



Australian Government

Commonwealth Environmental Water Office

Commonwealth Environmental Water

Portfolio Management Plan

# Murrumbidgee River

2016–17



Front cover image credit: Southern Bell Frog at Yarradda Lagoon. Photo by Jarrod McPherson, Charles Sturt University

Back cover image credit: Long-necked Turtle at Twin Bridges Swamp. Photo by Commonwealth Environmental Water Office

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# Commonwealth environmental water portfolio management planning

## Commonwealth environmental water

The Commonwealth Environmental Water Holder is an independent statutory position established by the *Water Act 2007* to manage the Commonwealth environmental water holdings. The Commonwealth Environmental Water Holder leads and is supported by the Commonwealth Environmental Water Office (the Office), a division of the Australian Government Department of the Environment.

Under the *Water Act 2007*, Commonwealth environmental water must be managed to protect or restore environmental assets, so as to give effect to relevant international agreements. The *Water Act 2007* also requires that the Commonwealth Environmental Water Holder perform its functions and exercise its powers consistently with and in a manner that gives effect to the Basin Plan and that Commonwealth environmental water is managed in accordance with the Basin Plan's environmental watering plan.

## Purpose of the document

This document sets out the plans for managing the Commonwealth environmental water portfolio in the Murrumbidgee Catchment for 2016–17. Efficient and effective management of Commonwealth environmental water requires the utilisation of all portfolio management options, including water delivery, carryover and trade. To support improved outcomes from water use over time, carryover provides the opportunity to optimise water use across water years and to improve water availability early in a water year, while trade provides further capacity to optimise use over the long-term as well as across catchments.

By taking a multi-year approach to planning, portfolio management tools such as use, carryover and trade can be managed for maximising environmental outcomes. The portfolio management plans support transparent, coordinated and adaptive management of the Commonwealth environmental water portfolio, consistent with Basin Plan obligations including the expected outcomes in the Basin-wide environmental watering strategy and the Basin annual environmental watering priorities.

To learn more about the portfolio management planning approach see *Portfolio Management Planning: Approach to planning for the use, carryover and trade of Commonwealth environmental water 2016–17* (available at: <http://www.environment.gov.au/water/cewo/publications>).

## Delivery partners

Commonwealth environmental water is managed in conjunction with and delivered by a range of partners. In the Murrumbidgee Catchment, our partners include: New South Wales Office of Environment and Heritage, Department of Primary Industries – Water, and Water NSW.

This portfolio management plan has been developed in consultation with our delivery partners.

## Your input

The management of Commonwealth environmental water relies on considerable advice and assistance from local organisations, state governments and others. Individuals and groups within the Murray-Darling Basin community are encouraged to submit suggestions for the management of Commonwealth environmental water. Please contact the Office via: [ewater@environment.gov.au](mailto:ewater@environment.gov.au).

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# 1.Environmental watering in the Murrumbidgee Catchment

## 1.1. The Murrumbidgee Catchment

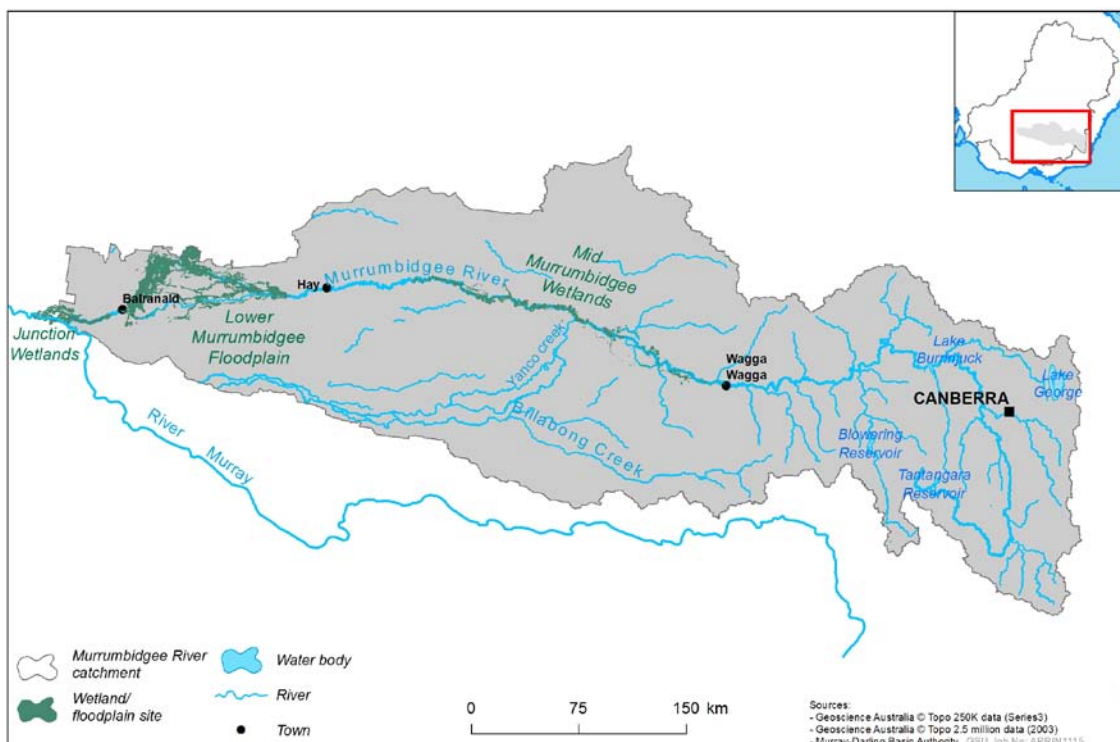
The Murrumbidgee Catchment covers 84 000 square kilometres of southern New South Wales. It is bordered by the Great Dividing Range to the east, the Lachlan Catchment to the north and the Murray Catchment to the south (Green et al 2011). The river originates in the alpine area of Kosciuszko National Park and flows through the Monaro High Plains and the low-lying plains of the western Riverina, joining the Murray River south of Balranald.

Supporting a complex range of natural ecosystems, the Murrumbidgee Catchment contains many significant in-channel and wetland habitats including the mid-Murrumbidgee and Lowbidgee wetlands, which provide important habitat for a range of aquatic and terrestrial species including frogs, fish and waterbirds.

The primary users of water in the region are the two major irrigation districts in the catchment—Murrumbidgee and Coleambally Irrigation Areas. Irrigation also occurs around Hay and Balranald in the west and in eastern parts of the catchment, including around Wagga Wagga.

Regulated water is provided by two major headwater storages, Burrinjuck Dam on the Murrumbidgee River and Blowering Dam on the Tumut River. Collectively these storages have a capacity of 2654 GL.

Most of the flow in the Murrumbidgee River comes from the upper portion of the catchment, and is delivered by the main tributary rivers: Cotter, Yass, Molonglo, Queanbeyan, Bredbo, Numerella, Goodradigbee and Tumut (Kingsford & Thomas 2001). Several tributaries located immediately downstream of the dams contribute significant inflows, including Adelong, Adjungbilly, Gilmore, Hillas, Tarcutta, Kyeamba, Jugiong, Muttama, Billabong and Houlaghans Creeks, and Goobarragandra River (Sinclair Knight Merz 2011). The middle and lower portions of the catchment do not contribute significant inflows.



**Figure 1:** Map of the Murrumbidgee Catchment (courtesy of the Murray-Darling Basin Authority).

## 1.2. Environmental objectives and outcomes in the Murrumbidgee Catchment

The long-term environmental objectives and expected outcomes for the Murray-Darling Basin are described in the Basin Plan's environmental watering plan and the Basin-wide environmental watering strategy. The Basin-wide environmental watering strategy includes quantified environmental outcomes at both a Basin-scale and for each catchment—outcomes relevant for the Murrumbidgee Catchment are described in [Attachment A](#).

Basin state governments are also developing long-term watering plans for each catchment. These plans will identify the priority environmental assets and ecosystem functions in the catchment, the objectives and targets for these assets and functions, and their watering requirements. Once developed, these plans will provide the key information on the long-term environmental water demands in the catchment. Prior to the development of long-term watering plans, the Office will continue to draw on existing documentation on environmental water demands developed by state governments, local natural resource management agencies and the Murray-Darling Basin Authority.

Based on these strategies and plans, and in response to best available knowledge drawing on the results of environmental watering monitoring programmes, the outcomes being targeted by environmental watering in the Murrumbidgee Catchment are summarised in Table 1 below. The objectives and targeted outcomes for water-dependent ecosystems will continue to be revised as part of the Commonwealth Environmental Water Office's commitment to adaptive management.

**Table 1:** Summary of outcomes being targeted by environmental watering in the Murrumbidgee Catchment

BASIN-WIDE OUTCOMES  (Outcomes in red link to the Basin-wide Environmental Watering Strategy)	TARGETED OUTCOMES FOR MURRUMBIDGEE ASSETS				
	IN-CHANNEL ASSETS	OFF-CHANNEL ASSETS			
	Murrumbidgee River channel	Yanco Creek system	Mid-Murrumbidgee Wetlands	Lowbidgee Floodplain Wetlands	Junction Wetlands
VEGETATION	Maintain and improve riparian and in-channel vegetation condition	Maintain and improve condition of wetland vegetation	Avoid further damage and to assist ecological capacity to recover	Maintain, improve and in some cases promote the recovery of wetland and floodplain vegetation diversity and condition	Avoid further damage and to assist ecological capacity to recover
WATERBIRDS		Provide habitat, including foraging habitat, to support survival and maintain the condition of waterbirds			
			Provide opportunities for waterbird breeding and support naturally triggered colonial bird breeding events that are in danger of failing due to drying.		
FISH	Provide flows, including restoring natural flow events that are affected by river regulation and/or extraction, to support habitat and food sources and promote increased movement, recruitment and survival of native fish.	Provide flows to support habitat and cues for increased movement, recruitment and survival of native fish (particularly for floodplain specialists).			
INVERTEBRATES	Provide habitat to support increased microinvertebrate and invertebrate survival, diversity, abundance and condition.				
OTHER VERTEBRATES	Provide habitat to support survival and maintain and improve the condition of frogs and turtles.				

