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Institute for Land, Water and Society
Charles Sturt University

Long Term Intervention Monitoring Project Murrumbidgee System
Selected Area Project Progress Report # 9
Watering highlights for 2015 - 2016

Yarradda Lagoon, mid-Murrumbidgee, January 2016

Wassens, S., Wolfenden, B., Spencer, J., Thiem, J., Jenkins, K., Lenon, E., Hall, A., Kobayashi, T. Thomas, R. Bino, G. McPherson, J., Dyer, J., Ocock, J, & Heath, J (2016). Long Term Intervention Monitoring Project, Murrumbidgee System Selected Area, Progress Report number 9, July 2016. Charles Sturt University, Institute for Land, Water and Society. Prepared for the Commonwealth Environmental Water Office.

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Ecological responses to Commonwealth environmental water in the Murrumbidgee system 2015-2016 highlights

This 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 January and 31 March 2016. Monitoring includes assessment of ecological outcomes in the Murrumbidgee River and connected wetlands through the mid-Murrumbidgee and Lowbidgee floodplain wetlands as outlined in the Murrumbidgee Monitoring and Evaluation Plan. This report includes key highlights of the watering actions undertaken in 2015-16 drawn from the **Commonwealth Environmental Water Office Long-term Intervention Monitoring project Murrumbidgee River system Selected Area Annual evaluation report 2014-16** which is due for public release later in 2016.

In 2015-16 there were four watering actions delivering water to the three floodplain monitoring zones (mid-Murrumbidgee, Nimmie-Caira and Redbank) which had objectives for maintaining wetland-dependent vegetation and fauna: the **Nimmie-Caira refuge** (North and south channel) and the **Nap Nap - Wagourah action** which were both undertaken with the primary goal of maintaining refuge habitats through the Nimmie-Caira and northern Redbank zones. The **Yanga National Park waterbird support** targeted waterbird rookeries in the Yanga National Park and the Yarradda Lagoon watering involved pumping water into **Yarradda Lagoon** in the mid-Murrumbidgee.

Highlights for 2015- 2016

Routine wetland monitoring activities targeting water quality, microinvertebrates, fish, frogs and tadpoles, and waterbirds were completed at eight of the 12 Murrumbidgee LTIM wetland sites (refer Appendix 1 and 2) that contained water during January and March 2016. Vegetation communities were surveyed at all 12 LTIM wetlands during the same period.

Evaluation of the key wetland indicators monitored in 2014-15 and 2015-16 are showing some significant benefits of inundation of wetlands. Without environmental watering events to wetlands in the Murrumbidgee Selected Area over this period, there would have been limited opportunities for the recruitment of native fish, aquatic vegetation, frogs, turtles and waterbirds. Frequent watering to support refuge habitats has also maintained water quality and densities of microinvertebrates and other prey species to support native fish

populations. Some recovery of wetland-dependent vegetation has occurred as a result of the delivery of environmental water over successive years. There were notable positive outcomes for southern bell frogs and other frog species following pumping of Yarradda Lagoon in the mid-Murrumbidgee, with tadpoles, recent metamorphs and adults all observed in 2015-16. Waterbird diversity and total abundance was greater in wetlands that received Commonwealth environmental water in 2015-16 compared to sites that were dry and sites that received water in 2014-15 only.

Vegetation diversity

Monitoring from 2014 to 2016 identified 43 additional aquatic vegetation species that were only recorded at wetlands that received Commonwealth environmental water. Watering supported the establishment of nine aquatic plant communities which included common spike rush, tall spike rush and water primrose. The percentage cover of species belonging to the amphibious functional groups increased following environmental watering across all monitoring zones and wetlands.

Yarradda Lagoon

In 2015-16 Commonwealth environmental water was used to top-up Yarradda Lagoon with the objective of "maintain wetland and riparian native vegetation". Yarradda Lagoon had been dry for an extended period between 2002 and 2010. It filled in 2010 as a result of heavy rainfall across the catchment and retained water until early in 2012 (Plate 1). The wetland remained dry through 2013 and most of 2014, initially receiving NSW environmental water in December 2014. We used SIMPER to identify which species contributed most to differences in the composition of the vegetation communities before and after environmental watering, prior to watering the key species included spear thistle (*Cirsium vulgare*), creeping knotweed (*Persicaria prostrata*), river red gum seedlings *(Eucalyptus camaldulensis*), prickly lettuce *(*Lactuca serriola) and burr medic (*Medicago polymorpha*). After environmental watering there were major changes in the composition of the plant communities. Red water milfoil (*Myriophyllum verrucosum*), hairy panic (*Panicum effusum*) and spiny mudgrass (*Pseudoraphis spinescens*) established, and the aquatic community continued to develop over 2015-16 with tall spike rush (*Eleocharis sphacelata*) and fringe lily (*Nymohoides crenata*) recorded.

