



Australian Government

Commonwealth Environmental Water Office

Commonwealth Environmental Water

Portfolio Management Planning

Approach to planning for the use, carryover and trade of
Commonwealth environmental water

2016–17



Front cover image credit: Egret in flight. Photo by Commonwealth Environmental Water Office

Back cover image credit: Birds in Lake Hawthorn. Photo by Russell Murphy

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.

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Acknowledgement of the traditional owners of the Murray-Darling Basin

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1. Introduction

1.1. Purpose of the document

Each year, plans are published to support the management and use of the Commonwealth environmental water portfolio. In preparing these plans, the Commonwealth Environmental Water Office adopts a multi-year approach that integrates all management options, including water delivery, carryover and trade.

This document provides an overview of this approach, including the processes and factors considered in the planning process and how this informs decisions of the use of Commonwealth environmental water. Plans for specific Basin regions are available at: <http://www.environment.gov.au/water/cewo/publications>.

1.2. About Commonwealth environmental water

Commonwealth environmental water holdings are water entitlements, issued by state governments, 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.

1.3. About the 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. This 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, so as to give effect to relevant international agreements.

The Commonwealth Environmental Water Holder is governed by the Water Act and the Basin Plan, and must comply with the specific requirements and standards of Commonwealth legal, policy and environmental legislation and frameworks.

Mr David Papps is the current Commonwealth Environmental Water Holder. He leads and is supported by staff of the Commonwealth Environmental Water Office, a division in the Australian Government Department of the Environment. The Office includes six local engagement officers who live and work in regional centres across the Murray-Darling Basin.

1.3.1. Good neighbour policy

As a member of the Basin community, the Commonwealth Environmental Water Holder is committed to being a 'good neighbour'. Operating effectively in a working river system where much of Australia's food and fibre is produced requires that the management of environmental water must co-exist with agricultural production in a mutually respectful and harmonious manner.

The Good Neighbour Policy is a set of practices that guide the management of Commonwealth environmental water. The Policy aims to promote mutually beneficial relationships with other water users and landholders, but always in a way that is consistent with statutory obligations.

The central principle of the Policy is to 'first, do no harm'. A precautionary approach is taken to managing environmental water, so that there is no material impairment of the interests of landholders and water users. All decisions are informed by comprehensive risk assessments, which draw on previous results captured through effective monitoring activities. In particular the CEWH has not and will not place water orders that would flood private land without the consent of the landholder. For example, orders are placed at below allowable delivery limits to provide a buffer in the case of unexpected inflows.

1.3.2. Basin Plan obligations

The Basin Plan is a high-level plan to ensure that the Basin's water resources are managed in an integrated and sustainable way. Key components include sustainable limits on surface water and groundwater extraction (referred to as 'sustainable diversion limits' or SDLs); an environmental watering plan; a water quality and salinity management plan; water resource plan requirements; water trading rules; and a monitoring and evaluation programme.

The Basin Plan's environmental watering plan requires the Commonwealth Environmental Water Holder to perform its functions and exercise its powers in a way that is consistent with both the environmental watering plan and the Basin-wide environmental watering strategy.

Commonwealth environmental watering must:

- be consistent with the environmental watering plan's objectives
- have regard to the Basin annual environmental watering priorities
- be in accordance with the principles to be applied in environmental watering, which include maximising environmental outcomes, having regard to risks and costs, working effectively with local communities, and applying adaptive management and the precautionary principle
- have regard to the water quality and salinity targets for managing flows.

Trade of environmental water must be undertaken consistent with the Basin Plan's water trading rules, including that arrangements be in place to avoid trading on the basis of non-public information that may have a material impact on a person's decision to trade.

The Basin Plan also places a number of other obligations relating to the Commonwealth Environmental Water Holder's monitoring, evaluation and reporting activities.

1.4. Working with others

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 across the Basin.

1.4.1. Delivery partners

Planning for Commonwealth environmental water use involves conversations with state government departments and agencies, river operators, catchment management and land service agencies, local environmental watering advisory groups, wetland managers, holders of environmental water, the Murray-Darling Basin Authority, landholders and communities, as well as the organisations responsible for the monitoring the outcomes from environmental water. These conversations identify environmental demands, relevant lessons learnt and outcomes from previous watering, barriers to delivery (e.g. infrastructure maintenance), potential risks, other complementary sources of water and any relevant operational plans.

The Commonwealth Environmental Water Holder has entered into formal partnership agreements with the Victorian Environmental Water Holder, the New South Wales Office of Environment and Heritage, the South Australian Natural Resource Management Board, the Nature Foundation South Australia, the Ngarrindjeri Regional Authority and the Renmark Irrigation Trust. These agreements outline the way in which the Commonwealth Environmental Water Holder and staff of the Commonwealth Environmental Water Office will work with partners to coordinate the management of environmental water. The Commonwealth Environmental Water Holder also continues to work collaboratively with other partners where formal agreements are not in place.

1.4.2. Working with communities

Local information and experience is 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 Commonwealth Environmental Water Office is involved in state government-led local engagement processes such as environmental water advisory groups and customer service committees. These local forums enable the Commonwealth Environmental Water Holder to keep abreast of local information whilst accessing a range of people who are experienced in local water and land management issues. This includes community representatives (landholders, Aboriginal community representatives and others) with intimate knowledge of how their rivers, floodplains and wetlands work.

In addition, the Commonwealth Environmental Water Holder regularly meets with individuals and representatives of local government, business, landholders, Aboriginal communities and peak bodies, to discuss the planning, management, and monitoring of Commonwealth environmental water. These meetings occur at locations throughout the Basin and in Canberra.

This outreach activity is complemented by the work of the Commonwealth Environmental Water Office, including the six local engagement officers who live and work in Basin communities. These officers are located in Goondiwindi, Dubbo, Leeton, Deniliquin, Mildura and Berri. These six officers, alongside other officers of local land and water management agencies, work closely with all levels of government as well as local communities and businesses to assist members of the community to participate in environmental water planning and decision making. For further information please refer to:

<http://www.environment.gov.au/water/cewo/local-engagement>

Case Study: Working together to support the recovery of the Murray hardyhead

The Murray hardyhead is a small native fish found only within the floodplains of the southern Murray-Darling Basin. It was once widespread and abundant in the Murray and Murrumbidgee river systems but has suffered a serious population decline over the past 50 years, and is now nationally endangered.

In 2012, Murray hardyhead that had been bred in captivity by the Murray-Darling Freshwater Research Centre, were re-introduced to two wetlands in the South Australian Riverland. Following conservation efforts by South Australian government agencies and the delivery of Commonwealth environmental water, record numbers of Murray hardyhead were found in these wetlands in 2015. This provided an opportunity to relocate a portion of these Murray hardyhead and establish a new population.

The Mallee Catchment Management Authority has been working to restore wetlands in the Victorian Mallee using Commonwealth and Victorian environmental water for many years. One of these restoration sites, Brickworks Billabong, was identified as providing suitable habitat for Murray hardyhead. This billabong was in a suitable condition due to the installation of a regulator to allow more natural wetting and drying cycles in the wetland and the delivery of environmental water to provide habitat and food for Murray hardyhead.

Additional Commonwealth environmental water was delivered to Brickworks Billabong to further boost habitat and enhance food supplies in preparation for the arrival of the fish. In March 2015, the Murray-Darling Freshwater Research Centre and South Australian government staff captured approximately 2500 Murray hardyhead and relocated them to Brickworks Billabong. The Murray hardyhead were transported in an oxygenated water-holding trailer provided by the Victorian Department of Environment, Land, Water and Planning.

The translocation appears to have been successful, with monitoring in August 2015 detecting juvenile Murray hardyhead (estimated to be 2–3 months old). These juveniles are likely to be the first generation off-spring of the translocated fish.

