

## Long Term Intervention Monitoring Project Murrumbidgee System Selected Area Project Progress Report #4 Report period: 1 April – 30 June 2015



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## **Ecological responses to Commonwealth environmental water in the Murrumbidgee system as of 1 April 2015**

This quarterly report outlines key activities undertaken and preliminary outcomes identified during monitoring of ecosystem responses to the use of Commonwealth environmental water in the Murrumbidgee Catchment undertaken as part of the Murrumbidgee Long Term Intervention Monitoring (LTIM) Project between 1 April and 30 June 2015. Monitoring includes assessment of ecological outcomes in the Murrumbidgee River and connected wetlands through the mid-Murrumbidgee and Lowbidgee floodplains wetlands as outlined in [the Murrumbidgee Monitoring and Evaluation Plan](#).

In 2014-15, monitoring of delivered Commonwealth environmental water was carried out in the North Redbank and South Redbank systems of the Lowbidgee floodplain and Yarradda Lagoon in the mid-Murrumbidgee wetlands (refer to maps at Appendix 2). The key objectives of these Commonwealth environmental watering actions were to support:

- native riparian, wetland and floodplain vegetation diversity and condition;
- maintain condition and provide reproduction opportunities for fish, waterbirds and other aquatic vertebrate species, and
- hydrological connectivity and water quality.

Observations, and recommendations, from monitoring activities undertaken during this period support adaptive management of environmental water.

## **Preliminary outcomes March – June 2015**

Routine wetland monitoring activities targeting water quality, microinvertebrates, fish, frogs and tadpoles, and waterbirds were completed at the ten Murrumbidgee LTIM wetland sites (refer Appendix 1 and 2) that contained water from 23 March to 11 May 2015. Vegetation diversity was conducted at all 12 LTIM wetlands during the same period.

### ***Vegetation diversity***

Vegetation surveys are undertaken to determine the response of vegetation species to environmental watering actions. Vegetation surveys are complete for 2014-15 and data is currently being analysed. As reported in previous quarterly reports, there has been a positive response of aquatic vegetation species following Commonwealth environmental watering. Aquatic and semi-aquatic vegetation species were observed in flower or setting seed during March surveys. This vegetation response is expected following prolonged inundation of wetlands and the gradual draw-down of water levels over late summer and autumn.



A well-developed aquatic vegetation community at Mercedes Swamp (March 2015), in the Lowbidgee floodplain.

### **Water Quality**

Water quality in wetlands receiving Commonwealth environmental water were broadly similar to those recorded in previous survey periods. There was a net increase of dissolved oxygen across all sites during March. However, dissolved oxygen at Two Bridges remained low (<2mg/L). As expected, conductivity increased slightly across most sites in response to declining water levels. All measured water quality variables were within the expected range of values for this time of year and, except for low dissolved oxygen at Two Bridges, were within known limits of tolerance for aquatic species.

### **Frogs and tadpoles**

As described in previous quarterly reports, southern bell frogs (*Litoria raniformis*, EPBC 1999) have been active through the LTIM monitoring sites in the Nimmie-Caira zone, with adults and tadpoles recorded at all four LTIM sites (Nap Nap, Avalon, Eulimbah and Telephone Creek) in January 2015. As expected, activity slowed in March due to cooler weather and wetland drying and no southern bell frogs were recorded during this period. Small numbers of other common species, barking marsh frogs and spotted marsh frogs were recorded at sites that retained water through the Lowbidgee floodplain. In the mid-Murrumbidgee, inland banjo frog adults and tadpoles were recorded in Yarradda lagoon for the first time since monitoring began in November 2010.



