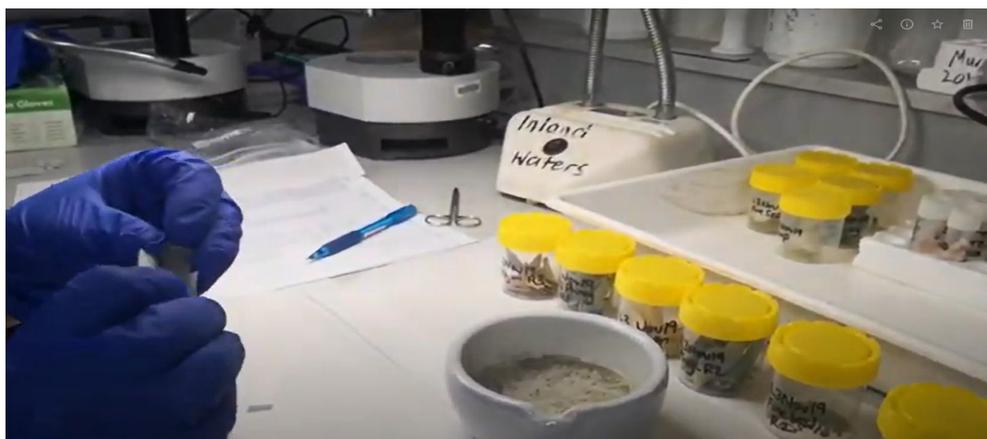
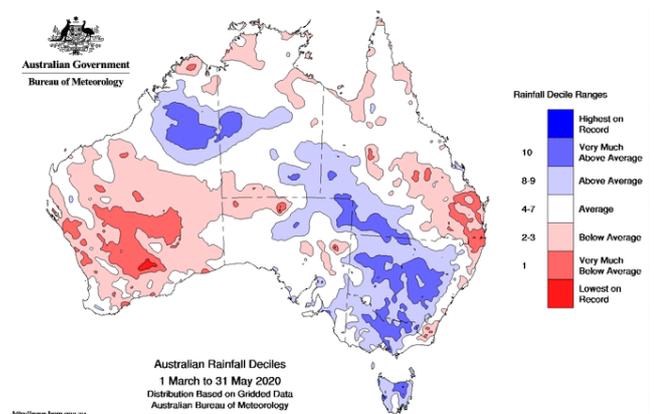
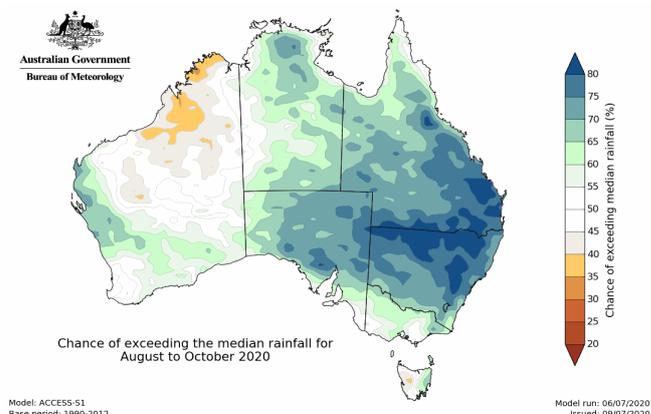


Photo: Freeze-dried samples been grinded in laboratory. (Photo credit: SARDI)

Recent rainfall and spring outlook - Rainfall was above average or well above average in the Northern and Southern Basin, for the period of March to May 2020. The rainfall outlook for the Murray Darling Basin (MDB) is promising. According to the Bureau of Meteorology (BoM) cooling in the Tropical Pacific Ocean may indicate early stage of La Niña (50% chance). La Niña typically favours above-average rainfall for large parts of Australia generally occurring in early spring. There is a good chance we will get above average rainfall for period of late July-August to October 2020.



