
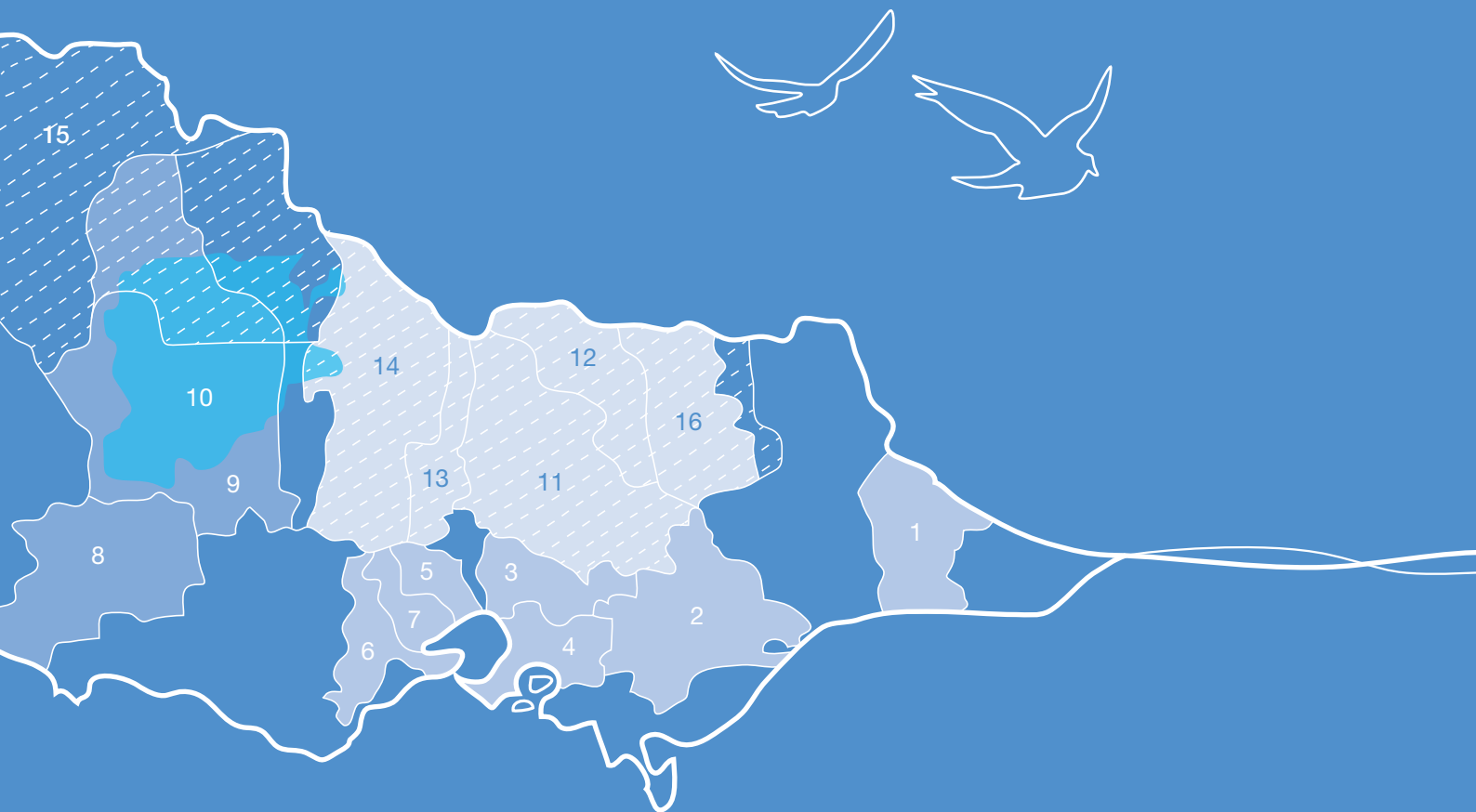


Reflections

**Environmental watering
in Victoria 2011-12**



The Victorian Environmental Water Holder acknowledges the significant contribution of its delivery partners, particularly the waterway managers, in managing the Water Holdings to improve the environmental health of Victoria's rivers, wetlands and floodplains.



-  Southern Victoria
-  Western Victoria
-  Wimmera Mallee wetlands
-  Northern Victoria
-  Northern wetlands and floodplains, and the Living Murray icon sites

Cover photo: Black Cormorant at Barmah boat ramp, Keith Ward, Goulburn Broken CMA

Inside cover photo: River Murray at Barmah Choke, Keith Ward, Goulburn Broken CMA

Systems where environmental water was delivered in 2011-12

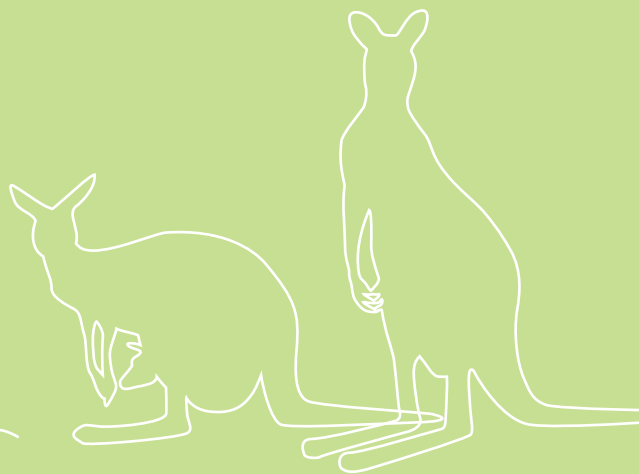
- 1 Snowy
 - 2 Latrobe, Thomson and Macalister
 - 3 Yarra
 - 4 Tarago
 - 5 Werribee
 - 6 Barwon
 - 7 Moorabool
 - 8 Glenelg
-
- 9 Wimmera
 - 10 Wimmera-Mallee wetlands
 - 11 Goulburn
 - 12 Broken
 - 13 Campaspe
 - 14 Loddon
 - 15 Northern wetlands and floodplains,
and the Living Murray icon sites
 - 16 Ovens



Foreword	2
Introduction	4
Southern Victoria	
Snowy system	6
Latrobe system	8
Thomson system	10
Macalister system	12
Yarra system	14
Tarago system	16
Werribee system	18
Barwon system	20
Moorabool system	22

contents

Western Victoria	
Glenelg system	24
Wimmera system	26
Wimmera-Mallee wetlands	28
Northern Victoria	
Goulburn system	30
Broken system	32
Campaspe system	34
Loddon system	36
Northern wetlands and floodplains	38
The Living Murray icon sites	44
Ovens system	50
Glossary	52



foreword

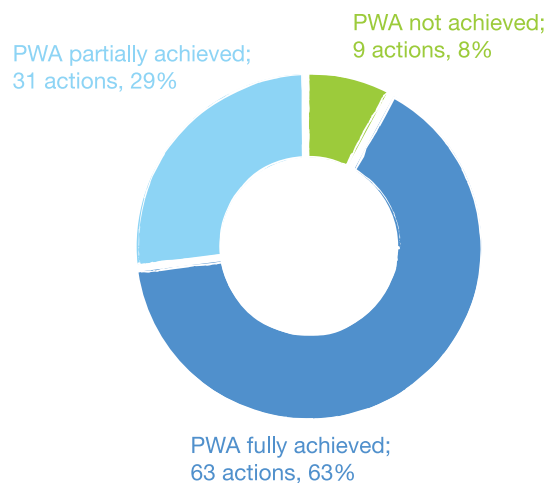
Welcome to the first edition of *Reflections – environmental watering in Victoria 2011-12*. This is the first annual watering booklet produced by the Victorian Environmental Water Holder (VEWH). It tells the stories of environmental watering in 19 systems across Victoria. Each chapter includes an interview with a catchment management authority or Melbourne Water representative, providing a unique and personal look at environmental watering in each system.

Reflections provides us with the chance to look back at the environmental watering achievements of 2011-12, which included providing environmental water to a wetland in dire need of water, minimising the impact of blackwater, and making the first managed environmental release in the Yarra system.

In our first year, we focussed on building relationships with key partners to make sure the best environmental outcomes could be achieved for Victoria's rivers, wetlands and floodplains.

These relationships, combined with average to wet conditions throughout Victoria, led to 92 percent of all planned priority watering actions being fully or partially achieved (see Figure 1). This allowed many systems to continue their road to environmental recovery after more than a decade of the most severe drought in recorded history.

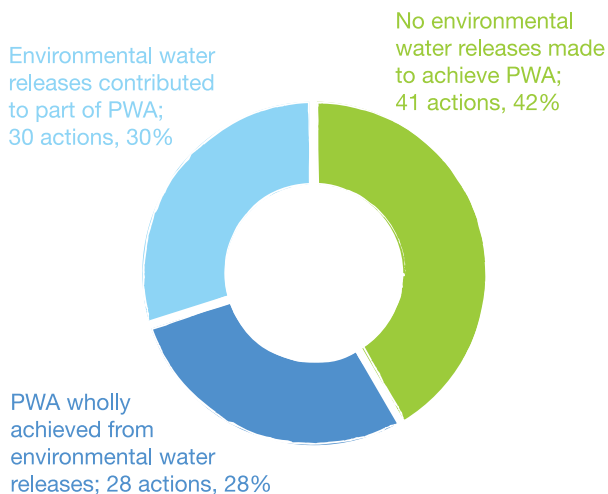
Figure 1 Priority watering actions (PWA) achieved in 2011-12



This impressive proportion of watering actions would not have been achieved without the hard work of waterway managers, storage operators and land managers in planning and delivering environmental water throughout Victoria. The partnerships that have developed are invaluable to the environmental watering program, leading to achievements that would otherwise not be possible.

While 42 percent of the achieved watering actions were met without any managed environmental releases (see Figure 2), significant amounts of staff time still went into planning for these actions. In some cases, these actions were able to be met with natural flows, or sometimes even by water being delivered to water users. However, the planning effort should still be recognised, as should the effort in monitoring flow to assess if additional action is required.

Figure 2 Contribution of environmental water releases to priority watering actions (PWA)



This highlights the swift responses and adaptive approach that is taken in managing environmental water.

I would also like to acknowledge the contribution of the Commonwealth Environmental Water Office and partners in the Living Murray program to environmental watering in Victoria.

Finally, I thank my fellow Commissioners and the dedicated VEWH staff for their diligence and commitment in 2011-12.

I hope you enjoy reading about environmental watering in Victoria in 2011-12.

Denis Flett
Chairperson

introduction

About the VEWH

On 1 July 2011, the VEWH was officially established, becoming the first independent statutory body responsible for managing Victoria's environmental water entitlements (Water Holdings). The mission of the VEWH is to manage Victoria's environmental Water Holdings, in cooperation with partners, to improve the environmental health of rivers, wetlands and floodplains.

In undertaking its mission, the VEWH:

- makes decisions on the most effective use of the Water Holdings, including use, trade and carryover
- authorises waterway managers to implement watering decisions
- liaises with other water holders to ensure coordinated use of all sources of environmental water
- publicly communicates environmental watering decisions and outcomes.
- commissions targeted projects to demonstrate ecological outcomes of environmental watering at key sites.

In 2011-12, over 516,000 ML of water was delivered to 35 river reaches and 10 wetlands, providing significant benefit to a wide range of water-dependent plants and animals. Pages 6 - 51 highlight the achievements and benefits in each system.

Carryover and trade

As well as authorising the use of environmental water for priority watering actions, the VEWH also considers opportunities to carry over or trade water where this will maximise the environmental outcomes.