*Inland banjo frogs are a large burrowing species, their tadpoles are also large and have long development times requiring standing water for between 4 and 6 months. Inland banjo frogs were recorded at Yarradda lagoon in March 2015 which is the first record of this species in the Lagoon since monitoring commenced in November 2010.*

### *Waterbird diversity*

Total waterbird species diversity and abundance was lower during the autumn surveys of the wetland sites compared to the summer surveys. This was in response to the drying down of many sites, with 20 waterbird species recorded in total. Fish-eating (Piscivores) waterbirds and aquatic deep-water foragers, predominately Eurasian coots, made up the majority of observations. However, dabbling ducks were the most widespread group across the surveyed wetlands. The largest counts of waterbirds were recorded at Yarradda Lagoon (in the mid-Murrumbidgee), Telephone Creek (Nimmie-Caira) and Piggery Lake (Redbank) (>110 birds) which still held sufficient water.

### *Fish (wetlands)*

Overall there was an increase in the number of native species recorded compared to January 2015, with six native fish species recorded (bony herring, carp gudgeon, Australian smelt, golden perch, unspoked hardyhead and Murray-Darling rainbow fish) and four invasive fish species (carp, gambusia, goldfish and weather loach). The greatest diversity of native fish species were recorded in the Nimmie-Caria, with the permanent water site, Telephone Creek, containing five native species. Carp gudgeon spp. continue to be the most abundant native with 7,022 individuals recorded, compared to 2,158 in November 2014 and 6,674 in January 2015. Comparatively large numbers of the introduced weather loach were present in wetlands through the Redbank systems of the Lowbidgee floodplain, no weather loach were recorded in the mid-Murrumbidgee wetlands during 2014-15.



*Native unspoked hardyhead from Piggery Lake, March 2015*

## Fish (River)

Fish community sampling within the Murrumbidgee River is now complete and data analysis is underway. A total of 1,044 fish comprising ten native and three exotic species were captured across 21 river sampling sites, including trout cod (Narrandera zone only) and silver perch (low abundance in all three zones) (Figure 1).

