Flow-MER in the Warrego: What We Do

Figure 1: View of the Warrego River during fish surveys. Photo credit. Leo Cameron, DPI – Fisheries.

Traditional Paakantyi Language of the Kurnu-Baakandji nation used in this article. (L. A. Hercus - Paakantyi Dictionary)

The Flow-MER program monitors the water, plants and animals of the Warrego-Darling/Baaka Selected Area to understand the influence of water for the environment. The indicators that we focus on are hydrology (Figure 1), waterbirds, frogs, fish (their diversity and where they move), vegetation, water quality and food webs. As we have just wrapped up our reporting for the 2021-2022 water year, we wanted to share an overview of what our monitoring told us for this period.

Hydrology is the study of water in channels and wetlands, and it drives environmental and ecological processes. For the hydrology indicator we use WaterNSW real time data to download flow information for different gauges across the Selected Area (Figure 2).

The 2021-22 water year saw large volumes of water flow down the Darling/Baaka River, driven by lots of catchment rainfall. Some water for the environment accounted in the upstream catchments contributed to enhanced habitat condition and ecosystem productivity. In contrast, the start of the water year was drier in the Warrego but flows in December 2021 produced full system connection and some inundation on the Western Floodplain. The Warrego River was connected to the Darling/Baaka for 65% of the monitoring period. Flow in the Warrego also included some portions of water for the environment.

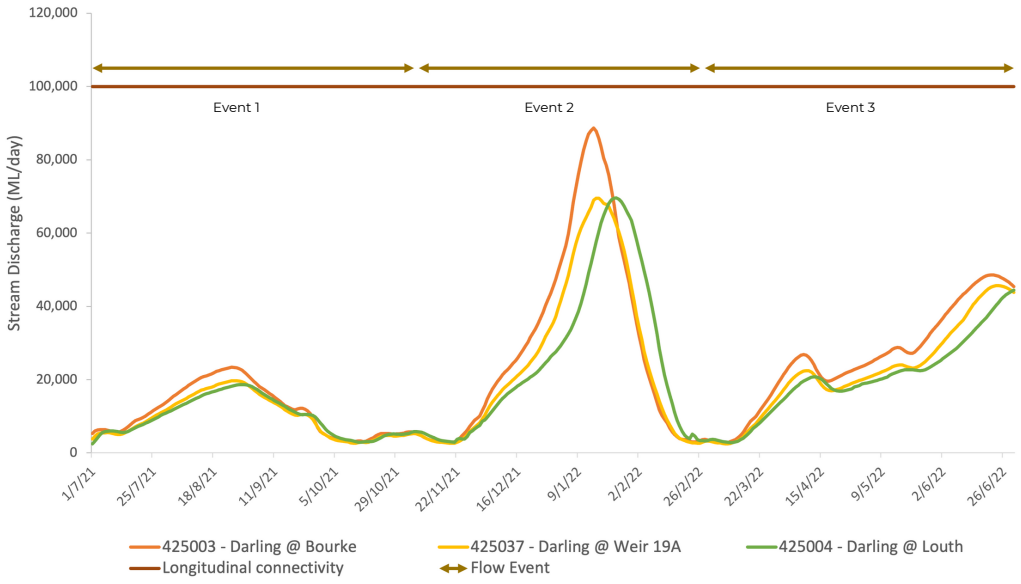

Figure 2: Darling/Baaka River flows at Bourke gauge. The Darling/Baaka was connected for 100% of the 2021-2022 water year with water for the environment (WFE) contributing to flow across three separate delivery events.

Figure 3: Unbaited bait trapping fish to sample fish diversity within the Warrego River. Photo credit. Leo Cameron, DPI – Fisheries.

The **Fish** indicator assesses how water for the environment relates to fish. How many fish are present, how big they are and how healthy. We determine this through monitoring fish in our reaches and comparing the results to what we'd expect to see in a healthy system (benchmarks). We also describe changes in fish community structure, abundance and overall health.

The Department of Primary Industries (DPI) Fisheries monitor fish diversity in the Warrego and Darling/Baaka Rivers by electrofishing, trapping and nets (Figure 3). Once captured, fish are identified, measured and recorded. Over the Flow-MER project we have also used data collected in the QLD portion of the Warrego River by the QLD Fisheries team, via funding from the Murray-Darling Basin Authority.

The extended flooding periods and high flows over the last several years has been beneficial for several species, while others have shown little response to the increased flows. While species such as bony herring (*Nematalosa erebi*) and golden perch (*Maquarie ambigua*) are breeding and recruiting regularly other species like the parntu (Murray cod – *Maccullochella peeli*), olive perchlet (*Ambassis agassizii*), and freshwater catfish (*Tandanus tandanus*) are not. Poor recruitment leads to low numbers; a significant problem for some of our native fish. To assist these threatened species, it is likely that other measures like stocking and habitat improvement as well as good provision of water will be required.

