



Australian Government

Commonwealth Environmental Water Office

# Commonwealth Environmental Water Portfolio Management Plan

## Barwon Darling

2019–20



## Acknowledgement of the traditional owners of the Murray–Darling Basin

The Commonwealth Environmental Water Office respectfully acknowledges the traditional owners, their Elders past and present, their Nations of the Murray–Darling Basin, and their cultural, social, environmental, spiritual and economic connection to their lands and waters.

© Copyright Commonwealth of Australia, 2019.



Commonwealth Environmental Water Portfolio Management Plan: Barwon Darling 2019–20 is licensed by the Commonwealth of Australia for use under a Creative Commons Attribution 4.0 International licence with the exception of the Coat of Arms of the Commonwealth of Australia, the logo of the agency responsible for publishing the report, content supplied by third parties, and any images depicting people. For licence conditions see: <https://creativecommons.org/licenses/by/4.0/>

This report should be attributed as 'Commonwealth Environmental Water Portfolio Management Plan: Barwon-Darling 2019–20, Commonwealth of Australia, 2019'.

The Commonwealth of Australia has made all reasonable efforts to identify content supplied by third parties using the following format '© Copyright' noting the third party.

The views and opinions expressed in this publication are those of the authors and do not necessarily reflect those of the Australian Government or the Minister for the Environment.

While reasonable efforts have been made to ensure that the contents of this publication are factually correct, the Commonwealth does not accept responsibility for the accuracy or completeness of the contents, and shall not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance on, the contents of this publication.

For more information about Commonwealth environmental water, please contact us at:

1800 803 772

[ewater@environment.gov.au](mailto:ewater@environment.gov.au)

[www.environment.gov.au/water/cewo](http://www.environment.gov.au/water/cewo)

@theCEWH

GPO Box 787, Canberra ACT 260

# Commonwealth environmental water portfolio management planning

## Commonwealth Environmental Water Holder

The Commonwealth Environmental Water Holder is a statutory position established under the *Water Act 2007* and is responsible for managing the Commonwealth's environmental water holdings. This water must be managed to protect and restore the rivers, wetlands and floodplains (and the native animals and plants they support) of the Murray–Darling Basin. Ms Jody Swirepik is the current Commonwealth Environmental Water Holder. She is supported by staff of the Commonwealth Environmental Water Office, which employs six local engagement officers who live and work in regional centres across the Murray–Darling Basin.

## Commonwealth environmental water

Commonwealth environmental water holdings are water entitlements that have been acquired by the Australian Government through investments in water-saving infrastructure and purchases on the water market. The holdings are a mix of entitlement types held across 19 catchments. The rules governing the entitlements vary across states and across catchments. Commonwealth environmental water entitlements are subject to the same fees, allocations, carryover and other rules as equivalent entitlements held by other water users.

There are broadly three options for managing Commonwealth environmental water:

- delivering water to a river or wetland to meet an identified environmental demand
- leaving water in storage and carrying it over for use in the next water year (referred to as 'carryover')
- trading water, that is, selling water and using the proceeds to buy water in another catchment or in a future year, or investing in complementary 'environmental activities'.

## Purpose of the document

This document sets out the plans for managing the Commonwealth environmental water portfolio in the Barwon-Darling for 2019–20. Efficient and effective management of Commonwealth environmental water requires the utilisation of all portfolio management options. 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 Commonwealth environmental water, consistent with the Basin-wide environmental watering strategy and having regard to the Basin annual environmental watering priorities.

To learn more about the planning approach see *Portfolio Management Planning: Approach to planning for the use, carryover and trade of Commonwealth environmental water, 2019–20* (available at: <http://www.environment.gov.au/water/cewo/publications> under 'Planning approach').

## Delivery partners

Commonwealth environmental water is managed in conjunction with and delivered by a range of partners. 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 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 Commonwealth Environmental Water Office via: [ewater@environment.gov.au](mailto:ewater@environment.gov.au).

# Table of contents

<b>Commonwealth environmental water portfolio management planning</b>	<b>2</b>
Commonwealth Environmental Water Holder	2
Commonwealth environmental water	2
Purpose of the document	2
Delivery partners	2
Your input	2
<b>Table of contents</b>	<b>3</b>
<b>Environmental watering in the Barwon-Darling</b>	<b>4</b>
1.1. The Barwon-Darling catchment	4
1.2. Environmental objectives in the Barwon-Darling catchment	1
1.3. Environmental flow requirements	2
<b>2. Portfolio management in 2019–20</b>	<b>3</b>
2.1. Lessons from previous years	4
2.2. Antecedent and current catchment conditions and the demand for environmental water in 2019–20	5
2.3. Water availability in 2019–20	6
2.4. Overall purpose of managing environmental water based on supply and demand	6
2.5. Water Delivery in 2019–20	7
2.6. Trading water in 2019–20	8
2.7. Carrying over water for use in 2020–21	8
2.8. Identifying Investment Opportunities	9
<b>3. Next steps</b>	<b>12</b>
3.1. From planning to decision making	12
3.2. Monitoring	12
3.3. Further information	13
<b>Bibliography</b>	<b>14</b>
<b>Attachment A – Expected outcomes from the Basin-wide environmental watering strategy</b>	<b>16</b>
<b>Attachment B – Operational details for watering</b>	<b>18</b>
Operational considerations in the Barwon-Darling catchment	18
Potential watering actions under different levels of water resource availability	18
Potential watering actions – standard operating arrangements	19
<b>Attachment C – Long-term water availability</b>	<b>20</b>
Commonwealth environmental water holdings	20
Other sources of environmental water	20
Planned environmental water	20

# Environmental watering in the Barwon-Darling

## 1.1. The Barwon-Darling catchment

The Barwon-Darling system and its tributaries covers an area of 699 500 square km, making up almost two-thirds of the Murray–Darling Basin. The system is comprised of the tributary catchments of the Paroo, Warrego, Condamine-Balonne and Moonie systems to the north, and the Border Rivers, Gwydir, Namoi and Macquarie-Castlereagh systems to the east.

The Barwon River flows south-west through a relatively narrow floodplain with a tightly meandering channel, and has a highly variable channel capacity and flow pattern. Channel capacity increases downstream of Collarenebri, after the Little Weir, Boomi, Moonie, Gwydir and Mehi rivers have joined the Barwon.

Downstream of Collarenebri, the Barwon River continues south-west, and is joined by more creeks and rivers including the Namoi River. Beyond Walgett the river turns in a westerly direction and flows unrestricted across alluvial plains. Further downstream there are many anabranches and effluent channels, which split and re-join the major channel.

The Darling River flows south-west within a deeply incised channel towards Wilcannia. Below Wilcannia the Darling reaches the Menindee Lakes, at the artificial storage of Lake Wetherell.

There are no major public water storages along the Barwon and Darling rivers, although there are in the Border Rivers, Gwydir, Namoi and Macquarie-Castlereagh systems. There are also large private off river storages that store water from harvesting of floodplain run-off, and the retention of irrigation tailwater . There are 14 major weirs along the main stem of the Barwon-Darling system from the Macintyre junction to upstream of Menindee Lakes, which create a barrier for fish passage. Only the Brewarrina Weir contains an effective fishway.

### *Barwon-Darling River channel*

The Barwon-Darling River channel connects the rivers, lakes and wetlands in the northern Murray–Darling Basin, providing a critical dry period refuge and movement corridor for fish and waterbirds, as well as habitats for other aquatic species including turtles, mussels, river snail and shrimp. This longitudinal connectivity is particularly important for regional communities of native fish and other aquatic species.

Diverse in-stream habitats including channels, deep pools, riffles, benches, snags, gravel beds and aquatic and riparian vegetation support a significant native fish community. There are more than 1 000 refugial waterholes between Walgett and Wilcannia.

