

Victorian Murray Long-term watering plan

2026 Update



Cover Photos

TOP LEFT: Black Fronted Dottrell at Brickworks Billabong, First Peoples of the Millewa Mallee Country
Credit MCMA

TOP RIGHT: Aerial image of Barmah Lake, Yorta Yorta Country, Credit Keith Ward

BOTTOM: Straw necked ibis flying over healthy lignum at Catfish Billabong, First Peoples of the Millewa Mallee Country, Credit Mallee Catchment Management Authority

We acknowledge and respect Victorian Traditional Owners as the original custodians of Victoria's land and waters, their unique ability to care for Country and deep spiritual connection to it.

We honour Elders past and present whose knowledge and wisdom has ensured the continuation of culture and traditional practices.

DEECA is committed to genuinely partnering with Victorian Traditional Owners and Victoria's Aboriginal community to progress their aspirations.



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Abbreviations

ANAE	Australian National Aquatic Ecosystems (Murray-Darling Basin classification system)
BWS	Basin-wide environmental watering strategy
CAMBA	China-Australia Migratory Bird Agreement
CEWH	Commonwealth Environmental Water Holder
CMA	Catchment Management Authority
CMS	MDBA Constraints Management Strategy 2013 to 2024
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DEECA	Victorian Department of Energy, Environment, and Climate Action
EEO	Expected environmental outcome
EVC	Ecological Vegetation Class
EWAG	Environmental Watering Advisory Group
EWMP	Environmental Water Management Plan
EWMEP	Environmental Water Monitoring and Evaluation Program
EWP	Environmental watering plan (Basin Plan chapter 8)
GMW	Goulburn-Murray Water
HEW	Held environmental water
JAMBA	Japan-Australia Migratory Bird Agreement
LTWP	Long-term Watering Plan
MDBA	Murray-Darling Basin Authority
PCV	Permissible Consumptive Volume
PEA	Priority environmental asset
PEF	Priority ecosystem function
PEW	Planned environmental water
ROKAMBA	Republic of Korea-Australia Migratory Bird Agreement
RWS	Regional Waterway Strategy
SDL	Sustainable Diversion Limit
SDLAM	Sustainable Diversion Limit Adjustment Mechanism
SCBEWC	Southern Connected Basin Environmental Watering Committee
TLM	The Living Murray program
VEWH	Victorian Environmental Water Holder
WRPA	Water resource plan area
VMFRP	Victorian Murray Floodplain Restoration Project
VWMS	Victorian Waterway Management Strategy

Glossary

Term	Basin Plan definition	Victorian definition	Example
Asset (see also priority environmental asset)	A water-dependent ecosystem that satisfies at least one of the following criteria: • is formally recognised in international agreements or, with environmental watering, is capable of supporting species listed in those agreements • is natural or near-natural, rare or unique • provides vital habitat • supports Commonwealth, State or Territory listed threatened species or communities • supports, or with environmental watering is capable of supporting, significant biodiversity. For expanded definitions see Schedule 8, also C8, P5, S8.49.	A significant water-dependent ecosystem (place). May be a single wetland, wetland complex, or a river.	<i>Barmah Forest</i> <i>Pyramid Creek</i>
Basin Plan	The <i>Basin Plan 2012</i> (Cth) was developed in accordance with the <i>Water Act 2007</i> (Cth). It sets out an overarching framework underpinned with specific obligations to enable sustainable use of water resources within the Murray-Darling Basin.		
Basin States	State and Territory jurisdictions within the Murray-Darling Basin (Australian Capital Territory, New South Wales, Queensland, South Australia, Victoria).		
Country Plan		Traditional Owner plan prioritising goals and actions for Country.	<i>Yorta Yorta Whole-of-Country Plan 2021-2030</i>
Ecosystem function	A process within or between assets which supports physical or trophic dynamics that benefit the asset and contribute to achieving ecological objectives. Under the Basin Plan an ecosystem function meets at least one of the following criteria: • “supports the creation and maintenance of vital habitats and populations • supports the transportation and dilution of nutrients, organic matter and sediment • provides connections along a watercourse (longitudinal connections)	A physical process involving the interactions, movement, energy exchange, or condition of biota, soil, water, nutrients, or other physical features, and will support an environmental value.	<i>Lateral connectivity between floodplains, anabranches and wetlands</i> <i>Water quality</i> <i>Drought refuges.</i>

	provides connections across floodplains, adjacent wetlands and billabongs (lateral connections)" (C8, P5, S8.50) (for details see Schedule 9).		
Ecological/environmental objective	An objective for the protection, and if necessary, restoration, of a priority environmental asset or priority ecosystem function (C1, P3, S1.07).	The desired condition for specific environmental value(s) that may be managed with environmental water. An objective includes a desired trajectory (e.g. 'maintain' or 'improve') for a desired measurable outcome (e.g. 'extent or 'species richness'). Measured through the more specific ecological target (see below).	<i>Improve abundance of large-bodied native fish</i> <i>Maintain species richness of frog communities.</i>
Ecological/environmental target	A target that must be met in order to achieve an ecological objective. (C1, P3, S1.07)	A measurement of progress towards, or achievement of, the ecological objective. Targets should be specific, measurable, attributable, realistic and timebound. Measured by environmental monitoring at the event-based, intervention, or condition scales. Results of this measurement indicate whether adaptive management is required to accomplish the objective (for example, management of the timing, frequency, duration or volume of environmental water).	<i>A positive trend in the catch per unit effort (CPUE) of large bodied native fish over the 10-year period to 2025.</i> <i>Maintain the number of native frog species recorded in 8 out of 10 years to 2025.</i>
Ecological vegetation class (EVC)		The standard unit for classifying vegetation types in Victoria - refer to website here .	<u><i>Murray Fans bioregion EVC 56: Floodplain Riparian Woodland</i></u>
Environmental water management plan (EWMP)		Victorian asset-based long-term (~10 year) plan that sets out environmental watering objectives and hydrological requirements	<u><i>Karadoc Swamp EWMP</i></u>
Environmental watering requirement	The environmental watering requirements of a priority environmental asset or priority ecosystem function, as the case may be, identified using the methods set out in Part 5 of Chapter 8. For details see C8, P5, S8.51.	<u>Hydrological objectives</u>: the flow components (river) or flooding regime (wetland/floodplain) that will support an environmental value reliant on hydrology for all or part of its life cycle. May consist of one or more of cease-to-flows, minimum flows, freshes, bank-full flows, and over-bank flows in a river, or filling volumes and drying in a wetland, plus timing (which seasons during the year), durations (how long does it need to occur for) and recurrence interval (every year or less frequently). May vary for dry, average and wet conditions depending on the hydrological tolerances of the environmental value.	<i>Winter fresh of 1,000 – 1,800 ML/day for 1-2 days, once per year in Jul-Aug.</i> <i>Maintain baseflows year-round, winter freshes each year, and winter overbank flows 1 in 3 years.</i>

		<u>Environmental watering requirements / regime</u> : an integration of the hydrological objectives at a specific asset that will support one or more of the ecological objectives, and be the means to achieve the ecological targets. Measured by compliance monitoring for environmental water deliveries.	
Environmental entitlement	<i>see held environmental water</i>	An environmental entitlement is a right to water granted to the Victorian Environmental Water Holder for the purpose of maintaining the Environmental Water Reserve or improving environmental values and health of the water ecosystems and other users that depend on environmental condition. Issued by the Minister for Water under the <i>Water Act 1989</i> (Vic) and relate to the Commonwealth definition for <i>held environmental water</i>	
Environmental value		In this context, an environmental value is a water-dependent species or community present in or supported by an asset or an ecosystem function.	<i>Murray cod, river red gums, wetland Ecological Vegetation Classes (EVCs), brolga.</i>
Held environmental water	Water available under a water access right; or a water delivery right; or an irrigation right; for the purposes of achieving environmental outcomes (including water that is specified in a water access right to be for environmental use).	Water that is set aside for the environment as an environmental entitlement, as per the <i>Water Act 1989</i> (Vic).	
Passing flow		The volume of water that water corporations or licensed diverters are obliged to provide out of storage or past a diversion point before water can be taken for consumptive use.	
Planned environmental water	As per the <i>Water Act 2007</i> (Cth), water that is committed or preserved for achieving environmental outcomes and cannot be taken or used for any other purpose.	In Victoria, these are passing flows, or other water left in the system, but only where specifically provided for environmental purposes.	
Priority environmental asset or ecosystem function	An ecological asset or ecosystem function (defined above) that can be managed with environmental water (C8, P5, S9.49).	An asset with significant environmental values (as per Schedule 8 of the Basin Plan), that can be managed with some form of environmental water. Important ecosystem functions (as per Schedule 9 of the Basin Plan) that can be managed with some form of environmental water, and are likely to support environmental values at a priority asset.	
Regional waterway strategy		Required under the <i>Water Act 1989</i> (Vic), waterway managers must prepare planning documents for each CMA	<u><i>North East Waterway Strategy</i></u>

		region's river, estuary and wetland management.	
Seasonal watering plan	Annual environmental watering priorities as required by Basin states under per Basin Plan s.8.23.	A requirement under the <i>Water Act 1989</i> (Vic), the VEWH prepares a plan each year to prioritise use of the water holdings, based on waterway manager seasonal watering proposals.	<u><i>Seasonal watering plan 2025-26</i></u>
Seasonal watering proposal		Victorian planning document identifying desired environmental water use for rivers, wetlands and estuaries that receive environmental water.	<u><i>Mallee CMA Murray Wetlands 2025-26</i></u>

Summary

This long-term watering plan (LTWP) has been prepared by the Victorian Government in accordance with its obligations under the Murray-Darling Basin Plan ('Basin Plan'). It concerns the Victorian Murray water resource plan area, which includes the Kiewa River and the Victorian Murray River catchment above Lake Hume (including Dartmouth Dam and the Mitta Mitta River), as well as river and wetland assets that are connected to or watered via the Murray River system.

This is a minor update to the 2021 LTWP for the Victorian Murray water resource plan area, as required under the Basin Plan (s. 8.22) following an update to the Basin-wide environmental watering strategy (MDBA, 2025a). This update:

- aligns with the 2025 Basin-wide environmental watering strategy expected environmental outcomes and the First Nations objectives
- incorporates policy from Water is Life: Traditional Owner Access to Water Roadmap (DELWP, 2022a), particularly for Traditional Owners having an increased role in determining how environmental water is used for the purpose of healing Country
- updates other sections that have evolved in the past five years such as constraints, climate change risks and monitoring
- updates priority environmental assets and ecological functions.

This LTWP focuses on the use of environmental water to achieve ecological outcomes in the Victorian Murray water resource plan area. It has been developed with regard to the Basin-wide environmental watering strategy (MDBA, 2025a) and primarily uses a bottom-up approach, drawing on a considerable body of work undertaken at the regional and asset scale by catchment management authorities (CMAs) in their regional catchment strategies, regional waterway strategies and environmental water management plans (EWMPs). The LTWP describes environmental objectives and targets for water-dependent priority environmental assets (PEAs) (rivers and wetlands) and ecosystem functions in the region, and explains the corresponding environmental watering requirements for these objectives. Full objectives and watering requirements can be found in the EWMPs and in the database accompanying this update (DEECA, 2026). This LTWP does not provide detailed management guidance for priority environmental assets; this information remains in the asset-scale EWMPs.

The Victorian Murray LTWP fits within Victoria's existing water entitlement and policy framework and has been prepared using best available information at the time of writing. The Victorian Murray LTWP is one of three LTWPs prepared to meet Victoria's planning obligations under Chapter 8 of the Basin Plan. The other LTWPs have also been updated: the Northern Victoria and Wimmera-Mallee water resource plan areas.

Key elements of this plan are summarised below.

Priority environmental assets

Priority environmental assets (PEAs) are connected to the Murray River, the lower Broken Creek below Katamatite, and the lower Loddon River below Kerang Weir. They include river and wetland assets that meet criteria for priority assets, in that they are able to receive environmental water, and meet criteria set out in Schedule 8 of the Basin Plan.

Priority ecosystem functions

Three main priority ecosystem functions (PEFs) have been identified for the Victorian Murray water resource plan area: hydrological connectivity, refuges and water quality. These are considered priorities in that they may be managed with environmental water and meet criteria in Schedule 9 of the Basin Plan.

Water-dependent ecological values

The Victorian Murray water resource plan area supports important water-dependent ecological values, including native fish (e.g. Murray hardyhead and trout cod); vegetation (e.g. river red gum communities and black box communities); waterbirds (e.g. painted snipe and white-bellied sea eagle), as well as frogs, turtles and platypus.

Objectives

The LTWP identifies 26 objectives for priority environmental assets and ecosystem functions to support waterway health in the Victorian Murray water resource plan area. These are listed in the table below and were developed from the environmental objectives set in asset-scale EWMPs, which were prepared by CMAs in consultation with local communities.

Objectives were extracted from individual EWMPs and standardised into a consistent suite of language involving trajectory (e.g. improve), aspect (e.g. abundance) and value (e.g. large-bodied native fish). Similar objectives across assets and ecosystem functions were grouped, producing a set of objectives relevant across the water resource plan area.

Theme	No.	Objective
Connectivity	VM1	Improve connectivity between floodplains, anabranches and wetlands
	VM2	Maintain refuges for native fish species (e.g. Murray hardyhead)
Vegetation	VM3	Improve the species richness of aquatic vegetation in wetlands
	VM4	Improve the species richness of in-channel aquatic vegetation
	VM5	Improve the condition and maintain extent of aquatic vegetation
	VM6	Improve the condition and maintain extent of river red gum dominated EVCs
	VM7	Improve condition and maintain extent of black box dominated EVCs
	VM8	Improve the condition of shrub and lignum dominated EVCs
	VM9	Successful growth and flowering of Moira grass plants
	VM10	Reduce extent and diversity of exotic vegetation
Waterbirds	VM11	Improve breeding opportunities for waterbirds (especially for colonial-nesting waterbirds)
	VM12	Improve habitat for waterbirds, including provision of refugia during drought
	VM13	Improve feeding areas for waterbirds
	VM14	Maintain and increase species richness of waterbird species
Fish	VM15	Improve the abundance of large-bodied native fish
	VM16	Maintain the abundance of small-bodied native fish in channel and wetlands
	VM17	Maintain distribution of threatened small-bodied native fish in wetlands
	VM18	Improve habitat for native fish
	VM19	Maintain species richness of native fish
Other Fauna	VM20	Improve habitat of frog communities
	VM21	Maintain species richness of frog communities
	VM22	Improve breeding opportunity for frog communities
	VM23	Improve habitat of turtle communities
Macroinvertebrates	VM24	Improve abundance of macroinvertebrates
	VM25	Improve number of macroinvertebrate functional groups present
Water Quality	VM26	Maintain water quality within an appropriate range to allow for ecosystem processes

Cooperative arrangements

Victoria has strong cooperative arrangements for the management and delivery of environmental water between holders of held environmental water, waterway managers and owners and managers of environmental assets. The Victorian government has established these arrangements, in consultation with delivery partners and communities. The arrangements are underpinned by a range of policy, regulatory and governance frameworks.

A range of authorities collaborate to deliver environmental water in Victoria: waterway managers (CMAs), Traditional Owners, water corporations and MDBA as storage managers and river operators, environmental water holders and public land managers. All agencies must engage with Traditional Owners in undertaking their functions.

Coordination and cooperation between Victorian environmental watering partners is critical in ensuring the success of environmental watering activities across the State. As the decision-making body for use of Victoria's held environmental water, the Victorian Environmental Water Holder (VEWH) leads the coordination process.

An annual process takes place that involves preparation of Seasonal Watering Proposals by CMAs and/or Traditional Owners, preparation of the Seasonal Watering Plan by the VEWH; consideration and prioritisation of actions in the Seasonal Watering Plan, in consultation with the Commonwealth Environmental Water Holder (CEWH) and the Murray-Darling Basin Authority (MDBA); the release of seasonal watering statements by the VEWH; and delivery coordination and consultation with storage managers. The Southern Connected Basin Environmental Watering Committee (SCBEWC) coordinates the delivery of environmental water across the southern Murray Darling Basin.

The North East, Goulburn Broken, North Central and Mallee CMAs work across the Victorian Murray, partnering with Traditional Owners in the planning and management of waterways and catchments. This includes formally recognised Traditional Owner groups and those that have not yet been formally recognised. Water is Life: Traditional Owner Access to Water Roadmap commits to the increased role of Traditional Owners in determining how environmental water is used for the purpose of healing Country. As part of this, Traditional Owners may submit seasonal watering proposals to VEWH independently or in partnership with waterway managers (CMAs).

Constraints

Development along rivers and associated river regulation has resulted in operational and physical constraints which restricts delivery of water including for the environment. These constraints have been examined and priority actions identified across the Basin, initially through the MDBA's Constraints Management Strategy 2013 to 2024 (MDBA, 2013) and then through reach-focused projects that are being led by Basin states.

State-led projects, called 'constraints measures', are exploring the potential impacts of delivering higher flows and how these can be addressed to support system-wide environmental outcomes through the reconnection of rivers to their floodplains. Working closely with affected communities will be critical to success.

A feasibility study on constraints in Northern Victoria was undertaken by DEECA in 2024 (DEECA, 2024d). Using updated modelling and technical investigations, the study details the benefits and risks of relaxing constraints along sections of the Goulburn and Murray Rivers and the potential implications for private landholders and local communities.

Following the publication of the Roadmap in December 2024, Basin governments and the MDBA have been focused on implementing key findings and facilitating more coordinated delivery across the Southern Basin constraints projects. The MDBA has established an independent panel, in line with the Roadmap, and is scheduled to report on findings to Basin governments at the end of 2026. Victoria will continue to provide information as requested by the Panel.

Risks

A detailed risk assessment was undertaken for Victoria's North and Murray Water Resource Plan (DELWP, 2019a). Long-term risks associated with providing for the environmental water requirements under this plan fall into two broad categories:

- Risk of failure to achieve (or demonstrate achievement of) the intended environmental objective.
- Risk of adverse impacts in the provision of environmental water.

The risks associated with a failure to achieve the intended environmental objectives are grouped into four types of risk: failure to provide recommended watering regime, failure to provide complementary works, external factors (e.g. climate change), and failure to demonstrate outcomes.

The risks associated with adverse impacts arising from the provision of environmental water have been assessed by their impact on environmental, social, cultural and economic values and management options identified.

A climate risk update has also been included in this 2026 LTWP.

Existing processes are in place for managing these risks at the regional and site-specific scale.

Consultation

Consultation has occurred through a three-part devolved approach. It has aimed to:

- *Involve* local communities, who have worked directly with CMAs in the development and delivery of EWMPs to ensure information and concerns were understood and considered.
- *Collaborate* with the VEWB and CMAs, who have provided material and guidance for the LTWP.
- *Consult* with the water corporations, land managers, MDBA, CEWH, upstream and downstream states, and Traditional Owners, who provided information where relevant and feedback on the content.

Traditional Owners

Water is Life: Traditional Owner Access to Water Roadmap acknowledges the truth of the historic and ongoing harms of colonisation and the dispossession of land and water rights from Traditional Owners. Given this history of dispossession, the Victorian Government has made a commitment to work in partnership with Traditional Owners and First Nations to support their right to self-determination.

Traditional Owners were invited to participate in the LTWP update. Several Traditional Owner groups expressed interest to DEECA in learning about Basin Plan and the role of LTWPs. However, no groups were able to review the Victorian Murray LTWP draft.

Traditional Owners contribute to long-term waterway health planning through regional waterway strategies (currently under review and due 2027), long-term environmental water planning through EWMPs (as updated), and annual environmental water planning via seasonal watering proposals.

Traditional Owners will continue to be engaged throughout Basin Plan implementation by Victorian and Commonwealth agencies.

Next Steps

This LTWP is one of many steps towards full implementation of Basin Plan. Monitoring and evaluation of the environmental objectives and targets in this LTWP is required, to report on achievement of environmental outcomes at the asset scale (Basin Plan Matter 8).

The next LTWP will be informed by the following:

- Outcomes of the 2026 Basin Plan Review
- The next update to the Basin-wide environmental watering strategy
- New environmental watering sites (priority environmental assets), such as those under the Sustainable Diversion Limit Adjustment Mechanism program
- Updates to EWMPs
- New evidence and knowledge generated from programs such as Victoria's Environmental Water Monitoring and Evaluation Program (EWMEP).

1. Introduction

The Murray-Darling Basin Plan aims to improve water security and establish a sustainable and long-term adaptive management framework for Murray-Darling Basin water resources.

The Basin Plan was released in November 2012 and sets out an overarching framework underpinned with specific obligations, to enable sustainable use of water resources within the Murray-Darling Basin.

The Murray-Darling Basin Authority (MDBA) works with Basin states to implement the Basin Plan. In Victoria, the responsibility for meeting state obligations for the Basin Plan is being met by the Department of Energy, Environment and Climate Action (DEECA), with important contributions from all water resource and asset managers.

All Basin states must develop a series of planning documents under the Basin Plan, including long-term watering plans (LTWPs) for environmental assets and ecosystem functions.

Separate LTWPs have been developed for each of Victoria's water resource plan areas for surface water: the Wimmera-Mallee, Northern Victoria and the Victorian Murray (Figure 1). These areas are based on surface water resource plan area boundaries (not catchment boundaries) and include priority rivers and wetlands that may be managed with environmental water.

This LTWP for the Victorian Murray water resource plan area incorporates information and planning that is both general to Victoria and specific to the water resource plan area. The first version of this LTWP was released in 2015, followed by an update in 2021, and this update in 2026.

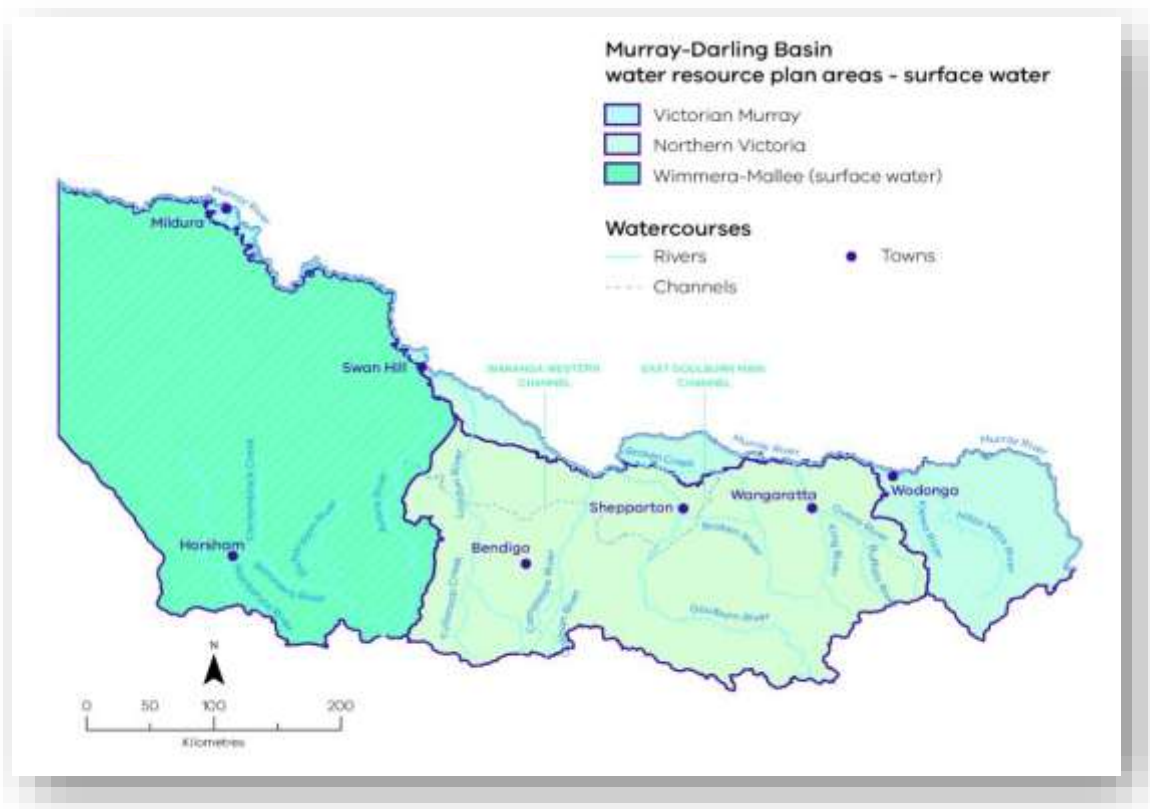


Figure 1. Victoria's three surface water resource plan areas – Victorian Murray, Northern Victoria, and Wimmera-Mallee.

1.1 Context

Many Victorian waterways have been highly modified by human use over the past 150 years and the construction and operation of water storages and other water interception activities have altered the natural flow regime of rivers and inundation patterns of wetlands. The provision of a suitable watering regime and complementary activities (see section 8) are critical to improve the health of these areas and provide a shared resource that supports economic, cultural and recreational needs.

Provision of a suitable watering regime is essential to achieve the objectives and targets outlined in this plan. This does not require restoration of a completely natural water regime. Specific components may have higher importance for different biota or support vital parts of their lifecycle. Water requirements to meet objectives and targets can be developed so that the volume, timing, duration, frequency and quality of environmental water that is provided is clearly linked to the proposed outcomes from the environmental flows.

Environmental watering cannot restore healthy waterways, many rivers and wetlands are so modified that this is not feasible. However, environmental watering can restore some components of the natural flow regime in our highly modified waterways to support critical ecological processes and to minimise some of the impacts of river and wetland modifications.

Basin Plan

The *Basin Plan 2012* (Cth) establishes long-term management objectives in relation to:

- Environmental outcomes.
- Water quality and salinity.
- Long-term average sustainable diversion limits.
- Trading in the water market.

For the **environmental outcomes** of the Basin Plan, the MDBA and Basin states (QLD, NSW, VIC, ACT and SA) are working toward attainment of four overarching objectives:

- To protect and restore water-dependent ecosystems of the Murray-Darling Basin.
- To protect and restore the ecosystem functions of water-dependent ecosystems.
- To ensure that water-dependent ecosystems are resilient to climate change and other risks and threats.
- To ensure that environmental watering is co-ordinated between managers of planned environmental water, owners and managers of environmental assets, and holders of held environmental water.

While overall Basin Plan implementation will support these objectives, the most specific actions are set out in Chapter 8 ‘Environmental Watering Plan’, which outlines planning required from the MDBA and Basin states to achieve the objectives. This planning provides for both long-term and annual environmental water objectives, at both the Basin and a more localised scale, as shown in Figure 2.

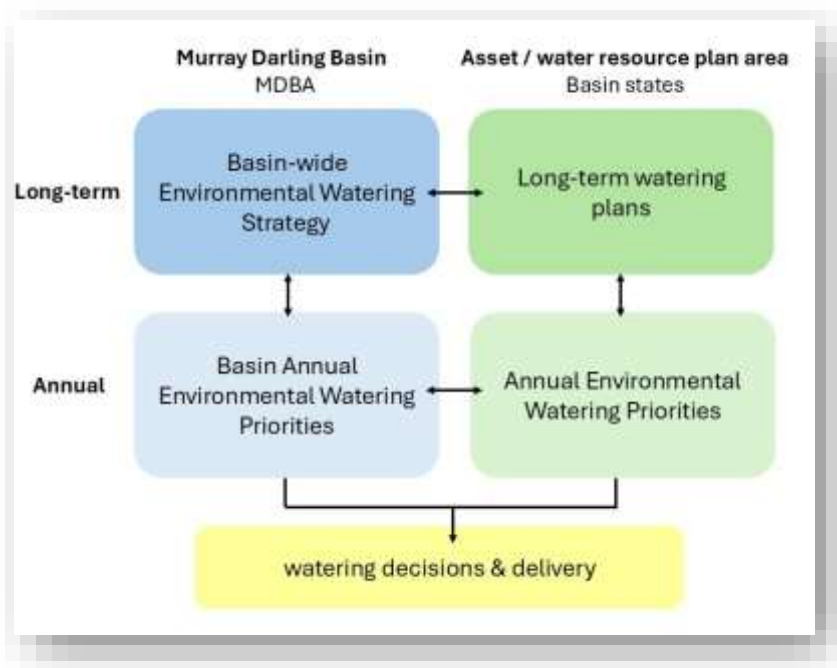


Figure 2. The long-term and annual planning documents required under Basin Plan Chapter 8 ‘Environmental Watering Plan’

To date, the MDBA and Basin states have completed annual watering priorities for each watering season since 2014-15. The MDBA also released its first Basin-wide environmental watering strategy in late 2014. This was updated in 2019 and most recently in 2025 (MDBA, 2025a).

1.2 Scope of the plan

This plan focuses on identifying the environmental watering objectives and requirements of priority river and wetland assets and ecosystem functions to achieve ecological outcomes in the Victorian Murray water resource plan area. It identifies the priority environmental assets and ecosystem functions for the water resource plan area, long-term environmental objectives and targets for these, watering requirements to meet the objectives and targets, cooperative arrangements between delivery partners, high level constraints for the water resource plan area and the long-term risks of providing environmental watering requirements. It also describes how the targets in the plan can be monitored and evaluated.

Due to the environmental watering focus, this plan is not intended to provide holistic management for catchments or waterways (this is addressed in the Victorian Waterway Management Strategy (DEPI, 2013a)). However, in recognition of co-dependencies between all waterway management issues, this LTWP includes a section on complementary actions that must work alongside environmental watering to meet waterway health outcomes.

This plan has been prepared according to the existing Victorian environmental water planning and management framework and using best available information at the time of writing.

The information in this plan has come primarily from asset-based environmental water management plans (EWMPs) that have been developed by catchment management authorities (CMAs) to guide environmental water use over the long-term. EWMPs have been used as underlying documents to this plan because the content aligns well with Basin Plan requirements for LTWPs. EWMPs must be consulted for full asset-specific information when reading this LTWP. Refer to Appendix B for links to individual EWMPs.

EWMPs are prepared by CMAs in consultation with their local communities. They set out the important water-dependent values of an asset, the condition of the asset, water related threats, management goals, objectives and targets for environmental watering and the water regime required to meet the objectives. EWMPs also identify constraints to watering at an asset and the risks associated with meeting the watering objectives. The purpose and content of EWMPs are explained in more detail in Appendix B.

A common set of terms has been defined for this LTWP to enable consistent language within this document and cross referencing between Victoria's three LTWPs and existing state planning documents (see Glossary). The definitions and terminology have been based on that adopted and used through Victoria in the development and implementation of EWMPs.

1.3 Purpose of the long-term watering plan

LTWPs assist planning for environmental water outcomes, to meet the Basin Plan objectives and targets, and the overall environmental objectives for water-dependent ecosystems outlined in Part 2 of Chapter 8 of Basin Plan.

The requirements for LTWPs are outlined in Chapter 8 of the Basin Plan. A LTWP must have regard to the Basin-wide environmental watering strategy (MDBA, 2025a) and be consistent with the principles the Basin Plan sets out for environmental watering (Chapter 8, Part 6). A table detailing each of the Basin Plan requirements and where they are met in the LTWP is provided in Appendix A. This LTWP also recognises there are Basin-wide obligations to take account of cultural outcomes.

Victoria's LTWPs have collated long-term environmental water planning information for priority rivers, wetlands and ecosystem functions in the northern Victorian water resource plan areas and inform:

- Victoria's Annual Watering Priorities (as per Figure 2).
- the Basin-wide environmental watering strategy and Basin Annual Watering Priorities (as per Figure 2).
- Water resource plans, particularly the environmental watering requirements
- Long-term outcomes and environmental water demand in the Commonwealth Environmental Water Holder's (CEWH) Portfolio Management Plans.
- Decisions for environmental watering by the Southern Connected Basin Environmental Watering Committee (SCBEWC) where relevant.

1.3.1 Updates to the plan

This second update to the Victorian Murray LTWP is required under the Basin Plan due to release of the third edition of the Basin-wide environmental watering strategy in 2025 (Figure 3), and to meet the 5-yearly review cycle. Under Basin Plan, both of these are triggers for updating the LTWP. It is a minor update that includes:

- Alignment with the updated 2025 Basin-wide environmental watering strategy, noting there are three new items that LTWPs must be consistent with:
 - A revised date of 2027 for expected outcomes
 - The inclusion of First Nations outcomes
 - A recommendation to consider complementary social and economic outcomes in environmental water management (refer section 1.6.8 Shared benefits)
- Incorporation of Water is Life: Traditional Owner Access to Water Roadmap (DELWP, 2022a) (Water is Life), which was released after the previous LTWP update. This sets important policy for Victoria, including that Traditional Owners have an increased role in environmental water management (refer section 1.6.1)
- Minor updates to Priority Environmental Assets and Ecological Functions, including the objectives and watering requirements (refer sections 3 and 4)
- Minor updates to other LTWP content including constraints to watering, complementary actions, monitoring programs to evaluate the LTWP targets and long-term risks (sections 7, 8, 9 and 10).

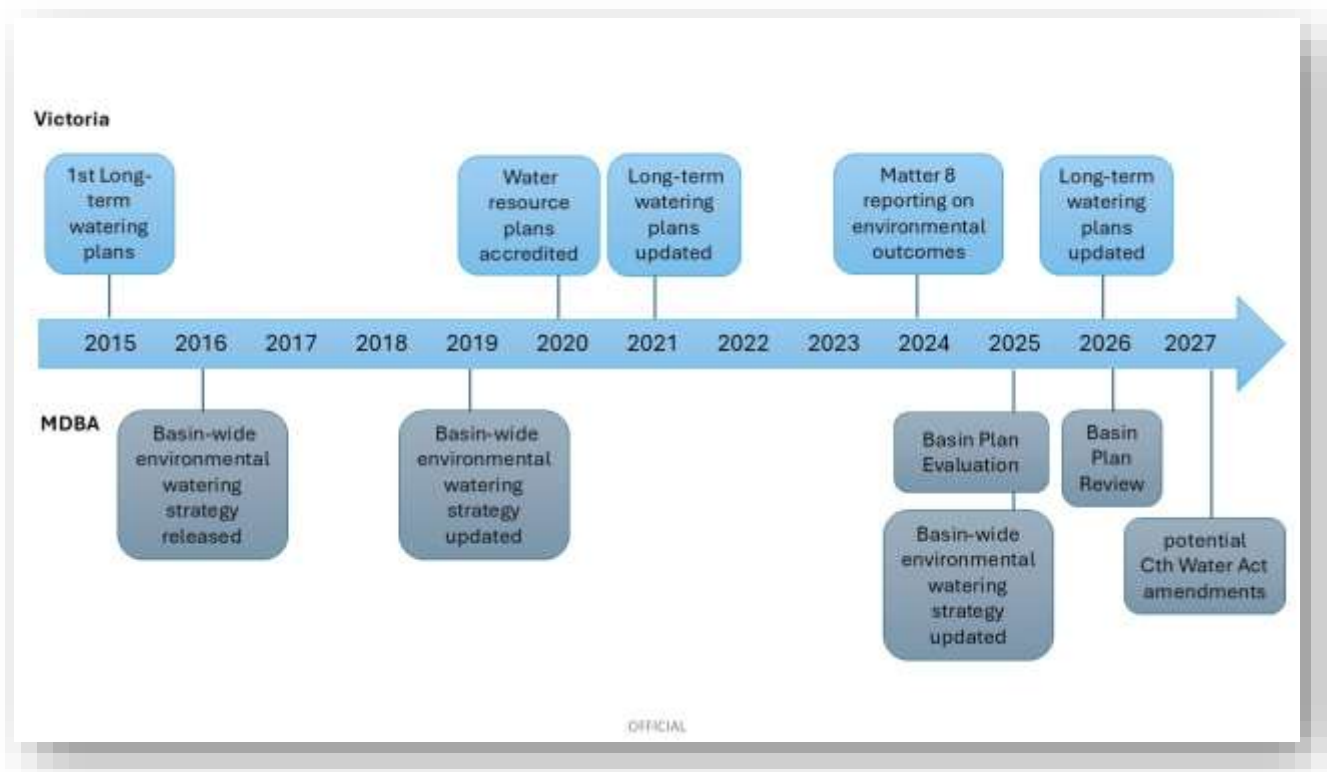


Figure 3. Victoria's long-term environmental water planning process in the context of other planning and strategic documents.

1.4 Basin-wide environmental watering strategy

The Basin-wide environmental watering strategy (BWS) (MDBA, 2025a) was first published by the MDBA in 2014 and updated in 2019 and 2025. Its purpose is to assist environmental water managers to plan and manage environmental watering at the Basin scale. The BWS identifies expected environmental outcomes (EEOs) grouped under four ecological themes: river flows and connectivity, native vegetation, waterbirds and fish. The BWS expected environmental outcomes relevant to Victoria are listed in Appendix I; alignment of LTWP objectives to the BWS expected environmental outcomes is shown in section 4.3.

As well as having regard to the BWS EEOs, LTWPs must also be consistent with any assets or functions and their requirements, identified within the BWS that support vegetation, waterbirds and fish at the Basin-scale.

The 2025 BWS also includes a policy to work with First Nations to increase opportunities for involvement in environmental water management. As part of this, a standalone Southern Basin First Nations Input to the BWS was coordinated by Murray Lower Darling Rivers Indigenous Nations (MLDRIN). Consistency of this LTWP with this policy is outlined in Table 9 and Appendix I.

1.5 Division 6 principles

The Basin Plan sets out 11 principles (Division 6 of the environmental water plan (Chapter 8)) to be applied in environmental watering and requires Basin states to have regard to them when developing long-term watering plans. Alignment with Division 6 principles is addressed in Appendix A (b).

1.6 Victorian frameworks

1.6.1 Traditional Owners

The Victorian Government recognises Aboriginal people as Australia's First Peoples, and as the Traditional Owners and Custodians of the land and waters on which we work and live. In 2025 the Statewide Treaty came into effect, establishing Gellung Warl as a permanent representative and decision-making body for First Peoples in Victoria. As the first Treaty with First Peoples in Australia this was an historic achievement and marks the beginnings of new relationship between First Peoples and the State of Victoria.

Water is Life: Traditional Owner Access to Water Roadmap

In 2022 the Victorian Government released Water is Life - Traditional Owner Access to Water Roadmap (DELWP, 2022a). This is an important framework to create and maintain a careful and considered balance between Traditional Owner self-determination in water access and management, and the rights and entitlements of a range of stakeholders. Water is Life sets out the Victorian government commitments and policy pathways in the short, medium, and long term to increase decision-making and resources for Traditional Owners in the management of water landscapes, as well as increasing Traditional Owner access to water. This includes outcomes and actions in the Murray-Darling Basin.

Water is Life commits to a greater role for Traditional Owners in determining how environmental water is used for the purpose of healing Country, including a stronger role in environmental water planning and decision-making, and opportunities to directly manage environmental water allocations.

Water is Life identifies targeted outcomes that the Victorian government commits to, including:

1. Recognition of waterways and their surrounding lands as living, integrated, natural, and cultural entities in law, with Traditional Owners recognised as a unique 'voice' of the living entities.
2. Traditional Owners entering formal partnership agreements with the water sector that increase the capacity and resources available to Traditional Owners to make and implement decisions about water landscape management on their Country.
3. Traditional Owners having increased role in determining how environmental water is used for the purpose of healing Country.
4. Increased involvement of Traditional Owners in public land management.
5. Recognition of Traditional Owners as waterway managers for specific locations.
6. Recognition of Traditional Owners as environmental water holders.
7. Water being returned to Traditional Owner groups across Victoria through the issue of water entitlements for their self-determined use.
8. Access to land not being a barrier to Traditional Owners applying for or holding water entitlements.
9. Traditional Owners becoming funded to pay any fees and charges associated with their water entitlements unless use is purely commercial
10. That where Traditional Owners become purely commercial users of water, they will become responsible for an increasing portion of fees and charges over time to full cost recovery.
11. Traditional Owners becoming able to hold and manage water in culturally appropriate ways.

Outcomes 3, 5 and 6 have direct effect on environmental water management in Victoria. As part of outcome 3, five Traditional Owner groups led the development of 'Water for Country – Guidance provided by and for Traditional Owners Making Proposals for the Use of Environmental Water in Victoria'. This collaborative process was supported by the VEWH (Victorian Environmental Water Holder) and DEECA, with guidance from an independent facilitator. Through this process, Traditional Owner-led proposals were developed for Molesworth Billabongs (Northern Victoria) and Musk Duck Wetland (Victorian Murray)¹. Both proposals were included as pilot watering projects in the VEWH's 2025-26 Seasonal Watering Plan (VEWH, 2025a). One of these sites is relevant to the Victorian Murray LTWP, Musk Duck Wetland (also known as Ned's Corner East, sitting within the Ned's Corner priority environmental asset), led by First People of the Millewa Mallee Aboriginal Corporation in partnership with Mallee CMA. This site is included in the LTWP as a priority environmental asset.

Preliminary work has progressed for further parts of Outcome 3 and also Outcomes 5 and 6 to understand current *Water Act 1989* legislative mechanisms to enable Traditional Owners to take on transfer of water allocation and/or specific waterway management responsibilities, and explore legislative barriers.

¹ Refer to VEWH's Seasonal Watering Plan 2025-26 (VEWH, 2025a)

1.6.2 Entitlement framework

Environmental water in Victoria is defined and protected as the Environmental Water Reserve under the *Water Act 1989* (Vic) and is provided in three ways:

- **Environmental water entitlements:** a proportion of water held by the environment in perpetuity. In general, the entitlements are a share of the available resource (inflows) in storages that can be released to meet specific environmental needs.
- **Obligations on consumptive entitlements:** the volume of water that water corporations or licensed diverters are obliged to provide out of storage or past a diversion point before water can be taken for consumptive use.
- **'Above cap' water:** the water available above limits on consumptive volumes of surface water and groundwater. Most water available to the environment is 'above cap' water, which can be a very unreliable source of water.

In regulated systems, environmental water is set aside mainly through environmental water entitlements. In unregulated rivers, environmental water is provided primarily through management of existing diversions via licence conditions, rostering and restriction rules.

Section 5 provides further details on the provision of environmental water in Victoria, including explanations of held and planned environmental water. More information is also provided in the Victoria's North and Murray Water Resource Plan (DELWP, 2019a).

1.6.3 Waterway management framework

State Strategy

The state policy for the environmental management of waterways is documented in the Victorian Waterway Management Strategy (VWMS) (DEPI, 2013a). A new VWMS is currently being finalised.

The VWMS outlines the overarching policy for management of Victorian waterways. It establishes integrated, devolved decision making. The VWMS recognises that environmental condition underpins environmental, social, cultural and economic values.

The VWMS documents policies and actions for major waterway management issues including environmental water management, riparian management, water quality, the river channel, wetlands and invasive species management in waterways. It acknowledges that co-dependencies exist between all management areas in maintaining or improving outcomes for waterway health.

The Victorian Waterway Management Program is based on an adaptive management cycle, where learning occurs at all stages and is used to update and improve the program in subsequent cycles. It comprises three main phases:

- Strategy and planning;
- Implementation and monitoring; and
- Evaluation and reporting.

Community participation and research and innovation occur across all parts of the Program. The Program is a partnership between state government, regional agencies and authorities, other management partners (such as Traditional Owners) and local communities. DEECA is responsible for establishing the state policy framework for waterway management. Regional implementation is led by waterway managers from the nine catchment management authorities and Melbourne Water. Some waterway manager functions may be led by the relevant Traditional Owners at specific locations (see section 1.6.1).

Regional Strategies

In northern Victoria,  are appointed as regional waterway managers under Part 10 of the *Water Act 1989* (Vic).

CMAs have established regional catchment strategies that are the primary integrated planning framework for land, water and biodiversity management in each region in Victoria, providing an overarching strategic framework for actions. CMAs have also prepared regional waterway strategies that identify, the regional priorities for on-ground works and environmental water based on the **values** (environmental, social, cultural, economic), **threats**, and **condition**.

In the Victorian Murray water resource plan area, the relevant CMAs and their regional waterway strategies are:

- North East - North East Waterway Strategy (NECMA, 2014).
- Goulburn Broken - Goulburn Broken Waterway Strategy 2014-2022 (GBCMA, 2014).
- North Central - North Central CMA Waterway Strategy 2014-22 (NCCMA, 2014).
- Mallee - Mallee Waterway Strategy 2014-22 (MCMA, 2014).

Regional waterway strategies are currently being reviewed and will be updated by 2027.

The next iteration of regional waterway strategies will be outcomes-focused, considering the broad range of waterway values. They will also be adaptable to reflect shifts in priorities based on new information and impacts of climate change and extreme events.

Traditional Owner role in regional waterway strategies

Ministerial Guidelines for regional waterway strategies (DEECA, 2024a) direct CMAs to seek collaboration with Traditional Owners when developing a strategy. Traditional Owners have the right to partner in decisions, and this may mean they embed their self-determined vision, outcomes, and priorities for managing waterways on their Country into the regional waterway strategies. Alternatively, Traditional Owners can develop a separate document to sit alongside the regional waterway strategies.

Victorian Government commitments in Water is Life include actions for increasing the resourcing for and role of Traditional Owners in the care and management of waterways and catchments. The development and implementation of regional waterway strategies are intended to play a significant role in progressing these actions (see section 1.6.1). See the full [Ministerial Guidelines](#) (DEECA, 2024a) to understand this further.

1.6.4 Environmental water planning and management framework

River regulation and licenced surface and groundwater use across Victoria has affected the natural hydrological regimes required to support environmental values, resulting in reduced variability of flows and degraded aquatic ecosystems.

To provide more appropriate water regimes for the environment, the adaptive management cycle is applied and includes:

- Ensuring environmental water needs are understood.
- Ensuring environmental water is protected – this includes having appropriate policy and legislation in place.
- Ensuring the water regime is managed to meet targeted environmental objectives (planning and delivering water for the environment).
- Overcoming physical or operational constraints to enable best use of the water and maximise outcomes for the environment.
- Monitoring to demonstrate outcomes, evaluate whether objectives are being achieved, and inform adaptive planning, delivery and management.
- Reviewing the process to adapt and improve as required.

Necessary to support these are:

- Clear roles and responsibilities.
- Management of risks relating to environmental water.
- Adequate research to support environmental watering knowledge.
- Appropriate investment at each stage.

1.6.5 Environmental water planning, prioritisation and delivery

Using the State and regional strategies as a basis, waterway managers (CMAs in northern Victoria) and the VEWH undertake detailed and adaptable planning for environmental water at both the long-term and annual scales. Since 2025, Traditional Owners may also plan for the use of environmental water at sites which they nominate via the preparation of a Seasonal Watering Proposal that they submit to the VEWH.

Figure 4 presents the environmental water planning and delivery framework in Victoria, and how this aligns with the Basin Plan. This includes national and state legislation, state and regional waterway strategies, asset-based EWMPs, regional Seasonal Watering Proposals, and the state-wide Seasonal Watering Plan released by the VEWH each year. Different partners (including DEECA, VEWH, Traditional Owners, CMAs, water corporations and MDBA) lead or are involved in each component. Traditional Owners currently partner or input into several components of this framework, however, there is still considerable work needed to facilitate their participation, partnership and leadership in environmental watering.

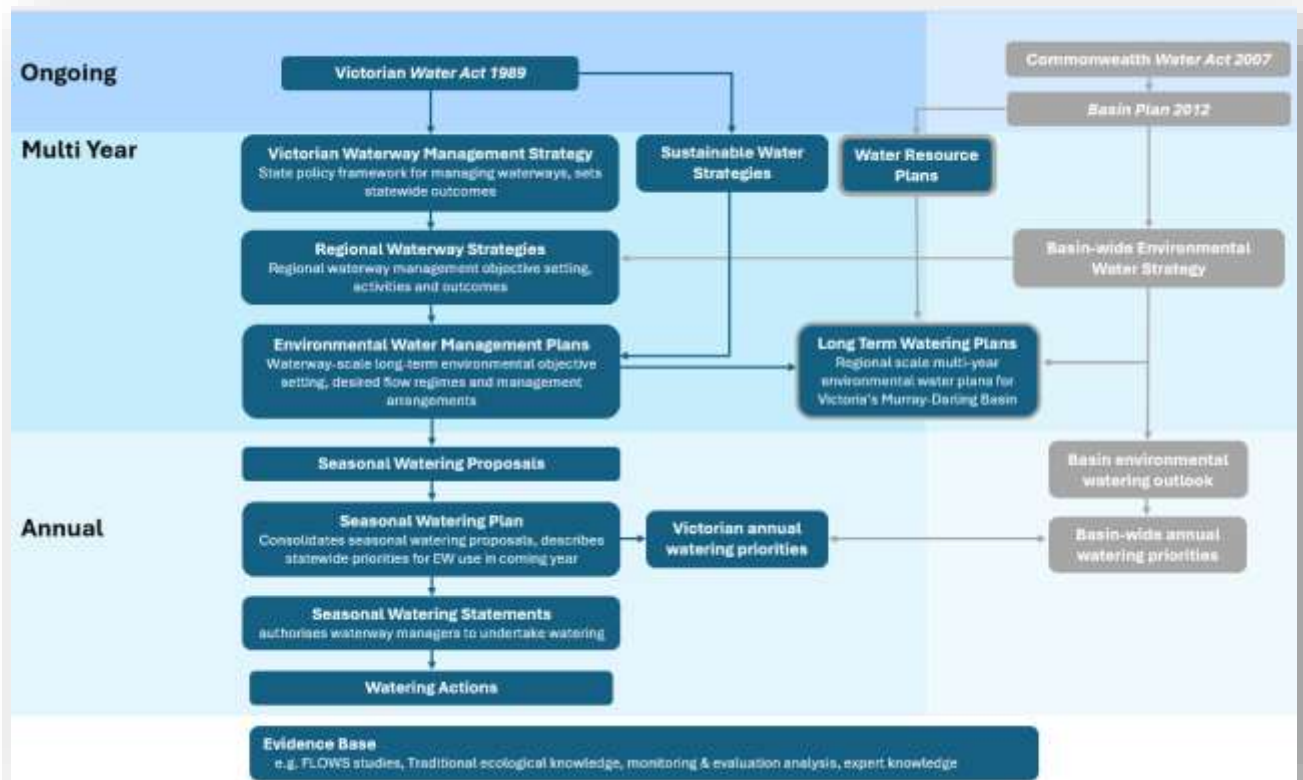


Figure 4. The Environmental water planning and management framework in Victoria and how it intersects with the Murray-Darling Basin Plan and associated instruments.

The VEWH's annual Seasonal Watering Plan identifies priority watering actions across the state by applying criteria that include the extent of environmental benefit, certainty of achieving environmental benefit, water requirements of a site, feasibility of the watering action and overall cost effectiveness (Figure 5).

GUIDING MATTERS	TYPES OF FACTORS CONSIDERED
Extent and significance of environmental benefit	• Size of the area being watered • Expected ecological outcomes • Expected scale of response • Conservation status of the species or community that will benefit • Expected contribution to regional environmental objectives
Likelihood of success	• Evidence that the desired outcomes are likely to be achieved • External threats that may affect getting the desired results
Longer-term benefits	• Value added to previous watering undertaken at the site • Longer-term environmental benefits expected • Ability to sustain these values into the future
Urgency of watering needs	• History of watering at the site • Potential for irreversible damage if the watering does not occur • Risks associated with not delivering the water
Feasibility of the action	• Capacity of infrastructure to meet the delivery requirements • System or operational constraints • Flexibility in the timing of delivery • Likelihood that planned management actions will mitigate external threats
Environmental or third-party risks	• Adverse environmental outcomes that may arise • Third-party risks associated with the event • Effectiveness of mitigation to manage third-party and environmental risks
Cost effectiveness of the watering action	• Likely environmental benefit compared against: – costs to deliver and manage water – costs of interventions to manage external threats and risks
Efficiency of water use	• Volume of water needed to achieve the desired outcomes • Volume and timing of return flows that may be used at downstream sites • Alternative supply options such as use of consumptive water en route or augmenting natural flows • Risks of spills from storages in the upcoming water year and any carryover water that may be available
In addition to the matters above the VEWH must consider opportunities to provide for the following	
Cultural, social, recreational and economic benefits	• Traditional Owner values and uses • Social and recreational values and activities • Economic benefits

Figure 5. VEWH (2025a) criteria for prioritising environmental watering actions

1.6.6 Seasonally adaptive approach

Victoria uses a 'seasonally adaptive' approach to identify annual watering actions, along with complementary works and measures, recognising that achieving objectives may require more than just delivering water (Table 1). It is a flexible way to deal with short-term climatic variability and helps to guide annual priorities and manage conditions from wet through to drought, depending on the amount of water available in a particular year. This approach recognises that it will take time to realise the ecological outcomes associated with the BWS and the objectives outlined in the Basin Plan. For example, increasing the abundance and

diversity of native fish populations is likely to require successful recruitment over multiple years, depending on such things as the life history of the target species, availability and quality of habitat (including refuge habitat during dry periods) the opportunity for fish to migrate and spawn, and management of invasive species.

Table 1. Victoria's seasonally adaptive approach to river and wetland management

	Drought	Dry	Average	Wet
Expected conditions	No or negligible contributions from unregulated flows; waterways may stop flowing at times, more likely in summer and autumn	Minor contributions from unregulated reaches and tributaries, more likely in winter and spring	Unregulated flows provide extended low flows and multiple freshes, more likely in winter and spring; minor storage spills may occur	Extended unregulated high flows, multiple large storage spills and overbank flooding, more likely in winter and spring but possible at any time of year
Long-term ecological objectives	Long-term objectives to move towards ecologically healthy waterways are set through the Victorian and regional waterway management strategies			
Short-term ecological objectives	Avoided irreversible losses and enable capacity for recovery	Maintain basic functions of watered rivers and wetlands	Maintain or improve the ecological health of watered rivers and wetlands	Improve the health and resilience of watered rivers and wetlands
Annual management objectives	Protect - Avoid critical loss - Maintain key refuges - Avoid catastrophic events	Maintain - Maintain river functioning with reduced reproductive capacity - Maintain key functions of prioritised wetlands - Manage within dry-spell tolerances	Recover - Improve ecological health and resilience - Improve recruitment opportunities for key plant and animal species	Enhance - Maximise recruitment opportunities for key animal and plant species - Restore key floodplain wetland linkages
Use of Environmental water reserve	- Water critical refuges - Undertake emergency watering to avoid catastrophic events - Provide carryover (for critical environmental needs the following year)	- Provide summer and winter baseflows in prioritised river reaches - Water prioritised wetlands - Provide river flushes where required to break critical dry spells - Provide carryover (for critical environmental needs the following year) - If necessary, use the market to sell or purchase water	- Provide all aspects of the flow regime - Provide sufficient flows to promote breeding and recovery - Provide carryover to accrue water for large watering events - If necessary, use the market to sell or purchase water	- Provide overbank flow - Provide flows needed to promote breeding and recovery - If necessary, use the market to sell or purchase water
Other waterway management activities	- Protect refuges (including stock exclusion) - Increase awareness of the importance of refuges - Enhanced monitoring of high-risk areas and contingency plans in place - Investigate feasibility of translocations - Environmental emergency management plans in place - Protect prioritised areas through fencing, invasive species management, and water quality improvement works - Implement post-bushfire river recovery plans	- Protect refuges - Protect prioritised areas through fencing, invasive species management, and water quality improvement works - Environmental emergency management plans in place - Improve connectivity - Implement post-bushfire river recovery plans	- Protect and restore prioritised areas through fencing, invasive species management, water quality improvement, and in-stream habitat works - Monitor and survey river and wetland condition - Improve connectivity between rivers and floodplain wetlands	- Protect and restore prioritised areas through fencing, revegetation, invasive species management, water quality improvement and in-stream habitat works - Monitor and survey river and wetland condition - Emergency flood management plans in place - Implement post flood river restoration programs

1.6.7 Delivery partners

Several organisations work together to deliver environmental water outcomes in Victoria. These organisations and their roles are described in the Cooperative Arrangements section of this plan (section 6).

1.6.8 Shared benefits

Shared or complementary benefits are additional opportunistic benefits that can be achieved from environmental watering, including social, cultural, recreational and economic benefits. While the primary purpose of environmental watering is to achieve ecological outcomes, the *Water Act 1989* (Vic) was amended in 2019 to require water resource managers, in performing their functions, to consider opportunities to provide for Aboriginal cultural values and uses of waterways, as well as social and recreational values and uses of waterways.

This aligns with guidance in the Basin-wide environmental watering strategy to look for opportunities to support complementary social and economic outcomes when planning and delivering environmental water where environmental outcomes are not compromised.

Waterway managers work with communities to identify the environmental, social, cultural and economic values of waterways through regional waterway strategies, EWMPs and seasonal watering proposals. Environmental water managers will continue to work with stakeholders to achieve shared or complementary benefits from environmental watering, as per the engagement principles outlined in Chapter 6 of the VWMS (DEPI, 2013a). More information can be found in Chapter 12 of the Victoria's North and Murray Water Resource Plan (DELWP, 2019a).

In 2025, 'Water for Country – Guidance provided by and for Traditional Owners Making Proposals for the Use of Environmental Water in Victoria' was released. This provides guidance co-developed with Traditional Owners, for Traditional Owners to submit proposals for the use of environmental water in Victoria. Water for Country provides a new pathway for involving Traditional Owners in how environmental water is accessed and managed; supporting this pathway will strengthen how cultural values are considered (in the context of the *Water Act 1989* (Vic)) and understood in relation to environmental, social, economic and, health and wellbeing outcomes for Country and all people. The approach to Water for Country is to learn together and to learn by doing.

Caring for Country by accessing environmental water through a seasonal watering proposal is one tool that Traditional Owners can now use, that sits within a broad range of healing and caring for Country initiatives. Environmental water may work or align closely with cultural water (Figure 6).

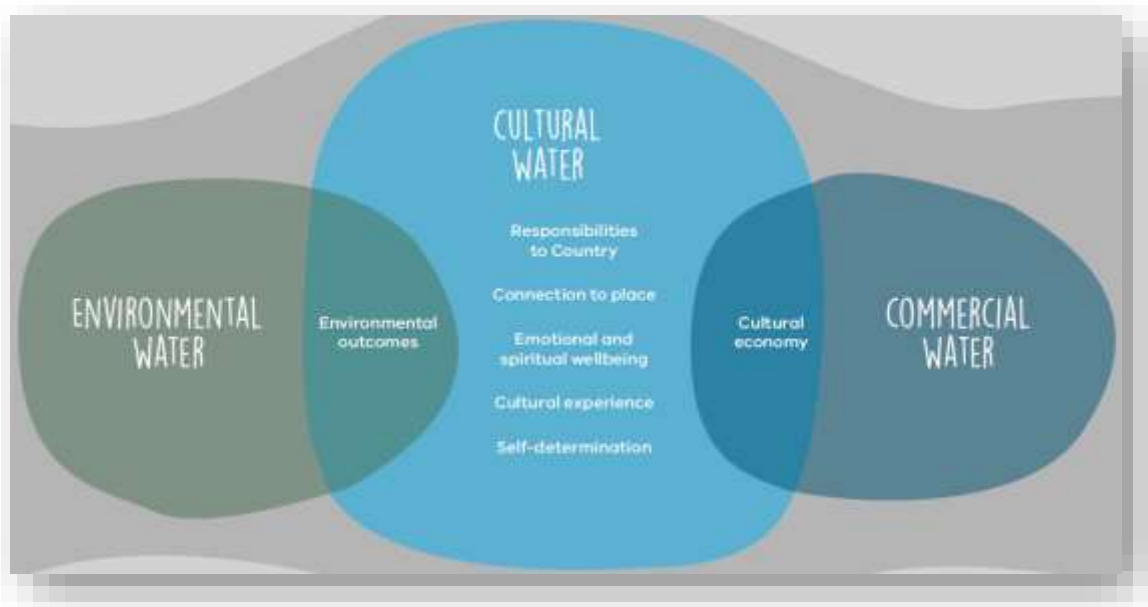


Figure 6. Cultural Water outcomes, from Water is Life (DELWP, 2022a)

2. Water resource plan area

The Victorian Murray water resource plan area covers a broad range of aquatic environments from the highlands in the far east, to the drier mid-Murray in the far west. It includes the downstream reaches of many northern Victorian tributaries and numerous floodplain wetlands along the Murray River. Some river systems are fully contained within the water resource plan area; others begin in a different water resource plan area and flow north into this one. Waterways in this water resource plan area are managed by North East, Goulburn Broken, North Central or Mallee CMA.