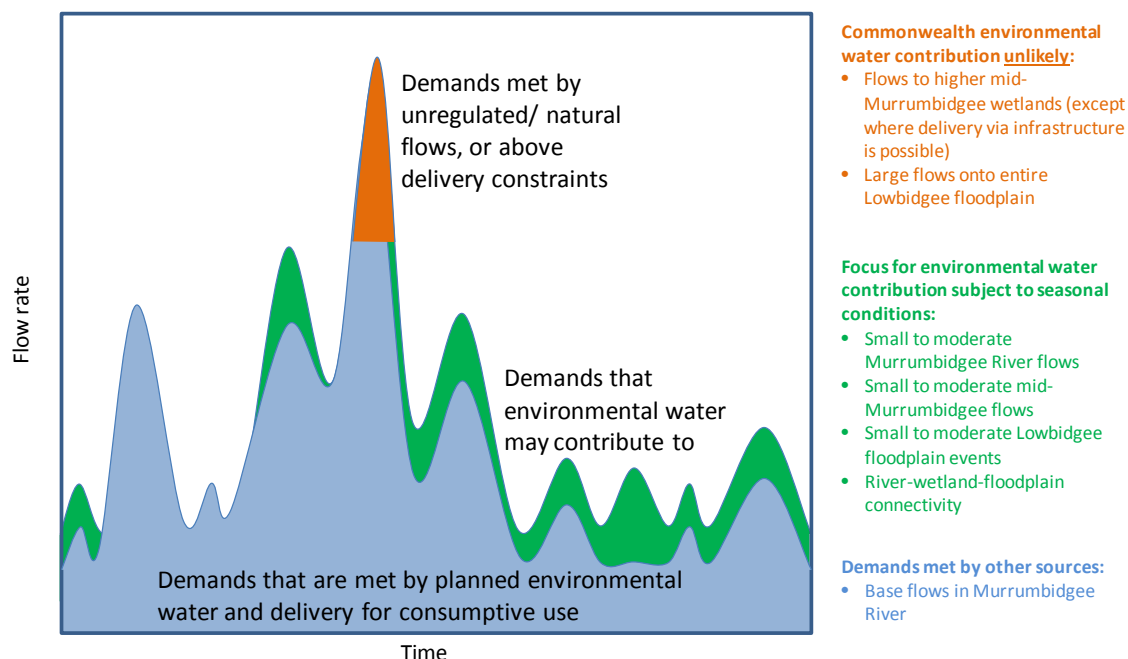


<b>CONNECTIVITY</b>	Support longitudinal connectivity along the Murrumbidgee River, including end of system flows. Support lateral connectivity (within constraints) to wetlands and floodplains	Support lateral connectivity (within constraints) between the river channel and wetlands and floodplains
<b>PROCESSES</b>	Support primary productivity, nutrient and carbon cycling, biotic dispersal and movement	
<b>WATER QUALITY</b>	Provide refuge habitat from adverse water quality events (e.g. blackwater)	Support water quality in off-channel assets in terms of Dissolved Oxygen (DO) and salinity Support transport of salt and nutrients off the floodplain into the river channel and downstream.
<b>RESILIENCE</b>		Provide drought refuge habitat

Information sourced from: Charles Sturt University (2014); CEWO (2015); MDBA (2012a, b, c, 2014); DPI (2014); Roberts and Marston (2011) and Sinclair Knight Merz (2011).

### 1.3. Environmental flow requirements

Not all environmental demands can and will be met through the use of held environmental water. Some demands are met by regulated water deliveries for consumptive purposes and inter-valley transfers, while others are met by large unregulated/natural flows events or are beyond what can be delivered within operational constraints. Figure 2 shows the broad environmental demands that are in scope for Commonwealth environmental water. Importantly, these are broad, indicative demands and individual watering events may contribute to particular opportunities, such as using infrastructure to deliver water to individual wetlands that would otherwise not be possible due to constraints. Also, there may be opportunities for Basin State governments to remove or modify constraints, which will improve the efficiency and/or effectiveness of environmental watering. Further information on delivery constraints are described in [Attachment B](#).



**Figure 2:** Scope of demands that environmental water may contribute to in the Murrumbidgee Catchment

Based on the above outcomes sought and delivery constraints, specific watering requirements (flow magnitude, duration, timing and frequency) have been identified as being in scope for Commonwealth environmental water. These water requirements are described in Table 3. As with the objectives and targeted outcomes, the environmental water requirements will continue to be reviewed and revised in response to new knowledge.

## 1.4. Monitoring and adaptive management

Operational monitoring is undertaken for all Commonwealth environmental watering actions and involves collecting on ground data with regard to environmental water delivery such as volumes delivered, impact on the river system's hydrograph, area of inundation and river levels. It can also include observations of environmental outcomes.

Intervention monitoring is also being undertaken at sites in the mid-Murrumbidgee Wetlands, Lowbidgee Floodplain and Murrumbidgee River. It aims to understand the environmental response from Commonwealth environmental watering with respect to targeted objectives and expected outcomes. Information on the monitoring activities is available at <http://www.environment.gov.au/water/cewo/catchment/murrumbidgee/monitoring>. Monitoring information is also provided by state governments.

The outcomes from these monitoring activities are used to inform portfolio management planning and decision-making.



## 2. Portfolio management in 2016–17

In planning for the management of Commonwealth environmental water, the Commonwealth Environmental Water Office aims to maximise the outcomes achieved from the available water. This includes consideration of the urgency of demands (based on targeted outcomes and watering requirements, watering history and asset condition watering) and the available supply under different resource scenarios. Plans for water delivery, trade and carryover are then made in a multi-year context, with an assessment also undertaken of need for water in future years.

This planning process is outlined in full in Table 3 below and summarised in the sections below.

### 2.1. Antecedent and current catchment conditions and the demand for environmental water in 2016–17

Following the breaking of the millennium drought, natural flow events and environmental watering actions resulted in improvements in the condition of many of the wetlands in the lower Murrumbidgee Catchment. However, in some cases particularly in the mid-Murrumbidgee wetlands, limited flows have compromised the recovery of vegetation and the recruitment of fauna such as frogs and turtles. Environmental water demands for environmental assets in the Murrumbidgee Catchment in 2016–17 are represented in Table 3 and summarised below:

**Mid-Murrumbidgee wetlands:** High demand. The mid-Murrumbidgee River Wetlands is a key environmental asset within the Basin. The condition of the mid-Murrumbidgee wetlands continues to decline due to a lack of inundation and reversing this trend has been identified as a Basin annual environmental watering priority for 2016-17. Environmental water is required this year to protect these assets from further decline and to assist with their ecological capacity to recover. Delivery to individual wetlands will not achieve outcomes required at system/landscape scale with associated continued decline in health of degraded wetland assets. Monitoring of ecological response at Yarradda Lagoon demonstrates the capacity for these assets to recover following repeat inundation.

**Yanco Creek system:** Moderate demand. Wetland vegetation is generally in good condition, with wetting required this year or next to maintain this condition.

**Lowbidgee floodplain wetlands:** Moderate-High demand. Environmental water use in 2015–16 focused on core habitat areas and low level wetlands only. Monitoring of past environmental watering has shown a positive vegetation response, along with waterbird and frog breeding. Under a low water availability scenario, Commonwealth environmental water will focus on maintaining core refuge sites (a key recommendation from LTIM reporting (Wassens et al 2016)). Under moderate and wetter conditions Commonwealth environmental water will build on outcomes of recent years and continue to maintain and build resilience to wetland sites in the Redbank (including Yanga National Park), Nimmie-Caira, Fiddlers-Uara and Western Lakes management areas.

**Murrumbidgee River Channel and distributaries:** Moderate demand. Native fish populations are continuing to recover. Previous environmental watering actions have contributed to increased native fish numbers, supported the productivity and biodiversity of fish and microcrustaceans, and supported functions such as nutrient and carbon cycling. Monitoring results have demonstrated the Murrumbidgee River supports spawning of medium and large bodied native fish species. Environmental water deliveries may focus on native fish condition and recruitment through improvements to fish passage and connectivity, aquatic habitat and riverine productivity.

#### Murray-Darling Basin 2016-17 environmental watering priorities

In contributing to these demands, the Commonwealth Environmental Water Office will also be aiming to contribute to the following 2016-17 Basin annual environmental watering priorities relevant for the Murrumbidgee River:

- Improve the condition of wetland vegetation communities in the mid-Murrumbidgee wetlands
- Support viable populations of threatened native fish species by protecting drought refuges and maintaining instream habitats



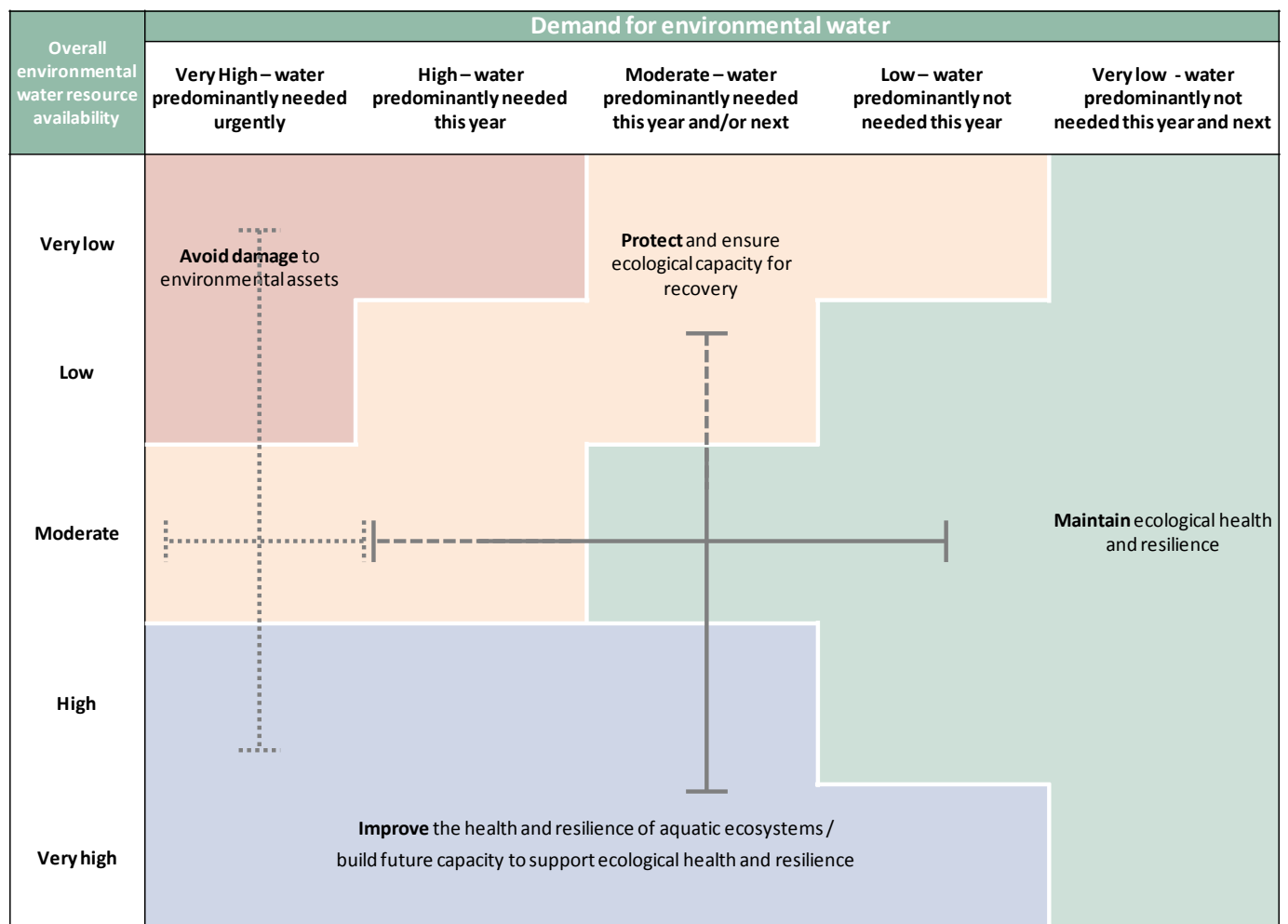
conveyance water and consumptive water. Further detail on sources of environmental water in the Murrumbidgee Catchment is provided in [Attachment C](#).

