



Australian Government

Commonwealth Environmental Water Office

Commonwealth Environmental Water Office Water Management Plan 2021–22

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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.

Acknowledgement of Traditional Owners

The Commonwealth Environmental Water Office (CEWO) proudly acknowledges the First Nations communities of the Murray-Darling Basin and pays respect to their Elders past and present.

We acknowledge First Nations people as the Traditional Owners and custodians of the land and waters of the Basin. We recognise the intrinsic connection of First Nations peoples to Country, and we value their enduring cultural, social, environmental, spiritual, and economic connection to the rivers, wetlands, and floodplains of the Basin.

Over millennia, First Nations peoples have shaped, managed, and cared for the land and waterways that sustain them. The objectives of the CEWO correspond profoundly with the cultural values and obligations Traditional Owners have to Country and community. We are continuing to build relationships with First Nations communities, to learn from and identify ways to support cultural values alongside environmental outcomes with water for the environment.

We value the ongoing contribution that First Nations peoples make to the planning and delivery of water for the environment. We acknowledge this contribution is made largely through frameworks and processes that have not been determined, or endorsed, by First Nations people. More can be done to increase First Nations people's input and enable progress towards self-determination within and beyond the environmental watering program. We will continue to support and enable this where we can.

There are more than 40 First Nations in the Basin with many distinct cultures and practices. In each chapter of this Water Management Plan, we have endeavoured, using the best available information, to name the Traditional Owner groups and their Nations that live in the valleys across the Basin and who continue to maintain and enhance longstanding culture and traditions.

We embrace the spirit of reconciliation, working towards equity and an equal voice for First Nations people.

Foreword

It is a pleasure to introduce the Commonwealth Environmental Water Management Plan for 2021–22.

Planning for the use of Commonwealth environmental water is a collaborative effort that draws on local knowledge, the latest science and lessons learnt from previous actions. I am grateful to the many people who have contributed to our plans.

In particular, I welcome the input we have received from First Nations across the Basin, such as the *Statement on environmental water use in 2021–22* made by participants at the Southern Basin First Nations' Environmental Watering Forum 2021 ([see Chapter 2](#)). I look forward to continuing to build relationships with First Nations' organisations and communities, to learn from and identify ways to support cultural values alongside environmental outcomes.

Rainfall and inflows across much of the Murray-Darling Basin over the last 12 months have provided a welcome relief for both communities and the environment following three years of record-breaking drought. I am pleased to see the rivers of the north and south of the Basin connected, with the Darling River once again flowing from its headwaters in Queensland all the way to the River Murray.

Flows over the past year have seen the internationally significant Narran Lakes and Macquarie Marshes showing signs of partial recovery, while the lower Murrumbidgee wetlands supported large-scale waterbird breeding as well as the highest numbers of Southern bell frogs seen in 20 years. Native fish species spawned in high numbers in multiple valleys, including the Macquarie River (Murray cod), Lachlan, Goulburn (both Golden perch) and the Lower Murray (Silver perch). The Southern pygmy perch population in the Lower Lakes quadrupled in numbers, compared to the previous year.

We start the 2021–22 water year with the highest volume of Commonwealth environmental water carried over to date (as compared to last year, which was the lowest in a decade): 538 gigalitres in the southern-connected Basin, 36 gigalitres in the Lachlan and 150 gigalitres in the northern Basin. This water is deliberately set aside so that we can continue to provide water to priority wetlands across the Basin, whether that be building on the benefits from a wet winter, through to providing drought refuge when the next dry period begins.

Many of the floodplain wetlands in the southern Basin have not received water for a number of years. 'Thirsty' sites include the mid-Murrumbidgee wetlands, the NSW Central Murray Forests, Hattah-Kulkyne Lakes, and the Chowilla, Pike and Katarapko floodplains in South Australia. Natural high flows are already providing water to some of these sites, with opportunities to consolidate on these outcomes with water for the environment in scope as flows recede. With more water in the Menindee Lakes, water for the environment will be used to benefit native fish in the lower Darling/Baaka and provide the first flow down the Great Darling Anabranch since 2017.

In the northern Basin, the severity of the recent drought means the recovery of some river ecosystems will take time and require further large flows. Water for the environment will continue to be used to promote the recovery of native fish populations and the Macquarie

Marshes, Gwydir Wetlands and Narran Lakes. These environmental outcomes will be aided by the efforts of the NSW and Queensland governments to protect environmental flows into and along the Darling River.

If wet conditions continue across the Basin, this will present both risks and opportunities. We will be responsive to conditions and avoid delivering water where this will exacerbate third-party impacts from flooding. Where it is feasible and within allowable limits, we will look to capitalise on opportunities to extend the duration of flows into important wetlands and rivers to benefit native plants and support waterbird breeding. If flooding results in low-oxygen blackwater events, providing refuge flows (e.g. high oxygen water) is also in scope.

In 2021–22, we will continue working closely with First Nations, local communities and landholders, irrigation corporations, scientists, a range of delivery partners, other water managers and river operators. Individuals and groups are encouraged to get in touch with their nearest Local Engagement Officer to provide suggestions for how we can best use water for the environment.

A handwritten signature in black ink, appearing to read 'H. Taylor', with a long, sweeping flourish extending to the right.

Hilton Taylor
Interim Commonwealth Environmental Water Holder

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1 Introduction

1.1 Background

1.1.1 Water for the Environment

The rivers of the Murray–Darling Basin have experienced significant changes over the past 100 years. As agriculture, industries and communities have grown over time, water use has increased dramatically. While benefiting our food and fibre production, this has seen as much as 50% of natural flows removed from the river in some locations. The changes in river flows have seen the health of our environment decline over many decades, which has had negative impacts on native fish, waterbirds, forests, woodlands and wetlands.

‘Water for the environment’ is water that is managed with the aim of restoring the health of the Basin’s rivers for the benefit of all users. Water is allocated to federal and state environmental water holders across the Basin, who make decisions about when, where and how much water is released for the environment and deliver flows to where nature needs it.

1.1.2 Commonwealth Environmental Water Holder

The Commonwealth Environmental Water Holder (CEWH) is a statutory position established by the *Water Act 2007* (the Water Act) to manage the Commonwealth environmental water holdings.

Mr Hilton Taylor is the interim CEWH. He is supported by staff of the Commonwealth Environmental Water Office (CEWO) within the Department of Agriculture, Water and the Environment. The CEWO employs 8 local engagement officers who live and work in regional centres across the Murray–Darling Basin.