2.1 Features of the Victorian Murray water resource plan area

The Victorian Murray water resource plan area (Figure 7) extends from Omeo in the far east of Victoria to the South Australian border in the north west of the state. The water resource plan area can be characterised by two distinct regions. The first of these regions comprises the Victorian rivers and tributaries flowing into the Murray River upstream of Albury. The second region comprises the lower reaches of tributaries from the Northern Victoria water resource plan area and the anabranches and floodplain wetlands along the length of the Murray River to the South Australian border.

2.1.1 Topography

The topography of the region varies between the highly undulating valleys in the northeast, down to the floodplains of the Murray River. The highest point in the water resource plan area is Mt Bogong, Victoria's highest peak at 1,986 metres above sea level, and the lowest point on the floodplains near Mildura below 50 m above sea level (Figure 8). The eastern part of the region has elevations ranging from 150 to almost 2000 m AHD (at Mt Bogong), while the Murray floodplain area gradually drops from 150 to less than 30 m AHD. Figure 8 presents the (relative) topography in the Victorian Murray water resource plan area.

2.1.2 Geology, soils and land use

The upper Murray area landscape is dominated by the key industries of dairy, beef, wool, cropping and horticulture. Over 55% of the North East (the area defined by the North East CMA) is public land. This includes over 200 parks and reserves, used for a variety of biodiversity, eco-tourism and recreational fishing activities. The Murray floodplain area also has some areas of public conservation land, coupled with large areas of irrigated agriculture.

The Murray River floodplain area is largely comprised of alluvium and incised alluvium geology units. The Upper Murray area is comprised of a mixture of sandstone and granite areas (Adaminaby Group, Omeo Metamorphic Complex, Early Devonian Granite, and Silurian Granite).

2.1.3 Rainfall distribution

The climate for the Victorian Murray is quite varied as it extends over a large geographic area. In the upper ranges, the average annual rainfall is up to 2,000 mm in some areas and drops to below 300 mm near Mildura. The rainfall occurs throughout the year, with the highest monthly averages in winter in the upper ranges and in spring in the vicinity of Mildura (BoM, 2025).

2.1.4 Waterways as living and connected entities

The numerous waterways of the Victorian Murray water resource plan area lie in the two surface water SDL resource units of the regulated Victorian Murray (SS2), and the unregulated system of the Kiewa (SS3).

Water is Life commits to recognition of waterways and their surrounding land as living, integrated, natural and cultural entities in law, with Traditional Owners recognised as a unique 'voice' of the living entities (DELWP, 2022a). Waterways and Country are a connected system. This connection is more than physical, and includes connection to community wellbeing, to culture, and to identity. Water is the lifeblood of Country and waterways are the basis for many creation stories. The Victorian Government is committed to reforms that reinforce the link between waterway management and caring for Country.

These waterways provide environmental, economic, social and cultural benefits. The environmental condition of the waterways is the result of historic and enduring land and waterway management practices such as land clearing, urban development, agriculture on floodplains and regulated water regimes for water supply.

It is not intended that these streams be restored to a pre-colonisation state but be managed as ‘working rivers’ with agreed sustainable levels of modification and use (DEPI, 2013a).

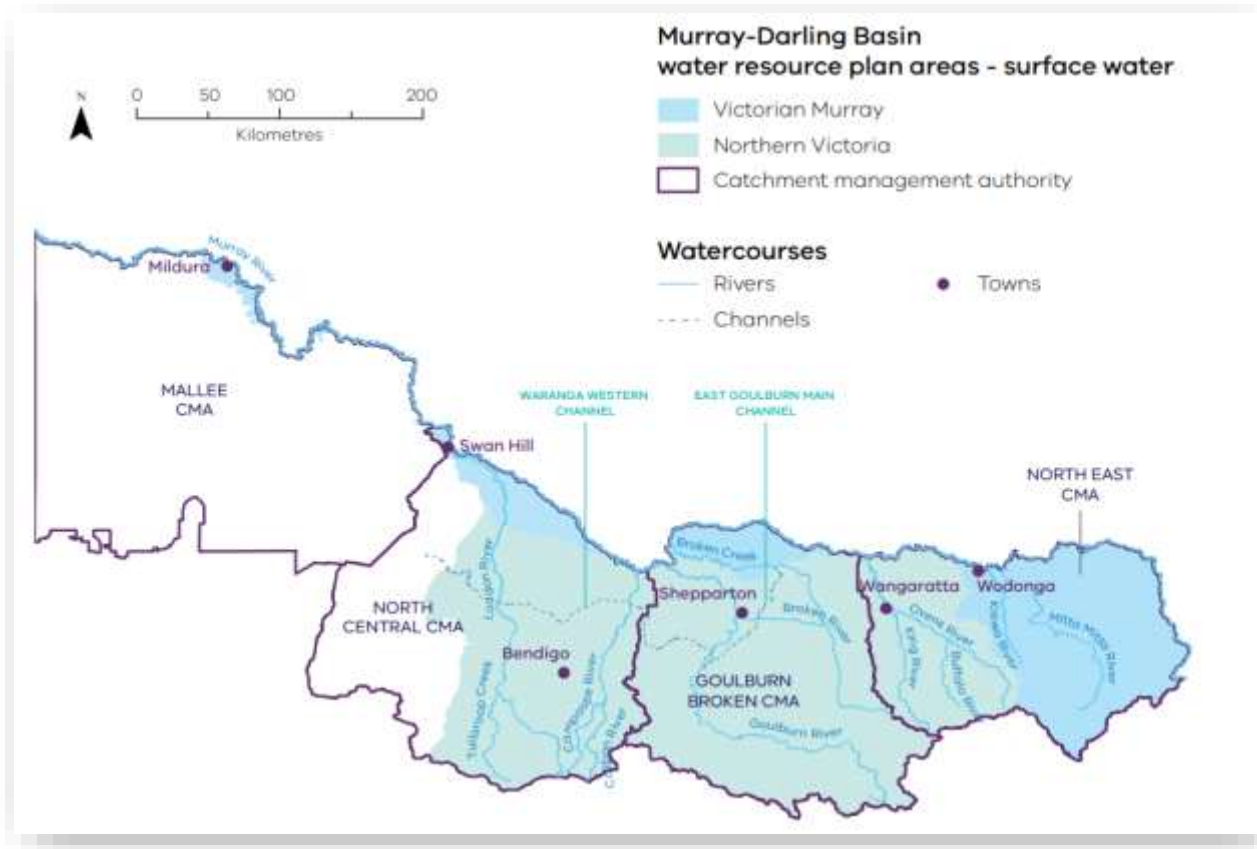


Figure 7. Victorian Murray and Northern Victorian water resource plan areas showing catchment management authority boundaries

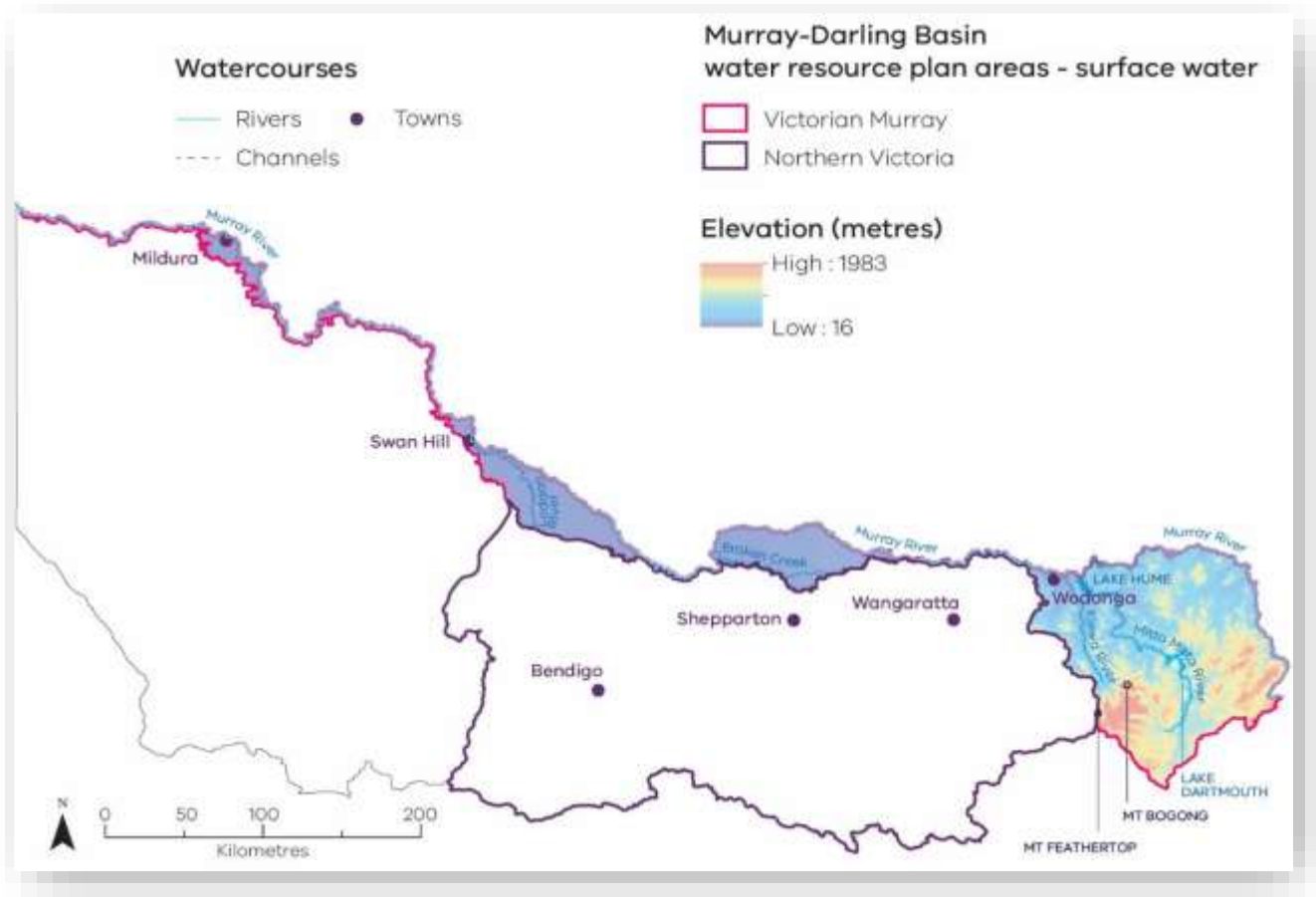


Figure 8. Topography across the Victorian Murray water resource plan area

2.2 Significant ecological values of the Victorian Murray water resource plan area

The Victorian Murray water resource plan area contains a myriad of extensive riverine, floodplain and wetland systems connected to the Murray River. The area includes four Ramsar sites: Barmah Forest, Gunbower Forest, Hattah-Kulkyne Lakes and Kerang Wetlands. The first three sites are also TLM Icon Sites, along with Lindsay, Mulcra and Wallpolla Islands. There are also other wetlands along the Murray and the lower reaches of the Broken Creek and the Loddon River that are recognised as nationally important.

In January 2026, a new threatened ecological community 'River Murray – Darling to Sea' was listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*. This community lies partially within the Victorian Murray water resource plan area, on the Victorian side of the confluence of the Darling and the Murray Rivers near Wentworth (Lock 10).

The information below focuses on the priority environmental assets that receive held environmental water (HEW) and are managed for environmental outcomes.

Significant water-dependent ecological values in the Victorian Basin are listed in the 2025 Matter 8 reporting (DEECA, 2024b).

The following sections contain information from the Index of Stream Condition which was last completed in 2013. An update is currently in scope for completion by 2028 which will inform a future update to LTWPs. While conditions in many systems may not have changed, we acknowledge that the information informing these assessments is not current.

2.2.1 Ramsar Wetlands

Ramsar sites are formally recognised for containing representative, rare or unique wetlands, or for being wetlands that are internationally important for conserving biodiversity. A wetland must satisfy one or more of the criteria for identifying wetlands of international importance to be designated to this list.

National guidelines are being developed to provide clear guidance on how Ramsar sites must be managed, under both the Ramsar Convention and Commonwealth Environment Protection and Biodiversity Conservation Act. A key component includes monitoring of a site's ecological character description, which is a baseline of wetland condition at the time of its listing as a wetland of international importance. The ecological character descriptions of all Australia's Ramsar-listed wetlands are at <http://www.environment.gov.au/water/wetlands/publications>.

The Basin Plan requirements for states in regard to Ramsar sites are:

- Declared Ramsar wetlands that depend on Basin water resources maintain their ecological character (section 8.05 (2a) of the Basin Plan).
- A declared Ramsar wetland is an environmental asset that requires environmental watering (Schedule 8 Criteria for identifying an environmental asset).
- Declared Ramsar wetlands have sufficient water quality to maintain the ecological character of those wetlands (section 9.04 (1) of the Basin Plan).

There are also water quality targets for declared Ramsar wetlands under Schedule 11 to the Basin Plan – Target values for target application zones.

These requirements are fulfilled in Victoria's water quality and salinity management plans in Appendix A of Victoria's North and Murray Water Resource Plan (DELWP, 2019a).

Implementation of the Basin Plan contributes to maintaining the ecological character of Ramsar wetlands. Section 5.02 of the Basin Plan states that the Basin Plan aims to give effect to international agreements, such as the Ramsar Convention, through an integrated approach to water management. Section 8.05 of Basin Plan further specifies that water dependent ecosystems are to be protected and restored, in part, by ensuring that declared Ramsar wetlands maintain their ecological character. As noted in the Basin Plan, provision of environmental water needs to be supported by other management actions. It is the responsibility of jurisdictions to maintain the ecological character of Ramsar wetlands through various strategies, investment, partnerships and on-ground actions.

As noted above, the Victorian Murray water resource plan area has four Ramsar sites²: Barmah Forest, Gunbower Forest, Hattah-Kulkyne Lakes and Kerang Wetlands. The watering regime is a critical component to support the ecological character of these sites; altered flow regime(s) caused by water resource use and climate change are noted as a high-risk threat, particularly for adverse effects on river red gum forests and woodlands and native fish abundance and diversity³. Managing the current and potential future impacts of threats is addressed in site management plans prepared for each Ramsar site. Strategies to address water regime and climate change threats include:

- Continuing to develop and implement environmental watering proposals to maintain the ecological character of the Ramsar site.
- Working with partner agencies to remove barriers to the passage of native fish, turtles and other aquatic species in waterways of the Ramsar site.
- Working with partner agencies to identify opportunities and options for managing environmental water in a changing climate.

The Ramsar site management plans also identify strategies to deal with other high-risk threats related to invasive plant and animal species.

Barmah Forest (along with the Millewa Forest across the river in NSW) is the largest river red gum forest in Australia and considered the most intact freshwater floodplain system along the Murray River. It supports a broad range of floodplain vegetation communities including river red gum forest and woodland and large, open wetlands, including once extensive Moira grass plains. The forest is an important feeding and breeding

² Kerang Wetlands are Ramsar-listed and located in the Avoca and Loddon River catchments but are watered from the Murray River and so are included in the Victorian Murray LTWP.

³ YYTOLMB (2020), NCCMA (2014), MCMA (2014), NCCMA (2017)

site for waterbirds, particularly colonial nesting species, including egrets, spoonbills, ibis, bitterns and night herons, as well as for frogs and turtles. When inundated, the forest creeks and wetlands support a diverse assemblage of native fish, including Murray-Darling rainbowfish, Australian smelt, carp gudgeon, unspotted hardyhead, Murray cod, trout cod and silver perch.

Gunbower Forest (along with the Koondrook-Perricoota Forest across the river in NSW) is the second-largest river red gum forest in Australia. It supports a range of important environmental values including diverse and rare wetland habitats, threatened plant and animal species and large areas of remnant vegetation communities (such as river red gum forest). The forest provides a diversity of habitats for birds and supports several migratory waterbirds protected under international agreements. Breeding events of colonial nesting waterbirds have been recorded in response to unregulated flooding and environmental water deliveries. Gunbower Forest wetlands support a diverse small-bodied fish community including a number of threatened species that have been reintroduced through conservation stocking, including southern pygmy perch, southern purple-spotted gudgeon and olive perchlet.

Gunbower Creek is an integral part of the Gunbower system, providing important habitat for native fish including Murray cod, golden perch, silver perch, trout cod and freshwater catfish. The creek is a valuable refuge and provides a source population for surrounding connected waterways with a number of fishways providing connectivity along Gunbower Creek, and with the Murray River.

Hattah-Kulkyne Lakes comprises more than 20 perennial and intermittent freshwater floodplain lakes, set in an arid landscape. Flood-dependent vegetation at Hattah-Kulkyne Lakes ranges from wetland communities that require frequent flooding to those higher on the floodplain that require only periodic inundation (such as lignum and black box-dominated communities). The lakes are recognised for their waterbird breeding habitat and provide an important drought refuge for waterbirds including the spoonbill, egret, night heron, bittern, for migratory bird species and many ducks. Sixteen native fish species have been recorded in the lakes; three of these have conservation significance in Victoria (silver perch, Murray cod, and Murray-Darling rainbowfish).

Kerang Wetlands consists of 23 named lakes, marshes and swamps of varying area, depth and salinity that cover an area of 9,793 hectares and are part of a larger system of wetlands on the lower floodplains of the Murray, Loddon and Avoca Rivers. Vegetation communities including black box, river red gum, tangled lignum, chenopod shrubland, grassland and reedbeds, support over 150 native plant species and 102 native fauna species. More than 75 species of waterbird have been recorded at the site, with more than 50 species nesting and feeding, including several protected under international agreements. Fish species of conservation significance include Murray cod, Murray hardyhead, and silver perch.

2.2.2 The Living Murray (TLM) icon sites

The Victorian Murray area contains four TLM icon sites, including three of the Ramsar sites described above – Barmah Forest, Gunbower Forest and Hattah-Kulkyne Lakes (referred to as ‘Hattah Lakes’ under TLM). In addition, the Lindsay, Mulcra and Wallpolla Islands Icon Site, located west of Mildura, includes semipermanent and ephemeral waterways and wetlands that support a range of vegetation types including river red gum and black box woodlands and lignum shrublands, providing diverse habitat for frogs, turtles and waterbirds. Many of the creeks and streams provide flowing water habitat for native fish such as Murray cod, freshwater catfish, silver perch, Murray-Darling rainbowfish and unspotted hardyhead. When flooded, waterways and wetlands within this system provide important habitat for a range of wetland-dependent species including many waterbirds (e.g. great egret and red-necked stint).

TLM sites also hold significant cultural values. Cultural and ecological values are supported by Traditional Owners through the Indigenous Partnership Program.

2.2.3 Central Murray wetlands

The Central Murray wetlands refer to 10 separate wetlands that are all wetlands of regional or international significance on the lower Loddon River and Murray River floodplains. The Central Murray wetlands include Guttrum Forest (Reed Bed Swamp Complex), Hird Swamp, Johnson Swamp, Kunat Kunat (Round Lake), Lake Cullen, Lake Elizabeth, Lake Murphy, McDonald Swamp, Richardson’s Lagoon and Third Reedy Lake. These wetlands are considered highly significant, supporting several vulnerable or endangered species such as the Murray hardyhead and the growling grass frog, and are highly productive for waterbird feeding and breeding with a number of waterbird species listed under legislation and international agreements, including the Australasian bittern, great egret and white-bellied sea eagle.

2.2.4 Lower Murray wetlands

The lower Murray wetlands are located in the linear floodplain along the Murray River from Swan Hill to the South Australian border and include Nyah and Vinifera, Bottle Bend Wetlands, and Neds Corner. There are a wide variety of wetland types, and depending on their location in the landscape, the interaction with groundwater, and their management history, wetlands may be permanent, temporary, fresh or saline. These differences in water regime and water quality provide a diverse range of habitats for different plants and animals. The dominant tree species found at most wetland sites are river red gum and black box. These trees form significant forests on the floodplain which provide habitat, particularly for birds, reptiles and mammals.

2.2.5 Lower Broken Creek

The Broken Creek diverges from the Broken River downstream of Benalla and enters the Murray River near Barmah Forest. Only the Lower Broken Creek, downstream of the confluence with Boosey Creek near Katamatite, is considered in this LTWP. The Upper Broken Creek is considered as part of the Northern Victorian LTWP (in the broader Broken River catchment).

The Lower Broken Creek is largely characterised by River red gum and box-dominated riparian vegetation and plains grassy woodlands, which support numerous threatened species of state and national conservation significance including Eastern Great Egret. The lower section of the creek runs through the Ramsar-listed Barmah Forest.

The existing Index of Stream Condition (third benchmark) results indicated the Lower Broken Creek to be in primarily moderate environmental condition (DEPI, 2013b).

Water for the environment is provided to Lower Broken Creek via outfalls from irrigation areas.

3. Priority environmental assets within the Victorian Murray water resource plan area

Priority environmental assets listed in this LTWP are water-dependent ecosystems that can be managed with environmental water and meet one or more of the criteria listed in Basin Plan Schedule 8 (see Glossary). An asset may be a single wetland or waterbody (e.g. Johnson Swamp), a wetland complex (e.g. Barmah Forest), or a river/creek (e.g. Gunbower Creek). Asset locations are shown in Figure 9 and listed in Table 3. Wetlands and floodplains which lie in the Wimmera-Mallee water resource plan area but source water from the Murray are considered PEAs for the Victorian Murray LTWP. Assets listed in the BWS as important for environmental outcomes are listed in Table 2.

It is important to note that the priority rivers in Table 3 are regulated and have HEW; this plan seeks to guide use of HEW to meet objectives and targets. There are also unregulated rivers within the water resource plan area that have important environmental values. However, in unregulated systems, there is no HEW to manage for specific environmental outcomes, so the aim for unregulated rivers is to maintain existing arrangements (e.g. conditions regulating the take of water through Bulk Entitlements and licences, see section 5.1.3).

Note that significant values have been identified by Traditional Owners in individual nation statements published in Victoria's North and Murray Water Resource Plan (DELWP, 2019a) chapter 8 and Appendix F, and Water is Life: Traditional Owner Access to Water Roadmap – Section B: Traditional Owner Statements (DELWP, 2022a).

Table 2. Important Basin environmental assets within the Victorian Murray, as listed in the Basin-wide Environmental Watering Strategy.

BWS outcome	Victorian Murray sites	Identified as PEA	Comment
Connectivity	Loddon, Broken, Kiewa	Yes except Kiewa River	River and wetland PEAs have been identified in these systems. The Kiewa is not identified as a PEA as it cannot be managed with HEW or PEW – refer to section 5.1.2
Vegetation	Broken Creek, Loddon, Murray	Yes	River and wetland PEAs have been identified in these systems
Waterbirds	Murray, Barmah, Gunbower, Lindsay, Wallpolla, Kerang Wetlands, Hattah Lakes	Yes	
Native Fish	Kerang Lakes, Murray, Lindsay-Wallpolla-Mullaroo Creek, Hattah Lakes, Gunbower, Barmah, Upper Mitta River, Broken Creek	Yes except Mitta Mitta River	Mitta Mitta River cannot be managed with HEW or PEW – refer section 5.1.2

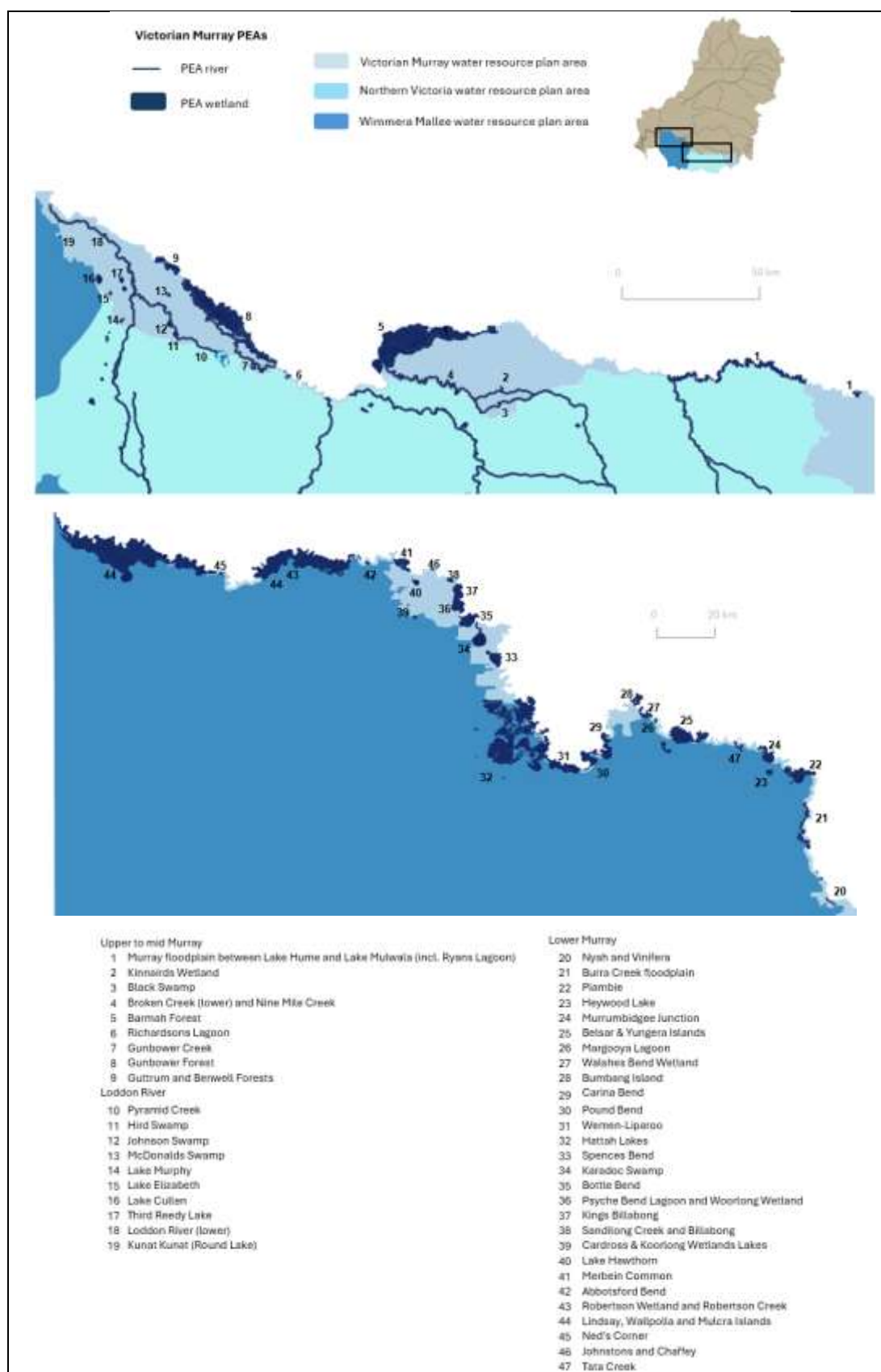


Figure 9. Priority environmental assets within the Victorian Murray water resource plan area

Table 3. Priority environmental assets in the Victorian Murray water resource plan area

* refer to Appendix J

Map no. (figure 9)	Asset Name	Catchment	Asset Manager	Basin Plan Schedule 8 Criteria *	Asset Characteristics
Upper to mid Murray					
1	Murray Floodplain between Lake Hume and Lake Mulwala (including Ryans Lagoon)	Murray	North East CMA	3 4 5	EPBC Act, FFG Act Directory of Important Wetlands
2	Kinnairds Wetland	Broken	Goulburn Broken CMA	2 3 4 5	Some deep freshwater marsh remains. FFG Act, EPBC Act Supports significant levels of native biodiversity and supports EVC 125 - plains grassy wetland - endangered community within the basin.
3	Black Swamp	Broken	Goulburn Broken CMA	2 4	EVC 292 red gum swamp - vulnerable JAMBA, CAMBA, Bonn Convention FFG Act, EPBC Act
4	Lower Broken and Nine Mile Creeks	Broken	Goulburn Broken CMA	3 4 5	Pathway for migration, movement of native water-dependent biota Endangered & vulnerable EVCs EPBC, FFG, vulnerable & endangered Victorian advisory listing
5	Barmah Forest	Murray	Goulburn Broken CMA	1 3 4 5	Ramsar, JAMBA, CAMBA, ROKAMBA, Bonn Convention important breeding, nursery & feeding habitat – waterbirds & native fish EPBC Act, FFG Act Supports significant numbers of native water-dependent species
6	Richardsons Lagoon	Murray	North Central CMA	1 3 4	CAMBA Plains woodland, EVC 103 - riverine chenopod woodland - endangered FFG Act

Map no. (figure 9)	Asset Name	Catchment	Asset Manager	Basin Plan Schedule 8 Criteria *	Asset Characteristics
7	Gunbower Creek	Murray	North Central CMA	1 3 4	JAMBA, CAMBA, ROKAMBA Important waterbird & native fish feeding & breeding habitat EPBC Act, FFG Act, threatened species Capable of supporting significant water dependent species 19 EVCs
8	Gunbower Forest	Murray	North Central CMA	1 2 3 4	Ramsar, JAMBA, CAMBA, ROKAMBA, BONN EVC 103 – riverine chenopod woodland - endangered. Large deep pools - drought refuge, triggers breeding EPBC Act, FFG Act Supports significant numbers of water dependent species.
9	Guttrum and Benwell Forests	Murray	North Central CMA	1 3 4	Semi-permanent wetlands, or swamps, are characterised by open water, marshland, reed bed and herbland vegetation, fringed with river red gum. EPBC Act, FFG Act Supports significant numbers of water dependent species
Loddon River					
10	Pyramid Creek	Loddon	North Central CMA	1 2 3 4 5	JAMBA, CAMBA, ROKAMBA, Bonn Convention High instream woody habitat values - critical habitat component for river blackfish Deep pools – critical drought refuge Provides connectivity to facilitate migration, movement and dispersal EPBC Act, FFG Act Supports significant levels of native biodiversity Endangered EVCs
11	Hird Swamp	Loddon	North Central CMA	1 3 4	Ramsar, RCW, JAMBA, CAMBA, Deep freshwater marsh - critical drought refuge EPBC Act, FFG Act Range of habitats through Hird Swamp, including open water, reed dominated areas and lignum habitats - highly valued and important wetland

Map no. (figure 9)	Asset Name	Catchment	Asset Manager	Basin Plan Schedule 8 Criteria *	Asset Characteristics
12	Johnson Swamp	Loddon	North Central CMA	1 3 4	Ramsar, JAMBA, CAMBA, ROKAMBA, BONN, EPBC Act, FFG Act Highly valuable wetland habitat including tall marsh
13	McDonalds Swamp	Loddon	North Central CMA	1 4	JAMBA, CAMBA, ROKAMBA, BONN EPBC Act, FFG Act Range of habitats including open water, reed dominated areas and lignum habitats - highly valued and important wetland
14	Lake Murphy	Loddon	North Central CMA	1 3 4 5	JAMBA, CAMBA, ROKAMBA, Bonn Convention Significant waterbird breeding & feeding habitat EPBC Act, FFG Act 9 EVCs
15	Lake Elizabeth	Loddon	North Central CMA	1 4	Ramsar, JAMBA, CAMBA, ROKAMBA, BONN EPBC Act, FFG Act Important waterbird habitat and drought refuge Supports endangered species Murray hardyhead
16	Lake Cullen	Loddon	North Central CMA	1 3 4 5	Ramsar, JAMBA, CAMBA, ROKAMBA, BONN EPBC Act, FFG Act Highly valued wetland particularly for waterbird habitat
17	Third Reedy Lake	Loddon	North Central CMA	1 3 4	Ramsar, EPBC Act, FFG Act Depleted EVC 813 – Intermittent Swampy Woodland and EVC 821 – Tall Marsh Freshwater wetland with dominant river red gum, black box and Lignum communities
18	Loddon River (lower – from Kerang Weir to the Murray)	Loddon	North Central CMA	1 2 3	JAMBA, CAMBA, ROKAMBA, Bonn Convention High instream woody habitat values - critical habitat component for river blackfish

Map no. (figure 9)	Asset Name	Catchment	Asset Manager	Basin Plan Schedule 8 Criteria *	Asset Characteristics
				4 5	Deep pools – critical drought refuge Provides connectivity to facilitate migration, movement and dispersal EPBC Act, FFG Act Supports significant levels of native biodiversity Endangered EVCs
19	Kunat Kunat (Round Lake)	Loddon	North Central CMA	1 2 3 4 5	JAMBA, CAMBA, ROKAMBA, Bonn Convention EPBC Act, FFG Act Wetland of regional significance Permanent saline wetland High biodiversity Supports endangered species Murray hardyhead
Lower Murray					
20	Nyah and Vinifera	Murray	Mallee CMA	2 4	EPBC listed Regent parrot and FFG listed Murray-Darling carpet python are indirectly dependent on water, i.e. they require riparian trees, vigorous ground cover and fallen timber EPBC Act, FFG Act
21	Burra Creek floodplain (Burra Creek North, Burra Creek South, Burra Creek South Proper)	Murray	Mallee CMA	1 4 5	CAMBA, JAMBA EPBC Act, FFG Act Ecological communities which would support high level of biodiversity as a result of environmental watering.
22	Piambie (Bridge creek, Fishers Lagoon, Piambie Bend East, Piambie Bend West)	Murray	Mallee CMA	1 4 5	CAMBA EPBC Act, FFG Act EVC 103 riverine chenopod woodland - endangered

Map no. (figure 9)	Asset Name	Catchment	Asset Manager	Basin Plan Schedule 8 Criteria *	Asset Characteristics
23	Heywood Lake	Murray	Mallee CMA	1 3 4 5	JAMBA, CAMBA, ROKAMBA Listed as a nationally important wetland in the Directory of Important Wetlands in Australia (DIWA) Vulnerable wetland EVCs EPBC Act, FFG Act, Supports high level of biodiversity
24	Murrumbidgee Junction (including Bidgee Lagoons, Wakool Creek)	Murray	Mallee CMA	1 3 5	JAMBA, CAMBA Water dependent species which will benefit from the wetlands in the target area receiving water EPBC Act, FFG Act EVC 103 riverine chenopod woodland - endangered, 809 floodplain grassy wetland - endangered
25	Belsar and Yungera Islands (Lakes Carpul & Powell, J1 Creek Complex, Yungera Wetland Complex)	Murray	Mallee CMA	4 2	FFG Act, EPBC Act EVC 103 riverine chenopod woodland - endangered
26	Margooya Lagoon	Murray	Mallee CMA	1 4	JAMBA, CAMBA, ROKAMBA EPBC Act, FFG Act
27	Walshes Bend	Murray	Mallee CMA	4 5	EPBC Act, FFG Act Thirteen Ecological Vegetation Classes (EVC's) occur at Walshes Bend. Four of these are listed as vulnerable within the Robinvale Plains bioregion
28	Bumbang Island	Murray	Mallee CMA	1 5	EPBC Act, FFG Act Providing appropriate water requirements to support the vegetation communities will support habitat for birds that have adapted to the flooding and drying cycle
29	Carina Bend	Murray	Mallee CMA	4 5	EPBC Act, FFG Act Diverse range of water dependent flora and fauna species

Map no. (figure 9)	Asset Name	Catchment	Asset Manager	Basin Plan Schedule 8 Criteria *	Asset Characteristics
30	Pound Bend (including Brown Swamp, Western Wetlands, Tammit Wetland)	Murray	Mallee CMA	1 3 4 5	JAMBA, CAMBA The movement of species of fish, invertebrates and amphibians is driven by floodplain and wetland connectivity. The site is important for specific dispersal and connectivity functions. EPBC Act, FFG Act High fauna biodiversity
31	Wemen-Liparoo	Murray	Mallee CMA	3 4 5	Contains a floodplain wetland complex of four wetlands which are categorised as deep freshwater marsh, shallow freshwater marsh and permanent open freshwater EPBC Act, FFG Act A high level of ecological communities exist within the site (9 EVCs)
32	Hattah Lakes	Murray	Mallee CMA	1 3 4	Ramsar, JAMBA, CAMBA, ROKAMBA Linkage enables movement and dispersal of biota between floodplain and terrestrial bioregions EPBC Act, FFG Act. High value drought refuge for wetland dependent waterbirds High level of biodiversity
33	Spences Bend (including Bullock Swamp North and South, Callanders Swamp, Spences Bend Billabong)	Murray	Mallee CMA	1 3 4 5	CAMBA Dominated by lignum which becomes an extensive aquatic habitat for fish, reptiles and macroinvertebrates when inundated EPBC Act, FFG Act Six bird species which are considered water-dependent because they forage or nest in or over water, or require flooding to trigger breeding and fledging (eastern regent parrot) 12 EVCs
34	Karadoc Swamp (including Outlet Creek, Inlet Creek, Karadoc)	Murray	Mallee CMA	1 3 4 5	JAMBA, CAMBA, ROKAMBA, BONN High habitat diversity EPBC Act, FFG Act Supports significant biodiversity

Map no. (figure 9)	Asset Name	Catchment	Asset Manager	Basin Plan Schedule 8 Criteria *	Asset Characteristics
35	Bottle Bend	Murray	Mallee CMA	1 2 4	JAMBA, CAMBA, ROKAMBA, BONN EVC 292 red gum swamp - vulnerable FFG Act, EPBC Act
36	Psyche Bend Lagoon and Woorlong Wetland	Murray	Mallee CMA	4 5	EPBC Act, FFG Act Recognised as a significant conservation area
37	Kings Billabong (including Butlers Creek, Ducksfoot Lagoon, Baggs Lagoon)	Murray	Mallee CMA	1 4 5	JAMBA, CAMBA EPBC Act, FFG Act Supports significant biodiversity Listed as a nationally important wetland in the Directory of Important Wetlands in Australia (DIWA)
38	Sandilong Creek and Billabong	Murray	Mallee CMA	1 4 5	JAMBA, CAMBA, ROKAMBA, BONN EPBC Act, FFG Act Important ecological vegetation communities that support a range of fauna including listed species Significant freshwater catfish population
39	Cardross & Koorlong Lakes (Cardross Lakes Basin 1 West, Cardross Lakes Basin 1 East, Koorlong Lake)	Murray	Mallee CMA	1 3 4 5	JAMBA, CAMBA Significant water depth, good water quality and diversity of aquatic habitat EPBC Act, FFG Act High fauna diversity. Good water quality and diversity of aquatic habitat.
40	Lake Hawthorn	Murray	Mallee CMA	1 4 5	JAMBA, CAMBA, ROKAMBA EPBC Act, FFG Act High level of biodiversity
41	Merbein Common (including Cowanna Billabong, Brickworks Billabong, Catfish Billabong)	Murray	Mallee CMA	1 3 4 5	JAMBA, CAMBA Waterbird breeding habitat EPBC Act, FFG Act Water-dependent and migratory species

Map no. (figure 9)	Asset Name	Catchment	Asset Manager	Basin Plan Schedule 8 Criteria *	Asset Characteristics
42	Abbotsford Bend (Cowra Rocks Wetland, Darling Junction Wetland and Darling Junction Creeks)	Murray	Mallee CMA	1 3 4 5	JAMBA, CAMBA, ROKAMBA, BONN, EPBC Act, FFG Act High diversity of waterbirds, breeding habitat for listed species, providing longitudinal connection to the Murray River and its floodplains, as well as lateral connection into the semi-arid Mallee environment 4 depleted EVC, including river red gum community
43	Robertson Wetland and Robertson Creek	Murray	Mallee CMA	3	Important aquatic macrophytes, riparian and floodplain vegetation – river red gum black box, cane grass, lignum Refuge and feeding shallow-water habitat for frogs and birds
44	Lindsay, Mulcra and Wallpolla Islands	Murray	Mallee CMA	1 3 4 5	JAMBA, CAMBA, ROKAMBA, BONN Providing longitudinal connection to the Murray River and its floodplains, as well as lateral connection into the semi-arid Mallee environment EPBC Act, FFG Act Important as habitat for both nomadic and migratory waterbirds. 17 water dependent EVCs are present
45	Ned's Corner (including Ned's Corner Central and Ned's Corner East/Musk Duck Wetland)	Murray	Mallee CMA	3 4	EPBC Act, FFG Act EVC 806 – alluvial plains semi-arid grassland & EVC 104 – lignum swamp; vulnerable
46	Johnsons and Chaffey Bends	Murray	Mallee CMA	4 5	FFG Act Important ecological vegetation communities that support a range of fauna including listed species
47	Tata Creek (including Racecourse Wetland, Tata Wetland, Tata South)	Murray	Mallee CMA	1 3 4 5	CAMBA Includes species that forage or nest in or on water or require flooding to trigger breeding and fledging EPBC Act, FFG Act Regent parrot, which is indirectly dependent on water as they require healthy river red gum and black box for nesting habitat

3.1 Changes to priority environmental assets since the previous LTWP

Updates to priority environmental assets since the 2021 LTWP are outlined at Table 4.

Ten assets are no longer considered priority environmental assets in the Victorian Murray, as they either do not receive held or planned environmental water, or they are now incorporated into other assets (i.e. as part of a wetland complex priority environmental asset). Two new assets are now included in this update of LTWP as they receive held environmental water. Two new stand-alone assets are also included as priorities.

Assets will continue to be re-assessed in future iterations of the LTWP.

Table 4. Changes to priority environmental assets (PEA) since 2021 LTWP

Removed from PEA list as not currently managed with held or planned environmental water
Murray River Lock 15 and Murray River Lock 6-10 are weir pool connected; environmental flows pass through, but the weirs are not specifically managed with environmental water for environmental outcomes. Mallee CMA are considering how to include these sites in their PEAs via a review of their environmental water planning.
Lake Ranfurly was previously a part of the PEA titled Lake Hawthorn and Lake Ranfurly, but is no longer watered. Mallee CMA focus watering efforts now to a target area at Lake Hawthorn. Lake Ranfurly is not within the watering target area as it is primarily used as an evaporation basin for the Mildura-Merbein Groundwater Interception Scheme.
Wirra-Lo Wetlands are no longer a PEA for this LTWP as these wetlands are no longer watered under the Victorian environmental watering framework (refer to section 8.9 Private land watering). Any future use of VEWH entitlements at the site is subject to seasonal watering proposals submitted by NCCMA.
Removed from PEA list as no longer standalone priority environmental assets, and are now incorporated into other assets
Brickworks Billabong and Cowana Billabong are now part of the Merbein Common asset.
Butlers Creek (Baggs and Ducksfoot Lagoon) is now part of the Kings Billabong asset.
Lake Carpul is now part of Belsar & Yungera Islands (Lakes Carpul & Powell, J1 Creek Complex, Yungera Wetland Complex) asset.
Lake Powell is now part of Belsar & Yungera Islands (Lakes Carpul & Powell, J1 Creek Complex, Yungera Wetland Complex) asset.
Lake Koorlong is now part of the Cardross & Koorlong Wetlands Lakes (Cardross Lakes Basin 1 West, Cardross Lakes Basin 1 East, Koorlong Lake) asset.
Added to PEA list as a new asset now receiving held environmental water
Robertson Wetland and Robertson Creek - located adjacent to Wallpolla Island, these assets are located near the Murray River with hydrology regulated by Murray River Lock 9 and 10. This asset was identified as a high priority for restoration, including environmental watering, due to its ecological and cultural significance. An EWMP has been drafted and is due for completion by late 2026.
Third Reedy Lake (Kerang Lakes) - one of the six permanent freshwater lakes that form part of the Kerang Lakes system in northern Victoria. The Kerang Lakes are designated as a Ramsar site and are listed in the Directory of Important Wetlands in Australia. Third Reedy Lake was bypassed as part of the GMW Connections Project and is to be rehabilitated by implementing a wetting and drying regime to return it to a deep freshwater marsh wetland. Environmental water is required to be delivered to meet the approval conditions of the Third Reedy bypass Project. Third Reedy Lake supports significant ecological values, recording high density of River Red Gums (<i>Eucalyptus camaldulensis</i>) and significant flora species.

Existing asset but not previously included in the 2021 LTWP as a standalone asset

Abbotsford Bend (Cowra Rocks Wetland, Darling Junction Wetland and Darling Junction Creeks):

- this asset was previously included in the LTWP under the Merbein Common PEA. Abbotsford Bend is located on the Murray River floodplain just upstream of the confluence of Darling River and Murray River. Its hydrology is influenced by upstream weirs and other river regulation but it supports a large diversity of species including internationally-listed threatened species and threatened ecological communities (e.g. Lignum Swampy Woodland).

Ryans Lagoon Wetland Complex

- consisting of Ryans Lagoon 1 and Ryans Lagoon 2, this asset was previously included under the asset Murray Floodplain between Lake Hume and Lake Mulwala. However, Ryans Lagoon is now managed and watered independently. The Ryans Lagoon Nature Conservation Reserve is managed by the Duduroa Dhargal Aboriginal Corporation (DDAC) along with Parklands Albury Wodonga Ltd. DDAC partner with North East CMA to water Ryans Lagoon to improve habitat for wetland plants, birds, frogs, turtles and fish, including EPCB and FFG listed species. An EWMP for Ryans Lagoon will be completed during 2026, removing it from the Murray Floodplain EWMP.

Confirming assets that were identified in previous LTWP as potential new PEAs

Kunat Kunat (Round Lake)

- this site is confirmed as a priority environmental asset for the LTWP, after being flagged in the previous Northern Victoria LTWP as under consideration for inclusion as a PEA. This asset is actually located in the Victorian Murray water resource plan area. This asset is one of the Central Murray wetlands which support numerous listed threatened species ranging from vulnerable to critically endangered including the Australasian bittern, Murray hardyhead, Australian painted snipe and growling grass frog. When the wetlands receive environmental water, they can attract prolific birdlife and provide feeding and breeding habitat for many threatened and endangered bird species (including the eastern great egret and white-bellied sea eagle) listed under legislation and international agreements.
-

3.2 Representativeness

An objective of the Basin Plan is to protect and restore a subset of all water-dependent ecosystems of the Murray-Darling Basin, and to support biodiversity by ensuring representative populations, communities and species are protected, and where necessary restored.

The Australian National Aquatic Ecosystems (ANAE) classification framework defines the distinct waterway types and their location in the Basin (Brooks, 2017)⁴. There are 47 ANAE wetland classifications identified in the Victorian Murray water resource plan area, and eight ANAE riverine classifications. These are outlined in Table 5 and 6 below.

Victoria has undertaken a representativeness assessment with the waterway type of each priority environmental asset in the Basin Plan area that are outlined in section 3. Each asset has been classified using the ANAE framework and compared to the total area of the relevant waterway type(s) at two different scales, for the entire Basin Plan area in northern Victoria and also for each water resource plan area. The ANAE mapping product was updated in 2021 (Brooks, 2021) with some minor changes and the representativeness assessment was updated for this LTWP update.

Broadly, most waterway types present in northern Victoria are represented by existing priority environmental assets. Some waterway types are well represented, particularly river red gum swamps, black box woodland riparian zones, and lignum shrubland riparian zones or floodplain, while others including clay pans, river red gum floodplains and mixed woodland floodplains are less well represented. Some of the sparsely represented types tend to be disconnected from water delivery channels or may occur at higher elevations and, as such, be difficult to water. Yet others (e.g. saltmarshes), would be damaged by addition of fresh water. For this LTWP update, the data provided by (Brooks, 2021) has been complemented with more recent

⁴ While this provided the basis for assessing the waterway types across the Basin that have received CEWH environmental water e.g. (Hale, 2020), Victoria uses a broader prioritisation process to select priority management areas (including sites that receive environmental water) that includes community values, and can be used for the southern (non-Murray Darling Basin) parts of the state (refer to DEPI, 2013a).

data for riverine ANAE types generated as part of an update to the ANAE classification (version 3.0). This data has been generated using more accurate slope attribute data, which has overcome many issues related to the coarse (raster) data used previously (S. Brooks, *Brooks.eco*, pers. comm.; see also Brooks et al., 2014).

Thirty-eight of the 47 ANAE wetland types recorded across the Victorian Murray are represented in the priority environmental assets for this water resource plan area (Table 5). These types are predominantly temporary river red gum swamp (27% of the priority environmental wetland assets), blackbox woodland riparian zone or floodplain (24%), and lignum shrubland riparian zone or floodplain (8%).

Of eight ANAE riverine types present across the Victorian Murray water resource plan area (Table 6), four types are present in the Victorian Murray priority environmental assets. These types include temporary low energy upland stream (62% of the priority environmental asset [river] length) and permanent low energy upland stream (34%).

ANAE types of individual priority environmental assets are listed in Appendix H.

Table 5. Representativeness of wetland priority environmental assets compared with Victorian Murray water resource plan area ANAE waterway types

Wetland ANAE Type	Victorian Murray WRPA		Victorian Murray PEAs	
	Area (ha)	% of total WRPA in this ANAE type	Area (ha)	% of total PEAs in this ANAE type
Pt1.1.2: Temporary river red gum swamp	36,733.50	20.2	34,856.00	26.6767
F1.8: Black box woodland riparian zone or floodplain	29,397.90	16.2	31,480.10	24.0930
F1.2: River red gum forest riparian zone or floodplain	23,520.20	13	13,818.30	10.5757
F1.4: River red gum woodland riparian zone or floodplain	11,844.30	6.5	11,060.40	8.4650
F2.2: Lignum shrubland riparian zone or floodplain	4,673.50	2.6	10,968.40	8.3946
F3.2: Sedge/forb/grassland riparian zone or floodplain	1,339.40	0.7	3,872.90	2.9641
Pt1.7.2: Temporary lignum swamp	1,130.20	0.6	3,179.90	2.4337
Pt1.2.2: Temporary black box swamp	6,473.40	3.6	3,164.00	2.4215
F1.12: Woodland riparian zone or floodplain	10,685.50	5.9	2,353.40	1.8012
Lt1.1: Temporary lake	378.2	0.2	1,746.70	1.3368
Pp4.2: Permanent wetland	3,947.30	2.2	1,727.60	1.3222
Rp1.4: Permanent lowland stream	5,705.90	3.1	1,597.10	1.2223
Pt2.3.2: Freshwater meadow	1,419.90	0.8	1,581.50	1.2104
F4: Unspecified riparian zone or floodplain	6,289.50	3.5	1,464.40	1.1208
Rt1.4: Temporary lowland stream	3,708.60	2	1,448.20	1.1084
Pst4: Temporary saline wetland	1,426.30	0.8	1,358.10	1.0394
Lp1.1: Permanent lake	3,890.50	2.1	944.7	0.7230
Pt2.1.2: Temporary tall emergent marsh	1,155.50	0.6	930.4	0.7121
Lst1.1: Temporary saline lake	1,511.10	0.8	892.8	0.6833
Pt1.6.2: Temporary woodland swamp	1,674.30	0.9	513.8	0.3932
Psp4: Permanent saline wetland	547.2	0.3	467.4	0.3577
Pt3.1.2: Clay pan	8,473.10	4.7	446.6	0.3418
Pp2.4.2: Permanent forb marsh	165.2	0.1	179.2	0.1371
Pt4.2: Temporary wetland	195	0.1	124.6	0.0954
Lsp1.2: Permanent saline lake with aquatic bed	181	0.1	93.7	0.0717
Pp2.1.2: Permanent tall emergent marsh	446.9	0.2	92.8	0.0710
F2.4: Shrubland riparian zone or floodplain	16.5	0	54.9	0.0420

Wetland ANAE Type	Victorian Murray WRPAs		Victorian Murray PEAs	
	Area (ha)	% of total WRPAs in this ANAE type	Area (ha)	% of total PEAs in this ANAE type
Pp2.3.2: Permanent grass marsh	39	0	44.5	0.0341
Psp2.1: Permanent salt marsh	100	0.1	41.7	0.0319
Pt2.2.2: Temporary sedge/grass/forb marsh	198.7	0.1	31.4	0.0240
F1.6: Black box forest riparian zone or floodplain	1,175.50	0.6	30.7	0.0235
Pp2.2.2: Permanent sedge/grass/forb marsh	35.1	0	29.5	0.0226
Rt1.2: Temporary transitional zone stream	2,857.20	1.6	25	0.0191
Rt1: Temporary stream	132.4	0.1	13.8	0.0106
Lsp1.1: Permanent saline lake	1,676.60	0.9	11.8	0.0090
Pu1: Unspecified wetland	6,289.50	3.5	8.3	0.0064
Pt1.8.2: Temporary shrub swamp	582.5	0.3	4.3	0.0033
Rp1: Permanent stream	28	0	1.8	0.0014
Rt1.1: Temporary high energy upland stream	5,302.70	2.9	0	0.0000
Pst1.1: Temporary saline swamp	1,010.70	0.6	0	0.0000
Rp1.2: Permanent transitional zone stream	464.1	0.3	0	0.0000
Rt1.3: Temporary low energy upland stream	443.6	0.2	0	0.0000
Rp1.1: Permanent high energy upland stream	205.2	0.1	0	0.0000
Pst2.2: Temporary salt marsh	176	0.1	0	0.0000
Rp1.3: Permanent low energy upland stream	80.8	0	0	0.0000
Pst3.2: Salt pan or salt flat	49.2	0	0	0.0000
Pps5: Permanent spring	0	0	0	0.0000
Total	181,487 ha		130,661 ha	

Note: 'stream' categories in this table represent the lateral flow of streams into the surrounding floodplain.

Table 6. Representativeness of Victorian Murray riverine priority environmental assets compared with ANAE waterway type

Riverine ANAE Type	Victorian Murray WRPAs		Victorian Murray priority environmental assets	
	Length (km)	% Length within WRPAs of this ANAE type	Length (km)	% Length within PEA of this ANAE type
Rt1.4: Temporary lowland stream	1460.8400	12.1600	1278.3400	62.0700
Rp1.4: Permanent lowland stream	937.0600	7.8000	714.5800	34.7000
Rt1.2: Temporary transitional zone stream	1513.9500	12.6000	38.9900	1.8900
Rp1.2: Permanent transitional zone stream	241.4800	2.0100	27.6900	1.3400
Rt1.1: Temporary high energy upland stream	7381.3400	61.4200	0.0000	0.0000
Rp1.1: Permanent high energy upland stream	317.3100	2.6400	0.0000	0.0000
Rp1.3: Permanent low energy upland stream	115.4200	0.9600	0.0000	0.0000
Rt1.3: Temporary low energy upland stream	50.4800	0.4200	0.0000	0.0000
total	12,018 km		2,060 km	

3.3 Priority ecosystem functions in the Victorian Murray water resource plan area

Three ecosystem functions are prioritised for the Victorian Murray water resource plan area: longitudinal connectivity, water quality and refuges for waterbirds (Table 7), derived from those identified at the asset scale through EWMP objective setting for environmental watering. This is not a comprehensive list of all possible functions that may exist, either at the asset or the water resource plan area scale. These are functions which CMAs can manage using held environmental water and which have specific watering objectives.

The priority ecosystem functions in Table 7 meet the criteria in Basin Plan schedule 9. The individual assets associated with these functions are listed in Table 10 of section 4.3.

Table 7. Priority ecosystem functions in the Victorian Murray water resource plan area

Ecosystem Function	Schedule 9 criteria *	Function characteristics
PEF 1 – Longitudinal and lateral hydrological connectivity (between floodplains, anabranches and wetlands)	1 2 3 4	Supports creation and maintenance of vital habitats and populations Supports the transportation and dilution of nutrients, organic matter and sediment Provides connection along a watercourse (longitudinal connections) Provides connections across floodplains, adjacent wetlands and billabongs (lateral connections)
PEF 2 - Water quality (that allows for ecosystem processes)	1 2	Supports the creation and maintenance of vital habitats and populations Supports the transportation and dilution of nutrients, organic matter and sediment
PEF 3 - Refuges (for waterbirds and native fish)	1	Supports the creation and maintenance of vital habitats and populations

* refer to Appendix J

4. Objectives, targets and environmental watering requirements

This section outlines environmental objectives and targets, with watering requirements, for priority environmental assets and functions in the Victorian Murray water resource plan area.

4.1 Approach to developing objectives, targets and watering requirements

The objectives for this LTWP have been collated from the EWMPs, environmental flow studies, seasonal watering proposals, or other watering guides prepared by CMAs or Traditional Owners for priority environmental assets across the Victorian Murray water resource plan area (refer to Appendix B for full list of relevant plans). LTWP objectives sit beneath overarching management goals (section 4.2) and align with Basin Plan objectives, Basin-wide environmental watering strategy expected environmental outcomes, and First Nations objectives (section 4.3, Table 9). Targets were developed for selected objectives.

Objectives may be set in terms of ecological outcomes (e.g. specific biota or ecological functions) or the hydrological requirements (e.g. flow, depth, timing) of specific biota or functions. Only when objectives have been set can an appropriate watering regime be developed.

The approach to developing LTWP objectives, targets and watering requirements is described in Appendix C. The approach builds on the asset-scale information from EWMPs, which include site-specific environmental objectives and watering requirements. These were categorised, analysed and regrouped to build a set of ecological objectives suitable for the water resource plan area scale.

Targets developed for this LTWP are designed to be 'SMART': Specific, Measurable, Attainable, Relevant and Time-bound. Targets were only set for objectives which are sensitive to environmental water, had available indicators and were relevant to the water resource plan area. From there, targets were developed using a standard framework.

Watering requirements for the objectives and targets are explained in section 4.5. At the regional scale, this is done by linking the objectives and targets to the relevant flow components. The EWMPs, and Seasonal Watering Plans (developed each year by VEWH), provide further detail on the watering requirements at an asset scale. More detail on watering requirements is available in the EWMPs (see Appendix B).

This LTWP has been developed with objectives and targets aimed at a 10-year planning horizon. While aspirational statements can provide some indication of the long-term outcome for assets and resources, they do not provide a good basis for target setting in the short-term. Longer-term aspirational outcomes have been balanced with the more certain shorter-term in setting the objectives and targets in this LTWP, as illustrated in Figure 10. DEECA will work with CMAs over coming years to consider whether more aspirational objectives can be revised and targets set for the LTWP.

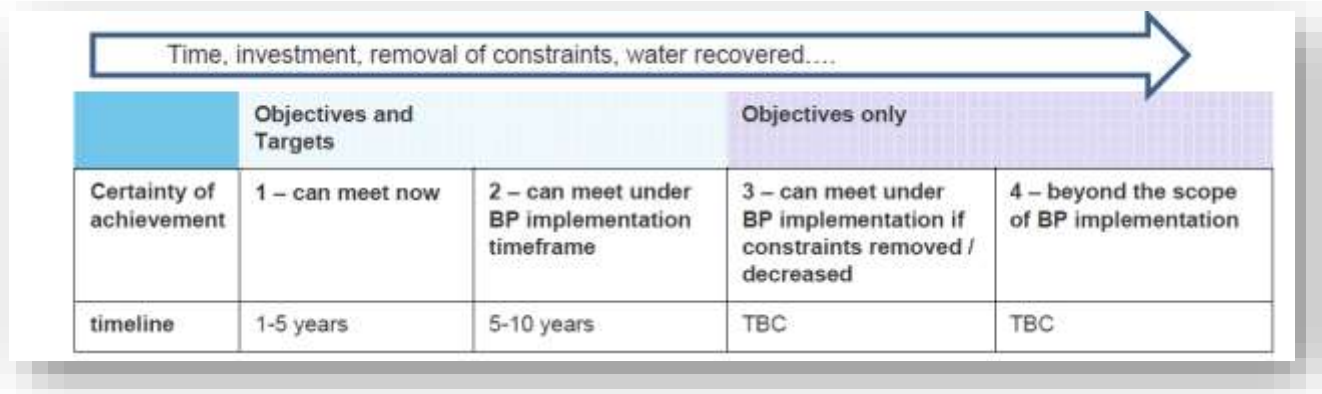


Figure 10. Certainty of achievement has been used in setting objectives and targets in this LTWP. Longer-term aspirational objectives have not had targets set, due to uncertainty in future conditions and ability for associated targets to be met.

