Australian Government

Water for the Future

COMMONWEALTH ENVIRONMENTAL WATER

2009-10 Outcomes Report

(FRONT COVER)

WHITE EGRET AT TWIN BRIDGES, YANGA NATIONAL PARK, NSW

(November 2009) - Post-watering.

Photo by James Maguire (New South Wales Department of Environment, Climate Change and Water)

(OPPOSITE)

PERON'S TREE FROG, WIGLEY REACH, SOUTH AUSTRALIA

(October 2010)

Photo by Callie Nickolai (South Australia Murray-Darling Basin Natural Resources Management Board)

RECYCLED CONTENT · EMS ENVIRONMENTAL MANAGEMENT SYSTEMS · ECF ELEMENTAL CHLORINE FREE · ISO CERTIFICATION · CERTIFIED CO_2 NEUTRAL

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COMMONWEALTH ENVIRONMENTAL WATER

2009-10 Outcomes Report

Contents


QUEENSLAND
Warrego, Moonie &
Nebine Catchments
NEW SOUTH
WALES
Barwon-Darling
Catchment
Macquarie-Castlereagh
Catchment
SOUTH
AUSTRALIA
Murray Catchment
Murrumbidgee
Catchment
VICTORIA

Introduction

The 2009-10 water year saw one of the worst droughts on record continue across much of the Murray-Darling Basin. Annual allocations of water against entitlements were low compared to long-term averages. However, the increased size of the Commonwealth environmental water holdings allowed an increase in the delivery of environmental water. In 2009-10, 154 gigalitres of Commonwealth environmental water was delivered, compared to 12.7 gigalitres in 2008-09.

Because of the drought conditions, the focus of 2009-10 watering was to avoid critical loss of threatened species, avoid irretrievable damage or catastrophic events, and maintain key refuges to allow recolonisation when conditions improve.

This outcomes report provides information on the early results of 2009-10 watering actions. While the full results of Commonwealth environmental watering will take some years to emerge, early monitoring indicates that environmental water has produced benefits, such as improved canopy cover and health in river red gums, as well as drought refuges for rare and endangered flora and fauna.

Environmental watering in 2009-10 also contributed to successful bird breeding events and helped to reduce the risk of acidification of Lake Albert, South Australia. In-stream flows following widespread rainfall across the northern Basin, contributed to connected system benefits. In some cases, floodwaters, which included a small amount of Commonwealth environmental water, filled flood-runners and anabranches.

Commonwealth environmental water is delivered with strong cooperation between governments and other organisations, catchment management authorities and local community groups. This approach takes advantage of local knowledge and on-ground capacity to manage water. It ensures the Commonwealth delivers targeted local benefits, while maintaining a Basin-wide perspective.

This report includes examples where environmental outcomes have been enhanced because of effective working relationships across the Basin. During 2009-10, Commonwealth environmental water was delivered with an additional 169 gigalitres from other sources including state delivery partners and *The Living Murray* program. We welcome water use proposals being brought forward by any group operating in the Basin and we will assess these against our published criteria.

Experience shows how water can be actively managed to reduce the risk of permanent damage to environmental assets during drought. Following significant rain in the spring of 2010, there will be major improvements in the availability of environmental water. Increasingly, there will be watering actions taken that achieve benefits across multiple sites, catchments and jurisdictions.

Watering actions that achieve connected system benefits are expected to become the major element of Commonwealth environmental water use. Larger volumes will enable the scope of environmental watering to expand and therefore protect or restore a broader range of connected environmental assets. The objective is to achieve maximum system benefits from the available water.

As the size and complexity of Commonwealth environmental watering actions increase, so too will the emphasis placed on monitoring, evaluation and reporting. All current use has monitoring arrangements in place and we will be seeking to further develop this approach in the coming year.

The considerable assistance provided over 2009-10 from state agencies, catchment management authorities and local groups is greatly appreciated. We look forward to building on these relationships in the future.

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TWIN BRIDGES, YANGA NATIONAL PARK, NEW SOUTH WALES FOLLOWING ENVIRONMENTAL WATERING
(November 2009)
Photo by James Maguire (New South Wales Department of Environment, Climate Change and Water)

Context

To prepare for a future with less water, the Australian Government is implementing its *Water for the Future* initiative. This includes a major focus on the Murray-Darling Basin, including purchasing water for the environment, investing in more efficient irrigation infrastructure and the development of a Basin Plan by the Murray-Darling Basin Authority. Water acquired through *Water for the Future* becomes part of the Commonwealth environmental water holdings and will offset the expected impact of new sustainable diversion limits, which will be applied under the Basin Plan.

Environmental watering has a key role in ensuring the Murray-Darling Basin is a sustainable and productive system. Delivering water for the benefit of the environment achieves ecological objectives and contributes to maintaining healthy rivers and water quality. Healthy rivers are also essential for maintaining the social and economic wellbeing of Basin communities.

Commonwealth environmental water

Decisions on the use of Commonwealth environmental water holdings are made by the Commonwealth Environmental Water Holder, a statutory position established under the *Water Act 2007*. Under the Act, the objective of Commonwealth environmental watering is to protect or restore the environmental assets of the Basin. Water held in the Basin is required to be managed in accordance with the environmental watering plan being developed as part of the Basin Plan.

The amount of water available for use depends on the water entitlements acquired, and on seasonal water allocations. The water entitlements being acquired by the Commonwealth retain their existing characteristics. This means Commonwealth entitlements are subject to the same rules, restrictions and fees as other entitlements of the same kind, including carryover arrangements.

Using and monitoring Commonwealth environmental water

Active management of environmental water provides additional benefits because there is flexibility to address the highest environmental needs. This is important because of the integrated nature of the Basin's ecosystems and varying hydrological and climatic conditions.

In recent years, the available Commonwealth environmental water has largely been used within that year given the critical drought circumstances. An example of active management in wetter years will be the carrying over of water allocations (within the rules of water sharing plans) to provide some insurance for environmental assets against future drought.

Commonwealth water is being managed from a Basin-wide perspective in coordination with environmental water held by others. Working with state governments and local advisory groups allows us to benefit from local knowledge.

For each site watered in 2009-10, the relevant state government department, catchment management authority or local community group managed the delivery of the Commonwealth environmental water. These organisations are also monitoring the ecological responses and have reported to the Commonwealth on the preliminary outcomes of the watering presented in this report.

NEW SOUTH WALES OFFICE OF WATER STAFF CONDUCTING SITE MONITORING FOLLOWING ENVIRONMENTAL WATERING AT WILLANCORAH, MACQUARIE MARSHES, NEW SOUTH WALES
(November 2009)
Photo by Kaya Michener (New South Wales Office of Water)

Deciding where to use environmental water

Potential water use options are assessed and prioritised through a rigorous process, using published criteria, the best available scientific information and advice from the Environmental Water Scientific Advisory Committee. This committee is a panel of scientific experts appointed to advise on the use of environmental water. It comprises eminent scientists and experts in fields such as hydrology, limnology, river operations management, river and floodplain ecology, and the management of aquatic ecosystems. More information on the committee is available at:

www.environment.gov.au/water/policy-programs/cewh/committee.html

The objectives of the Commonwealth's environmental watering program depend on the prevailing climatic conditions. For example, in dry years the program will aim to ensure ecological capacity for recovery, while in wet years the program will aim to improve and extend healthy and resilient aquatic ecosystems. The 2009-10 year was extremely dry for much of the Murray-Darling Basin, so the primary objectives of the environmental watering program were to:

- avoid critical loss of threatened species
- avoid irretrievable damage or catastrophic events
- provide drought refuges to allow re-colonisation following the drought.

In delivering environmental water against these objectives in 2009-10, the Commonwealth focused on maximising ecological responses at a range of key environmental assets across the Murray-Darling Basin. This was considered the best way to use a small volume of environmental water for a Basin-wide response to the drought.

Further information on the decision framework for water use can be found in 'A Framework for Determining Commonwealth Environmental Watering Actions' at

www.environment.gov.au/water/publications/action/cewh-framework.html

CHOWILLA FLOODPLAIN, SOUTH AUSTRALIA, PRIOR TO ENVIRONMENTAL WATERING
(February 2010)
Photo by Oline Video Media

Summary of Commonwealth environmental watering in 2009-10

The significantly larger volume of water available in 2009-10 compared to 2008-09, provided the opportunity to build on and expand the scope of environmental watering to protect and restore a broader range of environmental assets.

Of the 187 gigalitres available, 154 gigalitres was delivered during the 2009-10 water year. Wetlands and floodplains in the Murray, Murrumbidgee and Macquarie catchments received 98 gigalitres. These watering events built on and consolidated environmental water use in 2008-09, in some cases with much larger volumes, such as at Hattah Lakes in Victoria. Water was delivered in larger volumes at the Lowbidgee Floodplain in New South Wales (48.74 gigalitres) and at Lake Albert in South Australia (20 gigalitres).

A further 56 gigalitres was used to contribute to in-stream and overbank flows in the Warrego and Moonie Rivers, Nebine Creek, the Darling River and Ovens catchments. These flows represent a new and what will be an increasing feature of the Commonwealth's environmental watering activities in future years.

