SECTION 5:
Northern region

5.1 Northern region overview

The northern region has six river systems, four major floodplain sites and many wetlands that can receive water for the environment. The Broken, Campaspe, Goulburn, Loddon and Ovens rivers are tributaries of the Murray River. The four major floodplain sites along the Murray River corridor are Barmah Forest, Gunbower Forest, Hattah Lakes, Lindsay, Mulcra and Wallpolla islands. The other wetlands are distributed across the Broken, Goulburn, Loddon and Murray floodplains. The Goulburn Broken, Mallee, North Central and North East CMAs manage the rivers and wetlands in the northern region.

Many of the water systems in the northern region are connected through infrastructure. For example, the Goulburn Weir and Waranga Western Channel are used to deliver water from the Goulburn River to the Loddon and Campaspe systems. Water trading can also transfer allocation between systems. Within the limitations of each mechanism, water for the environment can be moved between systems for delivery to environmental sites across northern Victoria, although most is used to provide benefits in the systems in which the water is held.

Environmental values, objectives and planned actions for each system in the northern region are presented in the following system sections.

Traditional Owners in the northern region

Traditional Owners in the northern region have a deep connection to Country that has endured for tens of thousands of years. This includes inherent rights and cultural obligations to Country and the community.

The Traditional Owner Nations in northern Victoria include Barapa Barapa, Bangerang, Dja Dja Wurrung, Duduroa, Dhudhuroa, Latji Latji, Ngintait, Nyeri Nyeri, Taungurung, Tati Tati, Wadi Wadi, Wamba Wemba, Waywurru, Weki Weki, Yorta Yorta and Yaithmathang.

The Dja Dja Wurrung Clans Aboriginal Corporation (trading as DJAARA), the First People of the Millewa-Mallee, the Taungurung Land and Waters Council (TLaWC), the Wamba Wemba Aboriginal Corporation and the Yorta Yorta Nation Aboriginal Corporation (YYNAC) are Registered Aboriginal Parties (RAPs) under the Victorian *Aboriginal Heritage Act 2006*. First People of the Millewa-Mallee hold native title over Crown land and waters. DJAARA and TLaWC each have a Recognition and Settlement Agreement with the Victorian Government, and YYNAC has a Traditional Owner Land Management Agreement to jointly manage Barmah National Park.

Engagement

Program partners engage extensively with Traditional Owners, stakeholders and local communities to understand community priorities for delivering water for the environment in the coming year and to understand how cultural, social, economic and recreational values, uses and objectives may be supported by delivering environmental flows, provided environmental outcomes are not compromised.

Engagement also informs environmental objectives in regional catchment and waterway strategies, environmental flows studies and environmental management plans.

Table 5.1.1 Program partners and stakeholders Goulburn Broken CMA engaged with to develop seasonal watering proposals and key documents informing the proposals for the Barmah Forest, Goulburn system, Goulburn wetlands, Broken wetlands, Broken River and upper Broken Creek and lower Broken Creek (in alphabetical order)[1]

Partner/ stakeholder	Barmah Forest	Goulburn system	Goulburn wetlands	Broken wetlands	Broken River and upper Broken Creek	Lower Broken Creek
Community groups and environment groups		• Goulburn Valley Environment Group	• Goulburn Valley Environment Group • Turtles Australia	• Goulburn Valley Environment Group • Turtles Australia	• Goulburn Valley Environment Group	• Goulburn Valley Environment Group
Government agencies	• Goulburn-Murray Water • Moira Shire Council • NSW National Parks and Wildlife Service • Parks Victoria	• Commonwealth Environmental Water Holder • Goulburn-Murray Water • Murray-Darling Basin Authority/ the Living Murray program • Parks Victoria • Victorian Environmental Water Holder • Victorian Fisheries Authority	• Department of Energy, Environment and Climate Action • Goulburn-Murray Water • Greater Shepparton City Council • Moira Shire Council • Parks Victoria • Victorian Environmental Water Holder	• Commonwealth Environmental Water Holder • Goulburn-Murray Water • Greater Shepparton City Council • Moira Shire Council • Parks Victoria • Victorian Environmental Water Holder	• Commonwealth Environmental Water Holder • Goulburn-Murray Water • Parks Victoria • Victorian Environmental Water Holder	• Commonwealth Environmental Water Holder • Goulburn-Murray Water • Parks Victoria • Victorian Environmental Water Holder
Landholders/ farmers		• Goulburn Environmental Water Advisory Group		• Individual landholders who are on the Broken Environmental Water Advisory Group or the Goulburn Broken Environmental Water Advisory Group	• Individual landholders who are on the Broken Environmental Water Advisory Group	• Individual landholders who are on the Broken Environmental Water Advisory Group

Partner/ stakeholder	Barmah Forest	Goulburn system	Goulburn wetlands	Broken wetlands	Broken River and upper Broken Creek	Lower Broken Creek
Local businesses	• Barmah Information Centre	• Local ecotourism operator • Trellys Fishing and Hunting		• Trellys Fishing and Hunting		
Recreational users	• Goulburn Broken Environmental Water Wetland Advisory Group members	• Burnanga Indigenous Fishing Club	• Trellys Fishing and Hunting		• Individual community members on the Broken Environmental Water Advisory Group	• Individual community members on the Broken Environmental Water Advisory Group
Technical experts		• Goulburn to Murray Trade Review Scientific Advisory Panel • Scientific leads from the Commonwealth Environmental Water Holder - Monitoring, Evaluation and Research Program Goulburn River	• Arthur Rylah Institute • Waters Edge Consulting • Wetland Revival Trust			
Traditional Owners	• Yorta Yorta Nation Aboriginal Corporation	• Taungurung Land and Waters Council • Yorta Yorta Nation Aboriginal Corporation	• Taungurung Land and Waters Council • Yorta Yorta Nation Aboriginal Corporation	• Taungurung Land and Waters Council • Yorta Yorta Nation Aboriginal Corporation	• Taungurung Land and Waters Council • Yorta Yorta Nation Aboriginal Corporation	• Yorta Yorta Nation Aboriginal Corporation

1 The listed partners/stakeholders include partners and stakeholders who engaged with the Taungurung Land and Waters Council, which developed a seasonal watering proposal for Molesworth Billabongs.

Table 5.1.2 Program partners and stakeholders Mallee CMA engaged with to develop seasonal watering proposals and key documents informing the proposals for the Hattah Lakes, lower Murray wetlands and Lindsay, Mulcra and Wallpolla islands (in alphabetical order)[1]

Partner/stakeholder	Hattah Lakes	Lower Murray wetlands	Lindsay, Mulcra and Wallpolla islands
Community groups and environment groups	• Special interest groups • Mallee CMA Land and Water Advisory Committee • Wider community	• Mallee CMA Land and Water Advisory Committee • Special interest groups • Wider community	• Mallee CMA Land and Water Advisory Committee • OzFish Unlimited • Special interest groups • Wider community
Government agencies	• Commonwealth Environmental Water Holder • Department of Energy, Environment and Climate Action • Goulburn-Murray Water • Mildura Rural City Council • Murray-Darling Basin Authority • Parks Victoria • Victorian Environmental Water Holder	• Department of Climate Change, Energy, the Environment and Water • Department of Energy, Environment and Climate Action • Lower Murray Water • Mildura Rural City Council • Parks Victoria • Swan Hill Rural City Council • Victorian Environmental Water Holder • Victorian Fisheries Authority • Victorian Murray Floodplain Restoration Project Team	• Commonwealth Environmental Water Holder • Department of Energy, Environment and Climate Action • Goulburn-Murray Water • Mildura Rural City Council • New South Wales Department of Climate Change, Energy, the Environment and Water • Parks Victoria • South Australian Water • Victorian Environmental Water Holder • Victorian Murray Floodplain Restoration Project Team
Landholders/farmers	• Neighbouring landholders	• Neighbouring landholders	• Lindsay Point irrigators
Local businesses	• Local businesses • Special interest groups (e.g., apiarists) • Tourism operators that use Hattah Lakes and the Mildura Visitor Information and Booking Centre	• Local businesses • Special interest natural resource management groups (e.g., apiarists) • Tourism operators that use the Murray wetlands and the Mildura Visitor Information Centre	• Tourism operators that use Lindsay-Mulcra-Wallpolla and the Mildura Visitor Information and Booking Centre • Wildside Outdoors
Recreational users			• BirdLife Mildura

Partner/stakeholder	Hattah Lakes	Lower Murray wetlands	Lindsay, Mulcra and Wallpolla islands
Traditional Owners	• Dadi Dadi/Weki Weki • Gilbie Corporation • Latji Latji • Latji Latji Mumthelang • Mallee CMA Aboriginal Reference Group • Munatunga Elders • Murray Valley Aboriginal Corporation • Nyeri Nyeri • Pearce Family	• Dadi Dadi/Weki Weki • First People of the Millewa-Mallee Aboriginal Corporation • Gilbie Corporation • Latji Latji Mumthelang • Munatunga Elders • Njeri Njeri • Pearce Family • Wadi Wadi Nations	• First People of the Millewa-Mallee Aboriginal Corporation

1 The listed partners/stakeholders include partners and stakeholders who engaged with the First People of the Millewa-Mallee Aboriginal Corporation, which developed a seasonal watering proposal for Neds Central.

Table 5.1.3 Program partners and stakeholders North Central CMA engaged with to develop seasonal watering proposals and key documents informing the proposals for Gunbower Creek and Forest, central Murray wetlands, Campaspe system, Coliban River, Loddon system (including Boort wetlands) and Birchs Creek (in alphabetical order)

Partner/ stakeholder	Gunbower Creek and Forest	Central Murray wetlands	Campaspe system	Coliban River	Loddon system (including Boort wetlands)	Birchs Creek
Community groups and environment groups	• Individual community members	• Birdlife Australia • Turtles Australia	• Landcare groups	• Malmsbury and District Landcare Group	• Birdlife Australia • Field and Game Australia • Lake Meran Committee of Management • Turtles Australia • VRFish	• Tullaroop Tributaries Project Reference Group
Government agencies	• Campaspe Shire Council • Commonwealth Environmental Water Holder • Department of Energy, Environment and Climate Action • Forestry Corporation of NSW • Gannawarra Shire Council • Goulburn-Murray Water • Murray-Darling Basin Authority • Parks Victoria • Victorian Environmental Water Holder	• Department of Energy, Environment and Climate Action • Goulburn-Murray Water • Parks Victoria • Victorian Environmental Water Holder	• Commonwealth Environmental Water Holder • Department of Energy, Environment and Climate Action • Goulburn-Murray Water • Victorian Environmental Water Holder	• Coliban Water • Commonwealth Environmental Water Holder • Victorian Environmental Water Holder • Victorian Fisheries Authority	• Commonwealth Environmental Water Holder • Department of Energy, Environment and Climate Action • Goulburn-Murray Water • Parks Victoria • Victorian Environmental Water Holder	• Central Highlands Water • Department of Energy, Environment and Climate Action • Goulburn-Murray Water • Parks Victoria • Victorian Environmental Water Holder

Partner/ stakeholder	Gunbower Creek and Forest	Central Murray wetlands	Campaspe system	Coliban River	Loddon system (including Boort wetlands)	Birchs Creek
Landholders/ farmers	• Enhancing the Northern Waterways Advisory Group • Individual landholders	• Enhancing the Northern Waterways Advisory Group • Individual landholders and community members	• Individual landholders and community members, including via the Campaspe Environmental Water Advisory Group	• Individual landholders and community members	• Individual landholders and community members, including via the Loddon Environmental Water Advisory Group	• Individual landholders and community members
Recreational users		• Field & Game Australia	• Game Management Authority • Local canoe clubs • VRFish		• Boort Angling Club	• VRFish
Technical experts	• Vegetation, fish and bird ecologists					
Traditional Owners	• Barapa Barapa Traditional Owners • Yorta Yorta Nation Aboriginal Corporation	• Barapa Barapa Traditional Owners • Wamba Wemba Traditional Owners • Yorta Yorta Nation Aboriginal Corporation	• Dja Dja Wurrung Clans Aboriginal Corporation • Taungurung Land and Waters Council		• Barapa Barapa Traditional Owners • Dja Dja Wurrung Clans Aboriginal Corporation • Wamba Wemba Traditional Owners	• Dja Dja Wurrung Clans Aboriginal Corporation

Table 5.1.4 Program partners and stakeholders North East CMA engaged with to develop seasonal watering proposals and key documents informing the proposals for the Ovens system and upper Murray wetlands (in alphabetical order)

Partner/stakeholder	Ovens system	Upper Murray wetlands
Community groups and environment groups	• Borinya Community Partnership School • Galen Catholic College • Mullinmur Wetland Management Committee • Wangaratta Landcare and Sustainability Inc.	• Birdlife Australia • Turtles Albury Wodonga • Wodonga Urban Landcare Group
Government agencies	• Commonwealth Environmental Water Holder • Department of Energy, Environment and Climate Action • Goulburn-Murray Water • Victorian Environmental Water Holder	• Commonwealth Environmental Water Holder • Department of Energy, Environment and Climate Action • Goulburn-Murray Water • North East Water • Victorian Environmental Water Holder • Murray-Darling Basin Authority
Landholders/farmers		• Private landholders on the surrounding farmland
Technical experts	• Arthur Rylah Institute • La Trobe University	
Traditional Owners	• Bangerang Aboriginal Corporation • Taungurung Land and Waters Council • Yorta Yorta Nation Aboriginal Corporation	• Dalka Wurra Mittung Aboriginal Corporation • Dhudhuroa Waywurru Nation Aboriginal Corporation • Duduroa Dhargal Aboriginal Corporation

Integrated catchment management

Altered water regimes are one of many threats to the health of Victoria's waterways. Many of the environmental objectives of water for the environment in the northern region are complemented by simultaneously addressing issues such as barriers to fish movement, high nutrient loads, loss of streambank vegetation and invasive species.