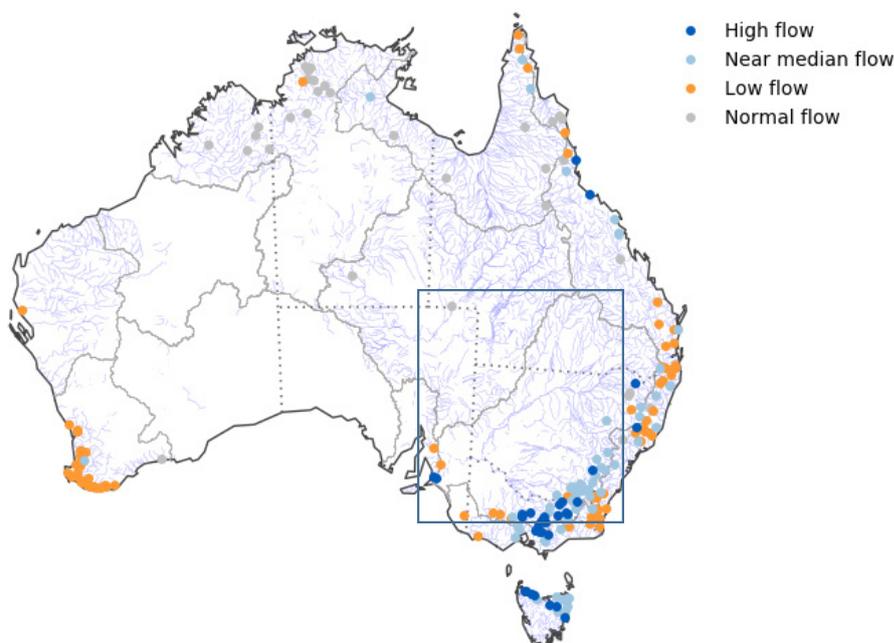
Australian map showing rainfall for the period of March to May 2020. Image credit: BoM.



Australian map predicting chance of above average rainfall. Image credit: BoM.

The MDB water storages are still filling up with the precipitations received in the Northern and Southern Basin. The MDB streamflow forecast for the period of July to September shows near median to high flows in more than half of locations within the MDB. We are keeping our eyes up on the sky and watching the rainfalls and river flows outlook with interest. If the flow conditions are right (in excess of 20,000 ML/day) then the monitoring of Golden perch spawning activities might be on the cards for our fish team.

Streamflow forecast for July 2020 to September 2020



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Map of Australia showing streamflow forecast for July-September 2020. Blue line indicate MDB area. Image credit: BoM.

Electrofishing: What is it and how does it work?

Throughout the world, electrofishing is commonly used by fisheries researchers to capture freshwater fish. It involves generating a field of electricity in the water, which temporarily stuns fish in the close proximity (~ 5m) so that they can be scooped up with a dip net. The technique offers many advantages including:

1. it captures fish from a wide range of sizes (20 millimetres to over 1 metre);
2. it is an active technique and not reliant on fish 'moving' like many passive netting methods;
3. it allows rapid surveys; and
4. stunning is temporary and fish can be returned to the river unharmed.

Scientists often use boat electrofishing to collect data and/or fish samples with the aim to understand the status of fish populations and their response to management. Electrofishing can help in answering questions such as, what is the distribution of different species? How many are there? Are they reproducing and what are the demographics of the populations? And importantly, how do these characteristics change through time?



Photo: Backpack electrofishing (Photo credit: SARDI)

Types of electrofishing

There are three types of electrofishing units; bank-mounted, boat-mounted and carried by an operator as a backpack. Bank-mounted and backpack units are typically used to capture fish in small wadeable streams, while boat electrofishing is used for sampling lakes and large rivers. In the case of boat electrofishing, the 'electrofishing unit' consists of a vessel-mounted generator, a control box, a cathode (vessel hull) and anodes (booms at front of vessel).

In general, electrofishing is most effective in fresh waters. In marine waters, electrofishing is less effective as the conductivity of water is higher than that of fish, directing the current around rather than through the fish. Nonetheless, new electrofishing units are currently under development that are effective at capturing fish in brackish estuarine environments.



Photo: Boat electrofishing (Photo credit: SARDI)

Is it safe for fish?

When performed correctly, electrofishing is safe for fish and does not cause long-term harm. Fish are temporarily stunned (seconds–a few minutes), dip netted and placed into live wells. Individuals are then processed (e.g. measured for length and weight and sometimes tagged) before being returned to the water once recovered. Tagging studies have indicated high survival rates for Golden perch and Murray cod following electrofishing and individuals display normal behaviours.



Photo: Murray cod in a live well. (Photo credit: SARDI)

Is it safe for humans?