1.5. Supporting multiple outcomes

While the primary purpose of any Commonwealth environmental watering action is to achieve environmental outcomes, there are also opportunities to support complementary social, cultural and economic outcomes. Providing environmental water to rivers, wetlands and floodplains can support recreational and tourism activities (such as fishing, birdwatching, boating/kayaking and camping), improve water quality and create a more sustainable environment to underpin commercial activities. In planning environmental watering actions, the Office welcomes ideas and advice from local community groups and local governments on opportunities for achieving complementary social and economic outcomes. This could include providing information on important local wetlands, recreational activities or tourism events.

1.5.1. Aboriginal cultural outcomes

The Office recognises and acknowledges that the traditional owners and their Nations in the Murray-Darling Basin have a deep cultural, social, environmental, spiritual and economic connection to their lands and waters. The concept of cultural flows has been developed to help translate this complex relationship into the language of water planning and management. The Northern Murray-Darling Basin Aboriginal Nations and the Murray Lower Darling Rivers Indigenous Nations have adopted the following definition of cultural flows: “Water entitlements that are legally and beneficially owned by the Indigenous Nations and are of sufficient and adequate quantity to improve the spiritual, cultural, environmental, social and economic conditions of those Indigenous Nations. This is our inherent right”¹.

While environmental flows are not cultural flows, there are opportunities to support complementary cultural outcomes through environmental water use. For this reason, the Office engages with Indigenous nations to identify such opportunities and welcomes interested communities or organisations bringing forward proposals.

1.5.2. Benefits to other water users

Environmental water is often delivered in response to natural triggers, such as naturally occurring flow events. This means the timing of environmental water is often different from the timing of irrigation deliveries, which can have benefits for other water users.

For example, in the southern Basin, significant volumes are delivered in winter and spring, prior to the start of the irrigation season. While environmental water is delivered in winter and spring for environmental outcomes, it also provides benefits for other water users, including:

- increasing the free space in dams available to capture inflows. This in-turn increases the availability of water for other water users. Preliminary modelling indicates early water delivery in the River Murray is expected to benefit water users in all states (New South Wales, South Australia and Victoria)
- reducing water losses in the system under standard river operations, resulting in improvements in state water resource shares
- reducing competition for channel capacity during periods of peak agricultural demands.

1.6. Contact information

The Office welcomes information from the community on how environmental water can best be managed. If you have any comments or suggestions, please call 1800 218 478 or send an email to: ewater@environment.gov.au

¹ *Echuca Declaration*, as adopted by Northern Murray-Darling Basin Aboriginal Nations and the Murray Lower Darling Rivers Indigenous Nations on 19 May 2010.

2. Portfolio management planning

2.1. Management options

The Commonwealth Environmental Water Holder seeks to maximise environmental outcomes at a Basin-scale and over the long-term through the efficient, effective and transparent management of the Commonwealth environmental water portfolio.

This requires the utilisation of all portfolio management options, including:

- 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, which includes
 - transferring water between entitlements in connected catchments
 - buying and selling water allocations
- investing in activities that improve the outcomes from Commonwealth environmental water.

2.2. Why do we undertake portfolio management planning

Planning supports decisions on how to optimise water use across water years and across catchments. For example, carryover provides the opportunity to optimise water use across water years and to improve water availability early in a water year. Transferring water between entitlements supports the optimisation of water across catchments. Allocation trade (buying or selling) provides further capacity to optimise use over the long-term as well as across catchments.

Portfolio management planning also supports the Commonwealth Environmental Water Holder in:

- meeting Basin Plan obligations and contributing to the long-term objectives of the environmental watering plan, the expected outcomes in the Basin-wide environmental watering strategy and Basin annual environmental watering priorities
- managing the Commonwealth environmental water portfolio in response to the demands identified by Basin States in long-term environmental watering plans (where available)
- applying adaptive management (including the setting of objectives, evaluating outcomes and informing future decision making)
- providing increased transparency in relation to the Commonwealth Environmental Water Holder's portfolio management (use, trade and carryover) behaviour
- coordinating water use with delivery partners, including developing long-term delivery arrangements.

Consistent with the CEWH's commitment to adaptively manage Commonwealth environmental water, portfolio management plans are periodically reviewed throughout the year in light of changes in water availability, environmental demands, constraints, risks and market conditions. Portfolio management statements, which provide updates on the latest intentions, are published every three months on the Office's website.

2.3. What are we trying to achieve?

The **Basin Plan**'s environmental watering plan establishes the objectives, processes and principles that guide the management of environmental water by the MDBA, Basin States and the Commonwealth Environmental Water Holder. The environmental watering plan and its supplementary documents provide key inputs into the planning and use of Commonwealth environmental water. In particular, they identify the long-term and annual environmental demands across the Basin.

2.3.1. Basin-wide long-term environmental objectives and outcomes

The **environmental watering plan**'s overall objectives can be summarised as:

- protect and restore the Basin's water-dependent ecosystems (that is, the rivers, wetlands and floodplains of the Basin, and the native plants and animals they support)
- protect and restore the functions that underpin these ecosystems; and
- ensure these ecosystems are able to withstand threatening impacts.

The environmental watering plan also sets broad targets to measure progress towards meeting the objectives. Up to 2019, the focus is on 'no environmental loss or degradation'. From 2019 onwards, it is expected there will be broad environmental improvements.

The **Basin-wide environmental watering strategy** provides the next level of detail on the environmental objectives and targets. It describes the environmental outcomes expected over the next decade as a result of implementing the Basin Plan and associated water reforms. These outcomes focus on four components: river flows and connectivity; native vegetation; waterbirds; and native fish. Examples of the expected outcomes include:

- a 20–25% increase in waterbirds
- a 10–15% increase in mature Murray cod and golden perch at key sites
- maintenance of the current area and condition (and in some regions, improved condition) of river red gum, black box, coolabah and lignum communities
- improved overall flow, such as 10% more flow in the Barwon-Darling, 30% more flow in River Murray and 30–40% more flow to the Murray mouth.

The total 2750 GL recovered for the environment under the Basin Plan (or its ecological equivalent in both water and works and measures) is required to support the achievement of these long term ecological objectives.

2.3.2. Catchment long-term environmental objectives and outcomes

At a catchment scale, **long-term watering plans** are being prepared by Basin state governments. The plans will identify the key rivers and wetlands in each catchment, and the objectives, targets and environmental watering requirements for each river or wetland.

These plans are being progressively developed over the coming years (plans are available for catchments in South Australia, Victoria and the western catchments in Queensland). In the meantime, environmental water managers will continue to draw on information from a large number of existing documents that describe environmental watering requirements for specific wetlands and catchments, as well as local knowledge and monitoring results.

2.3.3. Outcomes from Commonwealth environmental water

The above environmental objectives, outcomes and targets are all long-term. However, individual environmental watering actions are undertaken over much shorter timeframes. Therefore, it is necessary to identify the short-term outcomes that will contribute to these longer-term objectives. The **Commonwealth Environmental Water Outcomes Framework** identifies outcomes that can be expected from Commonwealth environmental watering:

- in less than one year (1 year outcomes)
- between one and five years (5 year outcomes).

When these shorter-term outcomes are achieved over multiple years, the best available science indicates that they will cumulatively contribute to meeting the longer term objectives and outcomes in the environmental watering plan and the Basin-wide environmental watering strategy (see Table 1). For further information please refer to: <http://www.environment.gov.au/water/cewo/publications/environmental-water-outcomes-framework>

Table 1: Commonwealth Environmental Water Outcomes Framework: The 1 and 5 year expected outcomes from Commonwealth environmental water and how they will contribute to Basin outcomes [note that the expected outcomes of the Basin-wide environmental watering strategy will be achieved through the efforts of all governments in implementing the Basin Plan, and not solely through Commonwealth environmental water. The monitoring of the Basin-wide environmental watering strategy outcomes is the responsibility of the Murray-Darling Basin Authority].