### *Lowland Darling River aquatic ecological community*

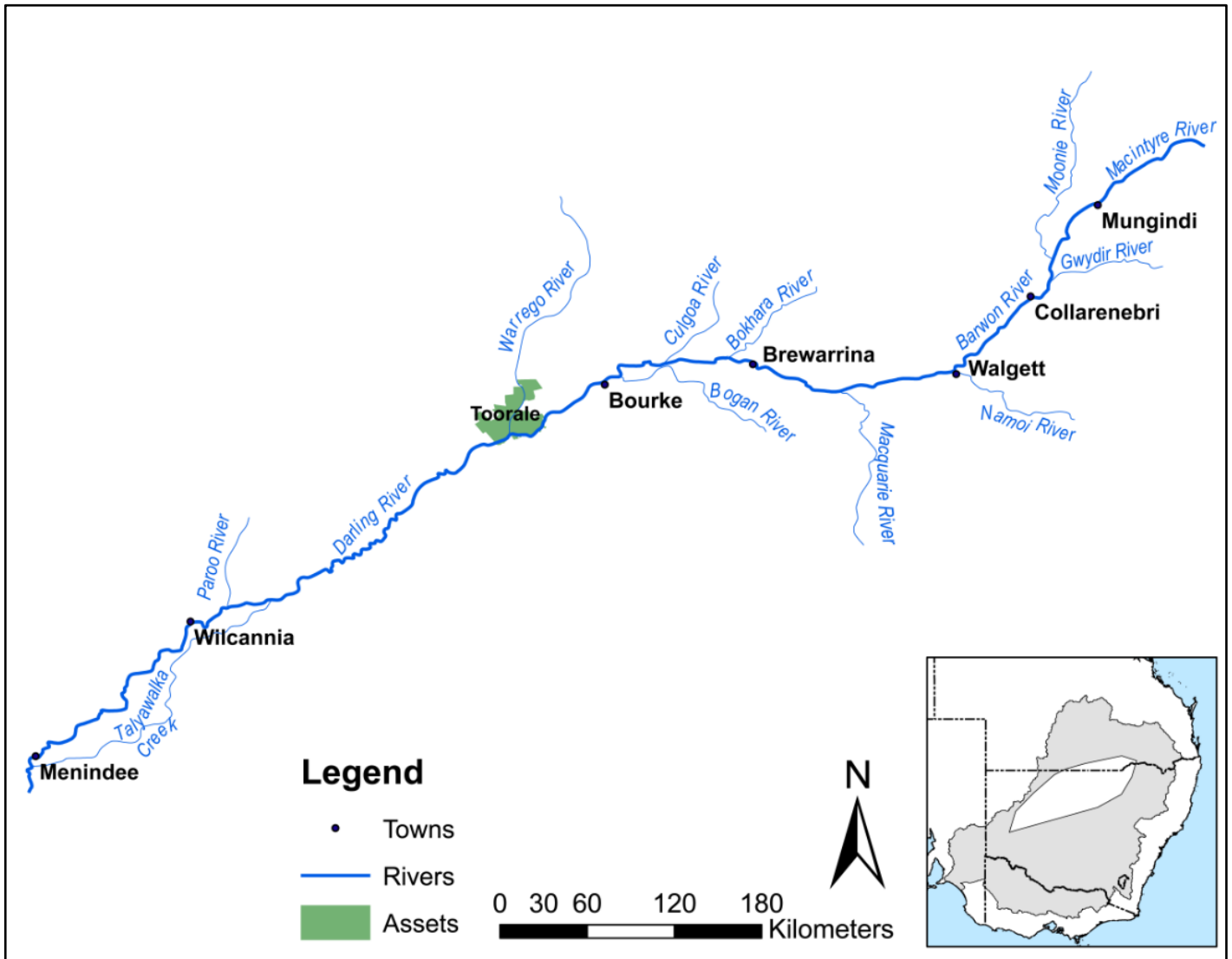
The Lowland Darling River aquatic ecological community has particular significance because the northern Basin is important for protecting the overall biodiversity of fish communities across the Basin. This community is listed as endangered under the *NSW Fisheries Management Act 2004*. Its fish community includes 25 resident species, and it is a stronghold for many species that are threatened in the south. It contains important remnant populations of olive perchlet, purple spotted gudgeon and freshwater catfish. There are also a number of species located in the north that are not present in the south, including Rendahl's tandan, Hyrtl's tandan, spangled perch, Darling River hardyhead and desert rainbowfish.

### *Barwon-Darling Wetlands*

The Barwon-Darling River supports a high density and wide variety of wetlands that receive flows from the main river before overbank inundation occurs. More than 580 wetlands have been mapped between Mungindi and Menindee from aerial photographs, including anabranches, flood runners, billabongs, deflation basins, lakes and swamps.

### *Talyawalka Anabranh-Teryaweynya Creek*

Talyawalka Anabranh-Teryaweynya Creek is a nationally important wetland system to the east of the main Darling River channel between Wilcannia and Menindee. The channels and lakes of Talyawalka Anabranh and its distributary Teryaweynya Creek support extensive areas of floodplain vegetation and black box woodland. When inundated the system's lakes provide habitat for large numbers of waterbirds. Poopelloe Lake, Talyawalka Creek and Pelican Lake (in the Teryaweynya system), along with the Darling River floodplain near Louth, are at times known or predicted to support 20 000 or more waterbirds .



**Figure 1:** Map of the Barwon-Darling catchment

## 1.2. Environmental objectives in the Barwon-Darling catchment

The long-term environmental objectives for the Murray–Darling Basin are described in the Basin Plan’s environmental watering plan and the Basin-wide environmental watering strategy, which includes ‘quantified environmental expected outcomes’ at both a Basin-scale and for each catchment. The expected outcomes relevant for the Barwon-Darling are summarised in Table 1 and described in detail 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 water plans, the Commonwealth Environmental Water 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. The long-term watering plan for the Barwon-Darling was not available at the time of preparation of this Portfolio Management Plan.

Based on these strategies and plans, and in response to best available knowledge drawing on the results of environmental watering monitoring programs, the objectives for environmental watering in the Barwon-Darling are summarised in Table 1 below. The objectives for water-dependent ecosystems will continue to be revised as part of the Commonwealth Environmental Water Office’s commitment to adaptive management.