Some examples of complementary programs that support environmental flow outcomes in the northern region are:

- a strategic action plan to protect floodplain marshes in Barmah Forest by removing invasive animals and controlling invasive plants
- a fishway on Taylors Creek Weir north of Kow (Ghow) Swamp to allow native fish to migrate up and down rivers in the region and to support diverse, healthy populations
- fishways at Koondrook and Cohuna weirs in Gunbower Creek and at Box Creek and Kerang Weir
- a fish screen in Gunbower Creek to reduce the number of native fish lost to irrigation channels
- an additional 270 km of native fish habitat and refuge opened up to native fish in the Ovens River with the construction of the Tea Garden Weir fishway in April 2023
- planting native aquatic plants and reintroducing woody habitat (such as snags) in lower Broken Creek to help accelerate the recovery of in-stream vegetation.

For more information about integrated catchment management programs in the northern region, see the Goulburn Broken, Mallee, North Central and North East CMAs' regional catchment strategies and regional waterway strategies.

Risk management

When developing seasonal watering proposals for the northern region systems, environmental watering program partners assessed risks associated with assessed risks associated with potential environmental water delivery in 2026-27 and identified appropriate mitigating strategies. Risks and mitigating actions are continually assessed by program partners throughout the year (see **subsection 1.2.7**).

Northern Victoria and the southern Murray-Darling Basin

Rivers, creeks and floodplains in northern Victoria form part of the southern connected Murray-Darling Basin. Water flows directly from the Victorian rivers and floodplains into the Murray River, which means that environmental flows delivered in northern Victorian systems can achieve environmental objectives at multiple sites throughout the southern Murray-Darling Basin. For example, water for the environment delivered in the Goulburn River flows into the Murray River and can be managed to make sure it flows all the way to the Lower Lakes and Coorong in South Australia, providing environmental outcomes at Gunbower Forest, Hattah Lakes, Lindsay Island and the Chowilla floodplain along the way.

Planning

The ***Murray-Darling Basin Plan 2012*** (Basin Plan) and the ***Basin-wide environmental watering strategy*** (third edition, 2025) guide the long-term planning of water for the environment in the Murray-Darling Basin. Under the Basin Plan, environmental objectives are met by achieving outcomes for connectivity, native vegetation, waterbirds and native fish. These objectives and outcomes reflect local site and state-based objectives. The VEWH coordinates its activities with other environmental water holders and managers in northern Victoria, NSW and South Australia to achieve environmental outcomes at the southern connected Murray-Darling Basin scale. Collaborative planning focuses on how upstream and downstream objectives align and how the broader operation of the Murray River system can help support environmental outcomes. The Southern Connected Basin Environmental Watering Committee (SCBEWC) decides on the use of the Living Murray entitlements, River Murray Increased Flows entitlement and River Murray Unregulated Flows entitlement, and it facilitates planning of coordinated environmental flows for the major rivers. The Murray Lower Darling River Indigenous Nations (MLDRIN) is a part of SCBEWC. MLDRIN directly engages with First Nations communities, and its ***Statement on environmental water use*** is also important for understanding Traditional Owners' objectives and desired outcomes.

Planning is documented in the Murray-Darling Basin Authority's basin annual environmental watering priorities, the Commonwealth Environmental Water Holder's annual portfolio management plans and the VEWH's annual seasonal watering plan (this document). SCBEWC publishes its annual operational scenarios for coordinating environmental flows in the Murray River. In Victoria, all water for the environment must be delivered in line with the VEWH's seasonal watering plan, meaning coordination during annual planning is fundamental to successful basin-scale outcomes.

Delivery coordination and monitoring

Environmental water holders and managers in the Murray-Darling Basin coordinate water deliveries to achieve landscape-scale environmental outcomes when possible. Examples include:

- delivering a winter fresh in the Goulburn River, which subsequently passed through to the Lower Lakes in South Australia and through the barrages to the Coorong to trigger upstream migration of fish (such as lamprey)
- delivering a spring flow from Hume Dam (to support floodplain sites, such as the Barmah-Millewa Forest) that meets downstream tributary flows from the Goulburn, Murrumbidgee and lower Darling rivers to support the river channel from the mid-Murray to the lower Murray all the way to the Lower Lakes and Coorong in South Australia. This event carries carbon and nutrients from the floodplain to the river and transports them through the system, increasing food availability, helping native fish to move and breed, and supporting native aquatic plants
- protecting environmental water from the northern Murray-Darling Basin to the southern Murray-Darling Basin through the Menindee Lakes. The additional environmental water improves both local and downstream outcomes along the Murray, supporting habitat for native fish and other water-dependent animals.

To assess the effectiveness of landscape-scale responses to environmental flows, the Southern Connected Basin Environmental Watering Committee developed the ***River Murray Channel Monitoring Plan 2021-22 to 2025-26***, which focused on productivity and fish indicators to inform the management of environmental flows. The successor to this plan is under development and will run for three years from 2026-27. The monitoring plans complement site-based monitoring programs across the Murray system.

Seasonal overview

Hydrological conditions

The temperature in northern Victoria was average to above average for most of 2025-26, with July and January being particularly warm. Rainfall was generally below average to average across northern Victoria, except for record-setting falls in the Mallee in March.

Inflow to major storages remained well below average, and there were no unregulated high flows in any river systems. This is the second consecutive year of dry conditions, and the influence of the wetter, preceding years has largely waned. Water for the environment was managed in line with dry planning scenarios across northern Victoria in 2025-26, whereas in 2024-25, additional water allowed some systems to be managed to an average planning scenario, despite dry conditions. For most of 2025-26, the natural flow was insufficient to meet planned watering actions, and water for the environment was used in waterways, including the Campaspe, Loddon and Goulburn rivers, to deliver low flows and spring freshes and to cue fish movement and spawning. Many floodplains and wetlands received active deliveries of environmental water in 2025-26 after drawing down to support dry-phase ecological processes in prior years.

Large volumes of inter-valley transfers were released from the Goulburn and Campaspe systems to the Murray system, which offset the need to deliver environmental water to the Goulburn, Campaspe and Broken river systems for prolonged periods.

The Bureau of Meteorology's climate outlook on 21 May 2026 predicted a 70 per cent chance of unusually high minimum and maximum temperatures and a 70 to 75 per cent chance of below-median rainfall across the northern region during winter and early spring 2026. A reliable forecast beyond early spring 2026 was not available at the time of writing.

Water availability outlook

The **seasonal determination outlook** provided by the Northern Victoria Resource Manager in May 2026 indicated all systems would reach 100 per cent high-reliability allocation in 2026-27 in average-to-wet conditions. The Campaspe system holds sufficient water to allocate 98 per cent at the beginning of July under wet conditions, while Bullarook will start the water year with no allocation. In extreme dry to dry conditions, small systems such as the Broken and Bullarook systems are forecast to receive severely low allocations across the year (between zero and 14 per cent high-reliability allocation). The larger Murray, Goulburn and Loddon systems have more reserves to smooth out annual variability. They are forecast to reach at least 37 per cent allocation to high-reliability water shares in an entremely dry scenario and at least 45 per cent in a dry scenario, with the Murray expected to reach 70 percent for the year.

In May 2026, the Northern Victoria Resource Manager indicated the risk of spill at the start of July 2026 was expected to be about 35 per cent in the Murray system, 25 per cent in the Campaspe system, and 10 per cent in the Goulburn system. Inflow conditions during 2026-27 will determine how seasonal determinations and the spill risk change through the year.

Water delivery outlook

Environmental watering actions across northern Victoria in 2026-27 have been planned to consolidate and, where possible, build on the environmental gains from environmental water deliveries in 2025-26. The forecast water availability is less than in recent years, with carryover being particularly important to meet early-season demands. In the drought and dry planning scenarios, supply generally focuses on avoiding loss and maintaining condition, while average to wet conditions will see a shift to improving environmental condition.

Delivery to floodplains will occur across northern Victoria to the larger icon sites as well as to individual wetlands. Overbank flows through Barmah are possible in all climate scenarios as part of the Murray multi-site event to deliver environmental water from Hume to the Coorong, maximising benefits along the way. Further downstream, icon sites like Gunbower and Lindsay-Wallpolla-Mulcra Islands also see some delivery in all planning scenarios, scaled to climatic conditions. Hattah is planned to receive water in all planning scenarios except drought.

A key ongoing priority for environmental watering in rivers in the region in 2026-27 will be to maintain water quality, support native animals and maintain or improve the condition of native streamside vegetation. Environmental flows to river systems are planned to be variable, depending on climatic conditions. The greatest volume of environmental water is expected to be used in an average planning scenario, while demand is lower in the drought and dry scenarios. In wet conditions, the demand for environmental water delivery is reduced as natural and unregulated flows meet many of the required environmental benefits.

During dry conditions, operational water deliveries, such as inter-valley transfers (IVTs), can offset or reduce the need for delivery of environmental water, but may also limit opportunities to use return flows for environmental outcomes further downstream in the Murray system and South Australia.

5.2 Victorian Murray system

Waterway managers – Goulburn Broken, Mallee, North Central and North East catchment management authorities

Storage managers – Goulburn-Murray Water, Lower Murray Water, Murray-Darling Basin Authority (River Murray Operations), SA Water and Water NSW

Environmental water holders – Victorian Environmental Water Holder (including the Living Murray program) and Commonwealth Environmental Water Holder

The lands and waters of the Murray River system are central to the culture of the many Traditional Owner groups that have lived along the Murray River for tens of thousands of years. Traditional Owners along the Murray have distinct cultural boundaries, languages and cultural practices. The Murray River has many different names in Aboriginal languages; for example, the Yorta Yorta people know the Murray as *Dhungulla*. The Victorian Murray system referred to in this plan includes waterways, storages, weirs, locks and regulators managed under state and Commonwealth Government legislation. This system overlays many Traditional Owner boundaries.

Within the Victorian Murray system, there are many significant floodplains and wetland systems within the jurisdictional boundaries of the North East, Goulburn Broken, North Central and Mallee CMAs. They are sites of significance for Traditional Owners, with tangible and intangible cultural connections dating back tens of thousands of years and continuing to the present day. The Barmah Forest, Kerang wetlands and Hattah Lakes are internationally recognised Ramsar-listed sites due to the significance of their wetland types and the abundance and range of waterbird species that use them. Many other wetlands in the system are either nationally or regionally significant.

Victorian Murray system water availability

Water for the environment can be supplied to the Victorian Murray system from various sources. These include entitlements held by the VEWH (a subset of which the VEWH holds on behalf of the Living Murray program), the Commonwealth Environmental Water Holder and the re-use of return flows. In some instances, operational water can be delivered to downstream users in a way that helps meet environmental outcomes within the river system en route.

The source of water used for individual watering actions and the ability to deliver all watering actions will depend on water availability, water commitments by other environmental water holders and operational requirements. The VEWH works with the Living Murray program and the Commonwealth Environmental Water Holder to supply Victorian Murray system demands, as well as broader southern Murray-Darling Basin demands across other jurisdictions.

At the time of writing, we cannot predict which sources of water will be available to meet Victorian Murray system demands, so the following Victorian Murray system sections do not specify the expected availability of water for the environment, nor do they classify potential environmental watering actions in each Victorian Murray system subsection as tier 1 or tier 2, based on water availability.

5.2.1 Upper Murray wetlands

System overview

The upper Murray wetlands are on the Murray River floodplain between Lake Hume and Lake Mulwala. The wetland system includes the Ryans Lagoon wetland complex, which has two main lagoons: Ryans Lagoon 1 and Ryans Lagoon 2 (Figure 5.2.1).