4.2 Management goals for the Victorian Murray water resource plan area

The North East, Goulburn Broken, North Central and Mallee CMAs developed site-specific environmental water management goals in consultation with communities through the EWMP process. During development of the Victorian Murray LTWP, these were summarised into management goals for the Victorian Murray water resource plan area (see Table 8). Management goals for individual assets are presented in Appendix D. These goals also help to support a range of valuable co-benefits such as improved health of culturally significant species and sites.

Table 8. Management goals for the Victorian Murray water resource plan area

Management goals
Maintain or improve populations of threatened species and communities (including internationally listed migratory waterbirds) that are dependent upon waterways and wetlands in the region.
Improve lateral connectivity and enhance floodplain productivity
Restore and maintain a mosaic of healthy floodplain communities across the region which will ensure that indigenous plant and animal species and communities survive and flourish throughout the site
Create and maintain a range of wetland types, with water regimes that vary from permanently inundated through to occasionally inundated.
Contribute to the maintenance of ecological character of Ramsar sites

4.3 Ecological objectives for the Victorian Murray water resource plan area

Twenty-six ecological objectives have been developed for the Victorian Murray water resource plan area and are set out in Table 9 below, with alignment to the Basin Plan environmental watering plan (EWP), and the 2025 BWS expected environmental outcomes (EEOs) and First Nations objectives. Refer to Appendix I for definitions of the codes used (Tables 32, 33 and 34).

Table 9. Ecological objectives for the Victorian Murray water resource plan area

Theme	No.	Objective	EWP Objectives	2025 BWS EEOs	BWS First Nations objectives
Connectivity	VM1	Improve connectivity between floodplains, anabranches and wetlands [PEF1]	8.06,3(a), 8.06,3(b)(i), 8.06,3(b)(ii), 8.06,3(f) 8.06,6(b), 8.07,6	FC1, FC3, FC5, FC6, FC7	2.1, 2.2, 2.3, 2.5, 2.10
	VM2	Maintain refuges for native fish species [PEF3]	8.05,3(a), 8.06,6(b), 8.07,3	FC1, FC3, FC5, FC6, FC7, F1 - F9, F17	2.1, 2.2, 2.3, 2.7
Vegetation	VM3	Improve the species richness of aquatic vegetation in wetlands	8.05,3(b), 8.06,3(a) 8.06,5, 8.06,7	V7, V9	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10
	VM4	Improve the species richness of in-channel aquatic vegetation	8.05,3(b), 8.06,3(a) 8.06,5, 8.06,7	V8	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10
	VM5	Improve the condition and maintain extent of aquatic vegetation	8.05,3(b), 8.06,2 8.06,3(a), 8.06,5 8.06,6(a), 8.06,7	V7, V8, V9	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10
	VM6	Improve the condition and maintain extent of river red gum dominated EVCs	8.05,3(b), 8.06,3(b)(ii), 8.06,5, 8.06,6(a), 8.06,6(b), 8.06,7	V1, V2, V3, V4	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10
	VM7	Improve condition and maintain extent of black box dominated EVCs	8.05,3(b), 8.06,3(b)(ii) 8.06,5, 8.06,6(a) 8.06,6(b), 8.06,7	V1, V2, V3, V4	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10
	VM8	Improve the condition of shrub and lignum dominated EVCs	8.05,3(b), 8.06,5 8.06,7,	V5, V6	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10
	VM9	Successful growth and flowering of Moira grass plants	8.05,3(b), 8.06,5 8.06,7	V9	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10
	VM10	Reduce extent and diversity of exotic vegetation	8.07,5	Not specified	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10

Theme	No.	Objective	EWP Objectives	2025 BWS EEOs	BWS First Nations objectives
Waterbirds	VM11	Improve breeding opportunities for waterbirds (especially for colonial-nesting waterbirds)	8.06,6(a), 8.06,6(b)	B1, B2, B3, B4	2.2, 2.9
	VM12	Improve habitat for waterbirds, including provision of refugia during drought [PEF3]	8.06,6(b)	B1, B2, B3, B4	2.2, 2.9
	VM13	Improve feeding areas for waterbirds	8.06,6(b)	B1, B2, B3, B4	2.2, 2.9
	VM14	Maintain and increase species richness of waterbird species	8.06,6(b)	B1, B2, B3, B4	2.2, 2.9
Fish	VM15	Improve the abundance of large-bodied native fish	8.06,6(a), 8.06,6(b) 8.07,3	F1, F2, F5, F7, F8	2.2, 2.5, 2.6, 2.7
	VM16	Maintain the abundance of small-bodied native fish in channel and in wetlands	8.06,5, 8.06,6(a)	F1, F2, F5, F6, F17	2.2, 2.5, 2.6, 2.7
	VM17	Maintain distribution of threatened small-bodied native fish in wetlands	8.05,3(a), 8.06,3(b)(i) 8.06,3(b)(ii), 8.06,6(a) 8.06,6(b)	F1, F2, F3, F4, F5, F6, F17	2.2, 2.5, 2.6, 2.7
	VM18	Improve habitat for native fish	8.06,6(b)	F1 - F9, F17	2.2, 2.5, 2.6, 2.7
	VM19	Maintain species richness of native fish	8.06,6(a)	F1 - F9, F17	2.2, 2.5, 2.6, 2.7
Other Fauna	VM20	Improve habitat of frog communities	8.06,6(b), 8.07,3	Not applicable	2.3, 2.5, 2.6, 2.9
	VM21	Maintain species richness of frog communities	8.06,6(b), 8.07,3	Not applicable	2.3, 2.5, 2.6, 2.9
	VM22	Improve breeding opportunity for frog communities	8.06,6(b), 8.07,3	Not applicable	2.3, 2.5, 2.6, 2.9
	VM23	Improve habitat of turtle communities	8.06,6(b), 8.07,3	Not applicable	2.1, 2.3, 2.5, 2.6, 2.9
Macroinvertebrates	VM24	Improve abundance of macroinvertebrates	8.06,6(b), 8.07,3	Not specified	2.6, 2.7, 2.8
	VM25	Improve number of macroinvertebrate functional groups present	8.06,6(b), 8.07,3	Not specified	2.6, 2.7, 2.8
Water Quality	VM26	Maintain water quality within an appropriate range to allow for ecosystem processes [PEF2]	8.06,2, 8.07,5	Not specified	2.1, 2.2, 2.6, 2.8, 2.10

Note: EWP Objective codes are the Basin Plan Chapter 8 Environmental Watering Plan objectives (Appendix I Table 32). BWS EEO codes are the 2025 Basin-wide environmental watering strategy expected environmental outcomes (Table 33). BWS First Nations objectives codes are outlined in **Error! Reference source not found.4**.

The specific assets these objectives relate to are set out in Table 10. The objectives for each asset can be found in Appendix D.

4.4 Targets for environmental watering in the Victorian Murray water resource plan area

Targets have been developed for a subset of the objectives developed for this water resource plan area (Table 10). The process for the development of the targets is set out in Appendix C. The aim was to make objectives measurable, unambiguous, time-bound and set clear thresholds for success.

The targets have been developed to measure progress towards the objectives. They are designed to enable reporting at a Basin level and as a consequence, while targets have been developed for only a selection of objectives, it is expected that water will be provided to meet all objectives set out in this LTWP. Like the development of ecological objectives, the targets have been developed based on a set of common terms and definitions:

- 'Maintain' means to prevent further decline (this does not discount an improvement as an acceptable outcome)
- 'Improve' is a general term based on the objectives in the EWMPs. The term refers to an increase in the nominated attributes of the target
- 'Habitat' refers to water-based/instream/riparian habitat
- Waterbird guilds are based on feeding and habitat requirements. The main guilds in the Victorian Murray water resource plan area are piscivores (e.g. pelicans and cormorants), waterfowl (e.g. ducks and coots), rallids (e.g. rails and crakes) and waders and shorebirds (e.g. spoonbills and ibis)
- EVC benchmarks have a list of "typical" species and lifeforms (e.g. shrub, herb) found in each EVC in a particular bioregion. EVCs with trees (usually terrestrial and riparian EVCs) have standards for tree size and density, organic litter, recruitment and presence of large logs. The condition score for an EVC benchmark is the sum of the ratings for each component of the benchmark (large trees, tree canopy cover, understorey composition, weeds, recruitment, organic litter and large logs), as outlined in the Vegetation Quality Assessment Manual (DSE, 2004) for terrestrial vegetation. For wetland vegetation, the biota sub-index is used, as outlined in the Index of Wetland Condition assessment procedure (DELWP, 2022b).

Refinement of targets is an ongoing process. Revisions to this section will be reflected in future iterations of this LTWP. Monitoring of the Victorian Murray LTWP objectives and targets are discussed in section 9.

Table 10. Objectives, targets and priority environmental assets for the Victorian Murray water resource plan area.

Theme	No.	Objective	Target	Assets
Connectivity	VM1	Improve connectivity between floodplains, anabranches and wetlands [PEF 1]	At least 50% of environmental watering events in these assets over a ten-year period are delivered via channels that provide hydraulic connectivity to the source waterway.	Gunbower Creek, Johnson Swamp, Lindsay Mulcra Wallpolla Islands, Spences Bend; Margooya Lagoon, Bottle Bend, Bumbang Island, Barmah Forest, Karadoc Swamp, Heywood Lake, Carina Bend, Murrumbidgee Junction, Wemen-Liparoo, Loddon River (lower), Tata Creek, Broken Creek (lower) and Nine Mile Creek, Hird Swamp
	VM2	Maintain refuges for native fish species [PEF 3]	<i>To be confirmed</i>	Barmah Forest; Black Swamp; Broken Creek (lower) and Nine Mile Creek; Karadoc Swamp
Vegetation	VM3	Improve the species richness of aquatic vegetation in wetlands	<i>To be confirmed</i>	Abbotsford Bend; Barmah Forest; Bottle Bend; Bumbang Island; Burra Creek floodplain Carina Bend; Hattah Lakes; Heywood Lake; Hird Swamp ; Kings Billabong; Lake Murphy; Lindsay, Wallpolla and Mulcra Islands; Merbein Common; Murrumbidgee Junction; Neds Corner; Nyah and Vinifera; Piambie Pound Bend); Robertson Wetland and Robertson Creek; Third Reedy Lake ; Walshes Bend Wetland; Wemen-Liparoo; Kinnairds Wetland; Johnson Swamp; McDonald Swamp; Richardson Lagoon; Gunbower Forest; Guttrum Forest; Kunat Kunat (Round Lake); Ryans Lagoon
	VM4	Improve the species richness of in-channel aquatic vegetation	<i>To be confirmed</i>	Abbotsford Bend; Barmah Forest, Bottle Bend; Bumbang Island; Burra Creek floodplain; Loddon River (lower); Murrumbidgee Junction; Robertson Wetland and Robertson Creek; Tata Creek; Pyramid Creek
	VM5	Improve the condition and maintain extent of aquatic vegetation	<i>To be confirmed</i>	Barmah Forest; Broken Creek (lower) and Nine Mile Creek; Cardross & Koorlong Wetlands Lakes; Gunbower Creek; Guttrum and Benwell Forests; Johnson Swamp; Lake Elizabeth; Lake Cullen; Lake Hawthorn; Psyche and Woorlong; Spences Bend; Richardson Lagoon; Hattah Lakes; Loddon River (lower); Gunbower Forest; Kunat Kunat (Round Lake); Ryans Lagoon

Theme	No.	Objective	Target	Assets
	VM6	Improve the condition and maintain extent of river red gum dominated EVCs	The condition or riparian EVCs in the asset is better at the end than at the start of a ten-year monitoring period as measured by the following sub-targets: - health of adult trees - recruitment and survival of juvenile trees - native species richness - native species cover/abundance - recruitment of understorey vegetation	Barmah Forest; Black Swamp; Bumbang Island; Belsar and Yungera Islands; Bumbang Island; Burra Creek; Carina Bend; Guttrum and Benwell Forests; Hattah Lakes; Heywood Lake; Johnsons and Chaffey; Karadoc Swamp; Kinnairds Wetland; Lindsay, Mulcra and Wallpolla Islands; Loddon River (lower); Margooya Lagoon; McDonalds Swamp; Murrumbidgee Junction; Neds Corner; Piambie; Pound Bend; Pyramid Creek; Robertson Wetland and Robertson Creek; Spences Bend; Tata Creek; Third Reedy Lake; Walshes Bend; Hird Swamp; Belsar Yungera
			In Gunbower Icon site, at least 30% of river red gum Water Regime Classes in healthy condition	Gunbower Forest
	VM7	Improve condition and maintain extent of black box dominated EVCs	The condition of black box dominated EVCs in the asset is better at the end than at the start of a ten-year monitoring period as measured by the following sub-targets: - health of adult black box trees - recruitment and survival of juvenile trees - recruitment of understorey vegetation - native species cover/abundance native species richness	Bottle Bend; Burra Creek floodplain; Gunbower Forest; Hattah Lakes; Johnson Swamp; Johnsons and Chaffey; Karadoc Swamp; Lake Cullen; Lake Murphy; Lindsay, Mulcra and Wallpolla Islands; Loddon River (lower); Piambie; Pyramid Creek; Richardson Lagoon; Sandilong Creek; Spences Bend; Tata Creek; Third Reedy Lake; Walshes Bend; Heywood Lake
	VM8	Improve the condition of shrub and lignum dominated EVCs	The condition of canegrass or lignum dominated EVCs is better at the end than at the start of a ten-year monitoring program as measured by the following sub-targets: - condition of lignum - cover of canegrass (there is no recognised condition assessment method for canegrass) - native species cover/abundance	Abbotsford Bend; Burra Creek floodplain; Carina Bend; Hattah Lakes; Hird Swamp; Johnson Swamp; Karadoc Swamp; Lake Elizabeth; Lake Murphy; Lindsay, Mulcra and Wallpolla Islands; Loddon River (lower); Murrumbidgee Junction; Neds Corner; Piambie; Pound Bend; Psyche and Woorlong; Pyramid Creek; Robertson Wetland and Robertson Creek; Sandilong Creek; Spences Bend; Tata Creek; Wemen-Liparoo; Karadoc

Theme	No.	Objective	Target	Assets
			native species richness	
	VM9	Successful growth and flowering of Moira grass	<i>Targets under development by TLM</i>	Barmah Forest; Karadoc Swamp
	VM10	Reduce extent and diversity of exotic vegetation	<i>To be confirmed</i>	Barmah Forest; Black Swamp; Guttrum and Benwell Forests; Hird Swamp; Kings Billabong; Kinnairds Wetland; Lindsay, Wallpolla and Mulcra Islands; McDonalds Swamp; Psyche Bend Lagoon and Woorlong Wetland; Johnson Swamp
Waterbirds	VM11	Improve breeding opportunities for waterbirds (especially for colonial-nesting waterbirds)	The minimum water regime required for colonial nesting waterbird breeding is met over a ten-year monitoring period.	Barmah Forest; Black Swamp; Bottle Bend; Bumbang Island; Gunbower Creek; Guttrum and Benwell Forests; Hattah Lakes; Johnson Swamp; Kinnairds Wetland; Karadoc; Kings Billabong; Lake Elizabeth; Lake Murphy; Lindsay, Mulcra and Wallpolla Islands; McDonalds Swamp; Belsar Yungera
	VM12	Improve habitat for waterbirds, including provision of refugia during drought [PEF 3]	The minimum water requirement for waterbird feeding and/or breeding is met in a ten-year period.	Hird Swamp; Bottle Bend; Bumbang Island; Cardross and Koorlong Wetlands; Carina Bend; Gunbower Forest; Guttrum and Benwell Forests; Hattah Lakes; Heywood Lake; Hird Swamp; Karadoc Swamp; Kings Billabong; Kinnairds Wetland; Lake Elizabeth; Lake Hawthorn; Lake Murphy; Lindsay Mulcra Wallpolla Islands; Merbein Common; Nyah Vinifera; Psyche and Woorlong; Wemen-Liparoo; Lake Cullen; Belsar Yungera, Ryans Lagoon
	VM13	Improve feeding areas for waterbirds	<i>To be confirmed</i>	Black Swamp; Gunbower Creek; Gunbower Forest; Hattah Lakes; Kinnairds Wetland; Lake Elizabeth; Lake Murphy; Lindsay Mulcra Wallpolla Islands; McDonalds Swamp; Lake Cullen, Ryans Lagoon
	VM14	Maintain and increase species richness of waterbird species	<i>To be confirmed</i>	Barmah Forest; Bottle Bend; Bumbang Island; Cardross & Koorlong Wetlands Lakes Carina Bend; Johnson Swamp; Hird Swamp; McDonald Swamp; Karadoc Swamp; Kings Billabong; Lake Hawthorn; Merbein Common; Psyche Bend Lagoon and Woorlong Wetland; Wemen-Liparoo; Kunat Kunat (Round Lake)

Theme	No.	Objective	Target	Assets
Fish	VM15	Improve the abundance of large-bodied native fish	A) The mean number of sites where large-bodied native fish species are detected is the same or higher in the last five years than the first five years of a ten-year monitoring program B) For annual age classes up to five years, the number of cohorts is the same or higher in the last year than the first year of a ten-year monitoring program	Barmah Forest; Bumbang Island; Gunbower Creek; Loddon River (lower), Broken Creek (lower) and Nine Mile Creek; Lindsay, Mulcra and Wallpolla Islands; Merbein Common; Sandilong Creek
	VM16	Maintain the abundance of small-bodied native fish in channel and wetlands	In small wetlands, maintain the presence of small-bodied native fish every year in the ten-year monitoring period <i>and</i>; in large or network wetlands, the average number of sites where small-bodied native fish species are detected in the first five years is not less than in the last five years of a ten-year monitoring program.	Barmah Forest; Bumbang Island; Cardross and Koorlong Wetlands; Carina Bend; Gunbower Creek; Loddon River (lower); Margooya Lagoon; Merbein Common; Murrumbidgee Junction; Psyche Bend and Woorlong Wetland; Walshes Bend
	VM17	Maintain distribution of threatened small-bodied native fish in wetlands	In small wetlands, maintain the presence of threatened small-bodied native fish every year in a ten-year monitoring period <i>and</i> in large or network wetlands, the average number of sites where threatened small-bodied native fish species are detected in the first five years is not less than in the last five years of a ten-year monitoring period	Barmah Forest; Broken Creek (lower) and Nine Mile Creek; Cardross and Koorlong Wetlands; Karadoc Swamp; Kings Billabong; Loddon River (lower); Merbein Common; Murrumbidgee Junction; Nyah Vinifera; Psyche Bend and Woorlong Wetland; Gunbower Forest; Lake Elizabeth; Round Lake (Kunat Kunat); Bumbang Island; Spences Bend; Walshes Bend; Margooya Lagoon; Hattah Lakes
	VM18	Improve habitat for native fish	<i>To be confirmed</i>	Barmah Forest; Loddon River (lower); Spences Bend; Wemen-Liparoo; Karadoc Swamp; Kunat Kunat (Round Lake); Margooya Lagoon; Spences Bend; Broken Creek (lower) and Nine Mile Creek
	VM19	Maintain species richness of native fish	The ratio of fish species observed to expected (using pre-European Reference Condition - PERCH) is the same in the first three years as	Barmah Forest; Broken Creek (lower) and Nine Mile Creek; Gunbower Creek; Gunbower Forest; Hattah Lakes; Murrumbidgee Junction; Lindsay, Mulcra and

Theme	No.	Objective	Target	Assets
			the last three years of a ten-year monitoring period	Wallpolla Islands; Loddon River (lower); Bumbang Island; Walshes Bend
Other Fauna	VM20	Improve habitat of frog communities	<i>To be confirmed</i>	Lake Murphy; Margooya Lagoon; McDonald Swamp; Ryans Lagoon
	VM21	Maintain species richness of frog communities	The number of frog species observed in eight in a ten-year period must be more than 75% of the highest diversity recorded in any one year.	Bottle Bend; Carina Bend; Gunbower Forest; Karadoc Swamp; Kinnairds Wetland; Loddon River (lower); Nyah & Vinifera; Psyche and Woorlong; Johnson Swamp, Ryans Lagoon
	VM22	Improve breeding opportunity for frog communities	<i>To be confirmed</i>	Barmah Forest; Black Swamp; Gunbower Creek; Kings Billabong
	VM23	Improve habitat of turtle communities	<i>To be confirmed</i>	Barmah Forest; Broken Creek (lower) and Nine Mile Creek; Gunbower Creek; Loddon River (lower)
Macroinvertebrates	VM24	Improve abundance of macroinvertebrates	<i>To be confirmed</i>	Kings Billabong; Lake Elizabeth; Loddon River (lower); Lake Elizabeth
	VM25	Improve number of macroinvertebrate functional groups present	<i>To be confirmed</i>	Loddon River (lower); Lake Elizabeth
Water Quality	VM26	Maintain water quality within an appropriate range to allow for ecosystem processes [PEF 2]	<i>To be confirmed</i>	Heywood Lake; Lake Elizabeth; Loddon River (lower); Spences Bend

4.5 Watering requirements of the objectives

This section describes the key components of the flow regime needed to meet objectives. Asset specific watering requirements are documented in EWMPs, seasonal watering proposals, and the VEWH's seasonal watering plan. Each of these uses the seasonally adaptive approach (DSE, 2009), where priorities for environmental watering, works and complementary measures in any given year vary according to climatic conditions and water availability.

4.5.1 Watering requirements of rivers

Watering requirements for rivers are specified in terms of flow components – low flow, freshes, high flow and overbank flow (Figure 11). In regulated rivers, some of the flow components that are needed can be provided through HEW (see section 5.1.5) provided sufficient water is available, and via coordination with other sources of water such as system operating water (e.g. provision of passing flows) and alterations to the timing and rate of delivery of consumptive water. It is relatively straightforward to deliver baseflows and to return some of the small and medium-sized freshes that are critical in the life cycles of various native plants and animals. Baseflows provide the basic habitat for in-stream biota, while freshes can trigger fish migration and spawning, move sediment and nutrients through river systems, connect habitats and improve water quality. However, very high flows (including bankfull and overbank flows) are generally not feasible via regulated delivery (due either to the volume of water required, infrastructure constraints or potential flooding issues including legal liability), although natural flows can be “topped up” to meet critical depth or duration requirements. Figure 11 shows the benefits of different environmental flow components in rivers.

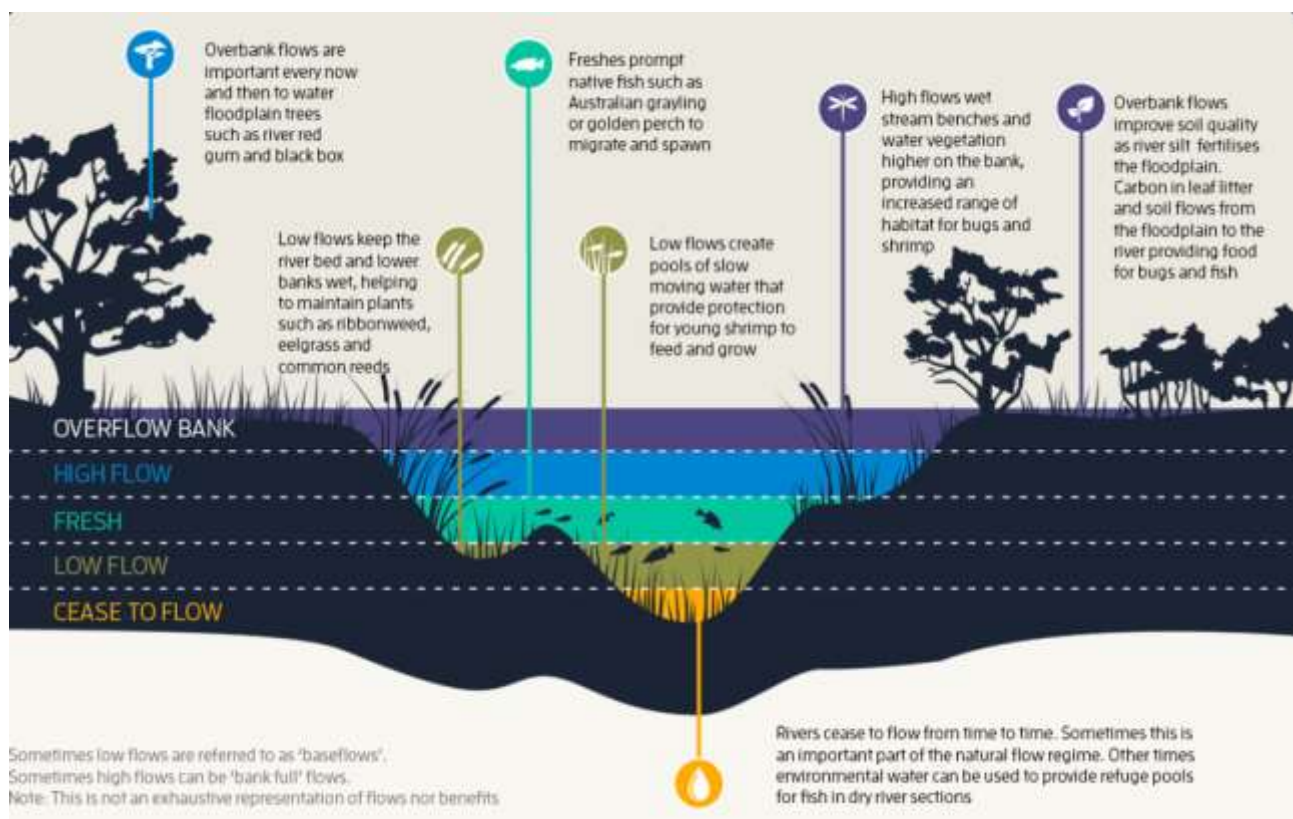


Figure 11. Conceptual diagram of benefits of different environmental flow components in rivers (VEWH, 2025c)

Table 11 and 12 link specific flow components to the ecological objectives for river assets. While the flow components apply across all river assets, the details (flow rate, timing, frequency and duration) will be asset specific. An example of the flow components required to meet ecological objectives for Gunbower Creek is presented in Table 13 (NCCMA, 2015).

In addition to watering requirements in individual river and wetland EWMPs (refer Appendix B), the environmental watering requirements of priority environmental assets have been captured in:

- Victoria's EWMP objective and watering requirements database (DEECA, 2026), prepared for this LTWP update.
- MDBA's Environmental Assets and Functions Database (MDBA, 2021), prepared under Basin Plan. This has not been updated since 2021, therefore will not contain all priority assets listed in this LTWP, but is expected to be updated again in coming years (A. Meehan, *pers. comm.*, 21 October 2025)
- MDBA's Environmental Watering Requirements (EWR) Tool (MDBA, 2025b), which is a tool for evaluating LTWP requirements for Basin Plan implementation, including the Basin Plan Review and SDL Assessment.

The latter two contain objectives, targets and associated watering regimes for all priority environmental assets receiving environmental water across the Murray-Darling Basin. These are valuable resources for all environmental water delivery partners and can be used to interrogate watering requirements at varying scales, from single environmental assets up to CMA and water resource plan scales.

Victorian Murray Floodplain at Hume to Yarrawonga

North East CMA have determined watering requirements for priority areas along the Victorian Murray floodplain between Hume and Yarrawonga in the Victorian Murray Floodplain EWMP (NECMA, 2015). This includes overbank flows which cannot currently be delivered under existing constraints. While the overbank watering requirements do not always align with the timing and duration of those outlined by NSW in the Murray-Lower Darling Long Term Water Plan, the Victorian watering requirements are a work in progress, and will be aligned with NSW requirements as technical information is improved.

Table 11. Flow components required to meet native fish and vegetation objectives related to river-based assets

Objective		Low flow	Freshes	High Flow	Bankfull	Overbank flow	Explanation (based on conceptual models)
Native fish	Improve abundance of large-bodied native fish	✓	✓	✓			Low flows all year for habitat; Jul-Nov fresh for breeding trigger, with winter fresh and high flow to cue spawning and movement
	Maintain abundance of small-bodied native fish	✓	✓				Low flows all year for habitat; summer fresh for habitat quality; freshes for movement and spawning
	Improve habitat for native fish	✓	✓	✓			Low flows all year for habitat; freshes and high flows for channel maintenance, habitat quality
	Maintain species richness of native fish	✓	✓	✓			Low flows for habitat; freshes and high flows for channel maintenance, habitat quality, movement and breeding
Vegetation	Improve the species richness of in-channel aquatic vegetation	✓	✓				Low flows for habitat; summer fresh for dispersal of propagules into disturbed habitats
	Improve the condition and maintain extent of aquatic vegetation	✓	✓	✓			Low flows for habitat; summer fresh for dispersal of propagules into disturbed habitats; freshes and high flows to wet lower bank and benches to grow and maintain littoral vegetation
	Improve the condition and maintain extent of river red gum dominated EVCs		✓	✓	✓	✓	Winter freshes to recruit and maintain riparian vegetation and water river red gum higher on the bank; high flows to support woody vegetation; bankfull flows to maintain river red gum trees on the bank and support juveniles; unregulated overbank flows water the floodplain

Objective		Low flow	Freshes	High Flow	Bankfull	Overbank flow	Explanation (based on conceptual models)
	Improve condition and maintain extent of black box dominated EVCs					✓	Unregulated overbank flows water the floodplain
	Improve the condition of shrub and lignum dominated EVCs					✓	Winter freshes to recruit and maintain riparian vegetation; high flows and bankfull to support littoral vegetation; unregulated overbank flows water the floodplain

Note: volume, timing, duration and frequency for each of these elements is asset specific.

Table 12. Flow components required to meet functions and 'other' objectives related to river-based assets

Objective		Low flow	Freshes	High Flow	Bankfull	Overbank flow	Explanation (based on conceptual models)
Functions	Improve connectivity between floodplains, anabranches and wetlands		✓	✓	✓	✓	Freshes for movement and connectivity of habitat; high flows and bankfulls for flow through anabranches; unregulated overbanks for connectivity between the river and floodplain wetlands
	Maintain refuges for native fish species	✓	✓				Low flows to maintain presence of water habitat; freshes to maintain water quality
	Maintain water quality within an appropriate range to allow for ecosystem processes	✓	✓				Low flows to support carbon cycling; freshes to dilute salinity, re-oxygenate water and transport nutrients downstream
Other	Maintain species richness of frog communities	✓	✓	✓	✓	✓	Low flows for habitat and feeding; freshes to trigger breeding and increase habitat; high flows for burrowing in river banks; bankfulls and unregulated overbank flows for dispersal to new habitats

Objective		Low flow	Freshes	High Flow	Bankfull	Overbank flow	Explanation (based on conceptual models)
	Improve habitat of turtle communities	✓	✓	✓	✓	✓	Low flows for habitat; freshes for habitat and increased foraging; spring high flows to soften banks for nest digging; bankfull and unregulated overbank flows for connection to new habitats
	Improve abundance of macroinvertebrates	✓	✓				Summer low flows for macroinvertebrates to access riffle, pool and edge habitats; summer freshes to wash fine silt and biofilm off substrate that increases macroinvertebrate productivity

Note: volume, timing, duration and frequency for each of these elements is asset specific.

Table 13. Environmental flow recommendations for Gunbower Creek (NCCMA, 2015)

	Reach 1 Headworks	Reach 2 Gunbower Weir	Reach 3a Cohuna Weir	Reach 3b Koondrook Weir	Duration	Timing	Frequency	Daily flow variability	Additional information incl. critical tolerances	Environmental objectives (as in the EWMP)
Winter base flow	No prescribed flow as targeting flows in lower reaches	>250-300 ML/day	250-500 ML/day	>150 ML/day	Approx. 3 months	Between 15 May to 15 Aug	1 event per year each year (opening of lower landscape regulators is opportunistic)	(+/-) 50-100 ML/day including ramp up at start of Aug to integrate with spring-autumn low flow / irrigation demand	Magnitude to vary depending on conditions (i.e. lower end of range if delivering to forest) however flows to occur in all years.	1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.8
	If flows are >300 ML/day open lagoon regulators to facilitate throughflow	If flows are >300 ML/day open lagoon regulators to facilitate throughflow	If forest inundated, open lower landscape regulators to facilitate bidirectional flow				Max. 2 in 3 years for opening lagoon regulators (to maintain aquatic community structure)	15 ML/day bidirectional flow per lower landscape regulator	Close lagoon regulators if levels in the creek begin to drop to maintain >1 metre depth	

	Reach 1 Headworks	Reach 2 Gunbower Weir	Reach 3a Cohuna Weir	Reach 3b Koondrook Weir	Duration	Timing	Frequency	Daily flow variability	Additional information incl. critical tolerances	Environmental objectives (as in the EWMP)
									in critical lagoons	
Winter-spring high flow	No prescribed flow as targeting flows in lower reaches	1,200 ML/day N.B. during forest water years majority of flow may be diverted @ Hipwell Road	Pass flow through reach to return to Murray River <u>or</u> if watering forest maintain winter base flow conditions D/S Hipwell Road (see <i>winter base flow</i> for Reach 3a and Reach 3b)	Up to 3 months	Between June and Nov	1 event per year every 2 in 3 years	(+/-) 50-100 ML/day Including ramp up and down to integrate with preceding and proceeding flows		1.1, 1.2, 1.5, 1.6	
Spring-autumn base flow	No prescribed flow as targeting flows in lower reaches		>400 ML/day If forest inundated, open lower landscape regulators to facilitate bidirectional flow	>150 ML/day Up to 8 months	Between 15 Aug to 15 May	1 event per year each year Opportunistic opening of regulators depending on conditions	(+/-) 50-100 ML/day where possible ~15 ML/day bidirectional flow per regulator	Flow likely to be exceeded due to irrigation demand. Flow can be adjusted to dilute water entering creek from a forest watering event (i.e. to maintain habitable DO in creek d/s Cohuna Weir)	1.2, 1.4	
Spring-summer modified fresh	No prescribed flow as targeting flows in lower reaches	400-700 ML/day	400-500 ML/day	Pass entire flow through reach	10-15 days to ramp up ----- 3.5 months hold phase ----- <1 month to ramp down	Aug-Oct to ramp up ----- Oct- Jan for hold phase ----- Jan-Feb to ramp down	1 event per year every 2 in 3 years	<100 ML/day rate during ramp up and down to integrate with preceding and proceeding flows. Ramp up needs to provide a pulse larger than that of the preceding flow (i.e. if base flows is 250 ML/day pulse may be	Flow to occur in alternative watering years to forest due to flow volume required D/S of Hipwell Road.	1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8

	Reach 1 Headworks	Reach 2 Gunbower Weir	Reach 3a Cohuna Weir	Reach 3b Koondrook Weir	Duration	Timing	Frequency	Daily flow variability	Additional information incl. critical tolerances	Environmental objectives (as in the EWMP)
								>450 ML/day) to trigger objective ----- Hold to not exceed 50 cm/day fall D/S Cohuna Weir		
Autumn ramp down	Slow recession in flow rate to meet winter base flow targets (see <i>winter base flow</i>)				Approx. 2 weeks	Start early May	1 event per year each year	Recommended to not exceed 25-50 ML/day rate of fall	Integrate with winter low flow	1.1, 1.2, 1.3, 1.4
Opportunistic flow components										
Recolonisation flow <i>Triggered by pulse @ Torrumbarry</i>	No prescribed flow as targeting flows in lower reaches	~600-800 ML/day	~600-800 ML/day	5-15 days	Between late October and April	Opportunistic events	100 ML/day rate during ramp up and down to integrate with preceding and proceeding flows	Flow in response to Murray River pulse (i.e. piggyback on rain rejection event)		1.1, 1.2, 1.3
Winter fresh <i>Triggered by <15,000 ML/day unregulated flow @ Torrumbarry</i>	No prescribed flow as targeting flows in lower reaches. However if flows are >300 ML/day open Gunbower Lagoon regulators to allow freshening flows and facilitate throughflow. Maintain at least 1 metre of depth at Phyland, Turner, Upper Gunbower, Gum and Cockatoo lagoons			50-750 ML/day	Estimated to be approx. 30 days	Between 15 May and 25 Aug	Opportunistic events. Max of 2 in 3 years for opening of lagoon regulators (to maintain aquatic community structure)	(+/-) 50-100 ML/day including ramp up and down to integrate with preceding and proceeding flows	Close regulators if levels in the creek begin to drop to maintain >1 metre depth in critical lagoons	1.1, 1.2, 1.3, 1.4, 1.5, 1.6

	Reach 1 Headworks	Reach 2 Gunbower Weir	Reach 3a Cohuna Weir	Reach 3b Koondrook Weir	Duration	Timing	Frequency	Daily flow variability	Additional information incl. critical tolerances	Environmental objectives (as in the EWMP)
Winter fresh <i>Triggered by >15,000 ML/day unregulated flows @ Torrumbarry</i>	~250 ML/day	No prescribed flow as targeting flows in lower reaches	Approximately 20-50 ML/ day release from forest through Yarran Regulator	Pass entire flow through reach	Estimated to be approx. 30 days	Between 15 May and 25 Aug	Opportunistic events	(+/-) 50-100 ML/day including ramp up and down to integrate with preceding and proceeding flows	Management under this scenario needs to take into consideration the watering regime of forest	1.1, 1.2, 1.3, 1.4, 1.5, 1.6

4.5.2 Watering requirements for wetlands

The Victorian Murray water resource plan area contains a considerable diversity of wetland types. Based on area, the priority environmental assets are predominantly *temporary river red gum swamp, black box woodland riparian land or floodplain, river red gum forest riparian land or floodplain wetlands, or lignum shrubland riparian zone or floodplain*.

Historically, wetlands would typically receive water from high river flows in wet winter/spring periods. Very heavy rainfall in summer/autumn could also lead to substantial inflows into wetlands. Land and water resource development since colonisation has altered the frequency, timing and duration of river flows, putting at risk the ecological values of priority wetland assets. Environmental water can be used to reinstate a more natural watering regime, including a wetting and drying cycle where appropriate.

In wetlands, phases of the managed watering regime include (Figure 12 and 13):

- Drying – declining water levels due to outflows, seepage and evaporation.
- Dry – no water in wetland.
- Filling – inflow of water and increasing water levels; when occurring naturally, this can be a trigger for environmental watering to ‘top up’.
- Full – the wetland is filled to the natural outflow or “sill” level and only evaporation and recharge to groundwater will subsequently reduce volume. May be topped up with environmental water to increase the duration of inundation.
- Flooded – water level is higher than the natural sill; occurs during floods or environmental watering that targets the surrounding areas (e.g. fringing vegetation).

Table 14 and 15 describe phases of the wetting and drying cycle that contribute to achieving different ecological objectives for wetland assets. EWMPs describe the environmental watering objectives and regime for each priority environmental asset. An example of wetland watering requirements is presented in Table 16, which shows the objectives and watering regime for Hattah Lakes.

The timing, duration and frequency of wetland watering is site-specific and will vary year-to-year depending on antecedent conditions and the availability of environmental water. Another consideration in deciding which wetlands receive environmental water in any year is maintaining a mosaic of wetland habitat types across the region. This will increase habitat availability over time for waterbirds and allow other water dependent plants and animals to disperse across the landscape (Morris, 2012). These factors are considered annually in the development of the VEWH’s Seasonal Watering Plan.

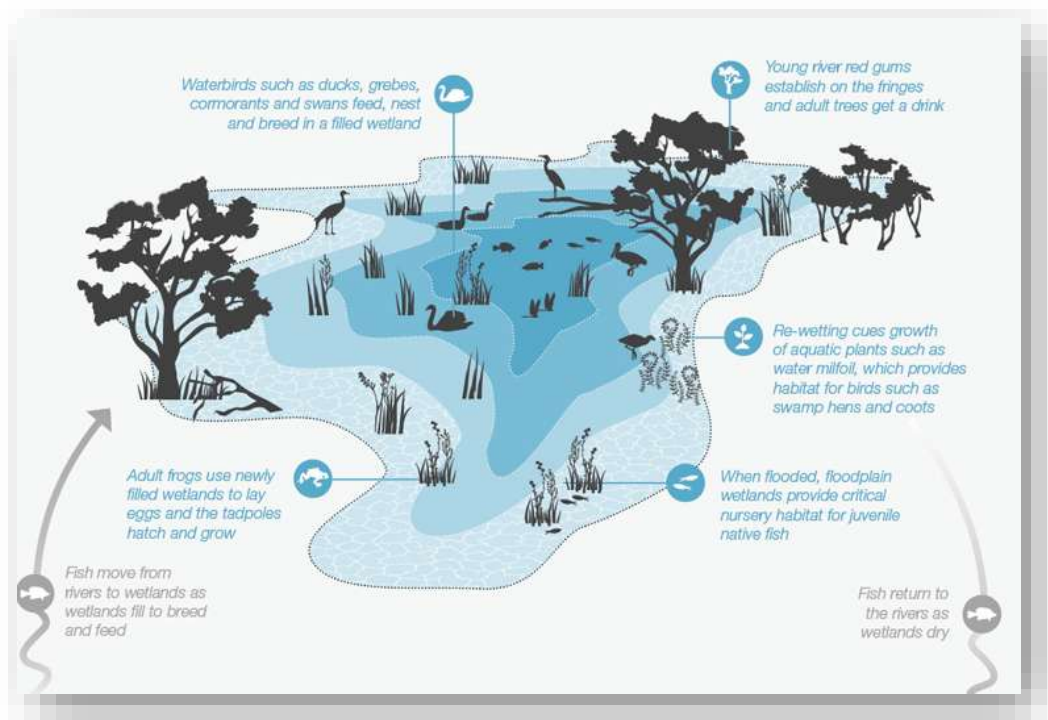


Figure 12. Benefits of wetting phases in wetlands (VEWH, 2025d)

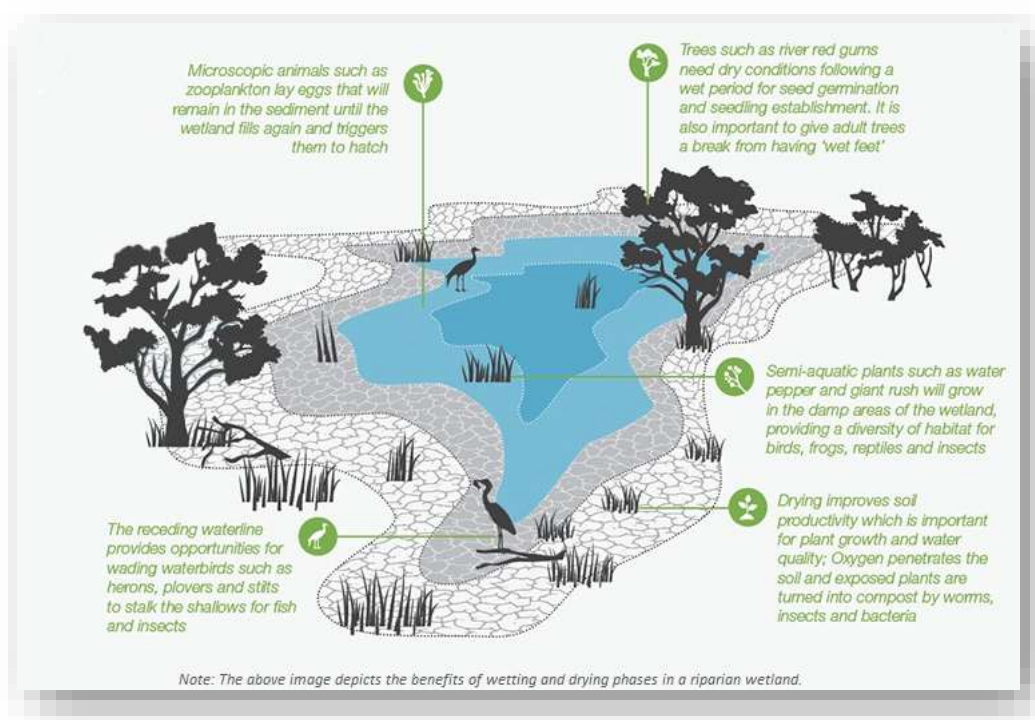


Figure 13. Benefits of drying phases in wetlands (VEWH, 2025e)

Table 14. Elements of the wetting/drying cycle required to meet waterbird and vegetation objectives for wetland-based assets

Objective		Regional mosaic	Dry	Filling	Full	Flooded	Drying	Explanation (based on EWMP conceptual model)
Waterbirds	Improve breeding opportunities for waterbirds (especially for colonial-nesting waterbirds)			✓	✓			Timing of filling important; full level determines duration
	Improve habitat for waterbirds, including provision of refugia during drought	✓			✓		✓	Mosaic provides different habitats across region; full level determines area of habitats and duration; drying wetlands provide additional habitat types
	Improve feeding areas for waterbirds	✓	✓	✓	✓	✓	✓	Partial fill for shallow feeding habitat; full for open water diving species; flooded for some grazing species; drying to expose mudflats for foraging; mosaics to increase feeding habitats
	Maintain and increase species richness of waterbird species	✓	✓	✓	✓	✓	✓	Mosaics to provide range of habitats; all stages of filling and drying to support range of habitats for different species breeding and feeding needs
Vegetation	Improve the species richness of aquatic vegetation in wetlands		✓		✓		✓	Filling and natural drying promotes germination of different functional groups and diversity of habitats
	Improve the species richness of in-channel aquatic vegetation	✓		✓	✓	✓	✓	Mosaics for range of habitats; filling and drying for different species' habitat and reproductive needs; flooding for dispersal of propagules
	Improve the condition and maintain extent of aquatic vegetation		✓	✓	✓		✓	Full level represents the maximum extent of wetted area for vegetation; filling and natural drying promotes germination and diversity of habitats

Objective		Regional mosaic	Dry	Filling	Full	Flooded	Drying	Explanation (based on EWMP conceptual model)
	Improve the condition and maintain extent of wetland EVCs	✓	✓	✓	✓	✓	✓	Spring flooding to support extent of vegetation out into floodplain, then reducing to full level to water adult trees and prevent waterlogging; and drying to support life cycle of floodplain marsh including moira grass
	Reduce extent and diversity of exotic vegetation		✓	✓	✓		✓	Drying may reduce aquatic weeds, filling may reduce terrestrial weed encroachment

Note: volume, timing, duration and frequency for each of these elements is asset specific.

Table 15. Elements of the wetting/drying cycle required to meet functions and other objectives for wetland-based assets

Objective		Regional mosaic	Dry	Filling	Full	Flooded	Drying	Explanation (based on EWMP conceptual model)
Functions	Improve connectivity between floodplains, anabranches and wetlands					✓	✓	Flooding to connect wetland to managed floodplain; drying to minimise invasive species such as carp
	Maintain refuges for native fish species	✓		✓	✓			In dry conditions, environmental water can be used to maintain water levels for refugia, at key locations within a region
	Maintain water quality within an appropriate range to allow for ecosystem processes		✓	✓	✓	✓	✓	All parts of the wetting-drying cycle e.g. dry to reduce invasive species that degrade water quality; filling, full and flooded to dilute and flush salinity and reduce turbidity

Objective		Regional mosaic	Dry	Filling	Full	Flooded	Drying	Explanation (based on EWMP conceptual model)
Other	Maintain and improve habitat for frog species richness and breeding opportunities	✓		✓	✓	✓		Mosaic provides different habitats across region; frog breeding triggered by filling; full level to allow time for metamorphosis; flooding for habitat extension
	Improve habitat of turtle communities	✓			✓			Mosaic provides different habitats across region; full level provides maximum available habitat
	Improve abundance of macroinvertebrates			✓			✓	Variable water depths provide habitat and support life cycles

Note: volume, timing, duration and frequency for each of these elements is asset specific.

Table 16. Watering requirements for the Hattah Lakes icon site environmental objectives (MDBA, 2012)

Refined environmental objectives	Vegetation community	Flow Rate (ML/d)	Duration	Timing	Frequency (years in 10)	Maximum time between events	Works or other measures to assist meeting objectives	Area flooded with works (ha)
Restore a mosaic of hydrological regimes	Semi-permanent wetlands	>37,000	90 days	Spring	6	4 years	Pumping station and regulators/stop banks	1,127
Maintain and restore ecological character of the Ramsar site								
Restore the macrophyte zone around at least 50% of the lakes	Persistent temporary wetlands	>50,000	30 days	Winter–Spring	4			
Improve the quality and extent of deep freshwater								
Maintain habitat for the freckled duck, grey falcon and white-bellied sea-eagle	Episodic wetlands	>150,000	7 days	Winter–Spring	1 year in 8	10 years	Pumping station and Kramen regulator	To be confirmed
Successful breeding events for colonial waterbirds at least two years in 10								
Provide habitat for migratory bird species								

Refined environmental objectives	Vegetation community	Flow Rate (ML/d)	Duration	Timing	Frequency (years in 10)	Maximum time between events	Works or other measures to assist meeting objectives	Area flooded with works (ha)
Increase distribution, number and recruitment of wetland fish Maximise use of floodplain habitat for fish recruitment								
Restore a mosaic of hydrological regimes Maintain and restore ecological character of the Ramsar site Maintain habitat for the freckled duck, grey falcon and white-bellied sea-eagle Successful breeding events for colonial waterbirds at least two years in 10 Provide habitat for migratory bird species Maximise use of floodplain habitat for fish recruitment	Fringing river red gum	>45,000	60 days	Winter–Spring	4–6	7 years	Pumping station and regulators/stop banks	1,563
Restore a mosaic of hydrological regimes Maintain habitat for the freckled duck, grey falcon and white-bellied sea-eagle Successful breeding events for colonial waterbirds at least two years in 10 Provide habitat for migratory bird species Maximise use of floodplain habitat for fish recruitment	River red gum woodland (flood-tolerant understory)	>75,000	30 days	Winter–Spring	2–4	7 years	Pumping station and regulators/ stop banks	1,396
Restore a mosaic of hydrological regimes Successful breeding events for colonial waterbirds at least two years in 10 Maximise use of floodplain habitat for fish recruitment	Black box woodland	>120,000	14 days	Winter–	1:3	10 years	Pumping station and regulators/stop banks, Lake Kramen regulator	1,272

5. Provision of environmental water

In Victoria, all water that is available for the preservation of the environmental values and health of water ecosystems is defined and protected as the Environmental Water Reserve (EWR) under the *Water Act 1989* (Vic).

This section describes the provision of the EWR in Victoria's regulated and unregulated water systems, as well as held and planned environmental water under Basin Plan.

Across all Victorian water resource plan areas, ecological objectives are met through:

1. Environmental water entitlements (bulk entitlements and environmental entitlements) and water shares that are held or managed by the VEWH or CEWH.
2. Passing flow requirements specified for environmental purposes under bulk entitlements or water supply protection area water management plans.
3. Other water managed through water system management rules, including passing flows not specified as having an environmental purpose, and unregulated river diversion rules. This includes water which remains in the system after consumptive and environmental entitlements are taken out - referred to as 'above cap' water – and water used primarily for consumptive purposes, but which can also have a benefit for the environment.

5.1 Victoria's water management

The approach to meeting ecological objectives in Victoria's surface water systems depends on whether the water resources are unregulated or regulated.

5.1.1 Regulated systems

Regulated systems contain structures such as dams or major diversion weirs which exert significant control over the flow of water in the river, primarily for consumptive users. The impact of regulation on the environment will depend upon the size and number of storages and weirs, the level of consumptive use, and the overall volume of flow the river receives. For example, the Murray River has a number of large storages and high consumptive demand. Upstream, the Ovens system has two relatively small reservoirs, receives relatively high annual river flows and is sometimes called semi-regulated. Impact on the environment from regulation is greater in the Murray River than in the Ovens River.

Regulation of river systems has a significant impact on the environmental values of the system. Storages capture water during naturally high flow periods and retain it, to be released to meet consumptive demands during drier times of the year. This creates unnaturally high flows during summer. Storages also create barriers to flow connectivity and biota migration, and cold water temperature in downstream releases. Environmental water can reduce the impact of river regulation and water extraction by providing flows at the right time of year for priority environmental assets and priority ecosystem functions.

In northern Victorian regulated systems, environmental water requirements can be met with HEW (section 5.1.5), a small amount of planned environmental water (see section 5.1.6), and other water in the system which also supports environmental water outcomes (see section 5.1.7). Other water includes passing flow requirements that meet multiple objectives, delivery of water from reservoirs to downstream users, delivery of water from inter-valley trade accounts, or transfers from storages.

There are two main regulated systems in the Victorian Murray water resource plan area, the Victorian Murray Lower Broken Creek, and the Lower Loddon River (Table 17).

Table 17. Regulated systems in the Victorian Murray water resource plan area

System	Description	Comments
Victorian Murray	Flows are regulated by Lake Dartmouth on the Mitta Mitta River and Lake Hume on the Murray River. Releases from Lake Dartmouth flow down, meeting local irrigation demands along the Mitta Mitta River and then entering the Lake Hume storage. Releases from Lake Hume supply urban, rural and environmental demands from Lake Hume to the SA border.	Lake Dartmouth and Lake Hume are managed by the MDBA under the terms of the MDB Agreement to supply water to NSW, SA and Victoria. They are operated in conjunction with a number of locks and weirs on the Murray River system to meet the water requirements of these jurisdictions. Further water resources are also available from MDBA managed storages on the Darling River in NSW (Menindee Lakes) and on the Murray River near the SA border (Lake Victoria). Additional supplements can also be provided from Victorian regulated tributaries. The Victorian Murray regulated system also supplies water into a number of irrigation systems. These include the Murray Valley and Torrumbarry Irrigation Areas, and the Tresco, Nyah, Woorinen, Robinvale, Red Cliffs, Mildura and Merbein Irrigation Districts.
Lower Broken Creek	Flows are primarily regulated by transfers of water into the Lower Broken Creek from the Goulburn regulated river system via the East Goulburn Main channel as well as outfalls from the Shepparton Irrigation Area. Flow can also be supplied from the Murray Valley Irrigation Area to meet system demands. The regulated reach of the Lower Broken Creek extends from Katandra Weir on the Broken Creek downstream to its confluence with the Murray River.	Supply into the Lower Broken Creek is reliant on the Shepparton and Murray Valley Irrigation Areas. Supply of water over the non-irrigation period (15 May – 15 August) is intermittent and dependant on works being undertaken.
Lower Loddon River including Pyramid Creek	The Loddon system begins in the Northern Victoria water resource plan area and enters the Victorian Murray downstream of Appin. Flows are regulated in the Loddon main channel by releases from Loddon Weir and Kerang Weir. Pyramid Creek flows into the Loddon main channel downstream of Kerang. Flows in Pyramid Creek are regulated by releases from Ghow (Kow) Swamp. The Lower Loddon River feeds into the Murray River near Swan Hill.	Pyramid Creek is in the Torrumbarry Irrigation Area. Ghow Swamp primarily receives water via the Torrumbarry Weir and channels.

5.1.2 Unregulated systems

In northern Victoria, the unregulated systems are generally upper reaches of regulated rivers and often upstream of reservoirs. Many unregulated rivers and streams in the Victorian Murray water resource plan area have high environmental values. As there are no major storages on these rivers and streams, flows in

these unregulated systems are largely unmodified – although are increasingly impacted by climate change. While unmodified rivers is positive, the absence of large storages means that there is no HEW in these systems that can be released to target specific flow components. Ecological objectives in unregulated systems exist to protect the existing conditions (habitat), rather than provide a specific flow to meet an ecological objective, for example, to trigger fish spawning or water a particular vegetation community.

In unregulated systems, the impact on the environment is managed by specifying limitations on the timing and the rate of take in bulk entitlements and take and use licences. The volume of water which can be extracted by consumptive users can be further limited by restricting or banning take during times of low flow for take and use licence holders. Domestic and stock take is still permitted even during bans which apply to irrigation and industry.

In the Victorian Murray water resource plan area, major unregulated rivers include the Kiewa and Mitta Mitta Rivers. A range of water management arrangements have been developed for unregulated streams. Local management rules have been developed and published for virtually all significant unregulated streams in the water resource plan area⁵.

No priority environmental assets or priority ecosystem functions have been identified in unregulated systems.

5.1.3 Groundwater systems

The hydrogeology of the Victorian Murray water resource plan area is situated on the northern floodplain of the Ovens, Broken, Goulburn, Campaspe and Loddon rivers, as well as the Victorian portion of the Murray River (DELWP, 2019a). It includes the Upper Tertiary Quaternary Aquifer (UTQA) of the Shepparton formation of layered clay, sands and silt that runs from near Seymour north to Nathalia, Barmah and Numurkah. Along the Murray River, the UTQA overlies the Calivil Formation Upper Tertiary Aquifer fluvial, containing fluvial sand, gravel and clay. Other formations include the Lower Tertiary Aquifers of the Renmark formation near Nathalia and Barmah, and Cretaceous Permian sediments made of fractured rock, sand and minor coal near Shepparton to parts of the north near Nathalia and Numurkah.

Groundwater in Victoria is managed through statutory Groundwater Management Plans and non-statutory local management plans. Such plans apply caps (or 'permissible consumptive volumes' (PCVs)) on extraction within a groundwater management area and, through licences that share water amongst users, ensure protection of environmental values. These plans particularly protect values associated with groundwater-dependent ecosystems (GDEs) that rely on groundwater for all or part of their water needs (e.g. river reaches that gain or lose groundwater, wetlands that rely on shallow aquifers, or terrestrial vegetation that relies on shallow or deeper aquifers).

In addition to planning processes for managing unregulated surface water entitlements, the Ministerial Guidelines for Groundwater Licensing and the Protection of Groundwater Dependent Ecosystems (DELWP, 2015) oblige water corporations to undertake a structured assessment of the risks to GDEs associated with the issue or transfer of a groundwater licence. For medium or high-risk proposals, suitable risk mitigation treatments must be developed and incorporated in licence conditions; a licence application may be refused if suitable mitigations are not available. These guidelines support and complement the objectives of the surface water management processes in unregulated catchments to protect and enhance environmental conditions.

Groundwater dependency of priority environmental assets

Victoria's North and Murray Water Resource Plan (DELWP, 2019a) identified the groundwater-dependent priority environmental assets in the Victorian Murray water resource plan area (see Appendix G). These assets have been assessed as to whether they are sufficiently protected from risks via the provision of existing groundwater management plans (Groundwater Logic, 2019)

Whilst the confidence assigned to groundwater dependence varied from high to low, the level of risk posed by groundwater resource use across northern Victoria was generally assessed as low for each of the priority environmental assets (Groundwater Logic, 2019). Four river reaches across northern Victoria were classified as moderate risk GDEs (including parts of Lower Broken and Nine Mile Creek in the Victorian Murray water resource plan area), but all are in areas with existing water management protections in place (e.g. ongoing groundwater usage restriction triggers in place under the Local Management Plan, or where there are

⁵ Local management plans or rules are developed and signed off by rural water corporations, as a delegate of the Minister for Water. All can be found on the relevant water corporations' websites.

baseflow-related targets for environmental watering). Overall, existing measures were considered sufficient to protect priority environmental assets from excessive groundwater resource use.

Groundwater dependency of priority environmental assets and their risk from groundwater use are captured in Appendix G.

5.1.4 Held environmental water in Victoria

The *Water Act 2007* (Cth) identifies two types of environmental water: held and planned. Held environmental water (HEW) is defined under Section 4 of the *Water Act 2007* (Cth) as water available under a water access right, water delivery right or irrigation right for the purposes of achieving environmental outcomes, including water that is specified in a water access right to be for environmental use.

In the Victorian context, HEW is any water held under an entitlement for an environmental purpose. This water includes:

- Environmental entitlements or bulk entitlements issued to the VEWH to provide water to be used for environmental purposes.
- Entitlements such as take and use licences or water shares held by the VEWH or CEWH.
- A passing flow specifically allocated to the holder in an environmental entitlement for environmental benefit or purpose.

This water is considered HEW under the Commonwealth definition because it is water specifically committed to environmental purposes under a water access right.

HEW is protected by Victoria's water entitlement framework, which provides security to all entitlement holders, regardless of use, including:

- secure and enduring entitlements.
- limits on take through sustainable diversion limits and permissible consumptive volumes.
- clear consultative process for changing entitlements.
- an annual process to allocate water to entitlements.
- the ability to trade.
- Ministerial intervention only during extreme events to ensure supplies for critical human water needs.
- a regime for compliance and enforcement.