	Yarradda lagoon in November 2014, this once highly diverse and productive wetland is dry and covered in spear thistle
	January 2015 patches of spiny mudgrass are recorded at the wetland for the first time since monitoring started in 2010.
	November 2015 spiny mudgrass (foreground) is now well established, and red water milfoil has established (background)

Plate 1. Time series of Yarradda lagoon before and after environmental watering

Waterbird diversity

Total waterbird diversity and abundance was higher in wetlands that received environmental water over September 2015 to March 2016 compared to sites that were not inundated, and sites that received water in 2014-15 only. Records of waterbirds in wetlands that received Commonwealth environmental water included: nationally threatened Australasian bittern (Nimmie-Caira) and NSW-listed freckled duck and magpie goose (mid-Murrumbidgee). Colonial waterbird breeding was recorded in five wetlands in the Murrumbidgee Selected Area, which included small-scale breeding in two wetlands of JAMBA listed Eastern great egrets.

Redbank watering actions

Two watering actions were undertaken in the Redbank zone - the Redbank (Yanga National Park) waterbird contingency and the Redbank (North) watering action. Delivery of Commonwealth environmental water to areas of North Redbank initiated breeding in small numbers (around 50-100 nests) of spoonbills, cormorants and darters at Glenn Dee Swamp near Redbank weir. Targeted delivery of Commonwealth environmental water was made to Tarwillie Swamp in Yanga National Park, to maintain stable water levels for around 350 nests (eight colonially-nesting waterbird species including around 250 Eastern great egret (*Ardea modesta)* nests) contributing to a successful fledging event (Spencer, Ocock et al. 2016).

Nimmie-Caira refuge watering

Complementary OEH monitoring determined that royal spoonbill and Australian white ibis (around 100 nests) nested successfully in Eulimbah Swamp, and small-scale colonial waterbird breeding (six species, around 100 nests) was also detected in Telephone Bank including the JAMBA listed Eastern great egret. Eulimbah Swamp also supported small numbers of nesting Australian white ibis (*Threskiornis moluccus)* and royal spoonbill (*Platalea regia)* (estimated 100 nests in total) (Plate 2), and six colonial waterbird species were detected nesting in Telephone Creek. This included about 20 Eastern great egret nests, a species listed under the Japan-Australia migratory bird agreement (JAMBA).

Yarradda Lagoon

Australasian darter (*Anhinga novaehollandiae)*, great cormorant *(Phalacrocorax carbo)*, little pied cormorant (*Microcarbo melanoleucos)* and little black cormorant nested in

Yarradda Lagoon successfully (estimated 175 nests in total) in response to the delivery of environmental water over November 2015 – March 2016.