Basin Plan Objectives	Basin Outcomes		Basin-wide Environmental Watering Strategy – Expected Outcomes	5 year Expected Outcomes	1 year Expected Outcomes
Biodiversity (Basin Plan S. 8.05)	Ecosystem diversity			<ul style="list-style-type: none"> Species diversity 	
	Species diversity	Vegetation	<ul style="list-style-type: none"> Maintenance of the current extent of river red gum, black box, coolibah forest and woodlands; existing large communities of lignum; and non-woody communities near or in wetlands, streams and on low-lying floodplains Maintain the current condition of lowland floodplain forests and woodlands of river red gum, black box and coolibah Improved condition of southern river red gum 	<ul style="list-style-type: none"> Vegetation diversity Growth and survival 	<ul style="list-style-type: none"> Reproduction Condition Germination Dispersal
		Macroinvertebrates		<ul style="list-style-type: none"> Macroinvertebrate diversity 	
		Fish	<ul style="list-style-type: none"> Improved distribution of key short and long-lived fish species across the Basin Improved breeding success for short-lived species, long-lived species and mulloway Improved populations of short-lived species, long-lived species, Murray cod and golden perch 	<ul style="list-style-type: none"> Fish diversity Larval and juvenile recruitment 	<ul style="list-style-type: none"> Condition Larval abundance Reproduction
		Waterbirds	<ul style="list-style-type: none"> Maintained current species diversity of all current Basin waterbirds and current migratory shorebirds at the Coorong Increased abundance with a 20–25 per cent increase in waterbirds by 2024 Improved breeding events for colonial nesting waterbird species and an increase in nests and broods for other waterbirds 	<ul style="list-style-type: none"> Waterbird diversity Waterbird population condition (Abundance and Population structure) 	<ul style="list-style-type: none"> Survival and condition Chicks Fledglings
		Other vertebrate diversity		<ul style="list-style-type: none"> Adult abundance 	<ul style="list-style-type: none"> Young

Ecosystem Function (Basin Plan S. 8.06)	Connectivity		<ul style="list-style-type: none"> • Maintained base flows - at least 60 per cent of natural levels • Improved overall flow • Maintained connectivity in areas where it is relatively unaffected • Improved connectivity with bank-full and/or low floodplain flows • Maintain the Lower Lakes above sea level 		<ul style="list-style-type: none"> • Hydrological connectivity including end of system flows
			<ul style="list-style-type: none"> • Improved movement with more native fish using fish passages 		<ul style="list-style-type: none"> • Biotic dispersal and movement
					<ul style="list-style-type: none"> • Sediment transport
	Process				<ul style="list-style-type: none"> • Primary productivity (of aquatic ecosystems) • Decomposition • Nutrient and carbon cycling
	Water quality	Chemical			<ul style="list-style-type: none"> • Salinity • Dissolved oxygen • pH • Dissolved organic carbon
		Biological			<ul style="list-style-type: none"> • Algal blooms
Resilience (Basin Plan S. 8.07)	Ecosystem resilience			<ul style="list-style-type: none"> • Population condition <ul style="list-style-type: none"> - individual refuges - landscape refuges - ecosystem recovery 	<ul style="list-style-type: none"> • Individual survival and condition (Individual refuges) • Individual condition (Ecosystem resistance)

2.3.4. Annual environmental water demands

Prior to the start of the each new water year, the MDBA must publish Basin annual environmental watering priorities. All environmental watering must be undertaken having regard to the priorities.

These are developed having regard to the annual environmental watering priorities developed by Basin States for each catchment.

The Office has also been consulted in the development of the priorities for 2016–17. Through an iterative process, the Office's development of portfolio management plans for Commonwealth environmental water in 2016–17 has informed the development of, and been informed by, the Basin annual environmental watering priorities.

The Basin annual environmental watering priorities for 2016–17 are available from: <http://www.mdba.gov.au/managing-water/environmental-water/basin-annual-environmental-watering-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.

2.4. How much water is available to manage?

2.4.1. Commonwealth environmental water holdings

The total volume of Commonwealth environmental water holdings as at 31 March 2016 was 2,410 GL, which has a long-term average annual yield of 1,674 GL.

The holdings will continue to grow, with the final volume of the holdings dependent on the implementation of the Basin Plan's sustainable diversion limit adjustment mechanism and the outcomes of the Northern Basin Review.

The volume of Commonwealth environmental water available will include both carryover from the 2015–16 water year and new allocations. Allocations against Commonwealth water entitlements are determined by state government and will vary depending on inflows. For the latest information on the volumes of Commonwealth environmental water carryover and allocations, see www.environment.gov.au/water/cewo.

2.4.2. Complementary water resources

Commonwealth environmental water is not managed in isolation. When considering the available resource to meet environmental demands, it is necessary to also factor in the resources managed by other entities that is available to contribute to environmental outcomes. Relevant resources include held environmental water, planned environmental water, conveyance water and consumptive water. For this reason, portfolio management planning is undertaken in conjunction with other environmental water holders and river operators.

2.5. How do we plan?

Commonwealth environmental water planning is primarily driven by supply—how much water is available—and demand—what are the environment's needs. Supply and demand can vary significantly across years and across catchments.

Environmental water demands are influenced by previous rainfall and flows, and by the condition of the targeted environmental assets. For example, under dry conditions, floodplain areas that have received water over the past couple of years and are in good condition may require a drying period—in this case, their demands are low. In contrast, some low-lying wetlands and rivers would have naturally received water in all but the very driest of years and will continue to have high water demands. There may also be wetlands in poor ecological health and the 'normal' wetting-drying cycle may have to be manipulated to assist in restoration and recovery (that is, provide flows to assets at a higher frequency to restore health, than what would be required to simply maintain health).

Similarly, the water available to meet environmental demands changes in response to rainfall and inflows. It can also be influenced operational factors that may limit the ability to deliver water.

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 four different purposes for managing the portfolio (Figure 1) and the outcomes that are in scope under each purpose (see Table 2).

The framework then also identifies the broad mix portfolio management strategies under the different levels of supply and demand (see Figure 2).




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					
Moderate					
High					
Very high					

Figure 1: Environmental demand and water available influence the purpose of Commonwealth environmental water management

Table 2: Environmental outcomes in scope under different ‘purposes’

	Avoid damage: Avoid damage to environmental assets	Protect: Ensure ecological capacity for recovery	Maintain: Maintain ecological health and resilience	Improve: Improve the health and resilience of aquatic ecosystems / build future capacity to support ecological health and resilience
Broad environmental outcomes in scope	<ul style="list-style-type: none"> - Avoid critical loss of species, communities and ecosystems - Maintain key refuges - Avoid irretrievable damage or catastrophic events 	<ul style="list-style-type: none"> - Support the survival and viability of threatened species and communities - Maintain refuges - Support key ecosystem functions. 	<ul style="list-style-type: none"> - Enable growth, reproduction and small-scale recruitment for a diverse range of flora and fauna - Promote low-lying floodplain-river connectivity - Support medium flow river and floodplain functional processes 	<ul style="list-style-type: none"> - Enable growth, reproduction and large-scale recruitment for a diverse range of flora and fauna - Promote and sustain higher floodplain-river connectivity - Support high flow river and floodplain functional processes
<1 year expected outcomes in scope	Vegetation condition			
	Vegetation reproduction, germination and dispersal			
	Fish condition			
	Fish larval abundance and reproduction			
	Waterbird survival and condition			
	Waterbird chicks and fledglings			
	Other vertebrate young			
	Hydrological connectivity including end of system flows (Longitudinal) (Lateral)			
	Biotic dispersal and movement			
	Sediment transport			
	Primary productivity; decomposition; nutrient and carbon cycling			
	Individual survival and condition (inc refuges)			
	Individual condition (ecosystem resistance)			
	Salinity; dissolved oxygen; pH; dissolved organic carbon; algal blooms			