Carrying water over allows the VEWH to retain control of unused water from one year to the next. The average to wet seasonal conditions experienced across Victoria in 2011-12 resulted in the following amounts of carryover, providing a good starting point for the implementation of priority watering actions in 2011-12:

- 42,643 ML in southern Victoria
- 50,868 ML in western Victoria
- 109,978 ML in northern Victoria.

The high availability of environmental water and the prevalence of natural and complementary water flows in 2011-12 also provided the opportunity for the VEWH to undertake its first water trades in the northern Victorian water market. When deciding whether to trade, the VEWH considered a number of factors. Only water not required for foreseeable priority watering actions was sold, and only where trade was considered a better option than carrying water over.

In January 2012, the VEWH sold about 200 ML of allocation from the River Murray Flora and Fauna Entitlement. Then 10,000 ML of allocation was sold in May 2012.

Proceeds from the sale of water by the VEWH will be used for future watering priorities for Victoria's waterways and direct environmental outcomes in rivers and wetlands. This may include funding the delivery of environmental watering actions, purchasing water allocation at a different time, or in a different system, or funding works and measures to improve water use efficiency.

Why is environmental water important?

River systems across Victoria provide water that is important to our consumptive water supply and modern agriculture. As a result, many of Victoria's river systems have become highly regulated and now operate in a way that is significantly modified from natural conditions. For example, instead of water flowing uninterrupted from the top of a catchment to the sea, water is stored in dams and weir pools, diverted via pipelines and man-made channels, and used for towns, cities and irrigation. This regulation of water has effects on the health of Victoria's waterways.

Many plants and animals depend on water, just as humans do. For example, rivers, wetlands and floodplains support various plant communities, from in-stream reeds through to Australia's iconic river red gum forests and blackbox communities. These systems and their plant communities in turn support a range of animals such as waterbirds, fish, turtles and frogs.

These environmental values are what make Victoria's waterways so important to their local communities. It is a big part of the reason people enjoy camping, picnicking, walking or running beside them, boating, fishing or yabbing on them, or taking part in any other countless recreational activities associated with them.

This is why it is so important we continue to look after our rivers, wetlands and floodplains. And water is a major factor in this.

With significant amounts of water allocated for human use, water also needs to be set aside for the environment. The Water Holdings are a small, but important part of the broader Environmental Water Reserve (EWR).

The EWR also includes:

- water set aside for the environment as obligations on consumptive water entitlements held by urban and rural water corporations, usually called 'passing flows'
- 'above cap' water provided once limits on consumptive water use have been reached or due to unregulated flows and spills from storages, usually created by heavy rainfall.

After determining the environmental values of most importance to the community, scientific studies are undertaken to identify the environmental flows required to protect these values. Water from the Water Holdings is then released, as best it can be, to create the recommended flow patterns. Often these releases help mimic what would have happened in a river, wetland or floodplain under natural conditions.

However, environmental water is just one factor that contributes to a healthy river, wetland or floodplain. Complementary works and measures managed by waterway managers protect other aspects including water quality, riparian land and in-stream habitat. These works can include:

- revegetation of waterways to provide habitat and prevent erosion
- streamside fencing to protect habitat from livestock damage and allow regeneration
- construction of fishways to allow fish passage.

Snowy system

Waterway manager – East Gippsland Catchment Management Authority (CMA)

The Snowy River received two major releases in 2011-12, continuing this heritage-listed river's road to recovery.

The Snowy River originates on the slopes of Mount Kosciuszko, draining the eastern slopes of the Snowy Mountains in New South Wales, before flowing through the Snowy River National Park in Victoria and emptying into Bass Strait near Marlo. The construction of the Snowy Mountains Hydro-electric Scheme between 1949 and 1974 resulted in the diversion of 99 percent of the Snowy River's natural flow at Jindabyne Dam.

The Snowy system is managed by the New South Wales Government on behalf of the Victorian and Commonwealth governments. The Victorian Government is working with the New South Wales

and Commonwealth governments to rehabilitate the health of the Snowy River by returning 21 percent of the average annual flow.

Simon Williams, Environmental Water Manager at New South Wales Office of Water explains that 164,400 ML of environmental water was released into the Snowy River from Jindabyne Dam in 2011-12.

“Two key releases occurred, with a spring snow melt release of 84,400 ML in October, and an 80,000 ML release as a flood pulse to alleviate flooding in Jindabyne Dam in March.”

“The spring release in October 2011 lasted for 19 days, mimicking components of the natural spring snowmelt floods that previously occurred every year before the construction of the Snowy Mountains Hydro Scheme.”

“The main objective of the release was to scour a new and deeper water course and flush built up silt and organic material downstream.”

“The narrowing of the channel and the build up of sand, silt and mud in the Snowy River bed, due to a lack of flushing flows, is seen as one of the key factors limiting the environmental recovery of the river.”



Water source (entitlement)	Volume in megalitres (ML)
Water allocated to the Snowy River from bulk entitlements and water shares held in the Goulburn, Loddon and Murray systems	<ul style="list-style-type: none">65,822 ML

“As a result of the October release, some small changes in the morphology of the river occurred in the Dalgety Uplands [20 kilometres downstream of Jindabyne Dam].”

Salinity levels in the Snowy River Estuary near Orbost in Victoria were also a focus of the release. Salinity in the estuary may be a likely limiting factor for some species of fish, such as Australian bass, to breed. Scientists from New South Wales and Victoria measured the response of the estuary’s salinity to the spring release as a first stage to determining the future implications for fish breeding.

“The results showed that salinity levels were responsive to the size of events that could be released from Jindabyne Dam. At the Snowy River Estuary near Orbost in Victoria, the water became mixed, reducing salinity levels with most of the estuary comprising fresher water,” Simon said.

More information on the Snowy system is available in the VEWB *Seasonal Watering Plan 2012-13* or by visiting the East Gippsland CMA website at www.egcma.com.au.

Other sources of information include:

- New South Wales Office of Water at information@water.nsw.gov.au
- Snowy Scientific Committee at www.snowyssc.org
- Snowy Hydro Limited at www.snowyhydro.com.au

Opposite: Spring environmental release from Jindabyne Dam, NSW Office of Water
Below left: Snowy River, NSW Office of Water
Below right: Snowy River, East Gippsland CMA



latrobe system

Waterway manager – West Gippsland Catchment Management Authority (CMA)

Wet conditions have resulted in an amazing environmental response from the lower Latrobe wetlands following years of drought.

Located in eastern Victoria along the Latrobe River between its confluence with the Thomson River and Lake Wellington, the lower Latrobe wetlands are part of the Gippsland Lakes system. The lower Latrobe wetlands are made up of Sale Common, Heart Morass and Dowd Morass, and cover an area of over 35 square kilometres.

These wetlands support a wide variety of plant and animal species including: a number of significant types and threatened; threatened waterbirds; and fish and frog species such as the green and golden bell frog and the growling grass frog. There are also diverse macroinvertebrate communities including damselflies, water beetles, bugs, snails and worms, which provide a valuable food source for birds and fish.

In 2011-12, the lower Latrobe wetlands received significant natural overbank flooding from the Latrobe River. Eleisha Keogh, Environmental Water Reserve Officer from the West Gippsland CMA explains that this provided great conditions for plant and animal species to thrive in all three wetlands to levels not seen in about 15 years.

“Sale Common supported a wide variety of waterbirds not commonly seen or recorded in other local wetlands, including many threatened species such as the intermediate egret and Baillon’s crane,” Eleisha said.

“Heart Morass provided a productive food bowl for thousands of waterbirds, including every duck species recorded in Victoria, Eurasian coots and large flocks of black swans through spring and summer. Dowd Morass supported a substantial waterbird breeding colony which included the vulnerable royal spoonbill.”

“Royal spoonbills have been mostly absent from the breeding colony at Dowd Morass for the last 10 years, so the fact that they are breeding here again in good numbers is quite exciting.”

While the overbank flows from the Latrobe River met the planned priority watering actions in 2011-12, Eleisha discusses the importance of environmental water for the system.



Water source (entitlement)	Volume in megalitres (ML)
Environmental Entitlement (Latrobe River – Environment) Order 2010 ¹	<ul style="list-style-type: none">• 0 ML
Environmental objectives	
The environmental objectives for 2011-12 were to: maintain and enhance the condition and extent of aquatic plants; limit the extent of giant rush; maintain waterbird breeding, recruitment and foraging opportunities; import organic matter and nutrients; and manage water quality.	

¹ This is an unregulated flow entitlement. The use of this entitlement is dependent on river heights and is therefore not measured in the same way as environmental releases made from storages into rivers.

“Environmental water can be used to inundate the rookery area of the wetlands providing foraging habitat for fledgling waterbirds, particularly spoonbills.”

“Environmental water can also provide habitat for a range of plants and animals. Providing variable water levels is particularly important to create habitat mosaics, by encouraging desirable plant and animal species and communities, while discouraging less desirable ones. It can also be used to manage water quality risks like salinity and adverse pH levels.”

A flow-on benefit of the environment’s recovery is the social outcomes healthy wetlands can provide for the local community.

“All three wetlands are important for walking and bird watching. Sale Common, in particular, due to its vicinity to the city of Sale and its walking tracks and boardwalks. Dowd Morass also provides access to the Latrobe riverbank for fishing, and both Dowd and Heart Morass provide opportunities for duck hunting and, along with Sale Common, eel fishing.”

“I’m delighted by the ability of the wetlands to recover post-drought. We hope to capitalise on this to maintain and improve how these three wetlands complement the habitat values of the broader Gippsland Lakes system.” Eleisha said.

More information on the lower Latrobe wetlands is available in the VEWL Seasonal Watering Plan 2012-13, or by visiting the West Gippsland CMA website at www.wgcma.vic.gov.au.

Opposite: Dowd Morass, VEWL
Below left: Sale Common, VEWL
Below right: Heart Morass, VEWL



thomson system

Waterway manager – West Gippsland Catchment Management Authority (CMA)

Australian grayling populations continued their recovery in 2011-12, after another wet year in the Thomson system.

The Thomson River flows for 213 kilometres in a south-easterly direction from the slopes of Mount Whitelaw on the Baw Baw Plateau, to join the Latrobe River south of Sale. As a result, the Thomson River also plays an important role in providing fresh water flows to the lower Latrobe wetlands.

The Thomson system is home to some of the largest and most diverse native fish populations in the Gippsland region with 16 species calling the river home, including the river blackfish, southern pygmy perch, and the flat-headed gudgeon. Seven of these are migratory fish, including the threatened Australian grayling, Australian bass, tumpung and the short and long finned eels.

David Stork, Environmental Water Reserve Officer at the West Gippsland CMA explains that above average rainfall experienced throughout 2011-12 resulted in significant flows down the Thomson River.

“A number of freshes, bankfull and overbank flows occurred naturally during the year, moving sediment that built up in the river channel and restoring important habitat for aquatic animals such as fish, freshwater crayfish, platypus and water rats,” he said.

“In addition to these natural flows, spring and autumn baseflows and autumn freshes were actively delivered to the system using water from the Water Holdings, resulting in all priority watering actions being achieved.”

One challenge facing the environmental watering program is the regulation of the system at the Thomson Reservoir.

“Due to system regulation at the reservoir, high rainfall events during autumn did not result in any natural autumn freshes. These are critical flow requirements for downstream migration and spawning of Australian grayling.”

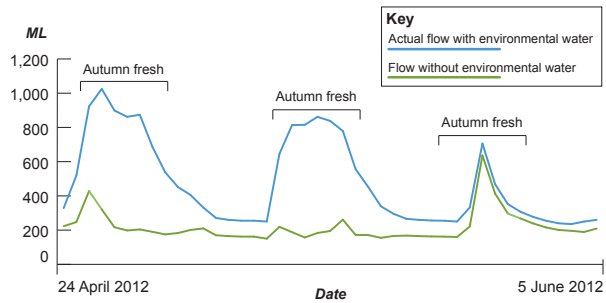
“However, the release of environmental water in 2011-12 to mimic these natural autumn freshes resulted in the downstream migration of the grayling. Electronic tags fitted to some grayling showed these fish travelled 60 to 150 kilometres downstream following the environmental flow release.”