Victoria's entitlement framework is described in detail in [Victoria's North and Murray Water Resource Plan](#) (DELWP, 2019a).

HEW can be equivalent to high-reliability entitlement or low-reliability entitlement, or it can be provisional and have reliability as described in the bulk or environmental entitlements.

All entitlements in Victoria are recorded on the [Victorian Water Register](#). Information about the holder of the entitlement, where the water may be taken and used, and the volumes authorised by the entitlement are described in this register.

Environmental watering objectives are achieved through the use of HEW and supported by PEW or water not otherwise allocated in the system, including minimum passing flows for system water. Protection and rules for passing flows or minimum flow obligations are outlined in the respective bulk or environmental entitlement instrument for each system.

The use of HEW is often closely integrated with other types of water use. The VEWH works closely with catchment management authorities and storage managers and, where practical, seeks opportunities to adjust the timing and route for delivering consumptive water to achieve ecological objectives efficiently. This can include 'piggy-backing' delivery of environmental water on the delivery of consumptive water or passing flow obligations to maximise ecological outcomes.

HEW in the Victorian Murray water resource plan area is summarised in Table 18.

5.1.5 Planned environmental water in Victoria

Planned environmental water (PEW) is defined in Section 6 of the *Water Act 2007* (Cth) and has three components:

- Water committed or preserved by an instrument.
- Water committed or preserved for the purpose of achieving an environmental outcome or other environmental purposes as specified in an instrument.
- Water that cannot, to the extent it is committed or preserved, be taken for any other purpose.

Section 10.09(1) of the Basin Plan requires the identification of planned environmental water (PEW). A review of Victoria's bulk entitlements and statutory management plans in Victoria's North and Murray water resource plan area was undertaken to determine what forms of PEW there are in northern Victoria.

In Victoria, these conditions are not met in most bulk entitlements and systems as:

- Minimum passing flows are generally not preserved exclusively for an environmental purpose or outcomes as specified in section 6 of the *Water Act 2007* (Cth). Passing flow requirements tend to serve multiple outcomes as shared benefits and are rarely identified as being solely for an environmental purpose.
- Where water is committed or preserved or required to exist within the system, such as a minimum passing flow for a specified environmental purpose or to meet a specific environmental outcome, the Commonwealth definition deems that committed or preserved water cannot be taken for any other purpose. In Victoria, this requirement cannot be met where a water user has a right to take water for domestic and stock purposes and it is not accounted for in measuring passing flows.

There are three instances in Victoria's North and Murray water resource plan - covering the connected Victorian Murray and Northern Victorian water resource plan areas together - where instruments meet the Basin Plan definition of PEW. These are:

- Minimum passing flows available under the Bulk Entitlement (Broken System – Goulburn-Murray Water) Conversion Order 2004.
- Minimum passing flows available under the Bulk Entitlement (Ovens System – Goulburn-Murray Water) Order 2004.
- Minimum passing flows available under the Upper Ovens River water supply protection area water management plan (GMW, 2012).

PEW in Victoria's North and Murray water resource plan is protected in two ways:

- Through the instruments that establish PEW and the instruments that regulate water resource management in Victoria under the *Water Act 1989* (Vic); and
- Measures under the *Water Act 1989* (Vic) such as the Environmental Water Reserve and offences for taking water without authorisation.

These are considered 'rules and arrangements' relating to the PEW and are identified in Table 2 of Appendix E of the Victoria's North and Murray water resource plan (DELWP, 2019a). The water resource plan also provides further details on PEW in Victoria.

The locations of PEW are shown in Figure 14. Note these forms of PEW fall predominantly in the Northern Victoria water resource plan area.

Table 18. Summary of environmental water holdings relevant to the Victorian Murray water resource plan area¹

System	Entitlement	Volume (ML)	Class	Holder	Notes
Broken	CEWH water shares	534	High	CEWH	This does not include provisions to the lower Broken Creek, which is supplied by Murray and Goulburn systems.
		4	Low		
	VEWH water shares	90	High	VEWH	
		19	Low		
Campaspe	Environmental Entitlement (Campaspe River – Living Murray Initiative) 2007	126	High	VEWH	The Living Murray entitlements are held by the VEWB in trust for the MDBA
		5,048	Low		
	Campaspe River Environmental Entitlement 2013	20,855	High	VEWH	
		4,394	Low		
	CEWH water shares	6,624	High	CEWH	
		395	Low		
Goulburn	Goulburn River Environmental Entitlement 2010	24,992	High	VEWH	
		5,792	Low		
	Environmental Entitlement (Goulburn System – Living Murray) 2007	39,625	High	VEWH	The Living Murray entitlements are held by the VEWB in trust for the MDBA.
		156,980	Low		
	Goulburn System – Mitigation Water Environmental Entitlement 2023	1,504	High	VEWH	This replaces the Environmental Entitlement (Goulburn System – NVIRP Stage 1) 2012, which was repealed in 2024
		749	Low		
	Silver and Wallaby Creeks Environmental Entitlement 2006	N/A	Passing flow only	VEWH	
	CEWH water shares	342,874	High	CEWH	

System	Entitlement	Volume (ML)	Class	Holder	Notes
		51,097	Low		
	The Living Murray - water shares	5,559	High	VEWH	The Living Murray entitlements are held by the VEWB in trust for the MDBA
Loddon	Bulk Entitlement (Loddon River – Environmental Reserve) Order 2005	11,798	High	VEWH	The entitlement includes passing flows in addition to a volumetric entitlement.
		2,024	Low		
	CEWH water shares	3,356	High	CEWH	
		527	Low		
Ovens	CEWH water shares	123	High	CEWH	
Murray	Bulk Entitlement (River Murray – Flora and Fauna) Conversion Order 1999	95,571	High	VEWH	
		30,860	Low		
		49,000	Provisional		Rules allow 40,000 ML of this entitlement to be borrowed to support high-reliability entitlements. 10,000 ML must be made available for low-level watering at Barmah Forest.
	Bulk Entitlement (River Murray – Flora and Fauna) Conversion Order 1999 – River Murray Increased Flows	N/A	Provisional	VEWH	Rules in the Bulk Entitlement (River Murray - Flora and Fauna) Order 1999 describe access rights for RMIF.
	Bulk Entitlement (River Murray – Flora and Fauna) Conversion Order 1999 – Barmah-Millewa Forest Environmental Water Allocation	50,000	Provisional	VEWH	
		25,000	Provisional		
	Bulk Entitlement (River Murray – Flora and Fauna) Conversion Order 1999 – Living Murray	9,589	High	VEWH	The Living Murray entitlements are held by the VEWB in trust for the MDBA.
		101,850	Low		
		34,300	Provisional		
		1,276	High	VEWH	

System	Entitlement	Volume (ML)	Class	Holder	Notes
	River Murray River – Mitigation Water Environmental Entitlement 2023	486	Low		This replaces the Environmental Entitlement (River Murray – NVIRP Stage 1) 2012, which was repealed in 2024.
	CEWH water shares	371,345	High	CEWH	
		40,637	Low		
	The Living Murray – water shares	12,267	High	VEWH	The Living Murray entitlements are held by the VEWB in trust for the MDBA

Note: The Northern Victorian and Victorian Murray water resource plan areas are highly connected allowing water sourced in one water resource plan area to be used in another. Water trading allows VEWB to move water to the systems where it is most needed and manage some of the variability within systems. In some systems, environmental water delivered through upstream sites can be used at downstream sites – the water credited to VEWB accounts at downstream sites is called return flows.

1. Sources: Victorian Water Accounts 2023-24 (DEECA, 2025a), VEWB water holdings at 31 March 2024 (<https://www.vewb.vic.gov.au/watering-program/our-water-holdings>), CEWH water holdings at September 2025 (<https://www.dcceew.gov.au/cewh/manage-water/basin/water-holdings>). This table may not be reflective of more recent water recovery.

5.1.6 Other water that contributes to environmental outcomes

The previous section (and Victoria's North and Murray Water Resource Plan (DELWP, 2019a)) explains what planned environmental water is and is not. Although there is other non-held water in Victoria's waterways that also contributes to ecological objectives for priority environmental assets and ecosystem functions, this water does not fall under the definition of PEW as it is not specifically committed for environmental purposes and provides shared benefits. For example, system operating water (the water released from storages to operate river and distribution systems) benefits the environment but also allows delivery of water to other users. Similarly, above-cap water (the water left over after the upper limits on diversions have been reached, including unregulated flows that cannot be kept in storage) provides significant benefits to the environment but also to recreational users of waterways. Cultural water can also provide significant environmental benefits - for example, Taungurung Land and Waters Council holds a water share on the King River, and each year, they have donated the majority of this water allocation to the environment (DELWP, 2022a).

Under the Basin Plan it was expected by the MDBA that a large portion of system water and/or above cap water would be identified as planned environmental water. Although all above cap or system water cannot be identified as planned environmental water under Victoria's framework, in Victoria this water is considered to have shared benefits. This can contribute to ecological objectives for priority environmental assets and ecosystem functions, and other environmental values in the water resource plan area.

Efficient and effective environmental outcomes

The VWMS (DEPI, 2013a) states that Victorian environmental water management will focus on making the most efficient and effective use of water available. Environmental water managers work with river operators to identify how all types of water can be best utilised to meet multiple objectives, including those for the environment. They coordinate the delivery of HEW with above cap and system water, as well as planned environmental water and consumptive water *en route*, to meet ecological objectives. Sometimes the timing and route for delivery of consumptive water can be altered to achieve ecological objectives without using environmental water.

Planning Our Basin Future Together (DEECA, 2024c) states that Victoria's approach to delivering on Basin Plan is to:

- Continue to find ways to deliver water recovery through approaches that minimise the volume of water taken from the consumptive pool, including through water infrastructure upgrades like the GMW Water Efficiency Project.
- Where any water is recovered from the consumptive pool, look for complementary water savings through a targeted approach, finding system savings to boost environmental outcomes without unnecessarily reducing the water available for productive use.
- Recover water through projects that result in a direct environmental outcome and can be delivered to where it is needed for targeted ecological requirements.
- Recover water in a way that has community support, including by working in partnership with Traditional Owners to deliver projects that can benefit cultural outcomes in specific regions.
- Look at ways to reduce the impacts of river regulation by thinking about how water recovery could open up opportunities to restore a large proportion of natural flow regimes (e.g. by creating entitlements to restore more natural components of flow regimes or removing barriers to flow and fish passage).
- Find water recovery approaches that actively reduce the long-term costs of water infrastructure for the community in Victoria, like rationalising irrigation delivery infrastructure or changing system operations to be more efficient.

Further initiatives to improve environmental outcomes in waterways are outlined in section 8 Complementary Actions.

6. Cooperative arrangements

Environmental water management involves a range of people and organisations. This section describes these partnerships and identifies the processes by which collaboration occurs between agencies and across regions.

6.1 Context

There are strong cooperative arrangements in place to support delivery of Victoria's environmental watering program, between environmental water holders (VEWH, CEWH, TLM), , managers or owners of environmental assets for the delivery of environmental water (water corporations, CMAs, land management agencies) and community members. Environmental water holders, water corporations, CMAs and land management agencies also partner with Traditional Owner groups to deliver Victoria's environmental watering program.

The Victorian government has established these arrangements, in consultation with delivery partners and communities, and participates in inter-jurisdictional arrangements, through the Environmental Watering Committee (EWC, formed in 2021) and the Southern Connected Basin Environmental Watering Committee (SCBEWC). The arrangements are underpinned by a range of policy, regulatory and governance frameworks.

The SCBEWC is responsible for coordination of operational planning for the delivery of environmental water consistent with the Basin Plan Environmental Management Framework including:

- Development of operational scenarios for the delivery of environmental water in the Southern Connected Basin (including tributary inflows) to inform the River Murray System Annual Operating Outlook.
- Review and update the delivery scenarios throughout the year in response to changing conditions and priorities, where required.

As per Victoria's North and Murray Water Resource Plan (DELWP, 2019a), when the VEWH undertakes environmental watering in accordance with the obligation under section 10.26 of the Basin Plan, VEWH must ensure that environmental watering in the Victorian Murray water resource plan area and the Northern Victoria water resource plan area is coordinated to ensure that the environmental watering objectives of connected plan areas can also be achieved.

6.2 Responsible organisations

Public and private authorities collaborate to deliver environmental water in Victoria. These authorities, referred to as program partners, are listed in Appendix E along with their respective roles and responsibilities, which are summarised as follows:

- **Waterway managers (CMAs)** are responsible for identifying, planning and implementing regional priorities for environmental waterway management, this includes identifying objectives and assessment of water regimes needed for priority environmental values, cultural values and uses, social and recreational uses and values and economic values. They consult with local communities, develop proposals for environmental watering in rivers and wetlands in their region, order environmental water from storage managers, and monitor the outcomes.

In the Victorian Murray water resource plan area, the responsible CMAs are Mallee, North Central, Goulburn Broken, and North East CMAs.

- **Storage managers** deliver water for all water users, including for waterway managers and environmental water holders. In the Victorian Murray water resource plan area, while Goulburn-Murray Water and Lower Murray Water are the responsible water corporations, MDBA River Operations manage storages at Dartmouth, Hume and Yarrawonga for Victoria, NSW and SA.
- **Environmental water holders** commit environmental water to different rivers and wetlands. They work together to ensure the coordinated delivery of water available under different environmental

entitlements, and often must prioritise across large regions or water resource plan areas. In the Victorian Murray, the environmental water holders are VEWH, CEWH and TLM.

- **Public land managers** are closely involved in environmental water planning and delivery for public land such as state forests or national parks. They may have a variety of responsibilities including operating infrastructure (such as pumps, outlets, gates and channels) and ensuring appropriate public signage during an event. In the Victorian Murray, the public land managers are Parks Victoria, DEECA, Traditional Owner land management boards and some local councils.
- **Traditional Owner groups** in the Victorian Murray water resource plan area includes formally recognised Traditional Owner groups of the First Peoples of the Millewa-Mallee Aboriginal Corporation, Wamba Wemba Aboriginal Corporation and the Yorta Yorta Nations Aboriginal Corporation. There are also First Nations groups without formal recognition who hold cultural rights and have customary obligations to care for Country. These are Barapa Barapa, Pierce Family, Duduroa Dhargal Aboriginal Corporation, Gilbie Corporation, Latji Latji Mumthelang, Munatunga Elders, Murray Valley Aboriginal Corporation, Nyeri Nyeri, Tati Tati Kaiejin, Tati Tati Land and Water, Wadi Wadi Land and Water, Wadi Wadi Nations, Dadi Dadi / Weki Weki Traditional Owners and Wiran Aboriginal Corporation.

Waterway managers, storage managers and environmental water holders seek to partner with Traditional Owners to support recognition of cultural values and uses in waterway management, noting the level of partnership is to be self-determined by each group (DEECA, 2024a). Water is Life (DELWP, 2022a) commits to the increased role of Traditional Owners in determining how environmental water is used for the purpose of healing Country. As part of this, Traditional Owners may submit seasonal watering proposals to VEWH independently or in partnership with waterway managers (CMAs).

- **Private land holders and other community members** are actively involved in environmental water planning, for example through involvement in seasonal watering proposal advisory boards.

6.3 Coordination processes

Coordination of environmental watering in the surface water systems in Victorian Murray water resource plan area, and across Victoria's state borders, is done through cooperative arrangements. The VEWH leads annual environmental water planning and coordination for Victorian waterways at a water resource plan area scale, in close consultation with CMAs as the local environmental water managers.

The VEWH represents the Victorian priorities and objectives at interstate and Commonwealth environmental watering coordination forums to help align and coordinate objectives and outcomes at the broader Murray-Darling Basin scale.

The VEWH works closely with the CEWH in areas where Commonwealth water holdings may be used in Victoria. The VEWH and CEWH have an agreement to collaborate and coordinate their activities (DELWP, 2019a). The VEWH also collaborates closely with CMAs and water corporations (e.g. Goulburn-Murray Water) in the planning and delivery of environmental water at local and regional scales as part of its annual watering planning process.

The VEWH's annual Seasonal Watering Plan outlines the annual watering priorities of the entire state. The process for development of the Seasonal Watering Plan is shown in Figure 15.

This process works year-round as follows:

- **December-March:** CMA planning and consultation to begin preparation of seasonal watering proposals for the coming water year. These are informed by their Regional Waterway Strategies, Environmental Water Management Plans and technical information, e.g. environmental FLOWS studies. The proposals are developed in consultation with the community, Traditional Owners and other partners (e.g. storage managers).
- **April-May:** The VEWH prepares a Seasonal Watering Plan based on seasonal watering proposals. This involves consultation with the CEWH, MDBA and other jurisdictions (e.g. through SCBEWC – see below) prior to the preceding season. The CEWH and SCBEWC also produce their respective annual plans, informed by Victorian site proposals.
- **June:** Release of Seasonal Watering Plan for the upcoming water year.

- **July-June** (year-round): Program partners coordinate delivery of environmental water. Throughout the season, the VEWH issues seasonal watering statements to waterway managers and the VEWH Office to authorise water use and communicate environmental watering decisions. The VEWH Office undertakes the role of waterway manager for multi-jurisdictional deliveries to the Murray River system.

Seasonal watering statements are available online at <http://www.vewh.vic.gov.au/news-and-publications/seasonalwateringstatements> .

Ongoing and regular communication between environmental water holders, storage managers and environmental water managers provides opportunities to discuss priorities, negotiate watering commitments, manage operational risks, review watering actions, report on outcomes and to integrate environmental watering into system operations to optimise outcomes, for example in planning to reuse return flows for watering at multiple sites. This is often achieved through Operational Advisory Groups that bring together site managers, river operators and environmental water holders to coordinate water use.

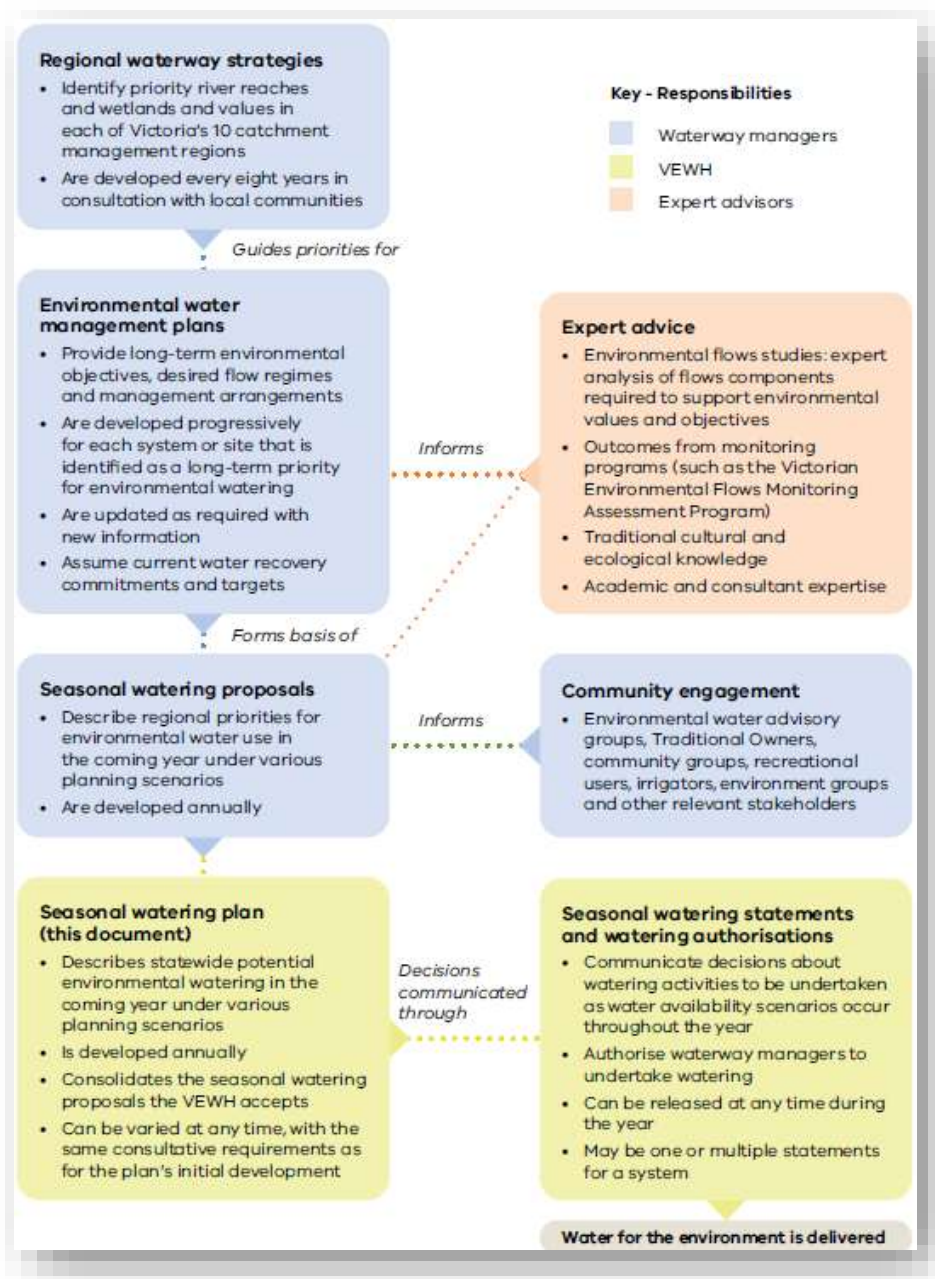


Figure 15. Victoria's annual environmental water planning process (VEWH, 2025a)

Inter-jurisdictional coordination occurs through the Southern Connected Basin Environmental Watering Committee (SCBEWC). SCBEWC was established in 2014 to coordinate the delivery of environmental water in the southern connected Basin by establishing a collaborative approach to delivery involving all environmental water holders. SCBEWC is also responsible for overseeing the TLM program, and for joint governments to approve the timing, use and allocation of jointly held water – TLM, River Murray Integrated Flows (RMIF) and River Murray Unregulated Flows (RMUF). SCBEWC has a particular focus on the southern connected basin – Murray River anabranches and tributaries, along with distributaries from NSW such as the Darling River, including the allocation and approval for using jointly held water (TLM, RMIF, RMUF). This water is managed by MDBA on behalf of joint governments, consistent with the Basin Plan Environmental Water Plan and its objectives, in order to meet the overall Basin Plan targets (outlined in section 1.1).

Members include representation from agencies with environmental water responsibilities: the MDBA; Commonwealth Department of Climate Change, Energy, Environment and Water; CEWH; NSW Department of Climate Change, Energy, Environment and Water; SA Department for Environment and Water; VEWH; and Victorian DEECA.

Murray Lower Darling Rivers Indigenous Nations (MLDRIN) are members with an advisory role to support increased First Nation influence in water management, including environmental water, and sensitively incorporate cultural values and First Nations outcomes.

SCBEWC typically meets five times each year to coordinate environmental water planning, approximately:

- **February-March:** environmental water holders begin to plan and prepare for the following water year, including discussing watering proposals for the southern connected Basin, including Living Murray Icon sites and broad plans for coordinated environmental watering actions.
- **April-May:** towards the end of the water year, watering actions undertaken to date are evaluated and an operational strategy for the following water year is developed that seeks to coordinate environmental water delivery for system outcomes. Basin and catchment annual environmental water proposals and priorities are fully drafted, and CEWH and SCBEWC produce their respective annual plans. Early approvals for jointly held water may occur (e.g. TLM, River Murray Increased Flows).
- **June:** water holders and partners plan for coordinated delivery of environmental water to contribute to system wide priorities and benefits (e.g. coordination of a multi-site spring pulse in the Murray); members re-evaluate proposed watering actions based on actual flow conditions, and consider actions for the remainder of the water year. Approval of jointly held water, and of all TLM monitoring for the year ahead.

Additional meetings are held to check-in on watering actions, further coordinate and inform decisions during watering events and/or make decisions on the use of TLM portfolio, monitoring and the Indigenous Partnerships Program.

Increased collaboration is seeing environmental water managers combine their water to deliver larger and more effective events than would otherwise be possible. In 2017, the MDBA's evaluation of the Basin Plan found that by 2016-17, over a third (37%) of all environmental watering events in the basin were coordinated events involving multiple environmental water holders. SCBEWC's 2022-23 Annual Report states that environmental water management across the southern connected Basin has evolved from largely site-based to now include large-scale coordinated watering events that improve downstream and system-wide connectivity outcomes (SCBEWC, 2023). Increased collaboration is seeing environmental water managers combine their water to deliver larger and more effective events than would otherwise be possible.

The effectiveness of these cooperative coordination processes continues to increase through inclusion of a broader number of connected sites such as the Edward-Wakool system, targeted alignment with floodplain demands, whole of river monitoring projects (River Murray channel monitoring) and incorporation of lessons from past deliveries.

6.4 Consideration of other values in use of environmental water entitlements

In planning for and making environmental watering decisions, the primary purpose is to maximise environmental benefit. Where consistent with this objective, environmental water managers must also consider whether social and cultural benefits can be achieved. The use of environmental water to provide specific social benefits cannot be prioritised at the expense of achieving ecological objectives.

Water for Victoria (DELWP, 2016) sets out Victoria's position on optimising the use of limited water resources to meet some of the objectives of key groups in the community, such as Traditional Owners and recreational users. Under the *Water Act 1989*, the VEWH, water corporations and CMAs must consider opportunities to provide for Aboriginal cultural values and uses of waterways, as well as the social and recreational uses and values of waterways, when performing their legislated functions. This is consistent with directions in the Basin-wide Environmental Watering Strategy (MDBA, 2025a).

7. Constraints

Environmental water delivery is subject to physical or operational and management barriers that limit what flows can be delivered down rivers and what outcomes are achievable. This section identifies the key constraints in the Victorian Murray water resource plan area and strategies to manage or overcome these.

'Bank full' and overbank flows that connect rivers to their floodplains are key flow components to support a healthy river and floodplain ecosystem. These higher flows are needed to restore the health of floodplain vegetation and reconnect wetlands, rejuvenating habitat for the diverse range of animals that depend on these areas, and provide an important productivity boost for rivers. The ability to provide these higher flows will contribute to achieving ecological objectives and targets for the priority ecological assets of the Victorian Murray water resource plan area and are linked to the Basin Plan's Environmental Watering Plan objectives and the system-wide targets.

Modelling indicates that the additional environmental water recovered through the Basin Plan will allow low-lying floodplains, wetlands and anabranches to be watered (i.e. mainly at or below minor flood level), provided that physical, operational and capacity constraints are addressed to mitigate impacts to private land, (e.g. agricultural production, stock, private access roads), public infrastructure (e.g. roads, bridges and culverts) and other users. Watering the mid to upper floodplain would require significantly more water, which would also have greater third-party impacts. Even in the instance of full implementation of the relaxed constraints projects (see section 7.1), the anticipated flow rates delivered will not meet the ecological watering requirements of wetlands situated in elevated floodplain areas. In many cases, the only way to water these areas will be by using environmental works to target high value sites (see section 8.6) or through moderate and major flood events that occur naturally.

Physical and operational (or management) constraints to environmental water delivery are defined below:

Physical constraints are a natural formation or a physical structure, for example a pipe or channel, that limit the volume of water that can pass a given location (refer to Basin Plan section 1.07). Physical constraints also include things like roads, bridges and private land that would be inundated at higher flows, causing potential damage to crops or fences and affecting access.

Operational (or management) constraints arise from the operating practices employed to manage water resources across the Basin, such as channel sharing, water accounting and the ability to order water from specific locations. Policies may also limit environmental water delivery, such as not flooding private land through overbank flows without landholder consent. Unlike physical constraints, these constraints cannot simply be resolved through infrastructure works, but require policy and procedural changes with stakeholder support. An example of overcoming an operational constraint is where water accounting frameworks in Victoria have been updated to allow crediting of return flows from environmental water use, permitting achievement of multi-site watering from a single water release.

7.1 Constraints Management Strategy 2013 to 2024

The MDBA's Constraints Management Strategy (CMS) 2013 to 2024 (MDBA, 2013) identified and prioritised physical and operational constraints across the Murray-Darling Basin, focusing on seven key areas including:

- Hume to Yarrawonga (Murray River)
- Yarrawonga to Wakool Junction (Murray River)
- Goulburn River (Victoria)
- Murrumbidgee River (NSW)
- Lower Darling River (NSW)
- Gwydir River (NSW)
- Lower Murray (SA).

The CMS (MDBA, 2013) looked at ways to address these constraints, including raising the height of bridges to maintain access at higher flows, improving flood warning systems and securing easements to enable private land to be watered. The process carried out to inform the development of the CMS (MDBA, 2013) is described further in Figure 16.

The outcomes that can be achieved in each reach will depend on the extent to which constraints can be addressed, and the links and interdependencies across these focus reaches. Projects to relax or overcome constraints in all key focus areas, except the Gwydir, are being delivered by the relevant Basin state governments. These projects, called 'constraints measures', are exploring the potential impacts of delivering higher flows and how these can be addressed to support local benefits and system-wide environmental outcomes through the reconnection of rivers to their floodplains. Working closely with affected communities will be critical to success.

In 2014, the MDBA, working with Basin states and communities, completed the first phase of the CMS — the pre-feasibility phase. This identified and prioritised important operational and management constraints, including their relationship to physical constraints, and set out to define and agree between the MDBA and each of the Basin governments the respective roles and responsibilities to progress priority operational and management constraints.

The CMS identified nine types of operational and management constraints for further consideration, and identified four that were considered to make the most significant difference to achieving environmental outcomes. These nine constraints are listed below, with the four priority constraints shown in bold:

- 1. delivery of environmental water on top of other instream flows**
- 2. channel capacity sharing**
3. timing of water availability
4. planned environmental water
- 5. environmental water can be used throughout the length of a river**
- 6. protection of environmental flows from extraction and re-regulation**
7. substitution of held environmental water with other water
8. coordinated planning and delivery of water delivery
9. current river management practices.

Figure 16. Pre-feasibility assessment of operational and management constraints in the CMS (MDBA, 2013)

7.2 Constraints affecting the Victorian Murray water resource plan area

The operational and management constraints affecting the Victorian Murray water resource plan area can be broadly grouped into the following types, associated with:

- Channel/watercourse capacity (i.e. the constraints due to insufficient flow capacity to meet both environmental and consumptive demands at key watering times).
- Consumptive water entitlement framework (i.e. the constraints imposed by the procedures and policies of the water supply system (which was designed to supply water for consumptive use)).
- Co-operative management (i.e. the constraints due to existing governance arrangements that have often been developed independently of environmental watering arrangements).
- Excess consumptive demand (i.e. the constraints preventing environmental water managers from reducing stream flow to environmental desirable levels at the expense of fulfilling consumptive demands).
- Geomorphic impacts (i.e. the constraints controlling rates of rise and fall which are designed to prevent degradation of the physical form of waterways).

- Travel time and attenuation (i.e. the long travel time and attenuation experienced by environmental flows, which constrains the ability to readily 'piggy-back' on other flows in the target reach).
- Flooding (i.e. the constraints arising from inundation of private land or public infrastructure).
- Outlet release capacity (i.e. constraints due to insufficient flow capacity through reservoir release valves).
- Storage capacity (i.e. constraints due to insufficient storage in weir pool to store, re-regulate and later release flows).
- Availability of irrigation assets during the non-irrigation period (when works are being undertaken on infrastructure, delivery of water may not be possible or limited between 15 May and 15 August each year).

Of the types of constraints listed above, those associated with outlet release capacity and the consumptive water entitlement framework are most numerous (DELWP, 2019a).

7.3 Strategies to manage or overcome constraints

7.3.1 Policy measures

According to the CMS, the most notable operational constraints affecting the southern connected Basin were the policy measures outlined in the Basin Plan (c7.15 (2)) to:

- Credit environmental return flows for downstream environmental use.
- Allow the call of HEW from storage during unregulated flow events.

The MDBA considered that implementation of these two policy measures would resolve a number of operational and management constraints and would be required to achieve the desired objectives of the Basin Plan and this LTWP. Provisions in the VEW's bulk and environmental entitlements and obligations on Goulburn-Murray Water in its bulk entitlements enable the above two policy measures and addresses these constraints. These arrangements allow use of environmental water to get the best environmental outcomes without impacting the security of supply to other entitlement holders. The MDBA has accepted that implementation of these policy measures is enduring, operational and transparent in Victoria.

7.3.2 Victoria's Constraints Measures Program (CMP)

Victoria's Constraints Measures Program (CMP) includes two separate constraints measures:

- the Hume to Yarrawonga project, a joint proposal with NSW; and
- the Goulburn project, where Victoria is the sole proponent.

A feasibility study was completed in 2024 focussing on the benefits and risks of addressing constraints in the Goulburn and Murray rivers (DEECA, 2024d).

Due to the complex nature of cross-border issues in managing the River Murray, an Independent Advisory Panel has been established to advise Basin Ministers on the merits, risks, costs and community sentiment of addressing constraints. The Panel is required to report to Ministers in December 2026.

Progressing constraints will be guided by the Basin Ministers once they have considered the Independent Panel's report.

7.3.3 Improving System-wide coordination

The former Enhanced Environmental Water Delivery (EEWD) project was being jointly delivered by Victoria, NSW and SA, working closely with the MDBA as the project delivery partner, prior to funding being suspended in October 2025. The EEWD project was designed to complement the cross-jurisdictional program of constraints relaxation described above in section 7. Where constraints relaxation projects explore opportunities to enhance higher river flows to re-establish natural river and wetland processes, through mitigation of third-party impacts, EEWD aimed to help river operators and environmental water holders use this increased operational flow range effectively through development of tools and improvements to planning, forecasting and delivery to coordinate managed flows at the southern connected Basin scale.

While the project described above looked to optimise environmental outcomes under existing flow limits, benefits will be greater if higher flows can be delivered through implementation of constraints relaxation

projects. However, even if constraints were relaxed to notified flows, many high value sites are located even higher on the floodplain and cannot be watered effectively without using environmental works (see section 8.6).

8. Complementary actions

Environmental water is only one component of the activities and works required to achieve environmental outcomes and address the various threats to waterway health, including those identified in the Long-term risks (section 10). Complementary actions implemented in a strategic, coordinated and integrated way continue to be vital to support priority environmental assets and functions, and to meet the ecological targets of this plan.

8.1 Overview

Victoria's catchment management framework helps us to achieve improvements in rivers, floodplains and catchment landscapes despite the modifications and impacts that have occurred because of the development of major towns, infrastructure, and agricultural industries. Together with Victorian communities, regionally focused, holistic, landscape-based strategies have been developed that co-ordinate efforts of local land, water and biodiversity managers. This includes sustainable water strategies, regional catchment strategies, regional waterway strategies, and land and water management plans in irrigation areas. CMAs strategically invest in integrated catchment management for effective environmental outcomes. Victorian investment in Basin environments is approaching \$1 billion statewide since 2004, with a focus on works like fishways, snags, in-stream vegetation and controlling pest plants and animals.

This chapter discusses a range of complementary actions essential to accompany the provision of environmental water in the Victorian Murray. Victoria has also developed a prospectus which provides rationale for a range of complementary measures across northern Victoria (DEECA, 2025b).

CMAs prioritise these actions to manage threats to waterway values, according to threat level, feasibility of success, contribution to local and broader outcomes, and resilience to a range of climate futures. Priorities are detailed in regional waterway strategies.

Victoria also has a [Flagship waterways](#) initiative that involves 19 large-scale, long term integrated waterway projects across the state with established vision, objectives as well as monitoring and evaluation processes. In the Victorian Murray water resource plan area this includes the Upper Mitta Mitta project in the North East CMA region, the Murray and Loddon Floodplain project in the North Central CMA region, and the Merbein Common and Kings Billabong projects in the Mallee CMA region. Many flagship waterway projects involve a range of complementary actions to achieve their objectives in an integrated approach such as invasive weed removal, environmental water management and fencing off waterways to limit livestock access.

Further information about complementary actions in the Victorian Murray water resource plan area are detailed in the relevant CMA regional waterway strategies (NECMA, 2014; GBCMA, 2014; NCCMA, 2014; MCMA, 2014). These are currently being updated, due for finalisation by 2027.

8.2 Traditional Owners delivering healthy waterways

For countless generations, First Nations and Traditional Owners in Victoria have practised their law and lore, customs and languages, and nurtured Country through their spiritual, cultural, material and economic connections to land, water and resources.

The Victorian Government is committed to enabling self-determination for Traditional Owners and Aboriginal Victorians in the health of waterways through overarching policies and frameworks such as the Victorian Aboriginal Affairs Framework 2018 -2023 (Aboriginal Victoria, 2018), Chapter 6 of Water for Victoria (DELWP, 2016), [Pupangarli Marnmarnepu 'Owning Our Future' Aboriginal Self-Determination Reform Strategy 2020-2025](#), supporting Traditional Owners to make choices that best reflect them, their values and their connection to Country, and Water is Life outcome 5 - recognition of Traditional Owners as waterway managers for specific locations (DELWP, 2022a).

The *Traditional Owner Settlement Act 2010* enables the Victorian Government and Traditional Owners to make agreements that recognise Traditional Owners and their rights in managing Country, including establishing Recognition and Settlement Agreements. CMAs are also required under the *Water and Catchments Amendment Act 2019* to recognise Aboriginal cultural values and knowledge in water and catchment planning and management and to include Traditional Owners in these processes.

Since establishment of the Aboriginal Water Program through Water for Victoria (DEPI, 2016), the Victorian Government has committed resources to support Aboriginal participation in water management and improve

outcomes for Aboriginal Victorians. The Aboriginal Water Program incorporates Aboriginal values and expertise into water management. The Aboriginal Water Program funds full-time Aboriginal Water Officers, and projects that bring Traditional Owners together to spend time engaging on Country, improve understanding of cultural values and uses, and share their expertise.

Traditional Owners are taking increased roles in waterway management, managing for both ecological and cultural outcomes. The Aboriginal Water Program has increased the roles of Traditional Owners involved in areas such as protecting crown land water frontages, invasives species management, and restoring in-stream habitat. Working collaboratively with CMAs, Traditional Owners are leading actions or cultural projects that overlap with the actions outlined below.

Examples in the Victorian Murray water resource plan area include joint management of Barmah Forest by Parks Victoria and the Yorta Yorta Traditional Owner Land Management Board; and the Aboriginal Water Officer at the First People of the Millewa Mallee Aboriginal Corporation working to bring water back to Musk Duck Wetland (Ned's Corner East).

8.3 Waterway land management

Waterway land includes riparian land and the bed and banks of rivers, creeks and wetlands. The effectiveness of environmental watering programs is heavily reliant on complementary waterway land management, such as controlling livestock grazing and other activities that may impact on waterways. Where vegetation has been cleared and there is limited natural regeneration, revegetation with appropriate species may also be required.

The Victorian Government invests in collaborations between waterway managers, landholders and other partners to undertake on-ground management activities and encourage good riparian management practices across all waterways with a focus on priority areas identified by regional waterway strategies. This work is undertaken through agreements and cooperative partnerships. Since 2013, this has included 89,892 ha of local riparian vegetation improvements and 1,950 km of waterways fenced to control livestock access across the state. Often waterway managers and partners like Landcare groups can attract substantial additional support such as through volunteer work and funding from Commonwealth and local governments.

The VWMS (DEPI, 2013a) establishes a framework to maintain and improve public and private waterway land in priority management areas. This is done particularly through the reduction of livestock access to waterways, on both public and private land. Voluntary and cooperative partnerships are encouraged between landholders, other partners and the government, providing funding for programs to undertake activities including fencing to reduce livestock access to waterways, revegetation, weed management and installation of off-stream livestock watering infrastructure. DEECA will also continue to support and implement improved compliance approaches for Crown frontages (strips of public land along waterways) and require landholders managing licensed Crown frontages to meet minimum management standards.

The Victorian Government and CMAs have also developed and implemented a range of guidance and supporting information for fencing and management of riparian land. This guidance promotes accepted best practice and covers the following aspects:

- Livestock management on riparian land
- Impacts of floods and fire on riparian land
- Benefits of riparian land to landholders
- Controlled grazing on riparian land.

The EPA also has guidance on managing impacts of grazing on water quality (EPA, 2025).

CMAs also have statutory responsibilities for issuing permits and licences for works on waterways to mitigate risks to environmental outcomes such as increased erosion or creating barriers to fish passage. They also undertake compliance and enforcement activities to prevent inappropriate works taking place on waterways.

8.4 Instream habitat

The VWMS (DEPI, 2013a) outlines the issues and management approach associated with the river channel and emphasises that high quality instream habitat is essential to support healthy populations of native fish, as well as for aquatic plants and other animals. While many aspects of instream habitat (e.g. channel form, instream vegetation) can be improved with the effective use of environmental water, other threats need to be mitigated.

Large wood in waterways is an important source of instream habitat as it provides shelter, food sources and breeding sites for a variety of waterway dependent animals and invertebrates. Victorian waterway policy states that large wood in waterways will not be removed unless it is demonstrated to pose a serious risk to public safety or public infrastructure. To improve habitat conditions, large wood may be moved to a suitable location and realigned parallel to direction of flow, or reinstated into rivers, for example sourced from trees felled due to storm events or infrastructure projects like road widening.

Instream barriers, such as weirs and dams, and road crossings such as fords and culverts, are a key threat to native fish. They prevent native fish from moving upstream for spawning and recruitment, and larvae from drifting downstream to new habitats. The loss of fish to irrigation channels is also a major issue, as diversions for irrigation flows lure fish into channels, removing them from rivers and creeks and losing them from the breeding population. Several threatened native fish species are affected including silver perch, flat-headed galaxias, trout cod, Macquarie perch and Murray cod.

The Victorian government has invested in projects to enable fish movement and improve connectivity at priority sites. In the Victorian Murray water resource plan area, this investment has provided fish passage at the highest priority remaining barriers in Gunbower Creek and the Lower Loddon River to improve flows, habitat and connectivity to support recovery of regional native fish populations.

8.4.1 Native fish

Utilising improved instream habitat, the Victorian Fisheries Authority stocks waterways to recover threatened species and improve recreational fishing opportunities. Priority rivers for native fish releases (Murray cod, golden perch, Macquarie perch) over the last five years have been the Ovens, Goulburn, Wimmera and Loddon rivers and Broken Creek (VFA, 2021).

Endangered native fish species are also translocated to new viable locations or habitats. For example, Mallee CMA are undertaking translocations of Murray hardyhead from Koorlong Lake to Brickworks Billabong in the Merbein Common (MCMA, 2025), and Goulburn Broken CMA have been supporting translocations of freshwater catfish into the lower Broken Creek.

Reintroduction of threatened species is now a common rehabilitation tool that is being used for a wide range of species. North Central CMA's native fish recovery project has been using surrogate sites to breed small bodied threatened species of olive perchlet, purple spots and southern pygmy perch, and successfully reintroduce these into the Gunbower Forest wetlands with successful recruitment.

8.5 Invasive species management

The Victorian Government has developed the Biosecurity Strategy (Agriculture Victoria, 2023) to protect our economy, natural environment, human health and cultural heritage from the impacts of plant and animal pests and diseases. The approach aligns with the Invasive Plant and Animals Policy Framework (Agriculture Victoria, 2010).

The VWMS (DEPI, 2013a) states that regional waterway strategies will consider both current and potential future risks, where known, of invasive species that affect the environmental condition of waterways, and direct management priorities for weed and pest management where invasive species are identified as a key threat to regional outcomes. Examples of activities to manage invasive species include removal of weeds like willows and gorse from riparian areas or fumigating, baiting and ripping rabbit burrows adjacent to wetlands. Pest plants and animals are managed where required to maintain the ecological character of Victoria's Ramsar sites.

Victoria is also participating in the Commonwealth Government's Carp Biological Control Program, which is investigating the potential use of *Cyprinid herpesvirus 3* (carp virus) to reduce carp numbers which are having major impacts on waterways. While investigations proceed, Victoria will continue to invest in and promote native fish recovery, ensuring conditions are suitable so that native fish species have a chance to outcompete carp.

The management of invasive species (plants or animals) is an occasional environmental watering objective recognised by CMAs in EWMPs. Appropriate hydrological regimes can be used to dry out, flush or flood a species (such as azolla) from a wetland or river, with varying degrees of success based on a range of factors. However, some exotic species (e.g. carp) also can benefit from environmental watering such as the creation of suitable breeding conditions when wetlands are inundated. Other specific management actions such as fish screens on water inlet structures on wetlands may be able to limit carp breeding by preventing them from entering.

Regional waterway strategies provide further information on management of invasive species (GBCMA, 2014; NCCMA, 2014; NECMA, 2014, and MCMA, 2014).

8.6 Environmental works and measures

In many cases, environmental works are the only way to get water to many of the sites that need it, such as fringing wetlands along the river and low-lying floodplains. This approach works when there is not enough water to flood wetlands naturally. Environmental works can enable ecological outcomes to be achieved in waterways with much smaller volumes of water than would be required to create a natural flood.

Works include pumps to supply water to disconnected wetlands, and regulators, channels and bunds to direct, retain or exclude flows. For example, a new regulator at Kynmer Creek in Barmah Forest was completed in 2024 and allows a more natural flow regime to be delivered in the waterway. More examples are outlined in section 8.7 below on SDLAM projects. Other measures may also be needed, such as flood easements to allow for overbank flows or altering river operations to improve environmental outcomes. This approach ties closely in with constraints relaxation measures to improve overall environmental outcomes (section 7).

Large-scale environmental works have been completed through TLM and are delivering results at three of Victoria's TLM icon sites in the Victorian Murray water resource plan area (see section 2.2.2). New works proposals have been developed for eight sites in the Victorian Murray water resource plan area, through the Victorian Murray Floodplain Restoration Project. This will enable another 14,000 ha of high-value wetlands and floodplain to be watered more frequently than would otherwise be the case and help offset some of the impacts of climate change (see section 8.7 on SDLAM projects).

Typically, it is not possible to reinstate flooding to higher parts of the floodplain. This would require large volumes of water that often cannot be delivered from dams and channels due to limitations in flow rates and volumes available and could cause flooding that damages private land and public infrastructure, such as bridges and roads⁶.

8.7 Sustainable diversion limit adjustment mechanism

Victoria's supply measure projects are part of the Sustainable Diversion Limit Adjustment Mechanism (SDLAM) of the *Basin Plan 2012*. SDLAM projects gain environmental outcomes with less water than required through 'natural' or unregulated flows. This includes the Constraints Management Program (section 7) and the below projects.

In addition to these, the *Planning Our Basin Future Together* prospectus (DEECA, 2024c) sets out ways that further water recovery in Victoria could be undertaken in a way that maximises environmental outcomes, while minimising socio-economic impacts.

Victorian Murray Floodplain Restoration Project (VMFRP)

The *Victorian Murray Floodplain Restoration Project (VMFRP)* will use environmental works such as containment banks, pumps and regulators to deliver available environmental water to restore up to 14,000 hectares of high value floodplain across eight sites.

VMFRP works at Nyah, Vinifera, and Hattah Lakes North are being funded under SDLAM and construction will commence in 2026. This will enable watering of over 2,000 hectares of Murray floodplain. Works at remaining sites (Gunbower Forest, Guttrum and Benwell Forests, Belsar Yungera Islands, Lindsay and Wallpolla Islands) will be constructed, subject to regulatory approvals, and Commonwealth construction funding beyond December 2026.

The Living Murray

The following six Living Murray projects are complete, with the first four projects located within Victoria:

- The Living Murray – Lindsay Island Stage 1
- The Living Murray – Mulcra Island

⁶ Environmental watering risks are managed under policy in the Victorian Waterway Management Strategy (DEPI, 2013a)

- The Living Murray – Hattah Lakes
- The Living Murray – Gunbower Forest
- The Living Murray – Koondrook-Perricoota (New South Wales)
- The Living Murray - Chowilla Floodplain (South Australia).

Environmental works have been constructed to enable water for the environment to be delivered to improve the ecological health at these ecologically and culturally important sites. Environmental works have been operational at Mulcra Island since 2011, Lindsay Island and Hattah Lakes since 2013, and Gunbower Forest since 2014, and the annual progress and outcomes from water for the environment deliveries are published annually by the MDBA (see: [Progress and outcomes – an improving system | Murray–Darling Basin Authority](#)).

Restoring Flows to the Mallee Floodplain

The Restoring Flows to the Mallee Floodplain (RFMF) Program is a new project that will build infrastructure to effectively and efficiently water up to 16 ecologically significant Mallee floodplain sites (across 1,486 ha) from Bridge Creek near Swan Hill to Scotties Billabong close to the South Australian border (Figure 17). Together, these sites form a cohesive program of works aimed at restoring landscape-scale floodplain function and habitat condition, supporting 70 EBPC-listed species and protecting culturally rich areas with no additional water recovery for the environment required. It will also improve:

- hydrologic connectivity between rivers and their floodplains;
- vegetation health, targeting river red gum, black box and lignum communities;
- outcomes for waterbirds including internationally significant migratory bird species.

The sites are located on Country of the First People of the Millewa Mallee Aboriginal Corporation and in areas without formal recognition. The program has engaged 11 Traditional Owner groups with an interest in these sites. All have been involved in the initial planning and are strongly in favour of the program as the works will also protect significant cultural values and cultural heritage including sacred burial grounds located on the sand dunes at these sites. Environmental watering will restore vegetation cover over the sand dunes which in turn protects the sand dunes (and cultural heritage) from erosion.



Figure 17. Location of the Restoring Flows to the Mallee Floodplain 16 program sites

8.8 Community wellbeing and waterways

Victoria has been at the forefront of community-driven environmental stewardship for over 30 years, exemplified by programs such as Landcare, WaterWatch and EstuaryWatch. The Victorian Government supports the pivotal role these programs play in nurturing communities' relationships with waterways.

The state's integrated catchment management program, Our Catchments Our Communities (DELWP, 2019 b), is also strongly grounded at the local scale. It recognises the community as a genuine partner in setting strategic directions and in the planning and delivery of place-based projects to improve catchment condition and resilience. A long-term outcome of the program is to build community members' capacity to act as catchment stewards, managing catchments to generate intergenerational benefits for the environment, people and place.

The Victorian Government developed the Recreational Values Program in 2016 to enhance the recreational values of water. In 2019, the *Water Act 1989* was amended to recognise the social and recreational values of water.

Current community and recreational programs that support environmental watering include:

- investment in facilities, like walking tracks and canoe launch sites to help the community enjoy the waterway.
- improving awareness of the environment, and increasing nature-based tourism through the Victorian Government's strategy Protecting Victoria's Environment – Biodiversity 2037 (DELWP, 2017) and over \$106 million of investment in Victoria's Great Outdoors program.

8.9 Private land watering

Sites on private land also play an important role in supporting aquatic ecosystems and biodiversity. In Victoria, the state water entitlement framework enables the VEW and CEWH to deliver environmental entitlement water to public land (see section 1.6 Victorian frameworks). Outside of this framework, watering of additional sites on private land is also occurring in the Victorian Murray water resource plan area, supported by not-for-profit organisations. In some instances this can include use of CEWH water.

The Wirra-Lo Wetlands lie on private property between the Murray River and the Loddon River. The property is under a perpetual Trust for Nature covenant. Infrastructure has been put in place that delivers water to eleven wetlands of varying habitat, supporting species such as growling grass frog, Australasian bitterns, brolga and ridged water-milfoil. The Wetland Revival Trust has secured a water allocation for the site, which became the first private property in the state to receive water for environmental purposes.

Raakajilm Wetland is on a private property just north of Hattah Lakes National Park and was watered in 2025 by Mallee Conservation and the Murray Darling Wetlands Working Group. The wetland has been planted with a range of wetland plants including listed species that attract endangered butterflies.

Tati Tati Traditional Owners and Wetlands Revival Trust are also managing water at Kirby Flats near Robinvale, planting wetland vegetation and treating stormwater and agricultural drainage before it reaches the Murray.

8.10 Climate change adaptation policy

Global climate modelling indicates that Victoria is expected to continue to become hotter, have a drier cool season and experience more extreme rainfall events (DEECA, 2025c). Given these long-term trends, waterway management must continue to be innovative and adaptable. Victoria's Climate Change Adaptation Action Plans 2022-2026 have been prepared by the Victorian Government under the Victorian *Climate Change Act 2018* for systems that are vulnerable to climate change, or essential to resilience. Climate Change Adaptation Plans for the Natural Environment (DELWP, 2022c) and the Water Cycle Climate Change Adaptation Action Plan 2022-2026 (DELWP, 2022d) state that the natural environment, including waterways and biodiversity, will continue to be managed to be resistant, resilient or in transition.

When setting management actions and outcomes for new regional waterway strategies, waterway managers must consider impacts of current and forecast future climate change, and appropriate approaches to adapt - resilience, transition or transformation (DEECA, 2025d):

1. **Resilience** – the ecosystem/value will be impacted but has the capacity to recover to its previous state. Management approaches may alter but not objectives.

2. **Transition** – the ecosystem/value will be impacted but will not recover to its previous state and could change in structure or composition. Management objectives, including for environmental watering, will change. Management involves supporting existing waterway systems/values to incrementally move to a new state.

3. **Transformation** – the ecosystem/value will be impacted when a step change or tipping point is reached and will not recover to its previous state. This may result in new waterway values and new management outcomes.

9. Monitoring and evaluation

Victoria's environmental water monitoring supports the evaluation and reporting component of the adaptive management cycle of the Victorian Waterway Management Program.

9.1 Environmental Water Monitoring and Evaluation Program

Victoria established the Environmental Water Monitoring and Evaluation Program (EWMEP) in 2025. EWMEP has been established to consolidate evidence across rivers and wetlands to evaluate the outcomes of environmental water management. The aim of the program is to ensure fit-for-purpose evaluation occurs that:

- informs adaptive management of environmental water planning and operations by CMAs
- supports reporting associated with CMA-led regional waterway strategies.
- contributes to DEECA and VEWH legislated reporting obligations.

EWMEP will support monitoring to evaluate watering objectives selected by CMAs, coupled with hydrological analysis to understand: (1) how hydrology is supporting SMART objectives, and (2) the contribution of environmental water to changes in hydrology.

CMAs will inform the priority objectives for EWMEP from their EWMPs and refine these as required to ensure they are suitable to support the development of key evaluation questions (KEQs). Any objectives that are updated to support evaluation through EWMEP will be incorporated into future EWMP updates. Evidence required to evaluate the KEQs will be identified and supported.

DEECA have established a strategic advisory group consisting of members from DEECA, CMAs and VEWH to ensure EWMEP meets the needs of stakeholders and partners.

9.2 Basin Plan reporting on environmental outcomes

Schedule 12 of the Murray-Darling Basin Plan requires Basin states to conduct 5-yearly reporting on a range of different matters from environmental watering (Matter 8) and water quality (Matter 12), to water trading and water resource planning (Matter 18).

Information gathered through EWMEP will contribute to meeting Basin Plan obligations to report on Schedule 12 Matter 8, the 'achievement of environmental outcomes at an asset scale'. Additional monitoring may be required to support Matter 8 reporting, measuring status and trend of ecological attributes (types of environmental responses) at a broader range of assets than those included in EWMEP.

Other programs with monitoring relevant to Basin Plan outcomes include TLM, Victoria's Native Fish Report Card, and the CEWH's Monitoring, Evaluation and Research Program (Flow-MER that replaced the Long-Term Intervention Monitoring program in 2020. Note that as of 2025 the only site in Victoria covered through Flow-MER is the Goulburn River). Various parameters are measured under TLM at icon sites of Hattah Lakes, Lindsay, Mulcra and Wallpolla Islands, Gunbower Forest, and Barmah-Millewa Forest. TLM contains an annual condition monitoring component, as well as intervention monitoring projects which can investigate questions around ecological responses to environmental water, or monitor to inform or manage event-based risks.

10. Long-term risks

This section describes the long-term risks associated with providing for the ecological objectives and watering requirements outlined in section 3 and 4. These risks fall into two broad categories: failure to achieve (or demonstrate achievement of) ecological objectives and adverse impacts stemming from environmental water.

10.1 Processes for identifying risks

Environmental risk is commonly assessed as the product of the *likelihood* of a threat or threatening process occurring and the *consequence* in terms of the impact of a threat (or threats) on asset values, condition or environmental outcomes. Victoria has annual and longer-term processes in place for identifying and managing risks associated with environmental watering events, which are outlined below. Victoria's policy for managing risks associated with environmental watering is also outlined in section 8.6 of the VWMS (DEPI, 2013a).

Annual

The Victorian Environmental Watering Program has a Risk Management Framework (VEWH, 2024) that articulates how partners in the Victorian environmental watering program will work together to manage risks associated with environmental water in Victoria. This framework is consistent with the Victorian Government Risk Management Framework, which adopts the Australian and international standard AS ISO 31000:2018 Risk Management Principles and Guidelines.

In the lead up to the development of the seasonal watering proposals each year, the VEWB coordinates annual shared risk identification and assessment workshops with CMAs across Victoria, held in mid-late February. The workshops are attended by relevant program partners such as environmental water holders, water corporations, Traditional Owners and public land managers. Partners jointly assess risks and commit to mitigation actions.

Long-term

CMAs across Victoria, in collaboration with communities and partner agencies, identify key risks that may impact on the ability to achieve environmental watering objectives in preparing EWMPs for priority environmental assets, and as part of regional waterway strategies. These are documented in the CMA's EWMPs, along with risk management measures.

In developing Victoria's North and Murray Water Resource Plan (DELWP 2019a), a risk assessment was completed at the water resource plan scale by the department to meet requirements of Part 9 of Chapter 10 of the Basin Plan. This included assessing environmental water requirements for priority environmental assets and priority ecosystem functions identified in this LTWP, and the health of water-dependent ecosystems. This process is outlined in detail in the water resource plan chapter 5. More than 95 percent of the high and medium risks identified by the risk assessment were found to be associated with:

- causes such as climate change, extreme drought and land use practices if there is a failure to proceed with existing strategies and improved management programs
- threats such as suspended sediment and nutrients, salinity, other water quality issues and a reduction in the volume of water available
- lack of information about the availability (or absence) of water for Aboriginal use, either for cultural flows or for Aboriginal environmental outcomes as proposed by the Murray-Darling Basin Authority.

The above long-term processes have been used to identify risks to include in this LTWP, considering the spatial and temporal scale of the plan.

10.2 Types of risks

The types of risks associated with providing environmental water requirements under this LTWP fall into two broad categories:

- Failure to achieve the intended ecological objectives (or demonstrate their achievement).

- Adverse impacts in the provision of environmental water.

The risks associated with a failure to achieve the intended objectives are described in terms of the process by which they are generated and have been grouped into themes that reflect the consequence of the risk. The risks of adverse impacts arising from the provision of environmental water have been grouped by their impact on environmental, cultural, social and economic values. Management measures to address the risks identified in Figure 18 are presented in Appendix F. It should be noted that failure to provide sufficient water through the bulk entitlement process was addressed in Victoria's North and Murray Water Resource Plan (DELWP 2019a, as per Basin Plan clause 10.41).