By combining the forecasts of water held by the Commonwealth with streamflow forecasts, as well as taking into account operational considerations, water resource availability scenarios can be developed ranging from very low to very high. Based on available information Moderate – Very High resource availability scenarios are in scope for 2016–17.

### 2.3. Overall purpose of managing environmental water based on supply and demand

Environmental water needs (demand) and water availability (supply) both influence the overall purpose of Commonwealth environmental water management. Under different combinations, the management purpose can range from ‘avoiding damage’ to the environment to ‘improving’ ecological health. This in turn informs the mix of portfolio management options available for maximising outcomes.

Figure 3 shows how current demands and forecast supply are considered together. The overall ‘purpose’ for managing the Commonwealth’s water portfolio in the Murrumbidgee Catchment for 2016–17 is to protect the mid-Murrumbidgee wetlands and ensure their ecological capacity for recovery, while maintaining and where possible improving the ecological health and resilience of other important sites in the catchment. As shown in Figure 3 the water requirements for the mid-Murrumbidgee wetlands (dotted lines) and Lowbidgee Floodplain (unbroken and dashed lines) are currently out of phase. In future, following successful inundation and improvements in condition of the mid-Murrumbidgee wetlands, it is anticipated environmental demand for these assets will be more closely aligned allowing a more whole of system watering strategy.



**Figure 3:** Determining a broad purpose for portfolio management in the Murrumbidgee Catchment for 2016–17. Note: dotted lines represent the mid-Murrumbidgee wetlands while unbroken-dashed lines represent likely range in demand and resource availability for other assets in the catchment for the 2016–17 water year.

Further detail on how the overall purpose for portfolio management changes under different supply and demand scenarios is provided in *Portfolio Management Planning: Approach to planning for the use, carryover and trade of Commonwealth environmental water 2016–17* (available at: <http://www.environment.gov.au/water/cewo/publications>).

## 2.4. Water Delivery in 2016–17

Consistent with the demands and purpose described above, the Office is considering supplying environmental water to the following watering actions for 2016–17 (see also Table 3 for supporting information regarding the basis for determining these watering intentions).

A key priority for Commonwealth environmental water is a winter–spring mid-Murrumbidgee wetlands connection event. The aim would be to contribute to river flows and inundation of fringing wetlands to prevent further damage and loss of wetland vegetation communities, and provide habitat for waterbirds and native aquatic species (including fish, turtles, frogs and invertebrates). This action may not go ahead under dry to very dry scenarios due to limitations on the magnitude and timing of water allocations across the southern-connected Basin. The action may or may not be in association with tributary flows and is subject to water availability, dam release capacities and assessment of potential third party impacts. See [Attachment B](#) for operational considerations and limitations (see also Action 1 in [Attachment B](#) for standard operational arrangements). The watering action would also contribute to downstream demands, including Yanco Creek and the Lowbidgee Floodplain and potentially the lower Murray<sup>1</sup>. The lack of credited return flows from the Murrumbidgee limits the contribution the Murrumbidgee can make to the outcomes downstream in the Murray except under very wet scenarios (where Lake Victoria is at capacity and the flow at the South Australian border is unregulated).

If the proposed reconnection action does not occur, Commonwealth environmental water may be pumped to individual high priority wetland assets in the mid-Murrumbidgee. See Action 2 in [Attachment B](#) for standard operational arrangements. It is important to note that it is not operationally feasible to pump to all wetland sites in the mid-Murrumbidgee.

Commonwealth environmental water will also target environmental assets in the Murrumbidgee River, Yanco Creek and across the Lowbidgee Floodplain to maintain the condition and diversity of wetland vegetation communities, and provide habitat and recruitment opportunities for waterbirds, native fish, turtles and frogs. Timing for these actions will be based on environmental demand and not just alternatives to a mid-Murrumbidgee connection. Target species include, but are not limited to the southern bell frog (EPBC Act vulnerable), Murray cod (EPBC Act vulnerable), Australasian bittern (EPBC Act critically endangered) and eastern great egret (EPBC Act migratory).

Under low water resource availability, Commonwealth environmental water use in the Lowbidgee will target critical refuge habitats (including Waugorah Lagoon, Telephone Creek, Avon Dam, Nimmie and Talpee Creeks). Larger scale wetland and floodplain inundation including river-floodplain connection will be targeted under moderate and wet scenarios and through Lowbidgee supplementary access. Target sites will include wetland and floodplain assets in North Redbank system (scale of watering subject to water availability), South Redbank (including Nap Nap Swamp and Yanga National Park), Nimmie-Caira (Eulimbah, Telephone and Suicide floodways) and potentially Fiddlers Creek and Western Lakes. See Action 4 in [Attachment B](#) for standard operational arrangements.

Regional scale watering actions (e.g. landscape waterbird breeding and habitat across lower Lachlan and Lowbidgee Floodplain) may also be targeted under wetter scenarios.

River-floodplain connectivity in the lower Murrumbidgee may be supported by in-channel flows targeting native fish recruitment and in-channel productivity.

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<sup>1</sup> Note: Commonwealth environmental water used in the Murrumbidgee River cannot currently be credited as return flows for further environmental use downstream in the River Murray.

## Stakeholder feedback

Stakeholder feedback from the lower Murrumbidgee has recommended that the mid-Murrumbidgee connection watering action be a priority for 2016–17 but not at the expense of other environmental assets and outcomes, given the operational considerations and potential third party impacts associated with a mid-Murrumbidgee connection. However, stakeholder feedback from some mid-Murrumbidgee areas remain opposed to a mid-Murrumbidgee connection action. The Office will continue working with stakeholders to resolve concerns.

## 2.5. Trading water in 2016–17

Planning for water trade considers supply and demand within the catchment, and across the Basin. As part of the planning process, the Commonwealth Environmental Water Office undertakes a Basin-wide analysis to identify opportunities to use allocation trade to better match differing demands across catchments (see *Commonwealth Environmental Water Portfolio Management: Basin-wide analysis 2016–17* available at: <http://www.environment.gov.au/water/cewo/publications>).

Where the need arises to adjust the availability of allocations in any valley in the southern-connected Basin, it should be noted that the transfer of allocations from other southern connected catchments would be explored as the preferred and more efficient option to allocation purchase or sale, consistent with the rules identified in state water resource plans that apply to all water users.

Potential trading options in line with this approach will be considered throughout the 2016-17 water year. The Commonwealth Environmental Water Office is also investigating the potential for purchases to augment water for the environment in a number of catchments in the Northern Murray-Darling Basin to meet high environmental water demands (particularly in the Macquarie Marshes, Lower Balonne/Narran Lakes and Border Rivers). Further information will be provided to the market ahead of any trade of Commonwealth environmental water at: <http://www.environment.gov.au/water/cewo/trade/current-trading-actions>.

For more information on the rules and procedures governing the trade of Commonwealth environmental water, see the *Commonwealth environmental water Trading Framework* available at: <http://www.environment.gov.au/water/cewo/publications/water-trading-framework-dec2014>.

## 2.6. Carrying over water for use in 2017–18

The volume of water carried over for use in 2017–18 will depend upon resource availability and demand throughout the year. A carryover target of at least 50 GL is preferred to meet early season water requirements and as a risk management strategy should low inflows result in low allocations. As documented in Table 3 below, potential demands in 2017–18 include:

- winter-spring watering of the mid-Murrumbidgee wetlands
- Lowbidgee Floodplain and Junction Wetlands watering actions
- restoring natural flow components impacted by river regulation to support native fish.

Carryover volumes will be adjusted throughout the year as the season unfolds in response to both current and future demands and the water available to meet these demands.

Given the connected nature of southern Murray-Darling Basin catchments and the varying carryover, account and use limits, carryover is considered at a broader scale than just the Murrumbidgee Catchment. More information on how the Commonwealth makes decisions on carryover is here: <http://www.environment.gov.au/water/cewo/portfolio-mgt/carryover>

Table 3a: Environmental demands, priority for watering in 2016–17 and outlook for coming years in the Murrumbidgee Catchment – **VERY LOW - LOW WATER RESOURCE AVAILABILITY IN 2016–17**

Environmental assets	Indicative demand <sup>2</sup> (for <u>all sources of water</u> in the system)		Watering history (from all sources of water)				2016–17			Implications for future demands	
	Flow/volume	Required frequency (maximum dry interval) <sup>3</sup>	2012–13	2013–14	2014–15	2015–16	Predominant urgency of environmental demand for water	Purpose under low to very low resource availability	Potential Commonwealth environmental water contribution?	Likely urgency of demand in 2017–18 if watering occurred as planned in 2016–17	2018-19 Range of likely demand  Met in 2017–18  Not met in 2017–18
			(mod)	(drying)	(drying)	(drying)					
Mid-Murrumbidgee Wetlands <sup>4</sup>	Pumping to individual high priority wetland assets	8 in every 10 years - annual (2 years)					HIGH However overbank connection is preferred	<b>Avoid Damage - Protect</b>	A high potential for watering in 2016–17 Up to 50 GL	HIGH	HIGH
											HIGH
	Minimum of 15.5 GL/day @ Darlington Point for 3–5 days plus a gradual recession	7–8 in every 10 years (2 years)					HIGH Limited flows since 2012 have severely compromised the recovery of degraded wetland vegetation and the recruitment of frogs and turtles.	Not Applicable	Option unlikely to be achievable under this resource availability.	HIGH	Follow up watering may be warranted due to very poor condition of sites
											HIGH
	Winter-spring action (~27.5 GL/day @ Wagga Wagga for 3–5 days plus a gradual recession)	5–6 in every 10 years (4 years)					HIGH Limited flows since 2012 have severely compromised the recovery of degraded wetland vegetation and the recruitment of frogs and turtles.	Not Applicable	Option unlikely to be achievable under this resource availability.	HIGH	Follow up watering may be warranted due to very poor condition of sites
											HIGH
Yanco Creek System	~ 40 GL action, targeting up to 1400 ML/day @ Yanco Creek off-take	3 in every 10 years (3 years)					LOW- MODERATE Watering required to maintain condition of wetland vegetation	Protect	Low level watering achieved in 2016-17. Supplementary take possible.	MODERATE	LOW-MODERATE
											MODERATE
Lowbidgee Core refuge and permanent aquatic habitat sites	Up to 25 GL	Annual					HIGH Annual watering required for critical habitat requirements	Protect-Maintain	High Potential only for critical/permanent habitats up to 25 GL	HIGH	HIGH
											HIGH
Lowbidgee North Redbank	Up to 120 GL	River red gum forest and spike rush wetlands 1-3 years (3 years)					MODERATE Watering required to maintain the good condition of wetland-floodplain vegetation	Protect-Maintain	Potential for low level wetland inundation Up to 30 GL	MODERATE	MODERATE
											HIGH
Lowbidgee Yanga National Park	50 -100 GL	River red gum forest and spike rush wetlands 1-3 years (3 years)					HIGH Watering required to maintain the good condition of wetland-floodplain vegetation	Protect-Maintain	Potential for low level wetland inundation Up to 30 GL	MODERATE	MODERATE
											HIGH
Lowbidgee Nimmie-Caira	60-70 GL	Refuge habitat annual Lignum dominated wetlands 1 to 5 years, with duration of up to 7 months					MODERATE Watering required to maintain the good condition of wetland-floodplain vegetation, particularly to keep known rookery sites in 'event ready' condition	Protect-Maintain	Potential for low level wetland inundation Up to 20 GL	MODERATE	MODERATE
											HIGH
Lowbidgee Fiddler-Uara	30-50 GL	Blackbox and lignum wetlands every 3 to 7 years					LOW Watering required to protect and maintain the condition of wetland-floodplain vegetation.	Protect-Maintain	Low Potential.	HIGH for sections not watered in 2014-15	LOW
											HIGH

<sup>2</sup> Volume limited by current channel constraints.