Demand for environmental water					
Overall environmental water resource availability	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	Purpose: avoid damage to the environment		Purpose: Protect and ensure capacity for recovery		
Low	Extended dry conditions <ul style="list-style-type: none">Water availability may be insufficient to meet all environmental demandsUse a high proportion of limited allocations in targeted manner (e.g. individual wetlands, base flows)<ul style="list-style-type: none">Carryover a small proportion or no allocationsInvestigate opportunity to purchase allocations by exception, to assist in meeting urgent and critical demands		Transitioning from wet period to dry <ul style="list-style-type: none">Water availability typically sufficient to meet demandsAllow drying to occur and use a low-moderate proportion of available allocations as needed(e.g. for base flows)Carryover a moderate proportion of allocations to meet minimum requirements in coming years<ul style="list-style-type: none">An opportunity for sale of allocations, subject to:<ul style="list-style-type: none">Environmental demands being met;Sufficient carryover to meet future demands; andMarket conditions		
			Moderate or average conditions <ul style="list-style-type: none">Environmental demands and water availability broadly matchUse a moderate to high proportion of available allocations (e.g. for base flows through to limited overbank flows)<ul style="list-style-type: none">Carryover a low to moderate proportion of available allocationsInvestigate opportunity for allocation sale or purchase, depending on needs and market conditions		
Moderate			Purpose: Maintain ecological health and resilience		
High	Wet period following dry period <ul style="list-style-type: none">Water availability typically sufficient to meet demandsUse a moderate proportion of available allocations for a range of flow types, focused on connected and multiple-site watering events<ul style="list-style-type: none">Carryover a moderate proportion of allocationsAn opportunity for purchasing allocations to use or carryover, subject to market conditions			Extended wet conditions <ul style="list-style-type: none">Water availability typically in excess of that required to meet demandsUse a limited proportion of high allocations (e.g. base flows)<ul style="list-style-type: none">Carryover a high proportion of available allocationsInvestigate opportunity for allocation sale, market likely to be limited	
Very high	Purpose: Improve ecological health and resilience				

Note: the portfolio management actions in each scenario represent generic examples and the specific approach taken in individual catchments and conditions will vary

Figure 2: Examples of how environmental demand and water availability shape planning for the mix of portfolio management options for maximising environmental outcomes in different conditions

2.5.1. Catchment planning

Portfolio management planning is initiated at the catchment scale. It involves conversations between the Commonwealth Environmental Water Office and state environmental water managers, site managers, river operators, state regulating agencies as well as the organisations responsible for monitoring the outcomes from environmental water. These conversations identify environmental demands, relevant lessons learnt and outcomes from previous watering, barriers to delivery (e.g. infrastructure maintenance), potential risks, other complementary sources of water and any relevant operational plans.

Catchment plans 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 portfolio management intentions, considering the:

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

2.5.2. Basin-wide planning

Once initial catchment 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

The plans for individual catchments are then updated as required to reflect the outcomes of this Basin-wide planning.

2.6. Constraints to Commonwealth environmental watering

Constraints are river management practices and structures that govern the volume and timing of regulated water delivery through the river system. They can be:

- physical restrictions, like low-lying bridges or roads
- areas of private land that might be adversely impacted by high regulated flows
- river rules or practices that limit how environmental water can be delivered.

Not all environmental demands can and will be met through the use of held environmental water. Some demands are met by regulated water deliveries for consumptive purposes, while others are met by large unregulated/natural flows events or are beyond what can be delivered within operational constraints. Infrastructure can often be used to deliver water to individual wetlands that would otherwise not be possible due to constraints.

River operators have an important role to play in the delivery of environmental water. Operators are required to deliver water to their customers within the established river management practices. River operators manage environmental water with the same diligence and caution that they deliver irrigation and town water. This includes continually appraising any risks, forecasting rainfall events and tributary inflows against peak regulated operating levels and being careful to avoid any possible impacts while delivering water.

Environmental water holders work with operators in real time to vary delivery to avoid third party impacts while still getting the best environmental outcomes. The Commonwealth Environmental Water Holder takes a cautious approach to environmental flow management in order to eliminate, to the fullest extent practical, the risk of unintended impacts on landholders, irrigators and other third parties, while still delivering positive environmental outcomes.

2.6.1. Constraints relaxation

Basin State governments are working with the Murray-Darling Basin Authority to look at ways to reduce the limitations that constraints place on the use of environmental water and so improve environmental outcomes for the Basin. This work aims to improve the efficiency and/or effectiveness of environmental watering and get better environmental results for wetlands and rivers while avoiding, managing or mitigating impacts to local communities and industries. Governments will be working with communities to understand how to best avoid or mitigate any potential adverse impacts as well as the costs of addressing these to the satisfaction of affected communities. Any decision to remove or modify constraints will ultimately be a decision of Basin governments.

Until such a decision is made to change constraints, Commonwealth environmental water will continue to be delivered within the existing constraints. Commonwealth environmental water is not delivered to the maximum allowable flows all the time and most often, water is delivered in line with natural cues at levels well below existing constraints.

3. From planning to decision-making

Following the planning process outlined above, a number of factors specific to local conditions within catchments influences decision-making around water delivery, carry over and trade (Figure 3). Local knowledge and experience is critical to effectively manage and deliver Commonwealth environmental water. Stakeholders have an important role and provide critical information that informs each stage of the process for managing Commonwealth environmental water.



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

3.1. Commonwealth environmental watering decisions

The planning phase is the first stage in the cycle of environmental water management. The planning process occurs on an annual basis between January and the end of June, and each planning document represents the culmination of months of work and consultation. Throughout the planning process, the Office consults closely with state environmental water managers, river operators and local environmental water advisory groups. The information gathered as part of the planning process feeds into the development of watering intentions for the following water year.

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. Local on-ground knowledge is important for detailing a specific watering action including the flow magnitude, timing, triggers for commencement, rates of rise and fall and the area to be inundated.

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

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

Following the scoping and assessment of potential watering actions, the Commonwealth Environmental Water Holder is required to make a decision on whether or not to commit the water and funds required to support the watering action. In doing so, the Commonwealth Environmental Water Holder also has regard to the Basin annual environmental watering priorities, as required by the Basin Plan.

When a decision is made by the Commonwealth Environmental Water Holder to proceed with a watering action, arrangements for implementation are made with delivery partners. This includes river operators, who manage the delivery of the water and operational monitoring. Local community involvement is crucial at this stage of implementation and during water delivery as conditions can change rapidly and may result in the need to adjust, suspend or even cancel the watering action.

Upon completion of the watering action, a review process, which generally takes place from March through to October, informs future watering actions and long term management. This review is informed by the weekly operational monitoring, results of ecological monitoring, and feedback provided by site managers and the local community.