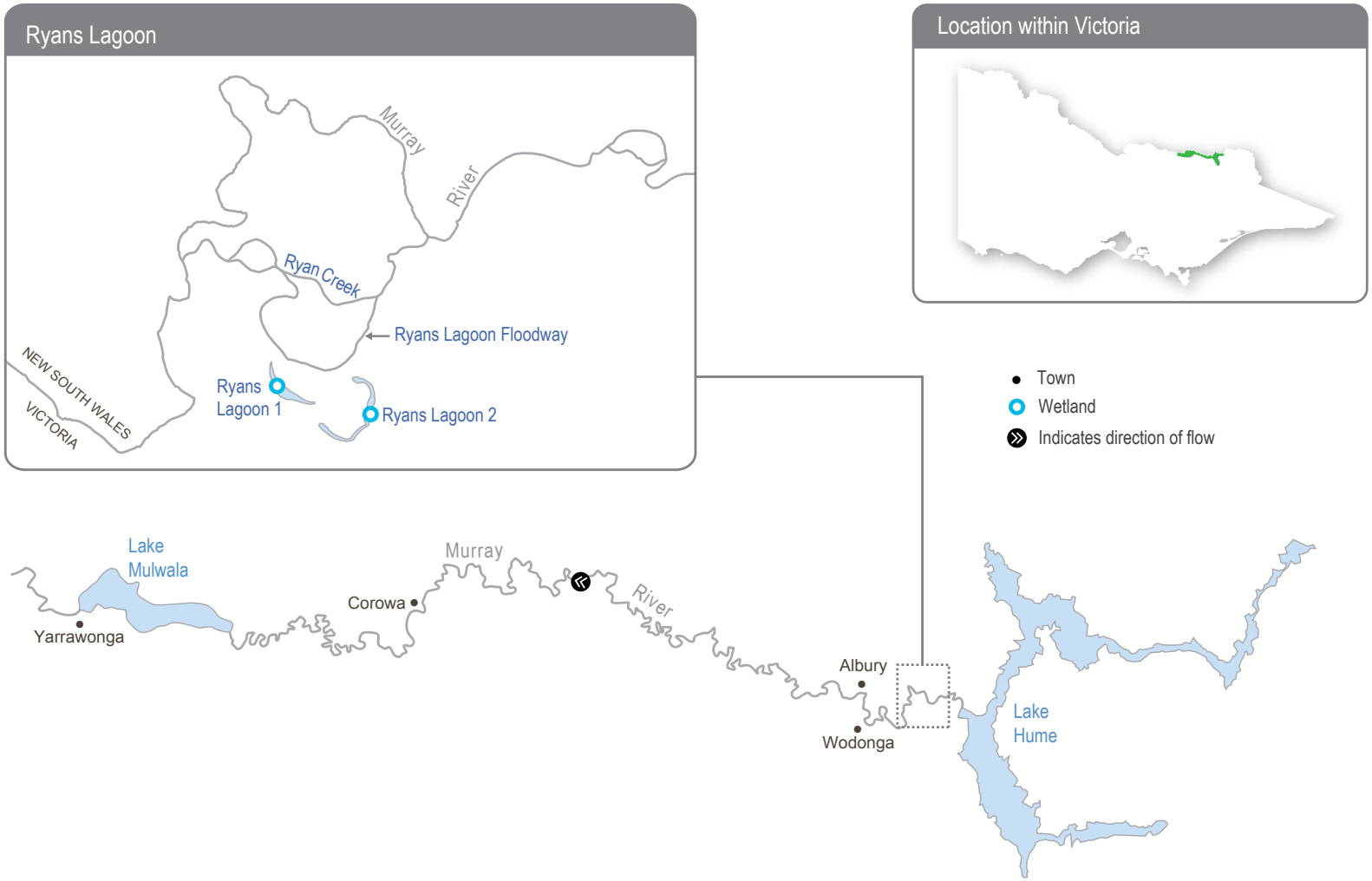
The Ryans Lagoon wetland complex is a network of wetlands positioned downstream of Lake Hume and upstream of the Kiewa River confluence with the Murray River.

Flows into the complex are mainly influenced by regulated releases from Lake Hume, which travel via Ryans Creek, an anabranch of the Murray River. The complex begins to fill from Ryans Lagoon Floodway through a culvert when the flow in the Murray River at the Heywoods gauge immediately below Lake Hume exceeds 23,000 ML per day, but sustained flows above 24,000 ML per day are needed to fill both lagoons completely.

It is proposed to use a temporary pump in late winter and through spring of 2026 to deliver water for the environment to restore the ecological health of the complex by providing a wetting and drying regime closer to the natural flow regime that existed before the Murray River was regulated. Water can be pumped into Ryans Lagoon 2 from the Ryans Lagoon Floodway when the flow in the Murray River exceeds 12,000 ML per day and fills the floodway to a suitable depth for a pump to operate.

A spring pulse for the Hume-to-Yarrawonga reach of the Murray may be required to fill Ryans Lagoon Floodway to a sufficient height and duration to enable pumping.

Figure 5.2.1 Upper Murray wetlands



Environmental values

The North East CMA's ***North East Waterway Strategy*** recognises the Ryans Lagoon wetland complex as a high-value wetland system, and it is listed as a nationally significant wetland in the ***Directory of Important Wetlands in Australia***. The complex provides habitat for five bird, two fish, one frog, two reptile, one mammal and two perennial plant species listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* and/or the Victorian *Flora and Fauna Guarantee Act 1988*. Ecological surveys conducted at the site since 1975 have recorded 250 species of waterbugs and over 30 species of waterbirds, including the Australian white ibis, eastern great egret, little egret, intermediate egret, musk duck and rufous night heron. Eight species of frog, including Sloane's froglet, have been observed. The complex also supports native wetland vegetation communities expected to benefit from a seasonally aligned, more variable watering regime.

Three species of freshwater turtle have been observed at Ryans Lagoon wetland complex during 2026 following the delivery of environmental water in 2025, including the endangered broad-shelled turtle, the critically endangered Murray River turtle and the culturally significant eastern long-necked turtle. These turtle species hold cultural significance to the Duduroa Dhargal people.

Environmental objectives in the upper Murray wetlands	
	A1 – Increase habitat for frogs and increase their population
	**B1** – Provide feeding habitat for a range of waterbird species
	**CN1** – Restore carbon and nutrient cycling within the wetlands to increase ecosystem productivity
	F1 – Increase habitat for native fish and increase their population
	**MI1** – Increase the abundance and diversity of waterbugs to support aquatic food webs
	**V1** – Increase the extent of fringing and aquatic vegetation **V2** – Decrease weed coverage and redgum encroachment
	**T1** – Provide food and breeding habitat for turtle populations

Traditional Owner cultural values and uses

Traditional Owners have lived on and cared for the upper Murray floodplain for tens of thousands of years. Wetlands in the region have immense cultural value to Traditional Owners. There is currently no Registered Aboriginal Party appointed for the Ryans Lagoon area. Several Traditional Owner groups are within the upper Murray area, including those represented by the Duduroa Dhargal Aboriginal Corporation (DDAC), the Dhudhuroa Waywurru Nations Aboriginal Corporation and the Dalka Warra Mittung Aboriginal Corporation.

Traditional Owners from DDAC in 2023 received funding to 2026 to assist in managing Ryans Lagoon Nature Conservation Reserve alongside Parklands Albury Wodonga Ltd. The funding has employed a DDAC Elder as a part-time ranger to undertake management activities, including ecological thinning, weed management, pest control and revegetation of native grasses and wetland plants for traditional uses. The ranger also trains First Nations people in cultural burning, cultural harvesting and cultural education activities. DDAC has also received funding to employ two Aboriginal Water Officers to undertake water management activities for self-determined purposes.

North East CMA and DDAC have partnered since 2023 to plan and deliver environmental water to Ryans Lagoon, providing an opportunity for DDAC to explain important cultural values at Ryans Lagoon and some of their objectives for managing Country, including water.

DDAC has specified that it would like environmental water to be delivered to Ryans Lagoon annually to restore a more natural water regime. DDAC would like to improve habitat for wetland plants, birds, frogs, turtles and fish, including through the planned environmental water deliveries, which will support management actions for the ecological and cultural values of the Duduroa Dhargal people.

> "The overall ideological reason (for the on-ground work) is to increase the biomass (meaning increase the native animals and traditional plants in the area for traditional purposes and practices) and create a refuge for species in this wetland complex, ensuring the survival and succession for the future within the catchment."
>
> *– DDAC Program Manager, 2024*
>
> "We are water people. We lived on the river and lived on the wetlands. We used these waterways for foods, medicines, and resources. When the wetlands dried up, we would have moved on. We moved to where the water was to sustain life. Water in these wetlands is essential to Cultural connection, learning and sharing knowledge with our people. Without water, we wouldn't be here today."
>
> *– DDAC Elders, 2024*
>
> "Some of our key challenges at Ryan's Lagoon are access to water, pests and weeds. Our partnership with the CMAs is important to securing water for the wetlands to benefit birds, fish and turtles, and to help us learn about the quality of the water within the wetland."
>
> *– DDAC Elder Uncle Allan Murray, 2026*
>
> "We want to be able to manage the wetland for our people. We want to plant our own bush tucker, we want to reintroduce medicine plants and bring back the native plants now that the cattle have been removed. We need water to sustain life."
>
> *– DDAC Elder Uncle Phil Murray, 2026*

Increasing the involvement of Traditional Owners in managing environmental flows and progressing opportunities towards self-determination in the environmental watering program is a core commitment of the VEWH and its program partners. This is reinforced by legislation and policy commitments, including the *Water Act 1989*, the ***Victorian Aboriginal Affairs Framework***, the 2016 ***Water for Victoria***, the 2022 ***Water is Life: Traditional Owner Access to Water Roadmap***, and, in some cases, agreements under the *Traditional Owner Settlement Act 2010*.

How proposed 2026-27 watering actions may support cultural values and uses

North East CMA and DDAC have reviewed and discussed the spring 2025 delivery of environmental water, the fill achieved and the initial ecological response. DDAC are partnering with North East CMA to deliver a project to construct permanent environmental water delivery infrastructure at Ryans Lagoon during 2026 to more reliably and efficiently deliver water for the environment annually.

DDAC support an annual delivery of environmental water to the wetlands in late winter and spring to improve productivity and the health and abundance of culturally significant species, as well as to suppress weeds, which is a key management action of the DDAC *Ryans Lagoon Cultural Wetland Management Plan*. The delivery of environmental water in winter/spring 2026 will provide the required watering regime and support the habitat of several species of focus for DDAC, including turtles, frogs, aquatic vegetation and waterbirds.

DDAC are working with La Trobe University to develop a seasonal calendar for Ryans Lagoon that documents the traditional seasons and the ecological response of the wetlands and Country in general. This calendar will incorporate learnings from research facilitated by La Trobe University, Turtles Albury Wodonga, Wodonga Urban Landcare Network, BirdLife Australia and North East CMA on freshwater turtles, native fish, waterbirds, frogs and native vegetation.

Watering planned and/or delivered in partnership with Traditional Owners to support cultural values and uses

Social, recreational and economic values and uses

In planning the potential environmental watering actions in **Table 5.2.1**, North East CMA considered how environmental flows could support values and uses, including:

- recreation and amenity (such as birdwatching)
- community and cultural events (such as visitation by schools, Landcare groups and other community members)
- socio-economic benefits (such as cultural tours and incidental visitation to local towns and businesses).

Environmental water deliveries will improve the function of the wetland by mimicking the natural flow regime, aiming to improve ecosystem function and provide multiple habitat niches for native plants and animals. This will align with a community benefit for members of the local Landcare group, Parklands Albury Wodonga and DDAC that have joint land management responsibilities and use the site for conservation and education-based events.

The 2026-27 proposed watering actions will support birdwatching activity opportunities, particularly of waterbirds during the summer months following environmental water delivery and wetland drawdown, as well as provide benefits to DDAC when hosting community and cultural events planned in 2026.

Environmental watering will also support waterbird-related recreational activities (e.g., twitching, birdwatching, ecological surveys) by providing suitable habitat to support food resources and foraging opportunities, including permanent, deep, open water habitat and inundated margins for waterbirds

Environmental watering will also support peaks in visitation (e.g., public events hosted by DDAC and its partners) by restoring a natural flow regime and demonstrating ecological outcomes from environmental water deliveries

Scope of environmental watering

The term 'environmental watering' refers to the active delivery of held environmental water to support particular environmental objectives by altering the flow in a river or the water level in a wetland. While other terms are sometimes used to describe the delivery of environmental water, 'environmental watering' is deliberately used here and in seasonal watering statements to ensure consistency in the legal instruments that authorise the use of water for the environment in Victoria.

Table 5.2.1 describes the potential environmental watering actions in 2026-27, their expected watering effect (that is, the intended physical or biological effects of the watering action) and the longer-term environmental objectives they support. Each environmental objective relies on one or more potential environmental watering actions and their associated physical or biological effects.

Table 5.2.1 Upper Murray wetlands potential environmental watering actions, expected watering effects and environmental objectives

Potential environmental watering action	Expected watering effects	Environmental objectives
Ryans Lagoon 1 and 2 (fill in winter/spring during August to November)	• Maintain permanent, deep, open water habitat that supports food resources for waterbirds, turtles and native fish • Prevent the encroachment of river red gum saplings and reduce exotic vegetation species • Mobilise carbon and nutrients within the wetlands to support wetland processes • Inundate margins to provide refuge and feeding habitat for small and large-bodied native fish • Increase soil moisture to promote the growth of fringing vegetation and the surrounding river red gum community • Inundate beds of aquatic and semi-aquatic vegetation to stimulate growth and increase their extent • Inundate wetland margins to provide habitat for waterbugs and foraging opportunities for waterbirds	A1, B1, CN1, F1, MI1, T1, V1, V2

Scenario planning

Table 5.2.2 outlines potential environmental watering and expected water use in a range of planning scenarios.