Water source (entitlement)	Volume in megalitres (ML)
Bulk Entitlement (Thomson River – Environment) Order 2005	• 12,046 ML
Environmental objectives	
The environmental objectives for 2011-12 were to: improve habitat for aquatic animal species; maintain fish passage; assist spawning and migration of priority fish species, in particular Australian grayling; and avoid a decline in water quality.	

Thomson flow snapshot

This hydrograph shows how environmental water contributed to autumn freshes in the Thomson River. Flows were recorded at Coopers Creek Gauge, downstream of Thomson Dam.



“This result builds on two years of wet conditions, with annual fish surveys reporting that grayling numbers are slowly recovering following a dramatic decline during the drought,” David said.

The continued recovery of the Australian grayling was not the only positive story in 2011-12. Environmental watering also helped with maintenance of the river channel by moving sediments through the system, and improving the health of in stream and riparian vegetation.

More information on the Thomson system is available in the VEWB *Seasonal Watering Plan 2012-13*, or by visiting the West Gippsland CMA website at www.wgcma.vic.gov.au.

Opposite: Upper Thomson River, West Gippsland CMA
Right: Juvenile Australian grayling caught during fish surveys, West Gippsland CMA
Far right: Upper Thomson River, West Gippsland CMA



macalister system

Waterway manager – West Gippsland Catchment Management Authority (CMA)

Like much of Gippsland, the Macalister system experienced another year of wet conditions, continuing its recovery from the recent drought.

The Macalister River has a diverse catchment, with its upper reaches beginning in the forested and mountainous areas of the Alpine National Park. It then flows into the Macalister Irrigation District (MID) near the township of Maffra – the largest irrigation area south of the Great Dividing Range. The Macalister River features two major structures – Glenmaggie Weir and Maffra Weir which both supply the MID.

The Macalister River joins with the Thomson River between Maffra and Sale, making it the third river that contributes fresh water to the lower Latrobe wetlands.

David Stork, Environmental Water Reserve Officer at the West Gippsland CMA explains that in 2011-12 the Macalister River was managed for recovery, with a particular focus on the Australian grayling.

“During 2011-12, we made two active environmental water releases from Glenmaggie Weir – freshening flows of 3,912 ML in May 2012 and autumn/winter baseflow releases of 10,106 ML during May and June 2012.

“Bankfull flows and a number of freshes also occurred naturally in the system, resulting in all priority watering actions being achieved.”

“The highest priority for us was to provide the best spawning and migratory flows possible for Australian grayling. During the drought period, grayling populations were shown to decline in the system.”

Australian grayling live for only two or three years and need to breed on a regular basis to maintain a viable population. Spawning is essential at least twice in any three-year period.

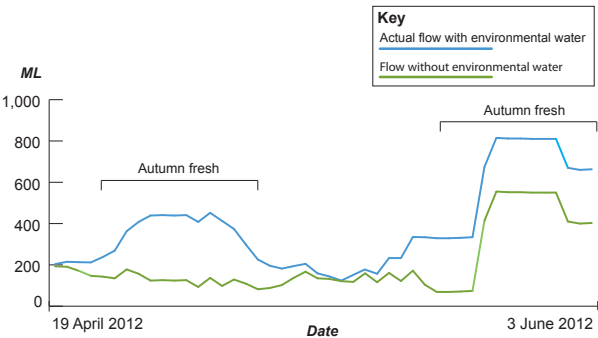
“Annual fish surveys in the Macalister River have shown a resurgence in abundance of Australian Grayling over the last two years, likely due to the wetter conditions and targeted environmental flow releases,” David said.



Water source (entitlement)	Volume in megalitres (ML)
Macalister River Environmental Entitlement 2010	• 14,018 ML
Environmental objectives	
The environmental objectives for 2011-12 were to: improve habitat for aquatic animal species; maintain fish passage; assist spawning and migration of priority fish species, in particular the Australian grayling.	

Macalister flow snapshot

This hydrograph shows how environmental water contributed to autumn freshes in the Macalister River. Flows were recorded at Lake Glenmaggie, north-west of Maffra.



Water savings achieved through the Main Northern Automation and Macalister Channel Automation Project totalling 14,018 ML were allocated to the environmental entitlement and used to deliver these releases in 2011-12.

Similar to the Thomson River, environmental watering also helped with maintenance of the river channel by moving sediments through the system, and improved the health of in stream and riparian vegetation.

More information on the Macalister system is available in the VEW Seasonal Watering Plan 2012-13, or by visiting the West Gippsland CMA website at www.wgcma.vic.gov.au.

Opposite: Upper Macalister River, West Gippsland CMA
Right: Macalister River immediately downstream of Lake Glenmaggie, DSE
Far right: Macalister River, West Gippsland CMA



Yarra system

Waterway manager – Melbourne Water

In 2011-12, the Yarra system received its first managed environmental flow releases since the environmental entitlement was created in 2006.

Covering over 4,000 square kilometres and supplying around 70 percent of Melbourne's drinking water, the Yarra River catchment is the largest within the Port Phillip and Westernport region. The Yarra River supports many important environmental values, including platypus and a number of nationally significant fish species such as the Australian grayling and the Macquarie perch.

During 2011-12, a combination of managed environmental releases and natural flows occurred in the Yarra River, resulting in all priority watering actions being either partially or fully achieved.

"The first managed flow event took place in September 2011, with a week-long release of just under 1,000 ML from the Upper Yarra Reservoir. This was the first time the river had received above minimum flow since the entitlement was reinstated in October 2010," said Anna Lucas, Environmental Water Reserve Officer at Melbourne Water.

"The next release totalling 3,988 ML was made over a two week period in February 2012 from the Upper Yarra, O'Shannassy and Maroondah reservoirs."

The first environmental flow releases resulted in a number of great outcomes – for both the environment and to inform planning for future events.

"Environmentally, we saw some great responses from high natural flows and the environmental releases. Australian grayling juveniles were observed in Warrandyte [24 km north-east of the Melbourne CBD], suggesting successful upstream migration over spring. Water quality was also maintained at a good level for fish through the season."

"We also saw an improvement in aquatic habitat downstream of the Upper Yarra Reservoir, with less fine sediment in riffles and pools and the inundation of billabongs in the Yarra floodplain, supporting bird and frog habitat."

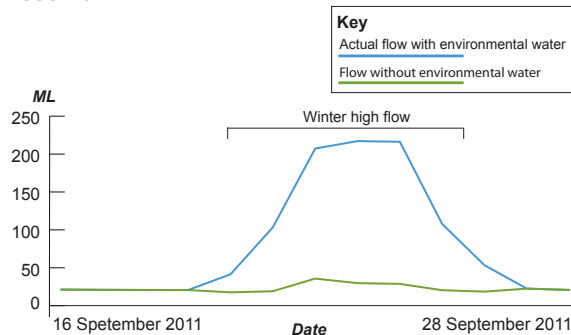
Below: Great egret spotted along the Yarra River, VEWH



Water source (entitlement)	Volume in megalitres (ML)
Yarra River Environmental Entitlement 2006	<ul style="list-style-type: none"> • 4,771 ML • Passing flows – 19,187 ML
Environmental objectives	
The environmental objectives for 2011-12 were to: improve habitat for aquatic animal species; maintain fish passage; assist spawning and migration of priority fish species, including Australian grayling and Macquarie perch; increase the spread of flood-tolerant vegetation; maintain the shape of the river channel; and avoid a decline in water quality.	

Yarra flow snapshot

This hydrograph shows how environmental water contributed to winter high flows in the Yarra River. Flows were recorded downstream of the Upper Yarra Reservoir.



“It is expected over time we will see an increased abundance of macroinvertebrates and native fish, including the Australian grayling and the Macquarie perch.”

Unregulated flows resulted in high flow events that helped reduce movement of terrestrial vegetation into the river channel. This provides an opportunity for flood-tolerant vegetation to spread and stabilise the riverbank.

“From a planning point of view, we were able to learn about the ecological response to high flows downstream of the reservoirs as well as travel times of releases in the system.”

“The summer release allowed us to test travel times between various release points along the river to meet the flow requirement downstream,” Anna said

More information on the Yarra system is available in the VEWB *Seasonal Watering Plan 2012-13*, or by visiting the Melbourne Water website at www.melbournewater.com.au.

Tarago system

Waterway manager – Melbourne Water

Water releases associated with dam maintenance and wet weather combined in 2011-12 to achieve the majority of the Tarago system's priority watering actions.

The Tarago system covers an area of over 950 square kilometres and includes the Tarago and Bunyip rivers. The Tarago River headwaters are within the Tarago State Forest and flow into the Tarago Reservoir at Neerim. Downstream of the reservoir, the Tarago River flows through the towns of Rokeby and Robin Hood before meeting the Bunyip River at Longwarry North, supplying water to a number of irrigators in the catchment.

The Tarago system is home to many native fish species such as the Australian grayling and river blackfish, along with one of Australia's most iconic

marsupials, the platypus. Threatened vegetation species such as long pink-bells, tree geebung, and swamp bush-pea can be found along some river reaches.

Wet catchment conditions continued throughout 2011-12, producing above average streamflows in the Tarago system.

"High unregulated flows, combined with operational releases and passing flow releases, resulted in most priority watering actions being fully achieved, including spring and autumn high flows and freshes," said Helen Clarke, Environmental Water Reserve Officer at Melbourne Water.

"This meant no active environmental water releases were needed in the Tarago system during 2011-12."

The water level in Tarago Reservoir was lowered in 2011-12 due to dam wall maintenance works. During this time the reservoir was operating at a restricted full supply level, which required regular operational releases to maintain this lower level.

"Regular communication with operational staff continued to identify opportunities for releases to help meet priority watering actions and environmental objectives."



Water source (entitlement)	Volume in megalitres (ML)
Tarago and Bunyip Rivers Environmental Entitlement 2009	<ul style="list-style-type: none">• 0 ML• Passing flows at Drouin West – 4,380 ML
Environmental objectives	
The environmental objectives for 2011-12 were to: improve habitat for aquatic animal species; maintain habitat connectivity; assist spawning and migration of priority fish species; increase the spread of flood-tolerant vegetation; maintain the shape of the river channel; and avoid deterioration of water quality.	

“These flows provided a range of benefits to the system, including discouraging the growth of terrestrial vegetation in the river channel, and providing important habitat for aquatic species such as river blackfish and platypus. Bankfull and overbank flows occurred naturally in the Tarago system during 2011-12.”

“Our long-term aim for the Tarago system is to manage environmental water releases to enhance species richness and diversity, while recognising the multiple uses of the system. We want to promote the system as an enjoyable place for all to live,” Helen said.

More information on the Tarago system is available in the VEWB *Seasonal Watering Plan 2012-13*, or by visiting the Melbourne Water website at www.melbournewater.com.au.

Opposite: Tarago Reservoir, Image supplied courtesy of Melbourne Water
Below left: Tarago River at Iona, Melbourne Water
Below right: Drouin west fish ladder, Melbourne Water



Werribee system

Waterway manager – Melbourne Water

The first year the Werribee environmental water entitlement was in place saw most priority watering actions achieved through natural flows; though significant planning took place to determine the best way to use environmental water in the future.