The CEWH is governed by the Water Act and the [Basin Plan 2012](#) (Basin Plan) and must comply with the specific requirements and standards of Commonwealth and state legal, policy and environmental legislation and frameworks.

The water managed by the CEWH are a mix of entitlement types held across 24 catchments. The rules governing the entitlements vary across states and across valleys, but they are subject to the same fees, allocations, carryover and other rules as equivalent entitlements held by other water users.

1.1.3 Options for managing water for the environment

Commonwealth water for the environment is managed efficiently and effectively, focused on maximising beneficial outcomes. The options for managing this water include:

- use – delivering water to a river or floodplain to meet an identified environmental demand
- carryover – leaving water in storage and carrying it over for use in the next water year
- trade – trading water, which includes:
 - transferring water between connected catchments
 - buying and selling water allocations
 - using the proceeds from selling water to invest in activities that improve the outcomes from the use of water for the environment.

Each year the CEWO considers and plans for how it will manage Commonwealth water for the environment. This document explains the process by which we plan and manage this water and captures the key information that will inform the CEWH's decisions in 2021–22.

1.1.4 Collaboration across communities

Commonwealth environmental water cannot be delivered without the coordinated effort of many stakeholders. The planning, delivery and monitoring of Commonwealth environmental water is undertaken in partnership with a range of organisations and communities across the Basin.

This plan reflects the collective effort of a multitude of government agencies, First Nations, scientists, local environmental watering advisory groups, wetland managers, landholders and community organisations that have provided valuable input.

Local information and experience are critical to being able to effectively manage and deliver Commonwealth environmental water. We are very grateful for the expertise, advice, feedback and support provided by our delivery partners, environmental water holders and members of regional advisory groups who invite us to participate in their processes, and the many landowners who work with us to plan, manage and monitor the use of environmental water in the Basin.

The CEWH has entered into formal partnership agreements with the Victorian Environmental Water Holder, the New South Wales Department of Planning, Industry and Environment, the South Australian Department for Environment and Water, the South Australia Murraylands and Riverland Landscape Board, and the Renmark Irrigation Trust. A formal partnership with the Nari Nari Tribal Council is also being finalised. These agreements outline the way in which the CEWH and staff of the CEWO will work with partners to coordinate the management of environmental water. The CEWH also continues to work collaboratively with other partners where formal agreements are not in place.

1.1.5 Providing feedback

The CEWO welcomes information from the community on how environmental water can best be managed. If you have any comments or suggestions, call 1800 218 478 or email ewater@awe.gov.au.

Learn more about [Commonwealth water for the environment](#).

1.2 Planning Commonwealth environmental water use

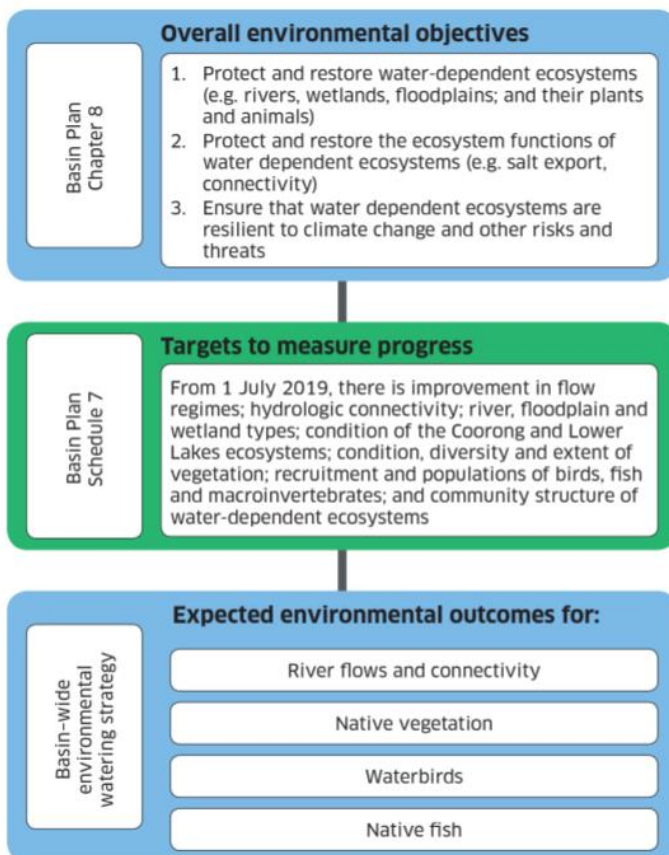
1.2.1 What we are trying to achieve for the environment

Commonwealth environmental water must be managed to protect or restore the rivers, wetlands and floodplains (and the native animals and plants they support) of the Murray–Darling Basin, to give effect to relevant international agreements, such as the Ramsar and Bonn conventions, and migratory bird agreements with Japan, China and Republic of Korea (s105(3) of the Water Act). The water must also be managed in accordance with the Basin Plan’s environmental watering plan (s105(4a)).

The environmental watering plan ([Basin Plan](#), chapter 8) establishes the objectives, processes and principles that guide the management of water for the environment. Schedule 7 of the Basin Plan sets broad targets to measure progress towards meeting the objectives (Figure 1).

The [Basin-wide Environmental Watering Strategy \(2019\)](#) provides the next level of detail on the environmental objectives and targets. The CEWH must act consistently with this strategy. It describes the environmental outcomes expected over the next decade from implementing the Basin Plan and associated water reforms. These outcomes focus on 4 components (Figure 1): river flows and connectivity; native vegetation; waterbirds; and native fish.

Figure 1 Hierarchy of environmental objectives, targets and expected outcomes for the Murray–Darling Basin



Source: Basin-wide Environmental Watering Strategy (MDBA 2019)

At a valley scale, long-term watering plans are prepared by Basin state governments. These plans identify the key rivers and floodplains in each valley, and the objectives, targets and environmental watering requirements for each river or floodplain. They provide the key information on the long-term environmental water requirements within the valley. For information about long-term watering plans, see:

- [Victorian long-term watering plans](#)
- [South Australian long-term watering plans](#)
- [Queensland long-term watering plans](#)
- [New South Wales long-term watering plans](#)

Prior to the start of each water year, annual environmental watering priorities are prepared by Basin state governments (for each valley) and by the MDBA (for the Basin as a whole). These articulate the environmental water needs (or demands) for the coming year.

The Basin annual environmental watering priorities establish both the context and key environmental water needs at a basin scale through describing the priority environmental values and the desired trend from a whole of basin perspective. For 2021–22 Basin priorities, see [section 2.2](#).