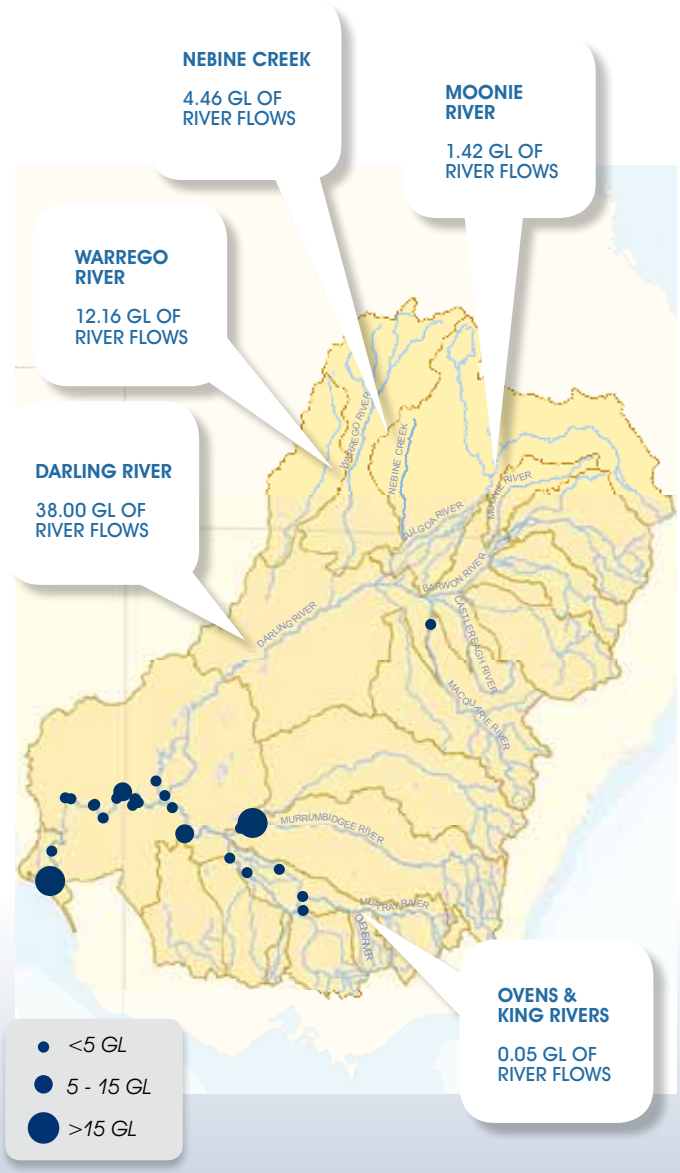
A total of 34 gigalitres was carried over for delivery in 2010-11. Of this, 11 gigalitres was committed for use at Hattah Lakes, Lake Wallawalla and Chowilla Floodplain early in the new water year. Carrying over water allowed late winter and early spring environmental needs to be met when seasonal water allocations were low.

AN EGRET FEEDING IN RESIDUAL POOLS AT TWIN BRIDGES, YANGA NATIONAL PARK, NEW SOUTH WALES FOLLOWING ENVIRONMENTAL WATERING

(October 2009)

Photo by James Maguire (New South Wales Department of Environment, Climate Change and Water)

The following sites received Commonwealth environmental water in the 2009-10 year:



Commonwealth environmental water delivered in 2009-10		
	Murray Catchment (wetlands, floodplains, in-stream and overbank flows)	Commonwealth water delivered (GL)
1	Chowilla Floodplain, near Renmark, SA & NSW	7.35
2	Hattah Lakes, near Mildura, Vic	7.06
3	Katarapko Creek Wetlands, near Berri, SA	0.02
4	Lake Albert, near the Murray Mouth, SA	20.00
5	Lake Wallawalla, near Mildura, Vic	4.15
6	Lower NSW Murray (Andruco Lagoon, Boeill Floodplain, Cliffhouse 1 and 2, Grand Junction, Nampoo, Wee Wee Creek)	1.75
7	Molo Flat, near Waikerie, SA	0.33
8	Morgan Conservation Park, near Morgan, SA	0.32
9	Ovens & King River, near Wangaratta, Vic	0.05
10	Overland Corner Complex, near Kingston-on-Murray, SA	0.20
11	Paiwalla Wetland, near Murray Bridge, SA	0.24
12	Toupna Creek, Millewa State Forest, near Deniliquin, NSW	1.50
13	Weila, near Renmark, SA	0.22

Commonwealth environmental water delivered in 2009-10		
14	Werai Forest, near Deniliquin, NSW	4.50
15	Wigley Reach, near Renmark, SA	0.25
	Total	47.93

	Murrumbidgee Catchment (wetlands and floodplains)	
16	North Redbank, Lowbidgee Floodplain, near Balranald, NSW	1.60
17	Yanga National Park, Lowbidgee Floodplain, near Balranald, NSW	47.14
	Total	48.74

	Macquarie-Castlereagh (wetlands and floodplains)	
18	Macquarie Marshes, near Dubbo, NSW	0.93
	Total	0.93

	Barwon-Darling Catchment (wetlands and floodplains)	
19	Darling River, NSW	37.99
	Total	37.99

Commonwealth environmental water delivered in 2009-10		
	Warrego, Moonie and Nebine (in-stream and overbank flows)	
20	Moonie River, Qld (approximately 230 km of river)	1.42
21	Nebine Creek, Qld (approximately 70 km of river)	4.46
22	Warrego River, Qld (approximately 400 km of river)	12.16
	Total	18.03

	Total 2009-10	153.62

Murray Catchment

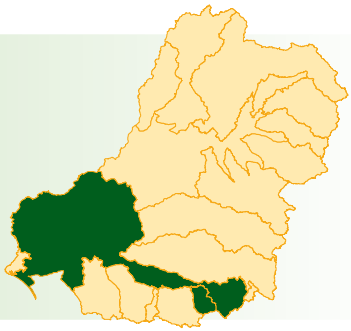
The Murray Catchment spans southern New South Wales, northern Victoria and south-eastern South Australia,. It represents 19.5 per cent of the total area of the Murray-Darling Basin. The catchment includes the River Murray and lower Darling River below Menindee, and extends the full length of the River Murray to the Southern Ocean.

CARPARK LAGOONS IN THE KATARAPKO FLOODPLAINS SOUTH AUSTRALIA - FOLLOWING ENVIRONMENTAL WATERING
(April 09)
Photo by Mark Mohell (Department of Sustainability, Environment, Water, Population and Communities)

Throughout the catchment there are many wetlands and river reaches that support a diverse range of flora and fauna. Areas of the Murray Catchment are recognised internationally and nationally under the Ramsar Convention and the Directory of Important Wetlands in Australia.

The Murray Catchment is home to some of the largest river red gum forests in Australia. The effects of drought, climate change, and high levels of extraction have reduced river flows in the catchment, resulting in a decline in the ecological health of many forests and their understorey vegetation. This decline is jeopardising the habitat of a diverse range of fauna, such as the threatened regent parrot (*Polytelis anthopeplus monarchoides*), that are dependant on the river red gum forests. The Murray-Darling Basin Authority Sustainable Rivers Audit (2008) reported overall ecosystem health of the Murray Catchment ranged from poor to very poor.

In 2009-10, the Murray Catchment received nearly 48 gigalitres of Commonwealth environmental water which was delivered to the following sites.



1 CHOWILLA FLOODPLAIN, SA & NSW

VOLUME: 7.35 GL **ENVIRONMENTAL WATERING OBJECTIVE:** Support black box (*Eucalyptus largiflorens*) and understorey vegetation, and provide habitat for waterbird species. **SEASON:** Autumn-Winter 2010

2 HATTAH LAKES, VIC

VOLUME: 7.06 GL **ENVIRONMENTAL WATERING OBJECTIVE:** Provide drought refuge for a range of species and prevent further decline in stressed river red gum (*Eucalyptus camaldulensis*) communities. **SEASON:** Spring 2009 & Autumn-Winter 2010

3 KATARAPKO CREEK WETLANDS, SA

VOLUME: 0.02 GL **ENVIRONMENTAL WATERING OBJECTIVE:** Avoid further loss of mature river red gum vegetation and provide drought refuge and habitat for the southern bell frog (*Litoria raniformis*) and regent parrot. **SEASON:** Autumn 2010

4 LAKE ALBERT, SA

VOLUME: 20.00 GL **ENVIRONMENTAL WATERING OBJECTIVE:** Reduce the risk of acidification in the lake. **SEASON:** Autumn 2010

5 LAKE WALLAWALLA, VIC

VOLUME: 4.15 GL **ENVIRONMENTAL WATERING OBJECTIVE:** Support fringing river red gum and black box woodlands, and provide drought refuge for waterbirds. **SEASON:** Autumn-Winter 2010

6 LOWER AND MID NSW MURRAY (ANDRUCO LAGOON, BOEILL FLOODPLAIN, CLIFFHOUSE 1 AND 2, GRAND JUNCTION, NAMPOO, WEE WEE CREEK, NSW)

VOLUME: 1.75 GL **ENVIRONMENTAL WATERING OBJECTIVE:** Support riparian vegetation and improve wetland habitat. **SEASON:** Spring 2009 & Autumn 2010

10 OVERLAND CORNER, SA
Volume 0.2 GL

1 CHOWILLA FLOOD PLAIN
Volume 7.35 GL

11 PAIWALLA WETLANDS
Volume 0.24 GL

2 HATTAH LAKES, VIC
Volume 7.06 GL

9 OVENS & KINGS RIVERS
0.05 GL OF RIVER FLOWS

7 MOLO FLAT, SA

VOLUME: 0.33 GL **ENVIRONMENTAL WATERING OBJECTIVE**: Provide important drought refuge for threatened wetland species, including the southern bell frog and regent parrot. **SEASON:** Autumn 2010

8 MORGAN CONSERVATION PARK, SA

VOLUME: 0.32 GL **ENVIRONMENTAL WATERING OBJECTIVE**: Support river red gums and provide drought refuge for regent parrots and southern bell frogs. **SEASON:** Autumn 2010

9 OVENS & KING RIVER, VIC

VOLUME: 0.05 GL **ENVIRONMENTAL WATERING OBJECTIVE:** Improve in-stream habitat. **SEASON:** Autumn 2010