The upper Murray wetlands were added to the VEWH's seasonal watering plan in 2022-23. However, pumping environmental water was not required in 2022-23 or 2023-24 because natural floods filled Ryans Lagoon 1 and Ryans Lagoon 2, as well as other wetlands across the upper Murray floodplain. Environmental water achieved a partial fill of the wetland complex in 2024-25 and 2025-26.

The two lagoons would have filled most years before the river was regulated. They require frequent watering to maintain permanent water to sustain native fish, provide a reliable foraging site for waterbirds and ensure terrestrial vegetation does not encroach into the wetlands. For these reasons, the planned winter/spring watering is a high priority in all planning scenarios in 2026-27, except for the wet planning scenario. Water for the environment will likely be needed to fill both lagoons in the drought, dry and average planning scenarios.

Unregulated flows and natural floods in the Murray River system have the ability to inundate the wetlands in the wet planning scenario, and water for the environment will only be used in these conditions to top up water levels in each lagoon if they do not fill naturally.

Operational constraints meant that only a partial fill of Lagoon 1 and a complete fill of Lagoon 2 could be achieved in spring 2025. The drawdown rate within the wetlands was monitored over the summer following the spring watering. At the end of February 2026, Lagoon 1 was completely dry, and Lagoon 2 had drawn down to 75 cm below the target fill height. Further drawdown is expected in the wetlands prior to winter/spring 2026, and as such, a volume of 240 ML is again proposed for 2026-27 to achieve a complete fill of both Ryans Lagoon 1 and 2.

Table 5.2.2 Upper Murray wetlands environmental watering planning scenarios

Planning scenario	Drought	Dry	Average	Wet
Expected conditions	• No unregulated flow below Hume Dam • Regulated flow from Hume Dam may connect Ryans Floodway to allow pumping into Ryans Lagoon 2	• Unregulated flow is unlikely below Hume Dam • Regulated flow from Hume Dam may connect Ryans Floodway to allow pumping into Ryans Lagoon 2 • Possible spring Murray multi-site environmental watering action could deliver water to Ryans Floodway to allow pumping to Ryans Lagoon 2	• Unregulated flow is possible below Hume Dam if storages are near capacity • Unregulated flow may achieve a partial or complete fill of Ryans Lagoon 1 and 2 • Regulated flow from Hume Dam may connect the Ryans Floodway to allow pumping into Ryans Lagoon 2 • Possible spring Murray multi-site watering action could deliver water to the Ryans Floodway to allow pumping to Ryans Lagoon 2	• Periods of unregulated flow below Hume Dam are likely and may achieve a partial or complete fill of Ryans Lagoon 1 and 2 • Pumping into Ryans Lagoon 2 to top up Ryans Lagoons 1 and 2 could be considered to achieve a complete fill if a sufficient water height in Ryans Floodway can be achieved
Expected availability of water for the environment	• 240 ML	• 240 ML	• 240 ML	• 240 ML
Potential environmental watering – tier 1 (high priorities)	• Ryans Lagoon 1 and Ryans Lagoon 2 (fill in winter/spring)	• Ryans Lagoon 1 and Ryans Lagoon 2 (fill in winter/spring)	• Ryans Lagoon 1 and Ryans Lagoon 2 (fill in winter/spring)	• Ryans Lagoon 1 and Ryans Lagoon 2 (fill in winter/spring)
Possible volume of water for the environment required to achieve objectives	• 240 ML (tier 1)	• 240 ML (tier 1)	• 240 ML (tier 1)	• 0-240 ML (tier 1)

5.2.2 Barmah Forest

System overview

The Barmah Forest is located within the Yorta Yorta's traditional boundaries. The forest reserve is 29,305 ha in size and forms the Victorian component of the broader Barmah-Millewa Forest that covers about 66,000 ha where it spans the New South Wales/Victorian border between Tocumwal, Deniliquin and Echuca (Figure 5.2.2).

The Barmah-Millewa Forest is listed under the Convention on Wetlands of International Importance (the Ramsar Convention) as well as included in the ***Directory of Important Wetlands in Australia***, and it is one of six Living Murray icon sites. The forest's Victorian components are the Barmah National Park and part of the River Murray Reserve, protecting a river red gum forest and associated wetlands that support a broad diversity of significant plant and animal species and culturally significant sites.

Flooding in the Barmah-Millewa Forest depends on the flow in the Murray River. A natural narrowing of the river ('the narrows') restricts the flow and causes overbank flooding when the flow below Yarrawonga Weir exceeds the channel's capacity. This restriction influences both the operation of Yarrawonga Weir and the magnitude of environmental flows that can be delivered to the forests.

The delivery of irrigation water during summer/autumn is now managed to minimise the unseasonal flooding of the forest. Regulators along the banks of the Murray River that control the flow between the river and the forest remain closed during summer and autumn to restrict the flow through low-lying flood runners to simulate natural conditions. The delivery of water to the Barmah-Millewa Forest is also limited by a flow constraint below Yarrawonga Weir that aims to minimise impacts to adjacent farming operations in NSW. The current constraint limits the regulated flow to a maximum river level of 3.3 m at the Tocumwal gauge (subject to conditions). The 3.3 m limit equates to about a 17,000 ML per day flow. A regulated flow up to a river level of 3.0 m on the Tocumwal gauge (about 14,600 ML per day) can be delivered at any time during the year and is not subject to conditions. To manage this constraint, most environmental flows are alternated between the Barmah and Millewa forests to deliver water to low-lying wetlands in each forest at least every second year. It is currently not possible to achieve the desired flood depth and duration for floodplain marsh vegetation in both forests at the same time without larger natural flooding.

Water management at the Barmah-Millewa Forest seeks to build on the natural flow and the delivery of consumptive and operational water to optimise environmental outcomes when possible. As the Barmah-Millewa Forest is located towards the upper reaches of the regulated portion of the Murray River, water for the environment that passes through the forest and returns to the river can often be used at sites further downstream as part of multi-site watering events. Being a broad and relatively flat floodplain, management of water for the environment seeks to inundate the greatest area possible, which is currently restricted to about 20 per cent of the floodplain due to maximum delivery constraints within the river. However, there are some key wetlands where group-nesting waterbirds usually occur (such as Boals Deadwood, Harbours Lake, Reedy Lagoon and Top Island), and these will be preferentially targeted in the event of waterbird nesting commencing.

Figure 5.2.2 Barmah Forest

Environmental values

The Barmah-Millewa Forest supports important floodplain vegetation communities, including the threatened Moira grass plains, and is a significant feeding and breeding site for waterbirds. Significant populations of native fish, frogs and turtles live in the forest's waterways. Barmah Forest is known to support 74 plant and animal species listed under state and national legislation, and is especially important for the endangered Australasian bittern.

Environmental objectives in the Barmah Forest

	A1 – Increase frog populations
	**B1** – Support the successful recruitment of colonial nesting waterbirds
	**CN1** – Enable carbon and nutrient cycling between the floodplain and river through connectivity
	F1 – Increase habitat for native fish and increase their populations
	**G1** – Protect forest waterways from increased erosion
	**T1** – Increase turtle populations
	**V1** – Enhance the health of river red gum communities and aquatic vegetation in the wetlands and watercourses **V2** – Increase the extent and improve the condition of floodplain marsh vegetation communities, with a particular focus on Moira grass
	WQ1 – Reduce the risk of low-dissolved-oxygen events in summer

Traditional Owner cultural values and uses

> "We are the First People of this place. We were here even before the Murray River flowed through Barmah."
>
> – Uncle Des Morgan, Yorta Yorta Elder, ***Joint Management Plan for Barmah National Park***

The Yorta Yorta Nation Aboriginal Corporation is the Registered Aboriginal Party for a broad area that includes all of the Barmah-Millewa Forest, and it manages Barmah National Park with Parks Victoria under a Traditional Owner Land Management Agreement with the State of Victoria. The ***Joint Management Plan for Barmah National Park*** and the ***Yorta Yorta Whole-Of-Country Plan 2021-2030*** inform environmental water management in Barmah National Park. Ongoing interaction on land and water management at Barmah also occurs with Yorta Yorta through the Living Murray Indigenous Partnerships Program.

The Yorta Yorta Nation Aboriginal Corporation continues to pursue the Yorta Yorta people's inherent rights to water for Country. Rights to water will address their spiritual, cultural, environmental, social and economic needs, in line with the ***Yorta Yorta Whole-Of-Country Plan 2021-2030***.

Yorta Yorta values encompass an inherent and living connection to land (woka), water (wala) and caring for Country. Examples of Yorta Yorta cultural values and uses in Barmah Forest that are supported through deliveries of water for the environment include:

- maintaining refuges that protect turtles, an important totemic species for the Yorta Yorta people, and native small-bodied fish such as southern pygmy perch, where reintroduced
- watering to support floodplain marsh vegetation, which includes important food, fibre and medicinal plants (such as sneezeweed and weaving sedge)
- improving the health of river red gums, which has benefits for important Yorta Yorta sites and significant markings (such as a scarred tree) and furthers connections to Country
- conserve abundant wildlife populations and protect and recover culturally important and threatened animal species
- protect nurtja gakan (our river forests and wetlands) through cultural practices, burning, improved watering and invasive plant and animal control
- protect, restore and reconnect the remnant vegetation and seasonal wetlands on natja (the grassy woodland plains)
- broader restoration to achieving healthy Country.

Increasing the involvement of Traditional Owners in planning and managing environmental flows and progressing opportunities towards self-determination in the environmental watering program is a core commitment of the VEWH and its program partners. This is reinforced by legislation and policy commitments, including the *Water Act 1989*, the ***Victorian Aboriginal Affairs Framework***, the 2016 ***Water for Victoria***, the 2022 ***Water is Life: Traditional Owner Access to Water Roadmap***, and, in some cases, agreements under the *Traditional Owner Settlement Act 2010*.

Social, recreational and economic values and uses

In planning the potential environmental watering actions in **Table 5.2.3**, the Goulburn Broken CMA, in conjunction with Yorta Yorta and Parks Victoria as joint managers, considered how environmental flows could support values and uses, including:

- water-based recreation (such as boating, fishing, canoeing)
- riverside recreation and amenity (such as birdwatching, picnicking, photography, camping and the general physical, mental and social benefits of being in nature)
- community events and tourism
- socio-economic benefits (such as for apiarists and improved water quality).

Generally, sites located along the major rivers have had high visitor exposure, where an increased flow associated with environmental water management could be seen as a benefit, where flooding did not prevent access.

Increased fishing and yabbying opportunities occur in all waterways where accessible. Improved birdwatching opportunities generally exist throughout the forest, especially in places that have previously flooded, given the stronger tree canopy and flowering responses to flooding.

Socio-economic considerations include:

- increased tourism opportunities (camping, fishing, birdwatching, canoeing, tourist boat patronage) leading to local economy expenditure (shopping, fuel, accommodation, food, services, etc)
- improved water quality in the Murray River downstream of the forest caused by forest-diverted flows returning to the river. This greatly reduces sediment loads – there is less turbidity – leading to lower town water supply processing costs, increasing sunlight penetration in the river to boost plant and algae growth and improving river aesthetics
- improved ability to bypass the narrows in spring when environmental water passes through the forest, returning downstream of the narrows where it can then be available for consumptive use.

	Environmental watering will also support water sports activities (e.g., canoeing, kayaking, swimming) by maintaining relatively high water levels in the Murray River and forest waterways
	Environmental watering will also support waterbird-related recreational activities (e.g., twitching, birdwatching) by targeting the inundation of wetlands used by birds as feeding, roosting and nesting areas
	Environmental watering will also support angling activities by inundating the waterway, providing more angling opportunities and targeting fish breeding cues to increase populations for future angling opportunities
	Environmental watering will also support peaks in visitation (e.g., camping or other public activities on long weekends or school holidays) by inundating forest waterways and wetlands in spring and early summer, increasing environmental aesthetics and wildlife viewing opportunities

Scope of environmental watering

The term 'environmental watering' refers to the active delivery of held environmental water to support particular environmental objectives by altering the flow in a river or the water level in a wetland. While other terms are sometimes used to describe the delivery of environmental water, 'environmental watering' is deliberately used here and in seasonal watering statements to ensure consistency in the legal instruments that authorise the use of water for the environment in Victoria.

Table 5.2.3 describes the potential environmental watering actions in 2026-27, their expected watering effect (that is, the intended physical or biological effects of the watering action) and the longer-term environmental objectives they support. Each environmental objective relies on one or more potential environmental watering actions and their associated physical or biological effects.