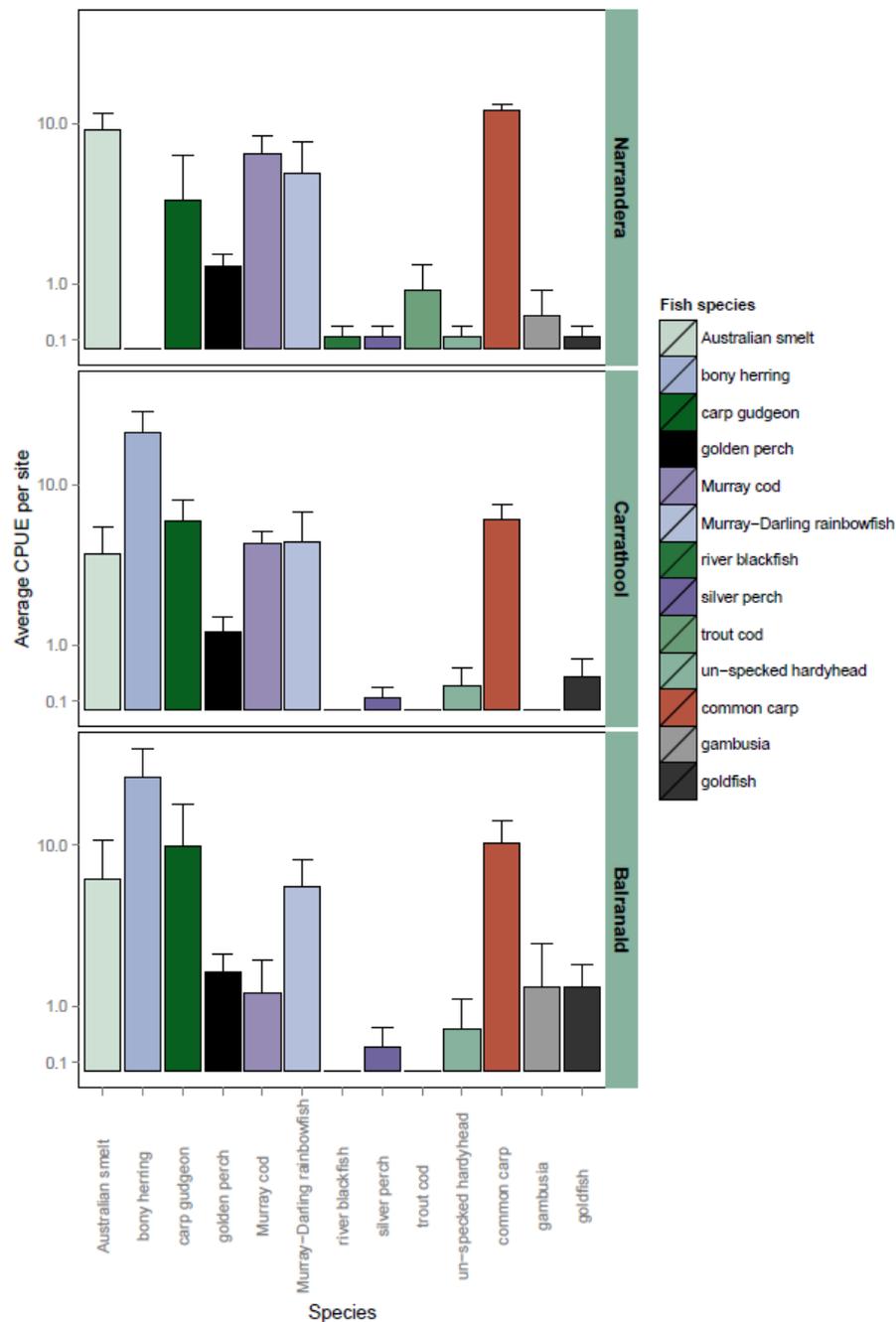


Figure 1. Average catch of fish per site ( $\pm$  standard error) among hydrological zones, collected using standardised Category 3 methods.

### *Fish (Larvae)*

Larval fish data entry is complete and analysis is underway. Genetic analysis confirmed the presence of golden perch and silver perch eggs (subsequently hatched in the laboratory and sent away for confirmation of species identification) (Plate 1).



Plate 1 (a) Silver perch larvae captured as an egg from Bringagee on the Murrumbidgee River in December 2014, and (b) golden perch larvae captured as an egg from the same site on the Murrumbidgee River in November 2014.

### *Microinvertebrates*

Microinvertebrate data entry for the larval fish sites is complete and analysis is almost complete. As in 2013-14, densities of microinvertebrates were much higher in benthic than pelagic habitats. Densities peaked at some sites (particularly Yarradda and McKenna's river sites) in mid to late December. This was later than the peaks observed at larval fish sites in 2013-14. Also overall densities appear lower than in 2013-14 at most sites.

Processing of wetland and return flow samples was completed by late April, and samples from rescheduled field work will be completed by the end of June. As soon as these additional samples are added to the database analyses will be run.

**Appendix 1 Summary of monitoring activities undertaken between April to June 2015 as part of the Monitoring and evaluating ecological responses to Commonwealth environmental water use in the Murrumbidgee River Valley**

Zone	Site name	Status	Water Quality	Microinvertebrates Chlorophyll A	Carbon Nutrients	Larval fish	Tadpoles, fish and turtles	Frogs	Waterbirds	Vegetation	Depth logger	Temperature logger	
mid-Murrumbidgee	Gooragool	Dry								✓	✓	✓	
	Mckennas	Dry									✓	✓	✓
	Sunshower	Dry									✓	✓	✓
	Yarradda	Residual	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
South Redbank	Mercedes	Residual	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
	Two Bridges	Residual	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
	Piggery Lake	Residua	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
	Waugorah Lagoon	Residual	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
Nimmie-Caira	Nap Nap	Dry							✓	✓	✓	✓	✓
	Avalon	Residual	✓	✓	✓		✓	✓	✓	✓			✓
	Telephone	Residual	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
	Eulimbah	Dry							✓	✓	✓	✓	✓
River sites	Mckennas (Carrathool zone)												
	Bringagee (Carrathool zone)												
	Yarradda (Carrathool zone)												
	Narrandera ( Narrandera zone)												
	Euroley ( Narrandera zone)												
	Dairy ( Narrandera zone)												
Return Flow	US Wynburn escape 1km *												
	Immediately US Wynburn escape *												
	Wynburn Wetland *												
	DS Wynburn escape 1km *												
	DS Wynburn escape 2km *												
DS Wynburn escape 3km *													

