

# Environmental Watering Outcomes 2014-15



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Photo on title page: Markaranka Wetland

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In the 2014-15 water year, 8398 ML of environmental water was delivered across approximately 811 ha to maintain and improve the condition of wetlands and floodplains across the SA Murray-Darling Basin and support key wetland and floodplain biota.





# Executive summary

The Natural Resources SA Murray-Darling Basin (SAMDB) Wetland and Floodplain Team delivers environmental water to priority wetlands and floodplains along the River Murray in South Australia. During 2014-15, approximately 8398 megalitres (ML) of environmental water was delivered across 811 hectares (ha). In total, 22 wetland and floodplain sites received water to maintain and improve their ecological values.

This report presents a brief summary of environmental watering sites and the ecological outcomes for 2014-2015.

Environmental water was primarily provided through the State Environment Reserve and the Commonwealth Environmental Water Holder (CEWH). Smaller but important volumes were also provided through private irrigation donation.

Monitoring of watered sites was undertaken by staff of Natural Resources SAMDB Wetland and Floodplain Team, Local Action Planning Groups and Landcare Associations, wetland community groups and research organisations.

Multiple ecological outcomes were achieved through the delivery of environmental water in 2014-15. Some of the more significant results include:

- improvements in river red gum (*Eucalyptus camaldulensis* var. *camaldulensis*) and black box (*Eucalyptus largiflorens*) tree condition with an increase in crown extent and density observed;
- improvement in the condition of long-lived floodplain vegetation such as lignum (*Duma florulenta*);
- waterbird species from a range of functional groups observed utilising watered wetlands;
- at least four species of waterbird recorded breeding across four watered sites, including two species of conservation significance;
- eight waterbird species of conservation significance were recorded at four watered sites;
- record numbers of the endangered Murray hardyhead (*Craterocephalus fluviatilis*) captured at Berri Evaporation Basin and Disher Creek, and;
- frog breeding and successful recruitment, including that of the nationally threatened southern bell frog (*Litoria raniformis*) was recorded.

# 1 Introduction

In the absence of natural flood events, environmental watering is important for maintaining key ecological values and processes at wetlands and floodplains adjacent to the River Murray in South Australia. Environmental water is the delivery or use of water to achieve environmental outcomes. These outcomes ensure that the ecological values and condition of wetlands and floodplains in the SA Murray-Darling Basin (SAMDB) region are maintained, protected or restored.

In 2014-15, the Natural Resources SAMDB environmental watering program resulted in numerous beneficial ecological outcomes being achieved across the region.

## 1.1 Why do wetlands and floodplains need water?

Since European settlement, wetlands and floodplains across the Murray-Darling Basin (including SA) have undergone major modification and widespread degradation. Declines of iconic and keystone flora and fauna species can be attributed to river regulation and landscape scale changes. Natural flood events, now occur so infrequently, and their magnitude and duration are so decreased, that deterioration in the condition of wetland and floodplain ecosystems has occurred.

Each year South Australia (SA) develops an Annual Environmental Watering Plan for the SA portion of the River Murray to ensure that the best environmental outcomes from environmental water are achieved. This is consistent with the requirements and objectives of the Murray-Darling Basin Plan. The Annual Plan is developed to coordinate and prioritise environmental watering actions to maximise the benefits of environmental water delivery within South Australia.

Environmental watering proposals are developed using the best available science and ecological data, and through the application of adaptive management principles. Priorities are determined by assessing the scale of environmental benefit, risk of not applying water, feasibility costs and the significance of each site.

## 1.2 Objectives for watering

The watering objectives identified in 2014-15 were based on the water requirements of the priority wetlands, as well condition assessments, scientific knowledge and long-term monitoring data.

The primary ecological objectives for watering undertaken during 2014-15 were to:

- Maintain and/or improve the condition of long-lived vegetation such as river red gum, black box, river cooba (*Acacia stenopylla*) and lignum, including mature and recently regenerated trees;
- Maintain and/or improve the diversity and abundance of aquatic vegetation;
- Provide and support habitat and breeding opportunities for water-dependent fauna such as waterbirds, frogs and fish, and;
- Maintain and/or improve conditions and habitat for threatened species such Murray hardyhead, regent parrot and southern bell frog.