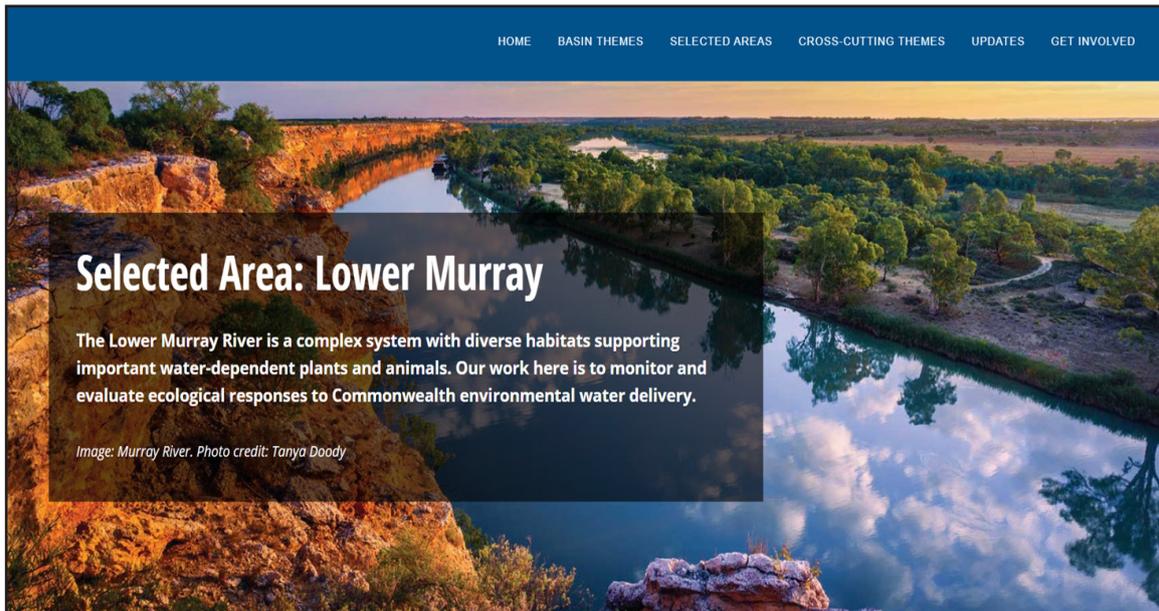
Electrofishing may conjure thoughts of danger, but it is perfectly safe when appropriate protocols are followed. These include the use of dip nets made from non-conductive materials, linesmans gloves (1000 volts), lifejackets and rubber soled shoes. Additionally, a system of pedals ensures that the electrical circuit is only completed and a field created, when all staff are ready and operating the pedals of the boat electrofishing unit.

Electrofishing in the Lower Murray River

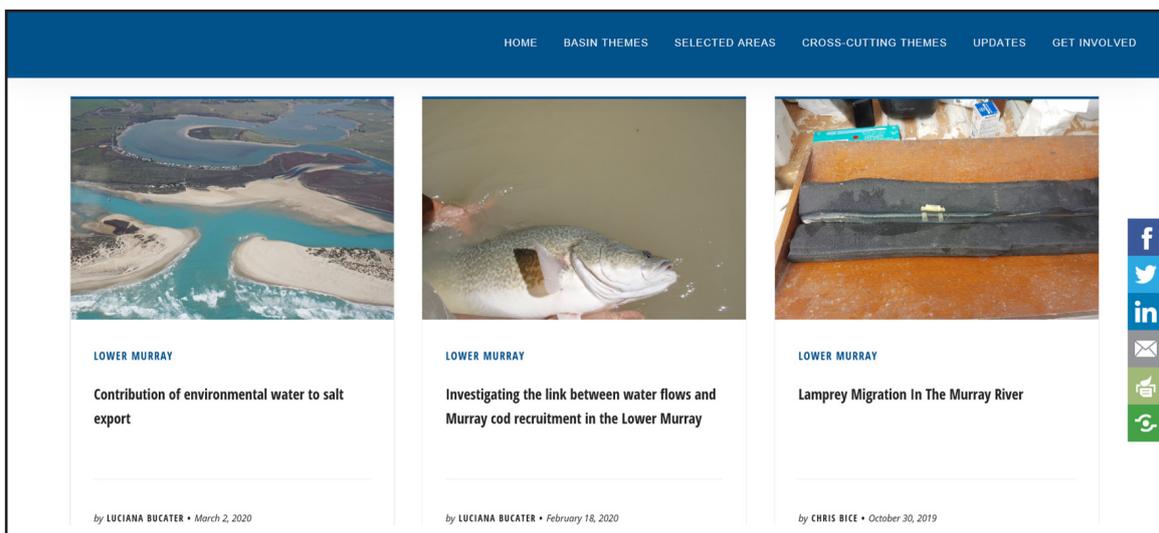
Electrofishing is a key method used for sampling fish as part of various long-term monitoring programs in the Lower Murray River including the CEWO Monitoring, Evaluation and Research (MER) Project. For the MER Project, electrofishing is a critical tool in assessing the response of fish to the delivery of water for the environment, in the Lower Murray River. We used electrofishing to support investigations of changes in fish communities through time, and specifically the abundance, growth and recruitment of Murray cod and Golden perch, in association with flow. One of the most exciting findings from this work so far is the increase in number of juvenile Murray cod since 2015 (for details [visit https://flow-mer.org.au/investigating-the-link-between-water-flows-and-murray-cod-spawning-in-the-lower-murray/](https://flow-mer.org.au/investigating-the-link-between-water-flows-and-murray-cod-spawning-in-the-lower-murray/)). We are currently investigating the link between river flow and Murray cod recruitment in the Lower Murray River.