10 OVERLAND CORNER, SA

VOLUME: 0.2 GL **ENVIRONMENTAL WATERING OBJECTIVE:** Prevent the loss of river red gum and lignum (*Muehlenbeckia florulenta*) communities, and provide habitat for threatened species including the regent parrot and southern bell frog. **SEASON:** Autumn 2010

11 PAIWALLA WETLAND, SA

VOLUME: 0.24 GL **ENVIRONMENTAL WATERING OBJECTIVE:** Protect long-lived river red gums and provide refuge habitat to waterbird communities. **SEASON:** Autumn 2010

12 TOUPNA CREEK, MILLEWA STATE FOREST, NSW

VOLUME: 1.50 GL **ENVIRONMENTAL WATERING OBJECTIVE:** Protect river red gum habitat and provide habitat for aquatic species, in particular the southern pygmy perch (*Nannoperca australis*). **SEASON:** Spring 2009

13 WEILA, SA

VOLUME: 0.22 GL **ENVIRONMENTAL WATERING OBJECTIVE:** Support river red gum health and provide drought refuge for regent parrots and southern bell frogs. **SEASON:** Autumn 2010

14 WERAI FOREST, NSW

VOLUME: 4.50 GL **ENVIRONMENTAL WATERING OBJECTIVE:** Provide drought relief for the creeks and fringing vegetation running through the forest including river red gum communities and aquatic plant species. **SEASON:** Spring 2009

15 WIGLEY REACH, SA

VOLUME: 0.25 GL **ENVIRONMENTAL WATERING OBJECTIVE:** Support river red gum health and provide drought refuge for regent parrots and southern bell frogs. **SEASON:** Autumn 2010

PRIOR TO

CARPARK LAGOONS, KATARAPKO FLOODPLAIN, SOUTH AUSTRALIA PRIOR TO ENVIRONMENTAL WATERING

(March 2009)

Photo by Mark Mohell (Department of Sustainability, Environment, Water, Population and Communities)

FOLLOWING

CARPARK LAGOONS, KATARAPKO FLOODPLAIN, SOUTH AUSTRALIA FOLLOWING ENVIRONMENTAL WATERING

(November 2009)

Photo by Mark Mohell (Department of Sustainability, Environment, Water, Population and Communities)

Feature site: Chowilla Floodplain

BLACKBOX AT COOMBOOL SWAMP ON THE CHOWILLA FLOODPLAIN, SOUTH AUSTRALIA FOLLOWING ENVIRONMENTAL WATERING (November 2010).

Photo by Erin Lenon (South Australian Murray-Darling Basin Natural Resources Management Board)

Background

The Chowilla Floodplain is situated north of Renmark on the border of South Australia and New South Wales. A large proportion of the 17,700 hectare floodplain is recognised internationally and nationally under the Ramsar Convention and the Directory of Important Wetlands in Australia. The Chowilla Floodplain is also part of an icon site of *The Living Murray* program.

The Chowilla Floodplain is the largest area of remaining natural riverine forest along the lower River Murray and contains a rich diversity of aquatic habitats. Drought and reduced flows in the River Murray have resulted in a significant decline in ecological health at Chowilla, including the death of mature river red gum and black box trees.

To improve the efficiency of water delivery to Chowilla Floodplain, construction has commenced on a major environmental flow regulator. The project is being funded through *The Living Murray Environmental Works and Measures* program and will help provide much needed water to up to 40 per cent of the floodplain.

Watering actions in 2009-10

The watering actions at Chowilla Floodplain were based on proposals put forward by the South Australian Department for Water to deliver water to Lake Limbra and Coombool Swamp, two large ephemeral lakes on the floodplain. A total of 7.35 gigalitres of Commonwealth environmental water was delivered to Chowilla Floodplain in autumn 2010. The watering of Coombool Swamp continued through winter, with a further 0.5 gigalitres contributed by the Commonwealth and 1 gigalitre of water contributed by the South Australian Government in the early part of 2010-11.

The Commonwealth and South Australian governments jointly funded the delivery of the environmental water to Lake Limbra and Coombool Swamp through metered pumps. Water delivery and ecological monitoring was managed by the South Australian Murray-Darling Basin Natural Resources Management Board.

Aims

The health of the Chowilla Floodplain has declined due to drought and the effects of salinity. Prior to environmental watering, Lake Limbra and Coombool Swamp had not received water for more than 10 years. The key aims of the Commonwealth environmental watering actions at Chowilla Floodplain were to support declining black box and understorey vegetation during the drought, and provide habitat for wetland dependent species such as waterbirds.

Outcomes

These watering actions built on previous Commonwealth environmental watering in which 1.70 gigalitres was delivered to Chowilla Floodplain in 2008-09. Commonwealth environmental water delivery in 2008-09 improved the health of aquatic and understory vegetation, which provided important habitat for frogs, including the threatened southern bell frog. The 2008-09 watering actions also provided drought refuge for waterbirds and improved foraging opportunities for birds of prey.

The environmental water delivered to the site in autumn 2010 inundated large sections of lignum, a native Australian shrub that provides important habitat for waterbirds and frogs. During preliminary monitoring, 25 species of waterbird were observed at Lake Limbra and Coombool Swamp, including the Australasian shoveler (*Anas rhynchotis*) and intermediate egret (*Ardea intermedia*), which are both listed as threatened under South Australian environmental law.

In July 2010, early monitoring of black box health at Lake Limbra and Coombool Swamp indicated a marginal improvement in health at that early stage. Recovery is expected to be slow due to the poor tree health at the time of watering, and is likely to require repeated watering to consolidate the benefits.

"Watering Limbra and Coombool is a positive first step in the long term recovery of these wetlands, which are planned to be inundated on a more frequent basis under operation of the Chowilla environmental regulator, currently under construction. It should be noted that while this site is showing early signs of improvement, the full benefits of watering these large sites would not necessarily be realised in one watering event."

(Erin Lenon, Chowilla Project Ecologist, South Australian Murray-Darling Basin Natural Resources Management Board)

RIVER RED GUMS ON THE RIVER MURRAY NEAR MARKARANKA FLOODPLAIN, SA
(November 2009)
Photo by Simon Banks (Department of Sustainability, Environment, Water, Population and Communities)

River red gum

Eucalyptus camaldulensis

River red gum forests tend to occur on deep heavy sedimentary soils. River red gums can grow up to 45 metres tall and have a smooth reddish brown, grey or white bark, which sheds regularly in distinctive long ribbons.

Throughout the Basin, the tree plays an important role in stabilising river banks, holding the soil and slowing flooding. River red gums also provide important habitat for a wide range of animals. Tree hollows are used for nesting, flowers are used for food, and fallen dead branches provide habitat for terrestrial mammals and fish.

Periodic flooding provides for seed dispersal, regeneration and growth. During the course of the last 100 years, river regulation and altered flooding regimes have impacted on the health of river red gum forests throughout the Basin. The Commonwealth has used environmental water to support river red gum forests at a number of sites throughout the Murray-Darling Basin, including Hattah Lakes, Overland Corner and the Macquarie Marshes.

A RIVER RED GUM ON THE MARKARANKA FLOODPLAIN, SOUTH AUSTRALIA FOLLOWING ENVIRONMENTAL WATERING

(November 2009)

Photo by Simon Banks (Department of Sustainability, Environment, Water, Population and Communities)

Feature site: Hattah Lakes

Background

Hattah Lakes is a complex of 20 freshwater lakes located approximately 50 kilometres south-east of Mildura, Victoria. The site is recognised nationally under the Directory of Important Wetlands in Australia and 12 of the lakes are recognised internationally under the Ramsar Convention.

Hattah Lakes provides important feeding, nesting and breeding habitat for more than 50 waterbird species, including the freckled duck (*Stictonetta naevosa*), pacific black duck (*Anas superciliosa*), grey teal (*Anas gracilis)* and Australian pelican (*Pelecanus conspicillatus*). The river red gum forests fringing the wetlands also provide habitat for the threatened regent parrot.

To make water delivery to Hattah Lakes more efficient, works funded through *The Living Murray Environmental Works and Measures* program are being constructed. These works will include lowering the inlet to Chalka Creek to allow more frequent flows from the River Murray into the lakes and a permanent pump station to deliver water at a low cost to the lakes during extended periods of low river flow. Regulators and levees will also be built to hold water at higher levels in the lakes.

Watering actions in 2009-10

The watering actions at Hattah Lakes were based on proposals put forward by the Victorian Department of Sustainability and Environment. A total of 15.56 gigalitres of environmental water was delivered to Hattah Lakes, of which the Commonwealth contributed 7.06 gigalitres, *The Living Murray* program contributed 2.34 gigalitres, the Victorian Government contributed 3.1 gigalitres and 0.4 gigalitres was contributed from public donations through the Australian Conservation Foundation.

The delivery of environmental water and ecological monitoring at Hattah Lakes was managed by the Victorian Department of Sustainability and Environment, the Mallee Catchment Management Authority and Parks Victoria.

PRIOR TO

HATTAH LAKES, VICTORIA PRIOR TO ENVIRONMENTAL WATERING

(April 2009)

Photo by Mark Mohell (Department of Sustainability, Environment, Water, Population and Communities)

FOLLOWING

HATTAH LAKES, VICTORIA FOLLOWING ENVIRONMENTAL WATERING

(November 2009)

Photo by Mark Mohell (Department of Sustainability, Environment, Water, Population and Communities)

Aims

The key aims of environmental watering at Hattah Lakes in 2009-10 were to provide drought refuge for a range of water-dependent species, such as waterbirds and frogs, and to prevent further decline in stressed river red gum forests. An additional aim was to build on the ecological benefits achieved from previous Commonwealth environmental watering actions in 2008-09. Four of the 13 lakes inundated in 2009-10 had not received water for 14 years.