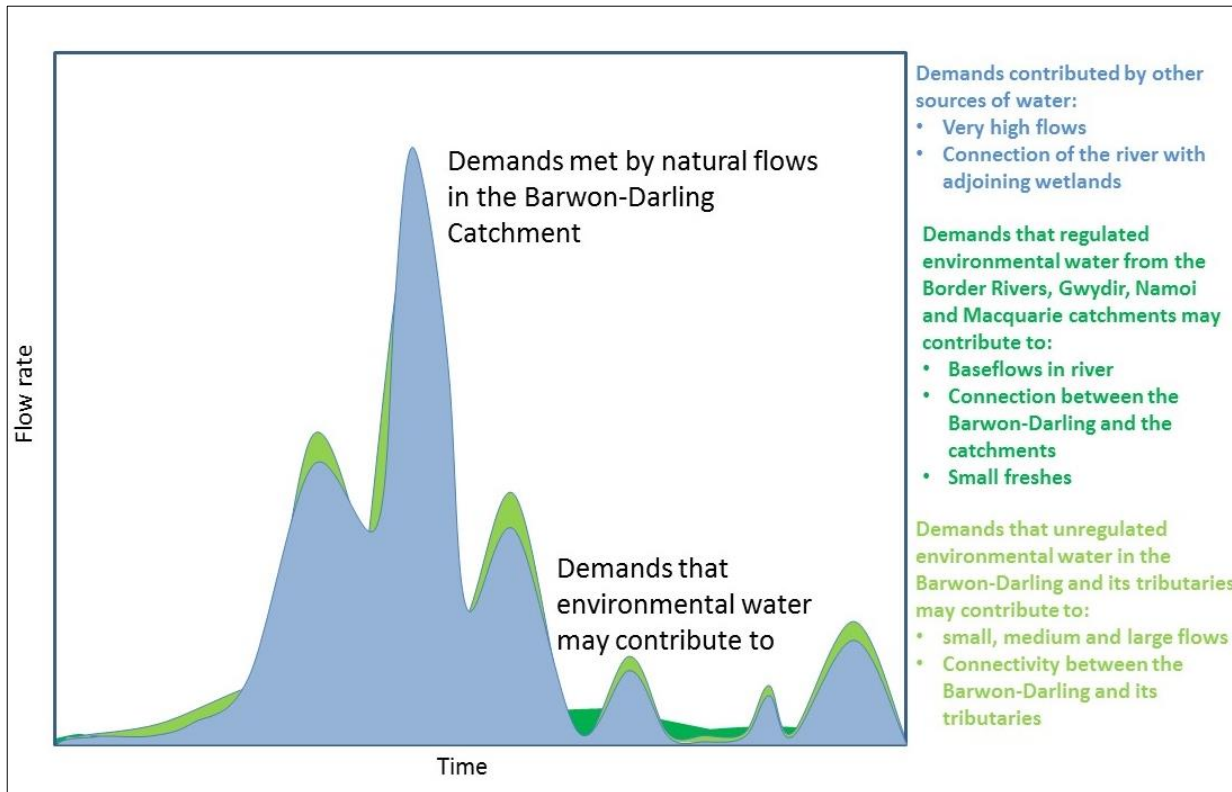
**Table 1:** Summary of objectives being targeted by environmental watering in the Barwon-Darling system

<b>BASIN-WIDE MATTERS</b> (Matters in red link to the Basin-wide Environmental Watering Strategy)	<b>OBJECTIVES FOR BARWON-DARLING ASSETS</b>
	<b>IN-CHANNEL ASSETS</b>
<b>VEGETATION</b>	Maintain riparian and in-channel vegetation condition, growth and survival
<b>FISH</b>	Provide flows that improve habitat conditions and support different life stages (migration, spawning, recruitment, refuge during dry times)
<b>INVERTEBRATES</b>	Provide habitat (e.g. pools and riffles) and conditions (low flows, freshes, and scouring flows) to maintain /improve micro and macroinvertebrate condition and diversity.
<b>OTHER VERTEBRATES</b>	Provide habitat and conditions to support survival and recruitment of native aquatic fauna (e.g. native water rat, frogs, turtles)
<b>CONNECTIVITY</b>	Support longitudinal connectivity in the Barwon-Darling and connection with its tributaries
<b>PROCESSES</b>	Support primary production, nutrient and carbon cycling and biotic dispersal and movement
<b>WATER QUALITY</b>	Maintain water quality within channels and pools
<b>RESILIENCE</b>	Provide refuge habitat for fish and other aquatic fauna
<b>WATERBIRDS</b>	

Information sourced from: Murray–Darling Basin Authority (2014).

### 1.3. Environmental flow requirements

In the Barwon-Darling most demands are met by unregulated/natural flows events, or are beyond what can be delivered within existing or likely holdings of environmental water. Only a limited range of environmental demands can be directly met through the use of held environmental water. 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. 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 operational delivery including constraints is described in [Attachment B](#).



**Figure 2:** Scope of demands that environmental water may contribute to meeting in the Barwon-Darling.

Based on the above objectives and current policies, 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 2. Through implementation of their Water Reform Action Plan, the NSW Government is committed to improving the way in which environmental water in the NSW northern Murray–Darling Basin is managed. Consistent with this, current policies relating to the management of environmental flows may change. As with the objectives, the environmental water requirements will continue to be reviewed and revised in response to new knowledge.

## 2. Portfolio management in 2019–20

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 objectives and watering requirements, watering history and asset condition) 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 2 below and summarised in the sections below.

There is some capacity to direct flows in at the junction of the Warrego and Darling rivers through infrastructure on the Toorale site (managed by the NSW National Parks and Wildlife Service in consultation with the Toorale Joint Management Committee), however this is limited by the nature of the Commonwealth's entitlements in the Warrego and Darling Rivers and day to day operations of the Toorale infrastructure is managed by NSW National Parks and Wildlife Service. Upgrades and changed management of the Toorale structures and operating structures is underway through the Toorale Infrastructure Project. Further information on the operation of the Toorale infrastructure can be found in the Northern Intersecting Stream Portfolio Management Plan.



## 2.1. Lessons from previous years

Outcomes from monitoring and lessons learned in previous years is a critical component for the effective and efficient use of Commonwealth environmental water. These learnings are incorporated into the way environmental water is managed.

The Commonwealth Environmental Water Office works with the following to collect and collate relevant monitoring information and evaluation results that facilitates adaptive management and changing our practices where needed:

- the Murray–Darling Basin Authority
- state agencies in particular the NSW Office of Environment and Heritage (OEH)
- research organisations
- regional organisations, local groups and landholders.

This continual review of information and outcomes is helping to build knowledge about the best way to get positive outcomes on a larger scale, based on what works and what does not work. Key findings and recommendations from event monitoring and observations include:

- Flow pulses in April 2018 and April-May 2019 refilled previously dry waterholes in the lower Warrego, allowing aquatic species such as fish, frogs and waterbirds to recolonise these sites.
- Increased flows down the Darling River zone, including the northern connectivity event improved water quality parameters such as conductivity (i.e. salinity) through dilution, which has been a consistent trend over the four years of the LTIM project.
- Fish death events can occur during long cease-to-flow events.
- Refuge holes can stratify, reducing habitat quality.
- The nature of tributaries and unregulated flows require that environmental demands for different portions of the Barwon-Darling are considered individually, not just as a collective system.;
- The water needed to replenish waterholes and allow for seepage is much greater if a river has ceased-to-flow and antecedent conditions are dry, compared to when a river is still flowing.
- The duration of regulated releases should reflect the duration of flow targets.
- Within catchment water requirements need to be balanced with broader system needs when environmental water availability is low.
- Travel times for regulated releases from storage need to be considered when coordinating flows between systems.
- Any future operational protocols and systems to better manage environmental flows should be practical. Improvements to metering and hydrometric systems are likely, which would underpin the implementation of sound operational protocols.
- There can be strong calls for water to meet broader social requirements before environmental demands become critical.

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

## **2.2. Antecedent and current catchment conditions and the demand for environmental water in 2019–20**

For the most part, the Northern Basin experienced below average to very much below average rainfall conditions in the 2018–19 water year, resulting in very low to no flows across all systems. At the same time, some areas were experiencing record hot temperatures during spring and summer, including very warm nights, which exacerbated no flow conditions and increased environmental demand. During the current water year, parts of the Barwon River, particularly between Collarenebri and the junction of Barwon and Namoi rivers and between Dangars Bridge gauge and the junction of the Barwon and Macquarie rivers, experienced over 300 days of cease to flow, increasing pressure on drought refuges.

During autumn, rain from cyclone Trevor and other weather systems resulted in flow into the Barwon-Darling system. The most significant of these flows occurred in the Warrego system and resulted in around 23GL passing the gauge at Louth in late April 2019. This helped to replenish waterholes within the mid to lower reaches of the system.

From an environmental perspective, the natural flows into the Barwon-Darling system provided great benefit in wetting the system following extended dry periods, filling up pools, connecting reaches of waterway and improving water quality. However, because the system was so dry and the extent of the rainfall events was limited, large scale connectivity along the system was not achieved.