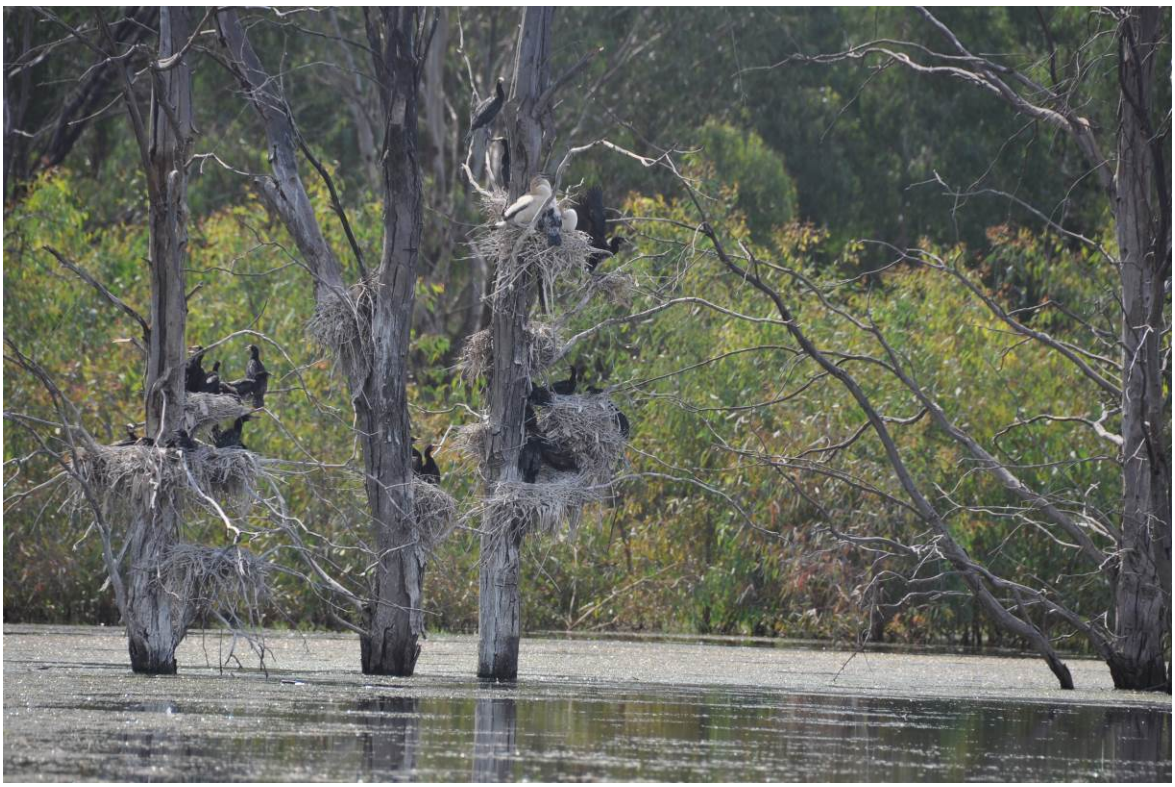

Plate 2. Waterbirds are back in Yarradda Lagoon, nesting darters and little black cormorants at Yarradda Lagoon, February 2016. Photo J. Dyer (NSW OEH).

Frogs

Six frog species were recorded in 2015-16 including the vulnerable (EPBC Act) southern bell frog which was recorded at four wetlands. Breeding activity for all six species was recorded in response to Commonwealth environmental water.

Nimmie-Caira refuge watering

The Nimmie-Caira watering action specifically focused on maintaining habitat for the southern bell frog (*Litoria raniformis* (Vulnerable EPBC Act 1999)) this watering action was successful in achieving this objective and there was a clear link between the area of inundation and calling activity by southern bell frogs. There was also an increase in abundance of adult frogs late in the season at Eulimbah and Telephone Creek which were targeted with environmental water with the objective of "supporting the habitat requirements of southern bell frogs (EPBC Act vulnerable) (Eulimbah Floodway)". Southern bell frog abundance declined at Avalon and Nap Nap Swamps which were not inundated

in 2015-16. *Litoria raniformis* was also observed at Wagourah Lagoon which received water as part of the Nap Nap –Wagourah watering action.

Yarradda Lagoon

Southern bell frog adults, tadpoles and metamorphs were also recorded at Yarradda Lagoon following repeated environmental watering activities undertaken by NSW OEH and CEWO. This is the first record of southern bell frogs (Plate 3) at Yarradda Lagoon in a number of decades and provides clear evidence of the success of pumping actions to maintain high quality habitat in the lagoon. While natural reconnections have multiple benefits for riverine species and benefit wetland water quality in the long-term, pumping was effective in creating suitable habitat for southern bell frogs and Peron's tree frogs.