1.2.2 First Nations environmental and cultural outcomes

Under the Basin Plan, environmental water holders must have regard to Indigenous values when undertaking environmental watering. One way this is occurring is through incorporating First Nations environmental objectives into planning processes. This occurs at the local level, with First Nations representatives typically engaged by state government agencies in the development of watering proposals and plans for specific wetlands, or through participation in valley-based environmental water advisory groups.

This site and valley-based planning is being complemented by increasing involvement in system-scale planning for environmental water. Representatives from the Murray Lower Darling Rivers Indigenous Nations (MLDRIN) participate in the Southern Connected Basin Environmental Watering Committee (SCBEWC), the main coordination forum for the use of water for the environment in the southern Basin. Workshops to inform water for the environment use in the Barwon-Darling (with Northern Basin Aboriginal Nation representatives) and the southern Basin (see [section 2.1](#)) were also held as part of the planning process.

There is variation between the level of First Nations input and consistency of engagement across the Basin. This reflects CEWO's journey to enhance how we work with First Nations people in the management of environmental water. We still have work to do and are continuously looking for opportunities to improve.

1.2.3 Providing water to meet environmental demands

Commonwealth environmental water planning is primarily driven by supply (how much water is available) and how this can be used to meet identified demands (what are the environment's needs).

The scope of watering actions and the environmental outcomes that can be achieved will be limited by availability of water (or 'supply') to achieve these outcomes. The Commonwealth

considers current water availability and estimates its likely future supply of environmental water based on factors such as rainfall, flow conditions and forecasts of water allocations. Other important considerations include the availability of other sources of water and other likely demands in the system that can either assist or hinder the ability to deliver water to meet environmental demands.

The Commonwealth Environmental Water Portfolio Management Framework has been developed to support decisions on the best mix of water delivery, carryover and trade under different levels of supply and demand. By considering both supply and demand, the framework identifies 4 different purposes for managing the portfolio (Figure 2) and the outcomes that are in scope under each purpose.

In planning for the new water year, we need to be prepared for all scenarios – from very dry through to very wet, providing flexibility and ability to adapt quickly to changing conditions.

Figure 2 Four purposes for managing environmental water based on demand and water availability

Overall environmental water resource availability	Demand for environmental water							
	Very High – water predominantly needed urgently	High – water predominantly needed this year	Moderate – water predominantly needed this year and/or next	Low – water predominantly not needed this year	Very low – water predominantly not needed this year and next			
Very low								
Low						<i>Purpose: avoid damage to the environment</i>	<i>Purpose: Protect and ensure capacity for recovery</i>	<i>Purpose: Maintain ecological health and resilience</i>
Moderate								
High								
Very high						<i>Purpose: Improve ecological health and resilience</i>		

Our water management planning occurs at both the valley and Basin-scale. Valley annual water management plans (see [chapter 3](#) onward), include a summary of the objectives and long-term flow regime required to meet environmental demands. A multi-year approach is then taken to identifying water management intentions, considering the:

- past watering history and its impact on environmental demands and asset condition
- likely effects of planned actions on environmental demands in future years.

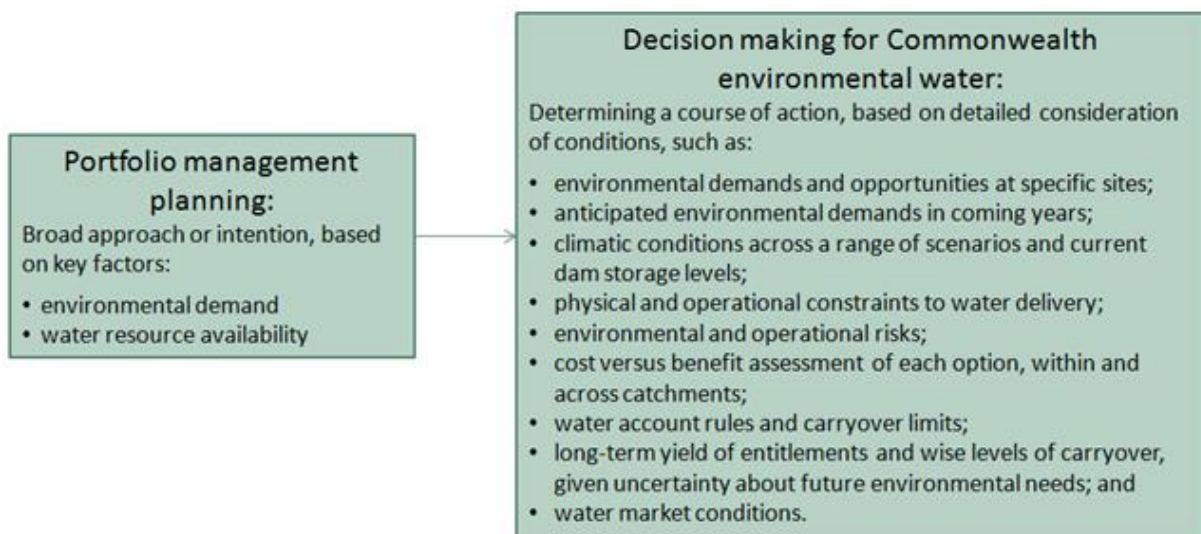
Once initial valley planning has been undertaken, this is then fed into a Basin-wide planning process. This process considers:

- key demands across the Basin
- opportunities to use allocation trade (purchase, sale or transfer) to rebalance the portfolio to better match differing demands across catchments
- opportunities to align environmental outcomes from watering, such as multi-site watering events in hydrologically connected catchments.

1.3 From planning to decision-making

Once planning is completed, decisions on the use of Commonwealth environmental water need to be made. Many local factors influence these decisions on water delivery, carryover and trade (Figure 3).

Figure 3 Factors informing planning and decision-making for Commonwealth environmental water



1.3.1 Decisions to use water

Towards the beginning of the new water year, the focus shifts from planning to implementation. Greater consideration is given to current and forecast catchment conditions and water availability to determine whether the watering intentions identified during the planning process can feasibly be implemented.

Once an action has been scoped in more detail, an assessment is undertaken against these criteria:

- ecological value of the river, floodplain or wetland
- expected outcomes from providing water
- potential risks
- long-term sustainability and management of the site
- cost effectiveness and feasibility.

When a decision is made by the CEWH to proceed with an action, arrangements for implementation are made with delivery partners.

Learn more about our [Framework for Determining Commonwealth Environmental Water Use](#).

1.3.2 Carryover

Carryover rules are set by state governments and vary markedly for different entitlements and in different water plan areas across the Basin. The carryover limits, account limits and use limits apply to all entitlement holders including the Commonwealth.