The main concern for native fish during the ongoing dry conditions was the depletion of available habitat and deterioration of the remaining habitat. In response to this, Commonwealth and NSW environmental water was released from Glenlyon Dam (Border Rivers) and Copeton Dam (Gwydir) between May and June 2019. This flow was known as the Northern Fish Flow, and increased flows along the Barwon River, supporting the survival of native fish. The purpose of these releases was to replenish drought refuges for native fish along rivers in the northern Murray–Darling Basin. This was achieved by improving longitudinal connectivity, and providing fish with suitable quality drought refuges and improved food sources. With no further natural inflows to the system at the time, environmental water replenished pools and waterholes along large sections of the Barwon River. The flow of water for the environment was protected by a temporary restriction on pumping by unregulated entitlement holders. This restriction was imposed by the NSW government in recognition of the environmental need and community benefit of the flow.

If dry conditions continue across the northern Basin, the requirement for low flows and freshes in the Barwon-Darling system is likely to remain high. However, without increased water availability, the capacity for tributary systems to contribute to watering actions in the Barwon-Darling during the 2019–20 water year will be limited. The environmental demands in the tributaries of the Barwon-Darling are described in the portfolio management plans for the individual catchments.

There are ongoing environmental demands in the Barwon-Darling for large fresh and overbank flows (generally these flows are over 6 000 ML/day at Bourke). These demands can only be achieved with unregulated flows. Unregulated flows through the Barwon-Darling system can be enhanced through use of a range of held environmental water entitlements in tributaries (see Table 2), however, a number of these holdings are only activated during wet conditions.

### **Murray–Darling Basin-wide environmental watering strategy and 2019–20 annual priorities**

The Murray–Darling Basin Authority publish the Basin annual environmental watering priorities each year and have published multi-year priorities since 2017-18. Commonwealth environmental water in the Barwon-Darling will contribute to the following multi-year environmental watering priorities and the 2019-20 Basin annual environmental watering priorities.

#### **Rolling, multi-year priorities**

The rolling, multi-year priorities for river flows and connectivity are to:

- Support lateral and longitudinal connectivity along the river systems.

The rolling, multi-year priorities for native vegetation are to:

- Maintain the extent, improve the condition and promote recruitment of forests and woodlands.

- Maintain the extent and improve the condition of lignum shrublands.

The rolling, multi-year priorities for waterbirds are to:

- Improve the abundance and maintain the diversity of the Basin's waterbird population.

The rolling, multi-year priorities for native fish are to:

- Improve flow regimes and connectivity in northern Basin rivers to support native fish populations across local, regional and system scales.
- Support viable populations of threatened native fish, maximise opportunities for range expansion and establish new populations.

### **2019–20 Annual Priorities**

Protect and provide flows in the Barwon–Darling

- increase connection along the Barwon–Darling and lower Darling
- protect refuges and support native fish populations

In making decisions on the use of Commonwealth environmental water the Commonwealth Environmental Water Holder will have regard to these priorities while also considering water resource availability and environmental demand. In contributing to these demands, the Commonwealth Environmental Water Office will also be aiming to contribute to the expected outcomes in the Basin-wide environmental watering strategy (see [Attachment A](#)).

## **2.3. Water availability in 2019–20**

### **Forecasts of Commonwealth water allocations**

Water availability in the Barwon–Darling in 2019–20 is subject to natural rainfall and flows from the tributaries. The Commonwealth Environmental Water Holder currently holds 28.6 GL of unregulated entitlements along the Barwon–Darling River mainly around Collarenebri and Toorale. Through the use of planned or held environmental water within tributary systems, additional environmental water may contribute to Barwon–Darling flows. Further information on potential water availability in tributary systems is provided in the Portfolio Management Plans for the intersecting streams and individual northern catchments.

Information on allocations to Commonwealth environmental water holdings can be found at <http://www.environment.gov.au/water/cewo/portfolio-mgt/holdings-catchment> and is updated monthly.

### **Water resource availability scenarios**

Commonwealth environmental water is not managed in isolation. When considering the available resources to meet environmental demands, it is necessary to also factor in the resources managed by other entities and available to contribute to environmental objectives. Relevant resources include unregulated and regulated flows from the tributaries to the Barwon–Darling. Further detail on sources of environmental water in the Barwon–Darling 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 a very low to low resource availability scenarios are in scope for 2019–20. Environmental demand throughout the Barwon–Darling is generally high entering the 2019–20 water year.

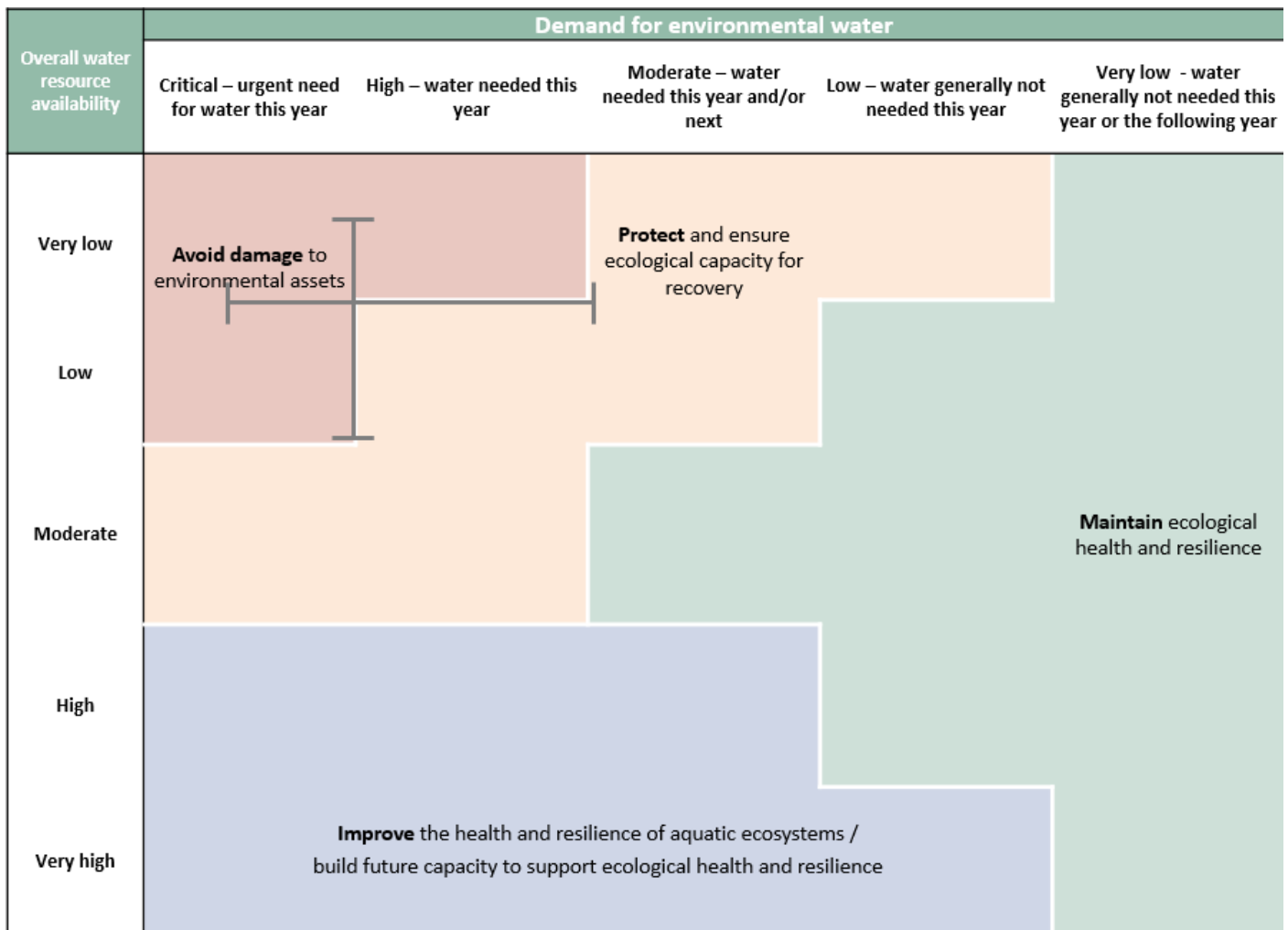
## **2.4. Overall purpose of managing environmental water based on supply and demand**

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 that are suitable for maximising outcomes.