## **Appendix 2**

### **About the Murrumbidgee Long-Term Intervention Monitoring Project (LTIM Project)**

The Long Term Intervention Monitoring (LTIM) Project for the Murrumbidgee River system is funded by the Commonwealth Environmental Water Holder (\$3.7M 2014-2019) and is being delivered as a collaborative partnership led by Charles Sturt University (Institute for Land, Water and Society) with NSW Department of Primary Industries (Fisheries), University of NSW, NSW Office of Environment and Heritage, and Riverina Local Land Services.

The Murrumbidgee LTIM Project is designed to provide a robust framework to evaluate the ecological outcomes of Commonwealth environmental water within wetland and river systems downstream of Narrandera, NSW. Monitoring activities target multiple taxonomic groups and ecological processes with a focus on indicators of high ecological and community significance, such as large bodied native fish, waterbirds, and endangered species.

Monitoring activities within wetlands are focused on the responses of fish, frogs, tadpoles, turtles, microcrustacea (a component of the zooplankton), waterbirds, vegetation, along with the changes in water quality, carbon and nutrients associated with black water and algal bloom risks, and hydrology measured before, during and after environmental watering. The riverine component includes intensive monitoring of native fish breeding and fish community responses to environmental watering actions, along with microcrustacea, stream metabolism (stream productivity) and water quality associated with black water and algal bloom risks, and hydrology.

The Murrumbidgee LTIM Project is being undertaken across three key ecological regions within the Murrumbidgee, the mid and lower Murrumbidgee River channel and adjacent mid-Murrumbidgee wetlands between Narrandera and Hay, and the Lowbidgee floodplain downstream of Maude, that is further divided into separate monitoring "zones" representing areas with common ecological and hydrological attributes.

The framework includes 12 fixed monitoring sites across three key wetland types, oxbow lagoons of the Mid-Murrumbidgee, lignum-black box wetlands through the Nimmie-Caira system and river red Gum-spike rush wetlands through the Redbank systems and six fixed sites across the mid and lower the Murrumbidgee River channel. Copies of the Murrumbidgee Monitoring and Evaluation plan are available at:

<http://www.environment.gov.au/system/files/resources/bc51ee00-ac5f-4e65-910d38f23416823e/files/murrumbidgee-me-plan.pdf>