The Werribee system, located 40 kilometres south-west of Melbourne, flows from the Wombat State Forest south-east to the undulating plains of basalt soils north of Ballan before flowing into Port Phillip Bay at Werribee. The upper Werribee River contains areas of relatively intact streamside vegetation and is an important habitat for native fish, platypus and macroinvertebrates. The middle reaches of the Werribee River provide good habitat for fish, including short-finned eel, pygmy perch, and tupong, as well as a significant platypus population. The lower reaches of the river are home to migratory wading birds and many fish species, and are lined with highly valued river red gums. The river provides water for irrigation districts

at Bacchus Marsh and Werribee, as well as private diverters west of Werribee, and supplies urban and rural centres including Melton and Bacchus Marsh.

During 2011-12, natural flows in the system resulted in achievement, or partial achievement, of all priority watering actions in the lower reaches of the Werribee system, including the estuary. This meant that no active environmental water releases were needed.

It is expected that natural high flow events in the system during 2010-11 and 2011-12 will have flushed salt water from the estuary during winter and allowed a well-oxygenated salt wedge to migrate upstream during spring. This will provide particular benefit to fish, especially estuarine residents such as black bream.

“Of particular note was the first spill from Melton Reservoir in six years, which partially delivered a winter fresh to the lower reaches below the reservoir,” said Bill Moulden, Environmental Water Reserve Officer at Melbourne Water.

“There is also evidence that platypus may have bred in the lower reaches of the Werribee River in the past few years.”

With the environmental entitlement for the Werribee River only formalised in May 2011, a lot of planning went into the system’s first year of environmental watering.



Water source (entitlement)	Volume in megalitres (ML)
Werribee River Environmental Entitlement 2011	<ul style="list-style-type: none">• 0 ML• Passing flows:<ul style="list-style-type: none">- below Melton Reservoir – 1,033 ML- below Bacchus Marsh diversion weir – 1,118 ML- below Lake Merrimu – 295 ML
Environmental objectives	
The environmental objectives for 2011-12 were to: maintain pool habitat and connectivity for platypus and priority fish species, including pygmy perch; maintain instream and riparian vegetation growth; mobilise sediment; and maintain the shape of the river channel.	

“The main task was to work out which environmental releases could be physically delivered in the short to medium term, given the constraints of the system,” Bill explains.

“We consulted heavily with the local community to help prioritise reaches and values to target for flow delivery. We identified social values within the catchment through broader consultation for our Healthy Waterways Strategy and also held a well-attended meeting in Wyndham Vale specifically about environmental flows.”

One key challenge for the river is the seasonal flow reversal between Melton Reservoir and the Werribee Diversion Weir.

“Because of the regulation of this section of the system, the river runs high in summer and low in winter, which is the opposite of what would have likely happened under natural conditions.”

“The amount of water available in the environmental entitlement isn’t enough to address this flow reversal. However, the overall impact of environmental releases will be quite noticeable in between Merrimu and Melton reservoirs and in the estuary downstream of Werribee as, these reaches currently receive so little flow,” Bill said.

More information on the Werribee system is available in the VEWB *Seasonal Watering Plan 2012-13*, or by visiting the Melbourne Water website at www.melbournewater.com.au.

Opposite: Werribee River, VEWB
Below: Werribee diversion weir, VEWB



barwon system

Waterway manager – Corangamite Catchment Management Authority (CMA)

2011-12 was a significant year for the Barwon system with the creation and first use of the Barwon River Environmental Entitlement.

The Barwon River rises in the Otway Ranges and flows through Geelong, joining the coast at Barwon Heads. It receives inflows from major tributaries, including the Moorabool and Yarrowee/Leigh rivers. The estuarine reach of the Barwon River incorporates a system of wetlands and lakes, including Lake Connewarre, Reedy Lake, Hospital and Salt Swamps, and Murtnaghurt Lagoon. These wetlands form part of the internationally significant Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site, and are also part of the Lake Connewarre State Game Reserve. The wetlands are a popular area for recreational activities for the communities surrounding Geelong and the Bellarine Peninsula.

Reedy Lake and Hospital Swamps support a diverse range of aquatic vegetation communities, providing important feeding and breeding habitat for native fish, including the nationally threatened Australian grayling, dwarf galaxias, and Yarra pygmy perch. They also support a number of wetland-dependent bird species, including the nationally threatened Australian painted snipe, Latham's snipe, caspian tern and whiskered tern.

Wetter conditions experienced during 2011-12 combined with the first use of the Barwon River Environmental Entitlement, has boosted the health of the lower Barwon wetlands following a prolonged period of low inflows.

"Wet catchment conditions throughout 2011-12 meant that Reedy Lake and Hospital Swamps both received inflows from the Barwon River, and were full entering 2012-13," said Jayden Wooley, Environmental Water Manager with Corangamite CMA.

"This meant that both wetlands were able to support a diverse range of fish and waterbird populations, although this was somewhat limited at Reedy Lake due to the spread of phragmites [a type of aquatic reed], reducing habitat diversity and limiting the area of open water available for waterbird foraging."



Water source (entitlement)	Volume in megalitres (ML)
Barwon River Environmental Entitlement 2011 ¹	<ul style="list-style-type: none">• The inlet to Hospital Swamps was open between 17 May and the start of June 2012 to allow inflows from the Barwon River.• The inlet to Reedy Lake was open and the outlet closed for the entire water year.
Environmental objectives	
The environmental objectives for 2011-12 were to: maintain the condition and extent of wetland vegetation; minimise reed encroachment; and maintain waterbird breeding, recruitment and foraging opportunities.	

¹ This is an unregulated flow entitlement. The use of this entitlement is dependent on river heights and is therefore not measured in the same way as environmental releases made from storages into rivers.

Jayden explains how scientific investigations and local knowledge are helping inform decisions on how the newly created environmental entitlement for the Barwon system can be managed.

“In the first year of the entitlement, it was important to maintain the current water management regime until the results of new investigations became available.”

“We have learned a lot from our discussions with the local community, stakeholders, Geelong Field and Game, and the public land manager, Parks Victoria. This includes how the wetland system works and the impact different infrastructure can have on water movement, as well as how the wetlands respond when there is more water around.”

“We also identified key information gaps, in particular, where further information is required to ensure habitat diversity is maintained at Reedy Lake - all of which will help us with future management of the Barwon system,” Jayden said.

More information on the Barwon River is available in the *VEWH Seasonal Watering Plan 2012-13*, or by visiting the Corangamite CMA website at www.ccma.vic.gov.au.

Opposite and below: Hospital Swamps, Corangamite CMA



moorabool system

Waterway manager – Corangamite Catchment Management Authority (CMA)

The Moorabool was another system that welcomed a combination of wetter conditions and managed environmental water releases in 2011-12.

The Moorabool is an important river for the major urban areas of Geelong and Ballarat, providing water for social and agricultural purposes in the region. Despite years of drought and water extraction, the Moorabool River still retains many environmental values, including native fish of high conservation value and areas of significant remnant vegetation. The river is home to populations of native aquatic species, such as platypus and native fish including tumpung, river blackfish, southern pygmy perch, Australian smelt and the short-finned eel.

Over the last two years the Moorabool River has received significant inflows, providing much-needed

relief after years of prolonged drought. During the drought, small amounts of water were released over summer to maintain water quality in remnant pools and supply downstream communities with water.

“Environmental watering in 2011-12 focused on building on the benefits created by these natural flows, targeting summer flows to maintain water quality and provide habitat for fish and platypus,” said Mark Schultz, Environmental Water Reserve Officer with Corangamite CMA.

“Summer freshes were provided, freshening pools within the river and limiting terrestrial vegetation spreading into the channel.”

While wetter conditions meant that a number of flow targets were met naturally, environmental water was used to improve flow variability, which is important for the ecological processes of the Moorabool River. This includes fish movement and maintaining diverse habitats for the river’s flora and fauna.

In 2011-12, all priority watering actions were partially or fully achieved, with the exception of a ‘cease to flow’ due to unregulated flows and the spilling of Lal Lal Reservoir.

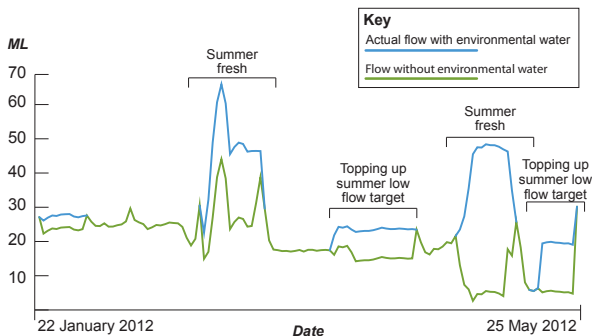
“The cooperation of Central Highlands Water and Barwon Water was crucial to the successful delivery of environmental water in 2011-12,” Mark explains.



Water source (entitlement)	Volume in megalitres (ML)
Moorabool River Environmental Entitlement 2010	<ul style="list-style-type: none">• 2,173 ML• Passing flows – 4,183 ML
Environmental objectives	
The environmental objectives for 2011-12 were to: maintain water quality; maintain diversity of macroinvertebrate and instream aquatic plants; limit encroachment of instream vegetation; maintain snag habitat; restore or maintain self-sustaining populations of priority fish species; and maintain riparian vegetation.	

Moorabool flow snapshot

This hydrograph shows how environmental water contributed to summer freshes and low flow targets in the Moorabool River. Flows were recorded at Morrisons, downstream of Lal Lal Reservoir.



“As the storage operator, Central Highlands Water was more than happy to deliver all of our planned environmental flows as required.”

“The timing of Barwon Water’s releases for consumptive purposes over summer play a key role in maintaining summer base flows in the river and means we can use water from the environmental entitlement to improve flow variability”. Mark said.

More information on the Moorabool River is available in the VEWB *Seasonal Watering Plan 2012-13*, or by visiting the Corangamite CMA website at www.ccma.vic.gov.au.

Opposite: Moorabool River near Bakers Bridge, Corangamite CMA
Right: Moorabool River before summer fresh in January 2012, Corangamite CMA
Far right: Moorabool River after summer fresh in June 2012, Corangamite CMA



glenelg system

Waterway manager – Glenelg Hopkins Catchment Management Authority (CMA)

The discovery of estuary perch in the upper reaches of the Glenelg River for the first time in several decades, heralded a turning point for the health of the system in 2011-12.

The Glenelg River, in south-west Victoria, starts in the Grampian Ranges and runs for over 500 kilometres, making it one of the longest rivers in Victoria. A short stretch of the estuary winds through South Australia before returning to Victoria to enter the sea at Nelson. The Glenelg River is a central feature of the Lower Glenelg National Park and is a popular place for recreational activities. One reach is listed as a heritage river due to the high-value aquatic life it supports, including the endangered freshwater mussel and Glenelg spiny crayfish. It is also the only river system in Victoria where Yarra pygmy perch, variegated pygmy perch and southern pygmy perch can all be found in the one location.

Wet conditions experienced in 2010 and 2011, combined with environmental water releases of 3,562 ML in 2011-12, have continued to help the recovery of the Glenelg River following many years of drought. These flows contributed to all priority watering actions being either fully or partially achieved in 2011-12.

“These conditions provided increased opportunities for fish breeding events, improved water quality and assisted in the establishment of in stream vegetation, which provides critical nursery habitat for juvenile fish,” said Bryce Morden, Environmental Water Reserve Officer with the Glenelg Hopkins CMA.

“The rediscovery of estuary perch in the upper reaches of the Glenelg River was a great outcome in 2011-12.”

“Increased flows, improved water quality and the reconnection of pools will likely have encouraged the upstream movement of estuary perch, which hasn’t been found so far upstream in six decades.”