Outcomes

These watering actions built on environmental watering in 2008-09, which delivered 4.9 GL to four lakes and included 2.12 GL of Commonwealth environmental water. Commonwealth environmental water delivery in 2008-09 supported river red gum forests that fringe the lakes and provided effective drought refuge for waterbirds. Aquatic vegetation responded strongly, supporting increased macroinvertebrate and fish communities.

River red gum health continued to improve following the 2009-10 watering actions at Hattah Lakes. By December 2009, the inundated area at the site was 586 hectares. The extent of inundation was increased during 2010 to approximately 1089 hectares. This led to a greater inundation of stressed river red gum forests and other wetland vegetation. The trees fringing the watered lakes have exhibited vigorous foliage growth and increased canopy cover. Monitoring conducted by the Mallee Catchment Management Authority has shown that aquatic vegetation is also responding well, supporting an increase in aquatic insects and frogs.

Waterbirds have flocked to the lakes in their thousands since the water was delivered. Waterbird surveys undertaken by *The Living Murray* at the site have observed more than 3200 birds including state listed threatened species such as the Australasian shoveler, blue-billed duck (*Oxyura australis*) and musk duck (*Biziura lobata*). It was reported that waterbird diversity and abundance at Hattah Lakes peaked following the delivery of environmental water.

A survey of frog calls identified five frog species at Hattah Lakes: the Peron's tree frog (*Litoria peronii)*, eastern banjo frog (*Limnodynastes dumerilii*), plains froglet (*Crinia parinsignifera*), spotted marsh frog (*Limnodynastes tasmaniensis)* and the common spadefoot toad (*Neobatrachus sudelli*).

In addition to the ecological benefits of these watering actions, the regeneration of the wetlands is likely to provide social and economic benefits for the broader regional community, such as improved water quality, increased tourism and recreation opportunities for local communities.

Hattah Lakes, like many wetlands in the Murray-Darling Basin, has suffered from many years of drought, river regulation and over extraction. Environmental watering by the Commonwealth and others is helping to ensure the environmental values of this important site are maintained. The Commonwealth delivered a further 9.34 GL of environmental water to Hattah Lakes in early 2010-11 to continue to support the site.

HATTAH LAKES, VICTORIA FOLLOWING ENVIRONMENTAL WATERING
(December 2009)
Photo by Mark Mohell (Department of Sustainability, Environment, Water, Population and Communities)

Regent parrot

Polytelis anthopeplus monarchoides

The regent parrot (eastern subspecies) is listed as vulnerable under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*. It is a slim, medium-sized parrot of about 37 to 42 centimetres in length. The males are a brilliant golden-yellow with a dark green back, blue-black flight feathers and a red band across the mid-wings. Female birds and juveniles are similarly patterned but are greener around the head and neck.

The regent parrot commonly uses tree hollows in river red gum forests and black box woodlands for nesting, usually in small colonies of up to 30 pairs within a short distance from permanent water. They forage on seeds, buds, flowers and sometimes on insect larvae, over large areas, sometimes up to 12 kilometres from their nests.

The population of regent parrots has declined due to clearance and degradation of large areas of breeding and foraging habitat, such as mallee and river red gum forests. Today, their continued survival is threatened by land clearing of nesting and foraging sites, long periods of drought, agricultural intensification and disease.

Surveys along the River Murray in South Australia in 1991 and again in 2003 indicated the number of breeding birds had declined by about 30 per cent during that 12 year period. It is estimated that the total population of breeding regent parrots is less than 2500.

By supporting river red gum forests, such as those at Hattah Lakes and Overland Corner, Commonwealth environmental water is helping to ensure there is habitat available for the long-term survival of this Australian bird species.

Information on the regent parrot was sourced from: *The Environment Protection and Biodiversity Conservation Act 1999* Regent Parrot Listing Advice, 16 July 2000; and the Birds Australia, Birds in Backyards website: http://birdsinbackyards.net/species/Polytelis-anthopeplus

REGENT PARROT AT HATTAH LAKES, VICTORIA FOLLOWING ENVIRONMENTAL WATERING
(January 2010)
Photo by Mallee Catchment Management Authority.

Feature site: Overland Corner

Background

Overland Corner is located on the River Murray floodplain north of Kingston-on-Murray, South Australia. The site has been managed by the National Trust of South Australia and the Overland Corner Wetland Group since 1997. Overland Corner is adjacent to the Banrock regent parrot breeding colony and provides important habitat for this threatened species. The site also provides habitat for 15 migratory bird species, including the Caspian tern (*Sterna caspia*) and great egret (*Ardea alba*).

The Overland Corner Wetland Group, a local community organisation, has made a significant contribution to the management of the site. In 2006, as part of a project to flood the wetland, the group found an old irrigation pump in a paddock and restored it for use at the site.

Watering actions in 2009-10

The watering actions at the site were based on proposals put forward by the South Australian Department for Water. Overland Corner received 0.5 gigalitres including 0.2 gigalitres contributed by the Commonwealth and 0.3 gigalitres contributed by the South Australian Government.

The environmental water delivery was managed by the South Australian Murray-Darling Basin Natural Resources Management Board. The water was delivered to Overland Corner using a private landholder's pump and ecological monitoring was undertaken by the Overland Corner Wetland Group in collaboration with the South Australian Murray-Darling Basin Natural Resources Management Board.

Aims

The 2009-10 environmental water delivery program at Overland Corner aimed to prevent the loss of river red gum forests and lignum communities, which were under severe stress due to the extended drought. This is important habitat for species, including the threatened regent parrot and southern bell frog. The watering also aimed to provide refuge and habitat for floodplain-dependent species, such as the Australasian shoveler and freckled duck.

Outcomes

The 2009-10 environmental watering at Overland Corner has built on the ecological benefits of previous watering actions in 2008-09 by reducing the decline of river red gums during the drought. Many river red gums have responded positively and fewer trees are showing signs of significant stress. River red gum saplings and juveniles have had the chance to become established as a result of the environmental watering.

Improvements in water quality were recorded immediately after environmental watering actions. Cleaner and clearer water allows sunlight to penetrate the water column to stimulate aquatic plant growth. Aquatic vegetation on the wetland bed, such as spiny lignum (*Muehlenbeckia horrida*), is now in good health.

Frog monitoring undertaken by the South Australian Murray-Darling Basin Natural Resources Management Board at Overland Corner indicated a rapid response to the watering action. The environmental watering and subsequent improvement in aquatic vegetation supported frog breeding.

Seven frog species were observed at the site, including the spotted marsh frog, plains froglet and eastern banjo frog. The painted frog (*Neobatrachus pictus*), which previously had only been recorded at one location within the wetland and is uncommon on the River Murray floodplain in South Australia, was found at three locations at Overland Corner. Large numbers of threatened southern bell frog tadpoles have also been observed at the site.

LIGNUM COMMUNITY, OVERLAND CORNER, SOUTH AUSTRALIA FOLLOWING ENVIRONMENTAL WATERING
(November 2009)

Photo by Simon Banks (Department of Sustainability, Environment, Water, Population and Communities)

Feature site: Paiwalla Wetland

PAIWALLA WETLAND, SOUTH AUSTRALIA FOLLOWING ENVIRONMENTAL WATERING
(November 2009)
Photo by Simon Banks (Department of Sustainability, Environment, Water, Population and Communities)

Background

Paiwalla Wetland is located on the River Murray Floodplain between the towns of Murray Bridge and Mannum in South Australia. The site forms part of the Lower Murray Swamps, which are nationally recognised under the Directory of Important Wetlands in Australia. The wetland was once an irrigated dairy property, but during the past 10 years the site has been owned and managed by Wetland Habitats Trust, a local community group. The Wetland Habitats Trust has worked to rehabilitate Paiwalla wetland and restore its original ecological values.

Paiwalla Wetland is nationally significant as it is one of a few sites in South Australia that support a population of southern purple-spotted gudgeon (*Mogurnda adspersa*), listed as threatened under South Australian environmental law. Several other threatened species are also found at the site including the nationally listed painted snipe (*Rostratula australis*). Wetland habitat has declined at the site due to lower river levels.

Watering actions in 2009-10

The watering actions at Paiwalla Wetland were based on proposals put forward by the South Australian Department for Water, with 0.38 gigalitres of environmental water delivered to the site. This comprised 0.24 gigalitres contributed by the Commonwealth and 0.14 gigalitres contributed by other sources, including 0.09 gigalitres from the environmental land management allocation to the Wetland Habitats Trust and 0.05 gigalitres from a private donation.

The Wetland Habitats Trust and the South Australian Murray-Darling Basin Natural Resources Management Board managed delivery of the water, jointly funded by the Commonwealth and South Australian Governments. The South Australian Murray-Darling Basin Natural Resources Management Board and the Wetland Habitats Trust monitored the ecological outcomes of the water delivery, including conducting surveys of bird, fish and frog populations. With the help of these local and state organisations, a total of 0.87 gigalitres of Commonwealth environmental water has been delivered to Paiwalla Wetland between 2009 and 2010.

Aims

The key aims of the 2009-10 environmental watering at Paiwalla Wetland were to provide refuge habitat for wetland-dependent communities during the extended drought, improve water quality and prevent the exposure of acid sulphate soils.

Outcomes

The 2009-10 watering action built on previous Commonwealth environmental watering in which 0.63 gigalitres was delivered to Paiwalla Wetland in 2008-09. Commonwealth environmental water delivery in 2008-09 improved water quality at the site, which benefited small-bodied native fish and supported frog breeding.