When making carryover decisions, under the rules set by Basin states, considerations include:

- having sufficient water in accounts for environmental water use early in a water year (e.g. winter and spring flows)
- the risk of carryover of water in accounts that may be subject to trade or use restrictions through the following water year
- the cost-effectiveness with regard to the cost of water delivery and transfer fees against the potential market cost of water being reallocated under state rules
- minimising the risk of water being reallocated under state rules by carrying over water in accounts with better carryover provisions
- during droughts, the minimum amount of water that can be used to sustain environmental assets whilst maintaining some carryover for future years.

1.3.3 Trade

The primary purpose behind any selling or purchase of Commonwealth environmental water is to improve environmental outcomes. The trade of Commonwealth environmental water can only occur on the open water market when the volume held in an account is excess to environmental requirements and there is no risk of harm to the ecosystems if environmental water is not provided in the near term. Under the law, water set aside for the environment cannot be given away or borrowed.

Decisions to sell water allocations are made by the CEWH consistent with Water Act (s106). Broadly, Commonwealth environmental water can be sold if one of 2 conditions are met:

- 1) If allocations are not required during the water year and either:
 - a) cannot be carried over, or
 - b) retaining the water is likely to result in forgoing future allocations due to account limits.
- 2) If the proceeds will be used to purchase water and/or invest in environmental activities, where the CEWH reasonably believes this will provide greater capacity to achieve environmental objectives.

The decision to trade water is made after considering:

- the current and forecast volume of water available in Commonwealth accounts
- the balance of available environmental water (supply) to meet identified environmental demands
- (where appropriate) the prudent level of carryover.

Decisions to trade also include undertaking a market assessment, which informs the mechanisms available to trade water, the volume of water to be pursued or made available from the holdings, the price at which the CEWH is willing to enter the market and (in the case of purchases) the available budget.

For information about current trading actions and trade intentions, see:

- [Trade of Commonwealth environmental water.](#)
- [Trade rules and legislation.](#)

1.4 Monitoring, Evaluation, Reporting and Improvement

Monitoring, evaluation and reporting are essential to improving the planning and use of water for the environment. Each year the evaluation of monitoring results and past delivery events expands our knowledge of managing water for the environment. This knowledge is then used to inform next year's planning enabling adaptation and trialling of new ways to achieve improved outcomes.

The CEWO Monitoring, Evaluation and Research Program ([Flow-MER](#)) is a core component of this adaptive management process. The Flow-MER program has the following components:

- Basin scale – Basin evaluation, research and engagement
- 7 selected areas – On-ground monitoring, evaluation, research and engagement in these areas
 - Junction of the Warrego and Darling rivers
 - Gwydir River system
 - Lachlan River system
 - Murrumbidgee River system
 - Edward/Kolety-Wakool River system
 - Goulburn River
 - Lower Murray River

The CEWO's program is complemented by work of state governments, including monitoring through [The Living Murray program](#).

2 Planning for 2021–22

2.1 First Nations statement on environmental water use in the southern Basin 2021–22

In April 2021, a forum on Latji Latji Country in Mildura brought together Traditional Owner representatives from many parts of the southern Murray-Darling Basin to share information about the health of Country and discuss preferred outcomes from the management of water for the environment. The forum was funded by the CEWO and organised with the Murray-Darling Basin Authority's The Living Murray Program and the Murray Lower Darling Rivers Indigenous Nations. This forum aimed to share information about the health of Country and discuss preferred outcomes from the management of water for the environment.

The *Statement on environmental water use in 2021–22* made by participants at the Southern Basin First Nations' Environmental Watering Forum 2021 is reproduced on the following pages. This statement is being used to guide environmental water planning for the 2021–22 water year, including through the Southern Connected Basin Environmental Watering Committee.

Box 1 Southern Basin First Nations' Environmental Watering Forum 2021

Statement on environmental water use in 2021–22

In April 2021, Traditional Owners from many parts of the Southern Murray Darling Basin came together on Latji Latji Country, in Mildura to share information about the health of Country and discuss preferred outcomes from the management of environmental water.

We want water holders, managers and decision makers to hear these key messages:

Respect water, Country and lore

First Nations are willing to share and collaborate with Government agencies to improve river health. But the inherent risks of the settler – colonial water management systems, that have been imposed on our Country, must be addressed. The current water regime in the Murray-Darling Basin ignores the principles and knowledges that underpin our practices of caring for Country.

Water can never be 'owned'. Water and rivers have life and spirit which cannot be bought and sold. All 'ownership' of water in this Country is based on the dispossession of First Nations and imposition of colonial legal frameworks. We have never ceded our inherent rights as guardians and caretakers of rivers and waters. First Nations lore provides a holistic, interconnected management system, where all elements contribute to the good of the whole.

We want to collaborate, but we do not accept or endorse the legal and management frameworks that have been imposed on our rivers. We ask our partners to respect our water spirits, knowledge and lore.

Address our concerns

We have major concerns about the legal, policy and governance setting that dictate how our rivers flow and how we get a voice. These include:

- Overallocation of water and water allocation decisions which do not leave enough in our rivers to sustain their survival or meet our cultural needs
- Over Reliance on damaging infrastructure to regulate and replicate complex natural systems, with little real benefit to our Country
- Short term decision making that doesn't properly account for a changing climate
- Limited commitment to and resourcing for First Nations participation and empowerment
- Decision making that marginalises First Nations' rights and interests
- Commodification and trading of water that disregards the limitations of natural systems
- Water theft and illegal extraction
- Inequitable access to water and poor distribution of the social and economic benefits it can bring.

The settler-colonial water framework has generated perverse outcomes which we contend with on a daily basis. The mindset of water management needs to change.

Recognise that our rivers are at risk

We see powerful examples where environmental water is helping to heal Country, but the overall policy and legal settings mean our waterways and cultural values are at risk.

Our biodiversity is suffering. We are struggling to save remnants of our ecologically and culturally significant landscapes. We are being asked to prioritise some places, while we watch others decline or die. We are grappling with this reality.

Infrastructure, including dams, weirs, regulators and pumps, is segmenting our waterways and damaging our Country with little real benefit. There is too much regulation of the floodplain and huge investment in infrastructure without proper engagement with our people.

Fluctuating river levels and unseasonably high flows, driven by consumptive demand, are degrading our waterways and cultural values. Land Use is driving unsustainable water demands and limited channel capacity means we can't get water to where we need it.

Water holes are silting up. Bank erosion and slumping is causing huge impacts on cultural heritage.