Water source (entitlement)	Volume in megalitres (ML)
Wimmera Glenelg Rivers Environmental Entitlement 2010	<ul style="list-style-type: none">• 3,562 ML• Passing flows – 17,240 ML
Environmental objectives	
The environmental objectives for 2011-12 were to: maintain and improve instream habitat and water quality; and provide connectivity between reaches to support native fish movement.	

“Fish monitoring also found an increase in the number of variegated pygmy perch, which relies on healthy in stream vegetation to feed and breed.”

Seeing the Glenelg River flow once again into the estuary during summer was another high point for the environmental watering program in 2011-12, explains Bryce.

“Freshwater inflows are very important to estuaries. They flush salt water from the system, improving water quality and providing habitat for a more diverse range of aquatic species.”

“Freshwater flows also provide the added advantage of improving water quality for stock and domestic users along the river,” Bryce said.

More information on the Glenelg River is available in the *VEWH Seasonal Watering Plan 2012-13*, or by visiting the Glenelg Hopkins CMA website at www.ghcma.vic.gov.au.

Opposite: Glenelg River during summer fresh, Glenelg Hopkins CMA
Below left: Glenelg River, Glenelg Hopkins CMA
Below centre: Clumes Hole on the Glenelg River, Glenelg Hopkins CMA
Below right: Glenelg River at Frasers Swamp, Glenelg Hopkins CMA



Wimmera system

Waterway manager – Wimmera Catchment Management Authority (CMA)

Platypus are showing signs of recolonising the Wimmera system thanks to a combination of managed environmental water releases and wetter conditions experienced in 2011-12.

The Wimmera system, which includes the Wimmera and MacKenzie rivers, lies in western Victoria, beginning in the Pyrenees and flowing into Lake Hindmarsh, then overflowing into Outlet Creek and into Lake Albacutya (a Ramsar listed wetland). The Wimmera system is home to Victoria's only self-sustaining population of freshwater catfish, and 85 significant plant species, including the endangered Wimmera bottlebrush.

The Wimmera River is listed as a heritage river due to its myriad of environmental and social values. These include evidence of long periods of Indigenous settlement in the area, including middens and scar trees. It is also a popular spot for recreational activities such as boating, fishing and camping.



In 2011-12, 14,183 ML of environmental water was released into the Wimmera River combining with operational and unregulated flows to partially or fully achieve all priority watering actions. This built on the benefits created by the wetter conditions experienced in 2010 and early 2011.

“Consistent flows provided by environmental water releases and passing flows, combined with flood events in 2010 and early 2011 have led to the most sustained flows in the Wimmera River in over 10 years,” said Greg Fletcher, Environmental Water Reserve Officer with the Wimmera CMA.

“This has led to big improvements in river health, including improved water quality and increased diversity and abundance of macroinvertebrates, fish and plants.”

“The discovery of four individual platypus in the middle reaches of the MacKenzie River for the first time since 2005 was an exciting discovery this year, and is an indication that platypus are beginning to recolonise this reach after all but disappearing during the drought.”

“The health of river red gums fringing the Wimmera River has also improved significantly, with once severely stressed trees now showing positive signs of life,” Greg said.

Water source (entitlement)	Volume in megalitres (ML)
Wimmera Glenelg Rivers Environmental Entitlement 2010	<ul style="list-style-type: none"> • 14,183 ML • Passing flows – 12,610 ML
Environmental objectives	
The environmental objectives for 2011-12 were to: maintain pool habitat and water quality for fish populations; improve potential for fish movement; increase macroinvertebrate populations; carbon/nutrient cycling and bench vegetation; and limit saline groundwater impacts on banks and deep pools.	

Greg explained that environmental water releases were also important in assisting with an ongoing battle against salinity in the Wimmera River.

“Without regular flows, salinity levels continue to increase month after month, increasing the chances of fish deaths and algal blooms.”

“Environmental water releases are one tool we are using to mitigate these impacts while also undertaking revegetation and erosion control to tackle the problems at the source,” Greg said.

Jonathon Starks, Project Facilitator – Delivery Program from Wimmera CMA explains Lake Hindmarsh was also a beneficiary of the flood waters in the Wimmera region, attracting hundreds of waterbirds, including some international tourists from Japan, China and New Zealand.

“Our April 2012 bird survey recorded over 900 birds at Lake Hindmarsh, including three migratory shorebirds listed under the JAMBA and CAMBA international migratory bird agreements, including the red-necked stint and the greenshank.”

“Some of these birds would have stopped over at the lake for a ‘top up’ before continuing on to northern Australia and beyond.”

“These observations highlight how vitally important Lake Hindmarsh can be for birds, not just in the Wimmera, or even Victoria, but nationally and internationally,” Jonathan said.

More information on the Wimmera River is available in the VEWB *Seasonal Watering Plan 2012-13*, or by visiting the Wimmera CMA website at www.wcma.vic.gov.au.

Opposite: MacKenzie River at Distribution Heads, Wimmera CMA
Right: Wimmera River at Jeparit Museum in 2009, Wimmera CMA
Far right: Wimmera River at Jeparit Museum in 2012, Wimmera CMA



Wimmera mallee wetlands

Waterway managers – Wimmera, Mallee and North Central catchment management authorities

The first wetlands to be connected to the Wimmera-Mallee Pipeline received a fresh injection of flows in the Mallee region.

Over 40 unique wetlands in the Wimmer-Mallee system have been selected for connection to the Wimmer-Mallee pipeline. The wetlands vary in size, and are home to a huge variety of native waterbird populations, including brolgas, egrets, blue-billed ducks, freckled ducks, Caspian terns and glossy ibis. They also provide a valuable source of water for other native animals such as the threatened growling grass frog. Important vegetation communities are present in the wetlands, such as spiny lignum and cane grass, providing diverse habitat for a wide range of animal species. In addition, many of the wetlands provide social values important to local communities, including canoeing and bird watching.

A shift from open channel systems to the more efficient Wimmera-Mallee Pipeline system resulted in many wetlands, including Roselyn Wetland and Barbers Swamp, being isolated from channel outfalls that historically watered the wetlands.

To address this, a 1,000 ML environmental entitlement was created through the Wimmera-Mallee Pipeline project to protect environmental values such as aquatic habitat for waterbirds, reptiles, frogs and macroinvertebrates; and maintaining the condition of aquatic and riparian vegetation.

In 2011-12, Roselyn Wetland and Barbers Swamp were the first two wetlands to be connected to the pipeline and received 6.7 ML and 15.3 ML of environmental water respectively during May and June 2012.

“Historically, Barbers Swamp and Roselyn Wetland received outfall water from the open channel supply system on an annual basis,” said Louise Searle, Waterways Coordinator at Mallee CMA.

“In 2010, when the open channel system was replaced with the pipeline, outfall into the wetlands stopped. The wetlands have continued to receive some water through both active water delivery and high rainfall events.”



Water source (entitlement)	Volume in megalitres (ML)
Wimmera Glenelg Rivers Environmental Entitlement 2010	• 22 ML
Environmental objectives	
The environmental objectives in 2011-12 were to: provide habitat for waterbirds including threatened species and native animals; and maintain the condition of fringing wetland vegetation.	

“Since 2010, the water regime of Barbers Swamp has supported a local population of Australian painted snipe, which is a nationally vulnerable and State-listed threatened species.”

“Both wetlands have also functioned as watering points for a variety of locally significant animals.”

“In 2011-12, our aim was to inundate the fringing native vegetation in autumn, followed by a winter drawdown to provide littoral habitat for waterbirds including the Australian painted snipe,” Louise said.

Significant consultation was undertaken throughout the pipeline project via the establishment of the Wetland Evaluation Team; a committee providing advice regarding the prioritisation, selection, connection and supply of water to the wetlands.

The delivery of environmental water to more wetlands within the system will occur as infrastructure connections are completed.

More information on the Wimmera-Mallee wetlands is available in the VEWHS *Seasonal Watering Plan 2012-13*, or by visiting the Wimmera (www.wcma.vic.gov.au), Mallee (www.malleecma.vic.gov.au) or North Central (www.nccma.vic.gov.au) catchment management authority websites.

Opposite: Barber’s Swamp, Mallee CMA
Right: Painted Snipe, Mallee CMA
Far right: Roselyn Wetland, Mallee CMA



Goulburn system

Waterway manager – Goulburn Broken Catchment Management Authority (CMA)

In 2011-12, the contribution of Commonwealth and Living Murray environmental water helped continue the environmental recovery of the Goulburn River following many years of drought.

The Goulburn River basin is Victoria's largest, covering over 1.6 million hectares or 7.1 percent of the State's total area. The Goulburn River is an iconic heritage river because of its significant environmental, recreational and cultural values. It supports areas of intact river red gum forest, and provides habitat for threatened species such as the great egret, Murray cod and Macquarie perch. It also contains many important cultural heritage sites, provides water for agriculture and supports recreational activities such as fishing and canoeing.

Below: Lower Goulburn floodplain, Goulburn Broken CMA



Over the last 12 years, the Goulburn River has experienced 10 years of very low flows and most recently, two years of high flows.

Between autumn 2011 and autumn 2012, the Goulburn River experienced a number of natural freshes, bankfull and overbank flows as a result of widespread and heavy rainfalls.

"In 2011-12, natural flows combined with targeted environmental releases allowed the environmental recovery of the Goulburn River and its floodplain to continue, with all priority watering actions being partially or fully achieved," explains Geoff Earl, Environmental Flow Coordinator with the Goulburn Broken CMA.

"These conditions increased opportunities for feeding and breeding of waterbirds, frogs and native fish species, particularly golden perch."

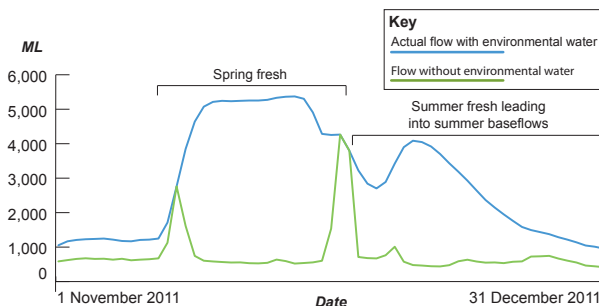
"We were also able to learn a lot about the flow conditions required for golden perch to breed, which will help us to better plan for environmental water releases in future years."

Storage operators also played an important role in managing consumptive water in a way that provided environmental benefits to the Goulburn River, Geoff explains.

Water source (entitlement)	Volume in megalitres (ML)
Environmental Entitlement (Goulburn System – Living Murray) 2007	• 61,038 ML
Commonwealth Environmental Water Holdings	• 134,072 ML
Environmental objectives	
The environmental objectives in 2011-12 were to: maximise fish habitat; improve and expand macroinvertebrate habitat; carbon/ nutrient cycling and promote the establishment and growth of riparian vegetation; and stimulate golden perch breeding.	

Goulburn flow snapshot

This hydrograph shows how environmental water contributed to spring and summer freshes and baseflow targets in the Goulburn River. Flows were recorded McCoys Bridge, north of Shepparton.



“Goulburn-Murray Water were able to time releases out of Lake Eildon to meet flow recommendations for the Goulburn River as well as meeting needs of water users,” he said.

“This is a great example of how environmental water managers and storage operators can work together to meet both the needs of the environment and consumptive users,” Geoff said.

The Commonwealth Environmental Water Holder contributed significant volumes of water to the Goulburn system. The Living Murray program also delivered water in the Goulburn River for downstream requirements. The VEW and Goulburn Broken CMA worked closely with the Commonwealth Environmental Water Office and the Murray-Darling Basin Authority to plan for, and deliver this water.