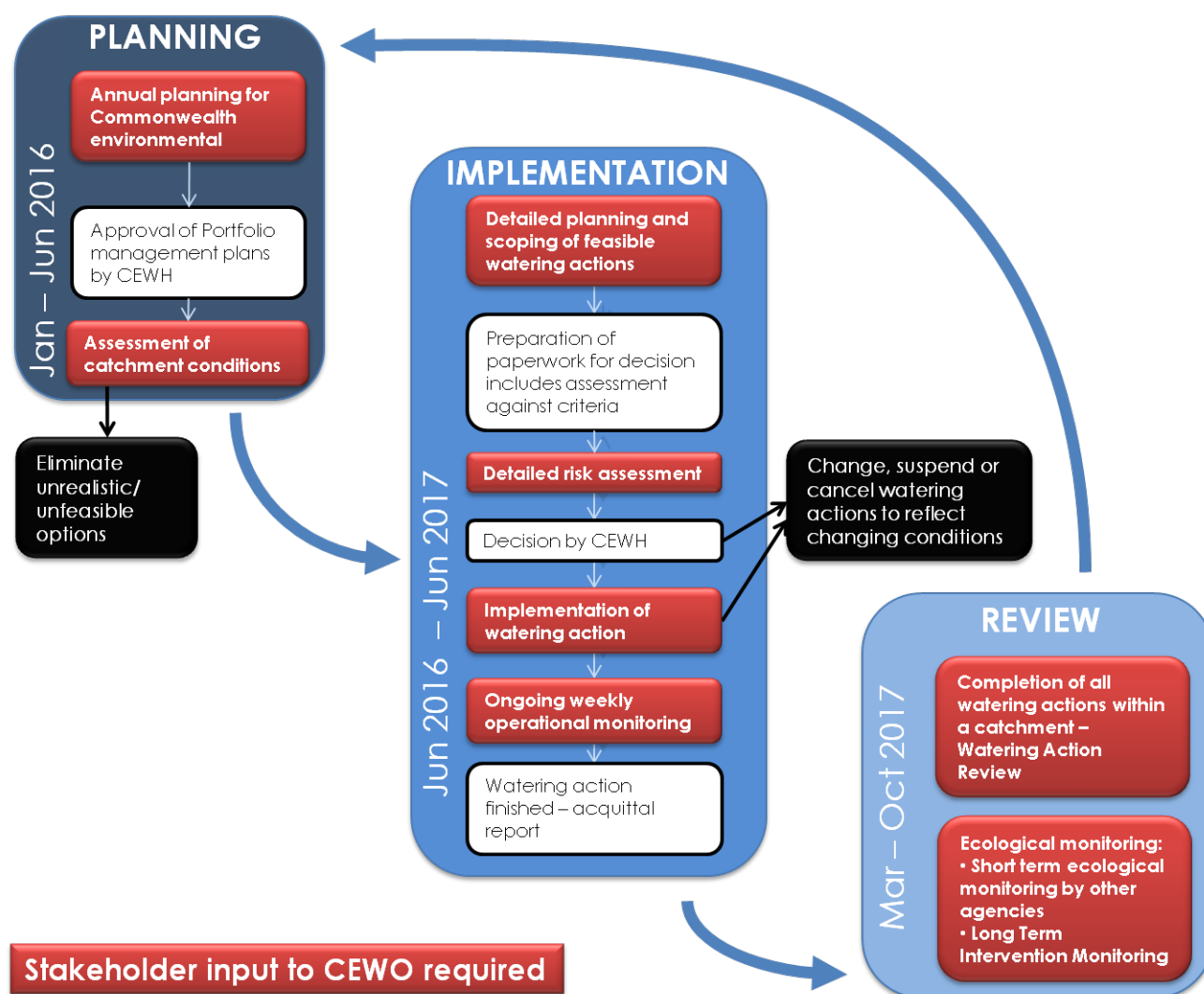


Figure 4: The annual management process for Commonwealth environmental water

For further information see the *Framework for Determining Commonwealth environmental water use* (available at: www.environment.gov.au/water/cewo/publications/framework-determining-cew-use).

3.2. Carryover decision-making

Carryover rules are set by States 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, considerations include:

- minimising the risk of water being reallocated under State rules by carrying over water in accounts with better carryover provisions
- having sufficient water in accounts for environmental watering actions that occur early in a water year
- considering 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
- considering the risk of carryover of water in accounts that may be subject to trade restrictions through the following water year.

3.3. Trade of environmental water allocations

Decisions to sell water allocations are made by the CEWH consistent with the obligations under s.106 of the Water Act. Broadly, Commonwealth environmental water can be sold if one of two conditions are met:

1. Allocations can be sold if they 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 (section 106(2))

Proceeds can be used in the same way as other Special Account funds.

2. Allocations can be sold 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 (section 106(3)).

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; and (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.

The process for conducting a trading action is shown in Figure 5.

The process is underpinned by a trading framework that includes operating rules, protocols and procedures. The trading framework has been developed to ensure that the CEWH's trading activities:

- support enhanced environmental outcomes
- have regard to social and economic outcomes
- consider impacts on the market, including any third-party impacts
- are undertaken in a manner which meets legislative requirements
- are financially responsible, fair, equitable, transparent and accountable.

The trading framework, operating rules, protocols and procedures also ensure that the Commonwealth Environmental Water Holder and the Office's staff act with integrity and high ethical standards throughout the process. More information on the *Commonwealth Environmental Water Trading Framework* can be accessed here: <http://www.environment.gov.au/water/cewo/trade/trading-framework>

Consistent with the operating rules, the Office publishes information on current trading actions as well as providing quarterly updates on Commonwealth Environmental Water Holder trading intentions.

Information on current trading actions is available at:

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

Portfolio management and trading intentions updates are available at:

<http://www.environment.gov.au/water/cewo/portfolio-mgt>

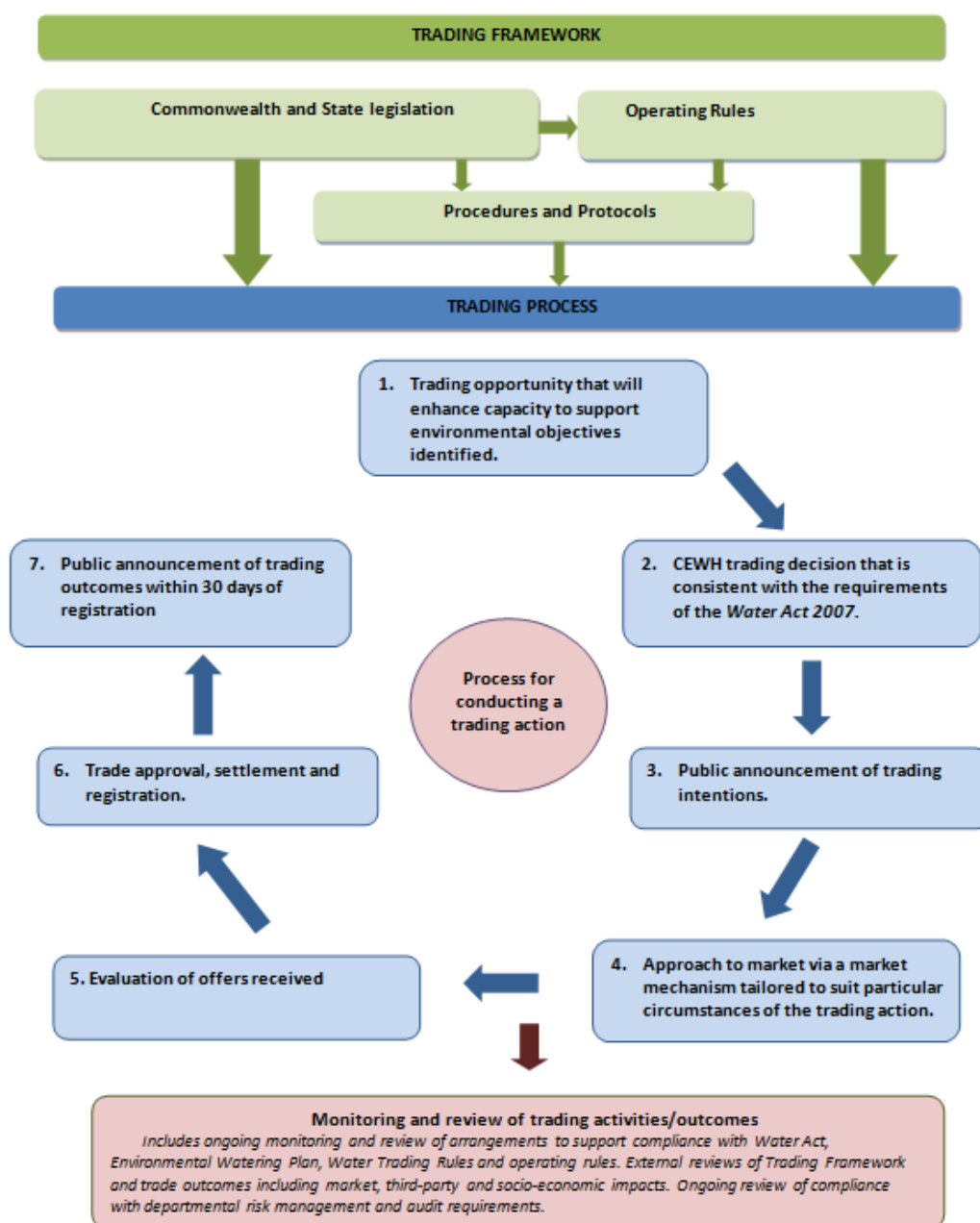


Figure 5: The process for conducting a Commonwealth environmental water trading action.