## 1.3 How is water delivered?

The environmental watering program is managed by the Natural Resources SAMDB Wetland and Floodplain Team in conjunction with Local Action Planning Associations, landholders and community wetland groups. The majority of the sites are temporary wetlands that do not naturally receive water during periods of low river flows, and consequently require water to be delivered via pumping or other infrastructure. Complementary on-ground works, such as the installation of temporary embankments and removal of flow barriers, are required at some wetlands. Many of these works are undertaken by the landholders and local contractors. The combined efforts of all stakeholders are essential to ensure the success of the environmental watering program.







Wetland and Floodplain Site		Environmental water source	Area (ha)	Volume delivered (ML)
Valley Geomorphic Reach				
Bookmark Creek		State Reserve	30.0	420.0
Gerard Floodplain	Black box watering trial	State Reserve	5.0	0.7
Katarapko Creek		State Reserve	4.2	27.3
Katarapko Island Creeks		State Reserve	17.8	134.7
Old Loxton Road		State Reserve	3.3	22.3
Overland Corner	Main basin	CEWH	93.0	741.0
	Lignum basin	CEWH	13.4	101.0
Piggy Creek		CEWH	33.0	201.2
Templeton		State Reserve	9.4	134.1
Whirlpool Corner		CEWH	11.0	90.0
Wiela Wetland	Temporary basin	CEWH	7.0	255.0
	Red gum stands	State Reserve	2.0	1.0
Gorge Geomorphic Reach				
Akuna Wetland		CEWH	6.0	125.4
Nikalapko Wetland		CEWH	46.0	800.0
Markaranka Wetland Complex	Markaranka and Markaranka South Basin	CEWH	70.0	1452.5
	Markaranka East	CEWH	10.0	799.5
	Black Box Watering Trial	Donation	4.0	9.4
Molo Flat		CEWH	62.0	748.4
Wigley Reach		CEWH	10.0	314.0
Morgan Conservation Park	South basin	State Reserve	14.2	128.3
Morgan East		State Reserve	122.0	193.8
Sugar Shack	Temporary basin	State Reserve	5.0	41.9
Lower Lakes Geomorphic Reach				
Tolderol Game Reserve		State Reserve	40.0	415.7
Threatened fish species sites				
Berri Evaporation Basin		CEWH	100.0	1241.0
<b>TOTAL</b>			<b>811.3</b>	<b>8398.0</b>



## Natural Resources SA Murray-Darling Basin Watering Sites 2014-15



## 2 Tree condition and vegetation

The River Murray floodplain in SA is dominated by two tree species: river red gum and black box. Other long-lived floodplain vegetation including river cooba and lignum are also widespread across the floodplain. Although these species are well adapted to an environment characterised by both droughts and floods, they are reliant upon frequent flood events to maintain condition.

In the last two decades, the decline in the condition of much of the floodplain vegetation in the SAMDB region has been evident. This has given rise to projects that specifically aim to restore and protect this important vegetation.

A major aim of environmental watering at many wetlands is to improve and maintain the condition of floodplain vegetation, in particular river red gum, black box and lignum. Watering to improve and maintain vegetation is important for conserving habitat vital for wetland fauna like the southern bell frog, a nationally threatened species, and also for maintaining important ecosystem functions such as nutrient and carbon cycles.

### Results

Watering led to a marked improvement in tree crown extent and density within river red gums and black box tree populations. Many trees were also observed to be exhibiting new tip growth and with buds or flowers. Additionally, small numbers of seedlings were observed at some wetlands. Lignum shrublands also showed a positive response to watering with new leaf growth and flowering.