More information on the Goulburn River is available in the VEW *Seasonal Watering Plan 2012-13*, or by visiting the Goulburn Broken CMA website at www.gbcma.vic.gov.au.

broken system

Waterway manager – Goulburn Broken Catchment Management Authority (CMA)

A season of mixed conditions meant swift and adaptive decision making was needed to manage environmental watering in the Broken system during 2011-12.

The lower Broken Creek, in northern Victoria, flows north-west from the Broken River into the River Murray, just downstream of Barmah Forest. It supports threatened plant and animal species, including six native fish species of state and national conservation significance, including the iconic Murray cod. The lower Broken Creek also supports valuable riparian vegetation, especially in the lower reaches, which provides important habitat for threatened waterbirds, such as the brolga and great egret. It is also a popular area for recreational fishing and walking.

After 10 years of drought, extensive flooding in 2011-12 led to some of the lower Broken Creek's environmental water needs being met naturally. However, these natural flows resulted in a blackwater event, with very low dissolved oxygen levels and some fish deaths.

"2011-12 was very much an erratic season, with fast changing conditions, which really tested the adaptive decision-making process we have in place in terms of when and how we release environmental water," explains Geoff Earl, Environmental Water Flow Coordinator with the Goulburn Broken CMA.

The spring and early summer was relatively dry with conditions constantly changing, and flows were required to manage dissolved oxygen levels in the creek in this period.

With cooperation of Goulburn-Murray Water and Murray-Darling Basin Authority, a range of water sources were used to provide the required flows.

Extensive flooding in February/March 2013 led to the lower Broken Creek's environmental water needs being met naturally.

"Once it became clear that the Broken system was going to experience high flows, all environmental water releases were stopped and nature took its course."



Water source (entitlement)	Volume in megalitres (ML)
Commonwealth Environmental Water Holdings	<ul style="list-style-type: none">• 10,418 ML
Environmental objectives	
The environmental objectives for 2011-12 were to: provide native fish passage; provide suitable water quality conditions for native fish; and provide fish habitat during migration and breeding seasons.	

“However, these natural flows resulted in a blackwater event, with very low dissolved oxygen levels and some fish deaths. Blackwater occurs when organic matter such as leaves are washed from the floodplain or creek banks, mixing with the water and creating low dissolved oxygen levels which can be harmful to fish and other aquatic species.”

“Following the blackwater event, further environmental flows were released to improve water quality and improve conditions for surviving native fish,” Geoff said.

Environmental releases were also made in the Broken River to maintain healthy native vegetation in riverbank areas, and connect areas of habitat for native fish.

At the end of 2011-12, all priority watering actions had been partially met.

The Commonwealth Environmental Water Holder contributed significant volumes of water to the Broken system. The VEWH and Goulburn Broken CMA worked closely with the Commonwealth Environmental Water Office to plan for and deliver this water.

More information on the Broken system is available in the VEWH *Seasonal Watering Plan 2012-13*, or by visiting the Goulburn Broken CMA website at www.gbcma.vic.gov.au.

Opposite and below: Broken Creek, Goulburn Broken CMA.



Campaspe system

Waterway manager – North Central Catchment Management Authority (CMA)

Native fish were the big winners of the largest environmental water release ever in the Campaspe system in 2011-12.

The Campaspe River, which flows to its confluence with the River Murray at Echuca, lies in north-central Victoria. The Campaspe provides irrigation water to an agriculturally diverse catchment, including dryland, dairy and intensive horticultural farming. The river system has high environmental values because of its connection to the River Murray, its banks of river red gums and its healthy native fish populations, including Murray cod, golden and silver perch. It also supports a diverse range of significant bird species, such as the threatened brown tree creeper.

Following an extended drought, the Campaspe system received above-average rainfall in 2010-11 and 2011-12. The resulting floods reset the river

system, scouring the river channel and removing the extensive reed beds (cumbungi and phragmites) that had spread during the drought. The system is starting to recover with improved water quality, though it will take a little while for long-term environmental benefits to become apparent.

The release of 1,200 ML a day of environmental water for four days in winter 2011 was the first time a flow of this magnitude had been delivered in the Campaspe.

“The large release of environmental water was possible due to the collaboration of partners in the Living Murray program, Commonwealth Environmental Water and the VEWB,” explains Darren White, Environmental Flows Project Manager with the North Central CMA.

“The high flows created by the environmental water release enabled native fish to move in the system, creating opportunities for feeding and breeding. The flows also improved habitat for macroinvertebrates.”

At the end of 2011-12, all priority watering actions had been partially or fully met.

A major on-ground works program has been initiated to complement the benefits of environmental water releases in the Campaspe system.



Water source (entitlement)	Volume in megalitres (ML)
Commonwealth Environmental Water Holdings	• 6,532 ML
Environmental Entitlement (Campaspe River – Living Murray Initiative) 2005	• 7,152 ML
Environmental objectives	
The environmental objectives for 2011-12 were to: maintain pool habitat and water quality for fish populations; improve the potential for fish movement; maintain macroinvertebrate populations; reduce the spread of terrestrial vegetation instream; and enhance river red gum recruitment.	

“The ‘Caring for the Campaspe River’ project will complement environmental flow management in the system over the next four years.”

“The project aims to reduce erosion, pests and algal growth while also improving water quality, stock management and fish habitat,” Darren said.

The Commonwealth Environmental Water Holder contributed significant volumes of water to the Campaspe system. The Living Murray program also delivered water in the Campaspe River for downstream requirements. The VEWH and North Central CMA worked closely with the Commonwealth Environmental Water Office and the Murray-Darling Basin Authority to plan for and deliver this water.

More information on the Campaspe River is available in the VEWH *Seasonal Watering Plan 2012-13*, or by visiting the North Central CMA website at www.nccma.vic.gov.au.

Opposite: Winter high flow at Avonmore Bridge, Campaspe River November 2011, North Central CMA

Below left: Winter base flow at Avonmore Bridge, Campaspe River May 2012, North Central CMA

Below right: Winter high flow at Campaspe Weir November 2011, North Central CMA



Loddon system

Waterway manager – North Central Catchment Management Authority (CMA)

The Loddon River continued its road to recovery in 2011-12 thanks to improved natural and environmental flows.

The Loddon River is located in north-central Victoria. The system is home to a range of native fish species, such as the river blackfish, Murray cod, golden perch and silver perch. It is also a popular spot for tourists due to its intact forests and high-value vegetation. The Bullarook River System, which includes Birch's Creek, also forms part of the Loddon System and has its own environmental water entitlement.

The Loddon River is on the road to recovery following over 10 years of drought. Improved flows over the last two years combined with the delivery of environmental water from Victorian and Commonwealth-held entitlements have helped to improve water quality, remove terrestrial species (including red gum saplings) from the middle of

the river channel, and provide improved habitat for macroinvertebrates and fish.

“Winter and spring flows were reinstated for the first time since 2007, providing opportunities for fish movement from the River Murray into the Loddon River and Pyramid Creek,” said Phil Slessar, Environmental Water Reserve Officer with the North Central CMA.

“Photo-point monitoring also indicated a significant improvement in river red gum health along the river from Loddon Weir to Kerang Weir.”

Environmental water was delivered to Birch's Creek for the first time in summer and autumn to improve deteriorating water quality, Phil explains.

“Because the conditions became drier during summer and autumn, we released a freshening flow of environmental water into Birch's Creek.”

“The aim of the flow was to freshen up pools for river blackfish, improve water quality and provide a bit of help to riparian vegetation, which was struggling with the drier conditions.”

At the end of 2011-12, all priority watering actions had been partially or fully met.

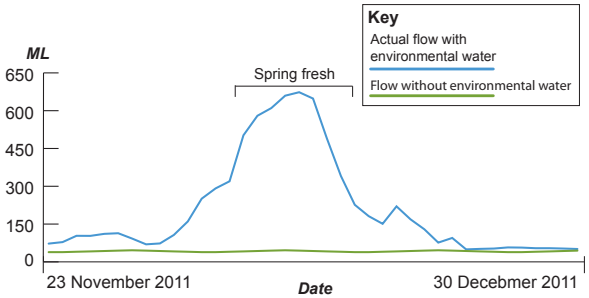
On-ground works, such as stock exclusion, fencing and revegetation, were carried out by the North Central CMA in 2011-12 to complement the benefits created by environmental water releases.



Water source (entitlement)	Volume in megalitres (ML)
Bulk Entitlement (Loddon River – Environmental Reserve) Order 2005 (Wimmera-Mallee Pipeline savings)	• 6,037 ML
Commonwealth Environmental Water Holdings	• 1,564 ML
Environmental objectives	
The environmental objectives for 2011-12 were to: maintain channel form; maintain instream and riparian vegetation; reduce the spread of terrestrial vegetation instream; and maintain water quality.	

Loddon flow snapshot

This hydrograph shows how environmental water contributed to a summer freshe in the Loddon River. Flows were recorded downstream of Loddon Weir.



“On-ground works combined with environmental water delivery have assisted in providing a clear pathway to recovery and improvement for the Loddon system.”

“Our vision is to continue these activities to improve the ecological condition of the river, provide suitable habitat for aquatic mammals, fish and macroinvertebrates and healthy riparian and in stream vegetation,” he said.

The Commonwealth Environmental Water Holder contributed water to the Loddon system. The VEWH and North Central CMA worked closely with the Commonwealth Environmental Water Office to plan for and deliver this water.

More information on Loddon River is available in the VEWH *Seasonal Watering Plan 2012-13*, or by visiting the North Central CMA website at www.nccma.vic.gov.au.

Opposite: Twelve Mile Frost’s Road, Loddon River, North Central CMA

Right: Loddon River, June 2009, North Central CMA

Far right: Loddon River, June 2012, North Central CMA



Northern wetlands and

Waterway managers – Mallee, North Central and Goulburn Broken catchment management authorities

The northern Victorian wetlands and floodplains are made up of the Living Murray icon sites (see next chapter) and over 50 regional wetlands covering the Mallee, North Central, and Goulburn Broken catchment management authority boundaries.

Environmental objectives

The environmental objectives for 2011-12 were to: improve ecological resilience; and where appropriate, begin drying regimes, returning these systems to a more natural flow regime.

Below: Lake Carpul, Mallee CMA.



Mallee region

Environmental water use in the Mallee region in 2011-12 resulted in incredible outcomes for the environment and local communities.

The wetlands in the Mallee region contain a range of habitats, including saline wetlands and freshwater marsh environments. Environmental water delivery is currently possible at 32 sites within the region, from Nyah to the South Australian border. Environmental water delivery at these sites relies on a combination of irrigation infrastructure and pumping directly from rivers to actively water the sites.

Six wetlands were managed with environmental water during 2011-12 (Lake Carpul, Lake Powell, Cardross Lakes, Sandilong Creek, Heywood Lake and Lake Koorlong), while the other sites were allowed to fluctuate naturally with rainfall, high River Murray flows and evaporation.

While all of the sites benefited from the environmental watering, Lake Carpul, which is adjacent to the River Murray and about 15 kilometres south-east of Robinvale, particularly highlighted the amazing transformation environmental water can help achieve.

“The last time Lake Carpul was inundated was in 1993 as a result of River Murray flooding. The lake has been dry ever since,” Louise Searle, Waterways Coordinator at the Mallee CMA said.

“The lake is dominated by a black box community that generally requires inundation every one in eight years.”

Lake Carpul was identified as being in the best condition of all sites assessed in the 2009 index of wetland condition survey, despite the long absence of water.

“However, this lack of water was causing deterioration of the vegetation condition, and without the pumping of 2,062 ML of environmental water, the condition of the lake would have continued to decline,” Louise explains.

“This water made sure the environmental values at Lake Carpul were maintained while the CMA investigated a works program to make future watering more efficient.