Following the environmental watering action in 2009-10, native water milfoil (*Myriophyllum*) germinated on inundated areas of the wetland and now covers a greater area. This has increased the foraging habitat for waterbirds, such as black swans (*Cygnus atratus*) and ducks, and for fish and tadpoles. Birds observed by the Wetland Habitats Trust during and after the water delivery included migratory waterbird species such as the glossy ibis (*Plegadis falcinellus*) and wood sandpiper (*Tringa glareola*). Musk ducks and black swans were observed nesting at the site.

The 2009-10 and earlier watering actions have improved the health of river red gums. Canopy density of these trees has improved and new growth is evident. The main lagoon at Paiwalla Wetland, which has benefited most from environmental watering, has shown the greatest improvement in tree health.

A total of seven species of frogs, including Peron's tree frog, eastern banjo frog, spotted marsh frog, common froglet (*Crinia signifera*), barking marsh frog (*Limnodynastes fletcheri*) and the threatened southern bell frog were recorded by the South Australian Murray-Darling Basin Natural Resources Management Board. Many of these species were found in high abundance.

Water quality at Paiwalla Wetland improved after the delivery of environmental water. Surface water salinity was significantly reduced, providing better conditions for breeding activity for small native fish and other species that inhabit the wetland. Species observed at the site following watering included the long-necked turtle (*Chelodina longicollis*), yabbies (*Cherax destructor*) and fish species, including carp gudgeon (*Hypseleotris*), flathead gudgeon (*Philypnodon grandiceps*), dwarf flathead gudgeon (*Philypnodon macrostomus*) and Australian smelt (*Retropinna semoni*).

Murray hardyhead
(Craterocephalus fluviatilis)

Murray hardyhead is a small native fish, which is listed as vulnerable under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999.* It was once widespread and common throughout the lower Murray-Darling Basin in South Australia, Victoria and New South Wales. In New South Wales, there has only been one record of the Murray hardyhead in the last 30 years, and the species is thought to be locally extinct. Today, it is only known to survive in a few isolated locations in Victoria and South Australia.

The species is usually found in schools of distinct size classes. Juveniles are found throughout lakes, in open areas with fringing vegetation. Adults have been observed in shallow habitats including open sand banks. The species also appears to tolerate highly saline waters but requires lower salinity levels to breed.

Several introduced fish species, including common carp (*Cyprinus carpio*), goldfish (*Carassius auratus*) and eastern gambusia (*Gambusia holbrooki*) commonly occur with Murray hardyheads. The precise impact of these introduced species on Murray hardyheads is not known, but the species' small size and requirement for aquatic vegetation in which to spawn makes it particularly vulnerable to predation and habitat degradation.

Murray hardyhead breeding has occurred following Commonwealth environmental watering at Rocky Gully in South Australia.

Information on the Murray hardyhead was sourced from the *Environment Protection and Biodiversity Conservation Act 1999* Murray Hardyhead Listing Advice, 16 July 2000.

MURRAY HARDYHEAD.
Photo by South Australian Murray-Darling Basin Natural Resources Management Board

Feature site: Werai Forest

Background

Werai Forest is located on the riverine plains of the River Murray, 40 kilometres northwest of Deniliquin, New South Wales. The site covers a 12,000 hectare floodplain at the intersection of the Edward River with the Colligen Creek and Niemur River. Werai Forest is one of three forests that make up the New South Wales Central Murray State Forests site which is recognised internationally and nationally under the Ramsar Convention and the Directory of Important Wetlands in Australia.

The Werai Forest floodplain contains areas of low-lying marshes and channels which distribute water, but much of the forest is only ever flooded by overbank flows. River regulation and the construction of water regulators in the forest have significantly reduced the frequency and duration of flooding in the wetlands, negatively impacting on the natural wetland biodiversity within the forest.

Watering actions in 2009-10

The watering actions at Werai Forest were based on proposals put forward by the New South Wales Department of Environment, Climate Change and Water. In spring 2009, the Commonwealth delivered 4.5 gigalitres of environmental water to the site. The water delivery and monitoring was managed by the New South Wales Department of Environment, Climate Change and Water and the Murray-Darling Basin Authority.

Aims

The key aims of the water delivery were to provide drought relief for the wetland vegetation, including stands of common reed (*Phragmites australis*) and river red gum forests, and to improve overall wetland health.

Outcomes

Commonwealth environmental water achieved significant overall ecosystem improvements in the Werai Forest. Plant species in Werai Forest responded positively following the Commonwealth environmental watering action. River red gum health improved in the flooded areas. New growth and an increase in canopy density were observed. Growth and flowering of aquatic species, including common reed, common nardoo (*Marsilea drummondii*), spiny mudgrass (*Pseudoraphis spinescens*) and lignum, was observed after the water delivery. Warrego summer grass (*Paspalidium jubiflorum*) became more robust and seeded well in flooded areas.

Monitoring undertaken by the New South Wales Department of Environment, Climate Change and Water and Ecosurveys Pty Ltd indicated that the increased connectivity created by the watering action allowed fish to move upstream within the Werai Forest system. Hundreds of small fish were observed in flood runners after environmental water had receded from the majority of the forest floodplain area. This abundance of fish supported waterbirds, such as azure kingfishers (*Alcedo azurea*) and little pied cormorants (*Phalacrocorax melanoleucos*).

Other bird species observed foraging in the wetlands include the white-bellied sea-eagle (*Haliaeetus leucogaster*), grey teal, white-faced heron (*Egretta novaehollandiae*) and black-tailed native-hen (*Gallinula ventralis*). Nankeen night herons (*Nycticorax caledonicus*) and great cormorants (*Phalacrocorax carbo*) were observed roosting in the forest and pacific black ducks were observed with ducklings.

The improved wetland vegetation also provided habitat for many frog species, including the Peron's tree frog, plains froglet, spotted marsh frog and common froglet. Surveys reported the presence of frog egg masses among the aquatic vegetation and foraging tadpoles were observed. Long-necked turtles were also observed feeding in the wetlands.

LONG-NECKED TURTLE, WERAI FOREST, NEW SOUTH WALES FOLLOWING ENVIRONMENTAL WATERING
(December 2009)
Photo by Emma Wilson (New South Wales Department of Environment, Climate Change and Water)

Murrumbidgee Catchment

The Murrumbidgee Catchment covers an area of approximately 8.8 million hectares and spans a section of southern New South Wales and the Australian Capital Territory.

The Murrumbidgee Catchment has a diverse climate, including the alpine areas of Kosciuszko National Park and the Monaro Plains, the rich grazing and grain belts of the south west slopes and plains, and the shrublands and grasslands of the semi-arid western Riverina. The Murray-Darling Basin Authority Sustainable Rivers Audit, published in 2008, reported the overall ecosystem health of the Murrumbidgee Catchment as very poor.

The most extensive wetland area in the catchment is the Lowbidgee Floodplain, which covers an area of about 200,000 hectares. The Lowbidgee Floodplain is nationally recognised under the Directory of Important Wetlands in Australia and includes some of the largest lignum wetlands in New South Wales. River red gum forest dominates the floodplain vegetation, with black box on the margins.

The Lowbidgee Floodplain is one of several sites in the Murrumbidgee Catchment that supports a diverse range of waterbirds. The Lowbidgee is one of the most important breeding sites in eastern Australia for the straw-necked ibis (*Threskiornis spinicollis*). The wetland also provides critical breeding habitat for many other waterbirds, including the Australian white ibis (*Threskiornis molucca*), glossy ibis, royal spoonbill (*Platalea regia*) and great egret. The threatened southern bell frog is also found on the Lowbidgee Floodplain.

As the Murrumbidgee Catchment remained in drought in 2009-10, Commonwealth environmental watering actions focussed on maintaining drought refuge and sustaining healthy wetland communities. Almost 49 gigalitres of Commonwealth environmental water was delivered to North Redbank and Yanga National Park.

(ABOVE)

EGRETS AND IBIS DOWN STREAM OF TWIN BRIDGES, YANGA NATIONAL PARK, NEW SOUTH WALES FOLLOWING ENVIRONMENTAL WATERING

(November 2009)

Photo by James Maguire (New South Wales Department of Environment, Climate Change and Water)

(BELOW)

PAIR OF GREAT EGRETS, TWIN BRIDGES YANGA NATIONAL PARK

(November 2009)

Photo by James Maguire (New South Wales Department of Environment, Climate Change and Water)

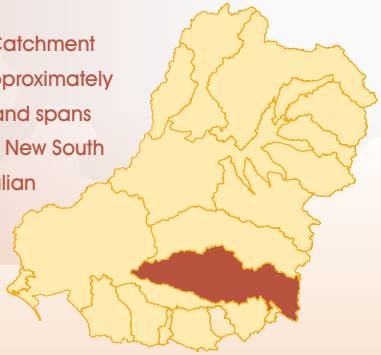
16 NORTH REDBANK

Volume 1.60 GL

17 YANGA NATIONAL PARK

Volume 47.14 GL

The Murrumbidgee Catchment covers an area of approximately 8.8 million hectares and spans a section of southern New South Wales and the Australian Capital Territory.



16 NORTH REDBANK

VOLUME: 1.60 GL **AIM**: To maintain wetland vegetation and river red gum communities to provide habitat for wetland species such as waterbirds, fish, frogs and turtles. **SEASON:** Autumn 2010

17 YANGA NATIONAL PARK

VOLUME: 47.14 GL **AIM:** To maintain and enhance the condition of river red gum forests and other critical habitat for wetland species, such as the threatened southern bell frog, and to support a colonial bird breeding event. **SEASON:** Spring 2009 to Summer 2009-10 & Autumn 2010 to Winter 2010

Feature site: North Redbank

LOOKING DOWNSTREAM FROM MURRUNDI AT SPRINGBANK BRIDGE INTO SPRINGBANK SWAMP, NORTH REDBANK FOLLOWING ENVIRONMENTAL WATERING
(March 2010)
Photo by Rachael Alderuccio (Local landholder)

Background

North Redbank is located in south-western New South Wales on the Lowbidgee Floodplain. The site consists of predominantly river red gum forests, healthy populations of which are becoming increasingly rare in the Murrumbidgee Catchment. The condition of North Redbank was poor and had been steadily declining, however, recent environmental watering is improving the health of some areas within the site.