Table 5.2.3 Barmah Forest potential environmental watering actions, expected watering effects and environmental objectives

Potential environmental watering action	Expected watering effects	Environmental objectives
Winter/spring forest low flow to various waterways in Barmah Forest (variable flow rates and duration during July to December 2026 and June 2027)	• Provide a gradual connection of waterways with the Murray River to minimise erosion within those waterways • Provide flow in forest waterways to make sure adequate refuge pools persist for native fish (including southern pygmy perch release sites) and turtles • Provide adequate depth and connection between floodplain waterways and the river to facilitate the movement of native fish • Remove accumulated organic matter from waterways to cycle carbon to the river system and minimise the risk of low-dissolved-oxygen blackwater by ensuring through-flow	CN1, F1, G1, T1, WQ1
Winter/spring/ summer low flow in the Murray River (greater than 7,500 ML/day below Yarrawonga Weir during August to December)	• Maintain a sufficient water level in the Murray River main channel to prevent Murray cod from abandoning their nests, increase juvenile survival and improve dispersal opportunities	F1
Spring/summer fresh(es) in the Murray River channel (one to three freshes that increase flow by at least 500 ML/ day and maintain it for two to eight days during November to December)	• Provide variable water levels once water temperatures exceed 22°C to trigger the spawning of native fish species, primarily silver perch	F1
Spring/summer/ autumn freshes to Gulf and Boals creeks (100 ML/day for three to five days as required during November to April)	• Maintain critical refuge pools to provide habitat for native fish (including southern pygmy perch release sites) and turtles • Flush refuge pools to maintain water quality	F1, T1, WQ1
Spring/summer/ autumn low flow to floodplain waterways, including Kynmer, Sandspit, Gulf, Big Woodcutter, Boals and Island creeks and Punt Paddock Lagoon (up to 200 ML/day for 30-60 days during November to April)	• Replenish refuge pools in permanent waterways to maintain water quality, fish (including southern pygmy perch release sites) and turtle populations • Maintain connectivity between the forest and the river • Remove accumulated organic matter, cycle carbon to the river system, and minimise the risk of low-dissolved-oxygen blackwater	CN1, F1, T1, WQ1

Potential environmental watering action	Expected watering effects	Environmental objectives
Boals Deadwood, Harbours Lake, Reedy Lagoon and Top Island wetlands fill or top-up (200-400 ML/day for four and a half months during September to February)	• Provide a cue to initiate waterbird breeding and maintain a depth of at least 0.5 m beneath reedbed-nesting waterbirds • Maintain wetting duration and depth to grow the wetland vegetation	 B1  V1
Spring wetting of floodplain marshes (variable flow rates between 8,300-14,600 ML/day[1] below Yarrawonga Weir for three months during September to December)	• Inundate open plains to a sufficient depth and for a sufficient duration to allow the growth of floodplain marsh vegetation • Inundate forest wetlands and low-lying floodplain areas to create foraging opportunities for waterbirds and increase available habitat for turtles, frogs and small-bodied native fish • Support waterbird breeding by maintaining a depth of at least 0.5 m beneath reed beds supporting group-nesting waterbirds	A1  B1 F1  T1  V2
Autumn/winter low flow in the Murray River (4,000-5,000 ML/day downstream of Yarrawonga during May to June)	• Increase the water depth in the Murray River channel to provide habitat for large-bodied native fish in the Murray River and unregulated anabranches in the Barmah-Millewa Forest	F1
Floodplain to river connection flow (variable flows to maintain less than 100 mm head differential through forest regulators during spring and summer)	• Enable native fish to exit the forest floodplain and return to the river	F1
Gulf Creek low flow (10 ML/day during summer)	Maintain dissolved-oxygen levels in the Gulf Creek regulator pool to support native fish	F1 WQ1

1 The maximum flow constraint is a level of 3.0 m at the Tocumwal gauge in the Murray River, achieved with a flow of 14,500 ML/day downstream of Yarrawonga Weir with all Barmah-Millewa Forest regulators open, or if only Barmah Forest regulators open, then this is achieved with a flow from Yarrawonga at 12,000 ML/day (the latter as per experience with the spring 2025 watering event).

Scenario planning

Table 5.2.4 outlines potential environmental watering and expected water use in a range of planning scenarios.

Barmah Forest experienced only one brief natural flood peak in 2025-26, which inundated an area slightly more than that achieved with environmental water releases alone under current delivery constraints (as delivered in 2024-25). Preferably, water for the environment would have directly followed this event to extend the duration of floodplain inundation, but delivery was delayed by two months due to local infrastructure works, meaning wetlands had mostly started drying in the interim. Nevertheless, the Moira grass plains achieved two months of continuous inundation from mid-October to create a reasonable flood regime on the lower regions of the floodplain. The broader forest therefore remained very dry, and very hot and dry conditions prevailed, forming a strong demarcation line on the floodplain between areas that had been inundated compared to those that had not. The last broadscale flooding of the forest was in spring 2022.

The potential watering actions in each climate scenario are required in most or all years to support the identified environmental values and objectives and are very similar to those outlined in previous plans.

The ecological objectives for the Barmah-Millewa Forest require a sustained flow in the Murray River from mid-winter to the end of spring, reflecting the natural flood regime of this wetland system. Flow-control structures are used to direct water from the Murray River channel into the forest, with most of that water returning to the river as an anabranch system, transporting carbon and nutrients downstream to feed the riverine food web.

Current river flow constraints, combined with regulator replacement works and metering issues in Millewa Forest, mean environmental watering will primarily target Barmah Forest in 2026-27, aiming to meet the depth and duration targets for wetlands. Millewa Forest may still receive a flow, but depth and duration targets for some forest wetlands may not be fully met.

Demands for water for the environment in Barmah Forest vary significantly in response to seasonal conditions. The spring/summer/autumn freshes provide critical short-term flows into forest anabranches to maintain water quality and avoid loss of native fish and turtles.

In drought conditions, fewer environmental objectives are expected to be achieved due to lower water availability. The spring/summer freshes specifically aim to trigger silver perch spawning when the water temperature exceeds 22°C and are achieved by varying the flow in the Murray River below Yarrawonga Weir, which can be achieved in all planning scenarios. A primary aim is to maintain water levels and water quality in refuge habitats within the forest to sustain fish (including southern pygmy perch release sites) and turtle populations. To achieve these objectives, spring/summer/autumn freshes provide the relatively small volumes of water needed in the forest and are unlikely to return much water to the Murray River for downstream use. In addition, maintaining a constant low flow during summer in the Gulf Creek regulator pool maintains water quality and native fish.

In the dry, average and wet planning scenarios, watering actions are scaled to the conditions and supply. Given current moderate-to-low storage levels and forecast moderate-to-low water availability for 2026-27, smaller volume watering actions are prioritised in the dry planning scenario. As such, the winter/spring forest low flow (translucent regulator strategy of opening regulators in winter while river levels are low) may have to be abandoned this coming year in favour of attempting to just maintain inundation of floodplain marshes (Moira grass plains) for two months in spring as part of a broader Murray multi-site event to get return flows downstream. Water for the environment may be able to 'piggyback' high operational transfers from Hume Dam or small natural flood peaks.

In the average or wet planning scenarios, the focus shifts to building resilience in the system by enhancing ecological responses to unregulated floods. Actions in the average and wet planning scenarios (such as spring wetting of floodplain marshes) may include extending the duration of unregulated floods (within flow constraints) to increase the vigour and resilience of wetland communities (such as Moira grass plains) and extending watering in river red gum forests to maintain the health of the trees. Large volumes of water will be directed into the forest, with water for the environment provided as a directed release from Hume Dam targeting specific flow rates downstream of Yarrawonga Weir and managed using forest regulators. Most of the water used for these actions eventually returns to the Murray River through the natural shedding action of the floodplain. Specific watering of group-nesting waterbird sites in summer may be delivered if significant events occur.

Forest regulators are usually closed in summer and autumn (and sometimes in spring if water availability is low) to keep unnaturally high river flows out of the forest and allow a natural drying phase. However, there have been instances of trapped fish behind regulators (those unable to return to the Murray River before regulator gates were closed) that have sometimes died in mass casualty events from asphyxiation when dissolved oxygen concentrations dropped to critical low levels. The main waterways behind regulators at Gulf, Punt and Boals creeks may be needed to maintain critical refuge by improving dissolved-oxygen levels for native fish using only a small volume of water.

Table 5.2.4 Barmah Forest environmental watering planning scenarios

Planning scenario	Drought	Dry	Average	Wet
Expected conditions	• Unregulated flow periods are unlikely • Flow in the Murray River will remain within the channel all year • Forest waterways and wetlands dry	• Some small, unregulated flow in late winter/spring • Low chance of overbank flow in late winter/spring • Forest waterways hold some water, but wetlands dry	• Likely chance of small-to-medium unregulated flow in winter/spring • Likely chance of overbank flow in winter/spring • Forest waterways and most low-lying wetlands hold water	• High probability of moderate to large unregulated flow in winter/spring • Expected large overbank flow • Forest waterways and all low-lying wetlands are inundated
Potential environmental watering – tier 1 (high priorities)	• Spring/summer fresh(es) in the Murray River (one to three freshes) • Spring/summer/autumn fresh(es) to Gulf and Boals creeks • Gulf Creek low flow	• Winter/spring forest low flow • Winter/spring/summer low flow in the Murray River • Spring/summer fresh(es) in the Murray River (one to three freshes) • Spring/summer/autumn freshes to Gulf and Boals creeks • Spring/summer/autumn low flow to floodplain waterways • Fill or top up Boals Deadwood • Spring wetting of floodplain marshes • Autumn/winter low flow in the Murray River • Floodplain to river connection flow • Gulf Creek low flow	• Winter/spring forest low flow • Winter/spring/summer low flow in the Murray River • Spring/summer fresh(es) in the Murray River (one to three freshes) • Spring/summer/autumn fresh(es) to Gulf, Punt and Boals creeks • Spring/summer low flow to floodplain waterways • Fill or top up Boals Deadwood, Harbours Lake, Reedy Lagoon and Top Island wetlands • Spring wetting of floodplain marshes • Autumn/winter low flow in the Murray River • Floodplain to river connection flow • Gulf Creek low flow	• Winter/spring forest low flow • Winter/spring/summer low flow in the Murray River • Spring/summer fresh(es) in the Murray River (one to three freshes) • Spring/summer/autumn fresh(es) to Gulf, Punt and Boals creeks • Spring/summer low flow to floodplain waterways • Fill or top up Boals Deadwood, Harbours Lake, Reedy Lagoon and Top Island wetlands • Spring wetting of floodplain marshes • Autumn/winter low flow in the Murray River • Floodplain to river connection flow • Gulf Creek low flow

Planning scenario	Drought	Dry	Average	Wet
Potential environmental watering – tier 2 (additional priorities)	• Spring wetting of floodplain marshes • Autumn/ winter low flow (in the Murray River) • Floodplain to river connection flow	• N/A	• N/A	• N/A
Possible volume of water for the environment required to achieve objectives[1,2]	• Variable ~9,000 ML (tier 1)	• 60,000 ML (tier 1)	• 267,000 ML (tier 1)	• 168,000 ML (tier 1)

1 The possible volumes of water for the environment required in Barmah Forest are estimates and highly variable, depending on factors such as seasonal conditions and the contributions of operational and/or unregulated flows. Much of the water for the environment delivered to Barmah Forest is returned to the Murray River – around 80 percent (less in the dry planning scenarios but more in the wet planning scenarios) – and can be reused at downstream sites.

2 The volume of water for the environment required to deliver tier 2 watering actions in the drought and dry planning scenarios will depend on demands for multi-site environmental events or operational transfers and is therefore not estimated.