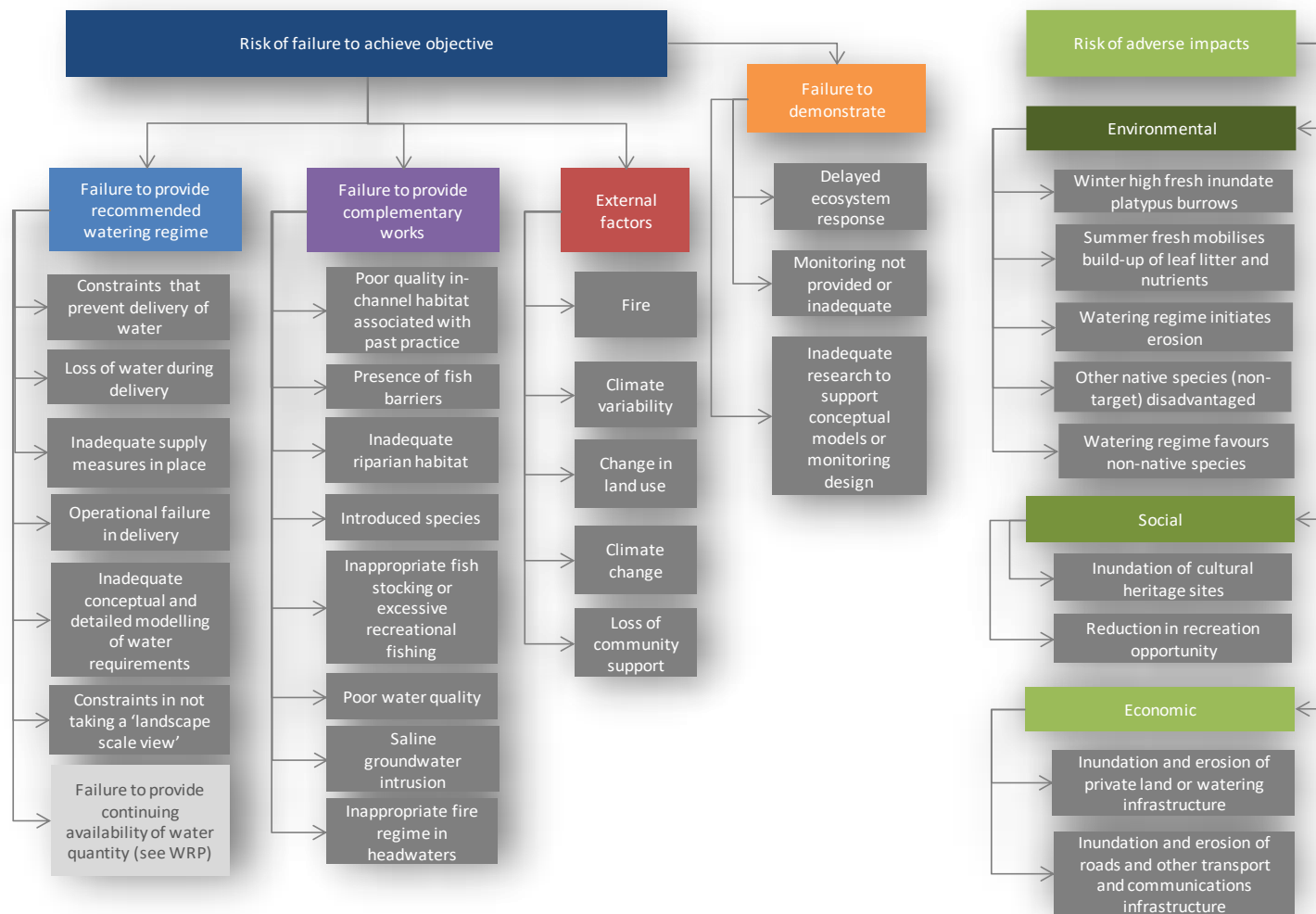


Figure 18. Risk types identified for this LTWP

Note future updates to the Water Resource Plan Risk Assessment (DELWP, 2019a) will separate cultural heritage impacts into a separate Cultural category.

10.3 Risk identification and assessment approach

While the characterisation of risk in Figure 18 and the management measures identified in Appendix F describe the suite of risks that may affect the benefits associated with environmental water management, they do not identify the relative importance of the risks or priorities for management. This has been addressed in Victoria's Northern and Murray Water Resource Plan (DELWP, 2019a), which assigned levels of risk to events and their consequences in a manner consistent with AS/NZS ISO 31000:2009 Risk Management principles. This risk assessment was also undertaken in accordance with the provisions of the Basin Plan, which required that:

Risks be examined in a consistent, structured and transparent way.

Risk levels, ranging from very low to very high, be determined as a product of likelihood and the consequence of a risk occurring.

Likelihood be assessed in terms of how each cause impacts on each threat, and consequence be assessed in terms of how each threat impacts on each beneficial use. The overall risk therefore represents how each cause will impact on each threat, and how that threat will in turn impact on each beneficial use.

The approach adopted in Victoria's Northern and Murray Water Resource Plan linked causal factors and their manifestation as threats, with limitations on the use and beneficial outcomes associated with the asset being considered (Figure 19). Threats were then ranked from very low to very high risk based on assessment rubrics of consequence and likelihood (Figure 20):

- 5 Very high risk
- 4 High risk
- 3 Medium risk
- 2 Low risk
- 1 Very low risk
- 0 Not plausible.

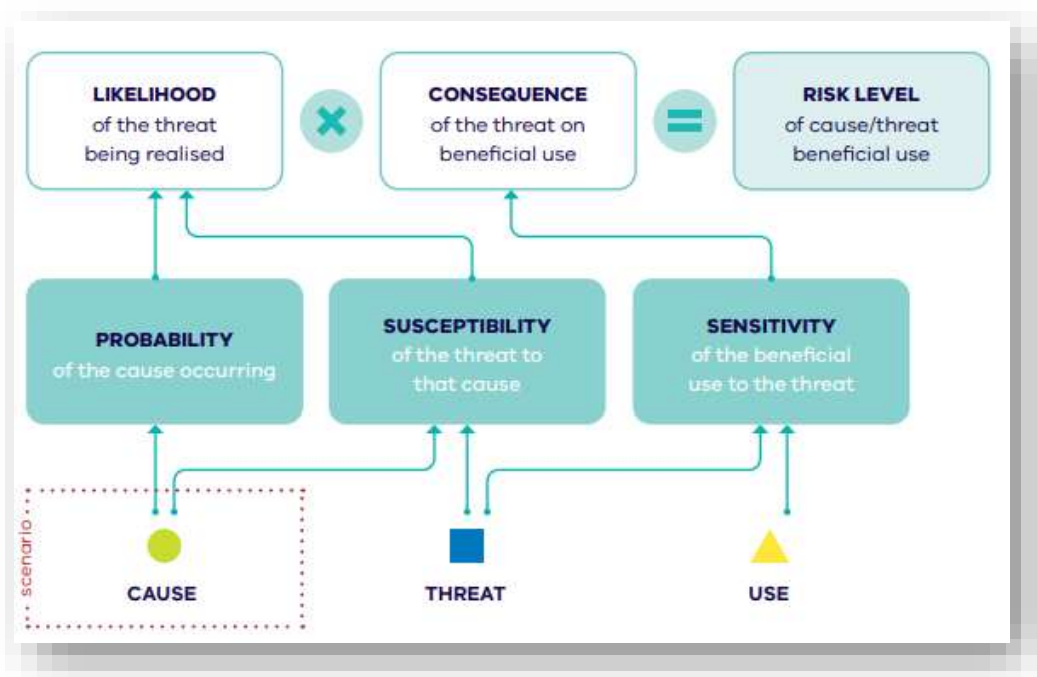


Figure 19. Overview of the risk assessment matrix, including cause-threat-use relationships for the Victorian Murray water resource plan area (from DELWP 2019a)

		Likelihood (of the threat occurring)					
		Very high	High	Moderate	Low	Very low	Not plausible
Consequence (sensitivity of the beneficial use to the threat)	Very high	Very high	Very high	High	Medium	Medium	Not plausible
	High	Very high	High	Medium	Medium	Low	Not plausible
	Moderate	High	Medium	Medium	Low	Very low	Not plausible
	Low	Medium	Medium	Low	Very low	Very low	Not plausible
	Very low	Medium	Low	Very low	Very low	Very low	Not plausible
	Not plausible	Not plausible	Not plausible	Not plausible	Not plausible	Not plausible	Not plausible

Figure 20. Risk matrix comprising the combination of likelihood and consequence (Alluvium, 2016)

The assessment of risks was considered on a water resource plan scale, rather than on a local scale, and was applied to the following risk categories (DELWP, 2019a):

- Water availability.
- Structural form (i.e. in relation to longitudinal and/or lateral connectivity, instream physical habitat).
- Water condition.

It should be noted that this consideration of risk at the water resource plan scale is not intended to replace the site-specific risk assessments that are included in EWMPs or Seasonal Water Proposals.

The risk assessment found that changes to the timing and location of demands (river regulation – see section 5.1) causing a loss or decline in instream physical habitat (threat) is very high risk for rivers and wetlands (see Table 19). Climate change, extreme drought, failure to continue to invest in best practice land use initiatives and pest and weed management generated medium risks to the health of rivers and wetlands in the Victorian Murray water resource plan area.⁷

⁷ While the Water Resource Plan risk assessment, completed in 2018, identified climate as a medium risk for the Victorian Murray, this could alter when the Water Resource Plan is updated in 2029.

Table 19. Victorian Murray water resource plan area summary of risks to priority environmental assets (DELWP 2019a).

Cause	Threat	Risk to Rivers	Risk to Wetlands
Climate change	Loss or decline in longitudinal connectivity	Medium risk	Medium risk
	Loss or decline in lateral connectivity	Medium risk	Medium risk
	Loss or decline in instream physical habitat	Medium risk	Medium risk
Extreme drought	Loss or decline in longitudinal connectivity	Medium risk	Medium risk
	Loss or decline in lateral connectivity	Medium risk	Medium risk
	Loss or decline in instream physical habitat	Medium risk	Medium risk
Failure to continue to invest in best practice land use initiatives	Loss or decline in longitudinal connectivity	Medium risk	Medium risk
	Loss or decline in lateral connectivity	Medium risk	Medium risk
	Loss or decline in instream physical habitat	Medium risk	Medium risk
Earth resource development	Loss or decline in longitudinal connectivity	Medium risk	Medium risk
	Loss or decline in instream physical habitat	Medium risk	Medium risk
Pests and weeds	Loss or decline in longitudinal connectivity	Medium risk	Medium risk
	Loss or decline in instream physical habitat	Medium risk	Medium risk
Changes to the timing and location of demands	Loss or decline in instream physical habitat	Very high risk	Very high risk

10.4 Strategies for management

Management actions to address the high priority risks listed above are presented in Table 20. These actions also relate to issues discussed elsewhere in this LTWP (namely, the provision of environmental water (section 5), constraints management (section 7), complementary actions (section 8) and monitoring and evaluation (section 9)).

While risk management will initially focus on preventing or mitigating the effects of the high priority cause(s) / threats, a 'watching brief' is being kept on causes and threats with a medium (or lower) level of risk. This will allow scope for opportunistic management of medium level cause(s) / threats and prevent them from progressing to being high level risks. Action on medium level risks to environmental watering outcomes, such as the effects of pests and weeds, can also provide mutual benefits by addressing threats that are high level risks to consumptive, recreational and Traditional Owner values of water. For example, investment in best practice land use initiatives could help mitigate excessive sediment and contaminants in runoff before it reaches waterways and consumptive water supplies.

Table 20. Summary of high priority environmental risks and related management measures (adapted from DELWP 2019a)

Risk level	Risk cause	Risk threat	Risk impact on uses	Confidence in risk assessment	Potential management actions
There is a very high risk	that the timing and locations of demands	lead to a loss or decline in instream physical habitat	which results in adverse impacts on environment – river water uses / users.	This risk has a moderate level of confidence in its assessment	Delivery of long-term watering plans Environmental water management in a changing climate (refer section 10.5)
There is a very high risk	that the timing and locations of demands	lead to a loss or decline in instream physical habitat	which results in adverse impacts on environment – wetland water uses/users.	This risk has a moderate level of confidence in its assessment	Improving public reporting on water availability and use User-focused information and reporting Maximising the effectiveness of the grid and markets across the state

10.5 Updates to climate risk

The risk assessment for the water resource plan was undertaken in 2018. Since then, new climate analyses have been undertaken which provide a more up-to-date picture of climate threats to water resources, including the environmental entitlements.

The Victorian Water and Climate Initiative (WaCI) is an ongoing partnership with the Bureau of Meteorology (BoM) and CSIRO to understand changes to climate and water resources across the state. The most recent phase of research (DEECA, 2025c) found that:

- Victoria's rainfall is variable but has decreased in the cool season, with a more rapid decline in recent decades
- Since the end of the Millennium Drought, streamflow has remained significantly lower than average in many central and western catchments
- Victoria's average temperature will continue to increase over future decades and average cool season rainfall will continue to decline
- Future annual runoff in Victoria is projected to decline.

Regarding held environmental entitlement reliability, HARC (2025) found that:

- the potential impacts of climate change on achieving environmental watering objectives are more significant in west and central Victoria (Wimmera, Campaspe and Loddon systems) compared to other systems
- in other systems, impacts may be greater in winter and spring and for high flows (e.g. freshes)
- early season allocations are more sensitive to changes in runoff
- end-of-season high reliability water share allocation in the Victorian Murray and Goulburn are not sensitive to small changes in runoff (~10%) but decrease significantly if the runoff reduction is more than 25%
- delivery of freshes is more vulnerable to changes in runoff than low flow targets.

Figure 21 below indicates modelled changes to environmental entitlement allocation.

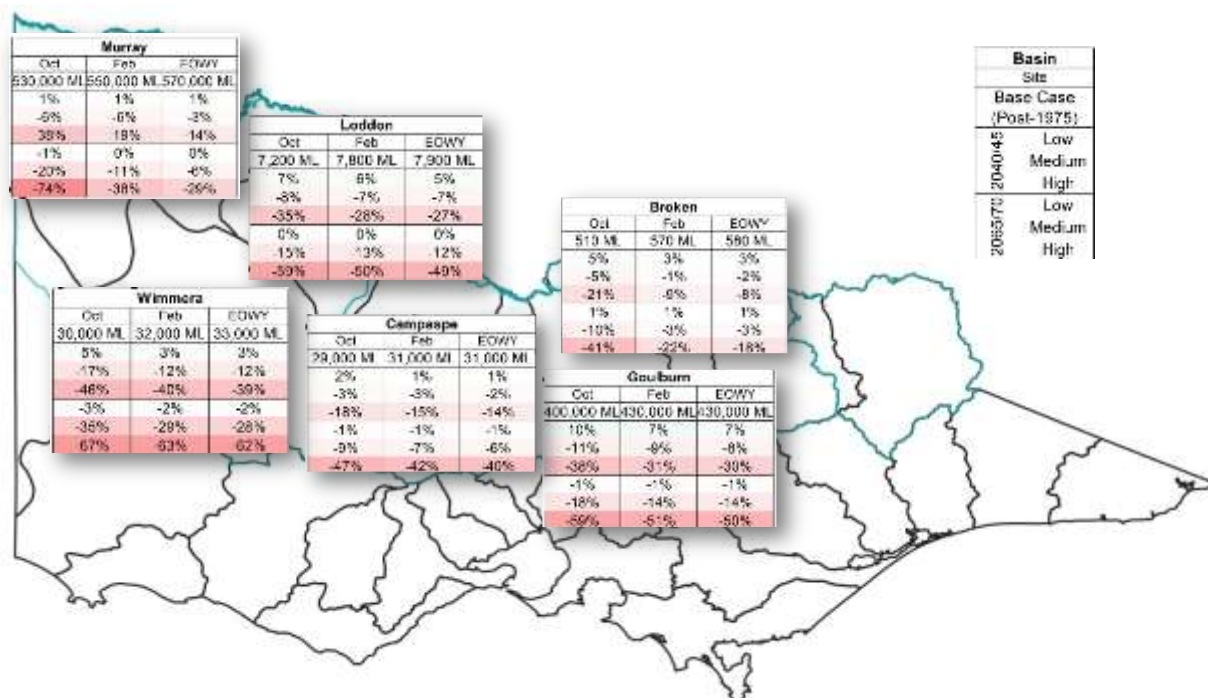


Figure 21. Percentage change in average allocation of environmental entitlements under climate change – inflows and seasonal determination for high and low reliability water shares (adapted from HARC, 2025)

Strategies for management

In line with Basin Plan s.4.03 - strategies to manage, or address, identified risks - the following are being used to manage climate risks to environmental watering and meeting the ecological objectives identified in this LTWP:

- *Water Act 1989* (Vic) and instruments - arrangements for water sharing including
- long-term water resource assessments (LTWRA) every 15 years
- sustainable water strategies
- licensing framework in unregulated systems to manage extractions - rosters and restrictions that come into effect as water availability declines
- Basin Plan implementation, including water resource plans and contributing to SDL assessments
- Victoria's Natural Environment Climate Adaptation Action Plan (DELWP, 2022c)
- climate change adaptation policy (outlined in section 8.10) in addition to the seasonally adaptive approach (outlined in section 1.6.66)
- use of alternative water sources e.g. recycled water for environmental benefit
- use of infrastructure to inundate specific floodplains and wetlands rather than use large water volumes to inundate broad areas
- provide other assistance as possible e.g. remove barriers to fish movement, pest plant and animal management programs (refer to section 8 Complementary Actions)
- adaptive long-term and annual objective setting by CMAs – in regional waterway strategies (currently being updated), EWMPs and seasonal watering priorities
- managing annual risks of environmental watering through VEW's risk framework (RMCG and Lloyd Environmental, 2014)
- coordinating flows to optimise outcomes – refer to section 6 on Cooperative Arrangements
- improved knowledge – e.g. continuation of the Victorian Water and Climate Initiative with BoM and CSIRO, the northern LTWRA, and improved sharing of Traditional Ecological Knowledge
- monitoring and evaluation to assist with adaptive management – e.g. the Victorian EWMP and Flow-MER in the Goulburn River (section 9).

11. Consultation

Preparation of this long-term watering plan has involved consultation with environmental water holders and managers, river operators, local communities and those materially affected by the management of environmental water.

Consultation for the LTWP is described below including additional consultation carried out for the review and update of this LTWP over 2019-21 and 2025-26.

Consultation occurred through a three-part devolved approach. It aimed to:

Involve local communities and Traditional Owners, who have worked directly with CMAs to ensure information and concerns were understood and considered (11.1 below)

Collaborate with the VEWH and CMAs, who have provided material and guidance for the LTWP (11.2 below)

Consult with the water corporations, land managers, the MDBA, CEWH, and upstream and downstream states, who provided information where relevant and feedback on the content (11.3 and 11.4 below).

11.1 Local engagement

During the development of the EWMPs that inform this LTWP, CMAs worked with local communities, Traditional Owners and stakeholders in order to gain input and feedback on all or a selection of the following: identification of the asset's ecological values; the long-term management goal for environmental watering of the asset; the environmental objectives for environmental watering; and the environmental watering requirements.

CMAs have a well-established network of stakeholders across Traditional Owners, local communities and peak bodies that are engaged on a range of issues. These networks are an effective mechanism to engage with local communities. CMAs have established specific environmental watering advisory groups (EWAGs) with community representatives, and water planning forums with Traditional Owners, to gain local contribution to seasonal watering proposals each year.

CMAs also conduct engagement on an 'as-needs' basis. Examples of those involved include local landholders, local Landcare or environment groups, interest groups (e.g. Field and Game, Birds Australia), local shires, local land managers, local representatives of water corporations and government agencies that manage relevant assets/infrastructure (such as roads, culverts, pipelines, and weirs), waterways and the environment, and representatives of CEWH and VEWH. Lists of those consulted can be found in individual EWMPs.

Examples of forums used in this tier include telephone interviews, site visits, workshops on water-dependent ecological values and review of the draft EWMP.

11.2 Working Group for the long-term watering plan

During the development of the original LTWPs in 2015, DELWP (now DEECA) convened a working group to collaborate with key environmental water delivery partners. This working group assists with updates of the LTWP as needed. Members of the working group include the VEWH, Wimmera CMA, Mallee CMA, North Central CMA, Goulburn Broken CMA and North East CMA. Some of the working group members authored or coordinated the EWMPs relevant to this LTWP and gave priority environmental asset management and technical input to the LTWP. Advice and input were particularly sought on development of the ecological objectives and targets in this plan.

11.3 Stakeholder review

The working group and other key environmental water stakeholders provided input to the plan's original development and via review of its updates. The original LTWP was reviewed by representatives from VEWH, North East CMA, Goulburn Broken CMA, North Central CMA, Mallee CMA, CEWH, MDBA, NSW and SA Environmental Water Working Group members, Goulburn-Murray Water, Lower Murray Water, MLDRIN, and Parks Victoria.

MDBA provided feedback which was incorporated into the 2015 and 2021 iterations. DELWP (now DEECA) also commissioned a review of Victoria's LTWPs in 2019, and many of those recommendations were incorporated into the 2021 iteration.

The 2026 update has worked with and/or involved CMAs, VEWH, Traditional Owners, MDBA, NSW DCCEEW, SA DEW, CEWH, Parks Victoria, and water corporations. CMAs and VEWH provided updated content for this LTWP. Other stakeholders provided feedback on the draft LTWP which was distributed on 18 February 2026.

11.4 Traditional Owners

Water is Life (DELWP, 2022a) acknowledges the truth of the historic and ongoing harms of colonisation and the dispossession of land and water rights from Traditional Owners, and that since the colonisation of land and waters, Australia's First Nations peoples have been treated as bystanders in the management, allocation, and ownership of water and water landscapes. Given this history of dispossession, the Victorian Government has made a commitment – on behalf of the people of Victoria – to work in partnership with Traditional Owners and First Nations to support their right to self-determination.

Water Resource Plans

As part of developing Victoria's North and Murray WRP (DELWP 2019a), the Basin Plan required Basin states to engage with local Traditional Owner groups to document their water-related aspirations. Groups consulted with an interest in this LTWP area included Bangerang, Barapa Barapa, Dhudhuroa, Waywurru, Yaitmathang, Dja Dja Wurrung, First People of Millewa Mallee (Nations of the Nyeri Nyeri, Ngintait and Latji Latji), Tati Tati Wadi Wadi, Taungurung, Wadi Wadi, Wamba Wemba, Weki Weki and Yorta Yorta⁸.

Engagement aimed to identify objectives and desired outcomes for water resources, support celebrating and sharing culture and traditional practices within Traditional Owner groups, discuss economic development opportunities and build relationships and Traditional Owner organisational and community capacity. The engagement process and feedback from Traditional Owners is documented in Chapter 8 and Appendix D of the Victoria's North and Murray Water Resource Plan (DELWP, 2019a).

Long-term watering plans

Traditional Owners were invited to participate in the LTWP update. Several Traditional Owner groups expressed interest to DEECA in learning about Basin Plan and the role of LTWPs. However, no groups were able to review the Victorian Murray LTWP draft.

Traditional Owners contribute to long-term waterway health planning through regional waterway strategies (currently under review and due 2027), long-term environmental water planning through EWMPs (as updated), and annual environmental water planning via seasonal watering proposals.

Traditional Owners will continue to be engaged throughout Basin Plan implementation by Victorian and Commonwealth agencies.

⁸ Traditional Owner Corporations and organisations evolve over time; the groups listed may represent multiple Nations that now work separately, or that have now merged.

12. Next Steps

This LTWP is one of many steps towards full implementation of Basin Plan. Monitoring and evaluation of the ecological objectives and targets in this LTWP is required to report on achievement of environmental outcomes at the asset scale (Basin Plan Matter 8). This requires implementing relevant monitoring programs, as well as research and innovation programs to better understand environmental flow needs of rivers and wetlands, even as our climate changes.

The next LTWP will be informed by the following:

- Outcomes of the 2026 Basin Plan Review
- The next update to the Basin-wide environmental watering strategy
- New environmental watering sites (priority environmental assets), such as those under the Sustainable Diversion Limit Adjustment Mechanism program
- Updates to EWMPs
- New Victorian Waterway Management Strategy
- New Regional Waterway Strategies
- New evidence and knowledge generated from programs such as Victoria's Environmental Water Monitoring and Evaluation Program (EWMEP).

A range of Next Steps were flagged in the 2021 LTWP. Each are addressed below:

Landscape scale (top down) approaches that can be integrated with the asset scale (bottom-up) approach taken in this LTWP iteration.

VEWH and CSIRO have undertaken research centred on colonial waterbirds. Research has considered wetlands where environmental watering or other management interventions could improve the recruitment of juvenile Royal Spoonbills, to stabilise and increase the population across northern Victoria and beyond. CSIRO are now undertaking broader Basin-wide research into waterbirds for the CEWH.

Regional waterway strategies (RWS) are currently being updated by all Victorian CMAs. Guidelines (DEECA, 2024a) state that long and medium-term outcomes for the RWS will be set at appropriate scales (e.g. whole of-Country, river reach, cross-regional) considering connectivity between waterways and systems and surrounding land use impacts; catchment-based activities if that is the most effective way to reduce threats to waterway values; and coordination of management activities with other regions (CMAs) to enable achievement of outcomes at meaningful scales, including whole-of-Country where relevant.

Further asset-based technical work through development of EWMPs for new assets, EWMP reviews and EWMP updates where needed (in line with the revised EWMP guidelines). For example, updates to all Mallee EWMP environmental objectives were carried out in 2020 to improve their adherence to SMART criteria and alignment with Basin Plan.

In 2022, DEECA updated EWMP guidelines to better align environmental/ecological objectives at the asset level with Basin Plan, to improve their adherence to SMART criteria and to guide partnership with Traditional Owner groups.

29 EWMPs have been updated by CMAs between 2021 and the 2025 drafting of this update, 16 of these in the Victorian Murray. Updates include revision of environmental/ecological objectives to better align with Basin Plan.

In addition to EWMP updates, all northern CMAs have worked with the MDBA on information for the Basin Plan Evaluation (MDBA, 2025c) and Review, providing input to their EWR Tool (MDBA, 2025b). Through this process, a number of environmental watering requirements were updated, but have not yet been included in EWMPs.

Use of the ANAE aquatic ecosystem classification V3 to refine the aquatic ecosystem types assigned to priority environmental assets.

This 2026 update has renewed classifications of all priority environmental assets under the latest ANAE V3.

Further incorporation of Basin Plan principles and objectives in the VWMS renewal (due 2023).

The new VWMS is currently in draft. In all existing policy, Victoria remains committed to the objectives of the Murray-Darling Basin Plan. Victorian agencies are working closely with the Murray-Darling Basin Authority, other jurisdictions and the CEWH to implement the Plan. Guidance for CMAs to develop regional waterway strategies states that CMAs are expected to consider Basin-wide Environmental Watering Strategy outcomes when developing their regional outcomes.

13. References

- Aboriginal Victoria (2018) Victorian Aboriginal Affairs Framework 2018 - 2023. Department of Premier and Cabinet, Melbourne.
- Agricultural Victoria (2010) Invasive Plant and Animals Policy Framework. Department of Energy, Environment and Climate Action, East Melbourne.
- Agricultural Victoria (2023) Biosecurity Strategy. Department of Energy, Environment and Climate Action, East Melbourne.
- Alluvium (2016) Water Resource Plan preliminary risk assessment. Report prepared by Alluvium Consulting Australia for the Victorian Department of Environment Land Water and Planning, East Melbourne.
- Basin Plan 2012 (Cth)
- BoM (2025) Mean rainfall maps. Bureau of Meteorology, Canberra.
- Brooks S (2017) Classification of aquatic ecosystems in the Murray-Darling Basin: 2017 update. Report to the Murray-Darling Basin Authority and Commonwealth Environmental Water Office. Canberra.
- Brooks S (2021) Australian National Aquatic Ecosystem (ANAE) Classification of the Murray-Darling Basin Technical Report, Revision 3.0, March 2021. Technical report prepared by Brooks Ecology and Technology for the Commonwealth Environmental Water Office, Department of Agriculture, Water and the Environment, Australia.
- Brooks, S.S., Cottingham, P., Butcher, R., and Hale, J. 2014. Interim classification of aquatic ecosystems in the Murray-Darling Basin: Stage 2 report. Canberra, Australia.
- Butcher R and Fenton A (2020) Briefing paper: Updating objectives for improved line of sight to Basin Plan for Wimmera pipeline wetlands. Report to Wimmera Catchment Management Authority, Horsham.
- Cooling MP (2017) Long Term Watering Plans Monitoring and Evaluation Plan. Ecological Associates report prepared for Department of Land, Water and Planning, East Melbourne.
- DEECA (2024a) Guidelines for regional waterway strategies. Department of Energy, Environment and Climate Action, East Melbourne.
- DEECA (2024b) Achievement of environmental outcomes in Victoria's Murray-Darling Basin waterways. Report prepared for Basin Plan reporting requirements by the Victorian Department of Energy, Environment and Climate Action, East Melbourne.
- DEECA (2024c) Planning Our Basin Future Together prospectus. Department of Energy, Environment and Climate Action, East Melbourne.
- DEECA (2024d) The feasibility of relaxing constraints in northern Victoria. Department of Energy, Environment and Climate Action, East Melbourne.
- DEECA (2025a) Victorian Water Accounts 2023-24. Department of Energy Environment and Climate Action, East Melbourne.
- DEECA (2025b) Northern Victoria Complementary Measures Prospectus. Database prepared for Department of Energy, Environment and Climate Action, East Melbourne.
- DEECA (2025c) At a glance: Victoria's water resources under a changing climate. Report prepared for Department of Energy, Environment and Climate Action, East Melbourne.
- DEECA (2025d) Guidance for the development of regional waterway strategies. Department of Energy, Environment and Climate Action, East Melbourne.
- DEECA (2026) Database of EWMP objective and watering requirements. Spreadsheet prepared for long-term watering plan updates, 2026. Department of Energy Environment and Climate Action, East Melbourne.
- DELWP (2015) Ministerial guidelines for groundwater licensing and the protection of groundwater dependent ecosystems. Department of Environment, Land, Water and Planning, East Melbourne.
- DELWP (2016) Water for Victoria. Department of Environment, Land, Water and Planning, East Melbourne.

- DELWP (2017) Protecting Victoria's Environment - Biodiversity 2037. Department of Environment, Land, Water and Planning, East Melbourne.
- DELWP (2019a) Victoria's North and Murray Water Resource Plan. Department of Land, Water, Environment and Planning, East Melbourne.
- DELWP (2019b) Our Catchments Our Communities. Department of Land, Water, Environment and Planning, East Melbourne.
- DELWP (2021) Victorian Murray long-term watering plan – minor update Jun 2021. Department of Land, Water, Environment and Planning, East Melbourne.
- DELWP (2022a) Water is Life: Traditional Owner Access to Water Roadmap. Department of Environment, Land, Water and Planning, East Melbourne.
- DELWP (2022b) Index of Wetland Condition Assessment Procedure. Department of Energy, Environment and Climate Action, East Melbourne.
- DELWP (2022c) Natural Environment Climate Adaptation Action Plan. Department of Land, Water, Environment and Planning, East Melbourne.
- DELWP (2022d) Water Cycle Climate Change Adaptation Action Plan 2022-2026. Department of Land, Water, Environment and Planning, East Melbourne.
- DEPI (2013a) Victorian Waterway Management Strategy. Department of Environment and Primary Industries, East Melbourne.
- DEPI (2013b) Index of Stream Condition – the third benchmark of Victorian river condition. Victorian Government Department of Environment and Primary Industries, Melbourne.
- DSE (2004) Native vegetation: sustaining a living landscape. Vegetation Quality Assessment Manual – Guidelines for applying the habitat hectares scoring method Version 1.3. Department of Sustainability and Environment, East Melbourne.
- DSE (2009) Northern Region Sustainable Watering Strategy. Department of Sustainability and Environment, East Melbourne.
- Environmental Protection and Biodiversity Conservation (EPBC) Act 1999 (Cth)*
- EPA (2025) Reducing the impacts of grazing on water quality. Environmental Protection Authority, Melbourne.
- GBCMA (2014) Goulburn Broken Waterway Strategy 2014-2022. Goulburn Broken Catchment Management Authority, Shepparton, Victoria.
- GMW (2012) Upper Ovens River Water Supply Protection Area Water Management Plan. Goulburn-Murray Water, Tatura.
- Groundwater Logic (2019) Priority Environmental Asset Groundwater Interaction. Report prepared for Department of Environment, Land, Water and Planning, East Melbourne.
- Hale J (2020) Murray–Darling Basin Long Term Intervention Monitoring Project — Basin Synthesis Report. Report prepared for the Agriculture, Water and the Environment Commonwealth Environmental Water Office by La Trobe University, Centre for Freshwater Ecosystems. CFE Publication 252.
- HARC (2025) Adapting to Climate Change – Stage 2. Report prepared by HARC Services for the Victorian Environmental Water Holder, East Melbourne.
- MCMA (2014) Mallee Waterway Strategy 2014-22. Mallee Catchment Management Authority, Mildura.
- MCMA (2025) Merbein Community Update. Mallee Catchment Management Authority, Mildura, Victoria.
- MDBA (2012) Hattah Lakes Environmental Water Management Plan. Murray Darling Basin Authority, Canberra.
- MDBA (2013) Constraints Management Strategy 2013 to 2024. Murray-Darling Basin Authority, Canberra.
- MDBA (2021) Environmental Assets and Functions Database. Murray Darling Basin Authority, Canberra.
- MDBA (2025a) Basin-wide environmental watering strategy. Murray-Darling Basin Authority, Canberra.
- MDBA (2025b) EWR Tool. Murray Darling Basin Authority, Canberra.

- MDBA (2025c) Basin Plan Evaluation. Murray Darling Basin Authority, Canberra.
- Morris K (2012) Wetland connectivity: understanding the dispersal of organisms that occur in Victoria's wetlands. Arthur Rylah Institute for Environmental Research Technical Report Series No. 225. Department of Sustainability and Environment, Heidelberg Victoria.
- NCCMA (2014) North Central Waterway Strategy 2014-22. North Central Catchment Management Authority, Huntly Victoria.
- NCCMA (2015) Gunbower Creek System environmental water management plan. North Central Catchment Management Authority, Huntly Victoria.
- NECMA (2014) North East Waterway Strategy. North East Catchment Management Authority, Wodonga, Victoria.
- NECMA (2015) Victorian Murray Floodplain EWMP. North East Catchment Management Authority, Wodonga, Victoria.
- NCCMA (2017) Kerang Wetlands Ramsar Site Action Plan 2017-2025. Prepared by North Central Catchment Management Authority, Huntly, Victoria.
- RMCG and Lloyd Environmental (2014) Victorian Environmental Water Holder Risk Framework. Prepared by RMCG and Lloyd Environmental for the Victorian Environmental Water Holder, East Melbourne.
- SCBEWC (2023) Water for the Environment. Southern Connected Basin Environmental Watering Committee Annual Report 2022-23. Report published by the Murray Darling Basin Authority, Canberra.
- Traditional Owner Settlement Act 2010* (Vic).
- VEWH (2025a) Seasonal Watering Plan 2025-26. Victorian Environmental Water Holder, East Melbourne.
- VEWH (2025b) Water for Country - Guidance provided by and for Traditional Owners Making Proposals for the use of Environmental Water in Victoria. Published by the Victorian Environmental Water Holder, East Melbourne.
- VEWH (2025c) The benefits of different environmental flows in rivers. Victorian Environmental Water Holder, East Melbourne.
- VEWH (2025d) Wetland wetting phase. Victorian Environmental Water Holder, East Melbourne.
- VEWH (2025e) Wetland drying phase. Victorian Environmental Water Holder, East Melbourne.
- VFA (2021) Fish Stocking Strategy 2021-25. Published by the Victorian Fisheries Authority, Melbourne.
- Water Act 1989* (Vic).
- Water Act 2007* (Cth).
- YYTOLMB (2020) Joint Management Plan for Barmah National Park. Published by the Yorta Yorta Traditional Owner Land Management Board.

Appendix A Basin Plan compliance

(a) Basin Plan Chapter 8 (environmental watering plan) obligations

The table below presents the details of each of the Basin Plan obligations related to long-term watering plans and how each of these obligations has been addressed within this plan.

Table 21. Basin Plan obligation compliance

Topic	Basin Plan obligations	Clause	Relevant sections of LTWP
Identification of environmental watering requirements	A long-term watering plan must identify • priority environmental assets in the water resource plan area; and • ecological objectives and ecological targets for those assets; and • environmental watering requirements needed to meet those targets in order to achieve those objectives; • using the method in section 8.49 A long-term watering plan must identify • priority ecosystem functions in the water resource plan area; and • ecological objectives and ecological targets for those functions; and • environmental watering requirements needed to meet those targets in order to achieve those objectives; using the method in section 8.50. If the Basin-wide environmental watering strategy has identified particular assets or functions, and their requirements under subparagraph 8.14(2)(a)(i), a long-term watering plan must be consistent with that part of the Basin-wide environmental watering strategy.	8.19 (1) 8.19 (2) 8.19 (3)	Section 3 and 4 Also refer to EWMPs listed in Appendix B.
Identification of possible co-operative arrangements	A long-term watering plan must identify: • possible co-operative arrangements (for example, possible co-operative watering regimes) between holders of HEW, managers of planned environmental water, and owners or managers of environmental assets for the delivery of environmental water: • within the water resource plan area; and • between that area and upstream and downstream water resource plan areas; that will ensure that environmental water meets the environmental watering requirements identified above.	8.19 (4)	Section 6
Identification of long-term risks	A long-term watering plan must identify: • long-term risks to providing for the environmental watering requirements of priority environmental assets and priority ecosystem functions; and • the strategies to manage those risks having regard to the strategies in Chapter 4⁹.	8.19 (5)	Section 10 EWMPs also provide important asset-based information for LTWP requirements regarding risks.
Operational constraints	A long-term watering plan must: (a) identify any operational constraints in relation to environmental watering in the water resource plan area; and (b) include strategies to manage or overcome those constraints.	8.19 (6)	Section 7 EWMPs also provide important asset-based information for LTWP requirements regarding constraints.

Topic	Basin Plan obligations	Clause	Relevant sections of LTWP
Supporting Information	A long-term watering plan must include references to the information that informed its preparation.	8.19 (7)	Throughout & References Section
Consultation	A Basin State must prepare a long-term watering plan in consultation with: • holders of HEW; and • managers of planned environmental water; and • river operators; and • local communities, including bodies established by a Basin State that express community views in relation to environmental watering; and • persons materially affected by the management of environmental water. Note: Under paragraphs (a) and (b), a Basin State may consult with any holder or manager whose environmental water could contribute to environmental watering in the water resource plan area, regardless of the location of the holder or manager, or of the location of the water.	8.20 (1)	Section 11 EWMPs also provide important asset-based information for LTWP requirements regarding community consultation.
Matters to which Basin State is to have regard	When preparing a long-term watering plan, a Basin State must have regard to the Basin-wide environmental watering strategy (Division 2). A long-term watering plan must be developed consistently with the principles to be applied in environmental watering (Division 6).	8.20 (2)	Section 3 Appendix A and Appendix I. Throughout Table 22
Consistency with international agreements	A long-term watering plan must not be inconsistent with relevant international agreements.	8.20 (5)	sections 2, 3 and 4

(b) Basin Plan environmental watering plan Division 6 principles

The table below presents the details of each of the Division 6 principles of the environmental water plan (Chapter 8 of Basin Plan) and where they are addressed in this LTWP or elsewhere.

Table 22. Basin Plan Environmental Watering Plan Division 6 Principles

Principle	Where addressed in the LTWP or elsewhere	Comment
Principle 1—Basin annual environmental watering priorities Environmental watering is to be undertaken having regard to the Basin annual environmental watering priorities. Note: There may be reasons why it is not possible in particular circumstances to undertake watering in accordance with these priorities. Section 8.44 then applies.	Annual watering priorities are established via seasonal watering proposals for individual assets, which in turn are prioritised through the annual VEWL Seasonal Watering Plan (see section 1.6.5).	Basin annual watering priorities are increasingly a consideration for asset managers when planning environmental water delivery to individual assets in accordance with EWMPs.
Principle 2—Consistency with the objectives in Part 2 Environmental watering is to be undertaken consistently with the objectives in Part 2.	Ecological objectives for the Victorian Murray assets, including their alignment with Basin Plan Chapter 8 objectives, are presented in section 4.3.	The 3 overarching Basin Plan Objectives are: (a) to protect and restore water-dependent ecosystems of the Murray-Darling Basin; and (b) to protect and restore the ecosystem functions of water-dependent ecosystems; and (c) to ensure that water-dependent ecosystems are resilient to climate change and other risks and threats.
Principle 3—Maximising environmental benefits Subject to the principles in sections 8.33 and 8.34, environmental watering is to be undertaken in a way that: (b) maximises its benefits and effectiveness by: (i) co-ordinating environmental watering between all holders of HEW and managers of planned environmental water; and (ii) co-ordinating environmental watering with flows regulated for consumptive use; and (iii) utilising local knowledge and experience; and (iv) having regard to Indigenous values; and (v) having regard to social and economic outcomes; and	Described in detail as part of the environmental watering framework (see section 1.6.4). Opportunities to achieve shared benefits from environmental watering will be considered, including contributions to social, cultural, recreational and economic benefits. However, the use of environmental water to provide shared benefits cannot be prioritised at the expense of achieving ecological objectives (see section 1.6.8). See also the response to Principles 10 and 11 (below). Annual watering priorities are established via seasonal watering proposals for individual assets, which in turn are prioritised through the annual VEWL Seasonal Watering Plan (see section 1.6.5).	Other environmental water co-ordination mechanisms to which DEECA is a party includes: • Southern Connected Basin Environmental Water Committee (SCBEWC)
(c) enhances existing flow events, where possible, so as to ensure improvement in the delivery of a full range of flow conditions, including high flow events; and	Delivery of a full range of flow conditions can require cooperative arrangements in the delivery of both	Other environmental water co-ordination mechanisms to which DEECA is a party includes:

Principle	Where addressed in the LTWP or elsewhere	Comment
	environmental and consumptive water. Cooperative arrangements between water delivery partners are presented in section 6.	Southern Connected Basin Environmental Water Committee (SCBEWC)
(d) takes into consideration the relative ecological benefits of applying environmental water to achieve one environmental outcome over another environmental outcome; and	At the asset scale, this occurs through EWMPs and seasonal watering proposals by CMAs, and at a broader scale through the VEWH's Seasonal watering plan (refer section 1.6). See also Principle 3c (above) on coordination and prioritisation with other jurisdictions and water holders (section 6).	
(e) takes into consideration the variability of the natural flow regime, for example, by mitigating or avoiding seasonal inversion of flows; and	Addressed in EWMPs and seasonal watering proposals for individual assets (see Appendix B).	
(f) incorporates strategies to deal with a variable and changing climate; and	Addressed in the Long-term Risks section (section 10) and Complementary actions section regarding climate change adaptation policy (section 8.10). CMAs also address climate adaptation for their regions and assets in the regional waterway strategies (see section 1.6.3)	Risk characterisation and management actions have been aligned to that presented in Victoria's North and Murray Water Resource Plan.
(g) enables information to be shared between the Authority, the Commonwealth, Basin States, holders of HEW and managers of planned environmental water to ensure efficient and effective use of environmental water.	Information is shared in planning and delivery stages of environmental water management (see sections 1.6.5 and section 6). Information is also shared through Victoria's Basin Plan reporting, with 5 yearly outcomes (mater 8 reporting) based on Victoria's environmental water monitoring (see section 9). EWMEP and past monitoring programs relate to the objectives and targets outlined in Victoria's long-term watering plans, which have direct links to objectives outlined in the EWMPs, as well as the objectives listed in both the Basin-wide environmental water strategy and in the Murray-Darling Basin Plan in Chapters 5 and 8, Schedules 7 and 8.	EWMEP and programs such as The Living Murray, contribute to Victoria's Schedule 12 Matter 8 reporting.
Principle 4—Risks Environmental watering is to be undertaken having regard to: (a) potential risks, including downstream risks, that may result from applying environmental water and measures that may be taken to minimise the risks; and	Annual and long-term risk processes are explained in the Long-term Risks section (section 10).	Risk characterisation and management actions have been aligned to that presented in the North and Murray Water Resource Plan.

Principle	Where addressed in the LTWP or elsewhere	Comment
(b) risks arising from impediments to the delivery of water to water-dependent ecosystems, including risks of extraction of that water for other uses, and inadequate accounting of water flows.		
Principle 5—Cost of environmental watering Environmental watering is to be undertaken having regard to the quantity of water and other resources required relative to the expected environmental benefits.	Addressed in: - the VEWL seasonal watering plan and its criteria for prioritising environmental watering actions (see section 1.6.5). - <u>Water for Victoria</u> (DELWP, 2016) – Environmental water charging arrangements will be clear, transparent and equitable and in line with the following principles: • Prices for services to EWHs will reflect costs • Prices to reflect level of service received • Prices to provide signals for efficient and sustainable use of water infrastructure, and • Prices will not deter environmental watering.	Likely environmental benefits compared against: - Cost to deliver and manage water - Costs of interventions to manage external threats and risks
Principle 6—Apply the precautionary principle A lack of full scientific certainty as to whether there are threats of serious or irreversible environmental damage should not be used as a reason for postponing measures to prevent environmental degradation.	This principle is dealt with in Victoria's Waterway Management Strategy (DEPI, 2013a), Principle 3g (sharing of information) and Principle 4 (assessment and management of risks) above. It is also addressed in Principle 8 (adaptive management) and Principle 9 (international agreements) (below).	Refer chapter 3 of the <u>Victorian Waterway Management Strategy</u> (DEPI, 2013a)
Principle 7—Working effectively with local communities Environmental watering should be undertaken having regard to the views of: (a) local communities, including bodies established by a Basin State that express community views in relation to environmental watering; and (b) persons materially affected by the management of environmental water.	Community engagement, including with First Nations, is addressed in section 11.	See also individual EWMPs for engagement undertaken at the asset scale (Appendix B).
Principle 8—Adaptive management Adaptive management should be applied in the planning, prioritisation and use of environmental water.	Adaptive management is a key principle of waterway management outlined in chapter 3 of the <u>Victorian Waterway Management Strategy</u> (DEPI, 2013a) and sections 1.6.3 and 1.6.4 of this LTWP.	
Principle 9—Relevant international agreements Environmental watering should be undertaken in a way that is not inconsistent with relevant international agreements. Note: A purpose of the Basin Plan, including Chapter 8, is to give effect to relevant international agreements (see	A management goal for the LTWP is to 'Maintain or improve wetlands of International, National or State significance' (see section 4.2). International agreements are considered with Ramsar-listed wetlands are included as priority environmental assets, and priority assets being managed to support	

Principle	Where addressed in the LTWP or elsewhere	Comment
paragraph 20(a) and subsections 21(1), (2) and (3) of the Act). This provision is a further check to ensure that this purpose is achieved.	values under JAMBA, CAMBA, ROKAMBA, and the Bonn Convention (see section 3 Table 3).	
Principle 10—Other management and operational practices River management and operational practices should be reviewed, and if necessary altered, to ensure that rivers can be managed to achieve multiple objectives, including the objectives in Part 2.	Under the Water Act 1989 (Vic), HEW is managed as part of Bulk Entitlements, which specify the water available to users, including consumptive users and the environment (see section 1.6.2). Water management to achieve multiple outcomes are also included in policies in the Victorian Waterway Management Strategy (DEPI, 2013a) and implemented through CMA regional catchment strategies and regional waterway strategies. The delivery of consumptive and environmental water is also being managed in a cooperative manner through such forums as the Southern Connected Basin Environmental Water Committee (SCBEWC) and the Water Liaison Working Group (WLWG) - Victoria is party to each group.	
Principle 11—Management of water for consumptive use Management of water for consumptive use should, where possible, be undertaken in a way that is consistent with achieving the objectives in Part 2.	See Principle 10 (above).	

Appendix B Environmental Water Management Plans

Environmental Water Management Plans (EWMPs) are developed to capture the long-term environmental objectives and watering requirements of priority Victorian wetlands and rivers that

- have environmental values at risk from altered water regimes, and
- can receive environmental water (DEPI, 2013a).

EWMPs have been completed across Victoria. EWMPs provide information to assist development of the VEWHS Seasonal Watering Plan, as well as the Annual Watering Priorities and long-term watering plans for the Basin Plan.

An EWMP is a scientifically based management plan that documents:

- the natural versus developed hydrology of the site, indicating what changes have occurred, leading to why environmental water is needed
- priority environmental values (those that rely on flows or inundation for all or part of their life cycle) associated with the wetland or river
- the condition of the wetland or river and its environmental values, indicating why the wetland or river requires environmental watering action
- an overarching environmental water management goal for the wetland or river, relating to the important ecological values, that can be advanced through environmental watering
- long-term environmental objectives that help meet the management goal
- the watering requirements for each objective
- a watering regime that considers all watering requirements needed to meet the objectives
- constraints to watering at the site
- risks to meeting the objectives
- monitoring required to demonstrate whether the objectives have been met
- outcomes of community consultation that has occurred during development of the EWMP.

The watering requirements to meet the environmental objectives are based on established technical information including FLOWS studies (for Victorian rivers). The expected ecological benefits of managed watering and drying (Alluvium, 2016) underpin the watering requirements of the EWMP.

The use of expert advice in developing the hydrological regime is an important component to the development of EWMPs. Where known, the hydrological tolerances of the environmental objectives are included to help establish thresholds for watering/not watering.

The EWMP process, as undertaken by CMAs with external expert advice, assists in creating a robust and scientifically defensible management plan, which effectively identifies a plan to best manage environmental watering at designated sites.

Also important to the EWMP is Traditional Owner ecological knowledge and input from community regarding the ecological values present at a wetland or river reach ('the asset'), the management goal for the asset, the objectives, and the hydrological regime of the asset. Traditional Owners has the right to partner with CMAs in EWMP development if they wish to.

EWMPs from the Wimmera, Mallee, North Central, Goulburn Broken, and North East CMAs have been used as important input to the preparation of LTWPs for Victoria's Basin Plan requirements. In particular, EWMPs have been used in the development of LTWP environmental objectives and watering requirements.

EWMPs also provide important asset-based information for other LTWP requirements regarding constraints, risks and community consultation.

The table below lists the EWMPs for priority environmental assets in the Victorian Murray water resource plan area where further details can be found on all aspects of management of environmental watering.

Table 23. EWMPs for priority environmental assets, including ecosystem function objectives, in the Victorian Murray water resource plan area.

Asset Name	CMA	EWMP (or other document)	Year
Abbotsford Bend (Cowra Rocks Wetland, Darling Junction Wetland and Darling Junction Creeks)	MCMA	Abbotsford Bend & Darling Junction Environmental Water Management Plan	2020
Barmah Forest	GBCMA	Barmah-Millewa Forest EWMP	2023
Belsar & Yungera Islands (Lakes Carpul & Powell, J1 Creek Complex, Yungera Wetland Complex)	MCMA	Belsar & Yungera Islands Floodplain Management Unit Environmental Water Management Plan	2020
Black Swamp	GBCMA	Black Swamp EWMP	2023
Bottle Bend	MCMA	Bottle Bend EWMP	2025
Broken Creek (lower) and Nine Mile Creek	GBCMA	Lower Broken Creek and Nine Mile Creek EWMP	2025
Bumbang Island	MCMA	Bumbang Island Environmental Water Management Plan	2020
Burra Creek floodplain (Burra Creek North, Burra Creek South, Burra Creek South Proper)	MCMA	Burra Environmental Water Management Plan	2020
Cardross & Koorlong Wetlands Lakes (Cardross Lakes Basin 1 West, Cardross Lakes Basin 1 East, Koorlong Lake)	MCMA	Cardross & Koorlong Lakes EWMP	2023
Carina Bend	MCMA	Carina Bend EWMP	2024
Gunbower Creek	NCCMA	Gunbower Creek System Environmental Water Management Plan	2015
Gunbower Forest	NCCMA	Gunbower Forest Environmental Water Management Plan	2012
Guttrum and Benwell Forests	NCCMA	Guttrum and Benwell State Forests Interim Environmental Water Management Plan Document not public	2022
Hattah Lakes	MCMA	Hattah Lakes EWMP	2021
Heywood Lake	MCMA	Heywood Lake EWMP	2024
Hird Swamp	NCCMA	Hird Swamp Environmental Water Management Plan	2013
Johnson Swamp	NCCMA	Johnson Swamp Environmental Water Management Plan	2016
Johnson's Bend and Chaffey Bend	MCMA	Johnson's Bend and Chaffey Bend EWMP	2020
Karadoc Swamp (Outlet Creek, Inlet Creek, Karadoc)	MCMA	Karadoc Swamp EMWP	2025
Kings Billabong (Butlers Creek, Ducksfoot Lagoon, Baggs Lagoon)	MCMA	Kings Billabong EWMP	2023

Asset Name	CMA	EWMP (or other document)	Year
Kinnairds Wetland	GBCMA	Kinnairds Swamp EWMP	2011
Kunat Kunat (Round Lake)	NCCMA	Kunat Kunat (Round Lake) Environmental Water Management Plan	2021
Lake Cullen	NCCMA	Lake Cullen Environmental Water Management Plan	2013
Lake Elizabeth	NCCMA	Lake Elizabeth Environmental Water Management Plan	2014
Lake Hawthorn	MCMA	Lake Hawthorn EWMP	2024
Lake Murphy	NCCMA	Lake Murphy Environmental Water Management Plan	2015
Lindsay, Wallpolla, Mulcra Islands	MCMA	Lindsay–Mulcra–Wallpolla Islands EWMP	2021
Loddon River (lower)	NCCMA	Loddon River System Environmental Water Management Plan	2015
Margooya Lagoon	MCMA	Margooya Lagoon EWMP	2020
McDonalds Swamp	NCCMA	McDonalds Swamp Environmental Water Management Plan	2015
Merbein Common (Cowanna Billabong, Brickworks Billabong, Catfish Billabong)	MCMA	Merbein Common EWMP	2023
Murray floodplain between Lake Hume and Lake Mulwala	NECMA	Victorian Murray Floodplain EWMP	2015
Murrumbidgee Junction	MCMA	Murrumbidgee Junction EWMP	2024
Ned's Corner	MCMA	Ned's Corner Environmental Water Management Plan	2020
Nyah and Vinifera	MCMA	Nyah & Vinifera Environmental Water Management Plan	2020
Piambie (Bridge Creek, Fishers Lagoon, Piambie Bend East, Piambie Bend West)	MCMA	Piambie EWMP	2024
Pound Bend (Brown Swamp, Western Wetlands, Tammit Wetland)	MCMA	Pound Bend EWMP	2025
Psyche Bend Lagoon and Woorlong Wetland	MCMA	Psych Bend Lagoon & Woorlong Wetland EWMP	2023
Richardson's Lagoon	NCCMA	Richardson's Lagoon Environmental Water Management Plan	2012
Robertson Wetland and Robertson Creek	MCMA	Robertson Wetland Environmental Water Operating Plan EWMP under development for completion late 2026	2025
Ryans Lagoon Wetland Complex	NECMA	see Victorian Murray Floodplain EWMP Stand-alone EWMP under development for completion late 2026	2015

Asset Name	CMA	EWMP (or other document)	Year
Sandilong Creek and Billabong	MCMA	<u>Sandilong Creek EWMP</u>	2023
Spences Bend (Bullock Swamp North and South, Callanders Swamp, Spences Bend Billabong)	MCMA	<u>Spences Bend EWMP</u>	2024
Tata Creek (Racecourse Wetland, Tata Wetland, Tata South)	MCMA	<u>Tata Creek Environmental Water Management Plan</u>	2020
Third Reedy Lake	NCCMA	<u>Third Reedy Lake - Goulburn-Murray Water Connections Project Operational Environmental Management Plan</u>	2019
Walshes Bend Wetland	MCMA	<u>Walshes Bend Environmental Water Management Plan</u>	2020
Wemen-Liparoo (Liparoo East Billabong, Liparoo West Billabong)	MCMA	<u>Wemen-Liparoo EWMP</u>	2024

Appendix C Determining objectives, targets and watering requirements

This appendix describes the approach used to develop ecological objectives and targets for this LTWP. The overall process is shown in Figure 22. below and is described in the following section. The green processes and products relate to objectives while the blue relates to targets, and the orange relates to watering requirements.

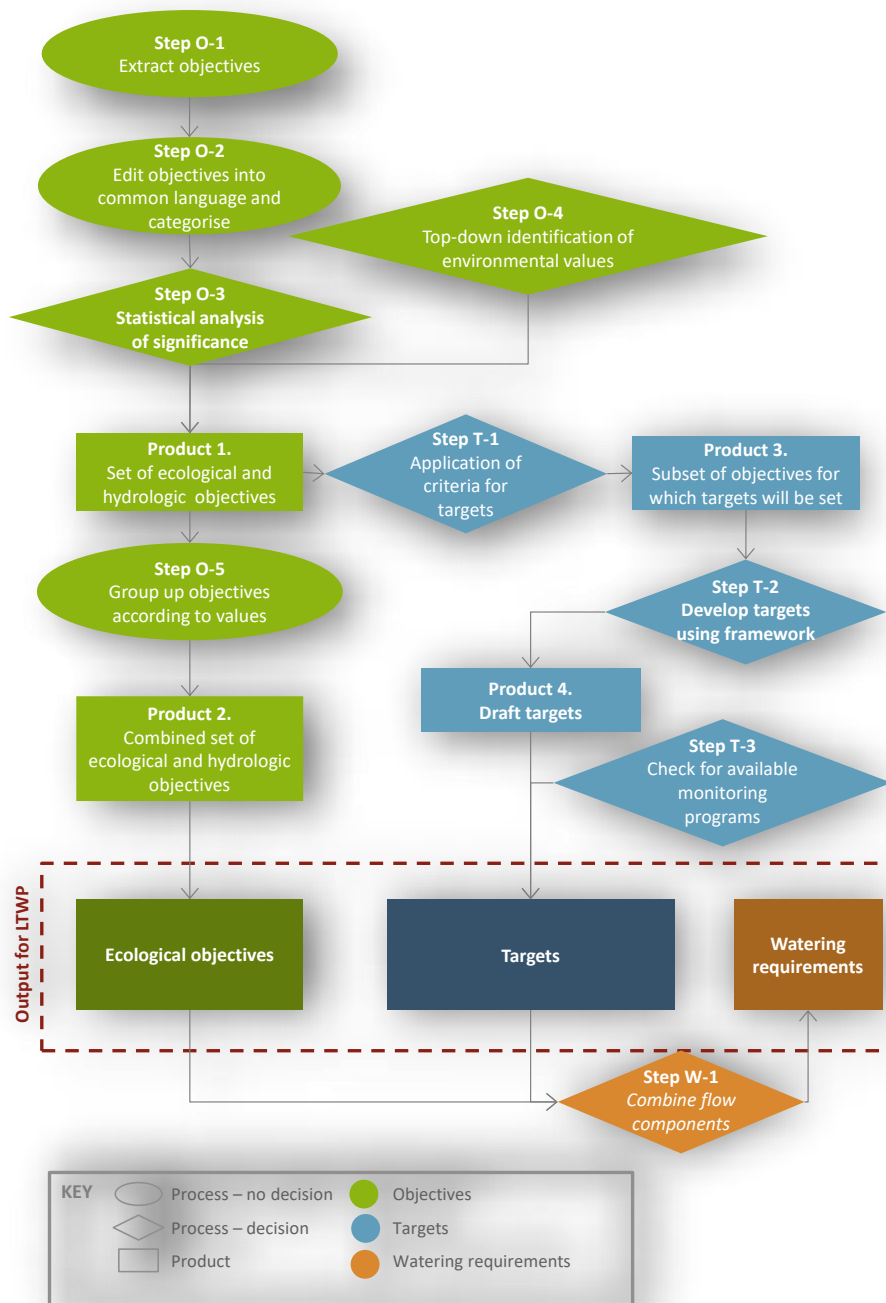


Figure 22. Overview of process for developing objectives and targets

The first step in process was to collate all available ecological objectives for environmental watering sites (assets) and ecological functions, as documented by Victoria's CMAs in Regional Waterway Strategies, EWMPs, SDL Business cases and TLM ecological watering guides. In all, for the three water resource plan

areas, 70 individual plans were identified that covered over 100 assets. Some 600 individual objectives were identified within the 70 plans.

Step O-2

The list of extracted objectives contained a wide variety of terminology and level of detail. The next step in the process was to standardise each objective into a consistent suite of language and detail. Each objective was categorised according to Figure .