Poor water quality, algal blooms and salinity are being compounded by the disruption of natural systems that flush and clean our rivers and wetlands. Waterways, creeks and wetlands are being left to dry out, exposing cultural sites and degrading cultural values.

The health of significant trees and medicinal plants is declining because of lack of water, impacting on our cultural sustainability, health and wellbeing. Culturally significant birds and animal species are not seen where they used to be. There are not enough native fish in the system.

Delivering water to our wetlands and billabongs through artificial systems can mean delivering the wrong water for Country. Legal and infrastructure constraints restrict us from being able to direct water to where we need it.

Help us protect and grow the things that are important to us

We are passionate about working together to protect and sustain our waterways.

We need the agency and life force of the river to be respected. We want to see more water going out onto Country and filling all our creeks and billabongs. We want water holders and managers to work with us, looking at the whole system and how to restore it to what it was, with adequate flows and proper timing. We want overbank flows to support total system health.

We want increased recovery of water for the environment, not decreased.

We want to see the Murray Mouth open and salt being flushed from the system.

We want the lakes, billabongs, creeks, wetlands and rivers that are important to us to get the water they need to thrive. We want to see dry and degraded wetlands restored to life with culturally informed watering to protect our cultural heritage values.

We want regular re-connecting flows from floodplains and billabongs, allowing the life in our natural nurseries to restock and replenish the river. We need adequate, sustained flows through our rivers to keep them connected and mitigate variation from irrigation demand.

We want healthy water to flow out of our Country to all mobs downstream. We want the nutrition and healthy water from upstream to replenish Country. We want to build back biodiversity and Traditional Owner management to improve water quality. We want to collaborate with all mobs to ensure a healthy system, renewing cultural connections between Nations.

We need to exercise self-determination over the development and operation of infrastructure on Country. We want to be empowered to use our natural and cultural infrastructure, billabongs, fish traps and breeding structures, to slow down flows and recharge the landscape.

We need adequate healthy water for improved tree health and thriving floodplain forests with red gum, black box and yellow box.

We need flows to replenish the floodplain and support our important cultural plants like old man weed, grasses and sedges, nardoo, cumbungie and milfoil.

We want to see water birds, ducks, swans and brolgas, returning and thriving in our wetlands.

We need connectivity and good water quality to support native fish including black bream, congolli, crayfish, mussels, small bodies fish, shrimp, shield shrimp, yabbies, yellowbelly, Murray cod, catfish, black fish, Murray hardyhead and trout cod. We want turtles, platypus, frogs and all the other animals that rely on water to be able to return to Country.

We want co-management of all environmental water. We want to be empowered to make the decisions about how environmental water is used. Prioritisation and water planning should be

driven from the ground up, by First Nations. Give us control and we will show you how to heal Country and, in doing so, we will maintain intergenerational transfer of knowledge.

We want water managers to listen deeply to what Traditional Owners and Elders have to say and to help us access your science to back our objectives (not the other way round).

We need policy changes, transparency and reviews of the existing entitlement system. We need to review and amend the Basin Plan to reflect our knowledge, science and human rights. We need Traditional Owners involved in the highest level of all Government agencies and we need our own agencies and statutory bodies.

The CEWO is committed to working with First Nations across the Basin in how we plan, deliver and monitor water for the environment.

The health of the Murray-Darling Basin benefits from meaningful partnerships with First Nations, and their involvement in water planning, coordination and delivery from the local to the basin scale is a priority for environmental water holders.

To complement the system-scale planning, First Nations objectives and outcomes have also been identified for particular sites or valley-scale (see [Chapter 3](#) onwards). There is variation between the level of First Nations input and consistency of engagement across the Basin. This reflects CEWO's journey to enhance how we work with First Nations people in the management of environmental water. We still have work to do and are continuously looking for opportunities to improve. This includes pilot projects in the Gwydir valley (see [Chapter 6](#)), and follow-up gatherings to the Barwon-Darling and southern Basin forums.

2.2 Basin annual environmental watering priorities

Prior to the start of each new water year, the MDBA must publish Basin annual environmental watering priorities (Table 1). They are developed having regard to the annual environmental watering priorities developed by Basin States for each catchment. All environmental watering, including by the CEWH, must be undertaken having regard to these priorities.

Commonwealth environmental watering actions will seek to contribute to the Basin annual environmental watering priorities, subject to conditions as they unfold throughout the year.

Table 1 Basin annual environmental watering priorities, 2021–22

Category	Rolling, multi-year priorities	2021–22 annual guidance
River flows and connectivity	Support longitudinal connectivity along the river system.	North
	Support lateral connectivity to inundate key wetlands.	Support cross-border system connectivity opportunities.
	Support inundation of mid and outer floodplains.	Support connectivity between the northern and southern Basin via Lower Darling.
	Support freshwater connectivity through and between the Lower Lakes, Coorong and Murray Mouth.	Provide baseflow to areas with extended cease-to-flow conditions.
	Maintain an open Murray Mouth to support exchange with the adjacent	Enhance variability of freshes (i.e., small, medium and large) to meet varied ecological requirements in river reaches.
		Support water quality in Menindee Lakes.

Category	Rolling, multi-year priorities	2021–22 annual guidance
	ocean and to prevent overfilling of the Coorong.	<p>South</p> <p>Re-instate small to medium in-channel flows and overbank flows where practical – particularly at key sites.</p> <p>Enable appropriate salinity and water levels in the Coorong lagoons at the appropriate season to support seed set of <i>Ruppia</i>.</p> <p>Where practical, water high conservation areas that have not received water since the 2016 flood.</p>
Native vegetation	<p>Provide opportunities for growth of non-woody riparian vegetation that fringes or occurs within river corridors and key wetlands.</p> <p>Maintain extent, improve condition and promote recruitment of forests and woodlands.</p> <p>Maintain extent, improve condition and promote recruitment of lignum shrublands.</p> <p>Expand extent and improve condition of Moira grass in Barmah-Millewa Forest.</p> <p>Maintain riparian vegetation in Lower Lakes with seasonally appropriate water levels.</p> <p>Expand extent and improve resilience of <i>Ruppia</i> in the Coorong.</p>	<p>North</p> <p>Support riparian vegetation and Lignum in key wetlands of the Northern Basin.</p> <p>Extend inundation duration on key sites at Macquarie Marshes.</p> <p>Support inundation of inner western floodplain.</p> <p>Support inundation of Lower Balonne floodplain.</p> <p>South</p> <p>Increase inundation higher on the floodplain to support parched and stressed forests, woodlands.</p> <p>Extend inundation of wetlands and floodplains to improve soil moisture and regenerate understory vegetation; where practical provide multiple watering events to further extend duration of inundation.</p> <p>Enhance recovery of <i>Ruppia</i> extent, turion production and seed bank through improved, seasonally appropriate, water levels and salinities.</p> <p>Where practical, promote wetting of bank substrate and snags to promote biofilm growth.</p>
Waterbirds	<p>Maintain diversity and improve abundance of the Basin’s waterbird populations.</p> <p>Maintain abundance of key shorebird species in the Lower Lakes and Coorong.</p>	<p>North</p> <p>Provide water to support colonial nesting waterbird breeding and recruitment triggered by natural flows in the Narran Lakes, Macquarie Marshes and Gwydir Wetlands.</p> <p>Support foraging and nesting of waterbirds by ensuring shallow-water and shoreline habitat.</p> <p>South</p> <p>Provide flows at adequate levels to support productive shorebird habitat, foraging resource availability, and local breeding – allowing for varying requirements within the different habitats offered by the Coorong and Lower Lakes.</p> <p>Avoid loss of adequate foraging and roosting habitat in Lower Lakes by ensuring water level is not too high.</p>
Native fish	Support Basin-scale population recovery of native fish by reinstating flows, improving variable flow regimes, and enhancing connectivity to promote	<p>North</p> <p>Water to support recovery, recruitment and dispersal of native fish populations.</p>