Watering actions in 2009-10

The watering actions at North Redbank were based on proposals put forward by the New South Wales Department of Environment, Climate Change and Water. In autumn 2010, a total of 7 gigalitres of environmental water was delivered to North Redbank, including 1.6 gigalitres from the Commonwealth and 6.2 gigalitres from the New South Wales Government. Additional water was subsequently made available to the Redbank site by private land holders in the region.

The environmental water was delivered via the North Redbank Channel and was managed by the New South Wales Department of Environment, Climate Change and Water. Water quality and fauna response surveys were conducted by the New South Wales Department of Environment, Climate Change and Water and Charles Sturt University.

Aims

The purpose of the watering action was to maintain wetland vegetation, including river red gum communities, and to provide habitat for wetland species, such as waterbirds, fish, frogs and turtles. Prior to this action, most of the lower North Redbank area had not been inundated since 2005 and some sites had not been inundated since 2001.

Good soil moisture levels can help reduce transmission losses during subsequent watering actions and support increased seasonal vegetation growth. Another aim was to establish good levels of soil moisture at North Redbank to increase the ecological response to inundation in spring.

Outcomes

Following the 2009-10 watering actions, water quality improved, and salinity and acidity levels in the wetlands were within or close to the national guidelines for healthy lowland rivers. Fauna surveys demonstrated significant responses by wetland species, particularly fish. However, the full extent of the environmental benefits will take time to materialise, as there is a lag period before aquatic and fringing habitat vegetation responses become clear.

Some fish species responded rapidly to the availability of new habitat, which resulted from the environmental water delivery. As the site was flooded in early autumn, water temperatures were still warm enough to provide cues for the movement of

SPRINGBANK SWAMP, LOWBIDGEE FLOODPLAIN, NEW SOUTH WALES FOLLOWING ENVIRONMENTAL WATERING

(April 2010)

Photo by James Maguire (New South Wales Department of Environment, Climate Change and Water)

fish into the wetlands. Large numbers of juvenile native fish, including Australian smelt, bony bream (*Nematalosa erebi*), carp gudgeons and Murray-Darling rainbowfish (*Melanotaenia fluviatilis*), were detected entering the wetlands. Broad-shelled turtles (*Chelodina expansa*), long-necked turtles, yabbies and freshwater shrimp (*Paratya australiensis*) were also observed.

Thirteen bird species were recorded at sites within North Redbank, including the black-fronted dotterel (*Elseyornis melanops*), darter (*Anhinga melanogaster*), grey teal and white-faced heron. No waterbird nesting activity was noted during surveys undertaken in April 2010. Most waterbirds commence breeding in early spring, however, some species, such as black swans, are able to start breeding in any month with favourable conditions. In April, courting behaviour was observed during monitoring.

Commonwealth water helped maintain and restore the environmental values of North Redbank that had suffered the effects of drought. As water availability improves, aquatic vegetation is likely to become more established and invertebrate abundance is expected to increase, providing adequate food supply for a more substantial fauna response.

Feature site: Yanga National Park

Yanga National Park covers about 76,000 hectares of land alongside the Murrumbidgee River to the east of Balranald in south-western New South Wales. The park sits on the Lowbidgee Floodplain, which is nationally recognised under the Directory of Important Wetlands in Australia. The park has significant ecological values and is home to one of the largest populations of southern bell frogs in Australia. Yanga National Park is also an important drought refuge for many animals, including waterbirds and turtles.

Watering actions in 2009-10

The watering actions at Yanga National Park were based on proposals put forward by the New South Wales Department of Environment, Climate Change and Water. In 2009-10, the Commonwealth provided about 47 gigalitres of environmental water to Yanga National Park in conjunction with the New South Wales Government, which provided an additional 42 gigalitres. Key sites such as Mercedes Swamp, Twin Bridges Wetland and Piggery Lake first received water in spring 2009 and summer 2009-10.

The water delivery was managed and monitored by the New South Wales Department of Environment, Climate Change and Water.

Aims

A mosaic of open water and emergent aquatic vegetation habitats were watered in order to rejuvenate this important wetland system and support a diverse range of plants and animals. The watering in 2009-10 aimed to maintain and enhance the condition of river red gum forests and aquatic vegetation that provide critical habitat for wetland species. This was particularly important for supporting threatened fauna species, such as the southern bell frog. The watering actions in summer 2009-10 were specifically intended to sustain bird breeding at Mercedes Swamp and Twin Bridges Wetland.

Outcomes

Good rainfall in winter 2010, helped optimise the benefits provided by environmental watering at Yanga National Park and allowed environmental water to inundate a greater area of the floodplain than had been expected. Watering in autumn 2010, inundated some 13,000 hectares of both south and north Yanga National Park, including areas that had not been flooded for 10 years.

Monitoring following the 2009-10 environmental watering at Yanga National Park identified significant frog, fish and waterbird responses. The nationally threatened southern bell frog was observed breeding in the park and was identified at locations that had not received water since 2005. Other frogs, detected through visual and audio surveying, included the plains froglet, barking marsh frog and the spotted marsh frog. Following the watering action a survey of tadpoles indicated that frog breeding had occurred in the wetlands. The presence of long-necked turtles was also confirmed.

PRIOR TO

MERCEDES SWAMP, YANGA NATIONAL PARK, NEW SOUTH WALES PRIOR TO ENVIRONMENTAL WATERING

(October 2009)

Photo by James Maguire (New South Wales Department of Environment, Climate Change and Water)

FOLLOWING

MERCEDES SWAMP, YANGA NATIONAL PARK, NEW SOUTH WALES FOLLOWING ENVIRONMENTAL WATERING

(December 2009)

Photo by Jennifer Spencer (New South Wales Department of Environment, Climate Change and Water)

Great egrets and cormorants began breeding following the environmental watering in spring 2009. The Commonwealth made available more water during the 2009-10 summer months to ensure sufficient water levels were maintained for nest building and the eventual fledgling of the young. The environmental watering also benefited the numerous other waterbird species at the site. Waterbird species recorded included the Australasian shoveller, Australian shelduck (*Tadorna tadornoides*), chestnut teal (*Anas castanea*), musk duck, pink-eared duck (*Malacorhynchus membranaceus*), white-faced heron and Australian wood duck (*Chenonetta jubata*). There was also evidence that the grey teal was breeding in the park.

"The environmental watering of Yanga National Park helped support the first significant colonial bird breeding event in the Lowbidgee since 2005 and primed the wetland system to respond to the flooding flows, which have subsequently come. The large scale inundation of the park provided abundant winter feeding areas for waterbirds such as egrets, which have now established several larger rookeries in the National Park. The wetland system hasn't looked this good in years."

(James Maguire, Senior Wetlands and Rivers Conservation Officer, New South Wales Department of Environment, Climate Change and Water)

YANGA NATIONAL PARK, NEW SOUTH WALES FOLLOWING ENVIRONMENTAL WATERING

(August 2009)

Photo by James Maguire (New South Wales Department of Environment, Climate Change and Water)

Southern bell frog

Litoria raniformis

The southern bell frog (or growling grass frog) is listed as vulnerable under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*. It is also protected under state environment legislation in New South Wales, South Australia and Victoria.

The southern bell frog is one of Australia's largest frog species, reaching up to 104 milimetres in length, with females usually larger than males. In general, they are olive to bright emerald green, with irregular gold, brown, black or bronze spotting. The groin and posterior of the thighs are turquoise blue, a colour thought to act as a predator deterrent. During the breeding season, males may become yellow or dark grey under the throat.

The southern bell frog was formerly found over much of south-eastern Australia. However, its range has declined significantly due to habitat fragmentation and degradation. The southern bell frog has become locally extinct in many parts of the Murray-Darling Basin, coinciding with reduced flood frequency.

The southern bell frog is dependent upon permanent freshwater lagoons for breeding. Submerged vegetation is important habitat for successful breeding, as it provides egg-laying sites, calling stages for males and food and shelter for tadpoles.

Commonwealth environmental watering at Yanga National Park in New South Wales supports southern bell frog breeding events and contributes to protecting this threatened species.

A SOUTHERN BELL FROG IN PIGGERY LAKE, YANGA NATIONAL PARK, NEW SOUTH WALES FOLLOWING ENVIRONMENTAL WATERING

(October 2009)

Photo by Simone Carmichael (New South Wales Department of Environment, Climate Change and Water)

Information on the southern bell frog was sourced from the *Environment Protection and Biodiversity Conservation Act 1999* Southern Bell Frog Listing Advice, July 2000; and the New South Wales Dept. of Environment, Climate Change and Water draft recovery plan for the Southern Bell Frog http://www.environment.nsw.gov.au/resources/nature/recoveryplanDraftSouthernBellFrog.pdf

Colonial nesting waterbirds

Colonial nesting waterbirds share two key characteristics: they gather together to breed and nest and they source some or all their food from aquatic environments. The wetlands, lakes, floodplains and rivers of the Murray-Darling Basin have supported a wide range of colonial nesting waterbirds, including cormorants, egrets, herons, ibis, spoonbills, ducks and pelicans, in the past.