The improvement in tree condition overtime was captured via time-lapse cameras. This may be viewed online at the Natural Resources SA Murray-Darling Basin Youtube channel:

**[www.youtube.com/playlist?list=PLnIFdswbYw6toAbRvoWSN9TEpKkyRY93w](https://www.youtube.com/playlist?list=PLnIFdswbYw6toAbRvoWSN9TEpKkyRY93w)**



*September 2014, before watering*



*March 2015, during watering*





# 3 Waterbirds

Waterbirds are species that are dependent on surface water for a range of activities essential to their survival including foraging, feeding and nesting. Waterbird breeding is strongly correlated with flood events, in part due to the productivity that occurs within wetlands and floodplains during floods. Habitat diversity is also important for the conservation of waterbirds from a range of different functional groups (e.g. ducks, wading birds).

Across the Murray-Darling Basin, the decline of waterbird populations and their habitats is well documented. Much of this decline is attributed to river regulation and a reduction in habitat availability and condition. Consequently many waterbird species are now considered threatened and the management of the remaining range of habitat types is critical to their survival.

The delivery of environmental water to wetlands can provide a diverse range of habitats, from wet mud to shallow and deep water, which may be utilised by a range of species. An important aim of the environmental watering program is to provide diverse habitats for both breeding and non-breeding waterbirds. Where watering specifically targets waterbirds, it can also achieve other objectives such as maintaining tree or vegetation condition.

## Results

Waterbirds were intensively surveyed at four of the watered wetlands. In total, 40 species of waterbird from a range of functional groups were recorded. This included nine species of conservation significance:

- Australasian darter (*Anhing novaehollandiae*)
- Australasian shoveler (*Anas rhynchotis*)
- blue-billed duck (*Oxyura australis*)
- common greenshank (*Tringa nebularia*)
- freckled duck (*Stictonetta naevosa*)
- glossy ibis (*Plegadis falcinellus*)
- great crested grebe (*Podiceps crastatus*)
- musk duck (*Biziura lobata*)
- regent parrot <sup>1</sup> (*Polytelis anthopeplus monarchoides*)

Evidence of waterbird breeding, including behaviour such as nesting, mating or mating displays, and the presence of juveniles, was observed at some of the watered wetlands. Four species that were observed showing breeding behaviour, or with juveniles include:

- Australasian wood duck (*Chenonetta jubata*)
- Australasian darter
- blue-billed duck
- sacred kingfisher (*Todiramphus sanctus*)

<sup>1</sup> Although not a waterbird, the regent parrot is dependent upon river red gums that are in close proximity to water and are in good condition for nesting and other activities.





## 4 Frogs and tadpoles

Frog species in the Murray-Darling Basin are reliant on water. Temporary wetlands provide breeding and foraging habitat for many species, including the nationally threatened southern bell frog (*Litoria raniformis*). Natural events such as rain and the flooding of wetlands and floodplains play an important role in triggering breeding and dispersal.

River regulation, a reduction in floods and habitat loss have severely impacted riverine and flood dependent biota, including frogs that are sensitive to changes in hydrology and habitat alteration.

An important aim of the environmental watering program is to provide breeding opportunities for frog species found within the River Murray corridor in SA.

### Results

A total of seven frog species were detected at watered wetlands, including the southern bell frog. Successful recruitment was observed in all species, which was indicated by the presence of tadpoles and metamorphs.

The abundance and diversity of tadpoles and frogs was greater at watered wetlands than in permanent wetlands. Southern bell frogs were detected at seven of the 12 watered wetlands surveyed, however they were recorded in low abundances and metamorphs were only detected at two wetlands. Overall, environmental watering at wetlands during summer triggered and supported successful recruitment for all frog species.







# 5 Murray hardyhead

The Murray hardyhead (*Craterocephalus fluviatilis*) is a small freshwater fish, endemic to the Murray-Darling Basin. This species faces many threats and has subsequently suffered a significant decline in distribution. As a result, the Murray hardyhead is now considered to be of conservation significance and is listed as nationally endangered.

Management of Murray hardyhead populations is undertaken at two important Riverland wetlands: Berri Evaporation Basin and Disher Creek. An important objective of the environmental watering program is to maintain the habitat and populations of Murray hardyhead at these wetlands.