Category	Rolling, multi-year priorities	2021–22 annual guidance
	<p>key ecological processes (such as feeding, breeding, recruitment, migration and dispersal) across local, regional and system scales.</p> <p>Support viable populations of threatened native fish and maximise opportunities for range expansion and establishing new populations.</p> <p>Support diadromous fish migration and recruitment via connectivity between the Murray Mouth and ocean.</p>	<p>Enhance connectivity between fish refuge water holes.</p> <p>Support Basin-scale downstream dispersal of Golden Perch juveniles (e.g., from Warrego and Condamine-Balonne via the Darling).</p> <p>Provide small pulses (freshes) to support productivity and movement of native fish including reintroduction sites of relocated fish.</p> <p>South</p> <p>Provide water for Lower Darling (Baaka) to support survival of young cohorts of Murray cod and dispersal of Golden Perch including if required in the Darling Anabranch.</p> <p>Ensure small winter flows to support migrations and progressive recovery of diadromous lamprey and congolli.</p> <p>Maintain fast-flowing habitats to cue movement and spawning for native fish.</p> <p>Provide off channel habitat to support the entire life cycle of threatened of small-bodied native fish including at reintroduction sites of rescued native fish and translocated threatened fish.</p>

Note: See [Basin environmental watering priorities – 2021](#).

2.3 Adaptive management

Outcomes from monitoring, evaluation and research play a key role in informing adaptive management of Commonwealth water for the environment. Collectively, we draw on the best available science, and the knowledge, insights and experiences of those people living and working in the Basin.

Environmental water delivery is still a relatively new practice, which means trialling and learning by doing from various events and outcomes. These learnings continue to be incorporated into the way water for the environment is managed to support adaptive management and help build knowledge.

2.3.1 Lessons learned

Table 2 and Table 3 provide a summary of key learnings and considerations at a Basin scale that are contributing to inform water planning for 2021–22. The findings are drawn from the results of the past 6 years of the CEWO's monitoring and research programs. For site-scale lessons, see the Valley Water Plans in [chapter 3 to 14](#).

Table 2 Basin-scale key learnings from LTIM, EWKR and Flow-MER projects

Theme	Learnings
Hydrology	<ul style="list-style-type: none"> • Delivery of water for the environment has contributed to restoring flow regimes through the provision of base flows. • Water for the environment has contributed to restoring and maintaining longitudinal and lateral connectivity.
Productivity	<ul style="list-style-type: none"> • In-channel flows using water for the environment can result in increased productivity.

Theme	Learnings
	<ul style="list-style-type: none"> • Source of water does not matter (although some exceptions apply).
Fish	<ul style="list-style-type: none"> • Fish responses such as spawning, recruitment and migration are linked to provision of fresh and baseflows. • Impact of fish death events will be significant, and recovery will take time. • Low flow conditions and river regulation result in limited spring/summer flow pulses which is linked to limited spawning and recruitment of golden perch.
Vegetation	<ul style="list-style-type: none"> • Water for the environment has been important in maintaining plant species diversity, including culturally significant and exotic species, both locally and at Basin scales. • Wetting and drying regimes are important for promoting diversity and seedling growth. • Over watering can compromise native vegetation outcomes just as underwatering may result in reduced diversity of vegetation communities at the landscape scale. • Active management of environmental water is important for supporting instream and riverbank vegetation, contributing to bank stability.
Ecosystem and biodiversity	<ul style="list-style-type: none"> • Water for the environment is supporting a diverse array of aquatic ecosystems that are representative of the Basin. • Southern bell frogs require longer durations of shallow water inundation in well-vegetated areas for breeding and are sensitive to high fish numbers.
Waterbirds	<ul style="list-style-type: none"> • There is a common movement route between the north and the south of the Basin. • Waterbird chicks require a large quantity (8 tonnes of small fish) of food to support survival.

EWKR Environmental Water Knowledge and Research project. LTIM Long-Term Intervention Monitoring project. Note: See [reports on EWKR, LTIM and Flow-MER projects](#).

Table 3 Key considerations for water planning

Theme	Learnings
Hydrology	<ul style="list-style-type: none"> • Promoting lateral and longitudinal river connectivity to support Basin Watering Strategy outcomes is beneficial for the health of the Basin.
Productivity	<ul style="list-style-type: none"> • Small amounts of extra water are valuable in boosting food for fish and waterbirds. Timing for delivery is important and should be considered in terms of the intended outcome e.g., linking timing with needs for fish and waterbird populations at different life-stages. • Likely to get more benefit (higher-quality food resources) if water can be reconnected from floodplain and backwaters following the initial inundation. Timing and duration are critical to avoid blackwater events.
Fish	<ul style="list-style-type: none"> • For fish outcomes, water for the environment should provide a range of hydraulic diversity (flow rate and depth) and hydrological connectivity. • During drought conditions, the primary objective is to support native fish persistence, including base flows. Fresh flows are important to maintain refuges, water quality and food availability. • After fish death events, it is critical to provide base flows and freshes to maintain refugia habitats, water quality and promote connectivity. • For golden perch, where possible spring and summer freshes or pulse events should be used to trigger spawning, recruitment and dispersal of young. Water for the environment should also aim to consider the large spatial scale in which this species operates, the need for hydrological and physical connectivity for all life stages.
Vegetation	<ul style="list-style-type: none"> • All watering is likely to enhance plant species and vegetation community diversity at the Basin scale in some way. • Watering lignum once in every 1 to 3 years assists in greatest clump size which supports waterbird recruitment. • There is an opportunity to support culturally significant species using environmental water.