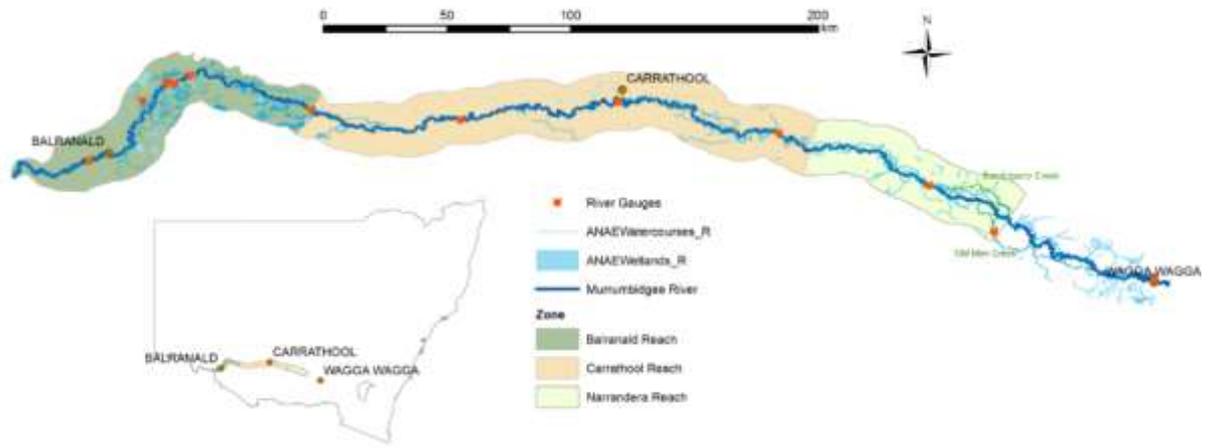


Figure 2 Distribution of riverine zones in the Murrumbidgee Selected Area.

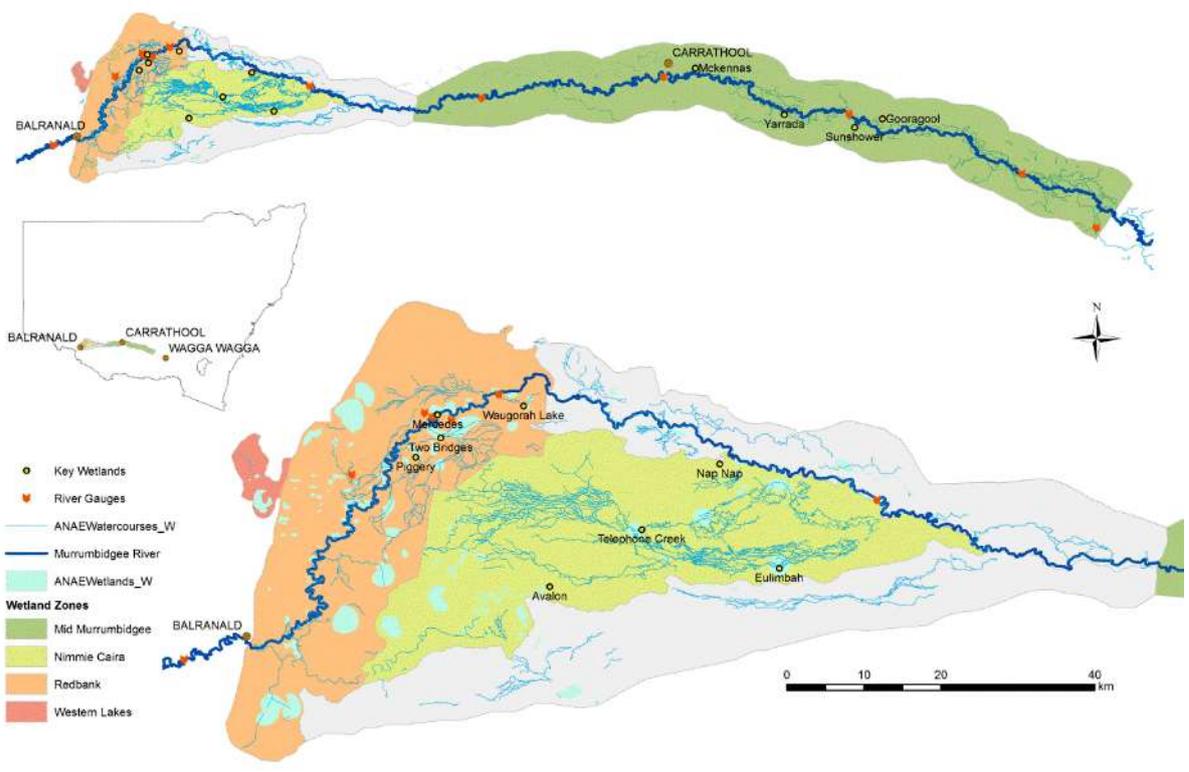


Figure 3 Distribution of wetland zones in the Murrumbidgee Selected Area and locations of key wetlands.