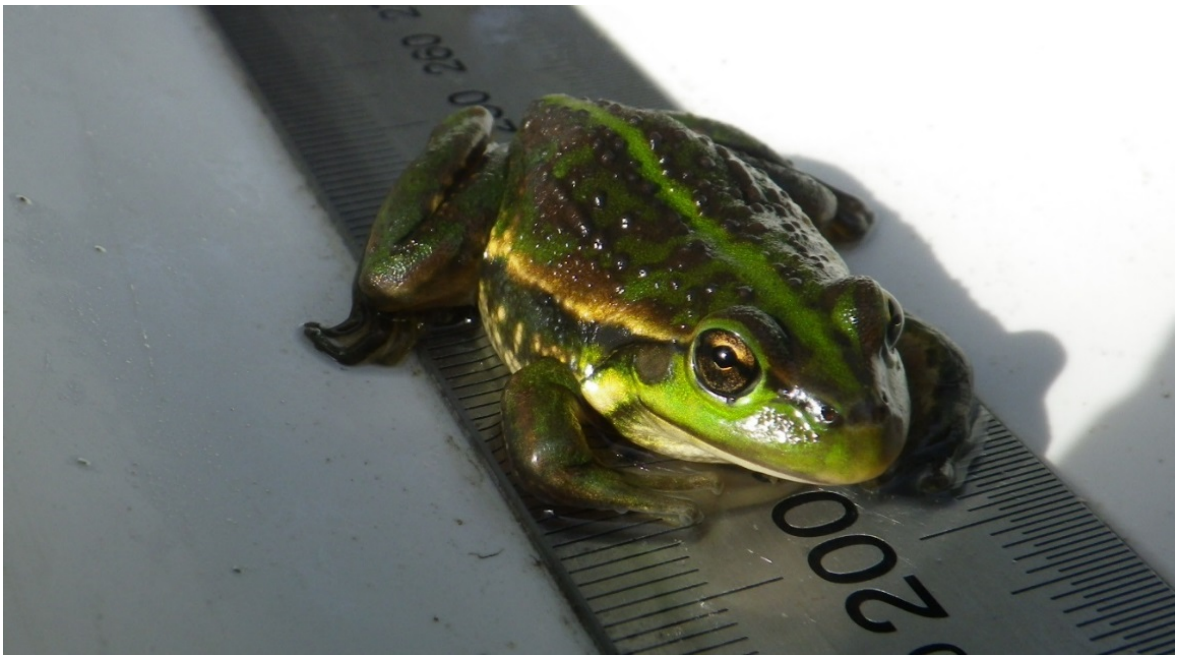

Plate 3. November 2015 with vegetation growing well the beautiful southern bell frog has arrived and is breeding in the Yarradda Lagoon

Appendix 1

Summary of monitoring activities undertaken during January and March 2016 as part of the monitoring and evaluating ecological responses to Commonwealth environmental water use in the Murrumbidgee River Valley. * = sampled 2014-15 and/or 2015-16

Zone	Site name	Status (March)	Water Quality	Microinvertebrates Chlorophyll A	Carbon Nutrients	Ecosystem metabolism	Larval fish	Tadpoles, fish and turtles	Frogs	Waterbirds	Vegetation	Depth logger	Temperature logger
mid-Murrumbidgee	Gooragool	Almost dry	*	*	*			*	*	*	*	*	*
	McKennas	Dry									*	*	
	Sunshower	Dry									*	*	
	Yarradda	1.8m	*	*	*			*	*	*	*	*	
	Molley's	Almost dry	*	*	*			*	*	*	*	-	-
	Yellow Clay Creek	Dry									*	-	-
South Redbank	Mercedes	Dry									*	*	*
	Two Bridges	Low	*	*	*			*	*	*	*	*	*
	Piggery Lake	Dry							*	*	*	*	*
	Waugorah Lagoon	Low	*	*	*			*	*	*	*	*	*
Nimmie-Caira	Nap Nap	Dry									*	*	
	Avalon	Low	*	*	*			*	*	*	*	*	*
	Telephone	Moderate	*	*	*			*	*	*	*	*	*
	Eulimbah	Moderate	*	*	*			*	*	*	*	*	*
River sites	McKennas (Carrathool zone)		Commenced October 2015			✓	Completed December 2015						
	Bringagee (Carrathool zone)												
	Yarradda (Carrathool zone)												
	Narrandera (Narrandera zone)					*							
	Euroley (Narrandera zone)												
	Dairy (Narrandera zone)												

*Narrandera zone Category 3 metabolism completed during January 2016

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 (Figure 1 and 2).