CASE STUDY: Selling water in the Goulburn catchment

In November 2015, the Commonwealth Environmental Water Holder sold 22.864 gigalitres of water allocations in the Goulburn catchment of Victoria. Environmental conditions and water availability at the time guided the decision to trade. There was sufficient Commonwealth environmental water available through carryover from 2014-15 and annual allocations to continue building environmental resilience in the Goulburn to allow the sale. The level of environmental water use at this time was in line with naturally drying conditions.

The trade provided win-win outcomes because:

- the Goulburn River's environmental needs were able to be met
- Victorian irrigators were able to buy much needed water for their farms
- sale proceeds will be used to benefit the environment elsewhere in the Basin in the future

Of the 22.864 gigalitres sold, more than 95% (21.864 gigalitres) was bought by Victorian Goulburn and Murray irrigators. The remaining 1 gigalitre was sold to primary producers in South Australia.

At the same time that the Commonwealth Environmental Water Holder conducted this trade, more than 320 additional Victorian Goulburn and Murray regulated river allocation trades were recorded, totalling 26 gigalitres at a value weighted average price of \$281 per megalitre. This indicates that other sellers in the market were not negatively affected by the sale of Commonwealth allocations as they received around the same market value for their water.

3.4. Investing in environmental activities

The Water Act was amended in 2016 to provide increased capacity for the Commonwealth Environmental Water Holder to invest in environmental activities using the revenue from water sales. Potential environmental activities must be tied to improving outcomes from the use of Commonwealth environmental water, which may include small scale works or other measures that improve water delivery to environmental assets.

Environmental activities do not include paying statutory fees and charges for holding and delivering water.

The Commonwealth Environmental Water Office will develop frameworks and processes to identify, assess and fund environmental activities in consultation with communities, governments and other stakeholder groups across the Murray-Darling Basin. These processes will be made publicly available.

4. Monitoring and Evaluation

Monitoring and evaluation of Commonwealth environmental water use is undertaken in accordance with the Monitoring, Evaluation, Reporting and Improvement Framework, available on the Office's website at: www.environment.gov.au/water/cewo/monitoring. The framework is a high level document that provides overarching guidance for the development and implementation of monitoring and evaluation activities.

Consistent with the role under the Water Act and Basin Plan, monitoring and evaluation that the Office puts in place will focus on the environmental response to the use of Commonwealth environmental water, or what is known as intervention monitoring. How intervention monitoring of Commonwealth environmental water fits in with operational monitoring and broad scale monitoring under the Basin Plan is shown in Figure 6.

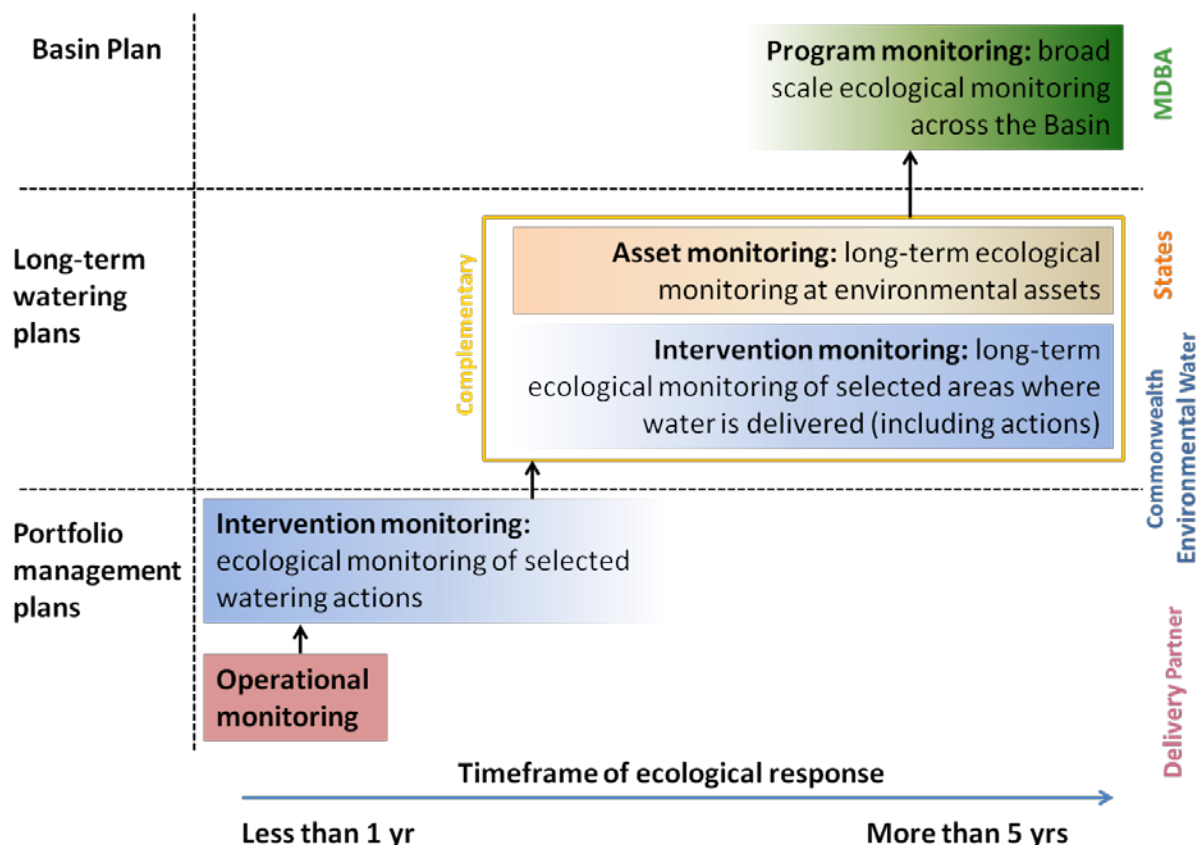


Figure 6: Operational and broad-scale monitoring under the Basin Plan

Operational monitoring

Operational monitoring is monitoring that helps assess whether water has been delivered as planned (e.g. the volumes, timing (frequency and duration), location and flow rates of water delivered) and at a high level can include immediate environmental responses. Operational monitoring also helps to manage unintended consequences. Operational monitoring is undertaken for all watering actions, mostly by delivery partners in conjunction with the Office.

Intervention monitoring

Intervention monitoring is monitoring that supports an assessment of the ecological response to water use. The Office commissions intervention monitoring of selected watering actions to:

- demonstrate that Commonwealth environmental water is being managed well
- demonstrate environmental outcomes
- help managers of environmental water learn from experience and improve the delivery of water over time.

The Office has established long-term intervention monitoring at selected areas within the Murray-Darling Basin that commenced in 2014–15. The approach has a sound scientific basis that will allow us to translate the results of monitoring to other areas and identify the contribution to Basin Plan objectives. The seven areas where monitoring is being undertaken (including links to the 2014-15 monitoring reports) are listed below.