5.2.3 Gunbower Forest and Creek

System overview

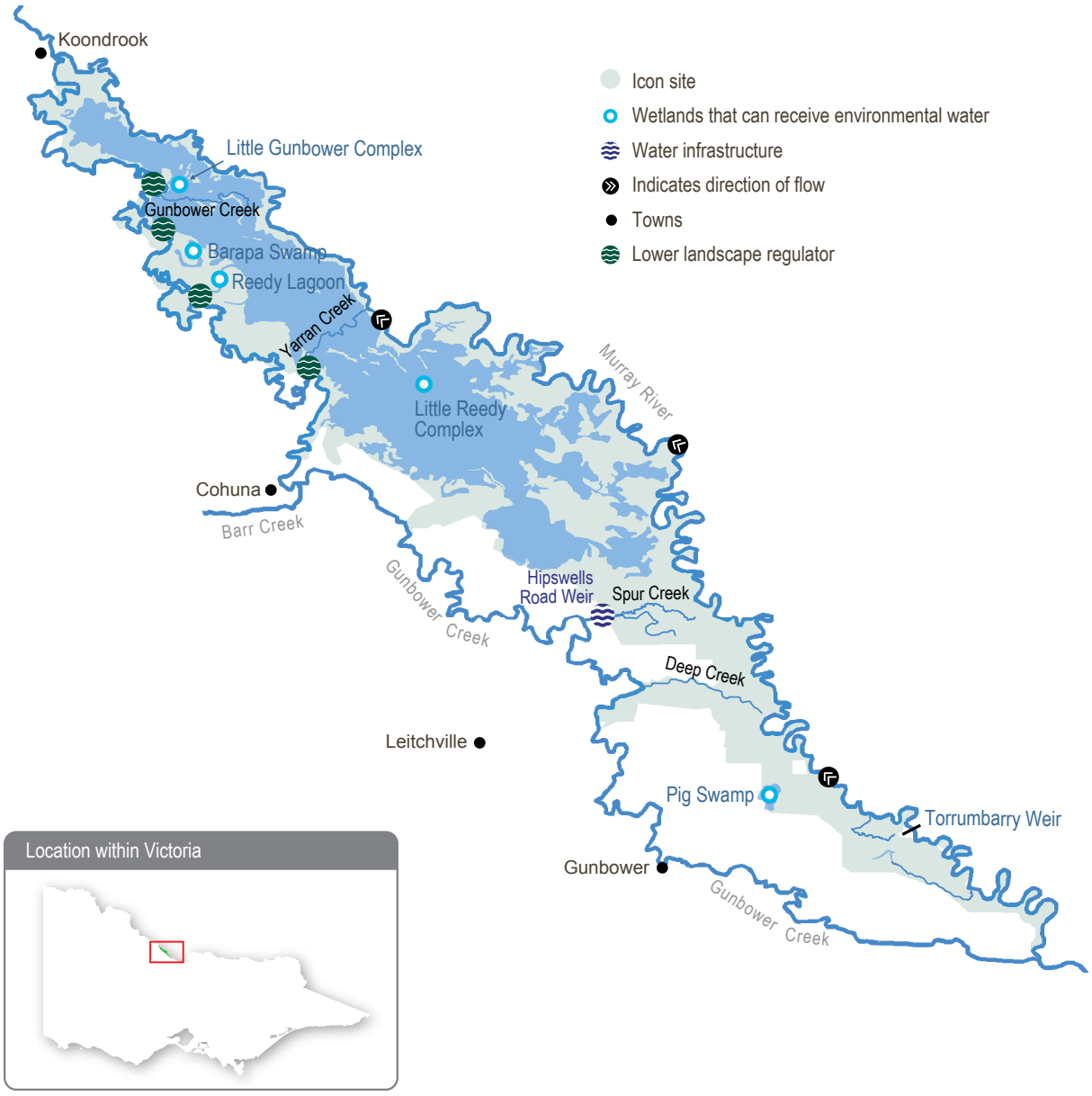
Gunbower Forest is a large (19,450 ha), flood-dependent forest situated on the Murray River floodplain in northern Victoria between Torrumbarry and Koondrook (Figure 5.2.3).

Gunbower Forest is bounded by the Murray River to the north and Gunbower Creek to the south. It is an internationally significant site under the Ramsar Convention and forms part of the Living Murray Gunbower-Koondrook-Perricoota Forests icon site. Regulation of the Murray River and water extraction has reduced the frequency, duration and magnitude of flood events in Gunbower Forest over the long term. This has affected the extent and condition of floodplain habitats and the health of native plants and animal communities (such as river red gum and black box communities, native fish, birds, platypus, frogs and turtles) that depend on those habitats.

Gunbower Creek is a natural creek that has been modified to supply irrigation water from the Murray River to the Torrumbarry Irrigation Area. There are 13 lagoons, largely located in the upper reaches of the creek system, that are permanently or seasonally connected to Gunbower Creek. Water for the environment is used in Gunbower Creek to improve habitat for native fish, especially Murray cod.

The Living Murray environmental works program in the middle and lower forest was completed in 2013-14. The works allow up to 4,500 ha of the wetlands and floodplain to be watered with considerably less water than would be required if the watering infrastructure was not in place. The works enable efficient watering through Gunbower Creek and the forest to maintain wetland and floodplain condition and provide connectivity between the creek, forest floodplain and the Murray River. Frequent connections between the river and floodplain habitats allow animals to move between habitats and support ecosystem functions (such as carbon exchange).

Figure 5.2.3 Gunbower Forest and Creek



Environmental values

Gunbower Forest contains many important environmental values. It includes rare and diverse wetland habitats and large areas of remnant vegetation communities (such as river red gum forest and woodlands). It is home to vulnerable and endangered plants and animals, including river swamp wallaby grass, wavy marshwort, Murray-Darling rainbowfish and eastern great and intermediate egrets. Gunbower Forest also supports internationally recognised migratory waterbird species.

Gunbower Creek provides important habitat for native fish such as Murray cod, golden perch and freshwater catfish. It is a valuable refuge for native fish and provides a source of fish to recolonise surrounding waterways.

Environmental objectives in Gunbower Forest and Creek

A1 – Increase the diversity and abundance of native frog species within the forest

B1 – Provide feeding, breeding and refuge habitat for waterbirds, including colonial nesting species (such as egrets, cormorants and herons)

CN1 – Enable carbon and nutrient cycles in the forest and wetlands, and periodically deliver carbon and nutrients from the forest to adjacent waterways to support food webs

F1 – Maintain healthy populations of native fish in wetlands and increase opportunities for riverine fish to access floodplain resources

F2 – Increase the abundance and improve the age class distribution of small-bodied and large-bodied native fish species in Gunbower Creek

F3 – Increase connectivity to promote movement and migration of native fish

F4 – Rehabilitate populations of native fish that are poorly represented or absent in the system (such as silver perch)

T1 – Maintain freshwater turtle populations by providing suitable feeding, breeding and refuge habitat

V1 – Improve the health and increase the abundance of native vegetation in permanent and semi-permanent wetlands

V2 – Improve the health of river red gum communities

V3 – Maintain the health of black box communities

WQ1 – Maintain the water quality in Gunbower Creek

Traditional Owner cultural values and uses

Yorta Yorta Nation Aboriginal Corporation (YYNAC) is a Registered Aboriginal Party (RAP) representing Traditional Owners with connections to the upper areas of Gunbower Forest. The Barapa Barapa First Nations People have connections to the middle and lower areas of Gunbower Forest.

North Central CMA supports self-determined involvement by Traditional Owners in environmental water planning and delivery, and environmental watering at Gunbower Forest is guided by ongoing consultation with the Yorta Yorta and Barapa Barapa First Nations People, to make sure opportunities to participate are readily available and can be prioritised if desired.

The Yorta Yorta First Nations people's participation in environmental water planning and delivery is facilitated by the Yorta Yorta Nation Aboriginal Corporation (YYNAC). Gunbower Forest is a highly significant cultural landscape for Yorta Yorta people, forming part of the broader Murray River floodplain system and supporting strong connections to Country, cultural practices, and the continuation of knowledge. Yorta Yorta Nation seeks to see Gunbower Forest managed in a way that maintains a healthy and functioning floodplain, including appropriate timing, duration, and extent of flooding that supports natural wetting and drying cycles. This is particularly important for supporting river red gum health and regeneration, waterbird breeding events, and the condition of wetlands and forest understorey. Culturally important species include waterbirds, frogs, freshwater turtles, and native fish such as Murray cod and golden perch, alongside key vegetation communities including river red gum, black box, lignum, and native aquatic vegetation that are critical to both habitat and cultural values.

Barapa Barapa have clearly expressed their aspirations for an active role in the management of land and water to fulfil custodianship obligations and contribute to improvements in the health of Country. Barapa Barapa have been working in partnership with North Central CMA to culturally inform environmental water activities in Gunbower Forest since 2015.

The cultural objectives that can be supported in 2026-27 have been informed by the Cultural Watering Objectives Framework, seasonal watering proposal engagement and formal and informal engagement with Barapa Barapa Traditional Owners throughout the year. The cultural objectives that can be achieved will depend on which environmental water operations are implemented, which will be guided by climatic conditions.

Increasing the involvement of Traditional Owners in planning and managing environmental flows and progressing opportunities towards self-determination in the environmental watering program is a core commitment of the VEWH and its program partners. This is reinforced by legislation and policy commitments, including the *Water Act 1989*, the ***Victorian Aboriginal Affairs Framework***, the 2016 ***Water for Victoria***, the 2022 ***Water is Life: Traditional Owner Access to Water Roadmap***, and, in some cases, agreements under the *Traditional Owner Settlement Act 2010*.

Social, recreational and economic values and uses

In planning the potential watering actions in **Table 5.2.5**, North Central CMA considered how environmental flows could support values and uses, including:

- water-based recreation (such as boating, canoeing, fishing, stand-up paddle boarding and water skiing)
- recreation and amenity (such as birdwatching, camping, photography and walking)
- community events and tourism (such as park visitation and tours and activities)
- socio-economic benefits (such as firewood harvesting, tourism and education opportunities).

Environmental flows may be modified to align with a social or recreational objective so long as environmental objectives are not compromised.

	Gunbower Forest watering is planned to support peaks in visitation (e.g., camping or other public activities on long weekends or school holidays)
	Gunbower Forest watering and the Gunbower Creek flow also provide opportunities for kayaking
	Gunbower Forest watering and the Gunbower Creek flow also provide opportunities for birdwatching
	Gunbower Creek flows also provide opportunities for anglers and support events such as fishing competitions

Scope of environmental watering

The term 'environmental watering' refers to the active delivery of held environmental water to support particular environmental objectives by altering the flow in a river or the water level in a wetland. While other terms are sometimes used to describe the delivery of environmental water, 'environmental watering' is deliberately used here and in seasonal watering statements to ensure consistency in the legal instruments that authorise the use of water for the environment in Victoria.

Table 5.2.5 describes the potential environmental watering actions in 2026-27, their expected watering effect (that is, the intended physical or biological effects of the watering action) and the longer-term environmental objectives they support. Each environmental objective relies on one or more potential environmental watering actions and their associated physical or biological effects.

Table 5.2.5 Gunbower Forest and Creek potential environmental watering actions, expected watering effects and environmental objectives

Potential environmental watering action	Expected watering effects	Environmental objectives
Gunbower Forest		
Wetlands and flood runners inundation via lower landscape regulators (LLRs) (variable flow rates during winter/ spring)	• Provide water at a depth and extent that supports the growth and successful recruitment of flood-dependent vegetation in wetlands, flood runners and low-lying areas • Provide water at a depth and extent that supports habitat for small-bodies native fish, including recently stocked threatened small-bodies fish • Provide a diversity of water depths throughout the season to provide feeding, foraging and refuge habitat for water-dependent plants and animals, including waterbirds, turtles and frogs • Inundate the red river gum forest surrounding wetland complexes to support flood-dependent understorey vegetation	A1, B1, F1, T1, V1, V2, V3
Extend natural flooding of floodplain, flood runners and wetlands via the Hipwells Road regulator (variable flow rates during winter/spring) *Trigger: unregulated inflows increase the duration of inundation and/or inundation footprint*	• Support the continued recovery of floodplain understorey and river red gums, which are still recovering from the Millennium Drought, by extending the duration of natural inundation, if it occurs • Maintain a diversity of water depths throughout the season and maintain areas of feeding, foraging and refuge habitat for water-dependent plants and animals, including waterbirds, fish, turtles and frogs	A1, B1, F1, T1, V2, V3
Yarran Creek fresh (spring) *Trigger: dependent on water levels in Gunbower Forest, the Murray River and Gunbower Creek*	• Provide lateral connectivity between Gunbower Creek, the Murray River and the Gunbower Forest floodplain to allow the exchange of carbon, nutrients and propagules as well as the movement of fish and other aquatic animals	F1, F3, F4, CN1
Wetland top-ups: Reedy Lagoon, Barapa Swamp, Green Swamp, Corduroy Swamp, Little Reedy Lagoon, Little Gunbower Lagoon and/or Long Lagoon (summer)	• Maintain an appropriate water depth, extent and quality to support the growth and successful recruitment of wetland vegetation • Maintain an appropriate water depth and extent and stable water levels surrounding group-nesting waterbirds to support successful breeding, if triggered • Provide feeding, breeding and refuge habitat for waterbirds (including juveniles), small-bodied native fish, frogs, turtles and other water-dependent animals	A1, B1, F1, T1, V1