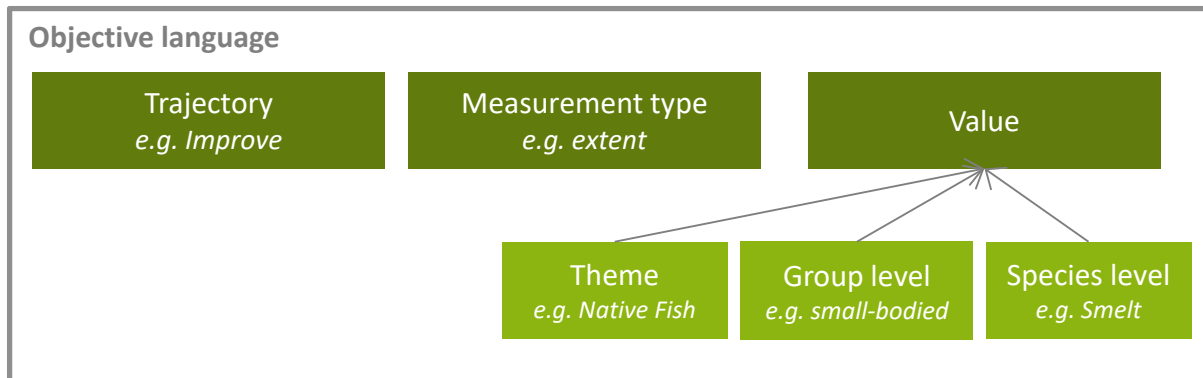


Figure 23. Objective language used to standardise objectives and categorise them

The **trajectory** represents the intended change (improve, maintain and reduce). The **measurement type** identifies in which particular aspect of the value the change should occur. This could include extent, abundance, species richness, condition, breeding, etc.

The **value** is the part of the ecosystem that is of interest, and split into 3 increasing levels of detail:

- Theme (native fish, vegetation, waterbirds, river flows and connectivity, other)
- Group-level (e.g. small-bodied fish, river red gum communities, colonial-nesting waterbirds)
- Species-level (e.g. brolga, Murray hardyhead, charophytes)

Some objectives included cross-theme components, or included many group level elements. These were split into separate themes or groups. For example, the following objective was split between the vegetation and the waterbird theme:

"To provide a watering regime that supports a cane-grass/plains grassy wetland Complex and provides breeding opportunities for a diverse range of native wetland biota in particular brolga"

Examples of the final list of objectives included:

- Improve abundance of short lived/ small-bodied fish.
- Maintain condition of river red gum communities.
- Improve feeding areas for waterbirds.

Step O-3

To achieve a set of objectives that are relevant at a regional scale (i.e. the water resource plan area scale), objectives were ranked within each water resource plan area based on the number of assets that had an objective related to each value (group level) measurement type and trajectory. This is the **bottom-up approach** to achieving a set of objectives that represent the region.

Note:

The production of a set of objectives for each water resource plan area in no way diminishes the importance of objectives at an individual asset scale. Some objectives that occur at only a few assets are not included in the Regional Objectives, but still remain valid for watering of the assets with that objective. Similarly, where the Regional Objective trajectory is "Maintain", and a particular asset trajectory is "Improve", any watering plan at the asset level should still be designed to improve the value.

It is recognised that there are no formal criteria for selecting how many assets need to have a particular value, measurement type or trajectory for inclusion, so there is a degree of subjectivity in the development of a regional set of objectives.

Step O-4

The sets of objectives were then cross-checked for gaps based on subjective assessments of the values in each water resource plan area. This subjective process was informed by guidance from the VEWH and DELWP (now DEECA), and expert ecologists (Alluvium team, Jane Roberts and Terry Hillman - LTWP reviewers).

This is the **top-down approach** at a regional scale to complement the bottom-up approach drawn from the objectives at an asset scale.

One identified objective that is not covered by individual asset objectives relates to the maintenance or improvement of the suite of wetland types (number and type based on water regime) across each water resource plan area.

Based on steps O-3 and O-4, a set of objectives was developed (in the format described in Step O-2). This feeds into the target setting process (from Step T-1).

Step O-5

To give the objectives more meaning and enhance readability, they were grouped according to the value (group level) they were focused on.

For example, where the following three objectives were included in the set of objectives (Product 1), they could be grouped into one objective about river red gum communities (the value).

$$\begin{array}{c} \text{Improve condition of river red gum communities} \\ + \\ \text{Maintain extent of river red gum communities} \\ + \\ \text{Improve species richness of river red gum communities} \\ = \\ \text{Maintain extent and improve species richness and condition of river red gum Communities} \end{array}$$

Based on this grouping process, a set of objectives was selected for each water resource plan area. This feeds directly into the LTWP.

Step T-1

Not all of the objectives will lead to good targets that can be used for reporting outcomes. Therefore, targets will be set for a subset of the objectives. This subset of objectives needs to be based on criteria for target setting. The subset of objectives should lead to targets being set that meet these criteria and also be significant to the water resource plan area. Therefore, the following criteria were adopted (Figure 24):

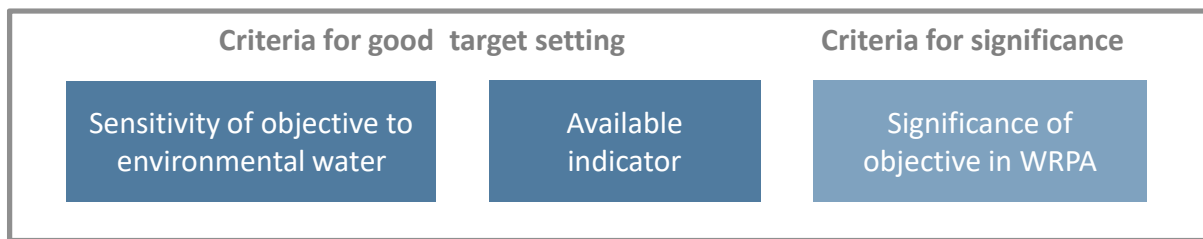


Figure 24. Criteria for target setting

The **sensitivity of the objective to environmental water** includes whether water delivery is the critical component that would lead to achieving the objective, or how dependent the value or asset associated with the objective is on water delivery. For example, successful bird breeding events are highly sensitive to inundation duration, and are therefore sensitive to the delivery of environmental water. Conversely, there is not a strong link established between flow and species richness of macroinvertebrates.

In order to match a target against an objective and report on that target, there must be an **available indicator** that can be monitored. This indicator guides the target setting process and relates directly to the *measurement type* component of the objective. For example, for extent of vegetation an indicator could be area in hectares. Some objectives where it would be difficult to provide an indicator include:

Maintain the quality of geomorphic habitat.

Improve breeding opportunities for platypus and rakali communities

Given that only a subset of the objectives for each water resource plan area will have targets set, this subset should represent the most **significant objectives** for that region. This significance has been informed by the number of assets in the water resource plan area that relate to each objective and also expert opinion. Note this is similar to the process used for the objectives in steps O-3 and O-4.

Based on the described criteria, a subset of objectives was selected for each water resource plan area to be used in the remainder of the target setting process.

Step T-2

In order to compose the targets, the following framework was used (Figure 25). This framework is based on the principles for target setting in the LTWP and an understanding of what components are required to set good targets that can be monitored and used for reporting.

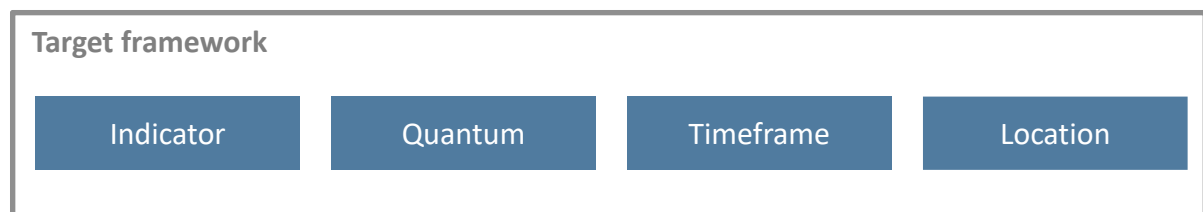


Figure 25. Framework for developing targets

The **indicator** was identified in Step T-1 (criteria for targets) and is the metric, that is, the item that will be measured. It relates directly to the objective type and value. For example, the **area** of Red Gum communities or **count per unit effort** (CPUE) of fish.

The **quantum** relates to the amount of the indicator that should be achieved. For example 3,000 ha or 10% increase. A target will include a **timeframe** within which the target should be achieved. Examples could include within 5 years or occurs in 90% of years. The **location** considers at which assets or type of assets the target should be achieved, for example, Tang Tang Swamp or priority river reaches.

For the subset of objectives (Product 3), draft targets were developed based on the framework for target setting. Any of these targets could be appropriate for inclusion in the LTWP.

Step T-3

Based on the draft targets, an extensive and bespoke monitoring program would be required to report on every target. Given that limited resources are available for monitoring, DELWP (now DEECA) indicated a preference to use existing monitoring programs where possible. Therefore, the list of draft targets was filtered for targets where there is an existing monitoring program already in place and/or can be replicated at increased spatial or temporal scales. This also impacts on whether baseline data will be available.

The output of step T-3 will be a finalised list of targets that will be incorporated into the LTWP.

Step W-1

The final step is to determine the watering requirements. At the regional scale, this is done by linking the objectives and targets to the relevant flow components. The EWMPs and Seasonal Watering Plan (SWP), which is developed each year, provide further detail on the watering requirements at an asset scale.

Updates to LTWP targets

Following the first LTWPs, updates to the LTWP targets were made by Ecological Associates (Cooling, 2017) during the process of developing a monitoring and evaluation plan to measure progress towards achievement of the objectives.

The targets were amended to ensure that they were measurable, unambiguous, time-bound and set clear thresholds for success. Where possible, the targets were worded to more closely align with existing monitoring protocols. This 2026 version of the LTWP uses those amended targets.

Further detail on the amendments can be found in the previous LTWP (DELWP, 2021).

Targets may again be updated in future to align with updates to EWMPs.

Appendix D Management goals and objectives for priority environmental assets

Table 24 below lists management goals and ecological objectives for each priority environmental asset in the Victorian Murray water resource plan area, cross-referenced to LTWP objectives, Basin-wide environmental watering strategy expected environmental outcomes (BWS EEOs) and First Nations Objectives, and Basin Plan environmental watering plan (Basin Plan chapter 8) objectives where appropriate. Codes used for the BWS EEOs and First Nations objectives are in Appendix I. Please refer to the individual EWMP for full information on the relevant site. Refer to Appendix B for relevant EWMPs.

Table 24. Management goals and objectives for each priority environmental asset in the Victorian Murray water resource plan area

Asset name	CMA	Management goal	EWMP Objectives	LTWP Theme	LTWP Objective no.	EEO BWS	First Nation's Objectives (BWS)	EWP objectives
Abbotsford Bend (Cowra Rocks Wetland, Darling Junction Wetland and Darling Junction Creeks)	MCMA	To provide a flow regime to the target site that improves biodiversity and thus increases the capacity of the target area to support key flora and fauna values.	AB2: By 2030, improve vital habitat at the Abbotsford Bend and Darling Junction asset by increasing the diversity of aquatic macrophytes present across a range of Water Regime Indicators Groups.	Vegetation	VM3	V7, V9	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(a), 8.06,5, 8.06,7
					VM4	V8	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(a), 8.06,5, 8.06,7
			AB3: By 2030, improve condition and maintain extent from baseline levels of Lignum (Duma florulenta) to sustain communities and processes reliant on Lignum communities at the Abbotsford Bend and Darling Junction asset.	Vegetation	VM8	V5, V6	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,5, 8.06,7
Barmah Forest	GBCMA	• Maintain or improve the site's ecological character, and • Maintain a healthy Murray River system, sustaining communities and preserving unique values.	BMF1_2023 Contribute to the maintenance of the ecological character of the Barmah Forest and Central Murray Ramsar sites.	NA refer Management goals section 4.2	-	-	-	8.05,2(a)
			BMF10_2023 By 2033 support successful breeding and recruitment of native fish across the whole Barmah-Millewa Forest in permanent and temporary riverine WRCs.	Native Fish	VM19	F1 - F9, F17	2.2, 2.5, 2.6, 2.7	8.06,6(a)
			BMF11_2023 By 2033 support successful breeding and recruitment of frogs at Barmah-Millewa Forest.	Other Fauna	VM22	N/A	2.3, 2.5, 2.6, 2.9	8.06,6(b), 8.07,3
			BMF12_2023 By 2033, support access to habitat for small bodied fish and movement of large bodied riverine native fish by ensuring that flow sequences, and inundation and recession events, meet ecological requirements of key species in Barmah-Millewa Forest.	Native Fish	VM18	F1 - F9, F17	2.2, 2.5, 2.6, 2.7	8.06,6(b)

Asset name	CMA	Management goal	EWMP Objectives	LTWP Theme	LTWP Objective no.	EEO BWS	First Nation's Objectives (BWS)	EWP objectives
			BMF13_2023 By 2033, regularly provide refugia to support the long-term survival of water dependent biota on the managed floodplain of the Barmah-Millewa Forest icon site and Gulpa Creek during drought.	Connectivity	VM2	FC1, FC3, FC5, FC6, FC7, F1 - F9, F17	2.1, 2.2, 2.3, 2.7	8.05,3(a), 8.06,6(b), 8.07,3
			BMF14_2023 By 2033, mitigate the impact of invasive species and feral animals on floodplain and wetland ecosystems and native water-dependent species at Barmah-Millewa Forest icon site.	Vegetation	VM10	N/A	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.07,5
			BMF2_2023 Continue to support key life cycle stages for migratory waterbirds listed under international treaties.	Waterbirds	VM11, VM12, VM13	B3	2.9	8.05,2(b), 8.05,3(a), 8.05,3(b), 8.06,5(a), 8.06,6(a), 8.06,6(b)
			BMF3_2023 A positive trajectory in the condition of representative ecosystem types (i.e., Water Regime Classes/ANAE) at Barmah-Millewa Forest by 2033.	Connectivity	-	FC1, FC3	2.1, 2.2, 2.3, 2.4, 2.5	8.05,2(a), 8.06,3(b)(i), 8.06,3(b)(ii), 8.06,3(b)(iii), 8.06,5, 8.07,2, 8.07,3, 8.07,4,8.07,6
			BMF4_2023 By 2033, maintain the presence of threatened water-dependent species that are recorded on a regular basis at Barmah-Millewa Forest icon site.	-	Refer to all other objectives	V1-V9, B1-B4, F1-F9	2.7, 2.9	8.05,3(a)
			BMF5_2023 By 2033, a positive trajectory in the condition of native non-woody aquatic vegetation in permanent river and creek, temporary river and creek, temporary marsh and permanent lake WRCs at Barmah-Millewa Forest.	Vegetation	VM5	V7, V8, V9	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,2, 8.06,3(a), 8.06,5, 8.06,6(a), 8.06,7

Asset name	CMA	Management goal	EWMP Objectives	LTWP Theme	LTWP Objective no.	EEO BWS	First Nation's Objectives (BWS)	EWP objectives
			BMF6_2023 A positive trajectory in condition of native woody vegetation associated with river red gum forest and woodlands and box woodlands WRCs at Barmah-Millewa Forest by 2033.	Vegetation	VM6	V1, V2, V3, V4	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(b)(ii), 8.06,5, 8.06,6(a), 8.06,6(b), 8.06,7
			BMF7_2023 Restore representative subpopulations of native water dependent biota at Barmah-Millewa Forest, by 2033.	-	Refer to all other objectives	V1-V9, B1-B4, F1-F9	2.7, 2.9	8.05,3(a), 8.05,3(b)
			BMF8_2023 By 2033, regularly support waterfowl breeding and small-scale colonial breeding events at Barmah-Millewa Forest icon site.	Waterbirds	VM11	B1, B2, B3, B4	2.2, 2.9	8.06,6(a), 8.06,6(b)
			BMF9_2023 By 2033, maintain or increase representative species richness of shallow-water and deep-water feeding guilds of waterbird (F2 and F3, respectively, after Jaensch 2002) at Barmah-Millewa Forest.	Waterbirds	VM14	B1, B2, B3, B4	2.2, 2.9	8.06,6(a), 8.06,6(b)
Belsar Yungera Islands	MCMA	To provide a watering regime that supports a mosaic of floodplain plant communities including River Red gum, Lignum/Black Box and wetland communities, which provide key habitat for a diverse range of flora and fauna.	BY1: By 2030, improve condition and maintain extent from baseline levels of River Red Gum (Eucalyptus camaldulensis) to sustain communities and processes typical of such communities at the Belsar & Yungera Islands asset.	Vegetation	VM6	V1, V2, V3, V4	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(b)(ii), 8.06,5, 8.06,6(a), 8.06,6(b), 8.06,7
			BY5: By 2030, maintain nesting and recruitment of non-colonial waterbirds (N1, N2, N3 and N4, after Jaensch 2002) at the Belsar & Yungera Islands asset, by maintaining a mixture of tree, low vegetation/shrubs, and ground/islet nesting habitat.	Waterbirds	VM11, VM12	B1, B2, B3, B4	2.2, 2.9	8.06,6(a), 8.06,6(b), 8.07,2, 8.07,3
Black Swamp	GBCMA	Maintain and improve the	By 2030, support waterbird breeding and feeding at Black Swamp at least five times in ten years.	Waterbirds	VM11	B1, B2, B3, B4	2.2, 2.9	8.06,6(a), 8.06,6(b)

Asset name	CMA	Management goal	EWMP Objectives	LTWP Theme	LTWP Objective no.	EEO BWS	First Nation's Objectives (BWS)	EWP objectives
		biological values, functioning and resilience of Black Swamp by providing a more natural wetting and drying regime			VM13	B1, B2, B3, B4	2.2, 2.9	8.06,6(b)
			Improve breeding of frogs at Black Swamp to 80% of years in which water is present by 2030.	Other Fauna	VM22	N/A	2.3, 2.5, 2.6, 2.9	8.06,6(b), 8.07,3
			Improve diversity of native water-dependent flora species consistent with Red Gum Swamp EVC 292 benchmarks at Black Swamp by 2030.	Vegetation	VM6	V1, V2, V3, V4	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(b)(ii), 8.06,5, 8.06,6(a), 8.06,6(b), 8.06,7
			Maintain the presence of six state listed threatened waterbird species at Black Swamp by 2030.	Waterbirds	VM14	B1, B2, B3, B4	2.2, 2.9	8.05,3(a)
			Provide refugia to support the long-term survival and resilience of water-dependent biota at Black Swamp by 2030.	Connectivity	VM2	FC1, FC3, FC5, FC6, FC7, F1 - F9, F17	2.1, 2.2, 2.3, 2.7	8.05,3(a), 8.06,6(b), 8.07,3
			Reduce the cover and diversity of exotic water-dependent flora species at Black Swamp by 2030.	Vegetation	VM10	N/A	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.07,5
Bottle Bend	MCMA	The target area of Bottle Bend will be managed to maintain the condition of fringing Riverine Chenopod Woodland and provide seasonal habitat for	Objectives BB1a: By 2030, maintain representative populations of shallow-water and deepwater feeding guilds of waterbird (F2 and F3, respectively, after Jaensch 2002) at the Bottle Bend asset, by maintaining a mixture of shallow and deep-water habitats.	Waterbirds	VM14	B1, B2, B3, B4	2.2, 2.9	8.06,6(a), 8.06,6(b)
			BB1b: By 2030, maintain nesting and recruitment of non-colonial waterbirds (N1, N2, N3 and N4, after Jaensch 2002) at the Bottle Bend asset, by maintaining a mixture of tree, low vegetation/shrubs, and ground/islet nesting habitat.	Waterbirds	VM12	B1, B2, B3, B4	2.2, 2.9	8.06,6(b), 8.07,2, 8.07,3

Asset name	CMA	Management goal	EWMP Objectives	LTWP Theme	LTWP Objective no.	EEO BWS	First Nation's Objectives (BWS)	EWP objectives
		waterfowl, wading birds and frogs.	BB2: By 2030, improve vital habitat at the Bottle Bend asset by increasing the diversity of aquatic macrophytes present across a range of Water Regime Indicators Groups.	Vegetation	VM3	V7, V9	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(a), 8.06,5, 8.06,7
					VM4	V8	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(a), 8.06,5, 8.06,7
			BB3: By 2030, protect and restore biodiversity by maintaining representative populations of frogs at the Bottle Bend asset.	Other Fauna	VM21	N/A	2.3, 2.5, 2.6, 2.9	8.06,6(b), 8.07,3
			BB4: By 2030, improve condition and maintain extent from baseline (2006) levels of Black Box (<i>Eucalyptus largiflorens</i>) to sustain communities and processes reliant of such communities at the Bottle Bend asset.	Vegetation	VM7	V1, V2, V3, V4	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(b)(ii), 8.06,5, 8.06,6(a), 8.06,6(b), 8.06,7
Broken Creek (lower) and Nine Mile Creek	GBCMA	A healthy system that provides water for human and agricultural use, protects and enhances our social, economic and cultural values, and sustains a vibrant range and abundance of native flora and fauna.	LBC 1 Maintain or improve distribution and abundance of threatened vegetation species along in-channel and within littoral zones of lower Broken Creek and Nine Mile Creek by 2035.	Vegetation	VM5	V7, V8, V9	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,2, 8.06,3(a), 8.06,5, 8.06,6(a), 8.06,7
			LBC 2 Maintain diversity of freshwater ecosystem types such as in-channel, littoral and riparian zones by 2035.	Connectivity	VM1	FC1, FC3, FC5, FC6, FC7	2.1, 2.2, 2.3, 2.5, 2.10	8.06,3(a), 8.06,3(b)(i), 8.06,3(b)(ii), 8.06,3(f), 8.06,6(b), 8.07,6
			LBC 3 Support the recovery of threatened native fish species in the lower Broken and Nine Mile Creek.	Native Fish	VM17	F1, F2, F3, F4, F5, F6, F17	2.2, 2.5, 2.6, 2.7	8.05,3(a), 8.06,3(b)(i), 8.06,3(b)(ii), 8.06,6(a), 8.06,6(b)
			LBC 4 Maintain or enhance self-sustaining native fish populations in the lower Broken Creek and Nine Mile Creek.	Native Fish	VM19	F1 - F9, F17	2.2, 2.5, 2.6, 2.7	8.06,6(a)

Asset name	CMA	Management goal	EWMP Objectives	LTWP Theme	LTWP Objective no.	EEO BWS	First Nation's Objectives (BWS)	EWP objectives
			LBC 5 Maintain flow conditions to support Rakali, Platypus and turtle populations in the lower Broken Creek and Nine Mile Creek by 2035.	Functions	VM23	N/A	2.1, 2.3, 2.5, 2.6, 2.9	8.06,6(b), 8.07,3
			LBC 6 Maintain flow conditions to prevent the build-up of Azolla within the lower Broken Creek and Nine Mile Creek and prevent blanketing occurring by 2035.	Vegetation	VM10	NA	2.8	8.05,3(a), 8.06,3(a), 8.06,3(f), 8.06,6(a), 8.06,6(b), 8.06,7
			LBC 7 Maintain lower Broken Creek and Nine Mile Creek flows during periods of drought to provide a refugium to support the long-term survival and resilience of populations of water dependent biota.	Functions	VM2	FC1, FC3, FC5, FC6, FC7, F1 - F9, F17	2.1, 2.2, 2.3, 2.7	8.05,3(a), 8.06,6(b), 8.07,3
Bumbang Island	MCMA	To provide a water regime which reflects natural water level variability and seasonality, that will maintain and promote the mosaic of available habitats and significant cultural heritage values.	BI1: By 2030, improve condition and maintain extent from baseline levels of River Red Gum (<i>Eucalyptus camaldulensis</i>) to sustain communities and processes reliant on River Red Gum woodlands at the Bumbang Island asset.	Vegetation	VM6	V1, V2, V3, V4	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(b)(ii), 8.06,5, 8.06,6(a), 8.06,6(b), 8.06,7
			BI4: By 2030, improve vital habitat at the Bumbang Island asset by increasing the diversity of aquatic macrophytes present across a range of Water Regime Indicators Groups.	Vegetation	VM3	V7, V9	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(a), 8.06,5, 8.06,7
					VM4	V8	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(a), 8.06,5, 8.06,7
			BI5: By 2030, protect and restore recruitment of small-bodied native fish at the Bumbang Island asset, including Carp Gudgeon spp. (<i>Hypseleotris</i> spp.), Fly-Specked Hardyhead (<i>Craterocephalus stercusmuscarum</i>), Flathead Gudgeon (<i>Philypnodon grandiceps</i>), Australian Smelt (<i>Retropinna semoni</i>), Murray-Darling Rainbowfish	Native Fish	VM16	F1, F2, F5, F6, F17	2.2, 2.5, 2.6, 2.7	8.06,5, 8.06,6(a)

Asset name	CMA	Management goal	EWMP Objectives	LTWP Theme	LTWP Objective no.	EEO BWS	First Nation's Objectives (BWS)	EWP objectives
			(<i>Melanotaenia fluviatilis</i>), Murray Hardyhead (<i>Craterocephalus fluviatilis</i>).					
			BI6: By 2030, protect and restore recruitment of large-bodied native fish at the Bumbang Island asset, including Golden Perch (<i>Macquaria ambigua</i>), Silver Perch (<i>Bidyanus bidyanus</i>) and Murray Cod (<i>Maccullochella peelii</i>).	Native Fish	VM15	F1, F2, F5, F7, F8	2.2, 2.5, 2.6, 2.7	8.06,6(a), 8.06,6(b), 8.07,3
			BI7a: By 2030, maintain representative populations of shallow-water and deep-water feeding guilds of waterbird (F2 and F3, respectively, after Jaensch 2002) at the Bumbang Island asset, by maintaining a mixture of shallow and deep-water habitats.	Waterbirds	VM14	B1, B2, B3, B4	2.2, 2.9	8.06,6(a), 8.06,6(b)
			BI7b: By 2030, maintain nesting and recruitment of non-colonial waterbirds (N1, N2, N3 and N4, after Jaensch 2002) at the Bumbang Island asset, by maintaining a mixture of tree, low vegetation/shrubs, and ground/islet nesting habitat.	Waterbirds	VM12	B1, B2, B3, B4	2.2, 2.9	8.06,6(b), 8.07,2, 8.07,3
Burra Creek floodplain (Burra Creek North Burra Creek South, Burra Creek South Proper)	MCMA	To provide a flow regime that more closely reflects natural events, thus improving the capacity of the target area to provide a productive ecosystem for native flora and fauna.	Objectives	Vegetation	VM6	V1, V2, V3, V4	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(b)(ii), 8.06,5, 8.06,6(a), 8.06,6(b), 8.06,7
			BC1: By 2030, improve condition and maintain extent from baseline levels of Lignum (<i>Duma florulenta</i>), River Red Gum (<i>Eucalyptus camaldulensis</i>), and Black Box (<i>E. largiflorens</i>) and to sustain communities and processes reliant on such communities at the Burra Creek asset		VM7	V1, V2, V3, V4	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(b)(ii), 8.06,5, 8.06,6(a), 8.06,6(b), 8.06,7
					VM8	V5, V6	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,5, 8.06,7
			BC2: By 2030, improve vital habitat at the Burra Creek asset by increasing the diversity of aquatic	Vegetation	VM3	V7, V9	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(a), 8.06,5, 8.06,7

Asset name	CMA	Management goal	EWMP Objectives	LTWP Theme	LTWP Objective no.	EEO BWS	First Nation's Objectives (BWS)	EWP objectives
			macrophytes present across a range of Water Regime Indicators Groups.		VM4	V8	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(a), 8.06,5, 8.06,7
Cardross and Koorlong Wetlands (Cardross Lakes Basin 1 West, Cardross Lakes Basin 1 East, Koorlong Lake)	MCMA	To provide a water regime to maintain and improve threatened fish and waterbird populations.	By 2030, improve the population of Murray hardyhead (<i>Craterocephalus fluviatilis</i>) at Koorlong Lake.	Native Fish	VM16	F1, F2, F5, F6, F17	2.2, 2.5, 2.6, 2.7	8.06,5, 8.06,6(a)
			By 2030, maintain populations and extent of saline aquatic vegetation at Koorlong including benthic herblands with <i>Ruppia</i> beds containing both <i>R. polycarpa</i> and <i>R. megacarpa</i> .	Vegetation	VM5	V7, V8, V9	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,2, 8.06,3(a), 8.06,5, 8.06,6(a), 8.06,7
			By 2030, maintain representative populations of shallow-water and deep-water feeding guilds of waterbird (F2 and F3, respectively, after Jaensch 2002) at the Koorlong Lake asset, by maintaining a mixture of shallow and deep-water habitats.	Waterbirds	VM14	B1, B2, B3, B4	2.2, 2.9	8.06,6(a), 8.06,6(b)
Carina Bend	MCMA	To provide a water regime that will support the health of fringing mature river red gum and provide seasonal habitat for native fish, frogs and waterfowl	CB1: By 2030, improve condition and maintain extent from baseline levels of river red gum (<i>Eucalyptus camaldulensis</i>) to sustain communities and processes typical of such communities at the Carina Bend asset.	Vegetation	VM6	V1, V2, V3, V4	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(b)(ii), 8.06,5, 8.06,6(a), 8.06,6(b), 8.06,7
			CB2a: By 2030, protect and restore biodiversity by maintaining representative populations of small bodied native fish at the Carina Bend asset, including gudgeon spp (<i>Phlypnodon</i> spp) and Murray-Darling rainbow fish (<i>Melanotaenia fluviatilis</i>).	Native Fish	VM16	F1, F2, F5, F6, F17	2.2, 2.5, 2.6, 2.7	8.06,5, 8.06,6(a)
			CB2b: By 2030, protect and restore biodiversity by maintaining representative populations of frogs at the Carina Bend asset.	Other Fauna	VM21	N/A	2.3, 2.5, 2.6, 2.9	8.06,6(b), 8.07,3
			CB3a: By 2030, maintain nesting and recruitment of non-colonial waterbirds (N1, N2, N3 and N4, after	Waterbirds	VM12	B1, B2, B3, B4	2.2, 2.9	8.06,6(b), 8.07,2, 8.07,3

Asset name	CMA	Management goal	EWMP Objectives	LTWP Theme	LTWP Objective no.	EEO BWS	First Nation's Objectives (BWS)	EWP objectives
			Jaensch 2002) at the Carina Bend asset, by maintaining a mixture of tree, low vegetation/shrubs, and ground/islet nesting habitat.					
			CB3b: By 2030, maintain representative populations of shallow-water and deepwater feeding guilds of waterbird (F2 and F3, respectively, after Jaensch 2002) at the Carina Bend asset, by maintaining a mixture of shallow and deep-water habitats.	Waterbirds	VM14	B1, B2, B3, B4	2.2, 2.9	8.06,6(a), 8.06,6(b)
			CB4a: By 2030, improve vital habitat at the Carina Bend asset by increasing the diversity of aquatic macrophytes present across a range of Water Regime Indicator Groups.	Vegetation	VM3	V7, V9	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(a), 8.06,5, 8.06,7
			CB4b: By 2030, improve condition and maintain extent from baseline levels of lignum (Duma florulenta) to sustain communities and processes reliant on lignum communities at the Carina Bend asset.	Vegetation	VM8	V5, V6	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,5, 8.06,7
Gunbower Creek	NCCMA	To rehabilitate the highly valued native fish populations of the Gunbower Creek System and facilitate connection between the Murray River, Gunbower Forest floodplain and associated wetlands through	Increase connectivity to promote movement/ migration of native fish species within the lagoons, floodplain and Murray River	Native Fish	VM19	F1 - F9, F17	2.2, 2.5, 2.6, 2.7	8.06,6(a)
			Increase littoral and aquatic vegetation extent, diversity and productivity	Vegetation	VM5	V7, V8, V9	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,2, 8.06,3(a), 8.06,5, 8.06,6(a), 8.06,7
			Increase the abundance and improve age class distribution of small and large bodied native fish species	Native Fish	VM16	F1, F2, F5, F6, F17	2.2, 2.5, 2.6, 2.7	8.06,5, 8.06,6(a)
			Increase the size of the resident breeding population of Platypus	Other Fauna	VM21	N/A	2.3, 2.5, 2.6, 2.9	8.06,6(b), 8.07,3
			Maintain feeding and breeding opportunities for frogs	Other Fauna	VM22	N/A	2.3, 2.5, 2.6, 2.9	8.06,6(b), 8.07,3

Asset name	CMA	Management goal	EWMP Objectives	LTWP Theme	LTWP Objective no.	EEO BWS	First Nation's Objectives (BWS)	EWP objectives
		an appropriate water regime.	Maintain feeding and breeding opportunities for turtles	Other Fauna	VM23	N/A	2.1, 2.3, 2.5, 2.6, 2.9	8.06,6(b), 8.07,3
			Maintain feeding and opportunistic breeding conditions for a diversity of waterbirds	Waterbirds	VM11	B1, B2, B3, B4	2.2, 2.9	8.06,6(a), 8.06,6(b)
					VM13	B1, B2, B3, B4	2.2, 2.9	8.06,6(b)
			Rehabilitate populations of native fish species that are poorly represented or absent in the system	Native Fish	VM15	F1, F2, F5, F7, F8	2.2, 2.5, 2.6, 2.7	8.06,6(a), 8.06,6(b), 8.07,3
			Restore connectivity between the creek, lagoons and their associated riparian zones	Functions	VM1	FC1, FC3, FC5, FC6, FC7	2.1, 2.2, 2.3, 2.5, 2.10	8.06,3(a), 8.06,3(b)(i), 8.06,3(b)(ii), 8.06,3(f), 8.06,6(b), 8.07,6
Gunbower Forest	NCCMA	Not specified	Ensure maintenance of healthy River Red Gum communities	Vegetation	VM6	V1, V2, V3, V4	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(b)(ii), 8.06,5, 8.06,6(a), 8.06,6(b), 8.06,7
			Increase area of healthy permanent and semi-permanent wetlands	Connectivity	VM1	FC5	2.2, 2.3, 2.4	8.05,2(a), 8.06,3(b)(ii)
			Increase the diversity and abundance of native frog species within the forest.	Other Fauna	VM21	N/A	2.3, 2.5, 2.6, 2.9	8.06,6(b), 8.07,3
			Maintain Black Box and Grey Box communities	Vegetation	VM7	V1, V2, V3, V4	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(b)(ii), 8.06,5, 8.06,6(a), 8.06,6(b), 8.06,7
			Maintain healthy populations of native fish in wetlands and increase opportunities for riverine fish to access floodplain resources.	Native Fish	VM19	F1 - F9, F17	2.2, 2.5, 2.6, 2.7	8.06,6(a)

Asset name	CMA	Management goal	EWMP Objectives	LTWP Theme	LTWP Objective no.	EEO BWS	First Nation's Objectives (BWS)	EWP objectives
			Provide suitable feeding, breeding and refuge habitat for waterbirds, including colonial nesting species	Waterbirds	VM12	B1, B2, B3, B4	2.2, 2.9	8.06,6(b), 8.07,2, 8.07,3
Guttrum and Benwell Forests	NCCMA	Maintain and restore healthy floodplain communities across Guttrum and Benwell State Forests, to ensure that indigenous plant and animal species and communities survive and flourish.	Objectives	Vegetation	VM5	V7, V8, V9	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,2, 8.06,3(a), 8.06,5, 8.06,6(a), 8.06,7
			By 2034, a positive trajectory in condition of native woody vegetation plant functional groups associated with River Red Gum FDU and FTU at Guttrum and Benwell State Forests.	Vegetation	VM6	V1, V2, V3, V4	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(b)(ii), 8.06,5, 8.06,6(a), 8.06,6(b), 8.06,7
			By 2034, increase transport of organic carbon from the managed floodplain at Guttrum and Benwell State Forests	Water Quality	VM26	-	2.1, 2.2, 2.6, 2.8, 2.10	8.06,2, 8.07,5
			By 2034, maintain the presence of water-dependent threatened species recorded at Guttrum and Benwell State Forests	-	refer to other objectives	V1-V9, B1-B4, F1-F9	2.7, 2.9	8.05,3(a)
			By 2034, mitigate the impact of invasive flora species on floodplain and wetland ecosystems at Guttrum and Benwell State Forests and native water-dependent biota	Vegetation	VM10	N/A	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.07,5
			By 2034, restore representative subpopulations of native water dependent fauna Guttrum and Benwell State Forest.	-	refer to other objectives	B1-B4	2.7, 2.9, 2.10	8.05,3(a), 8.05,3(b), 8.06,5, 8.06,6(b)
			By 2034, restore vital habitat and ecosystem functions which support successful breeding of waterbirds at Guttrum and Benwell State Forests.	Waterbirds	VM11	B1, B2, B3, B4	2.2, 2.9	8.06,6(a), 8.06,6(b)
Hattah Lakes	MCMA	Improve biodiversity values of Hattah Lakes,	By 2030, improve biodiversity at Hattah Lakes by supporting the life-cycle of the EPBC-listed regent parrot (<i>Polytelis anthopeplus monarchoides</i>).	Other fauna	NA	-	2.9	8.05,3(a)

Asset name	CMA	Management goal	EWMP Objectives	LTWP Theme	LTWP Objective no.	EEO BWS	First Nation's Objectives (BWS)	EWP objectives
		maintaining wetland and floodplain communities representative of those which would be expected under natural flow conditions	By 2030, maintain or improve biodiversity at Hattah Lakes by ensuring that feeding habitat for the dominant guilds of waterbirds, most notably waterfowl, herbivores and piscivores, are supported.	Waterbirds	VM13	B1, B2, B3, B4	2.2, 2.9	8.06,6(b)
			Improve condition and maintain extent from baseline (2006) levels of river red gum (<i>Eucalyptus camaldulensis</i>), black box (<i>E. largiflorens</i>) and lignum (<i>Duma florulenta</i>) to sustain communities and processes typical of such communities at the Hattah Lakes Icon Site by 2030.	Vegetation	VM6	V1, V2, V3, V4	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(b)(ii), 8.06,5, 8.06,6(a), 8.06,6(b), 8.06,7
			Improve species richness and abundance of native water-dependent floodplain and wetland aquatic vegetation at the Hattah Lakes Icon Site by 2030.	Vegetation	VM3	V7, V9	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(a), 8.06,5, 8.06,7
			Maintain a diversity of freshwater ecosystem types within the Hattah Lakes Icon Site, including semi-permanent lakes, persistent temporary wetlands, floodplain woodlands, shrublands, and episodic wetlands (Lake Kramen) by 2030.	Connectivity	VM1	FC1, FC3, FC5, FC6, FC7	2.1, 2.2, 2.3, 2.5, 2.10	8.06,3(a), 8.06,3(b)(i), 8.06,3(b)(ii), 8.06,3(f), 8.06,6(b), 8.07,6
			Maintain recruitment of populations of small-bodied native fish and presence of large-bodied native fish at Hattah Lakes by 2030.	Native Fish	VM19	F1 - F9, F17	2.2, 2.5, 2.6, 2.7	8.06,6(a)
			Maintain the ecological character of the Hattah-Kulkyne Lakes Ramsar site by 2030	NA refer Management goals section 4.2	-	-	-	8.05,2(a)
			Protect and restore ecosystem functions of water-dependent ecosystems that support successful colonial nesting waterbird species at Hattah Lakes by providing conditions for breeding and fledging at least three times every 10 years.	Waterbirds	VM11	B1, B2, B3, B4	2.2, 2.9	8.06,6(a), 8.06,6(b)

Asset name	CMA	Management goal	EWMP Objectives	LTWP Theme	LTWP Objective no.	EEO BWS	First Nation's Objectives (BWS)	EWP objectives
			Provide refugia to support the long-term survival and resilience of water-dependent populations of waterbirds, including during drought, to allow for subsequent re-colonisation beyond Hattah Lakes by 2030.	Waterbirds	VM12	B1, B2, B3, B4	2.2, 2.9	8.06,6(b), 8.07,2, 8.07,3
Heywood Lake	MCMA	Restore Heywood Lake to an intermittently flooded deep water wetland that sustains resident aquatic fauna while flooded and supports breeding waterbirds.	HeL1: By 2030, improve condition and maintain extent from baseline (2006) levels of black box (<i>Eucalyptus largiflorens</i>) to sustain communities and processes reliant of such communities at Heywood Lake and Little Heywood Lake	Vegetation	VM6	V1, V2, V3, V4	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(b)(ii), 8.06,5, 8.06,6(a), 8.06,6(b), 8.06,7
			HeL2: By 2030, improve vital habitat at Heywood Lake by increasing the diversity of aquatic macrophytes present across a range of Water Regime Indicators Groups.	Other Fauna	VM25	N/A	2.6, 2.7, 2.8	8.06,6(b), 8.07,3
				Vegetation	VM3	V7, V9	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(a), 8.06,5, 8.06,7
					VM5	V7, V8, V9	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,2, 8.06,3(a), 8.06,5, 8.06,6(a), 8.06,7
			HeL3: By 2030, maintain representative populations of shallow-water and deepwater feeding guilds of waterbird (F2 and F3, respectively, after Jaensch 2002) at Heywood Lake, by maintaining a mixture of shallow and deep-water habitats.	Waterbirds	VM14	B1, B2, B3, B4	2.2, 2.9	8.06,6(a), 8.06,6(b)
			HeL4: By 2030, maintain nesting and recruitment of non-colonial waterbirds (N1, N2, N3 and N4, after Jaensch 2002) at Heywood Lake and Little Heywood Lake, by maintaining a mixture of trees, low vegetation/shrubs, and ground/islet nesting habitat.	Waterbirds	VM11	B1, B2, B3, B4	2.2, 2.9	8.06,6(a), 8.06,6(b)
					VM12	B1, B2, B3, B4	2.2, 2.9	8.06,6(b), 8.07,2, 8.07,3
			HeL5: Encourage a productive aquatic ecosystem through the release of nutrients and organic matter from the sediments and decomposition of inundated	Water Quality	VM26	N/A	2.1, 2.2, 2.6, 2.8, 2.10	8.06,2, 8.07,5

Asset name	CMA	Management goal	EWMP Objectives	LTWP Theme	LTWP Objective no.	EEO BWS	First Nation's Objectives (BWS)	EWP objectives
			terrestrial vegetation through inundation of wetlands following a dry phase					
Hird Swamp (Kerang Lakes)	NCCMA	To provide an appropriate water regime that will maintain varying habitats through Hird Swamp (east and west) important for waterbird resting, nesting and feeding, in particular the provision of: ▪ Open-water habitat ▪ Lignum dominated woodland ▪ Reed habitat, with associated wetland flora which can withstand periods of dry.	Maintain biota typical of lignum and chenopod woodland.	Vegetation	VM8	V5, V6	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,5, 8.06,7
			Maintain open water habitats at current extent through wetland.	Waterbirds	VM12	B1, B2, B3, B4	2.2, 2.9	8.06,6(b), 8.07,2, 8.07,3
			Reduce current extent and density of Phragmites australis and Typha sp., ensuring it does not encroach on other ecological values.	Vegetation	VM5	V7, V8, V9	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,2, 8.06,3(a), 8.06,5, 8.06,6(a), 8.06,7
			Restore wetland macrophyte plant community during watering events, and ensure successful reproduction through viable seeds and propagules for subsequent watering events.	Vegetation	VM3	V7, V9	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(a), 8.06,5, 8.06,7
Johnson Swamp (Kerang Lakes)	NCCMA	Rehabilitate Johnson Swamp using environmental water management to reduce the extent of cumbungi	Create through flow conditions by rehabilitating lateral connectivity between wetland and Pyramid Creek	Functions	VM1	FC1, FC3, FC5, FC6, FC7	2.1, 2.2, 2.3, 2.5, 2.10	8.06,3(a), 8.06,3(b)(i), 8.06,3(b)(ii), 8.06,3(f), 8.06,6(b), 8.07,6
			Increase, or facilitate, breeding opportunities for waterbirds at Johnson Swamp through environmental water management by either:	Waterbirds	VM11	B1, B2, B3, B4	2.2, 2.9	8.06,6(a), 8.06,6(b)

Asset name	CMA	Management goal	EWMP Objectives	LTWP Theme	LTWP Objective no.	EEO BWS	First Nation's Objectives (BWS)	EWP objectives
		(Typha spp.), expand the area of Aquatic Herbland (EVC 653), and improve the condition of Intermittent Swampy Woodland (EVC 813) and Lignum Swampy Woodland (EVC 823). This will provide the physical habitat and condition to support a high diversity and abundance of breeding and feeding waterbirds.	- Providing improved habitat conditions for breeding (achieved through vegetation objectives 1 and 2); or - Prolonging flooded conditions to allow successful fledging once a significant breeding event has commenced.					
			Maintain all waterbird feeding guilds, a waterbird species richness between 30 and 50 species and abundance levels in the thousands per month between October to January at Johnson Swamp, in three out of four targeted surveys over any 10-year period	Waterbirds	VM14	B1, B2, B3, B4	2.2, 2.9	8.06,6(a), 8.06,6(b)
			Reduce extent of cumbungi in Tall Marsh (EVC 821) by twenty percent at Johnson Swamp west by 2025 1.1 Corresponding increase in extent of Aquatic Herbland (EVC 653) 1.2 Reduce density of common reed in Tall Marsh (EVC 821).	Vegetation	VM5	V7, V8, V9	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,2, 8.06,3(a), 8.06,5, 8.06,6(a), 8.06,7
			Rehabilitate Intermittent Swampy Woodland (EVC 813) and Lignum Swampy Woodland (EVC 823) at Johnson Swamp West and East by 2025 2.1 Improve condition of lignum fringing vegetation 2.2 Improve condition of existing river red gum and facilitate recruitment 2.3 Improve condition of existing black box woodland and facilitate recruitment.	Vegetation	VM6	V1, V2, V3, V4	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(b)(ii), 8.06,5, 8.06,6(a), 8.06,6(b), 8.06,7
					VM7	V1, V2, V3, V4	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(b)(ii), 8.06,5, 8.06,6(a), 8.06,6(b), 8.06,7
					VM8	V5, V6	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,5, 8.06,7
Johnstons and Chaffey	MCMA	Support healthy ecosystems across the floodplains. The	JCB1: By 2030, improve condition and maintain extent from baseline levels of River Red Gum (Eucalyptus camaldulensis) to sustain communities	Vegetation	VM6	V1, V2, V3, V4	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(b)(ii), 8.06,5, 8.06,6(a), 8.06,6(b), 8.06,7

Asset name	CMA	Management goal	EWMP Objectives	LTWP Theme	LTWP Objective no.	EEO BWS	First Nation's Objectives (BWS)	EWP objectives
		goal considers the values the wetland supports and the potential threats that need to be managed. This includes consideration of the values the wetland has historically supported and the likely values it could support into the future.	and processes reliant on River Red Gum woodland at the Johnsons & Chaffey Bend asset.					
			JCB2: By 2030, improve condition and maintain extent from baseline (2006) levels of Black Box (<i>Eucalyptus largiflorens</i>) to sustain communities and processes reliant of such communities at the Johnsons & Chaffey Bend asset	Vegetation	VM7	V1, V2, V3, V4	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(b)(ii), 8.06,5, 8.06,6(a), 8.06,6(b), 8.06,7
Karadoc Swamp (Outlet Creek, Inlet Creek, Karadoc)	MCMA	To provide a water regime which supports a seasonally connected and functional wetland complex which provide feeding and breeding habitat for small fish, frogs, waterbirds and microbats. The system should also provide refuge habitat for the endangered Murray Hardyhead and support a healthy	K1: Establish and maintain a refuge habitat for Murray Hardyhead: - improve aquatic	Native Fish	VM2	FC1, FC3, FC5, FC6, FC7, F1 - F9, F17	2.1, 2.2, 2.3, 2.7	8.05,3(a), 8.06,6(b), 8.07,3
			K2: By 2030, improve condition and maintain extent from baseline levels of Lignum (<i>Duma florulenta</i>), River Red Gum (<i>Eucalyptus camaldulensis</i>), and Black Box (<i>E. largiflorens</i>) and to sustain communities and processes reliant on such communities at Karadoc Swamp	Vegetation	VM6	V1, V2, V3, V4	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(b)(ii), 8.06,5, 8.06,6(a), 8.06,6(b), 8.06,7
					VM7	V1, V2, V3, V4	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(b)(ii), 8.06,5, 8.06,6(a), 8.06,6(b), 8.06,7
					VM8	V5, V6	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,5, 8.06,7

Asset name	CMA	Management goal	EWMP Objectives	LTWP Theme	LTWP Objective no.	EEO BWS	First Nation's Objectives (BWS)	EWMP objectives
		population of Swamp Sheoak.	K3: By 2030, protect and restore biodiversity by maintaining representative populations of small bodied native fish populations at the Karadoc asset, including Murray Darling Rainbow Fish (<i>Melanotaenia fluviatilis</i>), Carp Gudgeon (<i>Hypseleotris</i> spp) and Fly-specked Hardyhead (<i>Craterocephalus stercusmuscarum</i>)	Native Fish	VM17	F1, F2, F3, F4, F5, F6, F17	2.2, 2.5, 2.6, 2.7	8.05,3(a), 8.06,3(b)(i), 8.06,3(b)(ii), 8.06,6(a), 8.06,6(b)
			K4: By 2030, protect and restore biodiversity by maintaining representative populations of frogs at Karadoc Swamp, Karadoc.	Other Fauna	VM21	N/A	2.3, 2.5, 2.6, 2.9	8.06,6(b), 8.07,3
			K5a: By 2030, maintain representative populations of shallow-water and deep-water feeding guilds of waterbird (F2 and F3, respectively, after Jaensch 2002) at the Karadoc asset, by maintaining a mixture of shallow and deep-water habitats.	Waterbirds	VM14	B1, B2, B3, B4	2.2, 2.9	8.06,6(a), 8.06,6(b)
			K5b: By 2030, maintain nesting and recruitment of non-colonial waterbirds (N1, N2, N3 and N4, after Jaensch 2002) at the Karadoc asset, by maintaining a mixture of tree, low vegetation/shrubs, and ground/islet nesting habitat.	Waterbirds	VM12	B1, B2, B3, B4	2.2, 2.9	8.06,6(b), 8.07,2, 8.07,3
			K6: Improve the health of the Swamp Sheoak community	Vegetation	VM8	V5, V6	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,5, 8.06,7
			K7: By 2030, improve condition and maintain extent from baseline (2006) levels of Black Box (<i>Eucalyptus largiflorens</i>) to sustain communities and processes reliant of such communities at the Karadoc asset	Vegetation	VM7	V1, V2, V3, V4	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(b)(ii), 8.06,5, 8.06,6(a), 8.06,6(b), 8.06,7
Kings Billabong (Butlers Creek, Ducksfoot)	MCMA	To provide a watering regime that supports a	KB 10 (BTC5): Protect and restore ecosystem functions of water-dependent ecosystems that support successful breeding of large waders at	Waterbirds	VM11	B1, B2, B3, B4	2.2, 2.9	8.06,6(a), 8.06,6(b)

Asset name	CMA	Management goal	EWMP Objectives	LTWP Theme	LTWP Objective no.	EEO BWS	First Nation's Objectives (BWS)	EWMP objectives
Lagoon, Baggs Lagoon)		mosaic of aquatic and semi emergent wetland vegetation communities to provide key habitat and food sources for a diverse range of fauna. For the Butlers Creek complex to be permanent wetlands with seasonal variation in water levels that will support the populations of Growling Grass Frog and support key habitat requirements of piscivorous and large wading birds	Ducksfoot Lagoon by providing conditions for breeding and fledging at least 3 times every 10 years KB 9 (BTC4): By 2030, maintain representative populations of piscivores (guild D4, after Jaensch 2002) at the Butlers Creek asset. KB1: By 2030, improve vital habitat at the King's Billabong asset by increasing the diversity of aquatic macrophytes present across a range of Water Regime Indicators Groups. KB2: Reduce the abundance or dominance of Vallisneria. KB3: Increase abundance and diversity of zooplankton and macroinvertebrates KB4a: By 2030 increase breeding of frogs at the Kings Billabong asset. KB4b: By 2030, improve biodiversity at the Kings Billabong asset by supporting the life cycle of EPBC listed Growling Grass Frog (<i>Litoria raniformis</i>). KB5: By 2030, protect and restore biodiversity by maintaining representative populations of native small-bodied fish at the Kings Billabong asset, including Australian Smelt (<i>Retropinna semoni</i>), Carp gudgeon (<i>Hypseleotris</i> spp.), Flat-headed Gudgeon (<i>Philypnodon grandiceps</i>), Murray-Darling Rainbowfish (<i>Melanotaenia fluviatilis</i>), Un-specked Hardyhead (<i>Craterocephalus stercusmuscarum fulvus</i>).	Waterbirds Vegetation Vegetation Other Fauna Other Fauna Other Fauna Native Fish	VM14 VM3 VM10 VM24 VM22 VM20, VM21, VM22 VM17	B1, B2, B3, B4 V7, V9 N/A N/A N/A - F1, F2, F3, F4, F5, F6, F17	2.2, 2.9 2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10 2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10 2.6, 2.7, 2.8 2.3, 2.5, 2.6, 2.9 2.3, 2.5, 2.6, 2.9 2.2, 2.5, 2.6, 2.7	8.06,6(a), 8.06,6(b) 8.05,3(b), 8.06,3(a), 8.06,5, 8.06,7 8.07,5 8.06,6(b), 8.07,3 8.06,6(b), 8.07,3 8.06,6(b), 8.07,3 8.05,3(a), 8.06,3(b)(i), 8.06,3(b)(ii), 8.06,6(a), 8.06,6(b)

Asset name	CMA	Management goal	EWMP Objectives	LTWP Theme	LTWP Objective no.	EEO BWS	First Nation's Objectives (BWS)	EWP objectives
Kinnairds Wetland	GBCMA	To provide a more natural hydrological regime that supports Red Gum Swamp and Plains Grassy Wetland EVCs and habitat for significant waterbird and flora species	KB6: By 2030, improve the population of Freshwater catfish (<i>Tandanus tandanus</i>) at the Kings Billabong asset.	Native Fish	VM19	F1 - F9, F17	2.2, 2.5, 2.6, 2.7	8.06,6(a)
			KB7: By 2030, maintain representative populations of the shallow-water and deep feeding guilds of waterbirds, including shorebirds (F2 and F3, after Jaensch 2002) at the Kings Billabong asset, by maintaining a mixture of foraging habitats.	Waterbirds	VM14	B1, B2, B3, B4	2.2, 2.9	8.06,6(a), 8.06,6(b)
			KB8: By 2030, maintain vital habitat to provide a refugium for listed species of waterbirds at the Kings Billabong asset.	Waterbirds	VM12	B1, B2, B3, B4	2.2, 2.9	8.06,6(b), 8.07,2, 8.07,3
			Improve the diversity of native wetland flora species to be consistent with Red Gum Swamp and Plains Grassy Wetland EVC benchmarks.	Vegetation	VM6	V1, V2, V3, V4	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(b)(ii), 8.06,5, 8.06,6(a), 8.06,6(b), 8.06,7
					VM9	V9	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,5, 8.06,7
				Other Fauna	VM21	N/A	2.3, 2.5, 2.6, 2.9	8.06,6(b), 8.07,3
				Vegetation	VM5	V7, V8, V9	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,2, 8.06,3(a), 8.06,5, 8.06,6(a), 8.06,7
			Provide feeding habitat for significant waterbird species such as the Eastern Great Egret, Magpie Goose, Brolga, Glossy Ibis, Latham's Snipe and Whiskered Tern.	Waterbirds	VM13	B1, B2, B3, B4	2.2, 2.9	8.06,6(b)

Asset name	CMA	Management goal	EWMP Objectives	LTWP Theme	LTWP Objective no.	EEO BWS	First Nation's Objectives (BWS)	EWP objectives
Kunat Kunat (Round Lake)	NCCMA	Maintain Round Lake as a permanent, saline lake that provides habitat for the Murray hardyhead (MHH; Craterocephalus fluviatilis), a threatened native fish, in addition to submerged	Provide opportunities for waterbird breeding especially Royal Spoonbills and Australasian Shoveler during flood events	Waterbirds	VM11	B1, B2, B3, B4	2.2, 2.9	8.06,6(a), 8.06,6(b)
			Reduce the cover and diversity of exotic and/ or highly invasive native flora species	Vegetation	VM10	N/A	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.07,5
			Maintain representative species of shallow water and deep feeding guilds of waterbirds including shorebirds (F2 and F3, Jaensch, 2002) at Round Lake by 2030.	Waterbirds	VM14	B1-B4	2.2, 2.9	8.06,6(a), 8.06,6(b)
			Objective 3: Maintain other aquatic halophytic macrophytes (including charophytes) persisting in Round Lake by 2030	Vegetation	VM3	V7, V9	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(a), 8.06,5, 8.06,7
			Support annual breeding of Murray hardyhead (Craterocephalus fluviatilis) at Round Lake to 2030	Native Fish	NV18	F1, F2, F4, F5, F6, F17	2.2, 2.5, 2.6, 2.7	8.06,5 8.06,6(a)
			Support vital habitat for Murray hardyhead by maintaining extent and cover of Large-fruit Tassel (Ruppia megacarpa) at 32ha by 2030 at Round Lake by 2030.	Native Fish	VM18	F1 - F9, F17	2.2, 2.5, 2.6, 2.7	8.06,6(b)

Asset name	CMA	Management goal	EWMP Objectives	LTWP Theme	LTWP Objective no.	EEO BWS	First Nation's Objectives (BWS)	EWMP objectives
		aquatic vegetation, particularly Large-fruit Tassel (Ruppia megacarpa) and charophytes (macroscopic algae), and waterfowl and migratory waterbird species		Vegetation	VM5	V7, V8, V9	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,2, 8.06,3(a), 8.06,5, 8.06,6(a), 8.06,7
Lake Cullen (Kerang Lakes)	NCCMA	To provide an appropriate water regime that targets the maintenance of a submerged salt-tolerant aquatic plant assemblage typical of an intermittent saline lake, and ability to support high levels of waterbird use.	Maintain Black box communities surrounding the wetland and promote regeneration of species typical of Black Box communities.	Vegetation	VM7	V1, V2, V3, V4	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(b)(ii), 8.06,5, 8.06,6(a), 8.06,6(b), 8.06,7
			Maintain submerged aquatic species typical of a saline wetland (e.g. Ruppia spp., Lepilaena spp. And Potamogeton spp.).	Vegetation	VM5	V7, V8, V9	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,2, 8.06,3(a), 8.06,5, 8.06,6(a), 8.06,7
Lake Elizabeth (Kerang Lakes)	NCCMA	To provide an appropriate water regime that maintains Lake	Maintain and support breeding of Murray Hardyhead	Native Fish	VM17	F1, F2, F3, F4, F5, F6, F17	2.2, 2.5, 2.6, 2.7	8.05,3(a), 8.06,3(b)(i), 8.06,3(b)(ii), 8.06,6(a), 8.06,6(b)

Asset name	CMA	Management goal	EWMP Objectives	LTWP Theme	LTWP Objective no.	EEO BWS	First Nation's Objectives (BWS)	EWP objectives
		Elizabeth as a permanent, saline wetland whilst providing habitat for reintroduction of the critically endangered Murray Hardyhead through maintenance of appropriate water quality and the provision of Saline Aquatic Meadow (EVC 842) vegetation, particularly Large-fruit Sea Tassel, Long-fruit Water-mat and Stonewort.	Maintain salinity within 25,000 to 40,000 EC	Functions / water quality	VM26	N/A	2.1, 2.2, 2.6, 2.8, 2.10	8.06,2, 8.07,5
			Maintain/ reinstate submerged aquatics (i.e. Large-fruit Sea Tassel, Stonewort and Long-fruit Water-mat)	Vegetation	VM5	V7, V8, V9	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,2, 8.06,3(a), 8.06,5, 8.06,6(a), 8.06,7
			Restore and maintain (expansion) of chenopod shrubland from the littoral zones to wetland margins	Vegetation	VM8	V5, V6	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,5, 8.06,7
			Restore breeding of waterbirds	Waterbirds	VM11	B1, B2, B3, B4	2.2, 2.9	8.06,6(a), 8.06,6(b)
			Restore diversity and abundance of invertebrates	Other Fauna	VM24	N/A	2.6, 2.7, 2.8	8.06,6(b), 8.07,3
					VM25	N/A	2.6, 2.7, 2.8	8.06,6(b), 8.07,3
			Restore feeding opportunities (food source for waterbirds)	Waterbirds	VM12	B1, B2, B3, B4	2.2, 2.9	8.06,6(b), 8.07,2, 8.07,3
			Restore littoral zone of wetland	Waterbirds	VM12	B1, B2, B3, B4	2.2, 2.9	8.06,6(b), 8.07,2, 8.07,3
Lake Hawthorn	MCMA	To provide a flow regime to the target area that provides permanent shallow wading habitat for internationally important migratory shorebirds and a diverse population	LH1 By 2030, maintain populations and extent of saline aquatic vegetation at the Lake Hawthorn asset including benthic herblands with Ruppia beds containing both R. polycarpa and R. megacarpa.	Vegetation	VM5	V7, V8, V9	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,2, 8.06,3(a), 8.06,5, 8.06,6(a), 8.06,7
			LH2: By 2030, maintain representative populations of the shallow-water feeding guild of waterbirds including shorebirds (F2, after Jaensch 2002) at the Lake Hawthorn asset, by maintaining shallow-water habitats.	Waterbirds	VM14	B1, B2, B3, B4	2.2, 2.9	8.06,6(a), 8.06,6(b)