## Results

Record abundances of Murray hardyhead were captured at both Disher Creek and Berri Evaporation Basin in early 2015. A total of 9704 Murray hardyhead were captured at Disher Creek and 4644 were captured at Berri Evaporation Basin. This was an improvement in abundance from the same time the previous year where only 172 and 391 individuals had been captured at Disher Creek and Berri Evaporation Basin respectively.

Due to the success of the Riverland Murray hardyhead populations, in March 2015 approximately 2500 individuals were translocated to a suitably prepared wetland in Victoria. This important project was a partnership between the South Australian Department of Environment, Water and Natural Resources, the Murray-Darling Freshwater Research Centre, Mallee Catchment Management Authority and Victorian Department of Environment, Water, Land and Planning.









# 6 Whirlpool Corner Wetland

Whirlpool Corner is a temporary wetland located upstream of Renmark, within the Riverland Ramsar region. Since 2005, Natural Resources SAMDB has been working closely with the Whirlpool Corner Wetland Group to improve the health of this priority wetland. On-ground works, such as the removal of flow barriers and pest control has been undertaken at the site. Importantly, Whirlpool Corner has received environmental water which has been delivered during periods of low river flows, such as those observed in 2014-15.

The primary objectives for watering in 2014-15 were to:

- Maintain and improve tree and vegetation condition, and
- Provide habitat and support breeding opportunities for frogs including the nationally threatened southern bell frog.

## Results

The watering of the Whirlpool Corner wetland resulted in a number of positive ecological outcomes including:

- freshening of the groundwater around the wetland;
- reversal of groundwater gradients away from the wetland (decreasing the risk of wetland bed salinization);
- growth and germination of aquatic and semi-aquatic vegetation including nardoo (*Marsilea drummondii*), slender knotweed (*Persicaria sp.*) and spiny flat-sedge (*Cyperus gymnocaulos*);
- improvement in tree condition and riparian edge vegetation;
- calling of six species of frog recorded including the nationally threatened southern bell frog, and;
- numerous waterbird species from a range of functional groups such as black swan (*Cygnus atratus*), grey teal (*Anas gracilis*), white-necked heron (*Ardea pacifica*), royal spoonbill (*Platalea flavipes*) and little pied cormorant (*Microcarbo melanoleucos*) were observed utilising the site for foraging activities.

September 2014





September 2014



March 2015



June 2015





# 7 Markaranka Flat Wetland Complex

Markaranka Flat Wetland Complex is an important floodplain located downstream of the township of Waikerie. The floodplain and adjacent vineyards are owned by Treasury Wine Estates who, in collaboration with Natural Resources SAMDB, have undertaken environmental watering at the site since 2005.

In 2014-15 a number of watering actions were undertaken across the Markaranka Floodplain. These included the inundation of the larger wetland basins at Markaranka, Markaranka South and Markaranka East, as well as the continuation of the black box watering trials in the eastern part of the floodplain.

## Black box watering trial results

Investigations into innovative techniques to deliver water to black box trees has been trialled at the Markaranka Floodplain since 2013. This trial has been undertaken in partnership with the South Australian Research and Development Institute (SARDI) and Commonwealth Scientific and Industrial Research Organisation (CSIRO). The aim of the trial is to alleviate further declines in tree health condition through the use of drip irrigation as a direct watering technique for black box woodland.

Three successive years of drip irrigation have shown that watering via this method appears to arrest the decline in condition and promote significant growth flushes in the black box trees.

## Wetland watering

As a result of the watering, the mature river red gums surrounding the Markaranka and Markaranka South wetland basins improved in condition, with extensive tip growth, flowering and buds recorded. Lignum in the Markaranka East basin responded with increased growth, greening and flowering observed. Aquatic and semi-aquatic vegetation was also observed growing in and around the wetlands basins.

A total of 30 waterbird species were recorded at Markaranka Flat Wetland Complex including five species of conservation significance. They were: Australasian darter, Australasian shoveler, blue-billed duck, great crested grebe and musk duck.