Potential environmental watering action	Expected watering effects	Environmental objectives
Wetland top-ups: Reedy Lagoon, Barapa Swamp, Green Swamp, Corduroy Swamp, Little Reedy Lagoon, Little Gunbower Lagoon and/or Long Lagoon (autumn)	• Trigger the early germination of aquatic vegetation on the margins of wetlands, which helps promote early establishment • Increase habitat for water-dependent animals	A1  B1 F1  T1  V1
Floodplain, flood runners and wetlands inundation (variable flow rates during winter 2027; average and wet scenarios only)	• Inundate river red gums and the flood-dependent and flood-tolerant understorey species to maintain and improve the condition of these ecological communities • Create connectivity between wetland complexes for the exchange of propagules, nutrients and aquatic organisms • Provide a diversity of habitats throughout autumn and winter for feeding, foraging and refuge for water-dependent plants and animals, including waterbirds, fish, turtles and frogs	A1  B1 F1  T1  V1, V2, V3
Gunbower Creek (targeting Cohuna Weir)		
Autumn/winter low flow (150-250 ML/day during July to August 2026 and April to June 2027)	• Maintain connectivity through the length of Gunbower Creek and between lagoons during the off-irrigation period and prevent sections from drawing down to isolated pools supporting movement, refuge use and survival of native fish • Provide access to food resources over the cooler months and reduce predation pressure on juvenile fish through increased habitat availability • At 250 ML/day, the effects above, plus: – enhanced hydraulic diversity and habitat availability, with increased velocities and greater inundation of foraging and shelter habitat for adult fish and young-of-year recruiting	F2, F3
Spring/summer stable high flow (above 400 ML/day during September to December)	• Maintain about 1.5 m depth in deep pools and 30 cm depth in the littoral zone to provide habitat and food resources for native fish • Minimise water level fluctuations to less than 0.5 m to support Murray cod and other native fish breeding and larval survival	F2, F3, F4
Summer/autumn high flow (above 300 ML/day during January to March)	• Maintain water to inundate fringing littoral habitat and provide resources for native fish, including adult and young-of-year Murray cod and small-bodied native fish • Maintain connectivity between habitats during the irrigation season	F2, F3, F4

Potential environmental watering action	Expected watering effects	Environmental objectives
Gunbower Creek (targeting Koondrook Weir)		
Year-round low flow (15-200 ML/day)	• Provide suitable conditions to support the emigration of native fish species (such as golden and silver perch and bony bream) via the Koondrook Weir fishway	**F3**
Spring/summer/ autumn fresh (up to 600 ML/day for three to 10 days from November to March)	• Provide a flow cue to attract native fish (such as Murray cod, golden perch, silver perch and bony bream) to migrate to the upstream reaches of Gunbower Creek, maximising the effect of the fishways at Koondrook and Cohuna weirs	**F2, F3, F4**
Trigger-based spring/summer freshes (50-300 ML/ day as required during September to February)	• Dilute low-dissolved-oxygen return flows from Gunbower Forest at Three Corner Hole to improve the water quality (oxygen concentration) in lower Gunbower Creek if required	**WQ1**

Scenario planning

Table 5.2.6 outlines potential environmental watering and expected water use in a range of planning scenarios.

Gunbower Forest

In 2022, Gunbower Forest received its largest flood since 1993, inundating about 80 per cent of the floodplain. This was followed by multiple unregulated flood peaks in 2023 and in January 2024 that added substantial inflows.

The extensive and prolonged inundation resulted in a decline in species diversity and plant cover in wetland vegetation communities between 2022 and 2023. In response, a drying phase was implemented across the forest in 2024-25 to allow the wetlands to reset.

During 2025-26, no unregulated inflows occurred at Gunbower Forest. Environmental water deliveries during this year provided the first year of a strategic plan to deliver consecutive waterings to recover the richness and cover of wetland species, with a wetland and low-lying floodplain watering delivered in winter/spring 2025.

In 2026-27, the delivery of environmental water to Gunbower Forest aims to consolidate vegetation recovery following the drying phase and the targeted watering delivered in 2025. Watering will be staged to provide an appropriate depth and duration for priority wetlands, maintain river red gum with flood-dependent understorey in low-lying areas and support habitat for waterbirds and aquatic animals. The operating mode and extent will vary with seasonal conditions, using the Hipwells Road regulator and/or lower landscape regulators to provide the optimal level and duration for wetlands and wetland complexes.

In the drought, dry and average planning scenarios, environmental water will be delivered to inundate wetland and low-lying floodplain via the lower landscape regulators, with the aim to support the continued recovery of the wetlands. This potential watering action will fill and spill key wetland complexes in winter/spring to maintain the condition of low-lying river red gum with flood-dependent understorey in the vicinity of the Little Reedy and Little Gunbower wetland complexes.

In a wet planning scenario, environmental water will be delivered as a high priority in 2026 to build on unregulated flooding by extending the duration of floodplain inundation and maintaining the area of inundation, helping to optimise benefits for river red gums and flood-tolerant understorey and woodland vegetation. This will be achieved through a hybrid approach, where water delivered via the Hipwells Road regulator supplements any gaps in unregulated flood flows to support up to 4,500 hectares of floodplain.

By topping up natural flooding, the event will support flood-dependent understorey plants and help consolidate the recovery of river red gum canopies, which are only now showing recovery to levels observed before the Millennium Drought. In the average and wet planning scenarios, deliveries to the floodplain via the Hipwells Road regulator will also be prioritised from early June 2027 and continue into the following water year to support flood-dependent tree and vegetation communities.

In the dry, average and wet planning scenarios, the Yarran Creek fresh aims to return carbon-rich water from the forest to Gunbower Creek and the Murray River and improve connectivity between the floodplain, forest and river to support aquatic productivity and animal movement. The watering action is a tier 2 priority in the drought planning scenario because water levels in the Murray River are unlikely to be sufficient to provide connectivity with the floodplain and enable animal movement. Any return flows would be subject to water-quality risk assessments to ensure dissolved-oxygen levels remain adequate in receiving waterways.

Wetland top-ups may occur in all planning scenarios to maintain inundation and optimise vegetation and waterbird outcomes. Top-up events may be initiated at individual wetlands where waterbird breeding has been identified or where additional inundation is required to support wetland vegetation and optimise the ecological outcomes of watering actions during the season.

Gunbower Creek

The flow in Gunbower Creek is highly influenced by irrigation demands, which can cause significant fluctuations in the creek's water level during the irrigation season. Without environmental water, there would be little or no flow from late autumn to the end of winter. Water for the environment is primarily used to smooth out these flow fluctuations to provide habitat and breeding and dispersal opportunities for native fish throughout the year.

In 2026-27, the delivery of environmental water in Gunbower Creek aims to support the continued recovery of native fish following the impacts of floods in 2022 and 2023-24. Environmental water delivery in all planning scenarios aims to provide the seasonal flow patterns that native fish rely on: steady winter flows, higher flows during the spring and summer breeding period, gentle summer/autumn edge flows for feeding and refuge, and occasional movement cues to help fish move into the creek.

The low-flow recommendations for Gunbower Creek aim to maintain habitat connectivity during the off-irrigation season when flows were historically ceased before the introduction of environmental water in 2013.

During the irrigation season, a high flow will generally be delivered. The Murray cod breeding season extends from about September to December, depending on the weather and water temperature, and the flow aims to maintain a stable high flow during this period to prevent Murray nest abandonment due to variable water levels. A high flow during summer/autumn will maintain nursery habitat to support the recruitment of native fish, particularly Murray cod. From autumn, the flow will gradually be reduced to provide a smooth transition between the irrigation and non-irrigation seasons. All low-flow targets will be subject to the environment's share of channel capacity.

In the wet planning scenario, other opportunistic or trigger-based watering actions may be delivered in Gunbower Creek during 2026-27 to optimise ecological outcomes and manage risk (such as periods of low-dissolved-oxygen conditions in the creek). If this happens, a trigger-based dilution flow may be delivered downstream of Koondrook Weir to mitigate impacts to aquatic animals.

Gunbower Creek's ability to meet flow demands has changed in recent years, and the magnitude of planned environmental flows has been adjusted accordingly to achieve the targeted physical and ecological responses within the current operational environment. In 2024-25, the native fish flow regime for Gunbower Creek was reviewed and updated to incorporate the latest science and learnings to make sure flows continue to support native fish breeding, movement and access to habitat.

Carryover priority

Priority carryover volume for the Gunbower Forest is the estimated volume required to achieve watering from 1 July 2027. These potential watering actions will be detailed in the *Seasonal Watering Plan 2027-28*. The priority carryover volume in the wet planning scenario is to cover part B of the potential environmental watering action that is planned to start in late 2026-27 and continue into 2027-28. For Gunbower Creek, the priority carryover volume is 5,000 ML in all planning scenarios to supply a winter baseflow component during the off-irrigation season from 1 July to 15 August.

Table 5.2.6 Gunbower Forest and Creek environmental watering planning scenarios

Planning scenario	Drought	Dry	Average	Wet
Expected conditions	• Natural inflows into Gunbower Forest are unlikely, with Murray River flows expected to remain low	• Natural inflows into Gunbower Forest are unlikely, with Murray River flows expected to remain low • Some run-off-producing rainfall is expected, with inflows into storages unlikely to cause spills and unregulated flow	• Natural inflows into Gunbower Forest during winter/spring are possible and could result in inundation of low-lying creeks and wetlands	• Overbank flows are likely in winter and/or spring • High inflows into full storages in autumn, winter and/or spring 2026 will likely result in spilling events and unregulated flooding
Gunbower Forest				
Potential environmental watering – tier 1 (high priorities)	• Wetlands and flood runners inundation via (LLRs) (variable flow rates during winter/spring) • Wetland top-ups (summer) • Wetland top-ups (autumn)	• Wetlands and flood runners inundation via (LLRs) (variable flow rates during winter/spring) • Yarran Creek fresh (spring) • Wetland top-ups (summer) • Wetland top-ups (autumn)	• Wetlands and flood runners inundation via (LLRs) (variable flow rates during winter/spring) • Yarran Creek fresh (spring) • Wetland top-ups (summer) • Wetland top-ups (autumn) • Floodplain, flood runners and wetlands inundation (winter 2027)	• Extend the natural flooding of floodplain, food runners and wetlands via the Hipwells Road regulator (variable flow rates during winter/spring) • Yarran Creek fresh (spring) • Wetland top-ups (summer) • Wetland top-ups (autumn) • Floodplain, flood runners and wetlands inundation (winter 2027)
Potential environmental watering – tier 2 (additional priorities)	• Yarran Creek fresh (spring)	• N/A	• N/A	• N/A
Possible volume of water for the environment required to achieve objectives	• 30,500 ML (tier 1) • 2,400 ML (tier 2)	• 32,900 ML (tier 1) • N/A (tier 2)	• 50,900 ML (tier 1) • N/A (tier 2)	• 66,400 ML (tier 1) • N/A (tier 2)

Planning scenario	Drought	Dry	Average	Wet
Priority carryover requirements for 2027-28	• N/A	• 20,000 ML	• 30,000 ML	• 25,000 ML
Gunbower Creek (targeting Cohuna Weir)				
Potential environmental watering – tier 1 (high priorities)	• Autumn/ winter low flow (250 ML/day) • Spring/summer stable high flow • Summer/ autumn high flow	• Autumn/ winter low flow (150-200 ML/ day) • Spring/summer stable high flow • Summer/ autumn high flow	• Autumn/ winter low flow (150-200 ML/ day) • Spring/summer stable high flow • Summer/ autumn high flow	• Autumn/ winter low flow (150-200 ML/ day) • Spring/summer stable high flow • Summer/ autumn high flow
Potential environmental watering – tier 2 (additional priorities)	• N/A			
Gunbower Creek (targeting Koondrook Weir)				
Potential environmental watering – tier 1 (high priorities)	• Spring/summer/ autumn fresh • Year-round low flow	• Spring/summer/ autumn fresh • Year-round low flow	• Spring/summer/ autumn fresh • Year-round low flow	• Spring/summer/ autumn fresh • Year-round low flow • Trigger-based spring/summer dilution flows
Potential environmental watering – tier 2 (additional priorities)	• N/A			
Possible volume of water for the environment required to achieve objectives	• 23,000 ML (tier 1) • N/A (tier 2)	• 18,000 ML (tier 1) • N/A (tier 2)	• 18,000 ML (tier 1) • N/A (tier 2)	• 19,000 ML (tier 1) • N/A (tier 2)
Priority carryover requirements for 2027-28	• 5,000 ML	• 5,000 ML	• 5,000 ML	• 5,000 ML