Asset name	CMA	Management goal	EWMP Objectives	LTWP Theme	LTWP Objective no.	EEO BWS	First Nation's Objectives (BWS)	EWP objectives
		of resident native waterbirds.						
Lake Murphy	NCCMA	Maintain Lake Murphy as a temporary freshwater marsh able to support a diversity of vegetation communities that provide high quality feeding and breeding habitat for a diversity of waterbirds and frogs.	Maintain emergent vegetation at the outfall and littoral zone	Vegetation	VM5	V7, V8, V9	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,2, 8.06,3(a), 8.06,5, 8.06,6(a), 8.06,7
			Maintain open water and associated mudflat habitat	Waterbirds	VM12	B1, B2, B3, B4	2.2, 2.9	8.06,6(b), 8.07,2, 8.07,3
			Maintain opportunistic breeding of waterbirds	Waterbirds	VM11	B1, B2, B3, B4	2.2, 2.9	8.06,6(a), 8.06,6(b)
			Maintain the existing Black Box (<i>E. largiflorens</i>) overstory and provide conditions to promote recruitment, where possible.	Vegetation	VM7	V1, V2, V3, V4	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(b)(ii), 8.06,5, 8.06,6(a), 8.06,6(b), 8.06,7
			Rehabilitate a diversity of feeding opportunities for waterbirds	Waterbirds	VM13	B1, B2, B3, B4	2.2, 2.9	8.06,6(b)
			Rehabilitate habitat for frog and macroinvertebrate populations	Other Fauna	VM20	N/A	2.3, 2.5, 2.6, 2.9	8.06,6(b), 8.07,3
			Rehabilitate the existing amphibious herb assemblage	Vegetation	VM3	V7, V9	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(a), 8.06,5, 8.06,7
			Rehabilitate the Tangled Lignum (<i>Duma florulenta</i>) habitat	Vegetation	VM8	V5, V6	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,5, 8.06,7
Lindsay, Wallpolla and Mulcra Islands	MCMA	Improve biodiversity values of Lindsay, Mulcra and Wallpolla Islands, with environmental	By 2030, improve ecosystem functions of water-dependent ecosystems by maintaining or improving productivity linkages between the river and floodplain habitats (on and off) at the Lindsay-Mulcra-Wallpolla Icon Site by achieving variable extents of lateral connectivity.	Functions / Connectivity	VM1	FC1, FC3, FC5, FC6, FC7	2.1, 2.2, 2.3, 2.5, 2.10	8.06,3(a), 8.06,3(b)(i), 8.06,3(b)(ii), 8.06,3(f), 8.06,6(b), 8.07,6

Asset name	CMA	Management goal	EWMP Objectives	LTWP Theme	LTWP Objective no.	EEO BWS	First Nation's Objectives (BWS)	EWP objectives
		conditions in anabranches and floodplains to be representative of those which would be expected under natural flow conditions.'	By 2030, improve native fish populations (large- and small-bodied fish) across the Lindsay-Mulcra-Wallpolla Icon Site and their relative abundance and diversity; assessment to include comparison with 2006-2012 levels for short-lived species and the spread of age-classes for long-lived fish.	Native Fish	VM19	F1 - F9, F17	2.2, 2.5, 2.6, 2.7	8.06,6(a)
			By 2030, limit the spread of Typha and other invasive species.	Vegetation	VM10	N/A	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.07,5
			By 2030, protect and restore breeding habitat for colonial nesting waterbirds at Lake Wallawalla and non-colonial waterbird breeding at Mulcra Horseshoe and Wallpolla Horseshoe.	Waterbirds	VM12	B1, B2, B3, B4	2.2, 2.9	8.06,6(b), 8.07,2, 8.07,3
			By 2030, protect and restore vital feeding habitats that support sustainable communities of colonial nesting waterbirds, waterfowl, waders and piscivores to maintain the current species diversity at the Lindsay-Mulcra-Wallpolla Icon Site.	Waterbirds	VM13	B1, B2, B3, B4	2.2, 2.9	8.06,6(b)
			Improve condition and maintain extent (ha) from baseline (2006) levels of river red gum (Eucalyptus camaldulensis), black box (E. largiflorens) and lignum (Duma florulenta) to sustain communities and processes typical of such communities at the Lindsay-Mulcra-Wallpolla Icon Site by 2030.	Vegetation	VM6	V1, V2, V3, V4	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(b)(ii), 8.06,5, 8.06,6(a), 8.06,6(b), 8.06,7
					VM7	V1, V2, V3, V4	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(b)(ii), 8.06,5, 8.06,6(a), 8.06,6(b), 8.06,7
					VM8	V5, V6	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,5, 8.06,7

Asset name	CMA	Management goal	EWMP Objectives	LTWP Theme	LTWP Objective no.	EEO BWS	First Nation's Objectives (BWS)	EWP objectives
			Improve or maintain the populations of threatened flora and fauna that are flow dependent at the Lindsay-Mulcra-Wallpolla Icon Site by 2030.	refer to other objectives				
			Improve the species richness and abundance of native wetland and floodplain aquatic vegetation functional groups by 2030.	Vegetation	VM3	V7, V9	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(a), 8.06,5, 8.06,7
			LMW1: By 2030, maintain diversity of freshwater ecosystem types at the Lindsay-Mulcra-Wallpolla Icon Site, including palustrine, riverine and floodplain ecosystems with temporary and permanent water regimes.	Connectivity	VM1	FC1, FC3, FC5, FC6, FC7	2.1, 2.2, 2.3, 2.5, 2.10	8.06,3(a), 8.06,3(b)(i), 8.06,3(b)(ii), 8.06,3(f), 8.06,6(b), 8.07,6
			Objectives					
Loddon River (lower)	NCCMA	Promote a widespread and diverse aquatic fauna community particularly native fish and Platypus, by providing high quality breeding and feeding habitat and where possible facilitating movement throughout the Mid-Murray Floodplain System. Rehabilitate riparian River Red Gum vegetation	Enhance natural recruitment and dispersal of stocked Murray Cod populations in disconnected impoundments e.g. Laanecoorie Reservoir, Serpentine Weir pool, Loddon Weir pool, and large pools between Laanecoorie Reservoir and Serpentine Creek (Durham Ox weir pool).	Native Fish	VM15	F1, F2, F5, F7, F8	2.2, 2.5, 2.6, 2.7	8.06,6(a), 8.06,6(b), 8.07,3
			Enhance natural recruitment of Murray Cod population and allow fish to disperse and colonise suitable habitats in the Mid-Murray floodplain system.	Native Fish	VM15	F1, F2, F5, F7, F8	2.2, 2.5, 2.6, 2.7	8.06,6(a), 8.06,6(b), 8.07,3
			Extend available critical habitat to facilitate recolonisation of large bodied fish such as Silver Perch and Golden Perch populations in the Mid-Murray floodplain system	Native Fish	VM18	F1 - F9, F17	2.2, 2.5, 2.6, 2.7	8.06,6(b)
			Flush accumulated silt and sediment from substrates including rocks, submerged wood and macrophytes	Functions	-	-	2.6	8.06,2, 8.06,7

Asset name	CMA	Management goal	EWMP Objectives	LTWP Theme	LTWP Objective no.	EEO BWS	First Nation's Objectives (BWS)	EWP objectives
		communities along the river and where possible connect floodplain habitats through the provision of an appropriate flow regime	Increase diversity and appropriate spatial extent of native emergent fringing non woody vegetation along the banks and in floodrunners or anabranches.	Vegetation	xx	V7, V8, V9	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,2, 8.06,3(a), 8.06,5, 8.06,6(a), 8.06,7
			Increase population size (with appropriate age structure) and distribution of River Blackfish and facilitate re-colonisation of Reach 1 via Laanecoorie Reservoir.	Native Fish	VM15	F1, F2, F5, F7, F8	2.2, 2.5, 2.6, 2.7	8.06,6(a), 8.06,6(b), 8.07,3
			Increase population size (with appropriate age structure) of small-bodied native fish species including Murray-Darling Rainbowfish, Flathead Gudgeon, Carp Gudgeon, and Australian Smelt.	Native Fish	VM16	F1, F2, F5, F6, F17	2.2, 2.5, 2.6, 2.7	8.06,5, 8.06,6(a)
			Increase population size and diversity (with appropriate age structure) of small-bodied native fish species including Murray-Darling Rainbowfish, Flathead Gudgeon, Carp Gudgeon, and Australian Smelt.	Native Fish	VM16	F1, F2, F5, F6, F17	2.2, 2.5, 2.6, 2.7	8.06,5, 8.06,6(a)
			Increase size of resident breeding Platypus populations and facilitate dispersal of surplus juveniles that can colonise other reaches of the Loddon River and connected catchments.	Other Fauna	-	-	2.9, 2.10	8.05,3(a),8.05,3(b), 8.06,6(b),8.07,6
			Maintain adult riparian woody vegetation (e.g. River Red Gum, Black Box, Bottlebrush, Tea Tree, Melaleuca and Tangled Lignum – species composition will vary between reaches) and facilitate recruitment adjacent to the river channel and in low lying floodplain areas that are watered via floodrunners	Vegetation	VM6	V1, V2, V3, V4	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(b)(ii), 8.06,5, 8.06,6(a), 8.06,6(b), 8.06,7
					VM7	V1, V2, V3, V4	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(b)(ii), 8.06,5, 8.06,6(a), 8.06,6(b), 8.06,7

Asset name	CMA	Management goal	EWMP Objectives	LTWP Theme	LTWP Objective no.	EEO BWS	First Nation's Objectives (BWS)	EWP objectives
					VM8	V5, V6	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,5, 8.06,7
			Maintain and increase spatial extent of instream vegetation	Vegetation	VM4	V8	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(a), 8.06,5, 8.06,7
			Maintain biofilm productivity, especially on coarse woody debris.	Functions	-	-	2.6	8.06,2, 8.06,7
			Maintain habitat for stocked populations of Golden Perch in disconnected reaches e.g. Laanecoorie Reservoir, Serpentine Weir pool, Loddon Weir pool, and large pools between Laanecoorie Reservoir and Serpentine Creek	Native Fish	VM17	F1, F2, F3, F4, F5, F6, F17	2.2, 2.5, 2.6, 2.7	8.05,3(a), 8.06,3(b)(i), 8.06,3(b)(ii), 8.06,6(a), 8.06,6(b)
			Maintain low lying floodplain vegetation communities. These communities are characterised by a River Red Gum overstory and grassy, sedge or lignum understorey.	Vegetation	VM6	V1, V2, V3, V4	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(b)(ii), 8.06,5, 8.06,6(a), 8.06,6(b), 8.06,7
					VM8	V5, V6	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,5, 8.06,7
			Maintain water quality at a level that is able to support fish and macroinvertebrates. In particular maintain adequate concentrations of dissolved oxygen, prevent salinity levels rising above 3,000 EC and prevent excessive water temperatures during low flow periods.	Functions	VM26	N/A	2.1, 2.2, 2.6, 2.8, 2.10	8.06,2, 8.07,5
			Maintain/Increase aquatic biota such as Freshwater turtles, native frogs and water rats	Other Fauna	VM22	N/A	2.3, 2.5, 2.6, 2.9	8.06,6(b), 8.07,3
			Maintain/increase diversity and productivity of macroinvertebrates and macroinvertebrate	Other Fauna	VM25	N/A	2.6, 2.7, 2.8	8.06,6(b), 8.07,3

Asset name	CMA	Management goal	EWMP Objectives	LTWP Theme	LTWP Objective no.	EEO BWS	First Nation's Objectives (BWS)	EWP objectives
			functional feeding groups to drive productive and dynamic foodwebs.					
			Re-establish deep pools in areas that have been affected by sand slugs, maintain existing pools in other areas and replenish benches within the channel.	Connectivity	VM1, VM2	FC1, FC3, FC5, FC6, FC7, F1-F9, F17	2.1, 2.2, 2.3, 2.5, 2.7, 2.10	8.06,3(a), 8.06,3(b)(i), 8.06,3(b)(ii), 8.06,3(f), 8.06,5, 8.06,6(a), 8.06,6(b), 8.07,6
			To increase the population size, with an appropriate age structure, and the diversity of native fish species, in the connected mid and lower Loddon River System	Native Fish	VM16	F1, F2, F5, F6, F17	2.2, 2.5, 2.6, 2.7	8.06,5, 8.06,6(a)
			To increase the population size, with an appropriate age structure, of native fish species in the impounded Loddon River System reaches	Native Fish	VM15	F1, F2, F5, F7, F8	2.2, 2.5, 2.6, 2.7	8.06,6(a), 8.06,6(b), 8.07,3
Margooya Lagoon	MCMA	To provide a water regime that improves River Red Gum health and maintains and enhances key habitats for native fish, frogs, waterbirds and threatened birds.	By 2030, improve condition and maintain extent from baseline levels of River Red Gum (<i>Eucalyptus camaldulensis</i>) to sustain communities (chenopod understorey) and processes reliant on such communities at the Margooya Lagoon asset.	Vegetation	VM6	V1, V2, V3, V4	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(b)(ii), 8.06,5, 8.06,6(a), 8.06,6(b), 8.06,7
			By 2030, protect and restore recruitment of Silver Perch (<i>Bidyanus bidyanus</i>) and Golden Perch (<i>Macquaria ambigua</i>) at the Margooya Lagoon asset by ensuring that nursery habitat is maintained.	Native Fish	VM16	F1, F2, F5, F6, F17	2.2, 2.5, 2.6, 2.7	8.06,5, 8.06,6(a)
			By 2030, protect and restore recruitment of small-bodied native fish at the Margooya Lagoon asset, including Unspecked Hardyhead (<i>Craterocephalus stercusmuscarum</i>), Flat-headed Gudgeon (<i>Philypnodon grandiceps</i>), Carp Gudgeon (<i>Hypseleotris klunzingeri</i>), Australian Smelt (<i>Retropinna semoni</i>), by ensuring that habitat	Native Fish	VM16	F1, F2, F5, F6, F17	2.2, 2.5, 2.6, 2.7	8.06,5, 8.06,6(a)

Asset name	CMA	Management goal	EWMP Objectives	LTWP Theme	LTWP Objective no.	EEO BWS	First Nation's Objectives (BWS)	EWP objectives
			diversity, condition and connectivity are maintained, and by the exclusion of large-bodied carp					
			By 2030, support water-dependent ecosystem functions that support the creation of vital habitat (breeding) for frogs at the Margooya Lagoon asset.	Other Fauna	VM20	N/A	2.3, 2.5, 2.6, 2.9	8.06,6(b), 8.07,3
McDonalds Swamp	NCCMA	Maintain McDonalds Swamp as a temporary freshwater marsh with a diversity of aquatic vegetation and habitat types to support feeding and breeding requirements for a range of native waterbirds (including colonial nesting and migratory species), frogs and turtles.	Maintain a diverse frog community by providing access to suitable habitat and food sources.	Other Fauna	VM20	N/A	2.3, 2.5, 2.6, 2.9	8.06,6(b), 8.07,3
			Maintain foraging and feeding areas for a diversity of waterbirds.	Waterbirds	VM13	B1, B2, B3, B4	2.2, 2.9	8.06,6(b)
			Maintain marsh habitat and associated sedges, rushes and reeds, keeping the extent of Typha and Phragmites to no more than 40% of the wetland extent.	Vegetation	VM10	N/A	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.07,5
			Maintain open water and mudflat habitat, and associated herbaceous aquatic and amphibious species in sections of the wetland.	Other Fauna	VM20	N/A	2.3, 2.5, 2.6, 2.9	8.06,6(b), 8.07,3
			Rehabilitate the extent of River Red Gum canopy and associated understorey (appropriate for Intermittent Swampy Woodland) · Maintain canopy health of existing trees · Provide opportunities for recruitment of River Red Gum and understorey species	Vegetation	VM6	V1, V2, V3, V4	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(b)(ii), 8.06,5, 8.06,6(a), 8.06,6(b), 8.06,7
			Support opportunistic breeding events for waterbirds.	Waterbirds	VM11	B1, B2, B3, B4	2.2, 2.9	8.06,6(a), 8.06,6(b)
Merbein Common (Cowanna Billabong,	MCMA	To provide a water regime for Cowanna Billabong and	MC1a: By 2030, protect and restore biodiversity by maintaining representative populations of large-bodied native fish at Cowanna Billabong and Catfish Billabong, Merbein Common, including Golden	Native Fish	VM15	F1, F2, F5, F7, F8	2.2, 2.5, 2.6, 2.7	8.06,6(a), 8.06,6(b), 8.07,3

Asset name	CMA	Management goal	EWMP Objectives	LTWP Theme	LTWP Objective no.	EEO BWS	First Nation's Objectives (BWS)	EWP objectives
Brickworks Billabong, Catfish Billabong)		Catfish Billabong that will support a diverse fish and bird community through high levels of aquatic productivity. To provide a water regime for Brickworks Billabong that will support a significant population of Murray Hardyhead.	Perch (<i>Macquaria ambigua</i>) and Bony Herring (<i>Nematalosa erebi</i>).					
			MC1b: By 2030, protect and restore biodiversity by maintaining representative populations of small-bodied native fish, Unspecked Hardyhead (<i>Craterocephalus stercusmuscarum fulvus</i>), Western Carp Gudgeon (<i>Hypseleotris klunzingeri</i>), Murray-Darling Rainbowfish (<i>Melanotaenia fluviatilis</i>), Flathead Gudgeon (<i>Philypnodon grandiceps</i>) and Australian Smelt (<i>Retropinna semoni</i>) at Cowanna Billabong and Catfish Billabong, Merbein Common.	Native Fish	VM16	F1, F2, F5, F6, F17	2.2, 2.5, 2.6, 2.7	8.06,5, 8.06,6(a)
			MC2: By 2030, maintain representative populations of the shallow-water feeding guild of waterbirds (F2, after Jaensch 2002) at Cowanna Billabong, Catfish Billabong and Brickworks Billabong, Merbein Common, by maintaining shallow-water habitats.	Waterbirds	VM14	B1, B2, B3, B4	2.2, 2.9	8.06,6(a), 8.06,6(b)
			MC4: By 2030, improve vital habitat at Cowanna Billabong and Catfish Billabong, Merbein Common by increasing the diversity of aquatic macrophytes present across a range of Water Regime Indicators Groups.	Vegetation	VM3	V7, V9	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(a), 8.06,5, 8.06,7
			MC7: By 2030, maintain and improve the population of Murray hardyhead (<i>Craterocephalus fluviatilis</i>) at Brickworks Billabong, Merbein Common	Native Fish	VM17	F1, F2, F3, F4, F5, F6, F17	2.2, 2.5, 2.6, 2.7	8.05,3(a), 8.06,3(b)(i), 8.06,3(b)(ii), 8.06,6(a), 8.06,6(b)
			MC8: By 2030, maintain populations and extent of saline aquatic vegetation at Brickworks Billabong, Merbein Common, including benthic herblands with <i>Ruppia</i> beds containing both <i>R. polycarpa</i> and <i>R. megacarpa</i> .	Vegetation	VM3	V7, V9	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(a), 8.06,5, 8.06,7

Asset name	CMA	Management goal	EWMP Objectives	LTWP Theme	LTWP Objective no.	EEO BWS	First Nation's Objectives (BWS)	EWP objectives
Murray floodplain between Lake Hume and Lake Mulwala (including Ryans Lagoon)	NECMA	Improve and maintain the ecological health of the range of wetland types in the floodplain, which have water regimes that vary from permanently inundated through to occasionally inundated, to realise the full range of ecological values expected to occur in the floodplain.	Rehabilitate cut-off meanders inundated at flows <25,000 ML/d by introducing a more variable water level regime with inundation in winter/spring and a period of draw down, preferably in summer / autumn yet retains a permanent aquatic habitat zone	Connectivity	VM1, VM2	FC1	2.1, 2.2, 2.3, 2.4, 2.5, 2.10	8.06,3(a), 8.06,3(b)(i), 8.06,3(b)(ii), 8.06,3(f), 8.06,6(a), 8.07,3, 8.07,4, 8.07,6
			Rehabilitate cut-off meanders inundated at flows >25,000 ML/d by implementing a seasonally variable regime that inundates cut-off meanders during winter and spring and allows summer and autumn draw down and drying of wetland margins yet retains a permanent aquatic habitat zone	Connectivity	VM1	FC5	2.1, 2.2, 2.3, 2.4, 2.5, 2.10	8.06,3(a), 8.06,3(b)(i), 8.06,3(b)(ii), 8.06,3(f), 8.06,6(a), 8.07,3, 8.07,4, 8.07,6
			Rehabilitate flood runners engaged at flows >25,000 ML/d by implementing a seasonally variable flow regime that engages flood runners during winter and spring	Connectivity	VM1	FC5	2.1, 2.2, 2.3, 2.4, 2.5, 2.10	8.06,3(a), 8.06,3(b)(i), 8.06,3(b)(ii), 8.06,3(f), 8.06,6(a), 8.07,3, 8.07,4, 8.07,6
			Rehabilitate flood runners inundated at flows <25,000 ML/d by introducing a more variable flow regime that provides a period of low flow, preferably in summer / autumn	Connectivity	VM1, VM2	FC1	2.1, 2.2, 2.3, 2.4, 2.5, 2.10	xx8.06,3(a), 8.06,3(b)(i), 8.06,3(b)(ii), 8.06,3(f), 8.06,6(a), 8.07,3, 8.07,4, 8.07,6
			Rehabilitate floodplain depressions inundated at flows <25,000 ML/d by introducing a more variable water level regime with inundation in winter/spring and a period of draw down, preferably in summer / autumn yet retains a permanent aquatic habitat zone.	Connectivity	VM1, VM2	FC1	2.1, 2.2, 2.3, 2.4, 2.5, 2.10	8.06,3(a), 8.06,3(b)(i), 8.06,3(b)(ii), 8.06,3(f), 8.06,6(a), 8.07,3, 8.07,4, 8.07,6
			Rehabilitate floodplain depressions inundated at flows >25,000 ML/d by implementing a seasonally	Connectivity	VM1	FC5	2.1, 2.2, 2.3, 2.4, 2.5, 2.10	8.06,3(a), 8.06,3(b)(i),

Asset name	CMA	Management goal	EWMP Objectives	LTWP Theme	LTWP Objective no.	EEO BWS	First Nation's Objectives (BWS)	EWMP objectives
Murrumbidgee Junction (Bidgee Lagoons, Wakool Creek)	MCMA	To provide a water regime for the Bidgee Lagoons (Narrung Wetlands) and Wakool Creek with a more natural frequency and duration that will maintain and promote the health of the mature river red gum and encourage regeneration and ecosystem productivity within the Murrumbidgee Junction target area.	variable regime that inundates floodplain lakes during winter and spring and allows summer and autumn draw down and drying					8.06,3(b)(ii), 8.06,3(f), 8.06,6(a), 8.07,3, 8.07,4, 8.07,6
			Rehabilitate shedding floodplains by introducing a seasonally variable inundation regime with a range of inundation recurrence intervals from annual through once every 3-5 years	Connectivity	VM1	FC1, FC5	2.1, 2.2, 2.3, 2.4, 2.5, 2.10	8.06,3(a), 8.06,3(b)(i), 8.06,3(b)(ii), 8.06,3(f), 8.06,6(a), 8.07,3, 8.07,4, 8.07,6
			MJ1b: By 2030, improve condition and maintain extent from baseline levels of river red gum (<i>Eucalyptus camaldulensis</i>) to sustain communities and processes reliant on mature river red gum at Bidgee Lagoons (Narrung Wetlands), Murrumbidgee Junction	Vegetation	VM6	V1, V2, V3, V4	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(b)(ii), 8.06,5, 8.06,6(a), 8.06,6(b), 8.06,7
			MJ3: By 2030, improve condition and maintain extent from baseline levels of Lignum (<i>Duma florulenta</i>) to sustain communities and processes reliant on Lignum communities at Wakool Creek, Murrumbidgee Junction.	Vegetation	VM8	V5, V6	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,5, 8.06,7
			MJ4: By 2030, protect and restore biodiversity by maintaining representative populations of small-bodied native fish at Bidgee Lagoons (Narrung Wetlands) Murrumbidgee Junction, including carp gudgeon (<i>Hypseleotris</i> spp.), flathead gudgeon (<i>Philypnodon grandiceps</i>) and Australian smelt (<i>Retropinna semoni</i>).	Native Fish	VM16	F1, F2, F5, F6, F17	2.2, 2.5, 2.6, 2.7	8.06,5, 8.06,6(a)
					VM17	F1, F2, F3, F4, F5, F6, F17	2.2, 2.5, 2.6, 2.7	8.05,3(a), 8.06,3(b)(i), 8.06,3(b)(ii), 8.06,6(a), 8.06,6(b)
					VM19	F1 - F9, F17	2.2, 2.5, 2.6, 2.7	8.06,6(a)

Asset name	CMA	Management goal	EWMP Objectives	LTWP Theme	LTWP Objective no.	EEO BWS	First Nation's Objectives (BWS)	EWP objectives
			MJ5: By 2030, improve vital habitat at Bidgee Lagoons (Narrung Wetlands), Murrumbidgee Junction by increasing the diversity of aquatic macrophytes present across a range of Water Regime Indicators Groups.	Vegetation	VM3	V7, V9	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(a), 8.06,5, 8.06,7
					VM4	V8	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(a), 8.06,5, 8.06,7
			NC1: By 2030, improve vital habitat at Ned's East and Woolshed Creek, Ned's Corner by increasing the diversity of aquatic macrophytes present across a range of Water Regime Indicators Groups.	Vegetation	VM3	V7, V9	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(a), 8.06,5, 8.06,7
Ned's Corner	MCMA	To provide a mosaic of intermittent wetlands that provide waterbird breeding and feeding habitat set within a productive floodplain system.	NC2: By 2030, improve condition and maintain extent from baseline levels of River Red Gum (Eucalyptus camaldulensis) to sustain communities and processes typical of such communities at Neds East and Woolshed Creek, Ned's Corner	Vegetation	VM6	V1, V2, V3, V4	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(b)(ii), 8.06,5, 8.06,6(a), 8.06,6(b), 8.06,7
			NC3: By 2030, improve condition and maintain extent from baseline levels of Lignum (Duma florulenta) to sustain communities and processes reliant on Lignum communities at Neds Central, Ned's Corner.	Vegetation	VM8	V5, V6	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,5, 8.06,7
Nyah and Vinifera	MCMA	To restore the key species, habitat components and functions of the Nyah and Vinifera Park ecosystem by providing the hydrological environments required by indigenous plant	NV1: By 2030, improve vital habitat at the Nyah Park and Vinifera Park asset by increasing the diversity of aquatic macrophytes present across a range of Water Regime Indicators Groups.	Vegetation	VM3	V7, V9	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(a), 8.06,5, 8.06,7
			NV2a: By 2030, protect and restore biodiversity by maintaining representative populations of small-bodied fish at the Nyah Park and Vinifera Park asset, including expected species Unspecked hardyhead - (Craterocephalus stercusmuscarum fulvus); Carp Gudgeon (Hypseleotris klunzingeri); Murray-Darling Rainbowfish (Melanotaenia	Native Fish	VM17	F1, F2, F3, F4, F5, F6, F17	2.2, 2.5, 2.6, 2.7	8.05,3(a), 8.06,3(b)(i), 8.06,3(b)(ii), 8.06,6(a), 8.06,6(b)

Asset name	CMA	Management goal	EWMP Objectives	LTWP Theme	LTWP Objective no.	EEO BWS	First Nation's Objectives (BWS)	EWP objectives
		and animal species and communities.	fluvialis); Flathead Gudgeon (<i>Phylipnodon grandiceps</i>); Australian Smelt (<i>Retropinna semoni</i>).					
			NV2b: By 2030, protect and restore biodiversity by maintaining representative populations of frogs at the Nyah Park and Vinifera Park asset.	Other Fauna	VM21	-	2.3, 2.5, 2.6, 2.9	8.06,6(b), 8.07,3
			NV4: By 2030, maintain nesting and recruitment of colonial waterbirds (N7, after Jaensch 2002) at the Nyah Park and Vinifera Park asset, by maintaining a mixture of tree, low vegetation/shrubs, and ground/islet nesting habitat.	Waterbirds	VM12	B1, B2, B3, B4	2.2, 2.9	8.06,6(b), 8.07,2, 8.07,3
Piambie (Bridge Creek, Fishers Lagoon, Piambie Bend East, Piambie Bend West)	MCMA	To provide a flow regime that more closely reflects natural events, thus improving the capacity of the target area to provide a productive ecosystem for native flora and fauna	P1: By 2030, improve condition and maintain extent from baseline levels of lignum (<i>Duma florulenta</i>) and black box (<i>E. largiflorens</i>) and to sustain communities and processes reliant on such communities at Bridge Creek and Bridge Creek Floodplain, Piambie.	Vegetation	VM7	V1, V2, V3, V4	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(b)(ii), 8.06,5, 8.06,6(a), 8.06,6(b), 8.06,7
					VM8	V5, V6	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,5, 8.06,7
			P2a: By 2030, improve vital habitat at Fishers Lagoon Complex and Piambie Bends East and West, Piambe by increasing the diversity of aquatic macrophytes present across a range of Water Regime Indicators Groups.	Vegetation	VM3	V7, V9	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(a), 8.06,5, 8.06,7
			P2b: By 2030, improve condition and maintain extent from baseline levels of river red gum (<i>Eucalyptus camaldulensis</i>) to sustain communities and processes reliant on mature river red gum at Fishers Lagoon Complex and Piambie Bends East and West, Piambie.	Vegetation	VM6	V1, V2, V3, V4	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(b)(ii), 8.06,5, 8.06,6(a), 8.06,6(b), 8.06,7
Pound Bend (Brown Swamp,	MCMA	To provide a water regime that reflects natural	PB1: By 2030, improve vital habitat at Western Wetlands and Tammit Wetlands, Pound Bend by increasing the diversity of aquatic macrophytes	Vegetation	VM3	V7, V9	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(a), 8.06,5, 8.06,7

Asset name	CMA	Management goal	EWMP Objectives	LTWP Theme	LTWP Objective no.	EEO BWS	First Nation's Objectives (BWS)	EWP objectives
Western Wetlands, Tammit Wetland)		inundation seasonality and duration that will maintain and promote the mosaic of available habitats through the Pound Bend target area	present across a range of Water Regime Indicators Groups.					
			PB2: By 2030, improve condition and maintain extent from baseline levels of Lignum (Duma florulenta) to sustain communities and processes reliant on Lignum communities at Eastern Wetlands, Pound Bend	Vegetation	VM8	V5, V6	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,5, 8.06,7
			PB3: By 2030, improve condition and maintain extent from baseline levels of River Red Gum (Eucalyptus camaldulensis) to sustain communities and processes reliant on River Red Gum woodlands at the Pound Bend asset	Vegetation	VM6	V1, V2, V3, V4	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(b)(ii), 8.06,5, 8.06,6(a), 8.06,6(b), 8.06,7
Psyche Bend Lagoon and Woorlong wetland	MCMA	Maintain Woorlong Wetland as a permanent open freshwater wetland supporting habitat for small fish, frogs and waterbirds. Maintain Psyche Bend Lagoon as a permanent saline wetland supporting healthy populations of salt tolerant aquatic vegetation, and supporting habitat	Objectives	Native Fish	VM17	F1, F2, F3, F4, F5, F6, F17	2.2, 2.5, 2.6, 2.7	8.05,3(a), 8.06,3(b)(i), 8.06,3(b)(ii), 8.06,6(a), 8.06,6(b)
			PW2: By 2030, maintain populations and extent of saline aquatic vegetation at Psyche Bend Lagoon, Psyche/Woorlong including benthic herblands with Ruppia beds containing both R. polycarpa and R. megacarpa.	Vegetation	VM5	V7, V8, V9	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,2, 8.06,3(a), 8.06,5, 8.06,6(a), 8.06,7
			PW3: By 2030, maintain representative populations of the shallow-water feeding guild of waterbirds (F2, after Jaensch 2002) at Pysche and Woorlong by maintaining shallow-water habitats.	Waterbirds	VM14	B1, B2, B3, B4	2.2, 2.9	8.06,6(a), 8.06,6(b)
			PW4: By 2030, improve condition and maintain extent from baseline levels of Lignum (Duma florulenta) to sustain communities and processes reliant on Lignum communities at Woorlong Wetland, Psyche/Woorlong.	Vegetation	VM8	V5, V6	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,5, 8.06,7

Asset name	CMA	Management goal	EWMP Objectives	LTWP Theme	LTWP Objective no.	EEO BWS	First Nation's Objectives (BWS)	EWP objectives
		for frogs and waterbirds.	PW5a: By 2030, protect and restore biodiversity by maintaining representative populations of small bodied native fish at Woorlong, Psyche/Woorlong including Unspecked Hardyhead (<i>Craterocephalus stercusmuscarum fulvus</i>), Western Carp Gudgeon (<i>Hypseleotris klunzingeri</i>) and Flat-headed Gudgeon (<i>Philypnodon grandiceps</i>)	Native Fish	VM16	F1, F2, F5, F6, F17	2.2, 2.5, 2.6, 2.7	8.06,5, 8.06,6(a)
			PW5b: By 2030, protect and restore biodiversity by maintaining representative populations of frogs at the Psyche Bend Lagoon and Woorlong Wetland asset.	Other Fauna	VM21	-	2.3, 2.5, 2.6, 2.9	8.06,6(b), 8.07,3
			PW6: By 2030, reduce the extent of invasive emergent macrophytes (<i>Typha Typha domingensis</i> and Common reed <i>Phragmites australis</i>) to prevent the decline of native vegetation at the Woorlong Wetlands, Psyche/Woorlong.	Vegetation	VM10	N/A	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.07,5
			PW7: Maintain high levels of aquatic productivity (Psyche and Woorlong)	-	-	-	2.8, 2.9	8.05,2(c), 8.06,7
Pyramid Creek	NCCMA	Promote a widespread and diverse aquatic fauna community particularly native fish and Platypus, by providing high quality breeding and feeding habitat and where possible facilitating movement	Enhance natural recruitment and dispersal of stocked Murray Cod populations in disconnected impoundments e.g. Laanecoore Reservoir, Serpentine Weir pool, Loddon Weir pool, and large pools between Laanecoore Reservoir and Serpentine Creek (Durham Ox weir pool).	Native Fish	VM15	F1, F2, F5, F7, F8	2.2, 2.5, 2.6, 2.7	8.06,6(a), 8.06,6(b), 8.07,3
			Enhance natural recruitment of Murray Cod population and allow fish to disperse and colonise suitable habitats in the Mid-Murray floodplain system.	Native Fish	VM15	F1, F2, F5, F7, F8	2.2, 2.5, 2.6, 2.7	8.06,6(a), 8.06,6(b), 8.07,3
			Extend available critical habitat to facilitate recolonisation of large bodied fish such as Silver	Native Fish	VM18	F1 - F9, F17	2.2, 2.5, 2.6, 2.7	8.06,6(b)

Asset name	CMA	Management goal	EWMP Objectives	LTWP Theme	LTWP Objective no.	EEO BWS	First Nation's Objectives (BWS)	EWP objectives
		throughout the Mid-Murray Floodplain System. Rehabilitate riparian River Red Gum vegetation communities along the river and where possible connect floodplain habitats through the provision of an appropriate flow regime.	Perch and Golden Perch populations in the Mid-Murray floodplain system					
			Flush accumulated silt and sediment from substrates including rocks, submerged wood and macrophytes	Functions	-	-	2.5, 2.8	8.06,5, 8.06,6(b)
			Increase diversity and appropriate spatial extent of native emergent fringing non woody vegetation along the banks and in floodrunners or anabranches.	Vegetation	VM5, VM4	V8	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(a), 8.06,5, 8.06,7
			Increase population size (with appropriate age structure) and distribution of River Blackfish and facilitate re-colonisation of Reach 1 via Laanecoorie Reservoir.	Native Fish	VM15	F1, F2, F5, F7, F8	2.2, 2.5, 2.6, 2.7	8.06,6(a), 8.06,6(b), 8.07,3
			Increase population size (with appropriate age structure) of small-bodied native fish species including Murray-Darling Rainbowfish, Flathead Gudgeon, Carp Gudgeon, and Australian Smelt.	Native Fish	VM16	F1, F2, F5, F6, F17	2.2, 2.5, 2.6, 2.7	8.06,5, 8.06,6(a)
			Increase population size and diversity (with appropriate age structure) of small-bodied native fish species including Murray-Darling Rainbowfish, Flathead Gudgeon, Carp Gudgeon, and Australian Smelt.	Native Fish	VM16	F1, F2, F5, F6, F17	2.2, 2.5, 2.6, 2.7	8.06,5, 8.06,6(a)
			Increase size of resident breeding Platypus populations and facilitate dispersal of surplus juveniles that can colonise other reaches of the Loddon River and connected catchments.	Other Fauna	-	-	2.1, 2.9, 2.10	8.05,2(c), 8.05,3(a), 8.05,3(b), 8.06,3(a)
			Maintain adult riparian woody vegetation (e.g. River Red Gum, Black Box, Bottlebrush, Tea Tree, Melaleuca and Tangled Lignum – species composition will vary between reaches) and	Vegetation	VM6	V1, V2, V3, V4	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(b)(ii), 8.06,5, 8.06,6(a), 8.06,6(b), 8.06,7

Asset name	CMA	Management goal	EWMP Objectives	LTWP Theme	LTWP Objective no.	EEO BWS	First Nation's Objectives (BWS)	EWP objectives
			facilitate recruitment adjacent to the river channel and in low lying floodplain areas that are watered via floodrunners		VM7	V1, V2, V3, V4	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(b)(ii), 8.06,5, 8.06,6(a), 8.06,6(b), 8.06,7
					VM8	V5, V6	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,5, 8.06,7
			Maintain and increase spatial extent of instream vegetation	Vegetation	VM4	V8	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(a), 8.06,5, 8.06,7
			Maintain biofilm productivity, especially on coarse woody debris.	Functions	-	-	2.5,2.6,2.7,2.8	8.05,2(c), 8.06,7
			Maintain habitat for stocked populations of Golden Perch in disconnected reaches e.g. Laanecoorie Reservoir, Serpentine Weir pool, Loddon Weir pool, and large pools between Laanecoorie Reservoir and Serpentine Creek	Native Fish	VM17	F1, F2, F3, F4, F5, F6, F17	2.2, 2.5, 2.6, 2.7	8.05,3(a), 8.06,3(b)(i), 8.06,3(b)(ii), 8.06,6(a), 8.06,6(b)
			Maintain low lying floodplain vegetation communities. These communities are characterised by a River Red Gum overstory and grassy, sedge or lignum understorey.	Vegetation	VM6	V1, V2, V3, V4	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(b)(ii), 8.06,5, 8.06,6(a), 8.06,6(b), 8.06,7
					VM8	V5, V6	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,5, 8.06,7
			Maintain water quality at a level that is able to support fish and macroinvertebrates. In particular maintain adequate concentrations of dissolved oxygen, prevent salinity levels rising above 3,000 EC and prevent excessive water temperatures during low flow periods.	Functions	VM26	Not specified	2.1, 2.2, 2.6, 2.8, 2.10	8.06,2, 8.07,5

Asset name	CMA	Management goal	EWMP Objectives	LTWP Theme	LTWP Objective no.	EEO BWS	First Nation's Objectives (BWS)	EWP objectives
			Maintain/Increase aquatic biota such as Freshwater turtles, native frogs and water rats	Other Fauna	VM22	N/A	2.3, 2.5, 2.6, 2.9	8.06,6(b), 8.07,3
			Maintain/increase diversity and productivity of macroinvertebrates and macroinvertebrate functional feeding groups to drive productive and dynamic foodwebs.	Other Fauna	VM25	Not specified	2.6, 2.7, 2.8	8.06,6(b), 8.07,3
			Re-establish deep pools in areas that have been affected by sand slugs, maintain existing pools in other areas and replenish benches within the channel.	Functions	-	-	2.2,2.5	8.06,3(a), 8.063(f), 8.06,4,8.06,6(b), 8.07,3
			To increase the population size, with an appropriate age structure, and the diversity of native fish species, in the connected mid and lower Loddon River System	Native Fish	VM16	F1, F2, F5, F6, F17	2.2, 2.5, 2.6, 2.7	8.06,5, 8.06,6(a)
			To increase the population size, with an appropriate age structure, of native fish species in the impounded Loddon River System reaches	Native Fish	VM15	F1, F2, F5, F7, F8	2.2, 2.5, 2.6, 2.7	8.06,6(a), 8.06,6(b), 8.07,3
Richardsons Lagoon	NCCMA	To provide an appropriate water regime that targets the maintenance of varying habitats through Richardson's Lagoon to support a range of fauna species and habitat functions	Maintain deep water channels through the bed of the wetland with aquatic macrophytes and maintain healthy population of native aquatic reeds and rushes around the deep channels.	Vegetation	VM5	V7, V8, V9	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,2, 8.06,3(a), 8.06,5, 8.06,6(a), 8.06,7
			Maintain eucalypt floodplain woodland (Black Box) in the areas higher in the wetland reserve.	Vegetation	VM7	V1, V2, V3, V4	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(b)(ii), 8.06,5, 8.06,6(a), 8.06,6(b), 8.06,7

Asset name	CMA	Management goal	EWMP Objectives	LTWP Theme	LTWP Objective no.	EEO BWS	First Nation's Objectives (BWS)	EWP objectives
		including waterbird resting, nesting and feeding. This will be achieved through the provision of: - Various reed-dominated environments and open water habitats - River Red Gum floodplain habitats and associated communities and Spike-sedge Wetland communities - Black Box floodplain communities.						
Robertson Wetland and Robertson Creek	MCMA	To provide a flow regime that more closely reflects natural events, thus improving the capacity of the target area to provide a productive ecosystem for native flora and fauna.	By 2030, improve condition and maintain extent from baseline levels of river red gum to sustain communities and processes typical of such communities.	Vegetation	VM6	V1, V2, V3, V4	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(b)(ii), 8.06,5, 8.06,6(a), 8.06,6(b), 8.06,7
			By 2030, improve condition and maintain extent from baseline levels of tangled lignum to sustain communities and processes reliant on lignum communities.	Vegetation	VM8	V5, V6	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,5, 8.06,7
			By 2030, improve vital habitat by increasing the diversity of aquatic macrophytes present across a range of Water Regime Indicator Groups.	Vegetation	VM3	V7, V9	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(a), 8.06,5, 8.06,7

Asset name	CMA	Management goal	EWMP Objectives	LTWP Theme	LTWP Objective no.	EEO BWS	First Nation's Objectives (BWS)	EWP objectives
					VM4	V8	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(a), 8.06,5, 8.06,7
Sandilong Creek and Billabong	MCMA	To provide a watering regime that supports water dependent native fauna and supports productive native vegetation communities within the target area	SC2: By 2030, improve condition and maintain extent from baseline levels of Lignum (<i>Duma florulenta</i>) to sustain communities and processes reliant on Lignum communities at Sandilong Billabong, Sandilong Creek.	Vegetation	VM8	V5, V6	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,5, 8.06,7
			SC3: By 2030, improve condition and maintain extent from baseline (2006) levels of Black box (<i>Eucalyptus largiflorens</i>) to sustain communities and processes reliant of such communities at Sandilong Billabong, Sandilong Creek.	Vegetation	VM7	V1, V2, V3, V4	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(b)(ii), 8.06,5, 8.06,6(a), 8.06,6(b), 8.06,7
			SC4: By 2030, improve the population of Freshwater catfish (<i>Tandanus tandanus</i>) at the Sandilong Creek and Billabong asset.	Native Fish	VM15	F1, F2, F5, F7, F8	2.2, 2.5, 2.6, 2.7	8.06,6(a), 8.06,6(b), 8.07,3
Spences Bend (Bullock Swamp North and South, Callanders Swamp, Spences Bend Billabong)	MCMA	To provide a water regime that reflects natural inundation seasonality and duration, that will maintain and promote the mosaic of available habitats through the Spences Bend target area	SB1: By 2030, improve condition and maintain extent from baseline levels of lignum (<i>Duma florulenta</i>) to sustain communities and processes reliant on lignum communities at Stage 1 – Bullock Swamp North, Spence Bend	Vegetation	VM8	V5, V6	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,5, 8.06,7
			SB2: By 2030, improve condition and maintain extent from baseline levels of river red gum (<i>Eucalyptus camaldulensis</i>), and black box (<i>E. largiflorens</i>) and to sustain communities and processes reliant on such communities at Stage 2 – Spences Bend Billabong, Callanders Swamp and wetland #7329 246886, Spences Bend	Vegetation	VM6	V1, V2, V3, V4	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(b)(ii), 8.06,5, 8.06,6(a), 8.06,6(b), 8.06,7
					VM7	V1, V2, V3, V4	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(b)(ii), 8.06,5, 8.06,6(a), 8.06,6(b), 8.06,7

Asset name	CMA	Management goal	EWMP Objectives	LTWP Theme	LTWP Objective no.	EEO BWS	First Nation's Objectives (BWS)	EWP objectives
			SB3: By 2030, improve condition and maintain extent from baseline levels of river red gum (<i>Eucalyptus camaldulensis</i>), and black box (<i>E. largiflorens</i>) and to sustain communities and processes reliant on such communities at the Spences Bend asset.	Vegetation	VM6	V1, V2, V3, V4	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(b)(ii), 8.06,5, 8.06,6(a), 8.06,6(b), 8.06,7
					VM7	V1, V2, V3, V4	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(b)(ii), 8.06,5, 8.06,6(a), 8.06,6(b), 8.06,7
			SB4: Improve semi-permanent saline marsh habitat for Murray Hardyhead reintroduction.	Native Fish	VM18	F1 - F9, F17	2.2, 2.5, 2.6, 2.7	8.06,6(b)
			SB5: By 2030, protect and restore connectivity within and between water-dependent ecosystem at the Spences Bend asset, including by ensuring that: ecological processes dependent on hydrologic connectivity laterally between watercourses and their floodplains (and associated wetlands) are maintained.	Functions	VM1	FC1, FC3, FC5, FC6, FC7	2.1, 2.2, 2.3, 2.5, 2.10	8.06,3(a), 8.06,3(b)(i), 8.06,3(b)(ii), 8.06,3(f), 8.06,6(b), 8.07,6
			SB6: By 2030, improve vital habitat at the Spences Bend asset by increasing the diversity of aquatic macrophytes present across a range of Water Regime Indicators Groups.	Vegetation	VM5	V7, V8, V9	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,2, 8.06,3(a), 8.06,5, 8.06,6(a), 8.06,7
			SB7: Increase dissolved organic matter and macroinvertebrate productivity.	Water Quality	VM26	-	2.1, 2.2, 2.6, 2.8, 2.10	8.06,2, 8.07,5
			SB8: Improve or maintain water quality (particularly salinity) to meet standards for each wetland type and key species.	Water Quality	VM26	N/A	2.1, 2.2, 2.6, 2.8, 2.10	8.06,2, 8.07,5
Tata Creek (Racecourse Wetland, Tata South)	MCMA	To provide a flow regime that more closely reflects natural events, thus improving the	TT1: By 2030, improve condition and maintain extent from baseline levels of River Red Gum (<i>Eucalyptus camaldulensis</i>) to sustain communities and processes typical of such communities at Stage 1 – Tata North, Tata Creek.	Vegetation	VM6	V1, V2, V3, V4	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(b)(ii), 8.06,5, 8.06,6(a), 8.06,6(b), 8.06,7

Asset name	CMA	Management goal	EWMP Objectives	LTWP Theme	LTWP Objective no.	EEO BWS	First Nation's Objectives (BWS)	EWP objectives
		capacity of the target area to provide a productive ecosystem for native flora and fauna.	TT2: By 2030, improve vital habitat at Stage 1 – Tata North, Tata Creek by increasing the diversity of aquatic macrophytes present across a range of Water Regime Indicators Groups.	Vegetation	VM4	V8	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(a), 8.06,5, 8.06,7
			TT3a: By 2030, improve condition and maintain extent from baseline (2006) levels of Black Box (<i>Eucalyptus largiflorens</i>) to sustain communities and processes reliant of such communities at Stage 2 – Tata North and Tata South, Tata Creek	Vegetation	VM7	V1, V2, V3, V4	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(b)(ii), 8.06,5, 8.06,6(a), 8.06,6(b), 8.06,7
			TT3b: By 2030, improve condition and maintain extent from baseline levels of Lignum (<i>Duma florulenta</i>) to sustain communities and processes reliant on Lignum communities at Stage 2 – Tata South, Tata Creek.	Vegetation	VM8	V5, V6	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,5, 8.06,7
Third Reedy Lake (Kerang Lakes)	NCCMA	Achieve projected water savings whilst providing a watering regime that restores Third Reedy Lake to a deep freshwater marsh wetland type (dominated by Intermittent Swampy Woodland (EVC 813)) able to support recruitment of River Red Gums and promoting a diverse and extensive range of	Facilitate the establishment of River Red Gum trees across the bed of the lake	Vegetation	VM6	V1, V2, V3, V4	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(b)(ii), 8.06,5, 8.06,6(a), 8.06,6(b), 8.06,7
			Maintain the health of remnant Black Box and River Red Gum trees surrounding Third Reedy Lake	Vegetation	VM6	V1, V2, V3, V4	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(b)(ii), 8.06,5, 8.06,6(a), 8.06,6(b), 8.06,7
					VM7	V1, V2, V3, V4	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(b)(ii), 8.06,5, 8.06,6(a), 8.06,6(b), 8.06,7
			Restore a diverse ground layer of vegetation in the inundated zones of the wetland, characteristic of a deep freshwater marsh.	Vegetation	VM3	V7, V9	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(a), 8.06,5, 8.06,7

Asset name	CMA	Management goal	EWMP Objectives	LTWP Theme	LTWP Objective no.	EEO BWS	First Nation's Objectives (BWS)	EWP objectives
		habitat suitable for a variety of waterbirds						
Walshes Bend Wetland	MCMA	To provide a water regime which reflects natural water level variability and seasonality, maintains and enhances the mosaic of habitats that will protect and restore the key species, ecological communities and functions of the ecosystem within the EWMP target area.	WB1: By 2030, improve condition and maintain extent from baseline levels of River Red Gum (<i>Eucalyptus camaldulensis</i>), and Black Box (<i>E. largiflorens</i>) and to sustain communities and processes reliant on such communities at the Walshes Bend asset.	Vegetation	VM6	V1, V2, V3, V4	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(b)(ii), 8.06,5, 8.06,6(a), 8.06,6(b), 8.06,7
					VM7	V1, V2, V3, V4	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(b)(ii), 8.06,5, 8.06,6(a), 8.06,6(b), 8.06,7
			WB2: By 2030, improve vital habitat at the Walshes Bend asset by increasing the diversity of aquatic macrophytes present across a range of Water Regime Indicators	Vegetation	VM3	V7, V9	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(a), 8.06,5, 8.06,7
			WB5: By 2030, protect and restore recruitment of small-bodied native fish at the Walshes Bend asset, including Australian Smelt (<i>Retropinna semoni</i>), Unspecked Hardyhead (<i>Craterocephalus stercusmuscarum fulvus</i>), Murray-Darling Rainbowfish (<i>Melanotaenia fluviatilis</i>), Flat-headed Gudgeon (<i>Phlypnodon grandiceps</i>) and Carp Gudgeon (<i>Hypseleotris</i> spp).	Native Fish	VM16	F1, F2, F5, F6, F17	2.2, 2.5, 2.6, 2.7	8.06,5, 8.06,6(a)
Wemen-Liparoo (Liparoo East Billabong, Liparoo West Billabong)	MCMA	To provide a water regime for the Wemen-Liparoo target area that will maintain perennial, drought tolerant	WL1: Support seasonal habitat for small native fish.	Native Fish	VM18	F1 - F9, F17	2.2, 2.5, 2.6, 2.7	8.06,6(b)
			WL2: By 2030, maintain representative populations of shallow-water and deep-water feeding guilds of waterbird (F2 and F3, respectively, after Jaensch 2002) at Liparoo West and Liparoo East Billabongs, Wemen-Liparoo by maintaining a mixture of shallow and deep-water habitats.	Waterbirds	VM14	B1, B2, B3, B4	2.2, 2.9	8.06,6(a), 8.06,6(b)

Asset name	CMA	Management goal	EWMP Objectives	LTWP Theme	LTWP Objective no.	EEO BWS	First Nation's Objectives (BWS)	EWP objectives
		vegetation, provide seasonal habitat for, large waders and waterfowl and maintain an area of Lignum Swampy Woodland as an intermittent waterbird breeding habitat.	WL3: By 2030, improve vital habitat at Liparoo West and Liparoo East Billabongs, Wemen-Liparoo, by increasing the diversity of aquatic macrophytes present across a range of Water Regime Indicators Groups.	Vegetation	VM3	V7, V9	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,3(a), 8.06,5, 8.06,7
			WL4: By 2030, improve condition and maintain extent from baseline levels of Lignum (Duma florulenta) to sustain communities and processes reliant on Lignum communities at Liparoo West Billabong – Lignum Swampy Woodland area, Wemen-Liparoo.	Vegetation	VM8	V5, V6	2.1, 2.2, 2.3, 2.5, 2.8, 2.9, 2.10	8.05,3(b), 8.06,5, 8.06,7

Appendix E Roles and responsibilities

The below table outlines the range of agencies and authorities that are involved in managing and delivering environmental water.

Table 25. Responsible minister and agencies

Minister / Agency	Responsibilities
Minister for Water	Oversees Victoria's environmental water management policy framework. Oversees the VEWH, including appointment and removal of commissioners and creation of rules ensuring VEWH manages the water holdings in line with environmental water management policy. Administers the broader water allocation and entitlements framework and the <i>Water Act 1989</i>.
Department of Energy, Environment, and Climate Action (DEECA)	DEECA is a Victorian Government department that develops and implements statewide policy for waterway management, including environmental water and water resource allocation. It oversees Victoria's compliance with international and national water obligations and intergovernmental agreements, for example the Murray-Darling Basin Plan, Living Murray and Ramsar Convention for wetlands. DEECA's role includes: Manage the water allocation and entitlements framework Develop state policy on water resource management and waterway management approved by the Minister for Water and Minister for Environment and Climate Change Develop state policy for the management of environmental water in regulated and unregulated systems Act on behalf of the Minister for Environment and Climate Change to maintain oversight of the VEWH and waterway managers (in their role as environmental water managers).
Victorian Environmental Water Holder (VEWH)	The VEWH is an independent statutory authority under the <i>Water Act 1989</i> that manages Victoria's environmental water entitlements and liaises with other water holders to coordinate the use of all environmental water entitlements at Victorian sites. VEWH's role includes: Make decisions about the most effective use of the water holdings, including use, trade and carryover Authorise waterway managers to implement watering decisions Liaise with other water holders to ensure co-ordinated use of all sources of environmental water Publicly communicate environmental watering decisions and outcomes Commission targeted projects to demonstrate ecological outcomes of environmental watering at key sites Report on management of the water holdings.
Catchment management authorities (Mallee, North Central, Goulburn Broken and North East CMAs for this water resource plan area)	CMAs are independent statutory authorities that develop and coordinate the implementation of regional catchment strategies, regional waterway strategies and regional floodplain management strategies. They are the waterway manager appointed under Part 10 of the <i>Water Act 1989</i> and the regional floodplain manager. CMAs are required to submit seasonal watering proposals to the VEWH each year and deliver approved watering plans. They also provide critical input to management of other types of environmental water. Their role includes: Identify regional priorities for environmental waterway management in regional waterway strategies, in consultation with the community

Minister / Agency	Responsibilities
	Assess water regime requirements of priority rivers, estuaries and wetlands to identify environmental watering needs to meet agreed objectives Identify opportunities for, and implement, environmental works to use environmental water more efficiently Propose annual environmental watering actions to the VEWH and implement the VEWH environmental watering decisions Provide critical input to management of other types of environmental water (passing flows management, above cap water) Report on environmental water management activities undertaken.
Commonwealth Environmental Water Holder (CEWH)	Make decisions about the use of commonwealth water holdings, including delegating water to the VEWH for use in Victoria. Liaise with the VEWH to ensure co-ordinated use of environmental water in Victoria. Report on management of commonwealth water holdings.
Murray-Darling Basin Authority (MDBA)	Coordinates planning and management for the equitable, efficient and sustainable use of the water and other natural resources of the Murray-Darling Basin. This includes coordination of The Living Murray Program and management of its joint water portfolio.
Water corporations (Goulburn-Murray Water [in relation to its own assets and systems and also as Constructing Authority for MDBA], MDBA, South Australian Water [as Constructing Authority for MDBA], and Lower Murray Water)	Manage irrigation districts, reservoirs and water diversion licences (surface water and groundwater). Some water corporations manage land, including determined recreational areas (<i>Water Act 1989</i>) and riparian land in water supply catchments. Some provide untreated water to rural customers for domestic and stock use (e.g. via pipelines and channels) and operate water supply infrastructure such as dams and irrigation distribution systems to deliver environmental water. They work with the VEWH, waterway managers and Traditional Owners in planning for the delivery of environmental water and ensure the provision of passing flows and compliance with the management of diversion limits in unregulated and groundwater systems.
Formally recognised Traditional Owner groups in the Victorian Murray water resource plan area - First Peoples of the Millewa-Mallee Aboriginal Corporation - Yorta Yorta Nations Aboriginal Corporation	There are currently three different processes for groups to become formally recognised as Traditional Owners of Country in Victoria. This includes holding Registered Aboriginal Party (RAP) status (under the <i>Aboriginal Heritage Act 2006</i>), Native Title Determination (under the Commonwealth <i>Native Title Act 1993</i>) and entering into a Recognition and Settlement Agreement (under the Victorian <i>Traditional Owner Settlement Agreement Act 2010</i>). First Nations people are recognised as: • holding cultural rights and responsibilities • having customary obligations to care for Country • holders of traditional ecological knowledge • holders of knowledge about Aboriginal cultural values • partners in waterway management • holders of contemporary rights to participate or take a leadership and develop enduring cultural governance arrangements for managing Country. They have state recognition of ‘right people for right Country.’
First Nations groups without formal recognition	First Nations people are also recognised as: • holding cultural rights and responsibilities • having customary obligations to care for Country • holders of Traditional ecological knowledge • holders of knowledge on Aboriginal cultural values

Minister / Agency	Responsibilities
	• partners in waterway management.
Local Government	Specifically with regard to waterways, local government have the responsibilities to: Incorporate waterway and catchment management objectives, priorities and actions into strategic and statutory planning processes Undertake elements of floodplain management in accordance with the renewed Victorian Floodplain Management Strategy; Develop and implement urban stormwater plans Manage on-site domestic wastewater systems Manage sections of waterways where formal agreements are in place Manage rural drainage and infrastructure (e.g. town weirs) where appropriate.
Parks Victoria	Parks Victoria is a statutory authority under the <i>Parks Victoria Act 2018</i>. It manages public land including some waterway lands for conservation, recreation, leisure, tourism and water transport. It works with waterway managers, Traditional Owners, water corporations and the VEWH to plan and deliver environmental water entitlements, including endorsing relevant seasonal watering proposals that affect public land.