Cormorants, egrets and herons tend to build stick nests in trees next to or overhanging water. Many duck species build nests in tree hollows. Ibis build their nests in lignum bushes or, like spoonbills and bittern, they may trample down aquatic vegetation such as rushes and reeds to form nesting platforms. Pelicans and swans tend to build their nests on land, generally on islands surrounded by deep water where they are safe from predators. Although the nesting habitat and behaviour of colonial waterbirds differ between species, all species require habitat inundation events to trigger breeding activity.

In the Murray-Darling Basin, Australian fauna and flora evolved to exist in a boom and bust environment, and are responsive to natural cycles of flood and drought. These cycles have been disrupted by keeping the landscape either too wet or too dry through river regulation and modification of the landscape.

One aim of environmental water use is to replicate natural water variability and flows in order to help colonial nesting waterbird lifecycles. Commonwealth environmental water has supported colonial waterbird breeding events through initial water provision and subsequent top up flows. Breeding at sites such as Yanga National Park is a good indication of what can be achieved.

Information on colonial nesting birds was sourced from "Relationships between waterbird ecology and river flows in the Murray-Darling Basin" by Anthony Scott, CSIRO Land and Water, 1997 and http://www2.mdbc.gov.au/livingmurray/mfat/waterbirds/zd _ nesting.htm

A WHITE EGRET AT TWIN BRIDGES, YANGA NATIONAL PARK, NEW SOUTH WALES FOLLOWING ENVIRONMENTAL WATERING
(November 2009)
Photo by James Maguire (New South Wales Department of Environment, Climate Change and Water)

Macquarie-Castlereagh Catchment

The Macquarie-Castlereagh Catchment is located in central western New South Wales. The catchment covers about 8.5 million hectares and makes up about 6.9 per cent of the total area of the Murray-Darling Basin. The catchment includes the Castlereagh, Macquarie and Bogan River valleys.

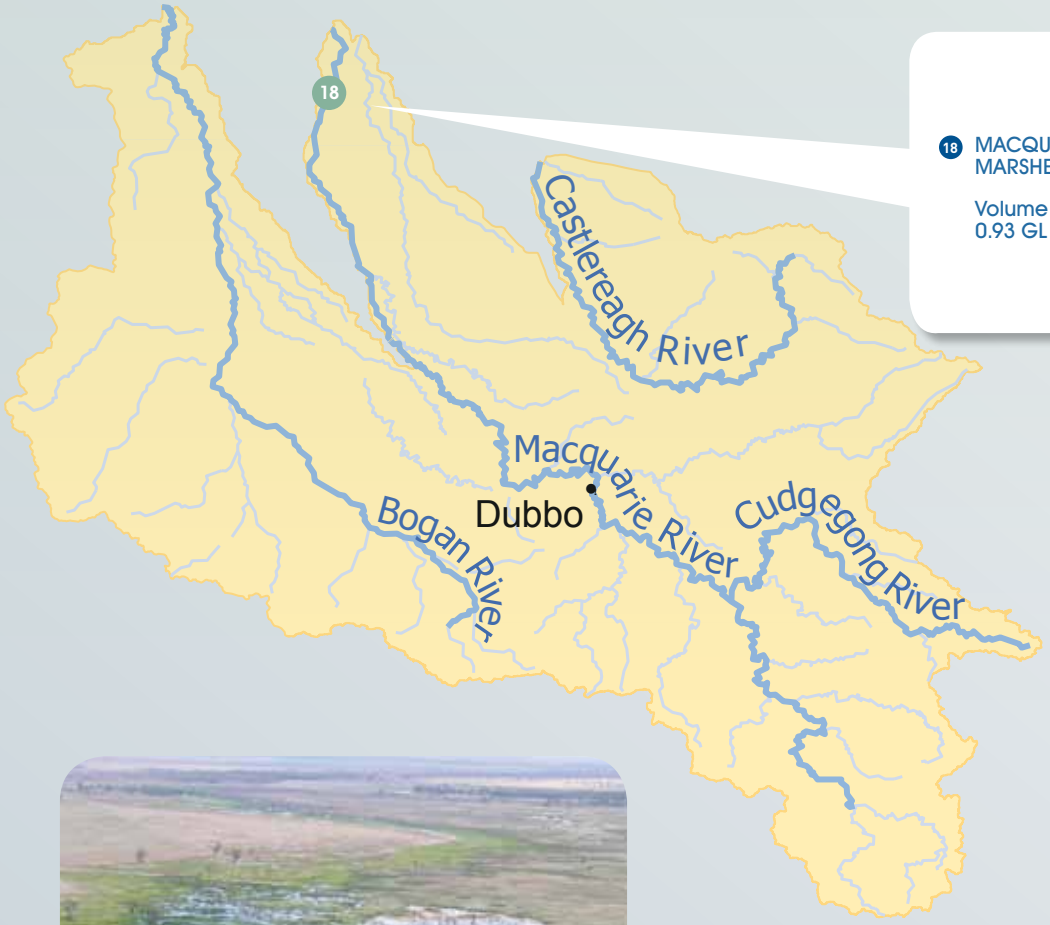
The landscape of the Macquarie-Castlereagh Catchment varies markedly from east to west. The tablelands in the east are characterised by steep, densely vegetated ranges and cleared grazing lands. The western slopes have cleared hills graduating to flatter lands, with some pockets of remnant vegetation. The plains area is characterised by flat landscapes and the occasional rocky outcrop. The Murray-Darling Basin Authority Sustainable Rivers Audit, released in 2008, reported the overall ecosystem health of the Macquarie-Castlereagh Catchment was very poor.

The Macquarie Marshes, one of the largest and most important wetlands in the Murray-Darling Basin, is located approximately 75 kilometres northwest of Coonamble, New South Wales. The Macquarie Marshes is one of the last remaining inland semi-permanent wetlands in New South Wales and is made up of swamps, lagoons, channels and floodplain. The Macquarie Marshes is recognised internationally and nationally under the Ramsar Convention and the Directory of Important Wetlands in Australia.

The Macquarie Marshes support a number of flood-dependent vegetation communities. These include river red gum forests, water couch (*Paspalum distichum*) grasslands, extensive beds of common reed, coolibah (*Eucalyptus coolibah*), black box, lignum, native cumbungi (*Typha domingensis and Typha orientalis*) and river cooba (*Acacia stenophylla*). The marshes support over 300 plant species, including nationally threatened basalt peppercress (*Lepidium hyssopifolium*).

A diverse array of wildlife, including birds, frogs, reptiles and fish, rely on the habitat provided by the Macquarie Marshes. The site is important habitat for native fish species including threatened species, such as the silver perch (*Bidyanus bidyanus*) and Murray cod (*Maccullochella peelii peelii*). The site also provides habitat for a large number of waterbird species, such as the glossy ibis, Australasian bittern (*Botaurus poiciloptilus*) and brolga (*Grus rubicunda*).

When flooded, the marshes become one of the most important sites in Australia for the breeding of colonial water birds, particularly in terms of the number of nests, frequency of breeding and the diversity of species breeding. The Macquarie Marshes also act as a refuge in dry periods by providing significant habitat for nesting birds when many other inland wetlands and waterways have dried out.



18 MACQUARIE MARSHES

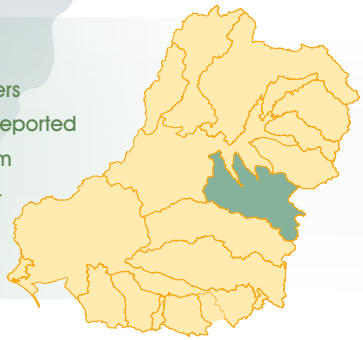
Volume
0.93 GL

WILGARA, A PRIVATELY OWNED RAMSAR SITE, ON THE MACQUARIE MARSHES, NEW SOUTH WALES
(January 2010)
Photo by Tim Hosking (New South Wales Department of Environment, Climate Change and Water)

NSW

MACQUARIE MARSHES, NEW SOUTH WALES FOLLOWING ENVIRONMENTAL WATERING
(October 2009)
Photo by Richard Kingsford.

The Murray-Darling Basin Authority Sustainable Rivers Audit, released in 2008, reported that the overall ecosystem health of the Macquarie-Castlereagh Catchment is very poor.



Watering actions in 2009-10

The watering actions at the Macquarie Marshes were based on proposals put forward by the New South Wales Department of Environment, Climate Change and Water. The Commonwealth provided about 1 gigalitre of environmental water to the Macquarie Marshes in spring 2009 and summer 2009-10. The New South Wales Government concurrently delivered about 20 gigalitres of environmental water to the marshes. These environmental flows were made possible following three significant regional rainfall events.

The water delivery was managed and monitored by the New South Wales Department of Environment, Climate Change and Water with support from the Macquarie and Cudgegong Environmental Flows Reference Group, which includes local community representatives. Highlighting the effectiveness of this arrangement, the chair of the reference group has written: *"The group would like to express its appreciation and acknowledge the benefit of any additional water contributed by the Commonwealth to the marshes. The continued good communication between all those involved is appreciated by all members of the Environmental Flows Reference Group."*

Aims

The key aim of the environmental watering action in the Macquarie Marshes is to relieve the effects of severe prolonged drought and improve the health of river red gum forests and aquatic vegetation.

Outcomes

Wetland vegetation, such as common reed, water couch and common spike rush (*Eleocharis acuta*), increased in cover and abundance following the 2009-10 environmental watering at the Macquarie Marshes. River red gums responded positively with an improvement in canopy density. Other floodplain vegetation, such as lignum and river cooba communities and water couch, also responded well and now provide nesting habitat for colonial waterbirds, such as egret, heron and ibis.