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

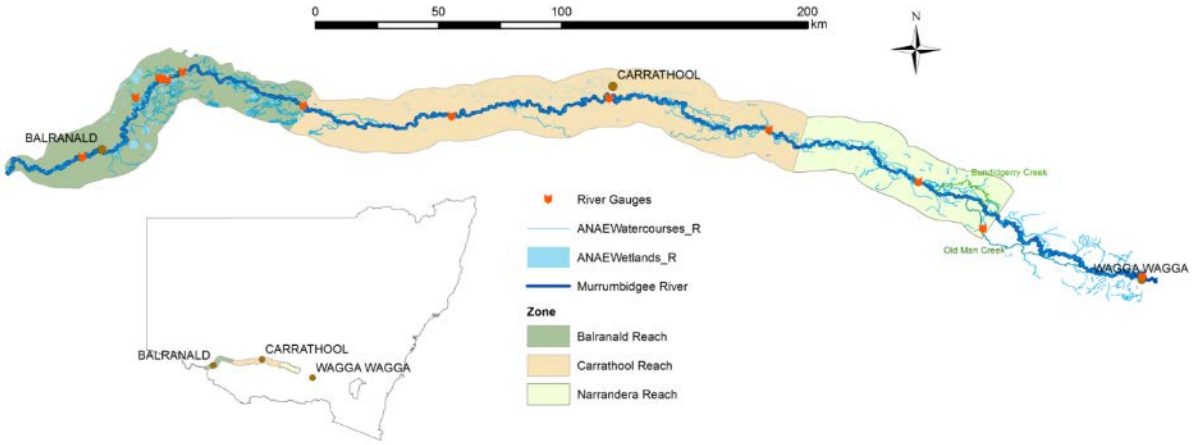

Figure 1 Distribution of riverine zones in the Murrumbidgee Selected Area.

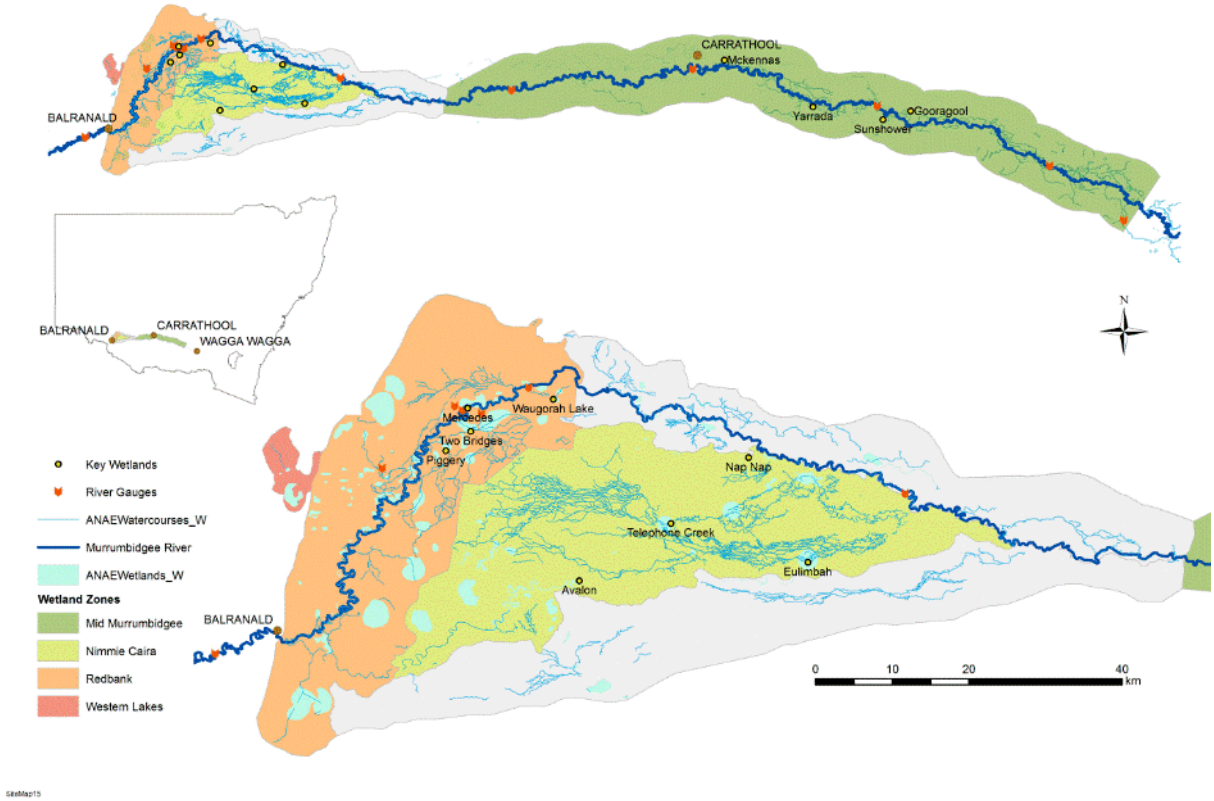

Figure 2 Distribution of wetland zones in the Murrumbidgee Selected Area and locations of key wetlands.