Frogs play an important role in riverine ecosystems, occupying terrestrial and aquatic habitats they are both the predators and prey in the food web. Within the Warrego Darling/Baaka Selected Area fifteen frog species are found in the riverine and floodplain habitats.

Monitoring of these species is typically undertaken twice a year, after dark, by two observers. We use headlamps to search for frogs along the edges of the wetlands and surrounding terrestrial habitat. Additionally, we also use audio surveys to collect data about which frog species are calling. All individuals sighted and recorded on audio are identified, with number of individuals of species seen and heard catalogued for our records.

Although we did not monitor frogs this past water year, we did in the 2020-21 water year. During 2020-21 we found nine frog species, six of which are common and three uncommon. With recent wet conditions we have found previously undetected species such as the salmon striped frog (*Limnodynastes salmini*) (Figure 4) and broad-palm rocket frog (*Litoria latopalmata*).

Figure 4: Salmon striped frog (*Lymnodynastes salmini*) recorded at Ross Billabong. Photo credit. UNE.

Figure 5: Common yabby (*Cherax destructor*) caught in a fish baiting net during fish surveys early 2022. Photo credit. Leo Cameron, DPI – Fisheries.

Water Quality and **Food Webs** describe the characteristics of the food chain within a community (who eats who) and we measure the production and transfer of energy within the ecosystem. The Flow-MER project has the objective of improving life cycle completion of key plants and animals and meeting the needs of the fish and waterbirds. Water quality is responsive to flow management and underpins many ecological processes that form the basis of the food web.

We look at water quality (nutrients, temperature, pH, light and salinity), metabolism and productivity (carbon and energy). To do this we use tools such as a Hydrolab Quanta multiprobe, measuring water temperature, electrical conductivity, dissolved oxygen, pH and turbidity. Keeping an eye on the chemical, physical and biological parameters of water tells us if the water quality is within safe ranges for the aquatic plants and biota that depend on it.

We use a few different methods to look at micro- and macro- invertebrates (tiny bugs and bigger bugs) depending on where they live. For instance, benthic microinvertebrates live in the underlying sediments and mud and are collected in core samples and then decanted through a fine sieve which has tiny holes to prevent the invertebrates from getting out. Microinvertebrates that live in the water column are collected using a drag net. Once collected, invertebrates are preserved in alcohol until they are identified using a microscope in the laboratory.

Because there was a lot of water in the system during 2021-22 invertebrate species spread out, dispersing into habitat that was previously stagnant.

Waterbird diversity is driven by inundation events; some of our nationally and internationally significant migratory birds such as ibis and egrets rely on these events. Waterbird surveys are undertaken during spring and autumn with the team going into the field to survey channels, floodplain wetlands and waterhole habitats (Figure 6). We identify waterbirds visually and by their calls, with a bird expert or two among the survey team members.

While we did not specifically monitor waterbird diversity in 2021-22, during the 2020-21 water year, we found that the diversity and abundance of waterbirds was lower than the previous years. This can be attributed to the surveys having been conducted long after the

Figure 6: An intermediate egret (*Ardea intermedia*) in breeding plumage. Photo credit. Felix Nobel, UNE.

Figure 7: Vegetation survey quadrat on the Western Floodplain. Photo credit. Ben Vincent, UNE.

significant flood event that occurred during the March to May 2020 period. This meant that conditions during surveys were less favourable for waterbird communities to remain in the floodplains, with species likely dispersing to other water landscapes.

Vegetation communities on the Warrego River Western Floodplain (Figure 7) are dominated by coolibah (*Eucalyptus coolabah*), black box (*Eucaluptus largiflorens*), river cooba (*Acacia stenophylla*), lignum (*Duma florulenta*) and a range of other species that are adapted to surviving long dry and wet periods.

Vegetation surveys are usually conducted during spring and autumn. At each site we set up 20 m by 20 m survey plots. Within a plot we record which species are present, how many are present and the total ground cover as a percentage. We also record other factors such as the degree of grazing and site inundation.

With the extended inundation of the Western Floodplain in recent years, our monitoring has found that vegetation growth, survival and reproduction is strongly linked to when, and how much, water flows through the floodplain. During the 2021-22 monitoring period we have seen the continued growth and survival of lignum seedlings, the promotion of flowering in important woodland tree species and the dropping of seeds from species such as the coolibah. We've monitored these sites for eight years, so we also look at the history of our data to understand vegetation trends at a larger scale.

Managing water for the environment is a collective and collaborative effort, working in partnership with communities, private landholders, scientists and government agencies - these contributions are gratefully acknowledged.

We acknowledge the Traditional Owners of the land on which we live, work and play. We also pay our respects to Elders past, present and emerging.