Two species were observed breeding at the site. These were the Australian wood duck and Australasian darter, both with dependent young. Regent parrots were observed utilising watered trees at the site. A wide range of waterbirds from a range of functional groups were recorded, and is likely to be indicative of the variety of habitats and resources made available by the watering.

Four species of frogs heard at the site were the eastern sign-bearing froglet (*Crinia parinsignifera*), spotted grass frog (*Limnodynastes tasmaniensis*), Peron's tree frog (*Litoria peronii*) and eastern banjo frog (*Lim. dumerilii*).



*pink-eared ducks*







# 8 Gerard Floodplain

Gerard Floodplain is located downstream of Loxton, within the greater Katarapko Floodplain area. The land is managed by the Aboriginal Lands Trust and the Gerard Community Council and is of great cultural significance to the Riverland Aboriginal community.

Since 2013, Natural Resources SAMDB has worked in close partnership with the Gerard Community Council and the Aboriginal Lands Trust to undertake a watering trial on the floodplain.

The purpose of the trial was to determine whether gravity fed irrigation infrastructure was sufficient to improve or maintain the condition of black box trees. Another important aim was to develop a program that enabled the Gerard Aboriginal Learning on Country team to develop skills in monitoring and to undertake the delivery of the environmental water.

The project involved trialling three types of watering regimes: not watered, watered every month, and watered every two months.

## Results

The results of the monitoring showed that the unwatered trees continued to decline in condition. By contrast, the greatest improvement in condition was observed in trees that were watered monthly, although this improvement was marginal and trees continue to be in poor condition. Trees that were watered every two months maintained their generally poor condition with little change in condition noted.

## Partnerships

The project is a collaborative partnership between Natural Resources SAMDB, the Aboriginal Lands Trust and the Gerard Community Council, and has provided natural resources management employment, training and qualifications to members of the local Aboriginal community.





# 9 Tolderol Game Reserve

Tolderol is a wetland complex fringing Lake Alexandrina, within the Coorong and Lakes Alexandrina and Albert Ramsar Wetland. The wetland is one of the most ecologically diverse wetlands in this region and plays an important role in providing significant habitat for many migratory waterbird species. It is an important community asset with many tourists and birdwatchers visiting the site over the years.

In 2014-15, the watering of Tolderol was undertaken by Natural Resources SAMDB in partnership with local landholders and community volunteers. Three of the 17 bays received environmental water to provide extensive areas of shallow water and mudflat for migratory wader foraging.

## Results

A total of 45 waterbird species were observed at Tolderol during the environmental watering. Species of conservation significance observed include:

- Australasian shoveler
- elegant parrot (*Neophema elegans*)
- glossy ibis (*Plegadis falcinellus*)
- Latham's snipe (*Gallinago hardwickii*)
- long-toed stint (*Calidris subminuta*)
- pectoral sandpiper (*Calidris melanotos*)
- wood sandpiper (*Tringa glareola*)
- banded stilt (*Cladorhynchus leucocephalus*)
- blue-winged parrot (*Neophema chrysostoma*)
- curlew sandpiper (*Calidris ferruginea*)

Nine migratory wader species were recorded at the site during environmental watering. These were:

- common greenshank (*Tringa nebularia*)
- curlew sandpiper
- Latham's snipe
- long-toed stint
- marsh sandpiper (*Tringa stagnatilis*)
- pectoral sandpiper
- red-necked stint (*Calidris ruficollis*)
- sharp-tailed sandpiper (*Calidris acuminata*)
- wood sandpiper

A diverse range of functional groups were present during the environmental watering which is indicative of the range of habitats and other resources available at the site as a result of the watering.







# 10 Conclusion

The environmental watering program undertaken in 2014-15 resulted in many highly beneficial ecological outcomes being achieved across the SAMDB region. The monitoring program provides conclusive evidence that environmental water is important for maintaining wetland and floodplain ecosystems and processes in the absence of flood events within the SAMDB region.

Community support for environmental watering activities is growing, and it remains important to continue to develop engagement programs that increase community understanding of the importance of environmental watering. On-going monitoring and community engagement forms an important foundation for future watering activities, particularly during future drought and low flow years.







## For more information

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