The CMA worked with the surrounding landholders, local community, indigenous groups, water corporations and the VEWB to deliver the environmental water.

“We saw an amazing response from waterbirds as a result of the watering, with over 20 species recorded, including the blue-billed duck and great egret. The surrounding area also saw benefits with the river red gums and black box trees around the lakes flourishing and the surrounding environment becoming much healthier.”

“At the end of May 2012 we held a well attended community day to celebrate Lake Carpul’s full benefits for the first time in nearly 20 years, thanks to environmental watering,” Louise said.

Water delivered – site	Volume in megalitres (ML)
Sandilong Creek ¹	• 150 ML
Lake Powell ¹	• 1,772 ML
Lake Carpul ¹	• 2,062 ML
Cardross Basin ¹	• 819 ML
Lake Koorlong ¹	• 6,700 ML
Heywoods Lake ¹	• 1,999 ML

¹ Bulk Entitlement (River Murray – Flora and Fauna) Conversion Order 1999

One participant who attended the community day said: “It was fascinating to observe the immediate impacts of the past four months of water travelling through a landscape that had not seen water for 19 years. There were millions of tadpoles and the newly establishing cumbungi was being heavily grazed by kangaroos. As well as the ubiquitous ducks, there was an optimistic sea eagle.”

Below: Lake Carpul, Mallee CMA





Northern wetlands and floodplains

North Central region

Thousands of waterbirds and an endangered fish species benefited from environmental water management in the North Central region during 2011-12.

The North Central region features wetlands between Echuca and Swan Hill, and wetlands that are part of the Boort complex, between Boort and Kerang on the Loddon River. The wetland types range from naturally saline (salty) environments to freshwater marshes.



There are currently 13 wetlands that can be managed with environmental water, three of which are part of the Kerang Wetlands Ramsar site.

Wetlands within the North Central region did not receive natural flooding during 2011-12. Round Lake was managed with environmental water during the season to support the endangered Murray hardyhead, while the other wetlands were allowed to draw down naturally. Smaller wetlands dried completely, while larger wetlands are still holding water from the 2010-11 flood events.

Bree Bisset, Project Officer from the North Central CMA explains that the region's wetlands have attracted thousands of waterbirds throughout the 2011-12 season.

"Over 4,400 individual birds were recorded at Hird Swamp in January, including threatened species such as hardheads, royal spoonbills and great egrets. There was a high diversity of species recorded at McDonalds Swamp, with 27 species, including the freckled duck, recorded in November 2011."

"Blue-billed ducks were also observed on Richardson's Lagoon and Lake Cullen."

Round Lake, which received 481 ML of environmental water in 2011-12 also supports a number of significant species including the Murray hardyhead.

“There was a very successful breeding season for the Murray hardyhead. The Round Lake population is the only stable Murray hardyhead population in the region, maintained by environmental watering.”

The Murray hardyhead is critically endangered and can only be actively managed at four known Victorian sites. Individuals live for a maximum of 18 months, so the populations are critically dependent on successful breeding events every year.

“Allowing the water level to recede towards the end of summer and through winter, before delivering water in spring has been found to facilitate the release of nutrients critical for larvae and adult fish,” Bree said.

Water delivered – site	Volume in megalitres (ML)
Round Lake ¹	• 481 ML

¹ Bulk Entitlement (River Murray – Flora and Fauna) Conversion Order 1999

Opposite: Brolga at Murphy’s Lake, Rakali Ecological Consulting
Below left: White-bellied sea eagles, Rakali Ecological Consulting
Below right: Murray hardyhead, North Central CMA



Northern wetlands and floodplains

Goulburn Broken region

Following a number of wet years, wetlands in the Goulburn Broken region were left to naturally draw down in 2011-12 to preserve their important environmental values.

The Goulburn Broken region has nine wetlands that can currently be managed with environmental water between Yarrawonga, Benalla, Murchison and Echuca. They contain vegetation communities ranging from river red gum dominated swamps to cane-grass wetlands.

“Unseasonal rain has seen many wetlands across the Goulburn Broken region remain full since March 2010. Therefore, no environmental water was needed in 2011-12,” said Simon Casanelia, Environmental Water Reserve Officer at Goulburn Broken CMA.

“Many of these wetlands are still holding water which in most cases has been a welcome reprieve, as many of them were previously dry for 10 years.”

“The flooding has regenerated many wetland plant species and created habitat for a range of wetland-dependent animals including birds, frogs, turtles and the water rat.”

“Brolga successfully bred at Moodies Swamp and the Flora and Fauna Guarantee listed wavy marshwort (an aquatic plant) was recorded at the wetland for the first time. Thousands of waterbirds also made the most of the habitat provided by Gaynor Swamp. On one day over 7,000 grey teal and over 1,500 black-winged stilts were recorded at the wetland.”

However, Simon said some of the wetlands have now held water for extended periods.

“This can temporarily or permanently alter wetland vegetation communities by favouring species adapted to prolonged inundation, reducing the diversity and structure of habitat.”

“River red gums are of particular concern because they can die as a result of waterlogging – and a mature hollow-bearing river red gum can take over 100 years to grow,” Simon said.

More information on the northern wetlands and floodplains is available in the VEWB *Seasonal Watering Plan 2012-13*, or by visiting the Mallee (www.malleecma.vic.gov.au), North Central (www.nccma.vic.gov.au) or Goulburn Broken (www.gbcma.vic.gov.au) catchment management authority websites.



*Far left: Daunts billabong, Goulburn Broken CMA
Left: Broad-shelled turtle, Goulburn Broken CMA*

*Right: Perons Tree Frog, Keith Ward, Goulburn Broken CMA
Below: Dragonfly on Lignum, Keith Ward, Goulburn Broken CMA*



the living murray icon

Waterway managers – Goulburn Broken, Mallee and North Central catchment management authorities

The Living Murray Initiative is one of Australia's most significant long-term river restoration programs. It aims to achieve a healthy working River Murray system for the benefit of all Australians. Victoria has four sites as part of the Living Murray program, known as 'icon sites': Barmah Forest, Hattah Lakes, Lindsay-Wallpolla Islands and Gunbower Forest.

Environmental objectives

The environmental objectives for 2011-12 were to: improve ecological resilience; and where appropriate, begin drying regimes, returning these systems to a more natural flow regime.

Below left: Wetland view of Keyes Point looking west, Barmah Forest, Keith Ward, Goulburn Broken CMA

Below right: Chinaman's Bend, Gunbower Forest, North Central CMA



Barmah Forest

Natural flooding combined with a large release of environmental water resulted in ideal conditions for waterbird breeding in Barmah Forest.

Widespread flooding occurred in Barmah Forest during 2011-12, continuing on from flooding experienced in 2010-11. 171,550 ML of environmental water was released to maintain water heights at a level that would ensure successful breeding of waterbirds.

“Environmental water was delivered to maintain shallow flooding for colonially-nesting waterbirds between natural flood peaks in spring and summer,” explains Keith Ward, Environmental Water Reserve Manager, Goulburn Broken CMA.

“Approximately 400 cormorant nests and 1,600 ibis nests are estimated to have resulted in the successful fledging of about 5,400 chicks. A further 24 waterbird species also bred in Barmah Forest during the year.”

“Without the environmental water release, water levels in the forest would have dropped, resulting in a high chance that the waterbirds would have abandoned their nests, leading to many chick deaths.”

“This waterbird breeding event, along with last year’s event, which was the largest in 60 years, is evidence of the success of the environmental watering program at Barmah Forest. Vegetation, such as river red gums, also responded well, with new growth appearing on trees in the flooded areas.”

Keith explains new monitoring technology was introduced at Barmah Forest in 2011-12 in the form of automated acoustic recorders to record bird calls during the breeding season.

Water delivered – site	Volume in megalitres (ML)
Barmah Forest ¹	• 171,550 ML

¹ Bulk Entitlement (River Murray – Flora and Fauna) Conversion Order 1999 - Barmah-Millewa Environmental Water Allocation and Bulk Entitlement (River Murray – Flora and Fauna) Conversion Order 1999 – Living Murray

“This technology will become a useful tool for monitoring birds and other species such as frogs, via call recordings with minimal disturbance and at times of day and night that would otherwise be impractical to monitor with direct staff presence.”

“The ability to remotely monitor wetlands is especially useful when monitoring distant wetlands during flood events.”

“It is also likely to assist with water management planning and promoting the ecological outcomes of environmental watering events,” Keith said.

More information on Barmah Forest is available in the *VEWH Seasonal Watering Plan 2012-13*, or by visiting the Goulburn Broken CMA website at www.gbcma.vic.gov.au.

*Below left: White Ibis egg and chick, Keith Ward, Goulburn Broken CMA
Below right: Barmah Lake, Barmah Forest, Keith Ward, Goulburn Broken CMA*





Hattah Lakes

The Hattah Lakes did not receive any environmental water during 2011-12 due to the construction of large-scale works, which will allow for widespread environmental watering of the site in future years.

Most of the major wetlands that make up the Hattah Lakes were still holding water in 2011-12, following overbank flooding in spring and summer 2010-11.

“The Hattah Lakes have received environmental water over the last few years through pumping from the River Murray and natural flooding,” explains Louise Searle, Waterways Coordinator at the Mallee CMA.

“We have seen excellent results from these environmental watering events, including huge improvements in river red gum and black box health, and breeding of many waterbird and fish species.”

The structural works program, which includes the construction of a permanent pumping station, levees and regulators, will provide a more permanent way of providing environmental water to the Hattah Lakes, Louise explains.

Below left: Hattah Lakes, Mallee CMA

Below right: Regent Parrot, Hattah Lakes, Mallee CMA



Water delivered – site	Volume in megalitres (ML)
Hattah Lakes ¹	• 0 ML

¹ 108 ML of water was delivered to Lake Kramen, (one of the Hattah Lakes) in 2011-12. However, this was for the completion of the 2010-11 program

“The package of works planned for Hattah Lakes under the Living Murray program is a long-term solution that will help protect and improve the lakes that are under pressure from river regulation.”

“A permanent pumping station is being constructed near the junction of the River Murray and Chalka Creek to deliver water to the lakes during extended periods of low river flow and to top up small natural floods. Extensive investigations have shown that this is currently the most feasible way to get water into the lakes in the absence of large floods.”

“Three new regulators and three levee banks will be built to hold environmental water within the lakes and surrounding floodplain, and an existing regulator is being refurbished to help manage smaller volumes of water within the Hattah system,” Louise said.

The works are expected to be completed in mid 2013.

More information on the Hattah Lakes is available in the VEW Seasonal Watering Plan 2012-13, or by visiting the Mallee CMA website at www.malleecma.vic.gov.au.

Lindsay-Wallpolla Islands

Lindsay-Wallpolla Islands have received environmental water since 2005, providing drought refuge for waterbirds such as spoonbills, and frogs such as the endangered growling grass frog. In 2010-11 and 2011-12, the majority of the site was inundated, improving river red gum condition. Only Lake Wallawalla required active environmental water delivery as all other wetlands were either full or required a drying phase.

The delivery of environmental water to Lake Wallawalla (part of the Lindsay-Wallpolla Living Murray icon site) in 2011-12 provided a new way of controlling European carp – a highly invasive introduced fish species.

Lake Wallawalla was mostly dry from 2001 until the floods of 2010. This wetland was also inundated during the floods in early 2012, and a top up of 3,876 ML of water was provided in autumn 2012.

“Under a managed environmental water delivery to the lake, screens prevent large-bodied carp from entering the wetland and damaging the aquatic vegetation,” said Mallee Catchment Management Authority Waterways Coordinator, Louise Searle.

“However, given the high flows, it wasn’t possible to direct all water through the screens, so carp were able to enter the lake”.