Theme	Learnings
	<ul style="list-style-type: none"> Vegetation diversity is promoted by differing wetting and drying cycles, however, to maintain the existence of some aquatic vegetation communities e.g. Moira grass wetlands, repeated annual watering is important.
Ecosystem and biodiversity	<ul style="list-style-type: none"> Sustained high flows in summer, and periods of very low flow may negatively impact platypus populations. Multi-year watering approaches are encouraged to help maintain ecological character of Ramsar sites – consider both wetting and drying cycles and protecting biodiversity hotspots.
Waterbirds	<ul style="list-style-type: none"> Basin-scale thinking and coordination in planning water for the environment is required for waterbird recruitment outcomes. For maximum impact, water for the environment could be managed to support foraging habitat and stopover within the north and south route. This could occur both between and during breeding events. Improvements in productivity (see Table 3, row 2) will help ensure food sources are available to support waterbird breeding events and survival of juveniles.

2.4 Current conditions and seasonal outlook

Despite more recent rains, the Murray–Darling Basin is still recovering from the hottest and driest 3-year period on record during 2017–2019. This period significantly affected water resources throughout the Basin, including groundwater, soil moisture and water held in storages, with devastating and lasting impacts on both communities and the environment. Large-scale fish deaths, permanent waterholes drying up, limited waterbird breeding and declines in the health of some floodplain woodlands were all observed.

Recent rainfall and inflows have provided some welcomed relief. In the Murray–Darling Basin, above average rainfall during spring 2020, built on the earlier high rainfall in February–April 2020, resulting in generally average streamflow conditions throughout the latter half of 2020. High rainfall across most of the northern Basin in late March 2021 resulted in well above average river flows, including major flooding in valleys near the New South Wales–Queensland border. Throughout April–May 2021, floodwaters from the March rainfall made their way downstream, filling the Menindee Lakes system to its highest level in four years.

Water for the environment has played an important role in assisting the recovery of key parts of the Basin’s environment over this period, including:

- replenishing important refuge habitat across the Border Rivers, the Gwydir, Macintyre, Lower Balonne, Warrego and Barwon-Darling – with golden perch spawning and recruitment observed in some of these rivers
- improving the condition of wetland vegetation and waterbird habitat and increasing frog populations in the Macquarie Marshes, Narran Lakes and Gwydir wetlands
- supporting breeding and recruitment of Murray cod in the Macquarie River, helping recovery of these populations following the devastating fish deaths and rescue efforts in 2018 and 2019
- supporting a seven-fold increase in total native fish numbers between Spring and Autumn surveys and evidence of Murray cod breeding with young-of-year fish found in latest survey in the Baaka/lower Darling

- maintaining in-stream and off-channel refuge habitat and improving water quality in the Lachlan and Murrumbidgee river systems
- supporting breeding of over 18,000 straw-necked and glossy ibis nesting pairs, and a diverse range of other waterbird species, including royal spoonbills, egrets, herons and threatened Australasian bitterns at Gayini Nimmie-Caira
- supporting southern bell frogs in the Lowbidgee, with highest numbers seen in over 20 years
- supporting important colonial waterbird nesting habitat in the Barmah-Millewa Forest
- supporting high numbers of golden and silver perch spawning in the Goulburn and Murray rivers
- maintaining connectivity between the River Murray and its estuary to support the movement of migratory fish species, including pouched and short-headed lamprey and congolli, which need to move between fresh and saltwater environments to complete their breeding cycles
- providing favourable conditions in the Coorong for estuarine fish spawning opportunities and helping to maintain salinities to support flowering and seed set in *Ruppia tuberosa*
- supporting inundation of submergent and fringing vegetation to provide habitat and favourable spawning conditions for threatened small-bodied fish and frogs in the Lower Lakes, with a four-fold increase in southern pygmy perch population over the past year.

In the northern Basin, the severity of the recent drought means the recovery of many river and wetland ecosystems will take time and require further large flows. This includes the Macquarie Marshes, Gwydir Wetlands and Narran Lakes. The recovery of native fish populations throughout the Darling/Baaka and its tributaries remains a priority, with a focus on supporting connectivity all the way through to the Murray (including via the Great Darling Anabranch).

Many of the floodplain wetlands in the southern Basin have not received water for a number of years. 'Thirsty' sites include the mid-Murrumbidgee wetlands, the NSW Central Murray Forests, Hattah-Kulkyne Lakes, and the Chowilla, Pike and Katarapko floodplains in South Australia. Sites higher on the floodplain and outside the influence of the CEWO have seen ongoing declines, with floodplain woodlands increasingly stressed due to lack of flows.

2.4.1 Outlook

Wet conditions have continued over the winter months, with rainfall across the Basin 81% above average for June and 19% above average in July 19%. In response, water storages are rising, with whole of Basin storage 77% full, with 73% in the north and 78% in the south (as at 4 August, 2021). Overall, the Bureau of Meteorology is forecasting wetter conditions in spring, with greater than 80% chance of above median rainfall for most of the Basin.

2.5 Water availability

Box 2 Water words

Entitlement – Also known as a licence or holding. An entitlement is a legal right to a share of the water available at a location, subject to rules and conditions. Water entitlements can be used for a range of purposes, including household use, industry, irrigated farming or the environment. A bucket is a good metaphor for a water entitlement – the bigger the water entitlement, the bigger the bucket.

Allocation – the amount of water made available in proportion to the entitlement (how full the bucket is). Available water varies from year to year, depending on how much water is in storage and how much it has rained. Dry will have low water allocation, while wet years have a higher water allocation. Whether or not an allocation is made may depend on the type and/or security of the entitlement. Generally, each entitlement (bucket) gets filled with water (allocation) as more water becomes available. Some entitlements are not linked to water storage (unregulated entitlements) and allow diversion of in-river flows above a certain height/rate of flow in excess of what is needed to supply consumptive users.

Carryover – the amount of water allocated and not used in a water year that can be used in subsequent years, depending on the rules and conditions of the entitlement.

Security/reliability – the higher the security/reliability level of the entitlement, the more certainty of a water allocation each year.

Commonwealth water entitlements are subject to the same state government regulations, fees, allocations and other rules as apply to equivalent entitlements held by other water users. In valleys where carryover is available, Commonwealth entitlements are governed by the same rules as other water users. Environmental water managers need to make careful decisions about how much water to use, trade or carryover, just like other water users.