<sup>3</sup> Roberts and Marston (2011), Hardwick and Maguire (2012), Alluvium (2013)

<sup>4</sup> Note: Differences in filling height (i.e. flows required to fill a wetland) vary among the lagoons that make up the mid-Murrumbidgee wetlands, and so their condition and watering requirement vary accordingly.



Lowbidgee Western Lakes	15 – 30 GL to maintain open water habitats and floodplain vegetation	Wetland habitats and open water blackbox and lignum wetlands every 3 to 7 years					LOW Watering required to protect and maintain the condition of wetland vegetation.	Protect-Maintain	Low Potential	MODERATE	LOW
							MODERATE				
Murrumbidgee channel	Winter-spring fresh (~5 GL/day @ Darlington Point - Balranald for 20 days)	7 in every 10 years					MODERATE Native fish populations are continuing to recover. Water required for improved fish passage and connectivity, aquatic habitat and riverine productivity	Protect	Low Potential subject to natural cues	MODERATE	MODERATE
							MODERATE				
	Summer fresh (~1 GL/day @ Darlington Point - Balranald for 20 days)	7 in every 10 years					LOW Native fish populations are continuing to recover. Water required for improved fish passage and connectivity, aquatic habitat and riverine productivity	Protect	Low Potential	LOW	LOW
							LOW				
	Distributary freshes to restore flow components most impacts by river regulation and support movement opportunities	7 in every 10 years to annual					MODERATE Native fish populations are continuing to recover. Water required for improved fish passage and connectivity, aquatic habitat and riverine productivity	Protect	Moderate potential subject to natural cues up to 10 GL	MODERATE	MODERATE
							MODERATE				
Junction Wetlands	Flows greater than 5 GL/day @ d/s Balranald Weir and >10 GL/day @ Barmah on the Murray	5 in every 10 years					HIGH Limited flows since 2012 have severely compromised the recovery of degraded wetland vegetation and the recruitment of frogs and turtles.	Not Applicable	Option unlikely to be achievable under this resource availability.	HIGH	HIGH
							HIGH				
	Pumping to individual high priority wetland assets	7–8 in every 10 years (2 years))					HIGH Limited flows since 2012 have severely compromised the recovery of degraded wetland vegetation and the recruitment of frogs and turtles	Avoid Damage - Protect	A high potential for watering in 2016–17 Up to 10 GL	HIGH	HIGH
							HIGH				
<div>Key - events in previous years</div> <div><div></div> means demand was met by Commonwealth environmental water or any other source</div> <div><div></div> means demand was partially met by Commonwealth environmental water or any other source (may be used to indicate infrastructure assisted delivery)</div> <div><div></div> means water not provided (or not required)</div> <div>Note that not all demands require water every year; drying phases are important for floodplains and temporary wetlands or streams</div> <div>Key - potential watering in 2016-17</div> <div><div></div> means a high priority for Commonwealth environmental watering (full or partial contribution, and subject to seasonal and operational considerations)</div> <div><div></div> means a secondary priority for Commonwealth environmental watering, likely to be met via other means (other water holders, or natural flows)</div> <div><div></div> means a low priority for Commonwealth environmental watering</div> <div>Key - urgency of environmental demands</div> <div><div></div> means critical demand i.e. urgent need for water in that particular year to manage risk of irretrievable loss or damage</div> <div><div></div> means high demand for water i.e. needed in that particular year</div> <div><div></div> means moderate demand for water i.e. water needed that particular year and/or next</div> <div><div></div> means low demand for water i.e. water generally not needed that particular year</div> <div><div></div> means very low demand for water i.e. water generally not needed that particular year or the following year</div> <div>Note that demand is considered at a generalised scale; there may be specific requirements that are more or less urgent within the flow regime</div>								Carryover potential	Approximately 57 GL carried into 2016–17 in the Murrumbidgee	Target of ~50 GL carried into 2017–18 in the Murrumbidgee	To be confirmed, depending on environmental demands and water availability
								Trade potential	Potential for purchases to augment water for the environment in a number of catchments in the Northern Murray-Darling Basin to meet high environmental water demands. Further information will be provided to the market ahead of any trade of Commonwealth environmental water. Transfer of allocations between catchments in the southern-connected Basin would be explored as the preferred option to allocation purchase or sale, consistent with the rules identified in state water resource plans that apply to all water users.		

**Table 3b:** Environmental demands, priority for watering in 2016–17 and outlook for coming years in the Murrumbidgee Catchment - **MODERATE** WATER RESOURCE AVAILABILITY IN 2016–17

Environmental assets	Indicative demand <sup>5</sup> (for <u>all sources of water</u> in the system)		Watering history (from all sources of water)				2016–17			Implications for future demands	
	Flow/volume	Required frequency (maximum dry interval) <sup>6</sup>	2012–13	2013–14	2014–15	2015–16	Predominant urgency of environmental demand for water	Purpose under low to very low resource availability	Potential Commonwealth environmental water contribution?	Likely urgency of demand in 2017–18 if watering occurred as planned in 2016–17	2018-19 Range of likely demand  Met in 2017–18 Not met in 2017–18
			(mod)	(drying)	(drying)	(drying)					
Mid-Murrumbidgee Wetlands <sup>7</sup>	Pumping to individual high priority wetland assets	8 in every 10 years - annual (2 years)					HIGH However overbank connection is preferred	<b>Avoid Damage - Protect</b>	A high potential for watering in 2016–17 should system watering not be possible Up to 50 GL	HIGH	MODERATE
											HIGH
	Minimum (~15.5 GL/day @ Darlington Point for 3–5 days plus a gradual recession	7–8 in every 10 years (2 years))					HIGH Limited flows since 2012 have severely compromised the recovery of degraded wetland vegetation and the recruitment of frogs and turtles.	<b>Avoid Damage - Protect</b>	A high potential for watering in 2016–17 Up to 150 GL	HIGH	HIGH - Follow up watering may be warranted due to very poor condition of sites
											HIGH
	Winter-spring action targeting (~27.5 GL/day @ Wagga Wagga for 3–5 days plus a gradual recession)	5–6 in every 10 years (4 years)					HIGH Limited flows since 2012 have severely compromised the recovery of degraded wetland vegetation and the recruitment of frogs and turtles.	<b>Avoid Damage</b>	A high potential for watering in 2016–17 >150 GL	HIGH	HIGH - Follow up watering may be warranted due to very poor condition of sites
											HIGH
Yanco Creek System	~ 40 GL action, targeting up to 1400 ML/day @ Yanco Creek off-take	3 in every 10 years (3 years)					LOW- MODERATE Watering required to maintain condition of wetland vegetation	<b>Protect</b>	A moderate potential for up to 40 GL including potential supplementary take	MODERATE	LOW-MODERATE
											MODERATE
Lowbidgee Core refuge and permanent aquatic habitat sites	Up to 25 GL	Annual					HIGH Annual watering required for critical habitat requirements	<b>Protect-Maintain</b>	High Potential only for critical/permanent habitats up to 25 GL	HIGH	HIGH
											HIGH
Lowbidgee North Redbank	Up to 120 GL	River red gum forest and spike rush wetlands 1-3 years (3 years)					MODERATE Watering required to maintain the good condition of wetland-floodplain vegetation	<b>Protect-Maintain</b>	A high potential for watering in 2016–17 Up to 60 GL	MODERATE	MODERATE
											HIGH
Lowbidgee Yanga National Park	50 - 100 GL	River red gum forest and spike rush wetlands 1-3 years (3 years)					HIGH Watering required to maintain the good condition of wetland-floodplain vegetation	<b>Protect-Maintain</b>	A high potential for watering in 2016–17 Up to 40 GL	MODERATE	MODERATE
											HIGH
Lowbidgee Nimmie-Caira	60-70 GL	Refuge habitat annual Lignum dominated wetlands 1 to 5 years, with duration of up to 7 months					MODERATE Watering required to maintain the good condition of wetland-floodplain vegetation, particularly to keep known rookery sites in 'event ready' condition	<b>Protect-Maintain</b>	A high potential for watering in 2016–17 Up to 20 GL	MODERATE	MODERATE
											HIGH
Lowbidgee Fiddler-Uara	30-50 GL	Blackbox and lignum wetlands every 3 to 7 years					LOW Watering required to protect and maintain the condition of wetland-floodplain vegetation.	<b>Protect-Maintain</b>	Low Potential.	HIGH for sections not watered in 2014-15	LOW
											HIGH

<sup>5</sup> Volume limited by current channel constraints.

<sup>6</sup> Roberts and Marston (2011), Hardwick and Maguire (2012), Alluvium (2013)

<sup>7</sup> Note: Differences in filling height (i.e. flows required to fill a wetland) vary among the lagoons that make up the mid-Murrumbidgee wetlands, and so their condition and watering requirement vary accordingly.