Figure 3 shows how current demands and forecasted supply are considered together.

The overall ‘purpose’ for managing the Commonwealth’s water portfolio in the Barwon River system for 2019–20 is to avoid damage and protect aquatic ecosystems and native fish habitat in the Barwon and Darling rivers. This includes providing water to support:

- Species known to occur through out the Barwon-Darling system and listed as vulnerable, endangered or critically endangered under the *Environment Protection and Biodiversity Conservation Act 1999*. These species include Murray cod and silver perch.
- The Lowland Darling River aquatic ecological community listed as endangered under the NSW Fisheries Management Act 1994.



**Figure 3:** Determining a broad purpose for portfolio management in the Barwon-Darling for 2019–20. Note: grey lines represent potential range in demand and water resource availability.

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, 2019–20* (available at: <http://www.environment.gov.au/water/cewo/publications>).

## 2.5. Water Delivery in 2019–20

Environmental water contained within unregulated flows is important in achieving ecological outcomes in the Barwon-Darling system. These flows are particularly important for fish as they contain the natural cues and nutrients fish require for their lifecycles as this water is from natural flows (it is not delivered from dams). Unregulated flows through the Barwon-Darling system can be enhanced using Commonwealth holdings both along the Barwon-Darling and within tributary systems.

The focus for the 2019–20 water year will be the enhancement of unregulated flows into and along the Barwon-Darling through a range of options (see Table 2) to meet the following watering priorities:

- dry spell breaking low flows along the Barwon-Darling to refresh refuge pools; and
- fresh pulses to maintain or improve water quality and enhance fish condition, and support fish movement along the Barwon-Darling.

Low resource availability in regulated upstream storages is likely to significantly constrain the ability for regulated releases to further enhance environmental outcomes in the Barwon-Darling for the 2019–20 watering year.

## Stakeholder Feedback

Input on environmental demands and management options for the Barwon-Darling has been provided by the MDBA, NSW OEH, Eco Logical and NSW DPI Fisheries during 2018–19 and in previous years.

## 2.6. Trading water in 2019–20

The Water Act 2007, requires the Commonwealth Environmental Water Holder to trade for the purpose of protecting and restoring the environment. In addition to the obligations of the Water Act 2007, the CEWH and CEWO staff are required to comply with a wide range of existing legislative requirements. This includes: financial management arrangements for Commonwealth agencies; freedom of information; and policies relating to information management, auditing, employee conduct and accountability.

Through implementation of the Water Reform Action Plan, the NSW Government is committed to improving the way in which environmental water in the NSW northern Murray–Darling Basin is managed. Consistent with this, arrangements for any trade of water in the Barwon-Darling are evolving.

Significant rainfall is required to break the drought, wet up the catchment and improve inflows. Without imminent inflows, the lack of water will continue to impact water quality and the riverine environment, while reducing agricultural production. There has been no extraction by irrigators in 2018–19 in the Barwon Darling due to an embargo put in place by NSW government. The New South Wales water restriction policies are expected to continue while prolonged drought conditions continue.

Although no specific trade of water in the Barwon Darling has been identified for 2019–20, trade opportunities will be reviewed throughout the water year and as trade arrangements evolve and conditions change. 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>.

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-nov2016>.

## 2.7. Carrying over water for use in 2020–21

The volume of water carried over in the tributaries for use in the Barwon-Darling in 2020–21 will depend upon resource availability and demand throughout the year. Low resource availability in regulated upstream storages is likely to significantly limit the ability for regulated releases to contribute to environmental outcomes in 2020–21, unless conditions significantly change during 2019–20.

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. These decisions will be based upon best information available at the time.

More information on how the Commonwealth makes decisions on carryover is here: <http://www.environment.gov.au/water/cewo/portfolio-mgt/carryover>

## **2.8. Identifying Investment Opportunities**

Under the *Water Act 2007*, the Commonwealth Environmental Water Holder (CEWH) has the flexibility to use the proceeds from the sale of water allocations to fund environmental activities in the Basin.

'Environmental activities' must be consistent with the CEWH's obligation to exercise their function to protect and restore environmental assets. Environmental activities must also improve the capacity of the CEWH to meet the objectives of the Basin Plan environmental watering plan, and be directly linked to current or future delivery of water for the environment.

The option of investing the proceeds in environmental activities will be considered alongside other available water management options, such as purchasing water at another time or place. The CEWH is finalising an Investment Framework and an Annual Investment Plan to inform future investment in environmental activities.

**Table 2:** Environmental demands, priority for watering in 2019–20 and outlook for coming year in the Barwon-Darling.

Environmental assets		Indicative demand (for all sources of water in the system)		Watering history (from all sources of water)	2019–20	
		Flow/Volume	Required frequency (maximum dry interval)		Environmental demands for water	Potential Commonwealth environmental water contribution?
<b>Low flow pulse over extended river reach</b>	Dry period refuges (waterholes)	20–50 GL tributary inflow (volume dependent on antecedent conditions)	As required to offset an unusually long no flow period  Indicative triggers: <ul style="list-style-type: none"> <li>• 60–80 days at Bourke</li> <li>• 75 – 100 days at Louth</li> <li>• 120–150 days at Wilcannia</li> </ul>	During the 2017–18 and 2018–19 water years, reaches along the Barwon and Darling Rivers experienced extended cease to flow periods of 200–300 days. These periods were broken by either unregulated flow events or regulated delivery from storages within the Gwydir and Border Rivers systems regulated delivery from Gwydir and Border Rivers.	<b>Critical</b>	Tributary inflows may be delivered through one or more of the following: <ul style="list-style-type: none"> <li>• Regulated delivery from Gwydir, Border Rivers, Macquarie and Namoi catchments. However, without increased water availability, the ability for tributary systems to provide these type of flows during the 2019–20 water year will be limited.</li> <li>• Using supplementary entitlements to protect a portion of a supplementary event flowing through a regulated tributary.</li> <li>• Enhancing unregulated flows into the Barwon-Darling through the passive management of Commonwealth unregulated entitlements held in tributary systems.</li> <li>• Directing Commonwealth environmental water from entitlements on the NSW section of the Warrego (Toorale) to the Darling River. Subject to trigger flows in the Warrego River and use in the Darling being the priority under CEWO's use strategy for the Toorale entitlements.</li> </ul>
<b>Small in-channel flow pulse</b>	Water quality – suppress persistent stratification	510 ML/day at Brewarrina 450 ML/day at Bourke 350 ML/day at Wilcannia Oct to Mar	As required	Flow requirements met in 2017–18 but not met in 2018–19	<b>Moderate</b>	Identified demand could be achieved through a combination of the following: <ul style="list-style-type: none"> <li>• Regulated delivery from Gwydir, Border Rivers, Macquarie and Namoi catchments. However, without increased water availability, the ability for tributary systems to provide these type of flows during the 2019–20 water year will be limited.</li> <li>• Enhancing unregulated flows into and along the Barwon-Darling through the passive management of Commonwealth unregulated entitlements.</li> <li>• Using supplementary entitlements to protect a portion of a supplementary event flowing through a regulated tributary.</li> <li>• Directing Commonwealth environmental water from entitlements on the NSW section of the Warrego (Toorale) to the Darling River. Subject to trigger flows in the Warrego River and use in the Darling being the priority under CEWO's use strategy for the Toorale entitlements.</li> </ul>
	Increase fish access to habitat, small scale movement, water quality and spawning in small bodied fish	500 ML/day Barwon River at Walgett for 7–20 days	1–3 times a year in an average of 8–9 years out of 10	Flow requirements met in 9 of the last 10 years	<b>Low</b>	
		500 ML/day Darling River at Bourke for 7–20 days	1–2 times a year in an average of 8–9 years out of 10	Flow requirements met in 9 of the last 10 years	<b>Low</b>	
<b>Moderate in-channel flow pulse</b>	Fish condition and small scale movement	2 500 ML/day at Bourke	As required after dry spell	N/A	<b>High</b>	Identified demand can only be achieved with the support of unregulated flows. Unregulated flows into and along the Barwon-Darling system could be enhanced through one or more of the following: <ul style="list-style-type: none"> <li>• Passive management of Commonwealth unregulated entitlements held within the Barwon-Darling system and its tributaries.</li> <li>• Using supplementary entitlements to protect a portion of a supplementary event flowing through a regulated tributary.</li> <li>• Directing Commonwealth environmental water from entitlements on the NSW section of the Warrego (Toorale) to the Darling River. Subject to trigger flows in the Warrego River and use in the Darling being the priority under CEWO's use strategy for the Toorale entitlements.</li> </ul>
	Algal suppression flows	2 000 ML/day at Wilcannia for 5 days between Oct and April	8–9 years out of 10	Flow requirements not met in 2017–18 and 2018–19	<b>High</b>	
<b>Large in-channel flow pulses</b>	Small scale fish movement/ access to habitat (snags, in channel benches Brewarrina to Bourke)	6 000 ML/day Darling River at Bourke for 14 days	8–9 in 10 years	Flow requirements not met in 2018–19. Met for 4 years out of the last 10 years	<b>High</b>	Identified demand can only be achieved with unregulated flows. Unregulated flows into and along the Barwon-Darling system could be enhanced through one or more of the following: <ul style="list-style-type: none"> <li>• Passive management of Commonwealth unregulated entitlements held within the Barwon-Darling system and its tributaries.</li> <li>• Using supplementary entitlements to protect a portion of a supplementary event flowing through a regulated tributary.</li> </ul>
		500 ML/day with a minimum peak of 1 500 ML/day Darling River at Bourke (Sept to April) for 50 days with the peak flow for 14 days	Average of 7–8 out of 10 years	Flow requirements not met in 2018–19. Met for 5 years out of the last 10 years	<b>High</b>	