- Gwydir River system (wetlands and floodplains)
<http://www.environment.gov.au/water/cewo/catchment/gwydir/monitoring>
- Lachlan River system (in-stream and on fringing wetlands)
<http://www.environment.gov.au/water/cewo/catchment/lachlan/monitoring>
- Murrumbidgee River system (in-stream, on fringing wetlands and floodplains)
<http://www.environment.gov.au/water/cewo/catchment/murrumbidgee/monitoring>
- Edward-Wakool River system (in-stream and on fringing wetlands)
<http://www.environment.gov.au/water/cewo/catchment/mid-murray/monitoring>
- Goulburn River (in-stream)
<http://www.environment.gov.au/water/cewo/catchment/northern-victorian-rivers/monitoring>
- Lower Murray River (in-stream)
<http://www.environment.gov.au/water/cewo/catchment/lower-murray-darling/monitoring>
- Junction of the Warrego and Darling rivers (in-stream and floodplains, as well as an indicator of upstream unregulated rivers)
<http://www.environment.gov.au/water/cewo/catchment/northern-unregulated-rivers/monitoring>

These areas have been chosen to be broadly representative of Commonwealth environmental watering, and complement existing monitoring programmes in the Murray-Darling Basin, including The Living Murray programme and Basin state monitoring initiatives. The Office will continue to publish on its website results from all monitoring and evaluation that has been commissioned.

Case study: Long-term Intervention Monitoring Outcomes – results for 2014–15

The key environmental outcomes for 2014–15 are:

- Native fish species including Golden perch, Silver perch, Murray hardyhead, Bony bream, Murray cod and Rainbowfish and Gudgeon species responded well to environmental watering.
- The breeding of native birds such as nankeen night heron, cormorants and the first breeding of the internationally protected Eastern great egrets since 2011, following the delivery of Commonwealth environmental water to the Yanga National Park in early 2015. There have also been significant increases in waterbird species diversity and total abundance at sites that received environmental water in the Gwydir river system.
- Between November 2014 and May 2015, Commonwealth environmental water accounted for 100 per cent of flows across the barrages, increasing freshwater flows to the Coorong. Results showed a reduction in salinity in the Murray Mouth.

5. Adaptive management

Adaptive management is a systematic approach for deliberately learning from past actions, with the intent to continually improve future planning and actions. It relies on a combination of the latest information, including best available science and monitoring outcomes, and the knowledge, insights and experiences of those people living and working in the Basin. As outlined in the Murray-Darling Basin Plan, adaptive management involves the following:

- setting clear objectives
- linking knowledge (including local knowledge) management, evaluation and feedback over time
- identifying and testing uncertainties
- using adaptive management as a tool to learn about the relevant system and change its management
- improving knowledge and ongoing implementation
- having regard to the social, economic and technical aspects of management.

The development of portfolio management plans are a critical element of the Office's adaptive management process (see Figure 7). The plans set out the objectives and outcomes that environmental water is aiming to contribute to (based on input from government agencies, communities and scientists) and the actions required to achieve these outcomes. These are then updated each year based on the evaluation of monitoring results and the experience of what has worked well and areas that require improvement.

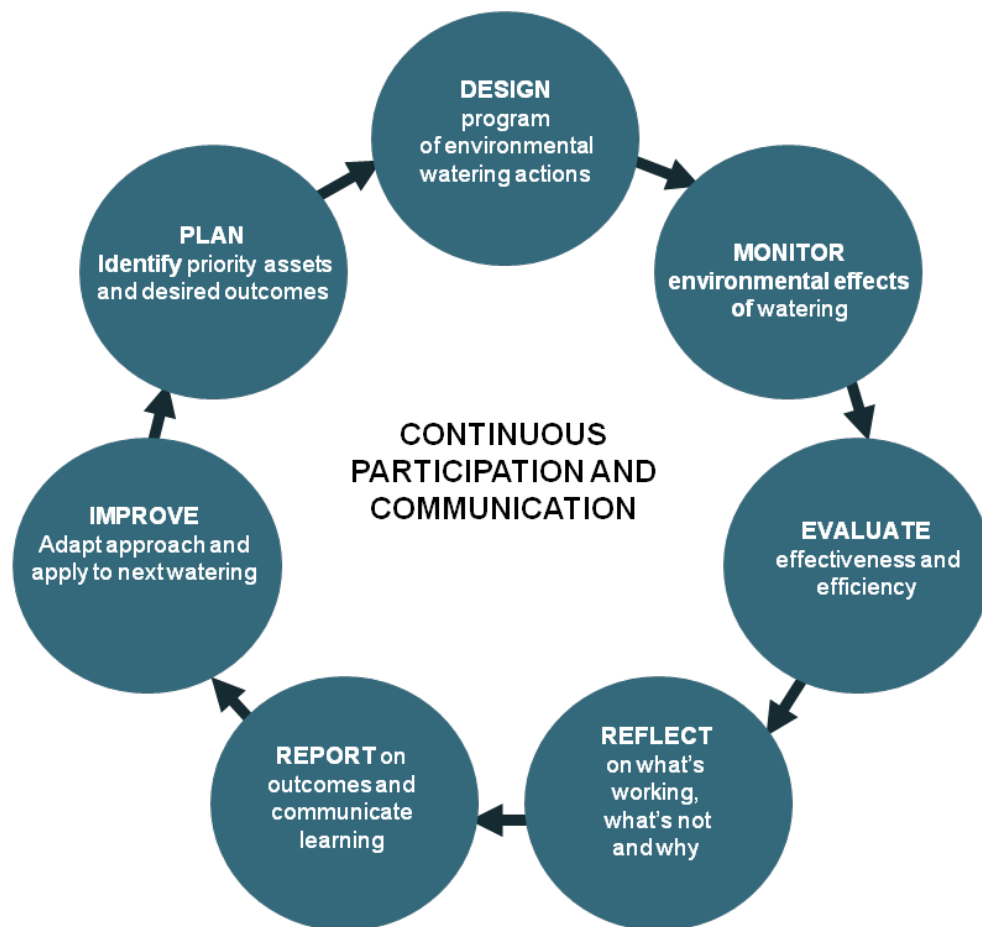


Figure 7: The adaptive management cycle

The practice of environmental water management will continue to evolve through the development of innovative and flexible approaches. This will help maximise environmental outcomes despite uncertainty over future conditions and changing circumstances.

CASE STUDY: Adaptive management and local engagement in practice—environmental watering in the Goulburn River

The Commonwealth Environmental Water Holder works closely with the Victorian Environmental Water Holder and local delivery partners—the Goulburn Broken Catchment Management Authority and the river operator, Goulburn Murray Water— through an operational advisory group to design and manage environmental watering events in the Goulburn River, and to monitor and evaluate the effectiveness of Commonwealth environmental water use.

When planning for environmental water use in 2014–15, all the parties met and reviewed the lessons of the past three years of spring flows. This review noted:

- After some unsuccessful attempts in previous years, an environmental flow delivered in spring of 2013 supported golden perch breeding. The peak of the flow event had been increased from previous years on the advice of fisheries ecologists.
- The need for continuing recovery of riverbank vegetation, which remains in poor condition following prolonged drought and subsequent floods during the last decade.
- Concerns from community members about riverbank erosion (bank notching and slumping).
- Concerns from recreational fishers that environmental flows delivered during the opening of the Murray cod fishing season had disrupted local angling events.

In response, changes were made to the way in which the water was delivered in order to improve environmental outcomes (fish breeding), reduce impacts (bank notching) and accommodate local needs (fishing competition and pump access).

The hydrographs on the following page (Figure 8) show the contribution to flow of Commonwealth environmental water over the last three water years in the Goulburn River. These hydrographs show the ongoing adaptive management of environmental watering and some of the key decisions around the different timing and duration of watering events.

The first spring environmental flow in 2014 was brought forward to October, instead of November, and was delivered as a flow pulse (fresh) with a gradual recession. This watering action was intended to maximise outcomes for riverbank and in-channel vegetation (ensuring it received water before the hot summer), which in turn provides fish habitat and also reduces the risk of riverbank erosion.