Lowbidgee Western Lakes	15 – 30 GL	Wetland habitats and open water blackbox and lignum wetlands every 3 to 7 years					LOW Watering required to protect and maintain the condition of wetland vegetation.	Protect-Maintain	Low Potential.	MODERATE	LOW
							MODERATE				
Murrumbidgee channel	Winter-spring fresh (~5 GL/day @ Darlington Point - Balranald for 20 days)	7 in every 10 years					MODERATE Native fish populations are continuing to recover. Water required for improved fish passage and connectivity, aquatic habitat and riverine productivity	Protect	A high potential for up to 40 GL targeting fish passage and channel productivity	MODERATE	MODERATE
							MODERATE				
	Summer fresh (~1 GL/day @ Darlington Point - Balranald for 20 days)	7 in every 10 years					LOW Native fish populations are continuing to recover. Water required for improved fish passage and connectivity, aquatic habitat and riverine productivity	Protect	Low Potential, likely to be achieved by other environmental watering actions and other sources of water	LOW	LOW
							LOW				
	Distributary freshes	7 in every 10 years to annual					MODERATE Native fish populations are continuing to recover. Water required for improved fish passage and connectivity, aquatic habitat and riverine productivity	Protect	High potential subject to natural cues up to 10 GL	MODERATE	MODERATE
							MODERATE				
Junction Wetlands	>5 GL/day @ d/s Balranald Weir and >10 GL/day @ Barmah on the Murray	5 in every 10 years					HIGH Limited flows since 2012 have severely compromised the recovery of degraded wetland vegetation and the recruitment of frogs and turtles	Not Applicable	Option unlikely to be achievable under this resource availability.	HIGH	HIGH
							HIGH				
	Pumping to individual high priority wetland assets for refuge sites	7–8 in every 10 years (2 years))					HIGH Limited flows since 2012 have severely compromised the recovery of degraded wetland vegetation and the recruitment of frogs and turtles	Avoid Damage - Protect	A high potential for watering in 2016–17 Up to 10 GL	HIGH	HIGH
							HIGH				
<div>Key - events in previous years</div> <div><div></div> means demand was met by Commonwealth environmental water or any other source</div> <div><div></div> means demand was partially met by Commonwealth environmental water or any other source (may be used to indicate infrastructure assisted delivery)</div> <div><div></div> means water not provided (or not required)</div> <div>Note that not all demands require water every year; drying phases are important for floodplains and temporary wetlands or streams</div> <div>Key - potential watering in 2016-17</div> <div><div></div> means a high priority for Commonwealth environmental watering (full or partial contribution, and subject to seasonal and operational considerations)</div> <div><div></div> means a secondary priority for Commonwealth environmental watering, likely to be met via other means (other water holders, or natural flows)</div> <div><div></div> means a low priority for Commonwealth environmental watering</div> <div>Key - urgency of environmental demands</div> <div><div></div> means critical demand i.e. urgent need for water in that particular year to manage risk of irretrievable loss or damage</div> <div><div></div> means high demand for water i.e. needed in that particular year</div> <div><div></div> means moderate demand for water i.e. water needed that particular year and/or next</div> <div><div></div> means low demand for water i.e. water generally not needed that particular year</div> <div><div></div> means very low demand for water i.e. water generally not needed that particular year or the following year</div> <div>Note that demand is considered at a generalised scale; there may be specific requirements that are more or less urgent within the flow regime</div>								Carryover potential	Approximately 57 GL carried into 2016–17 in the Murrumbidgee	Target of >50 GL carried into 2017–18 in the Murrumbidgee	–
								Trade potential	Potential for purchases to augment water for the environment in a number of catchments in the Northern Murray-Darling Basin to meet high environmental water demands. Further information will be provided to the market ahead of any trade of Commonwealth environmental water. Transfer of allocations between catchments in the southern-connected Basin would be explored as the preferred option to allocation purchase or sale, consistent with the rules identified in state water resource plans that apply to all water users.		

**Table 3c:** Environmental demands, priority for watering in 2016–17 and outlook for coming years in the Murrumbidgee Catchment – **HIGH – VERY HIGH WATER RESOURCE AVAILABILITY IN 2016–17**

Environmental assets	Indicative demand <sup>8</sup> (for all sources of water in the system)		Watering history (from all sources of water)				2016–17			Implications for future demands		
	Flow/volume	Required frequency (maximum dry interval) <sup>9</sup>	2012–13	2013–14	2014–15	2015–16	Predominant urgency of environmental demand for water	Purpose under low to very low resource availability	Potential Commonwealth environmental water contribution?	Likely urgency of demand in 2017–18 if watering occurred as planned in 2016–17	2018-19 Range of likely demand	Met in 2017–18 Not met in 2017–18
			(mod)	(drying)	(drying)	(drying)						
Mid-Murrumbidgee Wetlands <sup>10</sup>	Pumping to individual high priority wetland assets	8 in every 10 years - annual (2 years)					HIGH However overbank connection is preferred	Not Applicable	Option unlikely to be required under this resource availability.	HIGH	MODERATE	
	Minimum (~15.5 GL/day @ Darlington Point for 3–5 days plus a gradual recession	7–8 in every 10 years (2 years))					HIGH Limited flows since 2012 have severely compromised the recovery of degraded wetland vegetation and the recruitment of frogs and turtles.	Avoid Damage - Protect	A high potential for watering in 2016–17 Up to 150 GL	HIGH	HIGH - Follow up watering may be warranted due to very poor condition of sites	
	Winter-spring action targeting (~27.5 GL/day @ Wagga Wagga for 3–5 days plus a gradual recession)	5–6 in every 10 years (4 years)					HIGH Limited flows since 2012 have severely compromised the recovery of degraded wetland vegetation and the recruitment of frogs and turtles.	Avoid Damage	A high potential for watering in 2016–17 >150 GL	HIGH	HIGH - Follow up watering may be warranted due to very poor condition of sites	
											HIGH	
Yanco Creek System	~ 40 GL action, targeting up to 1400 ML/day @ Yanco Creek off-take	3 in every 10 years (3 years)					LOW- MODERATE Watering required to maintain condition of wetland vegetation	Protect	A moderate potential for up to 40 GL including potential supplementary take	MODERATE	LOW-MODERATE	
											MODERATE	
Lowbidgee Core refuge and permanent aquatic habitat sites	Up to 25 GL	Annual					HIGH Annual watering required for critical habitat requirements	Not Applicable	Option unlikely to be required under this resource availability.	HIGH	HIGH	
											HIGH	
Lowbidgee North Redbank	Up to 120 GL	River red gum forest and spike rush wetlands 1-3 years (3 years)					MODERATE Watering required to maintain the good condition of wetland-floodplain vegetation	Protect-Maintain	A high potential for watering in 2016–17 Up to 60 GL and Lowbidgee Supplementary access	MODERATE	MODERATE	
											HIGH	
Lowbidgee Yanga National Park	50 - 100 GL	River red gum forest and spike rush wetlands 1-3 years (3 years)					HIGH Watering required to maintain the good condition of wetland-floodplain vegetation	Protect-Maintain	A high potential for watering in 2016–17 Up to 40 GL and Lowbidgee Supplementary access	MODERATE	MODERATE	
											HIGH	
Lowbidgee Nimmie-Caira	60-70 GL	Refuge habitat annual Lignum dominated wetlands 1 to 5 years, with duration of up to 7 months					MODERATE Watering required to maintain the good condition of wetland-floodplain vegetation, particularly to keep known rookery sites in 'event ready' condition	Protect-Maintain	A high potential for watering in 2016–17 Up to 20 GL and Lowbidgee Supplementary access	MODERATE	MODERATE	
											HIGH	
Lowbidgee Fiddler-Uara	30-50 GL	Blackbox and lignum wetlands every 3 to 7 years					LOW Watering required to protect and maintain the condition of wetland-floodplain vegetation.	Protect-Maintain	A high potential for watering in 2016–17 including Lowbidgee Supplementary access	HIGH	LOW	
											MODERATE	
Lowbidgee Western Lakes	15 – 30 GL	Wetland habitats and					LOW Watering required to protect	Protect-Maintain	A high potential for watering in 2016–17	MODERATE	LOW	

<sup>8</sup> Volume limited by current channel constraints.

<sup>9</sup>Roberts and Marston (2011), Hardwick and Maguire (2012), Alluvium (2013)

<sup>10</sup> Note: Differences in filling height (i.e. flows required to fill a wetland) vary among the lagoons that make up the mid-Murrumbidgee wetlands, and so their condition and watering requirement vary accordingly.



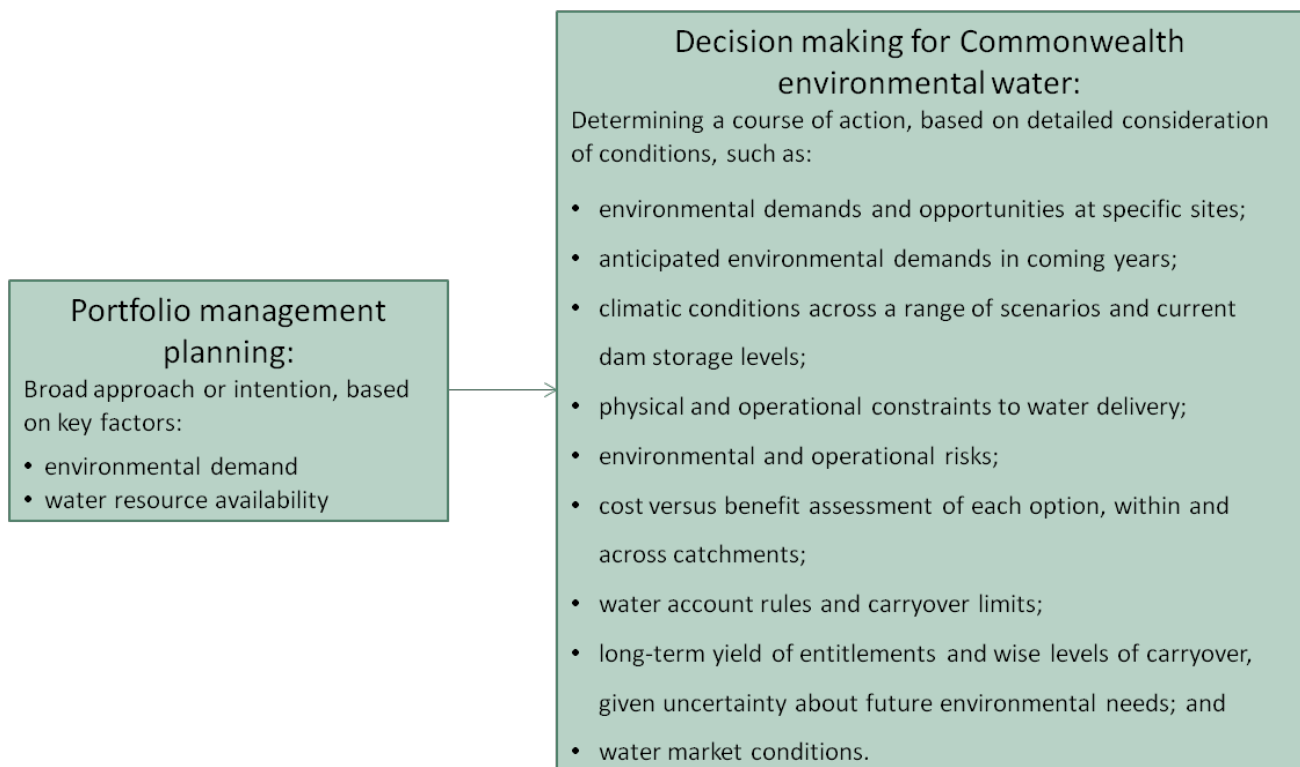
		open water blackbox and lignum wetlands every 3 to 7 years					and maintain the condition of wetland vegetation.		including Lowbidgee Supplementary access		MODERATE
Murrumbidgee channel	Winter-spring fresh (~5 GL/day @ Darlington Point - Balranald for 20 days)	7 in every 10 years					MODERATE Native fish populations are continuing to recover. Water required for improved fish passage and connectivity, aquatic habitat and riverine productivity	Not Applicable	Option unlikely to be required under this resource availability.	MODERATE	MODERATE
											MODERATE
	Summer fresh (~1 GL/day @ Darlington Point - Balranald for 20 days)	7 in every 10 years					LOW Native fish populations are continuing to recover. Water required for improved fish passage and connectivity, aquatic habitat and riverine productivity	Not Applicable	Option unlikely to be required under this resource availability.	LOW	LOW
											LOW
	Distributary freshes	7 in every 10 years to annual					MODERATE Native fish populations are continuing to recover. Water required for improved fish passage and connectivity, aquatic habitat and riverine productivity	Not Applicable	Option unlikely to be required under this resource availability.	MODERATE	MODERATE
											MODERATE
Junction Wetlands	>5 GL/day @ d/s Balranald Weir and >10 GL/day @ Barmah on the Murray	5 in every 10 years					HIGH Limited flows since 2012 have severely compromised the recovery of degraded wetland vegetation and the recruitment of frogs and turtles	Avoid Damage - Protect	A high potential for watering in 2016–17 Up to 100 GL	HIGH	HIGH
											HIGH
	Pumping to individual high priority wetland assets for refuge sites	7–8 in every 10 years (2 years))					HIGH Limited flows since 2012 have severely compromised the recovery of degraded wetland vegetation and the recruitment of frogs and turtles	Not Applicable	Option unlikely to be required under this resource availability.	HIGH	HIGH
											HIGH
<div>Key - events in previous years</div> <div><div></div> means demand was met by Commonwealth environmental water or any other source</div> <div><div></div> means demand was partially met by Commonwealth environmental water or any other source (may be used to indicate infrastructure assisted delivery)</div> <div><div></div> means water not provided (or not required)</div> <div>Note that not all demands require water every year; drying phases are important for floodplains and temporary wetlands or streams</div> <div>Key - potential watering in 2016-17</div> <div><div></div> means a high priority for Commonwealth environmental watering (full or partial contribution, and subject to seasonal and operational considerations)</div> <div><div></div> means a secondary priority for Commonwealth environmental watering, likely to be met via other means (other water holders, or natural flows)</div> <div><div></div> means a low priority for Commonwealth environmental watering</div> <div>Key - urgency of environmental demands</div> <div><div></div> means critical demand i.e. urgent need for water in that particular year to manage risk of irretrievable loss or damage</div> <div><div></div> means high demand for water i.e. needed in that particular year</div> <div><div></div> means moderate demand for water i.e. water needed that particular year and/or next</div> <div><div></div> means low demand for water i.e. water generally not needed that particular year</div> <div><div></div> means very low demand for water i.e. water generally not needed that particular year or the following year</div> <div>Note that demand is considered at a generalised scale; there may be specific requirements that are more or less urgent within the flow regime</div>								Carryover potential	Approximately 57 GL carried into 2016–17 in the Murrumbidgee	Target of >50 GL carried into 2017–18 in the Murrumbidgee	–
								Trade potential	Potential for purchases to augment water for the environment in a number of catchments in the Northern Murray-Darling Basin to meet high environmental water demands. Further information will be provided to the market ahead of any trade of Commonwealth environmental water. Transfer of allocations between catchments in the southern-connected Basin would be explored as the preferred option to allocation purchase or sale, consistent with the rules identified in state water resource plans that apply to all water users.		