	Access to snags and benches, some fish recruitment (Brewarrina to Tilpa)	6 000 ML/day Darling River at Louth (Aug to May) for 20 days	7 in 10 years	Flow requirements not met in 2018–19. Met for 4 years out of the last 10 years	High	
	Fish movement and increased access to habitat (snags, in channel benches and a few wetlands)	10 000 ML/day Darling River at Bourke for 14 days between August and May	6–8 in 10 years	Flow requirements meet 3 times in last 10 years	High	
<b>Overbank Flows</b>	Lateral connectivity with Talyawalka Anabranh	Above 30 000 ML/day at Wilcannia. Requires flows for over 60 days	Once in 10 years	Flow requirements partially met twice in last 10 years.	High	
				<b>Carryover potential</b>	There is no option for carryover allocations in unregulated systems like the Barwon-Darling. There is potential for carryover in the Barwon-Darling tributaries, refer to individual catchment portfolio management plans.	
				<b>Trade potential</b>	No specific commercial trade of water in the Barwon Darling has been identified for 2019-20, trade opportunities will be reviewed throughout the water year and as NSW Government trade arrangements evolve and conditions change..	

**Key - potential watering in 2019–20**

High priority for Commonwealth environmental watering (likely to receive water even under low water resource availability)
Secondary priority for Commonwealth environmental watering (watering to occur only if natural trigger is met, or under moderate – high water resource availability); or water demand likely to be met via other means
Low priority for Commonwealth environmental watering (under high – very high water resource availability)
Unable to provide Commonwealth water due to constraints

**Key - environmental demands**

critical demand i.e. urgent need for water in that particular year to manage risk of irretrievable loss or damage
high demand for water i.e. needed in that particular year
moderate demand for water i.e. water needed that particular year and/or next
low demand for water i.e. water generally not needed that particular year
very low demand for water i.e. water generally not needed that particular year or the following year

Note that demand is considered at a generalised scale; there may be specific requirements that are more or less urgent within the flow regime

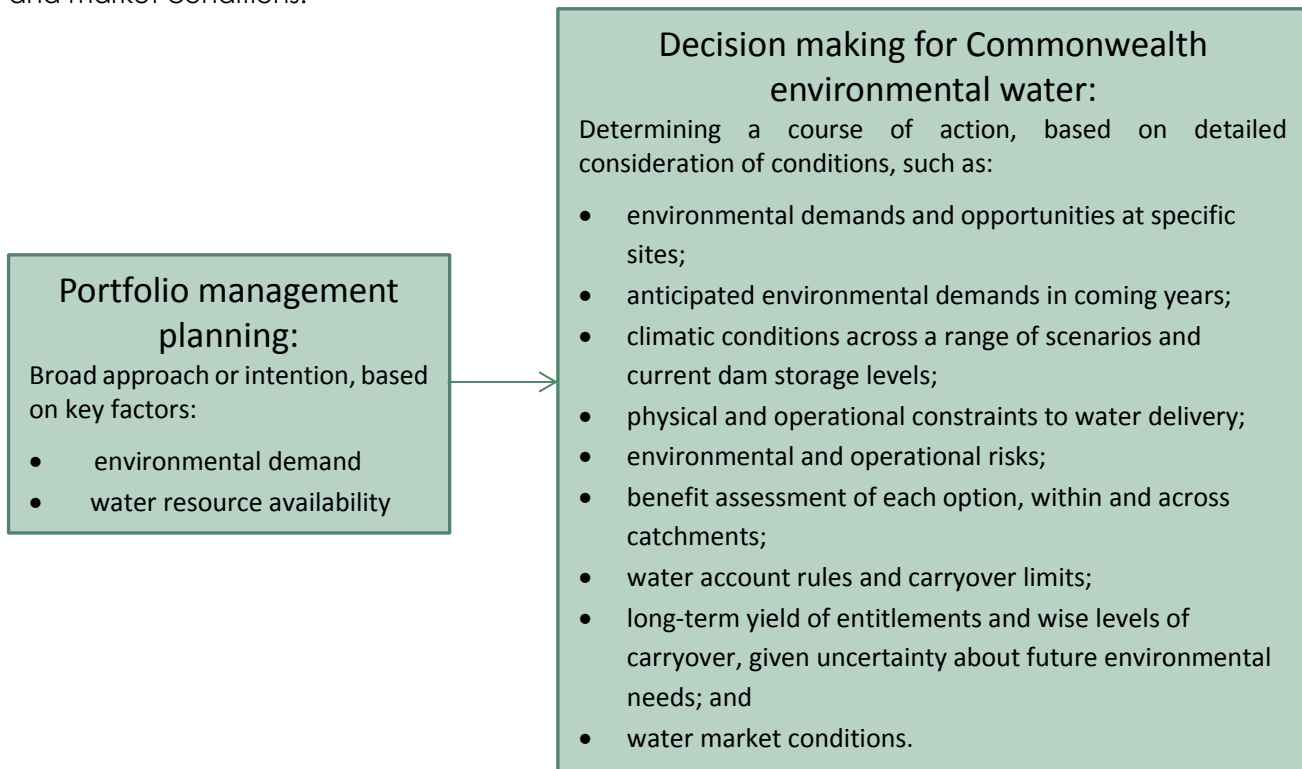


## 3. Next steps

### 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 Commonwealth Environmental Water 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. Monitoring

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 systems hydrograph, area of inundation and river levels. It can also include observations of environmental outcomes.

The Monitoring, Evaluation and Research (MER) Program (previously the Long Term Intervention Monitoring Project 2014–2019) has the junction of the Darling and Warrego Rivers as a focus area. It aims to understand the environmental response from Commonwealth environmental watering with respect to the targeted objectives by carrying out monitoring of site condition over many years.