Appendix F Qualitative risk analysis

This appendix documents a qualitative analysis of long-term risks identified for this LTWP through the water resource plan (DELWP, 2019a). The analysis includes a review of the process that generates the risk, the implications of that process and the options for management of the risk.

Table 26 relates to risks that result in failure to achieve objectives.

Table 27 relates to risks that arise from the provision of environmental water.

Table 26. Risks that result in failure to achieve objectives

Risk category	Threat	Implication	Themes and related objectives at risk	Management options
Failure to provide recommended watering regime	Operational failure in delivery e.g. Water released from dam at incorrect time	Failure to provide appropriate duration, timing, frequency, depth, extent, and velocity of watering	Has potential to impact on all ecological objectives for the water resource plan area	The identified risks can be addressed through the provision of an appropriate flow regime that addresses the objective
	Loss of water during delivery	Failure to provide appropriate duration, timing, frequency, depth, extent, and velocity of watering	Has potential to impact on all ecological objectives for the water resource plan area	The provision of water can be complemented with: Monitoring watering regime and ecological response Liaison with water authorities, land holders, other stakeholders and the broader community
	Constraints that prevent delivery of water e.g. isolation of wetlands from floodplain or river	Failure to provide appropriate duration, timing, frequency, depth, extent, and velocity of watering Reduced lateral connectivity	Has potential to impact on all ecological objectives for the water resource plan area	Prioritisation of watering requirements (in SWP) Determine environmental water requirements based on seasonal conditions and within constraints Develop and implement programs to alleviate physical constraints
	Inadequate conceptual and detailed modelling of water requirements	Failure to provide appropriate duration, timing, frequency, depth, extent, and velocity of watering	Has potential to impact on all ecological objectives for the water resource plan area	Monitoring watering regime and ecological response Update conceptual model with latest research Undertake research to fill knowledge gaps

Risk category	Threat	Implication	Themes and related objectives at risk	Management options
Failure to undertake complementary works necessary to achieve objective	Poor quality or lack of in-channel habitat associated with past practice e.g. de-snagging and channel modifications	Limited habitat and refuge for target species	Native fish, macroinvertebrates, platypus	Provision of in-channel habitat through large woody debris installation. Management of accelerated rates of erosion and sedimentation within and in adjoining reaches of waterway
	Presence of fish barriers	Reduced longitudinal connectivity	Native fish, aquatic vegetation, platypus	Provision of fish passage over / around structures and or removal of obsolete structures
	Inadequate riparian habitat (includes grazing pressures)	Prevent and regeneration of establishment of appropriate vegetation	Macroinvertebrates, native fish, aquatic and riparian vegetation	Fencing and stock management
	Introduced species	Limits establishment of native vegetation Predation of fauna Competition – reduced habitat and resource availability	Vegetation, platypus, native fish	Monitor introduced species Provide watering regimes that provide competitive advantage for native species Development and implementation of pest management plans Installation of carp screens
	Inappropriate fish stocking or excessive recreational fishing	Limits native fish populations through fishing pressure, predation and competition for resources	Native fish	Review fish stocking programs Education programs for recreational fishing
	Poor water quality	Low dissolved oxygen High turbidity High water temperature Increased salinity levels	Fish, Waterbirds, vegetation, amphibians, invertebrates, wetland habitats and types	Monitor groundwater and assets Manage water regime
	Saline groundwater intrusion	Poor vegetation health Limited regeneration and dominance of salt tolerant species	Vegetation, waterbirds, wetland habitats and types	Monitoring, adaptive management of watering regime Investigate regional groundwater influences

Risk category	Threat	Implication	Themes and related objectives at risk	Management options
		Unsuitable habitat for waterbirds and food sources		
External factors	Climate variability	Extreme low flows	May apply to all objectives	Use seasonally adaptive approach in setting EWRs
	Fire	Altered hydrology, sediment	May apply to all objectives	Monitoring and adaptive management of watering regime
	Land use change	Salinisation, altered hydrology	May apply to all objectives	Monitoring and adaptive management of watering regime
	Climate change	Changes in species composition and hence watering requirements at sites Changes in the variability of flow regimes		Monitoring and adaptive management of watering regime Undertake ongoing research into climate change adaption
Failure to demonstrate achievement of ecological objectives	Delayed ecosystem response	Objective may be achieved, but may not be demonstrated	May apply to all objectives	Monitoring and adaptive management of watering regime Ongoing research into ecosystem response to environmental water
	Monitoring not provided			
	Inadequate research to support conceptual models or monitoring design			

Table 27. Risk that arise from the provision of environmental water

Category	Threat	Implication	Comment and management options
Environmental	Winter high fresh inundate platypus burrows	Limits platypus populations	Deliver winter high fresh in August to trigger female to select or construct nursery burrows at high elevation in the river bank
	Summer fresh mobilises build-up of leaf litter and nutrients	Blackwater event or other water quality issues	Time water events to coincide with cooler water temperatures to reduce microorganism activity Management option is to deliver a summer fresh at the same magnitude as the previous winter low flow therefore the summer fresh will entrain only litter that has built up since the winter low flow was ceased Monitor nutrient and Blue Green Algae levels, and the ecological response of the wetland to flooding
	Other native species (non-target) disadvantaged	Decrease in abundance of non-target species	Identify potential non-target species and monitor the effect of intervention Adapt management intervention to reduce the effects on non-target species
	Watering regime favours non-native species	May competitively inhibit native species	Monitor the abundance of native and invasive aquatic species. Pest management plans and complementary works
	Watering regime initiates erosion	Scour of banks, loss of habitat, sediment mobilisation in large events	Manage rise and fall rates of freshes. Provision of complementary works including revegetation
Cultural	Inundation of cultural heritage sites	Damage to cultural heritage sites	Monitor condition of sites, communicate with community
Social	Reduction in recreation opportunity	Use of water for environmental outcome, reduces water available for recreation outcomes	Work closely and engage with local communities Monitor water levels
Economic	Inundation and or erosion of private land and or watering infrastructure (pump equipment)	Community angst and liability	Work closely with land managers, water agencies to provide advanced warning of water delivery Monitor water levels Communicate with landholders and establish watering agreements
	Inundation and or erosion of roads and other transport		Work closely with infrastructure managers to provide advanced warning of water delivery

Category	Threat	Implication	Comment and management options
	and communications infrastructure		Monitor water levels

Appendix G Groundwater dependency and risk from take

Tables 28 and 29 below provide the groundwater dependency of priority river and wetland assets respectively in the Victorian Murray water resource plan area, and the risk posed to the assets by groundwater use, as identified by Groundwater Logic (2019). Reaches classed as medium risk from groundwater use are managed through local management plans.

Note - a number of priority wetlands were unable to be assessed by the Groundwater Logic method due to size.

Table 28. Groundwater-dependent riverine assets in the Victorian Murray water resource plan area.

Priority environmental asset name	Index of Stream Condition Basin-Reach	Surface water SDL resource unit	Groundwater dependent features (confidence)	Risk posed by groundwater use
Gunbower Creek	7-38	SS2 (Victorian Murray)	M	L
	7-39	SS2 (Victorian Murray)	M	L
Broken and Nine Mile Creeks	4-21	SS5 (Broken)	non-GDE	na
	4-22	SS5 (Broken)	M	M
	4-23	SS5 (Broken)	M	M
	4-24	SS5 (Broken)	L	L
	4-28	SS5 (Broken)	L	L
	4-30	SS5 (Broken)	H	L
Loddon River (lower)	7-1	SS8 (Loddon)	L	L
	7-2	SS8 (Loddon)	non-GDE	na
	7-3	SS8 (Loddon)	non-GDE	na

Table 29. Groundwater-dependent wetland assets in the Victorian Murray water resource plan area.

Priority environmental asset name	Index of Wetland Condition ID	Surface water SDL resource unit source	Groundwater dependent features (confidence)	Risk posed by groundwater use
Barmah Forest	60702	SS2 (Victorian Murray)	M	L
	60706	SS2 (Victorian Murray)	M	L
	63903	SS2 (Victorian Murray)	M	L
	63971	SS2 (Victorian Murray)	M	L
Belsar and Yungera Islands	12218	SS2 (Victorian Murray)	H	L
	12220	SS2 (Victorian Murray)	M	L
	12221	SS2 (Victorian Murray)	H	L
Cardross Lakes	11461	SS2 (Victorian Murray)	H	L
Gunbower Forest	45248	SS2 (Victorian Murray)	M	L
	45249	SS2 (Victorian Murray)	M	L
	45239	SS2 (Victorian Murray)	H	L
	45250	SS2 (Victorian Murray)	M	L
	45251	SS2 (Victorian Murray)	M	L
	45252	SS2 (Victorian Murray)	M	L
	45270	SS2 (Victorian Murray)	M	L
Hattah Lakes	11155	SS2 (Victorian Murray)	M	L
	11186	SS2 (Victorian Murray)	M	L
Hird Swamp	45231	SS2 (Victorian Murray)	H	L
Johnson Swamp	45222	SS2 (Victorian Murray)	H	L
Kings Billabong	11355	SS2 (Victorian Murray)	M	L
	11367	SS2 (Victorian Murray)	H	L
	11371	SS2 (Victorian Murray)	M	L
	11373	SS2 (Victorian Murray)	H	L
	11374	SS2 (Victorian Murray)	H	L
	11374	SS2 (Victorian Murray)	H	L
Lindsay, Wallpolla, Mulcra Islands	10001	SS2 (Victorian Murray)	M	L
	10626	SS2 (Victorian Murray)	M	L
	10156	SS2 (Victorian Murray)	H	L
	10159	SS2 (Victorian Murray)	M	L
	10164	SS2 (Victorian Murray)	H	L
	10176	SS2 (Victorian Murray)	M	L
	10179	SS2 (Victorian Murray)	M	L

Priority environmental asset name	Index of Wetland Condition ID	Surface water SDL resource unit source	Groundwater dependent features (confidence)	Risk posed by groundwater use
	10180	SS2 (Victorian Murray)	H	L
	10181	SS2 (Victorian Murray)	M	L
	10183	SS2 (Victorian Murray)	M	L
	10186	SS2 (Victorian Murray)	M	L
	10187	SS2 (Victorian Murray)	H	L
	10188	SS2 (Victorian Murray)	H	L
	10189	SS2 (Victorian Murray)	M	L
	10191	SS2 (Victorian Murray)	H	L
	10195	SS2 (Victorian Murray)	M	L
	10197	SS2 (Victorian Murray)	H	L
	10199	SS2 (Victorian Murray)	M	L
	10207	SS2 (Victorian Murray)	M	L
	10208	SS2 (Victorian Murray)	M	L
	10209	SS2 (Victorian Murray)	M	L
	10212	SS2 (Victorian Murray)	M	L
	10213	SS2 (Victorian Murray)	H	L
	10219	SS2 (Victorian Murray)	H	L
	10220	SS2 (Victorian Murray)	H	L
	10228	SS2 (Victorian Murray)	H	L
	10234	SS2 (Victorian Murray)	H	L
	10235	SS2 (Victorian Murray)	H	L
	10242	SS2 (Victorian Murray)	H	L
	10245	SS2 (Victorian Murray)	H	L
	10555	SS2 (Victorian Murray)	H	L
	10561	SS2 (Victorian Murray)	H	L
	10562	SS2 (Victorian Murray)	M	L
	10563	SS2 (Victorian Murray)	M	L
	10565	SS2 (Victorian Murray)	H	L
	10594	SS2 (Victorian Murray)	M	L
	10613	SS2 (Victorian Murray)	M	L
	10619	SS2 (Victorian Murray)	H	L
	10620	SS2 (Victorian Murray)	H	L
	10622	SS2 (Victorian Murray)	H	L
	10625	SS2 (Victorian Murray)	H	L

Priority environmental asset name	Index of Wetland Condition ID	Surface water SDL resource unit source	Groundwater dependent features (confidence)	Risk posed by groundwater use
Murray floodplain between Lake Hume and Lake Mulwala	75156	SS2 (Victorian Murray)	M	L
	75373	SS4 (Ovens)	M	L
	75195	SS2 (Victorian Murray)	M	L
	75363	SS2 (Victorian Murray)	M	L
	75157	SS4 (Ovens)	M	L
	75174	SS4 (Ovens)	H	M
	75191	SS4 (Ovens)	H	L
	75197	SS4 (Ovens)	H	L
	75159	SS4 (Ovens)	M	L
	75164	SS4 (Ovens)	H	L
	75165	SS4 (Ovens)	H	L
	75173	SS4 (Ovens)	M	L
	75176	SS4 (Ovens)	H	L
	75178	SS4 (Ovens)	H	L
	75180	SS4 (Ovens)	M	L
	75181	SS4 (Ovens)	M	L
	75183	SS4 (Ovens)	M	L
	75184	SS4 (Ovens)	M	L
	75188	SS4 (Ovens)	M	L
	75192	SS4 (Ovens)	M	L
	75192	SS4 (Ovens)	M	L
	75193	SS4 (Ovens)	M	L
	75193	SS4 (Ovens)	M	L
	75196	SS4 (Ovens)	M	L
	75198	SS4 (Ovens)	M	L
	75200	SS4 (Ovens)	M	L
	75205	SS4 (Ovens)	M	L
	75208	SS4 (Ovens)	M	L
Nyah	12502	SS2 (Victorian Murray)	H	L
Vinifera	12508	SS2 (Victorian Murray)	M	L
Psyche Bend Lagoon & Woorlong Wetland	11354	SS2 (Victorian Murray)	M	L
Tata Creek	12789	SS2 (Victorian Murray)	M	L
	12790	SS2 (Victorian Murray)	M	L

Appendix H Waterway representativeness

The tables below show the Australian National Aquatic Ecosystems (ANAE) wetland and riverine type (Brooks, 2021) of each priority environmental asset in the Victorian Murray water resource plan area.

Table 30. ANAE wetland types of priority environmental assets in the Victorian Murray water resource plan area

Asset Name	ANAE Type	Area (ha)
Abbotsford Bend (Cowra Rocks Wetland, Darling Junction Wetland and Darling Junction Creeks)	F1.2: River red gum forest riparian zone or floodplain	1.9
	F1.8: Black box woodland riparian zone or floodplain	5.0
	F2.2: Lignum shrubland riparian zone or floodplain	0.2
	Pp4.2: Permanent wetland	65.1
	Rp1.4: Permanent lowland stream	8.7
Barmah Forest	F1.12: Woodland riparian zone or floodplain	673.3
	F1.2: River red gum forest riparian zone or floodplain	3506.8
	F1.4: River red gum woodland riparian zone or floodplain	57.5
	F1.8: Black box woodland riparian zone or floodplain	168.9
	F3.2: Sedge/forb/grassland riparian zone or floodplain	22.5
	F4: Unspecified riparian zone or floodplain	14.2
	Lt1.1: Temporary lake	76.3
	Pp2.1.2: Permanent tall emergent marsh	1.8
	Pp2.4.2: Permanent forb marsh	5.8
	Pp4.2: Permanent wetland	521.8
	Pt1.1.2: Temporary river red gum swamp	23634.3
	Pt1.2.2: Temporary black box swamp	85.8
	Pt1.6.2: Temporary woodland swamp	351.8
	Pt2.1.2: Temporary tall emergent marsh	675.9
	Pt2.3.2: Freshwater meadow	98.6
	Pt3.1.2: Clay pan	0.1
	Pt4.2: Temporary wetland	124.0
	Rp1.4: Permanent lowland stream	165.4
	Rt1.4: Temporary lowland stream	16.6
Belsar & Yungera Islands (Lakes Carpul & Powell, J1 Creek Complex, Yungera Wetland Complex)	F1.12: Woodland riparian zone or floodplain	8.7
	F1.2: River red gum forest riparian zone or floodplain	107.5
	F1.4: River red gum woodland riparian zone or floodplain	248.1
	F1.8: Black box woodland riparian zone or floodplain	1641.6
	F2.2: Lignum shrubland riparian zone or floodplain	988.4
	F3.2: Sedge/forb/grassland riparian zone or floodplain	95.1
	Lp1.1: Permanent lake	0.6
	Lst1.1: Temporary saline lake	128.1
	Pp2.4.2: Permanent forb marsh	3.9
	Pp4.2: Permanent wetland	14.6
	Pt1.1.2: Temporary river red gum swamp	4.8
	Pt1.2.2: Temporary black box swamp	31.3
	Pt1.6.2: Temporary woodland swamp	17.7
	Pt1.7.2: Temporary lignum swamp	15.1
	Pt2.3.2: Freshwater meadow	75.2
	Rp1.4: Permanent lowland stream	9.4
	Rt1.2: Temporary transitional zone stream	17.9

Asset Name	ANAE Type	Area (ha)
Black Swamp	Rt1.4: Temporary lowland stream	44.3
	Pt1.1.2: Temporary river red gum swamp	27.5
Bottle Bend	F1.4: River red gum woodland riparian zone or floodplain	33.4
	F1.8: Black box woodland riparian zone or floodplain	797.9
	F2.2: Lignum shrubland riparian zone or floodplain	125.8
	F3.2: Sedge/forb/grassland riparian zone or floodplain	11.4
	Pp2.3.2: Permanent grass marsh	21.3
	Pp2.4.2: Permanent forb marsh	3.9
	Pp4.2: Permanent wetland	3.9
	Pt1.1.2: Temporary river red gum swamp	4.7
	Pt1.2.2: Temporary black box swamp	335.1
	Pt1.7.2: Temporary lignum swamp	59.2
	Pt2.3.2: Freshwater meadow	10.5
	Rp1.4: Permanent lowland stream	7.2
Brickworks Billabong	F1.8: Black box woodland riparian zone or floodplain	1.8
	F2.2: Lignum shrubland riparian zone or floodplain	1.3
	Pp4.2: Permanent wetland	0.0
	Pt2.3.2: Freshwater meadow	28.0
Bumbang Island	F1.2: River red gum forest riparian zone or floodplain	49.3
	F1.4: River red gum woodland riparian zone or floodplain	67.2
	F1.8: Black box woodland riparian zone or floodplain	202.5
	F2.2: Lignum shrubland riparian zone or floodplain	119.7
	Pp4.2: Permanent wetland	41.8
	Pt2.3.2: Freshwater meadow	1.1
	Rp1.4: Permanent lowland stream	14.9
Burra Creek	F1.8: Black box woodland riparian zone or floodplain	3.9
	F2.2: Lignum shrubland riparian zone or floodplain	7.4
	F4: Unspecified riparian zone or floodplain	6.7
	Pp4.2: Permanent wetland	2.8
	Pt2.3.2: Freshwater meadow	2.3
	Rt1.4: Temporary lowland stream	0.0
Butlers Creek (Baggs and Ducksfoot Lagoons)	F1.4: River red gum woodland riparian zone or floodplain	4.6
	F1.8: Black box woodland riparian zone or floodplain	0.3
	F2.2: Lignum shrubland riparian zone or floodplain	2.1
	Pp4.2: Permanent wetland	13.5
	Pt1.7.2: Temporary lignum swamp	4.2
	Rt1.4: Temporary lowland stream	1.0
Cardross & Koorlong Wetlands Lakes (Cardross Lakes Basin 1 West, Cardross Lakes Basin 1 East, Koorlong Lake)	Lsp1.1: Permanent saline lake	11.8
	Psp4: Permanent saline wetland	219.6
Carina Bend	F1.12: Woodland riparian zone or floodplain	7.4
	F1.2: River red gum forest riparian zone or floodplain	116.6
	F1.4: River red gum woodland riparian zone or floodplain	308.5
	F1.6: Black box forest riparian zone or floodplain	7.2
	F1.8: Black box woodland riparian zone or floodplain	418.2
	F2.2: Lignum shrubland riparian zone or floodplain	486.5
	F3.2: Sedge/forb/grassland riparian zone or floodplain	29.9

Asset Name	ANAE Type	Area (ha)
	Pp2.4.2: Permanent forb marsh	10.8
	Pt1.1.2: Temporary river red gum swamp	7.3
	Pt1.2.2: Temporary black box swamp	5.8
	Pt1.7.2: Temporary lignum swamp	2.4
	Pt2.3.2: Freshwater meadow	19.2
	Rp1.4: Permanent lowland stream	7.0
	Rt1.4: Temporary lowland stream	25.4
Cowanna Billabong (part of Merbein Common)	F1.8: Black box woodland riparian zone or floodplain	0.9
	Pp4.2: Permanent wetland	15.4
Gunbower Forest	F1.12: Woodland riparian zone or floodplain	141.5
	F1.2: River red gum forest riparian zone or floodplain	5557.5
	F1.4: River red gum woodland riparian zone or floodplain	282.6
	F1.6: Black box forest riparian zone or floodplain	23.4
	F1.8: Black box woodland riparian zone or floodplain	2622.5
	F4: Unspecified riparian zone or floodplain	67.7
	Pp2.1.2: Permanent tall emergent marsh	6.1
	Pp4.2: Permanent wetland	20.2
	Pt1.1.2: Temporary river red gum swamp	8962.0
	Pt1.2.2: Temporary black box swamp	483.3
	Pt1.6.2: Temporary woodland swamp	3.0
	Pt2.1.2: Temporary tall emergent marsh	129.8
	Rp1.4: Permanent lowland stream	150.5
	Rt1.4: Temporary lowland stream	320.3
	Rt1: Temporary stream	13.2
Guttrum and Benwell Forests	Pt1.1.2: Temporary river red gum swamp	1846.0
	Rp1.4: Permanent lowland stream	3.3
Hattah Lakes	F1.12: Woodland riparian zone or floodplain	794.7
	F1.2: River red gum forest riparian zone or floodplain	471.0
	F1.4: River red gum woodland riparian zone or floodplain	6229.3
	F1.8: Black box woodland riparian zone or floodplain	7434.0
	F2.2: Lignum shrubland riparian zone or floodplain	595.1
	F2.4: Shrubland riparian zone or floodplain	54.9
	F3.2: Sedge/forb/grassland riparian zone or floodplain	161.2
	F4: Unspecified riparian zone or floodplain	29.9
	Lp1.1: Permanent lake	451.2
	Lst1.1: Temporary saline lake	54.4
	Lt1.1: Temporary lake	811.2
	Pp2.4.2: Permanent forb marsh	35.9
	Pp4.2: Permanent wetland	44.9
	Pt1.1.2: Temporary river red gum swamp	212.9
	Pt1.2.2: Temporary black box swamp	138.1
	Pt1.6.2: Temporary woodland swamp	58.3
	Pt1.7.2: Temporary lignum swamp	76.3
	Pt1.8.2: Temporary shrub swamp	4.3
	Pt2.3.2: Freshwater meadow	222.5
	Pt3.1.2: Clay pan	4.5
	Rp1.4: Permanent lowland stream	253.5

Asset Name	ANAE Type	Area (ha)
Heywood Lake	Rt1.4: Temporary lowland stream	14.4
	F1.4: River red gum woodland riparian zone or floodplain	0.4
	Lp1.1: Permanent lake	0.1
Hird Swamp (Kerang Lakes)	Pt3.1.2: Clay pan	201.3
	F1.8: Black box woodland riparian zone or floodplain	0.0
	Pt1.2.2: Temporary black box swamp	345.2
Johnson Swamp (Kerang Lakes)	Rp1.4: Permanent lowland stream	0.0
	F1.8: Black box woodland riparian zone or floodplain	0.0
	Pt1.2.2: Temporary black box swamp	411.0
Johnstons and Chaffey	Rp1.4: Permanent lowland stream	0.0
	F1.4: River red gum woodland riparian zone or floodplain	0.1
	F3.2: Sedge/forb/grassland riparian zone or floodplain	0.2
Karadoc Swamp (Outlet Creek, Inlet Creek, Karadoc)	Pp4.2: Permanent wetland	24.7
	F1.8: Black box woodland riparian zone or floodplain	0.2
	F4: Unspecified riparian zone or floodplain	0.0
	Pst4: Temporary saline wetland	1358.1
Kings Billabong (Butlers Creek, Ducksfoot Lagoon, Baggs Lagoon)	Rp1.4: Permanent lowland stream	0.3
	F1.4: River red gum woodland riparian zone or floodplain	280.0
	F1.8: Black box woodland riparian zone or floodplain	398.2
	F2.2: Lignum shrubland riparian zone or floodplain	62.0
	F4: Unspecified riparian zone or floodplain	37.2
	Pp4.2: Permanent wetland	186.2
	Pt1.1.2: Temporary river red gum swamp	2.1
	Pt1.2.2: Temporary black box swamp	56.8
	Pt1.7.2: Temporary lignum swamp	31.5
	Pt3.1.2: Clay pan	4.6
	Rp1.4: Permanent lowland stream	22.9
	Rt1.4: Temporary lowland stream	2.6
Kinnairds Wetland	Pt3.1.2: Clay pan	100.3
Kunat Kunat (Round Lake)	Psp2.1: Permanent salt marsh	41.7
Lake Cullen (Kerang Lakes)	Lst1.1: Temporary saline lake	628.8
	Pt3.1.2: Clay pan	0.0
Lake Elizabeth (Kerang Lakes)	Lsp1.2: Permanent saline lake with aquatic bed	93.7
Lake Hawthorn	Psp4: Permanent saline wetland	228.1
Lake Murphy	Pt1.2.2: Temporary black box swamp	167.9
Lindsay, Wallpolla and Mulcra Islands	F1.12: Woodland riparian zone or floodplain	43.2
	F1.2: River red gum forest riparian zone or floodplain	802.5
	F1.4: River red gum woodland riparian zone or floodplain	2425.0
	F1.8: Black box woodland riparian zone or floodplain	12486.3
	F2.2: Lignum shrubland riparian zone or floodplain	7601.0
	F3.2: Sedge/forb/grassland riparian zone or floodplain	3277.5
	F4: Unspecified riparian zone or floodplain	507.4
	Lp1.1: Permanent lake	9.0
	Lt1.1: Temporary lake	824.6
	Pp2.3.2: Permanent grass marsh	22.8
	Pp2.4.2: Permanent forb marsh	27.4
	Pp4.2: Permanent wetland	252.8

Asset Name	ANAE Type	Area (ha)
	Pt1.1.2: Temporary river red gum swamp	85.8
	Pt1.2.2: Temporary black box swamp	211.7
	Pt1.6.2: Temporary woodland swamp	41.5
	Pt1.7.2: Temporary lignum swamp	2231.7
	Pt2.1.2: Temporary tall emergent marsh	8.4
	Pt2.3.2: Freshwater meadow	1010.5
	Pt3.1.2: Clay pan	13.7
	Pu1: Unspecified wetland	8.3
	Rp1.4: Permanent lowland stream	468.5
	Rp1: Permanent stream	1.8
	Rt1.4: Temporary lowland stream	881.8
	Rt1: Temporary stream	0.6
Margooya Lagoon	Pp4.2: Permanent wetland	34.6
McDonalds Swamp	Pt1.2.2: Temporary black box swamp	141.8
Merbein Common (Cowanna Billabong, Brickworks Billabong, Catfish Billabong)	F1.2: River red gum forest riparian zone or floodplain	32.9
	F1.4: River red gum woodland riparian zone or floodplain	13.5
	F1.8: Black box woodland riparian zone or floodplain	497.1
	F2.2: Lignum shrubland riparian zone or floodplain	135.5
	F3.2: Sedge/forb/grassland riparian zone or floodplain	13.8
	F4: Unspecified riparian zone or floodplain	16.9
	Pp2.4.2: Permanent forb marsh	1.9
	Pp4.2: Permanent wetland	68.6
	Pt1.2.2: Temporary black box swamp	8.2
	Pt1.7.2: Temporary lignum swamp	8.2
	Pt2.3.2: Freshwater meadow	47.4
	Pt3.1.2: Clay pan	4.6
	Rp1.4: Permanent lowland stream	8.5
Murray floodplain between Lake Hume and Lake Mulwala (including Ryans Lagoon)	F1.12: Woodland riparian zone or floodplain	608.1
	F1.2: River red gum forest riparian zone or floodplain	2563.3
	F1.4: River red gum woodland riparian zone or floodplain	370.2
	F4: Unspecified riparian zone or floodplain	624.7
	Lp1.1: Permanent lake	50.2
	Lt1.1: Temporary lake	13.6
	Pp2.1.2: Permanent tall emergent marsh	63.5
	Pp2.2.2: Permanent sedge/grass/forb marsh	29.5
	Pp4.2: Permanent wetland	304.8
	Pt1.1.2: Temporary river red gum swamp	24.0
	Pt1.6.2: Temporary woodland swamp	26.7
	Pt2.1.2: Temporary tall emergent marsh	41.4
	Pt2.2.2: Temporary sedge/grass/forb marsh	31.4
	Pt2.3.2: Freshwater meadow	1.4
	Pt3.1.2: Clay pan	27.6
	Pt4.2: Temporary wetland	0.6
	Rp1.4: Permanent lowland stream	349.4
	Rt1.2: Temporary transitional zone stream	2.8
	Rt1.4: Temporary lowland stream	55.0
	F1.2: River red gum forest riparian zone or floodplain	156.6

Asset Name	ANAE Type	Area (ha)
Murrumbidgee Junction (Bidgee Lagoons, Wakool Creek)	F1.4: River red gum woodland riparian zone or floodplain	15.7
	F1.8: Black box woodland riparian zone or floodplain	573.0
	F2.2: Lignum shrubland riparian zone or floodplain	215.4
	F3.2: Sedge/forb/grassland riparian zone or floodplain	77.1
	Pp2.4.2: Permanent forb marsh	8.6
	Pt1.1.2: Temporary river red gum swamp	1.9
	Pt1.2.2: Temporary black box swamp	4.2
	Pt1.7.2: Temporary lignum swamp	3.5
	Pt2.3.2: Freshwater meadow	16.9
	Rp1.4: Permanent lowland stream	16.3
	Rt1.4: Temporary lowland stream	46.6
Neds Corner	F1.8: Black box woodland riparian zone or floodplain	7.0
	F2.2: Lignum shrubland riparian zone or floodplain	0.3
	Pp4.2: Permanent wetland	4.6
	Pt1.2.2: Temporary black box swamp	37.8
Nyah and Vinifera	F1.2: River red gum forest riparian zone or floodplain	15.1
	Pp2.4.2: Permanent forb marsh	1.2
	Pt1.1.2: Temporary river red gum swamp	2.0
	Pt2.1.2: Temporary tall emergent marsh	72.1
Piambie (Bridge Creek, Fishers Lagoon, Piambie Bend East, Piambie Bend West)	F1.2: River red gum forest riparian zone or floodplain	285.5
	F1.6: Black box forest riparian zone or floodplain	0.1
	F1.8: Black box woodland riparian zone or floodplain	1450.7
	F2.2: Lignum shrubland riparian zone or floodplain	130.7
	F3.2: Sedge/forb/grassland riparian zone or floodplain	46.8
	F4: Unspecified riparian zone or floodplain	27.0
	Pp2.4.2: Permanent forb marsh	9.3
	Pp4.2: Permanent wetland	22.7
	Pt1.1.2: Temporary river red gum swamp	3.5
	Pt1.2.2: Temporary black box swamp	36.8
	Pt1.7.2: Temporary lignum swamp	2.5
	Pt2.3.2: Freshwater meadow	4.6
	Pt3.1.2: Clay pan	17.4
	Rp1.4: Permanent lowland stream	7.5
	Rt1.4: Temporary lowland stream	37.8
Pound Bend (Brown Swamp, Western Wetlands, Tammit Wetland)	F1.12: Woodland riparian zone or floodplain	69.2
	F1.2: River red gum forest riparian zone or floodplain	9.5
	F1.4: River red gum woodland riparian zone or floodplain	261.0
	F1.8: Black box woodland riparian zone or floodplain	566.0
	F2.2: Lignum shrubland riparian zone or floodplain	19.3
	F3.2: Sedge/forb/grassland riparian zone or floodplain	110.4
	Pp4.2: Permanent wetland	4.4
	Pt1.1.2: Temporary river red gum swamp	2.4
	Pt1.2.2: Temporary black box swamp	264.9
	Pt1.6.2: Temporary woodland swamp	6.9
	Pt1.7.2: Temporary lignum swamp	14.9
	Pt2.3.2: Freshwater meadow	18.3
	Pt3.1.2: Clay pan	3.3

Asset Name	ANAE Type	Area (ha)
Psyche Bend Lagoon and Woorlong Wetland	Rp1.4: Permanent lowland stream	6.6
	Rt1.2: Temporary transitional zone stream	4.3
	F1.4: River red gum woodland riparian zone or floodplain	30.9
	F1.8: Black box woodland riparian zone or floodplain	571.3
	F2.2: Lignum shrubland riparian zone or floodplain	93.0
	Pp4.2: Permanent wetland	26.3
	Psp4: Permanent saline wetland	19.7
	Pt1.1.2: Temporary river red gum swamp	3.6
	Pt1.2.2: Temporary black box swamp	232.2
	Pt1.7.2: Temporary lignum swamp	30.3
	Pt2.1.2: Temporary tall emergent marsh	2.7
	Pt3.1.2: Clay pan	68.6
Richardsons Lagoon	Rp1.4: Permanent lowland stream	6.0
	F1.2: River red gum forest riparian zone or floodplain	1.4
	F1.8: Black box woodland riparian zone or floodplain	0.5
	Pp4.2: Permanent wetland	21.8
Robertson Wetland and Robertson Creek	Pt1.2.2: Temporary black box swamp	15.4
	F1.8: Black box woodland riparian zone or floodplain	0.5
	F2.2: Lignum shrubland riparian zone or floodplain	2.2
	F3.2: Sedge/forb/grassland riparian zone or floodplain	20.8
Ryans Lagoon Wetland Complex	Pp2.3.2: Permanent grass marsh	64.2
	F1.12: Woodland riparian zone or floodplain	7.3
	F1.4: River red gum woodland riparian zone or floodplain	1.2
	F4: Unspecified riparian zone or floodplain	3.1
	Pp2.1.2: Permanent tall emergent marsh	21.3
	Pt1.6.2: Temporary woodland swamp	7.9
	Pt3.1.2: Clay pan	0.6
Sandilong Creek and Billabong	Rp1.4: Permanent lowland stream	17.8
	Pt1.2.2: Temporary black box swamp	134.1
Spences Bend (Bullock Swamp North and South, Callanders Swamp, Spences Bend Billabong)	F1.2: River red gum forest riparian zone or floodplain	50.0
	F1.4: River red gum woodland riparian zone or floodplain	79.3
	F1.8: Black box woodland riparian zone or floodplain	365.9
	F2.2: Lignum shrubland riparian zone or floodplain	60.3
	F4: Unspecified riparian zone or floodplain	129.7
	Lp1.1: Permanent lake	3.5
	Lst1.1: Temporary saline lake	81.4
	Pp2.4.2: Permanent forb marsh	50.3
	Pt1.1.2: Temporary river red gum swamp	15.1
	Pt1.2.2: Temporary black box swamp	4.3
	Pt1.7.2: Temporary lignum swamp	642.4
	Pt2.3.2: Freshwater meadow	21.2
Tata Creek (Racecourse Wetland, Tata Wetland, Tata South)	Rp1.4: Permanent lowland stream	13.3
	Lt1.1: Temporary lake	20.9
Third Reedy Lake (Kerang Lakes)	Lp1.1: Permanent lake	430.1
Walshes Bend Wetland	F1.2: River red gum forest riparian zone or floodplain	84.9
	F1.4: River red gum woodland riparian zone or floodplain	112.3

Asset Name	ANAE Type	Area (ha)
	F1.8: Black box woodland riparian zone or floodplain	221.9
	F2.2: Lignum shrubland riparian zone or floodplain	19.2
	F3.2: Sedge/forb/grassland riparian zone or floodplain	5.5
	Pp2.4.2: Permanent forb marsh	2.5
	Pt1.1.2: Temporary river red gum swamp	14.8
	Pt1.2.2: Temporary black box swamp	1.8
	Pt1.7.2: Temporary lignum swamp	0.8
	Rp1.4: Permanent lowland stream	22.1
Wemen-Liparoo (Liparoo East Billabong, Liparoo West Billabong)	F1.2: River red gum forest riparian zone or floodplain	5.9
	F1.4: River red gum woodland riparian zone or floodplain	239.7
	F1.8: Black box woodland riparian zone or floodplain	1043.5
	F2.2: Lignum shrubland riparian zone or floodplain	303.7
	F3.2: Sedge/forb/grassland riparian zone or floodplain	21.5
	Pp2.4.2: Permanent forb marsh	17.7
	Pp4.2: Permanent wetland	32.0
	Pt1.1.2: Temporary river red gum swamp	1.3
	Pt1.2.2: Temporary black box swamp	10.6
	Pt1.7.2: Temporary lignum swamp	57.1
	Pt2.3.2: Freshwater meadow	3.7
	Rp1.4: Permanent lowland stream	38.1
	Rt1.4: Temporary lowland stream	2.3

Table 31. ANAE riverine types of priority environmental assets in the Victorian Murray water resource plan area

Asset Name	ANAE type	Length (km)
Barmah Forest	Rt1.4: Temporary lowland stream	94.23
Broken Creek (lower) and Nine Mile Creek	Rp1.2: Permanent transitional zone stream	26.12
	Rp1.4: Permanent lowland stream	269.60
	Rt1.4: Temporary lowland stream	163.91
Burra Creek floodplain (Burra Creek North, Burra Creek South, Burra Creek South Proper)	Rt1.4: Temporary lowland stream	77.89
Gunbower Creek	Rp1.4: Permanent lowland stream	4.20
	Rt1.2: Temporary transitional zone stream	21.85
	Rt1.4: Temporary lowland stream	657.26
Karadoc Swamp (Outlet Creek, Inlet Creek, Karadoc)	Rt1.4: Temporary lowland stream	19.02
Loddon River (lower)	Rp1.4: Permanent lowland stream	440.78
	Rt1.2: Temporary transitional zone stream	10.03
	Rt1.4: Temporary lowland stream	216.36
Piambie (Bridge Creek, Fishers Lagoon, Piambie Bend East, Piambie Bend West)	Rt1.4: Temporary lowland stream	12.56
Ryans Lagoon Wetland Complex	Rp1.2: Permanent transitional zone stream	1.57
	Rt1.4: Temporary lowland stream	24.88
Tata Creek (Racecourse Wetland, Tata Wetland, Tata South)	Rt1.4: Temporary lowland stream	5.14

Appendix I Basin Plan objectives

Table 32. Basin Plan objectives – Chapter 8 environmental watering plan.

EWP objective code	EWP objective
Ecosystem type and biodiversity	
8.05,2(a)	An objective is to protect and restore a subset of all water-dependent ecosystems of the Murray-Darling Basin, including by ensuring that: declared Ramsar wetlands that depend on Basin water resources maintain their ecological character; and (Note: see paragraph 21(3)(c) of the Act
8.05,2(b)	An objective is to protect and restore a subset of all water-dependent ecosystems of the Murray-Darling Basin, including by ensuring that: water-dependent ecosystems that depend on Basin water resources and support the life cycles of species listed under the Bonn Convention, CAMBA, JAMBA or ROKAMBA continue to support those species; and
8.05,2(c)	An objective is to protect and restore a subset of all water-dependent ecosystems of the Murray-Darling Basin, including by ensuring that: water-dependent ecosystems are able to support episodically high ecological productivity and its ecological dispersal.
8.05,3(a)	An objective is to protect and restore biodiversity that is dependent on Basin water resources by ensuring that: water-dependent ecosystems that support the life cycles of a listed threatened species or listed threatened ecological community, or species treated as threatened or endangered (however described) in State law, are protected and, if necessary, restored so that they continue to support those life cycles; and
8.05,3(b)	An objective is to protect and restore biodiversity that is dependent on Basin water resources by ensuring that: representative populations and communities of native biota are protected and, if necessary, restored.
Ecosystem function	
8.06,2	An objective is that the water quality of Basin water resources does not adversely affect water-dependent ecosystems and is consistent with the water quality and salinity management plan
8.06,3(a)	An objective is to protect and restore connectivity within and between water-dependent ecosystems, including by ensuring that: the diversity and dynamics of geomorphic structures, habitats, species and genes are protected and restored; and
8.06,3(b)(i)	An objective is to protect and restore connectivity within and between water-dependent ecosystems, including by ensuring that: ecological processes dependent on hydrologic connectivity: (i) longitudinally along watercourses;
8.06,3(b)(ii)	An objective is to protect and restore connectivity within and between water-dependent ecosystems, including by ensuring that: ecological processes dependent on hydrologic connectivity: (ii) laterally between watercourses and their floodplains (and associated wetlands);
8.06,3(b)(iii)	An objective is to protect and restore connectivity within and between water-dependent ecosystems, including by ensuring that: ecological processes dependent on hydrologic connectivity: (iii) vertically between the surface and subsurface; are protected and restored; and
8.06,3(c)	An objective is to protect and restore connectivity within and between water-dependent ecosystems, including by ensuring that: the Murray Mouth remains open at frequencies, for durations, and with passing flows, sufficient to enable the conveyance of salt, nutrients and sediment from the Murray-Darling Basin to the ocean; and
8.06,3(d)	An objective is to protect and restore connectivity within and between water-dependent ecosystems, including by ensuring that: the Murray Mouth remains open at frequencies, and for durations, sufficient to ensure that the tidal exchanges maintain the Coorong's water quality (in particular salinity levels) within the tolerance of the Coorong ecosystem's resilience; and Note: This is to ensure that water quality is maintained at a level that does not compromise the ecosystem and that hydrologic connectivity is restored and maintained.

EWP objective code	EWP objective
8.06,3(e)(i)	An objective is to protect and restore connectivity within and between water-dependent ecosystems, including by ensuring that: the levels of the Lower Lakes are managed to ensure sufficient discharge to the Coorong and Murray Mouth and help prevent river bank collapse and acidification of wetlands below Lock 1, and to avoid acidification and allow connection between Lakes Alexandrina and Albert, by: (i) maintaining levels above 0.4 metres Australian Height Datum for 95% of the time, as far as practicable; and
8.06,3(e)(ii)	An objective is to protect and restore connectivity within and between water-dependent ecosystems, including by ensuring that: the levels of the Lower Lakes are managed to ensure sufficient discharge to the Coorong and Murray Mouth and help prevent river bank collapse and acidification of wetlands below Lock 1, and to avoid acidification and allow connection between Lakes Alexandrina and Albert, by: (ii) maintaining levels above 0.0 metres Australian Height Datum all of the time; and
8.06,3(f)	An objective is to protect and restore connectivity within and between water-dependent ecosystems, including by ensuring that: barriers to the passage of biological resources (including biota, carbon and nutrients) through the Murray-Darling Basin are overcome or mitigated.
8.06,4	An objective is that natural in-stream and floodplain processes that shape landforms (for example, the formation and maintenance of soils) are protected and restored.
8.06,5	An objective is to support habitat diversity for biota at a range of scales (including, for example, the Murray-Darling Basin, riverine landscape, river reach and asset class).
8.06,6(a)	An objective is to protect and restore ecosystem functions of water-dependent ecosystems that maintain populations (for example recruitment, regeneration, dispersal, immigration and emigration) including by ensuring that: flow sequences, and inundation and recession events, meet ecological requirements (for example, cues for migration, germination and breeding); and
8.06,6(b)	An objective is to protect and restore ecosystem functions of water-dependent ecosystems that maintain populations (for example recruitment, regeneration, dispersal, immigration and emigration) including by ensuring that: habitat diversity, extent, condition and connectivity that supports the life cycles of biota of water-dependent ecosystems (for example, habitats that protect juveniles from predation) is maintained.
8.06,7	An objective is to protect and restore ecological community structure, species interactions and food webs that sustain water-dependent ecosystems, including by protecting and restoring energy, carbon and nutrient dynamics, primary production and respiration.
Ecosystem resilience	
8.07,2	An objective is that water-dependent ecosystems are resilient to climate change, climate variability and disturbances (for example, drought and fire).
8.07,3	An objective is to protect refugia in order to support the long-term survival and resilience of water-dependent populations of native flora and fauna, including during drought to allow for subsequent re-colonisation beyond the refugia.
8.07,4	An objective is to provide wetting and drying cycles and inundation intervals that do not exceed the tolerance of ecosystem resilience or the threshold of irreversible change.
8.07,5	An objective is to mitigate human-induced threats (for example, the impact of alien species, water management activities and degraded water quality).
8.07,6	An objective is to minimise habitat fragmentation.

Note: Coding system is from (Butcher & Fenton, 2020)

Table 33. Basin-wide environmental watering strategy (2025) Expected Environmental Outcomes relevant to Victorian Murray water resource plan area

Ecological themes	Types	Scale	BWS ID/Code	Expected environmental outcomes	Page of BWS	Relevance to VM WRPA
River flows and connectivity	Longitudinal connectivity	Basin-wide	FC1	To keep base flows at least 60% of the natural level (note: this will be especially important during dry years).	19	✓
		Barwon–Darling tributaries	FC2	A 10% overall increase in flows. From increased tributary contributions from the Condamine–Balonne, Border Rivers, Gwydir, Namoi and Macquarie–Castlereagh catchments collectively.	19	
		Murray River tributaries	FC3	A 30% overall increase in flows. From increased tributary contributions from the Murrumbidgee, Goulburn, Campaspe, Loddon and Lower Darling catchments collectively.	19	✓
		Lower Lakes, Coorong & Murray Mouth	FC4	A 30 to 40% increase in flows to the Murray mouth.	19	
	Lateral connectivity	Murray, Murrumbidgee, Goulburn–Broken and Condamine–Balonne	FC5	A 30 to 60% increase in the frequency of freshes, bank-full and lowland floodplain flows.	19	✓
		Border Rivers, Gwydir, Namoi, Macquarie–Castlereagh, Barwon–Darling, Lachlan, Campaspe, Loddon and Wimmera	FC6	A 10 to 20% increase of freshes and bank-full events.	19	
		Paroo, Moonie, Nebine, Kiewa, Ovens and Warrego	FC7	Current levels of connectivity maintained.	19	
	End-of-Basin flows	Lower Lakes, Coorong & Murray Mouth	FC8	The barrage flows are greater than 2,000 GL/yr on a 3-year rolling average basis for 95% of the time, with a two-year minimum of 600 GL at any time.	19	
	End-of-Basin flows	Lower Lakes, Coorong & Murray Mouth	FC9	The water levels in the Lower Lakes are maintained above: a) sea level (0m AHD) b) 0.4 metres AHD, for 95% of the time, as far as practicable, to allow for barrage releases	19	

Ecological themes	Types	Scale	BWS ID/Code	Expected environmental outcomes	Page of BWS	Relevance to VM WRPA
Native vegetation	End-of-Basin flows	Lower Lakes, Coorong & Murray Mouth	FC10	Salinity in the Coorong and Lower Lakes remains below critical thresholds for key flora and fauna including: a) salinity in Lake Alexandrina is lower than 1,000 EC 95% of the time and less than 1,500 EC all the time b) salinity in the Coorong's south lagoon is less than 100 grams per litre 95% of the time c) the Murray Mouth is open 90% of the time to an average annual depth of one metre.	20	
	Forest and woodlands	Basin-wide	V1	To maintain the extent of forest and woodland vegetation including approximately: a) 360,000 ha of river red gum b) 409,000 ha of black box c) 310,000 ha of coolabah	21	✓
		Regional	V2	Improved age class structure of river red gum, black box and coolabah communities to support viable population demographics.	22	✓
		Regional	V3	No decline in the condition of river red gum, black box and coolabah across the Basin.	22	✓
		Regional	V4	Improved condition of river red gum in the Lachlan, Murrumbidgee, Lower Darling, Murray, Goulburn-Broken and Wimmera-Avoca.	22	✓
	Shrublands	Basin-wide	V5	To maintain the extent of the large areas of lignum shrublands within the Basin.	22	✓
		Basin-wide	V6	Improvement in the condition of lignum shrublands.	22	✓
	Non-woody vegetation	Basin-wide	V7	To maintain the extent of non-woody vegetation.	22	✓
		Basin-wide	V8	Increased periods of growth for communities that closely fringe or occur within the main river corridors.	22	✓

Ecological themes	Types	Scale	BWS ID/Code	Expected environmental outcomes	Page of BWS	Relevance to VM WRP A
Waterbirds	Waterbirds	Regional	V9	Increased periods of growth for communities that form extensive stands within wetlands and floodplains including (but not limited to) Moira grassland in Barmah-Millewa Forest; common reed and cumbungi in the Great Cumbung Swamp and Macquarie Marshes; water couch on the floodplains of the Macquarie and Gwydir rivers; and marsh club-rush sedgeland in the Gwydir.	22	✓
		Lower Lakes, Coorong & Murray Mouth	V10	A sustained and adequate population of <i>Ruppia tuberosa</i> in the south lagoon of the Coorong, including: a) <i>Ruppia tuberosa</i> to occur in at least 80% of sites across at least a 43 km extent b) By 2029, the seed bank to be sufficient for the population to be resilient to major disturbances	22	
		Basin-wide	B1	The number and type of waterbird species present in the Basin will not fall below current observations.	24	✓
		Basin-wide	B2	A significant improvement in waterbird populations in the order of 20-25% over the baseline scenario*, with increases in all waterbird functional groups.	24	✓
		Basin-wide	B3	Breeding events (the opportunities to breed rather than the magnitude of breeding per se) of group-nesting waterbirds to increase by up to 50% compared to the baseline scenario*.	24	✓
		Basin-wide	B4	Breeding abundance (nests and broods) for all of the other functional groups to increase by 30-40% compared to the baseline scenario*, especially locations where the Basin Plan improves over-bank flows.	24	✓
		Lower Lakes, Coorong & Murray Mouth	B5	At a minimum, maintain populations of the following 4 key species: curlew sandpiper,	24	

Ecological themes	Types	Scale	BWS ID/Code	Expected environmental outcomes	Page of BWS	Relevance to VM WRP
Native fish	All native fish	Basin-wide	F1	greenshank, red-necked stint and sharp-tailed sandpiper, at levels recorded between 2000 and 2014.	27	✓
				No loss of native fish species currently present within the Basin.		
				Improved population structure of key fish species through regular recruitment.		
				Increased movement of key fish species.		
				Expanded distribution of key fish species and populations in the northern and southern Basin.		
		Basin-wide	F5	Improved community structure of key native fish species.	27	✓
	Short-lived species	Basin-wide	F6	Restored distribution and abundance to levels recorded pre-2007 (prior to major losses caused by extreme drought). This will require annual or biennial recruitment events depending on the species.	27	✓
		Basin-wide	F7	Improved population structure (i.e. a range of size/age classes for all species and stable sex ratios where relevant) in key sites. This will require annual recruitment events in at least 8 out of 10 years at 80% of key sites, with at least 4 of these being 'strong' recruitment events.	27	✓
	Moderate to long-lived species	Basin-wide	F8	A 10–15% increase of mature fish (of legal take size) for recreational target species (Murray cod and golden perch) in key populations.	27	✓
		Basin-wide	F9	Annual detection of species and life stages representative of the whole fish community through key fish passages; with an increase in passage of Murray cod, trout cod, golden perch, silver perch, Hyrtl's tandan, congolli, short-headed	27	✓

Ecological themes	Types	Scale	BWS ID/Code	Expected environmental outcomes	Page of BWS	Relevance to VM WRPA
				lamprey and pouched lamprey through key fish passages to be detected in 2019–2027; compared to passage rates detected in 2014–2019.		
Distribution of key fish species	Estuarine species	Lower Lakes, Coorong & Murray Mouth	F10	Detection of all estuarine-dependent fish families throughout 2014–2027.	28	
		Lower Lakes, Coorong & Murray Mouth	F11	Maintenance of annual population abundance (Catch Per Unit Effort – CPUE) of key estuarine prey species (sandy sprat and small-mouthed hardyhead) throughout the Coorong.	28	
		Lower Lakes, Coorong & Murray Mouth	F12	Detection of a broad spatial distribution of black bream and greenback flounder; with adult black bream and all life stages of greenback flounder present across >50% of the Coorong in 8 out of 10 years.	28	
		Lower Lakes, Coorong & Murray Mouth	F13	Detection in 9 out of 10 years of bi-directional seasonal movements of diadromous species through the barrages and fishways between the Lower Lakes and Coorong.	28	
		Lower Lakes, Coorong & Murray Mouth	F14	Increased rates of native fish passage in 2019–2027 compared to 2014–2019.	28	
		Lower Lakes, Coorong & Murray Mouth	F15	Improved population structure of mullet, including spawning aggregations at the Murray Mouth in 6 out of 10 years and recruitment in at least 5 out of 10 years.	28	
		Northern Basin	F16	A doubling of the current (mostly restricted) distributions of key species in the northern Basin.*.	28	
		Southern Basin	F17	Significant increases in the distributions of key species in the southern Basin.*	28	✓

Table 34. First Nations shared objectives for environmental water from the Basin-wide environmental watering strategy 2025.

Code/ID	Objective	Description	Supporting Information
2.1	Ensure Nations can fulfill their responsibilities to downstream and upstream neighbours	Nations passing on healthy water from their Country and supporting the health of Country upstream	Healthy water flowing out of Country to mobs downstream, replenishing Country so everyone can be healthy and thrive Consider upstream Nations when using water and support outcomes that benefit upstream Nations Vegetation (grasses, sedges, rushes) filters water as it passes through Country
2.2	Restore proper flows across all waterways	Returning flow regimes to conditions that sustain cultural values.	Restore flow components, volumes, timing and duration Proper timing of environmental flows to match seasonal cues, including breeding Reinstate overbank flows to support total system health Support adequate base flows Support end of system flows and salt transport Address flow variation from irrigation demand, extraction, and diversion.
2.3	Maintain and enhance connectivity across all waterways	Restoring connected flows along the lengths of rivers and onto the floodplain	Connected flows bringing water out to fill creeks, lakes, wetlands, and billabongs Water flowing out and nourishing dry and neglected parts of Country Restore flows in degraded rivers and support connected rivers from snowmelt to sea
2.4	Consider groundwater values and connectivity	Maintaining and restoring connections between surface and groundwater.	Consider the cultural significance of groundwater Maintain and restore surface water/groundwater connections
2.5	Maintain and enhance important physical features of waterways	Protecting and restoring riverbanks, lake edges, riverbeds and cultural infrastructure.	Minimise erosion and use environmental water to help stabilise riverbanks and lake edges Address sediment and sand build-up that impacts on flows and culturally significant species, sites and uses Support cultural infrastructure, fish traps and breeding structures, to slow down flows and recharge the landscape

2.6	Protect and restore water quality	Contribute to protecting and restoring water quality and mitigating thermal pollution and black water.	Reduce and minimise the impact of blackwater events, blue-green algae and salinity Contribute to mitigating the impact of cold water released from dams on native fish and other aquatic life
2.7	Support healthy native fish	Support healthy native fish.	Culturally significant food fish species Small-bodied fish Crayfish, yabbies and shrimp Freshwater mussels
2.8	Support healthy plants and forests	Support healthy plants and forests, culturally significant plant species.	Including, amongst others: River red gum (especially mature and culturally modified trees), black box and yellow box (especially mature and culturally modified trees). Medicinal plants Fibre and weaving plants Food plants
2.9	Support healthy animals	Protecting and restoring habitat and flows for culturally significant bird and animal species, including totemic species.	Birds and waterbirds Aquatic mammals, reptiles and amphibians Significant terrestrial species
2.10	Safeguard culture and cultural heritage	Sustain and strengthen tangible and intangible cultural heritage, practices and lore.	Protect and enhance cultural heritage features, including amongst others: scar trees, culturally modified/significant trees, middens, burial sites and earth ovens Protect and enhance significant cultural places and landscapes Strengthen cultural practices, lore and wellbeing by sustaining the health of Country

Appendix J Basin Plan Schedules 8 and 9

Table 35. Basin Plan Schedule 8 Criteria for identifying an environmental asset

Criterion 1: The water-dependent ecosystem is formally recognised in international agreements or, with environmental watering, is capable of supporting species listed in those agreements	
1	Assessment indicator: A water-dependent ecosystem is an environmental asset that requires environmental watering if it is: (a) a declared Ramsar wetland; or (b) with environmental watering, capable of supporting a species listed in or under the JAMBA, CAMBA, ROKAMBA or the Bonn Convention.
Criterion 2: The water-dependent ecosystem is natural or near-natural, rare or unique	
2	Assessment indicator: A water-dependent ecosystem is an environmental asset that requires environmental watering if it: (a) represents a natural or near-natural example of a particular type of water-dependent ecosystem as evidenced by a relative lack of post-1788 human induced hydrologic disturbance or adverse impacts on ecological character; or (b) represents the only example of a particular type of water-dependent ecosystem in the Murray-Darling Basin; or (c) represents a rare example of a particular type of water-dependent ecosystem in the Murray-Darling Basin.
Criterion 3: The water-dependent ecosystem provides vital habitat	
3	Assessment indicator: A water-dependent ecosystem is an environmental asset that requires environmental watering if it: (a) provides vital habitat, including: (i) a refugeum for native water-dependent biota during dry spells and drought; or (ii) pathways for the dispersal, migration and movements of native water-dependent biota; or (iii) important feeding, breeding and nursery sites for native water-dependent biota; or (b) is essential for maintaining, and preventing declines of, native water-dependent biota.
Criterion 4: Water-dependent ecosystems that support Commonwealth, State or Territory listed threatened species or communities	
4	Assessment indicator: A water-dependent ecosystem is an environmental asset that requires environmental watering if it: (a) supports a listed threatened ecological community or listed threatened species; or Note: See the definitions of listed threatened ecological community and listed threatened species in section 1.07. (b) supports water-dependent ecosystems treated as threatened or endangered (however described) under State or Territory law; or (c) supports one or more native water-dependent species treated as threatened or endangered (however described) under State or Territory law.
Criterion 5: The water-dependent ecosystem supports, or with environmental watering is capable of supporting, significant biodiversity	
5	Assessment indicator: A water-dependent ecosystem is an environmental asset that requires environmental watering if it supports, or with environmental watering is capable of supporting, significant biological diversity. This includes a water-dependent ecosystem that:

- (a) supports, or with environmental watering is capable of supporting, significant numbers of individuals of native water-dependent species; or
- (b) supports, or with environmental watering is capable of supporting, significant levels of native biodiversity at the genus or family taxonomic level, or at the ecological community level.

Table 36. Basin Plan Schedule 9 Criteria for identifying an ecosystem function

Criterion 1: The ecosystem function supports the creation and maintenance of vital habitats and populations	
1	Assessment indicator: An ecosystem function requires environmental watering to sustain it if it provides vital habitat, including: (a) a refugium for native water-dependent biota during dry periods and drought; or (b) pathways for the dispersal, migration and movement of native water-dependent biota; or (c) a diversity of important feeding, breeding and nursery sites for native water-dependent biota; or (d) a diversity of aquatic environments including pools, riffle and run environments; or (e) a vital habitat that is essential for preventing the decline of native water-dependent biota.
Criterion 2: The ecosystem function supports the transportation and dilution of nutrients, organic matter and sediment	
2	Assessment indicator: An ecosystem function requires environmental watering to sustain it if it provides for the transportation and dilution of nutrients, organic matter and sediment, including: (a) pathways for the dispersal and movement of organic and inorganic sediment, delivery to downstream reaches and to the ocean, and to and from the floodplain; or (b) the dilution of carbon and nutrients from the floodplain to the river systems.
Criterion 3: The ecosystem function provides connections along a watercourse (longitudinal connections)	
3	Assessment indicator: An ecosystem function requires environmental watering to sustain it if it provides connections along a watercourse or to the ocean, including longitudinal connections: (a) for dispersal and re-colonisation of native water-dependent communities; or (b) for migration to fulfil requirements of life-history stages; or (c) for in-stream primary production.
Criterion 4: The ecosystem function provides connections across floodplains, adjacent wetlands and billabongs (lateral connections)	
4	Assessment indicator: An ecosystem function requires environmental watering to sustain it if it provides connections across floodplains, adjacent wetlands and billabongs, including: (a) lateral connections for foraging, migration and re-colonisation of native water-dependent species and communities; or (b) lateral connections for off-stream primary production.