## 3. Next steps

### 3.1. From planning to decision making

It is important to distinguish between planning and operational decision making. As shown in Figure 4, planning allows the Office to manage the environmental water portfolio in a holistic manner and is an exercise in developing a broad approach or intention, based on the key drivers (demand and supply).

Decision making throughout each year builds on the intention by considering in more detail the specific prevailing factors and additional factors such as costs, risks and constraints to water delivery and market conditions.



**Figure 4:** Planning and decision making for Commonwealth environmental water use

### 3.2. Further information

For further information on how the Office plans for water use, carryover and trade, please visit our web site <http://www.environment.gov.au/water/cewo>

- Water use: [www.environment.gov.au/topics/water/commonwealth-environmental-water-office/assessment-framework](http://www.environment.gov.au/topics/water/commonwealth-environmental-water-office/assessment-framework)
- Carryover: <http://www.environment.gov.au/topics/water/commonwealth-environmental-water-office/portfolio-management/carryover>
- Trade: *Discussion Paper – Trade of Commonwealth Environmental Water and Commonwealth Environmental Water Trading Framework*: <http://www.environment.gov.au/water/cewo/trade/trading-framework>



# Bibliography

Alluvium (2013). Yanco Creek system environmental flow study (final report), report prepared for State Water, Leeton NSW.

Charles Sturt University (CSU) (2014). Murrumbidgee Monitoring and Evaluation Plan. Prepared for Commonwealth Department of the Environment, Canberra.

<http://www.environment.gov.au/water/cewo/publications/murrumbidgee-me-plan>

Commonwealth Environmental Water Office (CEWO) (2015). Integrated planning for the use, carryover and trade of Commonwealth environmental water: Murrumbidgee River Valley 2015-16, Commonwealth of Australia 2015

<http://www.environment.gov.au/system/files/resources/aab98d9b-c25a-427c-b03f-5f05a7775aa8/files/integrated-planning-cew-murrumbidgee-2015-16.pdf>

Green D., Petrovic J., Moss P., Burrell M. (2011). *Water resources and management overview: Murrumbidgee Catchment*, NSW Office of Water, Sydney

Hardwick L and Maguire J (2012). Environmental water needs of the Lower Murrumbidgee (Lowbidgee) floodplain; Discussion Paper 1 – Approach and ecological considerations

Kingsford, R. T. and Thomas, R.F. (2001). Changing water regimes and wetland habitat on the Lower Murrumbidgee floodplain of the Murrumbidgee River in arid Australia. Report to Environment Australia, April 2001.

Murrumbidgee Catchment Management Authority (MCMA) (2009). *Lower Murrumbidgee Floodplain Natural Resource Management Plan*. Murrumbidgee Catchment Management Authority, Wagga Wagga.

Murray-Darling Basin Authority (MDBA) (2012a). *Assessment of environmental water requirements for the proposed Basin Plan: Mid-Murrumbidgee River Wetlands*, <http://www.mdba.gov.au/what-we-do/basin-plan/development/bp-science/assessing-environmental-water-requirements>

Murray-Darling Basin Authority (MDBA) (2012b). *Assessment of environmental water requirements for the proposed Basin Plan: Lower Murrumbidgee River (in-channel flows)*, <http://www.mdba.gov.au/what-we-do/basin-plan/development/bp-science/assessing-environmental-water-requirements>

Murray-Darling Basin Authority (MDBA) (2012c). *Assessment of environmental water requirements for the proposed Basin Plan: Lower Murrumbidgee River Floodplain*, <http://www.mdba.gov.au/what-we-do/basin-plan/development/bp-science/assessing-environmental-water-requirements>

Murray-Darling Basin Authority (MDBA) (2012d). Hydrologic modelling to inform the proposed Basin Plan - methods and results, MDBA publication no: 17/12, Murray-Darling Basin Authority, Canberra.

Murray-Darling Basin Authority (MDBA) (2014). *Basin-wide environmental watering strategy*. <http://www.mdba.gov.au/what-we-do/environmental-water/basin-watering-strategy>.

Murray-Darling Basin Authority (MDBA) (2015). Murrumbidgee reach report: Constraints Management Strategy. <http://www.mdba.gov.au/publications/mdba-reports/murrumbidgee-reach-report>

Murray-Darling Basin Authority (MDBA) (2016). Basin environmental watering outlook for 2016–17. [http://www.mdba.gov.au/sites/default/files/pubs/Basin-environmental-watering-outlook-for-2016-17\\_1.pdf](http://www.mdba.gov.au/sites/default/files/pubs/Basin-environmental-watering-outlook-for-2016-17_1.pdf)

NSW Department of Primary Industry (DPI) (2014). Prioritisation process and environmental water needs for the Lowbidgee floodplain wetlands.

NSW Department of Primary Industry (DPI) (2015). *How water is shared in the regulated Murrumbidgee Valley*. October 2015. [online] available:

[http://www.water.nsw.gov.au/\\_data/assets/pdf\\_file/0004/585193/How-water-is-shared-in-the-regulated-murrumbidgee-valley.pdf](http://www.water.nsw.gov.au/_data/assets/pdf_file/0004/585193/How-water-is-shared-in-the-regulated-murrumbidgee-valley.pdf), accessed May 2016.

NSW Legislation (2003). *Water Sharing Plan for the Murrumbidgee Regulated River Water Source* 2003. [online] available:  
[www.legislation.nsw.gov.au/viewtop/inforce/subordleg+1038+2002+FIRST+0+N/](http://www.legislation.nsw.gov.au/viewtop/inforce/subordleg+1038+2002+FIRST+0+N/), accessed March 2014.

Roberts, J. and Masrton, F. (2011). *Water regime for wetlands and floodplain plants: A source book for the Murray-Darling Basin*.

Sinclair Knight Merz (2011). *Environmental Water Delivery: Murrumbidgee Valley*. Prepared for Commonwealth Department of the Environment, Canberra.  
<http://www.environment.gov.au/resource/environmental-water-delivery-murrumbidgee-valley>

Wassens, S., Bino, G., Spencer, J., Thiem, J., Wolfenden, B., Jenkins, K., Thomas, R., Hall, A., Ocock, J., Lenon, E., Kobayashi, T, Heath, J. and Cory, F. (2016). [Commonwealth Environmental Water Office long-term intervention monitoring program Murrumbidgee River system Selected Area, 2014-15 Synthesis report, Commonwealth of Australia 2014](#).

# Attachment A – Expected outcomes from the Basin-wide environmental watering strategy

Expected outcomes from the Basin-wide environmental watering strategy (MDBA 2014) that are relevant to the Murrumbidgee Catchment are described below.