Information on the monitoring activities is available

<https://www.environment.gov.au/water/cewo/catchment/northern-unregulated-rivers/monitoring>.

Monitoring information is also provided by state governments and other organisations throughout the Barwon-Darling system.

### 3.3. Further information

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

or the sites below:

- 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: <http://www.environment.gov.au/water/cewo/trade/trading-framework>

# Bibliography

Brandis, K and Bino, G (2016). *A review of the relationships between flow and waterbird ecology in the Condamine-Balonne and Barwon-Darling river system Systems*. Murray-Darling Basin Authority, Canberra. <https://www.mdba.gov.au/publications/independent-reports/flow-waterbird-ecology>

Brennan S, O'Brien M, Thoms M and Maher S (2002). *The Physical Character and Flow Criteria for Wetlands along the Barwon-Darling River*, CRC for Freshwater Ecology Technical Report to NSW Department of Land and Water Conservation.

Casanova, M (2015). *Review of Water Requirements for Key Floodplain Vegetation for the Northern Basin: Literature review and expert knowledge assessment*. Report prepared for the MDBA by Charophyte Services, Lake Bolac. [http://www.mdba.gov.au/publications/independent-reports/review-\\_water-requirements-key-floodplain-vegetation-northern-basin](http://www.mdba.gov.au/publications/independent-reports/review-_water-requirements-key-floodplain-vegetation-northern-basin)

Eco Logical Australia (2015). *Commonwealth Environmental Water Office Long Term Intervention Monitoring Project. Junction of the Warrego and Darling rivers Selected Area; Annual Evaluation Report – Year 1*. Report prepared for the Commonwealth Environmental Water Office, Department of the Environment, Commonwealth of Australia. <https://environment.gov.au/water/cewo/catchment/northern-unregulated-rivers/monitoring>

Eco Logical Australia (2016). *Vegetation of the Barwon-Darling and Condamine-Balonne floodplain systems of New South Wales: Mapping and survey of plant community types*. Prepared for the Murray-Darling Basin Authority. [http://www.mdba.gov.au/publications/independent-reports/vegetation-\\_barwon-darling-condamine-balonne-floodplain-systems-new](http://www.mdba.gov.au/publications/independent-reports/vegetation-_barwon-darling-condamine-balonne-floodplain-systems-new)

Eco Logical Australia (2017a). *Commonwealth Environmental Water Office Long Term Intervention Monitoring Project. Junction of the Warrego and Darling rivers selected area; 2015-16 Final Evaluation Report*. Report prepared for the Commonwealth Environmental Water Office, Department of the Environment and Energy, Commonwealth of Australia. <https://environment.gov.au/water/cewo/catchment/northern-unregulated-rivers/monitoring>

Eco Logical Australia (2017b). *Aquatic fauna use of the Warrego River Western Floodplain*. Report prepared for the Commonwealth Environmental Water Office, Department of the Environment and Energy, Commonwealth of Australia. <https://environment.gov.au/water/cewo/catchment/northern-unregulated-rivers/monitoring>

Eco Logical Australia (2018). *Commonwealth Environmental Water Office Long Term Intervention Monitoring Project. Junction of the Warrego and Darling rivers selected area; 2016-17 Final Evaluation Report*. Report prepared for the Commonwealth Environmental Water Office, Department of the Environment and Energy, Commonwealth of Australia. <https://environment.gov.au/water/cewo/catchment/northern-unregulated-rivers/monitoring>

Kingsford R, Bedward M and Porter J (1994). *Waterbirds and Wetlands in Northwestern New South Wales*. National Parks and Wildlife Service Occasional Paper No 19. NSW National Parks and Wildlife Service, Hurstville.

Kingsford, R.T, Thomas, R.F and Wong, P.S (1997). *Significant wetlands for waterbirds in the Murray-Darling Basin*. NSW National Parks and Wildlife Service, Hurstville.

R.T. Kingsford, G. Bino, J. Porter and K. Brandis (2013). *Waterbird communities in the Murray–Darling Basin (1983–2012)*. Murray–Darling Basin Authority (2014), Canberra. <http://www.mdba.gov.au/sites/default/files/pubs/Waterbird-communities-mdb-aug-2013.pdf>

Murray–Darling Basin Authority (MDBA) (2012). *Assessment of environmental water requirements for the proposed Basin Plan*: Murray–Darling Basin Authority, Canberra. [http://www.mdba.gov.au/publications/mdba-reports/assessing-environmental-\\_water-requirements-basins-rivers](http://www.mdba.gov.au/publications/mdba-reports/assessing-environmental-_water-requirements-basins-rivers)

MDBA (2014). *Basin-wide Environmental Watering Strategy 2014*. MDBA Publication No 20/14. Murray–Darling Basin Authority, Canberra .

MDBA (2016). *The Northern Basin Review: Understanding the economic, social and environmental outcomes from water recovery in the northern Basin*. Murray–Darling Basin Authority, Canberra. <https://www.mdba.gov.au/sites/default/files/pubs/Northern-basin-review-report-FINAL.pdf>.

MDBA (2017). *Ecological needs of low flows in the Barwon-Darling*. Murray–Darling Basin Authority, Canberra.

Nairn, L.C. and Kingsford R.T (2012). *Wetland distribution and land use in the Murray-Darling basin*. A report to the Australian Floodplain Association. Australian Wetlands, Rivers and Landscapes Centre, University of NSW, Sydney. [https://www.ecosystem.unsw.edu.au/content/wetland-distribution-and-land-use-\\_in-the-murray-darling-basin](https://www.ecosystem.unsw.edu.au/content/wetland-distribution-and-land-use-_in-the-murray-darling-basin)

NSW Department of Primary Industries (NSW DPI) (2007). *Endangered ecological communities in NSW–Lowland Darling River aquatic ecological community*. Primefact: 173. NSW Department of Primary Industries, Port Stephens, NSW.

NSW DPI (2012). *Water Sharing Plan for the Barwon-Darling Unregulated and Alluvial Water Sources Background document*. NSW Department of Primary Industries [http://www.water.nsw.gov.au/\\_data/assets/pdf\\_file/0006/549024/wsp\\_barwon\\_darling\\_background\\_document.pdf](http://www.water.nsw.gov.au/_data/assets/pdf_file/0006/549024/wsp_barwon_darling_background_document.pdf)

NSW DPI (2015a). *Fish and flows in the Northern Basin: responses of fish to changes in flows in the Northern Murray-Darling Basin*. Stage 2 Report prepared for the Murray-Darling Basin Authority by NSW DPI, Tamworth. [http://www.mdba.gov.au/publications/independent-reports/fish-flows-northern-basin-\\_responses-fish-changes-flows-northern](http://www.mdba.gov.au/publications/independent-reports/fish-flows-northern-basin-_responses-fish-changes-flows-northern)

NSW DPI (2015b). *Fish and Flows in the Northern Basin: responses of fish to changes in flow in the Northern Murray-Darling Basin – Reach Scale Report*. Stage 3 report prepared for the Murray-Darling Basin Authority by NSW DPI, Tamworth. [http://www.mdba.gov.au/publications/independent-reports/fish-\\_flows-northern-basin-responses-fish-changes-flows-northern](http://www.mdba.gov.au/publications/independent-reports/fish-_flows-northern-basin-responses-fish-changes-flows-northern)

NSW DPI (2018). *Draft Northern Connectivity Event Native fish condition and movement in the Barwon-Darling Progress Report*, Prepared for the Commonwealth Environmental Water Office, Canberra.