The improved vegetation health encouraged frog and bird breeding events. The Macquarie and Cudgegong Environmental Flows Reference Group reported eight frog species at the site, including the Peron's tree frog, spotted marsh frog, eastern banjo frog and barking marsh frog. Most of these species were calling, which signified breeding activity. The Macquarie and Cudgegong Environmental Flows Reference Group also identified grassy paddocks and reeds at the site as important habitat for the process of metamorphosis from tadpole to frog.

Several thousand waterbirds flocked to the Macquarie Marshes post-watering including brolga, yellow-billed spoonbill (*Platalea flavipes*), pacific heron (*Ardea pacifica*), pacific black duck and grey teal. The environmental water delivery triggered breeding events for a number of waterbird species. Also, a nesting colony of cattle egrets (*Ardea ibis*), intermediate and great egrets of between 800 and 1000 nests has been successfully established at the site.

The Macquarie and Cudgegong Environmental Flows Reference Group reported high numbers of juvenile carp and small numbers of native fish in the marshes following the actions. The breeding response of native fish will become clearer through continued monitoring as native fish typically take longer to respond to changes in condition than carp.

PRIOR TO

MOLE MARSH, MACQUARIE MARSHES, NEW SOUTH WALES PRIOR TO ENVIRONMENTAL WATERING

(September 2009)

Photo by Kaya Michener (New South Wales Office of Water)

FOLLOWING

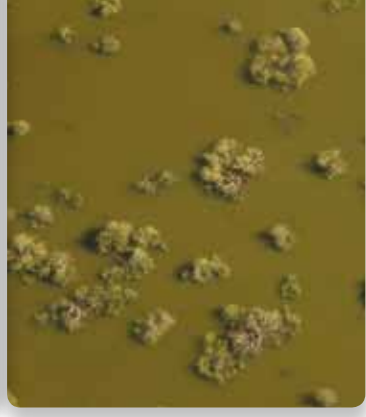
MOLE MARSH, MACQUARIE MARSHES, NEW SOUTH WALES DURING SITE MONITORING FOLLOWING ENVIRONMENTAL WATERING

(November 2009)

Photo by Kaya Michener (New South Wales Office of Water)

Barwon-Darling Catchment

The Barwon-Darling Catchment is a large dryland river system that extends from the Queensland border to the River Murray near the border of New South Wales and South Australia.



The Barwon-Darling Catchment is a large dryland river system that extends from the Queensland border to the River Murray near the border of New South Wales and South Australia. Key characteristics of the Barwon-Darling Catchment include its low gradient and large floodplains, seasonal variability, and arid to semi-arid conditions. About 30 per cent of the catchment is covered with open woodlands, timbered areas, shrublands and native pastures.

Important wetlands, rivers and floodplains within the catchment include the Menindee Lakes system and Talyawalka wetlands, which are nationally recognised in the Directory of Important Wetlands in Australia. The Menindee Lakes system sits about 200 kilometres north of the junction of the Murray and Darling Rivers. The system is comprised of nine lakes, including Lake Pamamaroo, Lake Wetherell, Lake Menindee and Lake Cawndilla.

The Talyawalka wetlands comprise the Talyawalka Anabranch wetlands of the Darling River and its tributary, Teryawynia Creek. These wetlands include numerous intermittent wet and dry lakebeds and are representative of a semi-arid inland floodplain wetland system. When inundated, the lakes provide habitat for more than 10,000 waterbirds. The main vegetation in the area includes black box, river red gum, lignum and canegrass (*Eragrostis australasica*). The Murray-Darling Basin Authority Sustainable Rivers Audit (2008) reported the overall ecosystem health of the Barwon-Darling Catchment was poor.

Watering actions in 2009-10

Following a major rainfall event in northwest New South Wales and southwest Queensland in early 2010, 38 gigalitres of water that would historically have been diverted for consumption at Toorale Station, was allowed to flow through the Darling River system. The aim of the 2010 action was to maximise flows through the Darling River, providing ecological benefits in the channel and to adjacent floodplains and wetlands.

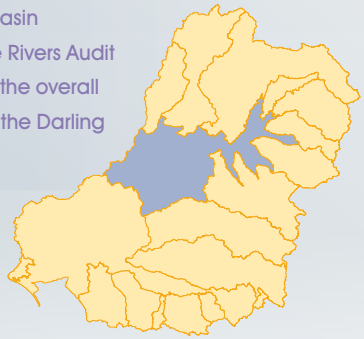
Outcomes

Environmental flows from Toorale Station provided benefits to in-stream habitats and riparian ecosystems along the Darling and lower Warrego Rivers. Riparian ecosystems on the property's western floodplain were extensively inundated and refreshed during the watering.

The water from Toorale Station's entitlements flowed down the Darling River providing in-stream environmental benefit and extending the area and duration of flooding along the Darling River and its floodplains, billabongs and anabranches.

STRAW-NECKED IBIS NESTING ON LIGNUM, WESTERN FLOODPLAIN, TOORALE STATION, NEW SOUTH WALES
(May 2010)
Photo by Terry Korn (New South Wales Department of Environment, Climate Change and Water)

The Murray-Darling Basin Authority Sustainable Rivers Audit (2008) reported that the overall ecosystem health of the Darling Catchment is poor.



COOLIBAH WETLAND, WESTERN FLOODPLAIN, TOORALE STATION, NEW SOUTH WALES

(May 2010)

Photo by Terry Korn (New South Wales Department of Environment, Climate Change and Water)

Warrego, Moonie & Nebine Catchments

The Warrego, Moonie and Nebine Catchments are located in Queensland and northern New South Wales.

The Warrego Catchment spans the area from the Carnarvon Range at the most northerly point of the Murray-Darling Basin to the Darling River in northern New South Wales. It covers a total area of about 7.6 million hectares. There are a number of nationally important wetlands in the Warrego Catchment. These wetlands are generally in good condition, though some have been affected by grazing and sedimentation.

The Moonie Catchment is located predominantly in south western Queensland and extends over the border into northern New South Wales. The catchment covers a total area of about 1.5 million hectares and is one of the most heavily cleared catchments in southern Queensland. Waterholes in the catchment, such as the Thallon waterholes, provide important aquatic habitats that can support up to 20,000 waterbirds.

The Nebine Catchment is situated in southern Queensland and covers about 3.8 million hectares. One per cent of the catchment lies over the border in northern New South Wales. The Nebine Catchment is made up of Nebine, Mungallala and Wallam Creeks and is characterised by predominantly flat terrain and low rainfall.

Watering actions in 2009-10

The Commonwealth's unregulated water entitlements in the Warrego, Moonie and Nebine Catchments flowed through the system as part of the floods from January to April 2010. In total, 18.03 gigalitres of the in-stream and overbank flow in these rivers was attributed to the Commonwealth's entitlements. While the Commonwealth's environmental water was a very small component of the total flows in southern Queensland, it contributed to the benefits from those floods, including filling of waterholes in the main river channels and distributaries, and the inundation of floodplains and associated wetlands.

Outcomes

In the Warrego Catchment, in-stream flows of 12.16 gigalitres of Commonwealth environmental water contributed to floodwaters that filled the vast Cuttaburra Basin in north western New South Wales. This area includes Yantabulla Swamp, which is nationally recognised in the Directory of Important Wetlands in Australia and provides a significant regional drought refuge and breeding area for ducks and colonial waterbirds.

YANTABULLA SWAMP, NEW SOUTH WALES
(March 2010)
Photo by Melissa Hull (New South Wales Department of Environment, Climate Change and Water)

In the Moonie Catchment, the Commonwealth water contributed to flows that substantially inundated large portions of the river system. The Moonie flood was a long duration, multi-peaked event that extensively watered the lower floodplain and filled waterholes throughout the system.

In Nebine Creek, Commonwealth water augmented natural floods providing almost 5 per cent of total flood flows in the lower reaches. This flood provided water to key ecological assets in the western portion of the Culgoa River floodplain, including the Queensland Culgoa Floodplain National Park and the New South Wales Culgoa National Park.

Unlike much of the southern Basin, these river reaches are unregulated and do not rely on large public storages to control water releases. The Commonwealth works closely with the Queensland Government to ensure Commonwealth environmental water is accurately accounted for and that this water provides optimal environmental benefits as it passes through the system.

FLOODWATERS AT YANTABULLA SWAMP, YANTABULLA, NEW SOUTH WALES
(March 2010)

Photo by Melissa Hull (New South Wales Department of Environment, Climate Change and Water)

Acknowledgments

Australian Government

- Murray-Darling Basin Authority

South Australia

- South Australian Murray-Darling Basin Natural Resources Management Board
- South Australian Department for Water
- South Australian Department of Environment and Natural Resources
- Overland Corner Branch of the National Trust of South Australia
- Overland Corner Wetland Rehabilitation Group
- Wetlands Habitat Trust and Paiwalla Pty. Ltd.

Victoria

- Victorian Department of Sustainability and Environment
- Mallee Catchment Management Authority
- North East Catchment Management Authority
- Goulburn-Murray Water
- Parks Victoria
- Sunraysia Bird Monitors

New South Wales

- New South Wales Department of Environment, Climate Change and Water (including the Office of Water and the National Parks and Wildlife Service)
- Murrumbidgee Catchment Management Authority
- Murray Catchment Management Authority
- Central West Catchment Management Authority
- New South Wales State Water Corporation
- Forests New South Wales

Queensland

- Queensland Department of Environment and Resource Management

We would also like to acknowledge the considerable assistance provided over 2009-10 from local groups and landholders to the environmental watering actions, including allowing access to land, provision of infrastructure and monitoring of ecological responses.

Data Sources:

Drainage Division, States, Rivers

Sustainable Yields Reporting Regions

Map produced by:ERIN
Department of the Sustainability, Environment, Water, Population and Communities, November 2010

Australian Government

Department of Sustainability, Environment, Water, Population and Communities

Murray-Darling Basin Authority