Engagement & Communication Updates

Since the start of June and easing of COVID-19 restrictions, we have been busy preparing communication materials and engaging with First Nations and recreational fishing groups. A major accomplishment is the launch of the Flow-MER website with a dedicated Lower Murray Selected Area page. Our site has been receiving a lot of traffic (139 page views and 117 page visits as at 30 June 2020) and we hope you can also check it out (<https://flow-mer.org.au/selected-area-lower-murray/>). There you will be able to find information about the Lower Murray River, the monitoring activities we undertake in the region, our approach, what we have learned so far and updates in the form of highlight stories. These stories shine the spotlight on some interesting results our team has found, such as how Commonwealth environmental water has contributed to salt export out of the Basin and migration of lamprey. Keep an eye out for these interesting updates.

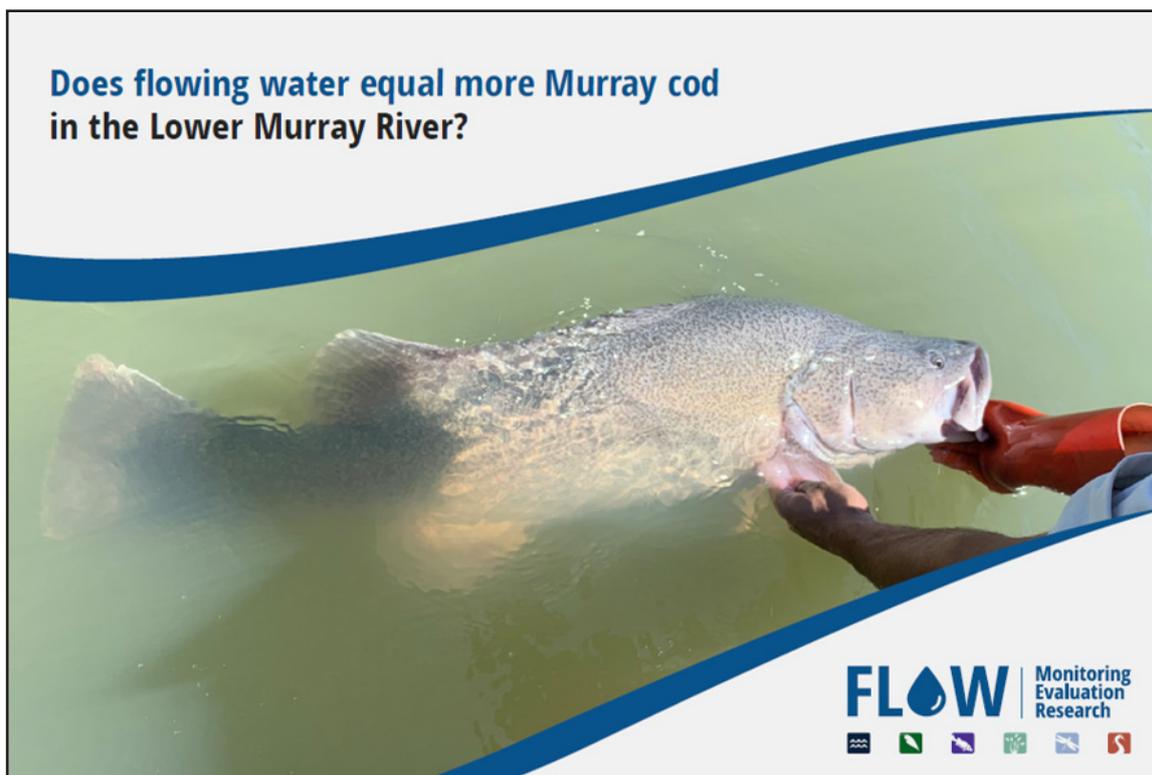


Home of the Lower Murray webpage.