Queensland Department of Science, Information Technology and Innovation (Queensland DSITI) (2015). *Waterhole refuge mapping and persistence analysis in the Lower Balonne and Barwon-Darling rivers*. Department of Science, Information Technology and Innovation, Brisbane. [http://www.mdba.gov.au/publications/independent-reports/waterhole-refuge-mapping-persistence-analysis-\\_lower-balonne-barwon](http://www.mdba.gov.au/publications/independent-reports/waterhole-refuge-mapping-persistence-analysis-_lower-balonne-barwon)

Sheldon F, Bunn S, Hughes J, Arthington A, Balcombe S and Fellows C (2010). *Ecological roles and threats to aquatic refugia in arid landscapes: dryland river waterholes*. Marine and Freshwater Research, 61, 885–895.

Sheldon F (2017). *Characterising the ecological effects of changes in the 'low-flow hydrology' of the Barwon-Darling River*. Australian Rivers Institute, Griffith University. <https://environment.gov.au/water/cewo/publications/characterising-eco-effects-changes-barwon-darling-2017>

# 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 Barwon-Darling are described below.

## River Flows and Connectivity

Connectivity outcome
Baseflows are at least 60% of natural levels
10 percent overall increase inflows to the Barwon-Darling
10 to 20% increase of freshes and bank-full events

## Vegetation condition and extent

- Maintain current extent of river red gum, black box, coolibah forest and woodlands
- No decline in the condition of black box, river red gum and coolibah.

Catchment	Area of river red gum (ha)*	Area of black box (ha)*	Area of coolibah (ha)*	Non-woody water dependent vegetation
Barwon Darling	7 800#	11 700#	14 900#	Fringing/within the Barwon and Darling rivers

Area estimates (ha) are from: Cunningham SC, White M, Griffioen P, Newell G and MacNally R (2013). 'Mapping vegetation types across the Murray-Darling Basin', Murray-Darling Basin Authority, Canberra # considered to be an underestimate due to technical limitations in determining the lateral extent of floodplain inundation achieved through Basin Plan implementation

## Water birds

Environmental asset	Total abundance and diversity	In scope for Commonwealth environmental watering
Talyawalka system	*	No

## Native 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 Native fish species in the Barwon-Darling

Species	Specific outcomes	In-scope for Commonwealth water in the Barwon-Darling
Silver perch ( <i>Galaxias rostratus</i> )	Expand the core range of at least 2 existing populations (Barwon–Darling is a candidate site)	Limited scope - mainly achieved through unregulated flow events breaking cease to flow periods and improving access to fish habitat.
Southern purple-spotted gudgeon ( <i>Mogurnda adspersa</i> )	Establish or improve the core range of 2–5 additional populations – (the Barwon– Darling is a priority sites).	
Murray cod ( <i>Maccullochella peelii</i> )	A 10–15 per cent increase of mature fish in key populations	
Golden perch ( <i>Macquaria ambigua</i> )	A 10–15 per cent increase of mature fish in key populations	

### Important environmental assets for native fish in the Barwon-Darling

Key site/ environmental asset	Key movement corridor	High biodiversity	Hydrodynamic diversity	Threatened species	Dry period refuge
Barwon-Darling River (Mungindi to Menindee)	*	*	*	*	*
Talyawalka	*		*		*

# Attachment B – Operational details for watering

## Operational considerations in the Barwon-Darling catchment

The Barwon-Darling is an unregulated catchment with inflows from the intersecting streams and northern catchments including the Border Rivers, Gwydir, Namoi and Macquarie. It is a complex catchment in terms of providing environmental water as the inflows to the catchment are dependent on the use of water in the tributaries and unregulated flows. The length of the catchment, over 2 000 km, means there will always be a large amount of “losses” to the river as water travels through the system. This is accounted for in planning for the use of environmental water.

Environmental water can be legally taken by other licence holders as there are no return flow or protection of environmental water in the catchment. In 2018 and 2019, the NSW Government agreed to the protection of environmental water from the Border Rivers and Gwydir in order to provide water to key parts of the system. Any future delivery of environmental water will consider the available options to protect this water from legal take. The Barwon-Darling is an area of policy focus and review by the NSW and Commonwealth governments. The provision of environmental water will be adapted to any relevant changes in policy.

In hot dry times the river can dry down to a series of pools. These pools provide important refuge for fish and other aquatic species. Providing water when the system is very dry can potentially cause water quality issues if pools are turned over and the water is traveling long distances over hot dry river beds. This risk is assessed when considering providing environmental water.

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

Under certain levels of water resource availability, active 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 3 identifies the range of potential watering actions in Barwon-Darling, and the levels of water resource availability that relate to these actions.

**Table 3:** Summary of potential watering actions for the Barwon-Darling.

Broad Asset	Indicative demand	Applicable level(s) of resource availability				
		Very Low	Low	Moderate	High	Very High
1. Dry spell breaking small pulse along the Barwon-Darling to refresh refuge pools	Critical	Dependent on resource availability in the tributaries. Refer to individual catchment portfolio management plans. Watering action could be achieved with unregulated flows augmented through one or more of the following:				
2. Fresh to inundate snags and benches, enable some fish movement and recruitment along the Barwon-Darling	Low	<ul style="list-style-type: none"> <li>Enhancing unregulated flows into and along the Barwon-Darling through the passive management of Commonwealth unregulated entitlements.</li> <li>Using supplementary entitlements to protect a portion of a supplementary event flowing through a regulated tributary.</li> </ul>				

## Potential watering actions – standard operating arrangements

Table 2 identifies the range of potential watering actions in Barwon-Darling in the Murray–Darling Basin that give effect to the long-term demands and flow regime identified as being in scope for the contribution of Commonwealth environmental water in any given year. The standard considerations associated with these actions are set out below.

**Watering Action [1]:** Dry spell breaking small pulse along the Barwon-Darling to refresh refuge pools.

*Standard operational considerations:* Risks to water quality in delivering and not delivering water. Protection of water from legal take. There will be very high losses along the river, consider providing water from multiple catchments to provide water at multiple places along the river. Consider providing water in conjunction with a natural flow to minimise losses and increase the distance covered by the water. Opportunity cost and losses to address needs in tributary systems is an important part of the decision making.

*Typical extent:* Potentially sections of the Barwon-Darling downstream of the Border Rivers, Gwydir, Namoi and Macquarie catchments subject to water availability and environmental demand.

*Approvals:* If possible have the environmental water protected from legal take.

**Watering Action [2]:** Fresh to inundate snags and benches, enable some fish movement and recruitment along the Barwon-Darling.

*Standard operational considerations:* Risks to water quality in delivering and not delivering water. Protection of water from legal take. There will be very high losses along the river, consider providing water from multiple catchments to provide water at multiple places along the river. Consider providing water in conjunction with a natural flow to minimise losses and increase the distance covered by the water and the habitat available for fish.

*Typical extent:* Potentially sections of the Barwon-Darling downstream of the Border Rivers, Gwydir, Namoi and Macquarie catchments subject to water availability and environmental demand.

*Approvals:* If possible have the environmental water protected from legal take.



# Attachment C – Long-term water availability

## Commonwealth environmental water holdings

The Commonwealth holds unregulated river access entitlements in the Barwon-Darling at Collarenebri and Toorale.

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 Barwon-Darling include a small entitlement recovered by the NSW Government in the Barwon-Darling (1 448 ML). This small entitlement can be used to further a number of environmental outcomes as well as Aboriginal, cultural and heritage outcomes.

Regulated and unregulated water held by the Commonwealth and NSW in the intersecting streams and northern NSW tributaries (Border Rivers, Gwydir, Namoi and Macquarie valleys) also provide flows into the Barwon-Darling.

## 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').

- Barwon-Darling – A, B and C class access in the Barwon-Darling and supplementary access in northern NSW tributaries may be restricted in response to prolonged dry conditions in order to maintain flows in the Barwon-Darling for algal suppression, fish passage and to meet critical town water supply needs. Application of these provisions is at the discretion of the NSW Water Minister.
- Planned environmental in the intersecting streams and northern NSW tributaries will also provide flows into the Barwon-Darling.