In unregulated river systems, water cannot be ordered from public storages at a particular time – environmental water can only be sourced as a share of an unregulated flow event. Thus, carryover and management of account balances cannot generally be used to influence the timing and volumes of environmental water in these river systems.

Table 4 summarises the carryover and allocation forecasts for regulated Commonwealth environmental water. Allocation forecasts through until 30 June 2022 are sourced from the relevant state agencies where the information is available and long-term averages where state agencies do not provide these forecasts.

Table 4 Carryover and forecast allocation of regulated (surface water) Commonwealth environmental water, 2021–22

Catchment	Carryover from 2020-21 (GL)	Forecasts of regulated allocations (including carryover) in 2021–22 (GL) (from very dry to very wet)					
		95 percentile	90 percentile	75 percentile	50 percentile	25 percentile	10 percentile
Border Rivers	6.6	9.4	9.7	11.0	13.9	15.9	16.3
Gwydir	59.9	74.2	74.2	74.2	90.5	114.2	138.8
Namoi	12.9	14.4	14.4	15.2	18.3	22.9	26.6
Macquarie	70.8	86.0	87.0	94.8	155.4	197.1	197.1
Lower Darling	0	25.8	25.8	25.8	25.8	25.8	25.8

Catchment	Carryover from 2020-21 (GL)	Forecasts of regulated allocations (including carryover) in 2021–22 (GL) (from very dry to very wet)					
		95 percentile	90 percentile	75 percentile	50 percentile	25 percentile	10 percentile
Lachlan	35.6	45.8	46.1	46.1	96.5	133.0	150.4
Murrumbidgee	81.9	290.8	302.4	350.5	351.8	351.8	351.8
Ovens	0	0.1	0.1	0.1	0.1	0.1	0.1
Upper Broken Creek and Broken River	0	0.1	0.3	0.4	0.5	0.5	0.5
Goulburn	190.9	369.3	413.9	445.7	509.5	530.7	551.9
Campaspe	2.0	4.0	4.3	8.1	8.6	8.6	8.6
Loddon	1.4	2.8	3.4	3.4	3.4	3.6	3.9
Wimmera	0	0	0	0	0	0	0
Murray – NSW	120.6	221.9	288.7	334.9	427.7	444.7	444.7
Murray – Vic	141.0	304.0	369.3	445.4	496.1	503.3	521.0
Murray – SA	0	162.2	162.2	162.2	162.2	162.2	162.2
Total for Southern-connected Basin ^a	538	1,381	1,570	1,776	1,985	2,031	2,070
Regulated total	724	1,611	1,802	2,018	2,360	2,514	2,600

^a The Southern-connected Basin is the network of rivers that feed into the Murray River between the Hume Dam and the Murray Mouth. This includes the lower Darling/Baaka, Murrumbidgee, Murray, Ovens, Goulburn-Broken, Campaspe and Loddon valleys.

Learn more about allocations and volumes transferred for delivery for [Commonwealth environmental water holdings](#). This information is updated monthly.

2.6 Water delivery in 2021–22

Environmental water use in the Southern-connected Basin in winter and spring could include providing freshes to support native fish survival, migration and spawning in several valleys (such as the northern Victorian tributaries, the River Murray, the Lower Darling/Baaka, the Great Darling Anabranch, and the creeks and rivers in the Edward-Wakool system), as well delivering water (including via infrastructure) to support the recovery and improvement in the condition of floodplain wetlands (such as the NSW Murray forests, Hattah/Kulkyne Lakes, and the Chowilla, Pike and Katarapko floodplains). If wet conditions continue and we see colonial waterbird breeding, environmental flows can be used to maintain water levels until the juvenile birds have fledged. Natural overbank flows over the warmer months could also lead to hypoxic (low-oxygen) blackwater events. If this eventuates, environmental flows will look to provide refuge habitat for native fish, where this is feasible. Opportunities to deliver water in autumn to consolidate on the outcomes from high winter-spring flows are also in scope, particularly for the Mid-Murrumbidgee wetlands.

In the northern Basin, water for the environment will be used to support native fish populations and internationally significant wetlands (including Narran Lakes, Macquarie Marshes and the

Gwydir wetlands). Unregulated flow events are also expected to continue to occur, increasing connectivity. These flows could continue the ecological recovery of the northern rivers that commenced in 2020–21. However, if these significant inflows don't eventuate, water use may be limited to contributing to refuges for native fish and possibly some small flows to internationally significant wetlands, in addition to protecting a share of unregulated flow events.

2.7 Trading water in 2021–22

2.7.1 Commercial trade

The CEWH has no plans to either buy or sell entitlements and is unlikely to enter the entitlement market until water recovery to meet the volumetric water recovery targets established in the Basin Plan 2012 have been reached.

The opportunity to buy or sell water allocations is being actively reviewed in all valleys throughout the water year and as conditions change. The CEWH's [trade intentions](#) are updated and published each quarter. Should the CEWH decide to enter the retail water market at any time during 2021–22, this will be publicly disclosed in advance on our [trade of Commonwealth environmental water](#) webpage.

2.7.2 Administrative transfers

In 2021–22, administrative transfers may be required between environmental water accounts in the Southern-connected Basin trade zones 6, 6B, 7, 10A, 10B, 11, 12 and 14 to enable environmental water delivery. Based upon water resource availability at the time of the watering event and scale of the event, this may include:

- small transfers for environmental watering activities
- moderate transfers (around 50 gigalitres) through the Barmah choke from trade zone 7, if required and allowable given the Barmah Choke trade limit
- large transfers (greater than 100 gigalitres)
- within trade zones, due to the large size of environmental watering activities.
- from New South Wales Murray and Victorian Murray to South Australia, most likely during Summer-Autumn for environmental outcomes in the Coorong and Lower Lakes.

2.8 Carrying over water for use in 2022–23

The volume of water carried over for use in 2022–23 will depend upon how the 2021–22 water year unfolds, overall water availability and both current and future environmental demands.

In the southern Basin, water carried over into 2022–23 will help meet environmental needs in winter-spring. Should wet conditions continue in 2021–22, the reserved water will also allow the opportunity to deliver water to the rivers and wetlands with the aim of consolidating on the recovery and improvements achieved from natural flows.

Similarly in the northern regulated valleys, under drier scenarios water carried over into 2022–23 would be set aside to maintain key environmental needs. Under moderate to wet scenarios, carryover volumes may be used to assist in the recovery of core wetland and native fish communities over multiple water years.

Targeted 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.