A second spring flow pulse was timed for late November, to take advantage of warmer water temperatures to support golden perch spawning. The flow was specifically designed to ensure environmental watering did not coincide with the start of the Murray cod-fishing season on 1 December.

Monitoring in 2014 identified the largest spawning of golden perch in the region since 2010, which occurred during the November environmental flow. Community members did not raise any concerns regarding riverbank erosion and reported that 'it was the best fishing in years'.

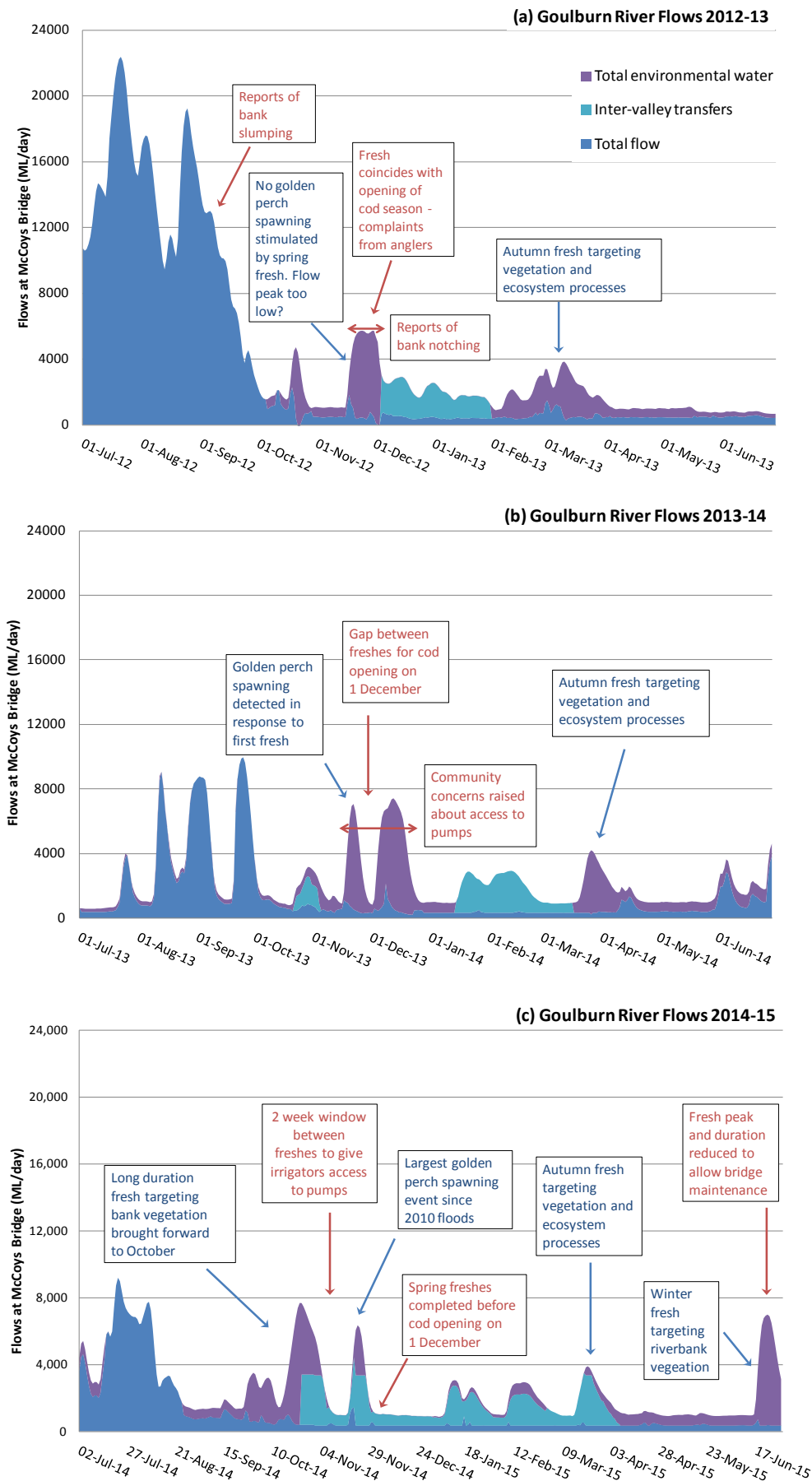


Figure 8: Hydrographs of the Goulburn River over the last three years

Attachment A: Basin-wide environmental watering strategy

The MDBA has identified the following list of quantified expected environmental outcomes that can be achieved beyond 2019 through the Basin-wide environmental watering strategy (<http://www.mdba.gov.au/media-pubs/publications/basin-wide-environmental-watering-strategy>).

River flows and connectivity	Vegetation	Waterbirds	Fish
Improve connections along rivers and between rivers and their floodplains	Maintain the extent and improve the condition	Maintain current species diversity, improve breeding success and numbers	Maintain current species diversity, extend distributions, improve breeding success and numbers
<p>Maintained base flows:</p> <ul style="list-style-type: none"> at least 60 per cent of natural levels <p>Improved overall flow:</p> <ul style="list-style-type: none"> 10 per cent more into the Barwon–Darling² 30 per cent more into the River Murray³ 30–40 per cent more to the Murray mouth (and it open to the sea 90 per cent of the time) <p>Maintained connectivity in areas where it is relatively unaffected:</p> <ul style="list-style-type: none"> between rivers and floodplains in the Paroo, Moonie, Nebine, Warrego and Ovens <p>Improved connectivity with bank-full and/or low floodplain flows:</p> <ul style="list-style-type: none"> by 30–60 per cent in the Murray, Murrumbidgee, Goulburn and Condamine–Balonne by 10–20 per cent in remaining catchments⁴ <p>Maintain the Lower Lakes above sea level</p>	<p>Maintenance of the current extent of:</p> <ul style="list-style-type: none"> about 360,000 hectares of river red gum; 409,000 ha of black box; 310,000 ha of coolibah forest and woodlands; and existing large communities of lignum non-woody communities near or in wetlands, streams and on low-lying floodplains <p>Maintain the current condition of lowland floodplain forests and woodlands of:</p> <ul style="list-style-type: none"> river red gum black box coolibah <p>Improved condition of:</p> <ul style="list-style-type: none"> southern river red gum 	<p>Maintained current species diversity of:</p> <ul style="list-style-type: none"> all current Basin waterbirds current migratory shorebirds at the Coorong <p>Increased abundance:</p> <ul style="list-style-type: none"> 20–25 per cent increase in waterbirds by 2024 <p>Improved breeding:</p> <ul style="list-style-type: none"> up to 50 per cent more breeding events for colonial nesting waterbird species a 30–40 per cent increase in nests and broods for other waterbirds 	<p>Improved distribution:</p> <ul style="list-style-type: none"> of key short and long-lived fish species across the Basin <p>Improved breeding success for:</p> <ul style="list-style-type: none"> short-lived species (every 1–2 years) long-lived species in at least 8/10 years at 80 per cent of key sites mulloway in at least 5/10 years <p>Improved populations of:</p> <ul style="list-style-type: none"> short-lived species (numbers at pre-2007 levels) long-lived species (with a spread of age classes represented) Murray cod and golden perch (10–15 per cent more mature fish at key sites) <p>Improved movement:</p> <ul style="list-style-type: none"> more native fish using fish passages

² Comprising tributary contributions from: Condamine–Balonne, Border Rivers, Gwydir, Namoi and Macquarie–Castlereagh

³ Comprising tributary contributions from: Murrumbidgee, Goulburn–Broken, Campaspe, Loddon and Lower Darling

⁴ Border Rivers, Gwydir, Namoi, Macquarie–Castlereagh, Barwon–Darling, Lachlan, Campaspe, Loddon and Wimmera



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