## RIVER FLOWS AND CONNECTIVITY

- Baseflows are at least 60 per cent of the natural level
- Contributing to a 30 per cent overall increase in flows in the River Murray
- A 30–60 per cent increase in the frequency of freshes, bankfull and lowland floodplain flows

## VEGETATION

- Maintain the current extent of water-dependent vegetation near river channels and on low-lying areas of the floodplain.
- Improve condition of black box, river red gum and lignum shrublands
- Improved recruitment of trees within black box and river red gum communities
- Increased periods of growth for non-woody vegetation communities that closely fringe or occur within the river and creek channels

### Vegetation extent<sup>11</sup>

Area of river red gum (ha)	Area of black box (ha)	Shrublands	Non-woody water dependent vegetation
68 300	38 900	Lignum in the Lower Murrumbidgee	Closely fringing or occurring within the Murrumbidgee River, Billabong and Yanco creeks

### Black box condition

Vegetation condition score		Percent of vegetation assessed (within the managed floodplain)
0 – 6	>6 – 10	
54 per cent	46 per cent	73 per cent

### River red gum condition

Vegetation condition score					Percent of vegetation assessed (within the managed floodplain)
0 – 2	>2 – 4	>4 – 6	>6 – 8	>8 – 10	
3 per cent	8 per cent	22 per cent	40 per cent	27 per cent	93 per cent

## WATERBIRDS

- Maintain current species diversity
- Increase Basin-wide abundance of waterbirds by 20–25 per cent by 2024
- A 30–40 per cent increase in nests and broods (Basin-wide) for other waterbirds
- Up to 50 per cent more breeding events (Basin-wide) for colonial nesting waterbird species

<sup>11</sup> Area (ha) (+/- 10%) is based on Cunningham et al (2013), cited in MDBA (2014)

### Important Basin environmental assets for waterbirds in the Murrumbidgee

Environmental asset	Total abundance and diversity	Drought refuge	Colonial waterbird breeding	Shorebird abundance	In scope for C'th watering
Fivebough Swamp	*			*	No
Lowbidgee floodplain	*	*	*	*	Yes

### FISH

- No loss of native species
- Improved population structure of key species through regular recruitment, including
  - Short-lived species with distribution and abundance at pre-2007 levels and breeding success every 1–2 years
  - Moderate to long-lived with a spread of age classes and annual recruitment in at least 80 per cent of years
- Increased movements of key species
- Expanded distribution of key species and populations

### Key species for the Murrumbidgee include:

Species	Specific outcomes	In-scope for C'th water in the Murrumbidgee?
Flathead galaxias ( <i>Galaxias rostratus</i> )	Improve core range in additional locations, including the Murrumbidgee	Not until a population is established
Freshwater catfish ( <i>Tandanus tandanus</i> )	Expand the core range of current populations in Colombo-Billabong Creek	Yes
Golden perch ( <i>Macquaria ambigua</i> )	A 10–15 per cent increase of mature fish (of legal take size) in key populations	Yes
Macquarie perch ( <i>Macquaria australasica</i> )	Expand current populations (candidate sites include Cotter River, Murrumbidgee above Cooma, Adjungbilly Creek).	No
Murray cod ( <i>Maccullochella peelii</i> )	A 10–15 per cent increase of mature fish (of legal take size) in key populations	Yes
Olive perchlet ( <i>Ambassis agassizii</i> )	Olive perchlet are considered extinct in the southern Basin. Reintroduction using northern populations is the main option for recovery. Candidate sites may result from improved flow that reinstates suitable habitat in the mid-Murrumbidgee wetlands.	Restoration of flow to mid-Murrumbidgee wetlands could support the future reintroduction of the species.
River blackfish ( <i>Gadopsis marmoratus</i> )	Expand the range of current population in the Murrumbidgee River.	Yes
Silver perch ( <i>Bidyanus</i> )	Improve core range in	Yes, but only in the Billabong–

Species	Specific outcomes	In-scope for C'th water in the Murrumbidgee?
<i>bidyanus</i> )	Billabong–Yanco system and ACT reaches of the Murrumbidgee.	Yanco system (ACT out of scope)
Southern purple-spotted gudgeon ( <i>Mogurnda adspersa</i> )	Establish 3–4 additional populations (candidate sites include the Murrumbidgee in Adjungbilly and Adelong Creeks).	No
Southern pygmy perch ( <i>Nannoperca australis</i> )	Establish additional populations in the lower Murrumbidgee wetlands	Only if additional populations are established
Trout cod ( <i>Maccullochella macquariensis</i> )	For the connected population of the Murrumbidgee–Murray–Edwards, continue downstream expansion.	Yes
Yarra pygmy perch ( <i>Nannoperca obscura</i> )	Establish additional populations (no specific locations identified)	Only if additional populations are established

#### Important Basin environmental assets for native fish in the Murrumbidgee

Environmental asset	Key movement corridors	High Biodiversity	Site of other Significance	Key site of hydrodynamic diversity	Threatened species	Dry period / drought refuge	In-scope for C'th e-water
Lowbidgee Floodplain			*				Y
Murrumbidgee main channel (including upland reaches)	*		*		*		Y (d/s of storages)
Upland Murrumbidgee main channel	*		*		*		N
Cotter River			*		*		N
Billabong–Yanco–Columbo Creeks		*	*	*	*	*	Y

# Attachment B – Library of watering actions

## Operational considerations in the Murrumbidgee Catchment

The delivery of environmental water in the Murrumbidgee River Valley is currently constrained by the release capacities from storages, channel capacities, and system constraints. The Water Sharing Plan for the Murrumbidgee River Regulated Water Source includes river channel capacity constraints on maximum flows (NSW Legislation 2003; DPI 2015). This includes:

- Flows in the Murrumbidgee River at Gundagai are limited to less than 29 500 ML/day to prevent inundation of Tenandra Bridge on the Mundarlo Road near Gundagai.
- Flows in Tumut River are limited to less than 9000 ML/day at Oddy's Bridge and 9300 ML/day at Tumut to minimise bank erosion.
- Yanco Weir diversion is currently limited by the Water Sharing Plan to 1400 ML/day to Yanco Creek. Flows over ~2000 ML/day may cause floodplain inundation.
- Release capacities of storages may constrain the magnitude of augmentation.
- Environmental watering actions may inundate areas of low-lying private property and impact on riparian landholders by restricting access to land and/or stock or by causing damage to crops, stock, or private infrastructure.
- Channel capacity may limit environmental water delivery

The Murray-Darling Basin Authority (2015) published the Murrumbidgee reach report: Constraints Management Strategy which provides further information about constraints in the Murrumbidgee Catchment.

## Potential watering actions under different levels of water resource availability

Under certain levels of water resource availability, watering actions may not be pursued for a variety of reasons, including that environmental demand may be met by unregulated flows and that constraints and/or risks may limit the ability to deliver environmental water. Table 4 identifies the range of potential watering actions in the Murrumbidgee Catchment and the levels of water resource availability that relate to these actions.



**Table 4:** Summary of potential watering actions for the Murrumbidgee Catchment

Asset	Indicative flow/volume requirement <sup>12</sup>	Applicable level(s) of resource availability				
		Very Low	Low	Moderate	High	Very High
Mid-Murrumbidgee wetlands	Minimum (~15.5 GL/d @ Darlington Point for up to 5 days plus a gradual recession  Target (up to 27.5 GL/d @ Wagga Wagga for up to 5 days plus a gradual recession)	Option a priority but unlikely under this resource availability.		<i>Reconnection action:</i> Contribute to river flows (fresh) and inundation of fringing wetlands to continue recovery of wetland vegetation communities, and provide habitat to support survival and maintain the condition of waterbirds and native aquatic biota (including fish, turtles, frogs and invertebrates).		Outcomes are likely to be achieved from unregulated flow under this scenario.
	Pumping to individual high priority wetland assets	<i>Infrastructure assisted:</i> Contribute to habitat to support survival and maintain the condition of waterbirds and native aquatic biota (including fish, turtles, frogs and invertebrates).			Option unlikely to be required under this resource availability.	
Yanco Creek system	Yanco Wetlands (~40 GL action @ Yanco off-take)	<i>Yanco Creek System:</i> Contribute to flows reconnecting and refilling the anabranch creeks and lagoons located in the mid-Yanco Creek system.				Option unlikely to be required under this resource availability.
Lowbidgee - Core refuge and permanent aquatic habitat	Up to 25 GL	<i>Critical Habitat provision:</i> support critical fauna and flora habitat requirements and recruitment opportunities.			Option unlikely to be required under this resource availability	
Lowbidgee - North Redbank	Up to 120 GL	<i>Wetland inundation:</i> Contribute to river flows (fresh) using regulators to inundate target wetlands in the Lowbidgee to maintain and improve wetland vegetation diversity and condition, provide habitat to support survival and maintain the condition of native fish, waterbirds, and other aquatic vertebrates (e.g. frogs), hydrological			<i>Bird breeding event contingency:</i> Maintain wetland water levels and acceptable levels of water quality to support the completion of a naturally-triggered breeding event, including landscape scale	
Lowbidgee - Yanga National Park	50 - 100 GL					

<sup>12</sup> Volume limited by current channel constraints. Volumes will be scaled according to resource availability.

Lowbidgee - Nimmie-Caira	60-70 GL (key wetland and rookery sites)	connectivity between the floodplain and river, and contribute to processes such as nutrient and carbon cycling through return flows.  <i>Wetting-Drying cycle:</i> A decision may be made to not provide water to sites that require a drying phase or where target watering frequency has been achieved in recent years.		watering with lower Lachlan.  <i>Lowbidgee Supplementary:</i> Utilise a portion of river flows to contribute to outcomes as per <i>Wetland Inundation</i> objectives for regulated allocations.
Lowbidgee - Fiddler-Uara	30-50 GL			
Lowbidgee - Western Lakes	15 - 30GL (Open water habitats and vegetation)			
Murrumbidgee River Channel and distributaries	Murrumbidgee channel fresh:	<i>Restoring natural flow variability:</i> Contribute to river flows (base flows and freshes) in the Murrumbidgee River channel.		Option unlikely to be required under this resource availability.
	spring (~5 GL/d @ Balranald for 20 days)	<i>Native fish flow:</i> Contribute to river flows (base flows and freshes) to provide suitable in-stream conditions for native fish breeding, recruitment, movement and dispersal.		Option unlikely to be required under this resource availability.
	summer (~1 GL/d @ Balranald for 20 days)	<i>Water quality contingency:</i> Provide localised refuge habitat for fish and aquatic biota to prevent, or during, an adverse water quality/water level event.	Option unlikely to be required under this resource availability.	<i>Water quality contingency:</i> Provide localised refuge habitat for fish and aquatic biota to prevent, or during, an adverse water quality event.
	Distributary freshes	<i>Restoring natural flow variability:</i> Contribute to river flows (base flows and freshes) in the Murrumbidgee distributaries: Yanco-Colombo-Billabong Creek system, Old Man Creek system and/or other creeks.		Option unlikely to be required under this resource availability.
Junction Wetlands	Requires flows >5,000 ML/day @ d/s Balranald Weir and >10,000 ML/day @ Barmah on the Murray	Option a priority but reduced likelihood of natural trigger events under this resource availability.		<i>Reconnecting event:</i> Contribute to river flows (fresh) and inundation of fringing wetlands to continue recovery of wetland vegetation communities, and provide habitat to support survival and maintain the condition of waterbirds and native aquatic biota (including fish, turtles, frogs and invertebrates).
	Pumping to individual wetland assets for refuge sties	<i>Infrastructure assisted:</i> Contribute to habitat to support survival and maintain the condition of waterbirds and native aquatic biota (including fish, turtles, frogs and invertebrates).		Option unlikely to be required under this resource availability.

Note: Under certain resource availabilities, options may not be pursued for a variety of reasons including that environmental demand may be met by unregulated flows and that constraints and/or risks may limit the ability the deliver environmental water.

## Potential watering actions – standard operating arrangements

Table 4 above identifies the range of potential watering actions in the Murrumbidgee Catchment that give effect to the long-term demands and flow regime identified as being in scope for the Office to contribute environmental water to in any given year. The standard considerations associated with these actions are set out below.