Louise explains that a top up of environmental water was delivered to provide water to vegetation surrounding the wetland with unexpected benefits.

“This top up resulted in the added benefit of triggering large numbers of carp to try to move out of the wetland. This was a great result, and may be used as a mechanism for carp control in other wetlands in the future.”

Water delivered – site	Volume in megalitres (ML)
Lake Wallawalla ¹	• 3,877 ML

¹ Bulk Entitlement (River Murray – Flora and Fauna) Conversion Order 1999 – Living Murray unregulated flows and above entitlement River Murray Unregulated Flows

Waterbird surveys conducted by the local bird observers group at Lake Wallawalla also observed 24 species of waterbirds and evidence of breeding activity.

“Waterbirds such as the great egret and Caspian tern were observed at Lake Wallawalla.”

“There were also a number of nests found, indicating that waterbirds were breeding at the site,” Louise said.

More information on the Hattah Lakes and Lindsay-Wallpolla Islands is available in the VEWHS *Seasonal Watering Plan 2012-13*, or by visiting the Mallee CMA website at www.malleecma.vic.gov.au.

Below left: Lindsay Island, Lake Wallawalla, Mallee CMA

Below right: Lake Wallawalla, Mallee CMA



Gunbower Forest

Environmental water provided to Gunbower Forest in 2011-12 provided benefits to native fish and enabled waterbirds to breed successfully.

High flows in the River Murray during 2010-11 resulted in overbank flooding in Gunbower Forest, inundating 90 square kilometres of the forest. In 2011-12, there was minor spring flooding, followed by more flooding in March 2012.

In spring 2011, environmental flows were delivered to Gunbower Creek to provide benefits to native fish and fringing vegetation.

“This water was delivered as a series of spring pulses and baseflows. These built on the benefits provided by unregulated flows in 2010-11, providing migration cues for species such as golden perch,” said Kathryn Stanislawski, Environmental Water Flows Project Officer at the North Central CMA.

“Monitoring in autumn 2012 detected an increased abundance of many native fish species in Gunbower Creek and its lagoons, including golden perch and bony herring, while carp gudgeon, a small-bodied native fish, dominated in the permanent and semi-permanent wetlands of the forest.”

Environmental water was also provided to the Little Gunbower Creek wetland complex in spring 2011 to maintain water at depths suitable for waterbird breeding.

“Monitoring was telling us that a waterbird colony nesting at the Little Gunbower Creek wetland complex was under threat when water levels began to recede,” Kathryn said.

Water delivered – site	Volume in megalitres (ML)
Gunbower Forest ¹	• 645 ML
Gunbower Creek ²	• 10,990.7 ML

¹ Bulk Entitlement (River Murray – Flora and Fauna) Conversion Order 1999 – Living Murray

² Bulk Entitlement (River Murray – Flora and Fauna) Conversion Order 1999 – Living Murray and Victorian River Murray Unregulated Flows

“Fortunately, we were able to provide environmental water to the wetlands which prevented these nesting waterbirds from abandoning their nests.”

“Approximately 175 pairs of waterbirds were then able to successfully fledge their young, which was a great result.”

Vegetation within Gunbower Forest is also showing signs of improvement due to the combination of wetter conditions and environmental watering, Kathryn explains.

“The abundance and diversity of plants and animals within Gunbower Forest reflects a transition phase, from extended drought prior to 2010, to a period of inundation.”

“While plant species typical of dry periods are still dominant, mudflat and floodplain plants that are dependent on wet periods to complete their life cycle, are now also present – which is a good sign for the diversity of species within the forest,” Kathryn said.

More information on Gunbower Forest is available in the VEWB *Seasonal Watering Plan 2012-13*, or by visiting the North Central CMA website at www.nccma.vic.gov.au.

*Right: Little Gunbower Creek, North Central CMA
Below: Egret chicks in Little Gunbower, North Central CMA*



Ovens system*

Waterway manager – North East Catchment Management Authority (CMA)

Environmental and operational releases were combined in 2011-12 to maximise environmental benefits for the Ovens system.

The Ovens River rises in the Great Dividing Range near Mount Hotham and flows approximately 150 kilometres to join the River Murray in the backwaters of Lake Mulwala. The Ovens system is one of the least regulated rivers in the Murray-Darling Basin. Only two small water storages have been constructed - Lake Buffalo on the Buffalo River and Lake William Hovell on the King River. The Ovens River is unique among rivers in the Murray-Darling Basin because it still has a relatively natural flow pattern. The Ovens system is considered to be home to one of Victoria's best Murray cod populations, which are listed as endangered in Victoria. It is also home to the threatened Macquarie perch and the Trout cod.

Catherine McInerney, Environmental Water Reserve Officer at North East CMA explains that 70 ML of Commonwealth Environmental Water entitlements are held in Lake Buffalo and Lake William Hovell. These entitlements are generally intended for use between late summer and early winter.

"In May 2012, 20 ML of environmental water was released from Lake Buffalo in conjunction with a water transfer of approximately 8,000 ML by Goulburn-Murray Water for dam maintenance," Catherine said.

"The release was designed to replicate a natural pulse in the river flow, providing variation to the steady autumn flows that were occurring. It was also aimed at maintaining the condition and functioning of the river, including connecting habitat and rejuvenating biofilms."

This release also coincided with the start of a study to monitor the movement of Murray cod in the lower Buffalo River and the confluence of the Ovens River using acoustic listening stations.

"A 50 ML release was also made from Lake William Hovell to support instream values of the King River by supplementing flows."



Water source (entitlement)	Volume in megalitres (ML)
Commonwealth Environmental Water Holdings	<ul style="list-style-type: none">• 70 ML
Environmental objectives	
The environmental objectives for 2011-12 were to: maintain natural flow variability and connectivity; provide food and habitat for macroinvertebrates; and provide water of sufficient depth to allow fish movement between habitats.	

“These environmental flows contribute to the lower Ovens Rivers below the junction of the Buffalo and King Rivers. The lower reaches of the Ovens River are designated as a Heritage River and support a nationally important wetland complex that extends from Killawarra downstream of Wangaratta to join the Murray River,” Catherine said.

The delivery of environmental water was undertaken by the North East CMA in consultation with Goulburn-Murray Water and the Commonwealth Environmental Water Office.

More information on the Ovens system is available by visiting the North East CMA website at www.necma.vic.gov.au.

** The VEWH has no Water Holdings in the Ovens system.*

Opposite: Buffalo River, North East CMA

Below left: Trout cod, Jarod Lyon

Below centre: Lake William Hovell on the King River, North East CMA

Below right: Buffalo River down-stream Lake Buffalo, North East CMA



glossary

- **Biofilms** Slimy films of bacteria, other microbes and organic materials that cover underwater surfaces including rocks and snags.
- **Blackwater** Occurs when accumulations of organic matter, such as leaves, twigs and nutrients, decay in wetlands or waterways after being washed in by a flood, drawing oxygen from the water. The water turns to a black colour and can have a very low level of dissolved oxygen, which can cause stress to fish, crayfish and other animals that breathe underwater.
- **Channel outfall** Spillage of water from irrigation channels to rivers or wetlands as part of system operations.
- **Confluence** The point where two rivers join.
- **Estuary** A partially enclosed body of water along the coast where freshwater from rivers and streams meets and mixes with salt water from the ocean.
- **Fledgling waterbirds** Young waterbirds about to leave their nests.
- **Flow components** Components of a river system's flow regime that can be described by magnitude, timing, seasonality, frequency and duration (for example, freshes, base flows and cease to flow).
- **Habitat mosaics** Different types of habitat in one area.
- **Heritage rivers** Listed under the Heritage Rivers Act 1992, and are particular parts of rivers and river catchment areas in Victoria which have significant nature conservation, recreation, scenic or cultural heritage attributes.
- **JAMBA/CAMBA** Japan/China Australia Migratory Bird Agreements relate to the conservation of migratory birds. Both agreements list terrestrial, water and shorebird species which migrate between Australia and the respective countries.
- **Littoral habitat** The shore of a wetland; usually includes the zone of shallow waters at the edge.
- **Macroinvertebrate** Animals that have no backbone and can be seen with the naked eye; they include worms, snails, mites, bugs, beetles, dragonflies and freshwater crayfish.
- **Main Northern Automation and Macalister Channel Automation Project** This project aimed to create water savings by modernising parts of the channel system in the Macalister Irrigation District to enhance environmental flows in the Macalister and Thomson Rivers, and to improve service levels to irrigators.
- **Managed releases** Release of water from the Water Holdings which is stored in major reservoirs; used for priority watering actions to achieve environmental outcomes.
- **Megalitre (ML)** One million (1,000,000) litres.
- **Morphology** Shape of a river bed.
- **Operational releases** Releases made from from major storages to enable the water distribution system to operate or to make water available to consumptive users.
- **Passing flows** Water released out of storages to operate river and distribution systems (to deliver water to end users), provide for riparian rights and maintain environmental values and other community benefits.
- **pH levels** A measure of the acidity levels of water.
- **Priority watering actions** Flow components that have been identified as priorities for delivery in a particular system in a particular year.
- **Ramsar-listed wetland** A wetland on the Ramsar list due to its international significance in terms of the biodiversity and uniqueness of its ecology, botany (plants), zoology (animals), limnology or hydrology (movement, distribution, and quality of water).
- **Restricted full supply level** A reduced level a reservoir is held at as a result of operational or maintenance needs.
- **Riparian vegetation** Vegetation located in the area of land that adjoins, regularly influences or is influenced by a river.
- **Rookery** An area where large groups of birds nest and breed.
- **Salt wedge** The area where salt water and fresh water mix in an estuary. Saltwater is more dense than the freshwater, so it sinks to the bottom of the estuary in a wedge shape as it moves further up the river.
- **Terrestrial vegetation** Land-based plants.
- **Unregulated flows** Natural stream flows that cannot be captured in major reservoirs or storages.
- **Water Holdings** The environmental water entitlements held by the VEWL.



Published by the Victorian Environmental Water Holder, Melbourne, December 2012

© Victorian Environmental Water Holder 2012

This publication is copyright. No part may be reproduced by any process except in accordance with the provisions of the Copyright Act 1968.

Authorised by the Victorian Environmental Water Holder, 8 Nicholson Street, East Melbourne.

Printed by: Finsbury Green Printed on 100% recycled paper

ISBN 978-1-74287-722-8 (print)

ISBN 978-1-74287-723-5 (online))



Reflections – environmental watering in Victoria 2011-12 is available to view or download from our website: www.vewh.vic.gov.au

As part of the Victorian Environmental Water Holder's commitment to environmental sustainability, we only print limited copies of *Reflections – environmental watering in Victoria 2011-12*. We encourage those with internet access to view the publication online.

If you require any additional printed copies, please contact the Victorian Environmental Water Holder using one of the methods below.

Phone: (03) 9637 8951

Email: general.enquiries@vewh.vic.gov.au

By mail: PO Box 500, East Melbourne VIC 3002

In person: 8 Nicholson Street, East Melbourne

Disclaimer

This publication may be of assistance to you but the Victorian Environmental Water Holder and its employees do not guarantee that the publication is without flaw of any kind or is wholly appropriate for your particular purposes and therefore disclaims any liability for any error, loss or other consequence which may arise from you relying on any information in this publication.

Accessibility

If you would like to receive this publication in an accessible format, such as large print or audio, please telephone (03) 9637 8951 or email general.enquiries@vewh.vic.gov.au



environmental health

Victorian Environmental Water Holder

T: (03) 9637 8951

E: general.enquiries@vewh.vic.gov.au

PO Box 500, East Melbourne VIC 3002

8 Nicholson Street, East Melbourne