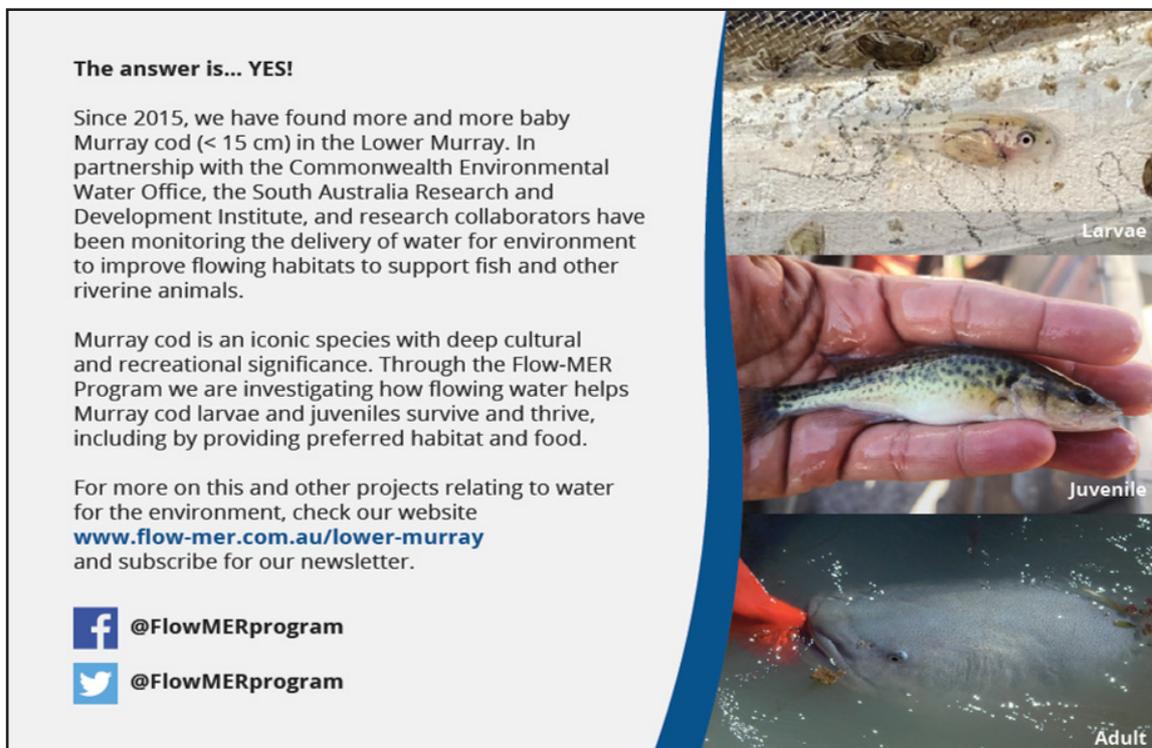


Highlight stories published on the Lower Murray Selected Area website.

Our team has spent some time producing other communication products, such as postcards for distribution at meetings with interested groups. We are now creating an animation video, which will help explain how the Lower Murray River changed after European settlement, and how water for the environment can contribute to restoring some pre-existing river conditions and benefit fish and the whole ecosystem.



Front of post card produced to hand out to interested groups. Image credit: SARDI.



Back of post card produced to hand out to interested groups. Image credit: SARDI.

Our team undertook an online communication workshop with Siwan Lovett from Australian River Restoration Centre (ARRC). She provided valuable information on how to be effective communicators, making our stories as personal, meaningful, succinct and memorable as possible. We enjoyed the workshop very much and team members are already applying their learnings.

In the engagement arena, during tight restrictions, activities were limited to phone calls and online meetings. After June 1, we had two initial meetings with Kingsley Abdulla representative of First Peoples of the Murray and Mallee, and with the Lower Murray Lure Fishing Club, respectively. These meetings presented an opportunity to introduce the MER project and potential for engagement. We now plan to meet with representatives of three First Nations groups, including the above mentioned as well as the Mannum Aboriginal Community Association Inc. (MACAI) and Ngarrindjeri to identify how the individual groups would like to engage with the MER project.

In May 2020, the Lower Murray project leader, Qifeng Ye, attended another online workshop “Learning by doing” alongside CEWO managers to discuss and plan for water management activities.



What's next?

Generally, winter is a quiet time for us regarding fieldwork. We keep busy, however, entering and analysing data, and preparing to report on our findings. Once our scientists receive official and final water discharge data from the Murray-Darling Basin Authority, they will be busy running models, assessing the contributions of flow towards ecological outcomes of stream metabolism, hydraulic regime, matter transport and Coorong habitat. The contribution of water for the environment will also be evaluated, including for microinvertebrates and fish.

The next three months will also be the time in which we will gear up for the next field season, which starts in September 2020. Around October 2020, we are also planning to hold a community workshop in the Riverland, where we will summarise different outcomes achieved by the use of water for the environment in the Lower Murray River. Watch this space!



Australian Government

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