### 1. Mid-Murrumbidgee Reconnection

Watering Action: Contribute to river flows (freshes) and inundation of fringing wetlands to avoid further damage and protect wetland vegetation communities, and provide habitat to support survival and maintain the condition of waterbirds and native aquatic biota (including fish, turtles, frogs and invertebrates).

Standard operational considerations:

The proposed event will involve the release of environmental water from upper storages in conjunction with rainfall-derived tributary flows. Should no suitable event occur, a smaller standalone option, targeting the lowest level wetlands only, or infrastructure assisted delivery to individual wetlands will be considered.

Typical extent:

- Inundation of low-level wetlands.
- This option will target a peak flow rate for three to five days and a recession that mimics a more natural recession rate (nominally a 10 to 15 per cent decrease in flow per day).
- Environmental flows likely to be delivered between winter and late spring to avoid peak irrigation season (November to April).
- While the volume of environmental water required will depend on the volume of baseflows, the proposed flow limits for this option are:
  - 28 000 ML/day (4.73 metres gauge height) at Gundagai.
  - 27 500 ML/day (4.9 metres gauge height) at Wagga.
- This option is likely to contribute flows required to inundate the mid-Yanco Creek system wetlands (Action 3), could provide some of the required flows for, and provide additional benefits to, the proposed in-channel actions (Actions 5 and 6) and watering of the Junction Wetlands.

Approvals:

- Agreement from landholders whose properties might be inundated by environmental flows is preferred.
- Target flows will result in the 1400 ML/day Yanco Creek off-take constraint specified in the Water Sharing Plan being exceeded. Approval to exceed the 1400 ML/day constraint at the Yanco Creek off-take is required from the NSW Minister for Primary Industries.

## 2. Mid-Murrumbidgee wetland – infrastructure assisted delivery

Watering action: Contribute to wetland inundation, using existing water delivery infrastructure, to refill high priority low lying wetlands to provide habitat to support survival and maintain the condition of waterbirds and native aquatic biota (including fish, turtles, frogs and invertebrates).

Standard operational considerations:

- Delivery to mid-Murrumbidgee wetlands through pumping is not as ecologically effective as filling the wetlands with a reconnecting river flow. The purpose of this option is to continue/maintain recent improvements in wetland vegetation condition at these sites and provide habitat to maintain condition of waterbirds, native fish, other aquatic vertebrates (turtles, frogs) and invertebrates.

Typical extent:

- It is not operationally feasible to pump to all sites; system scale outcomes cannot be achieved with infrastructure assisted watering alone. The wetlands in the mid-Murrumbidgee that can be delivered to via existing infrastructure and without higher reconnecting flows include:
  - Yarradda Lagoon in the mid-Murrumbidgee
  - Gras Innes and Oak Creek via Bundidgerry Creek
  - Yanco Agricultural (McCaughey's) Lagoon, Turkey Flat and Gooragool Lagoon via Murrumbidgee Irrigation infrastructure
  - Coonancoocabil Lagoon (off Murrumbidgee Irrigation infrastructure or via Gogeldrie Weir pool)
  - A number of wetlands within the Yanco Creek system
  - Other privately owned wetlands and waterways to restore ecological function to these areas.

Approvals:

- In some cases, access to channels will need to be negotiated with landholders or irrigation corporations and agreement for inundation of privately owned wetlands will need to be sought.

## 3. Mid-Yanco Creek Anabranches and Wetlands

Watering Action: The option would aim to maintain riparian and wetland vegetation condition (including river red gums) by reconnecting and refilling the anabranch creeks, flood-runners, lagoons and wetlands in the Yanco Creek System.

Standard operational considerations:

- The proposed event will involve the release of environmental water from upper storages, possibly in conjunction with rainfall-derived tributary flows.
- Alternatively delivery via both Yanco Creek Offtake and Coleambally Catchment Drain may achieve some objectives and limit inconvenience to upper Yanco Creek landholders.
- A third option is to divert a high unregulated flow, possibly through supplementary access, down the Yanco Creek system.

Typical extent:

- The action will target sites in the mid-Yanco Creek (between Morundah and Yanco Bridge on Kidman Way). Target sites include the 'Silver Pines' wetland complex.
- Flows above 1400 ML/day and/or additional volumes delivered through Coleambally Catchment Drain may be required to achieve desired outcomes.

Approvals:

- Agreement from landholders whose properties might be inundated by environmental flows is preferred.
- Target flows will result in the 1400 ML/day Yanco Creek off-take constraint specified in the Water Sharing Plan being exceeded. Approval to exceed the 1400 ML/day constraint at the Yanco Creek off-take is required from the NSW Minister for Primary Industries.

#### 4. Lowbidgee Wetlands

Watering Action: Using regulators, inundate target wetlands across the Lowbidgee to maintain, improve and in some cases promote the recovery of wetland vegetation diversity and condition (lignum, black box and river red gums and associated understory communities such as reeds, sedges and rushes), and provide habitat to support survival and maintain condition of native fish, waterbirds, other aquatic vertebrates (frogs) and invertebrates.

Standard operational considerations:

- The Lowbidgee contains suitable habitats for nationally important breeding colonies of threatened and internationally significant migratory waterbird species (MCMA 2009).
- Seasonal inundation of wetlands is important for the reproduction and survival of several frog species, including the EPBC Act vulnerable southern bell frog, in the Lowbidgee. Ensuring key southern bell frog sites receive flows over spring-summer and water levels are maintained over summer months is crucial for maintaining viable populations in the Lowbidgee system.
- Consideration will be given to the condition of individual sites as well as prevailing conditions to reinstate an appropriate wetting-drying cycle.
- Consideration will be given to using escapes to allow water to return to the river channel to improve hydrological connectivity and provide for transport of biota, nutrients, sediment and carbon and improve the health of the river system, and benefit fish and other organisms.
- Subject to occurrence and announcements, supplementary allocations may be used to protect a portion of river flows to inundate target wetlands in the Lowbidgee to maintain and improve wetland vegetation diversity and condition, hydrological connectivity between the floodplain and river, and contribute to processes such as nutrient and carbon cycling.

Typical extent:

- Possible target sites include: Core refuge and permanent aquatic habitat, North Redbank system, South Redbank (Yanga National Park), Nimmie-Caira and Fiddlers-Uara Creek systems and the Western Lakes. The scale of watering actions is dependent on environmental demand and water availability.

No additional approvals required.

## 5. Native fish flows

Watering Action: Contribute to base flows, freshes and the recession of natural bankfull and overbank flows to create favourable conditions for fish passage, reproduction and survival.

Standard operational considerations:

- This may involve contributing in-stream flows to improve movement opportunities (including off-channel recruitment), maximise available breeding habitat, create flow conditions favourable for reproduction, or contribute to the survival of native fish.

Typical extent:

- Target flow rates will be dependent on the prevailing flow conditions, target outcome and operational considerations.
- Environmental water will be delivered from storages and may target reaches along the length of the Murrumbidgee River and main distributaries.
- Subject to announcements, supplementary allocations may be used to protect a portion of river flows.
- Environmental deliveries for this option will likely be delivered in late winter (movement and condition), spring and early summer (spawning and recruitment).

No additional approvals required.

## 6. Restoring natural flow variability

Watering Action: Contribute to river flows restore natural flow events that are affected by river regulation and/or extraction.

Standard operational considerations:

- This option will contribute to objectives of the native fish flows (Action 5).

Typical extent:

- Environmental water may be delivered to the Murrumbidgee River channel, Yanco-Colombo-Billabong Creek system, Old Man Creek system, and/or other creek systems.
- Target flow rates will be dependent on the prevailing flow conditions, target outcome and operational considerations.
- Subject to announcements, supplementary allocations may be used to protect a portion of river flows.
- Environmental releases would be kept in channel and are not intended to inundate floodplain or wetland habitat.

No additional approvals required.



## 7. Contingency to support significant bird breeding events

Watering action: Maintain wetland water levels to support the completion of a significant waterbird breeding events.

Standard operational considerations:

- These contingency actions will only occur in response to developing issues/events.
- The bird breeding contingency is not to trigger a breeding event but for use when a breeding event is already underway and considered in danger of failure due to receding water levels.

Typical extent:

- Target flow rates will be dependent on the prevailing conditions, the nature of the water quality/falling water level issue and operational considerations.
- This option is contingent on conditions throughout the year, but is more likely to be required during warmer months.

No additional approvals required.

## 8. Contingency to support critical habitat requirements

Watering action: Contribute to managing water quality issues within in-stream and wetland environments across the Murrumbidgee Catchment.

Standard operational considerations:

- Contingency actions will only occur in response to developing issues/events.

Typical extent:

- Target flow rates will be dependent on the prevailing conditions, the nature of the water quality/falling water level issue and operational considerations.
- This option is contingent on conditions throughout the year, but is more likely to be required during warmer months.

No additional approvals required.

# Attachment C – Long-term water availability

## Commonwealth environmental water holdings

The Commonwealth holds the following entitlements in the Murrumbidgee Catchment:

- Murrumbidgee high security
- Murrumbidgee general security
- Murrumbidgee Irrigation (Conveyance)
- Coleambally Irrigation (Conveyance)
- Murrumbidgee supplementary

The full list of Commonwealth environmental water holdings can be found at [www.environment.gov.au/topics/water/commonwealth-environmental-water-office/about-commonwealth-environmental-water/how-much](http://www.environment.gov.au/topics/water/commonwealth-environmental-water-office/about-commonwealth-environmental-water/how-much) and is updated monthly.

## Other sources of environmental water

Other potential sources of held environmental water that may be used to complement Commonwealth environmental water delivery in the Murrumbidgee Catchment include:

- Environment Entitlement - The Living Murray Programme (Murray-Darling Basin Authority)
- Environmental Water Allowance (New South Wales Office of Environment and Heritage)
- NSW licensed entitlement (New South Wales Office of Environment and Heritage)
- Yanga Lowbidgee entitlement (NSW Parks and Wildlife Service)

## Planned environmental water

In addition to water entitlements held by environmental water holders, environmental demands may also be met via natural or unregulated flows and water provided for the environment under rules in state water plans (referred to as 'planned environmental water').

The Water Sharing Plan for the Murrumbidgee Regulated River Water Source (2003) establishes releases of planned environmental water (under Part 3, Clause 15) under operating rules for Burrinjuck and Blowering dams.

- Transparent releases:
  - Transparent releases from Blowering Dam to the Tumut River are equal to 560 ML/day plus any water use expected to occur between the dam and the confluence with the Murrumbidgee River. When inflows fall below 560 ML/day, release volumes are equal to inflows in addition to expected use.
  - Transparent releases from Burrinjuck Dam are the lesser of either the volume of inflows to the dam over the previous 24 hours or 615 ML.
- Translucent releases:
  - Translucent releases are made from Burrinjuck Dam on each day between 22 April and 21 October. Daily release volumes are calculated based on catchment conditions and storage volumes in Lake Burrinjuck.
- Minimum daily end of system flow targets (including Murrumbidgee River at Balranald).



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