5.2.4 Central Murray wetlands

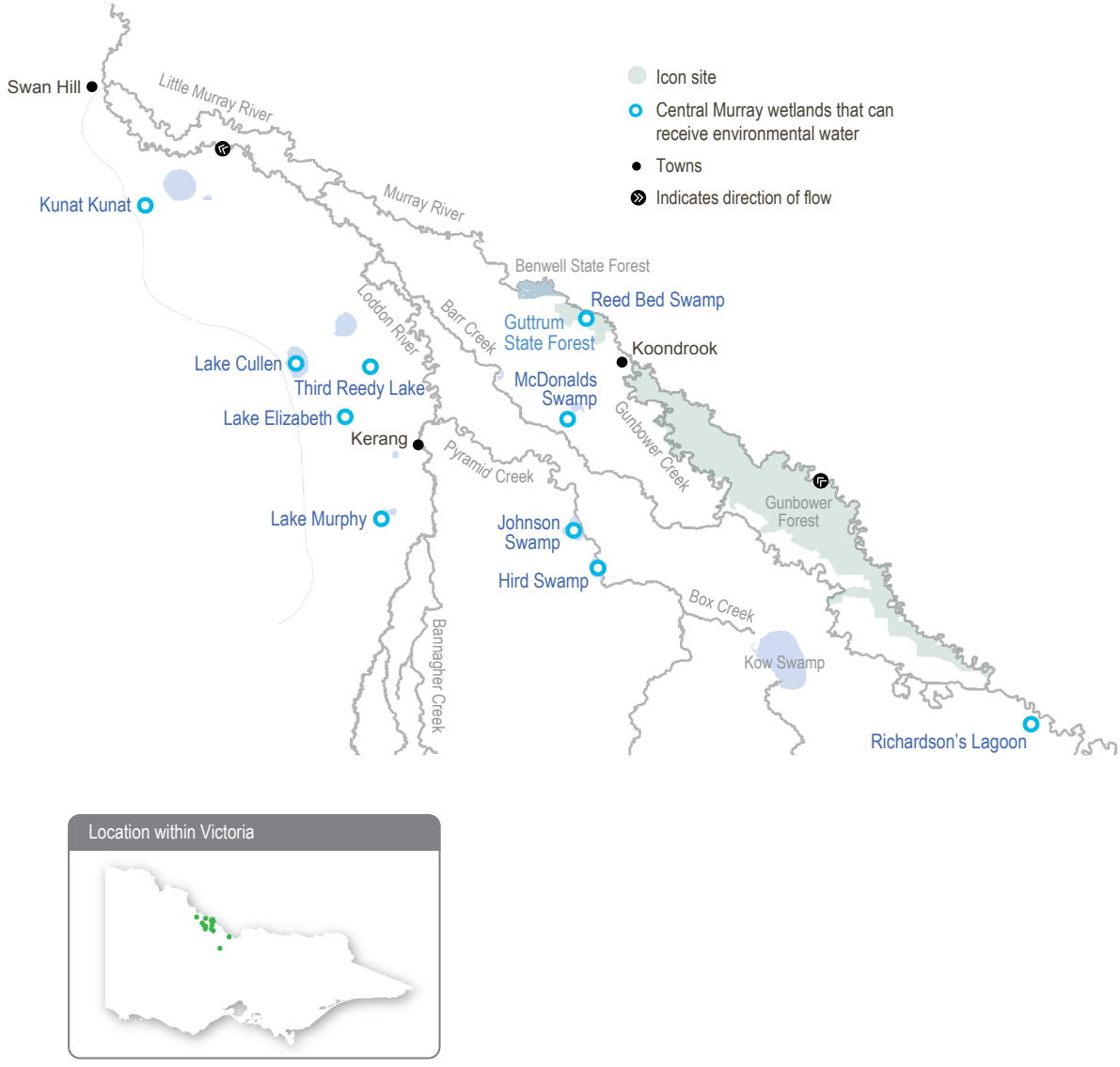
System overview

The central Murray wetlands are located on the lower Loddon River and Murray River floodplains (Figure 5.2.4). The wetland system includes Hird Swamp, Johnson Swamp, Kunat Kunat (Round Lake), Lake Cullen, Lake Elizabeth, Lake Murphy, McDonalds Swamp, Richardson's Lagoon, Third Reedy Lake and the Reed Bed Swamp complex in Guttrum Forest.

The central Murray wetlands are almost wholly contained within the Torrumbarry Irrigation Area and are all wetlands of regional or international significance. The area has experienced dramatic changes since European settlement with the construction of levees, roads and channels. Most of the wetlands are now cut off from natural flow paths and are rarely filled, except by large natural floods. They rely on water for the environment to support their ecological character and health.

Nine of the central Murray wetlands can receive water for the environment from permanent infrastructure. These wetlands are Hird Swamp, Johnson Swamp, Kunat Kunat, Lake Cullen, Lake Elizabeth, Lake Murphy, McDonalds Swamp, Richardson's Lagoon and Third Reedy Lake. Temporary pumps are currently used to deliver water for the environment from the Murray River to Reed Bed Swamp in Guttrum Forest when required. More permanent water delivery infrastructure for the forest is proposed as part of the Victorian Murray Floodplain Restoration Project.

Figure 5.2.4 Central Murray wetlands



Environmental values

The central Murray wetlands support numerous listed threatened species ranging from vulnerable to critically endangered, including the Australasian bittern, Murray hardyhead, Australian painted snipe, growling grass frog and southern purple spotted gudgeon, which was presumed extinct in Victoria until it was found at Third Reedy Lake in spring 2019. 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. Lake Cullen, Hird Swamp, Third Reedy Lake and Johnson Swamp are internationally recognised under the Ramsar Convention, while the other wetlands in the central Murray system have bioregional significance. The environmental objectives for the central Murray wetlands are outlined below.

Environmental objectives in the central Murray wetlands

	A1 – Maintain populations of common native frogs (such as barking marsh frog, Peron's tree frog and spotted grass frog)
	**B1** – Provide resting and feeding habitat for a variety of waterbird feeding guilds, including threatened species (such as Caspian tern, Australasian bittern, Australian little bittern and brolga) **B2** – Provide breeding habitat for a variety of waterbird feeding guilds, including threatened species (brolga, Australasian bitterns, blue-billed ducks)
	**CN1** – Maintain, increase or enable carbon and nutrient cycling and connectivity
	F1 – Maintain populations of small-bodied native fish, including threatened species (such as Murray hardyhead) **F2** – Protect and increase populations of native fish in Pyramid Creek
	**MI1** – Increase the diversity and biomass of waterbugs
	**T1** – Maintain populations of native turtles (such as the Murray River turtle and the eastern long-necked turtle)
	**V1** – Restore the extent of wetland trees (such as river red gum and black box) **V2** – Restore the extent of mudflat vegetation communities (such as tall marsh, herblands, rushes and sedges) **V3** – Restore the extent of native aquatic vegetation species (such as tassel, foxtail stonewort, milfoil and pondweed) **V4** – Maintain the extent of native aquatic vegetation species (such as tassel, foxtail stonewort, milfoil and pondweed) **V5** – Reduce the extent and density of invasive plant species **V6** – Support a mosaic of wetland plant communities across the region

Traditional Owner cultural values and uses

The wetlands and surrounding land in the central Murray region hold great significance for the Traditional Owners: the Barapa Barapa, Wamba Wemba and Yorta Yorta First Nations peoples. Their traditional knowledge is a living culture evident throughout the landscape in tree markings, significant cultural sites and cultural tools for cultural practices. The rivers and floodplains are a source of food and fibre and contain many sites of significance (such as campsites and meeting places). We acknowledge their rights to practice their culture and identity as Traditional Owners, to maintain their relationship with the wetlands, and to protect places and areas of importance on their land. The Traditional Owner people have rights as the primary guardians, keepers of Aboriginal cultural heritage and knowledge.

Environmental watering supports values including native fish, waterbirds and turtles, and it promotes the growth of culturally important plants that provide food, medicine and weaving materials for Traditional Owner groups. The presence of water itself can be a cultural value, as well as the quality of the water: healthy water promotes healthy Country.

Yorta Yorta First Nations peoples' participation in environmental water planning and delivery is facilitated by the Yorta Yorta Nation Aboriginal Corporation (YYNAC). Richardson's Lagoon is a culturally significant wetland for Yorta Yorta people, supporting ongoing connection to Country, cultural practices and the continuation of knowledge. Yorta Yorta Nation aspires to see the lagoon managed as a healthy and functioning wetland system with appropriate wetting and drying cycles that support water quality, habitat condition and the overall health of Country. This includes the protecting and regenerating of culturally significant species (such as waterbirds, frogs, freshwater turtles and native fish, as well as vegetation communities, including river red gum, lignum and native aquatic plants) that are important for habitat, cultural use and ecological function. In a meeting in February 2026, YYNAC expressed an interest in strengthening collaboration, as they have a settled water team which helps them to further explore YYNAC's priorities for Richardson's Lagoon in the coming years.

The Wamba Wemba First Nations People's participation in environmental water planning and delivery has been both formal and informal, with ongoing engagement with Traditional Owners throughout the year. In August 2024, the Wamba Wemba Aboriginal Corporation (WWAC) was registered as a Registered Aboriginal Party (RAP), and North Central CMA has been working to build capacity within the organisation to increase its involvement in the delivery of environmental water. North Central CMA remains committed to working with WWAC to support their cultural obligations and water aspirations, as well as other culturally significant sites that may fall outside of their RAP area. This ongoing collaboration ensures that environmental watering actions are culturally informed and aligned with the WWAC's aspirations for caring for Country. Moving forward, WWAC will facilitate Wamba Wemba participation in environmental water planning, delivery and all other North Central CMA engagements.

Barapa Barapa Traditional Owners have expressed their aspirations for an active role in the management of land and water to fulfil custodianship obligations and contribute to improvements in the health of Country. The cultural objectives able to be supported by environmental water have been informed by seasonal watering plan engagement in February and March 2026, and by formal and informal engagement with Barapa Barapa Traditional Owners throughout the year. Achievement of the cultural objectives will depend on the environmental watering actions implemented, according to climatic conditions.

Traditional Owner values and the shared benefits of delivering environmental water in the central Murray wetlands (except the Guttrum Forest – Reed Bed Swamp complex) are shown below in **Table 5.2.7** and are representative of all central Murray wetlands.

Table 5.2.7 Barapa Barapa, Wamba Wemba and Yorta Yorta Traditional Owners' cultural values and uses in the central Murray wetlands (except Guttrum Forest – Reed Bed Swamp complex) for 2026-27

Values/uses/ objectives/ opportunities	How this opportunity will be considered in environmental watering in 2026-27
Cultural plants and cultural practices	• Environmental water delivery and the occurrence of natural flooding support culturally important plants in the central Murray wetlands and allow the continuation of cultural practices, including harvesting of food, medicine and weaving plants. Two examples are the harvesting of cotton weed at Kunat Kunat for starting fires and the harvesting of black swans for cultural practices. • Watering actions in the central Murray wetlands will support cultural plants that Barapa Barapa, Wamba Wemba and Yorta Yorta Traditional Owners value and provide opportunities for cultural practices to continue. • Barapa Barapa, Wamba Wemba and Yorta Yorta Traditional Owners recognise the value of resources that occur on the drawdown after wetland inundation, providing food for animals as well as cultural plants (such as old man weed). This can be supported by allowing wetlands to draw down naturally after receiving water, to expose mudflats. • Having a diversity of habitat and vegetation responses is a priority for Barapa Barapa, Wamba Wemba and Yorta Yorta Traditional Owners. They consider it important to have a variety of water depths to create a more diverse vegetation response, which results in a range of resources being available over a longer timeframe. • Barapa Barapa Traditional Owners have undertaken revegetation activities as part of the Decision Support Tool Revegetation Project at McDonalds Swamp and planting works at Third Reedy Lake. Opportunities for Traditional Owner involvement in monitoring and revegetation at several wetlands will be sought in 2026-27. Traditional Owners are keen to be involved with any planned revegetation works at the central Murray wetlands. • Environmental water deliveries at McDonalds Swamp and Lake Murphy can be managed so revegetated areas are provided with an appropriate water regime—plants receive water but are not drowned—to ensure their survival and provide opportunities for natural recruitment.
Cultural animals and cultural practices	• Environmental water deliveries can help preserve and improve cultural animals (totem species). Also, environmental water deliveries will aim to ensure culturally important animals—food sources, such as black swans and mussels—are supported and can continue to breed and thrive.
Healthy Country	• Providing drought refugia (such as Lake Cullen, Johnson Swamp, McDonalds Swamp and Richardson's Lagoon) and maintaining areas with healthy habitat is a high priority for Barapa Barapa, Wamba Wemba and Yorta Yorta Traditional Owners. In the absence of natural inflows, they consider it important to ensure that water is delivered to healthy areas (such as Lake Cullen, Johnson Swamp, McDonalds Swamp and Richardson's Lagoon) to elicit a good vegetation response and support wetland animals. • Environmental watering actions at Lake Cullen, Johnson Swamp, McDonalds Swamp and Richardson's Lagoon will make sure there is water in high-priority central Murray wetlands, regardless of whether flooding occurs. This will provide refuge habitat for waterbirds, woodland birds, turtles and frogs and ensure high-quality habitat is available. Also, water can be delivered to any central Murray wetland that receives flood waters to support any waterbird breeding events.

Values/uses/ objectives/ opportunities	How this opportunity will be considered in environmental watering in 2026-27
Cultural heritage	• Cultural heritage artefacts are common at the central Murray wetlands, which have been important gathering sites for Traditional Owners. The loss of fringing trees and changes to natural watering regimes have left sediments around these wetlands exposed for prolonged periods, resulting in some cultural artefacts being uncovered. • Delivering environmental water can support the growth of fringing red gum trees and tall marsh, reduce erosion at the wetlands and help keep cultural heritage artefacts covered.

Barapa Barapa and Wamba Wemba input to watering actions for Guttrum Forest (Reed Bed Swamp complex) in 2026-27

Environmental water delivery to the Reed Bed Swamp complex in Guttrum Forest during 2026-27 has been planned in conjunction with the Barapa Barapa and Wamba Wemba peoples, for whom the wetlands and surrounding forest are places of high cultural significance. Traditional Owners are an important part of Reed Bed Swamp complex planning and management and have been directly involved in the delivery of environmental flows to Reed Bed Swamp complex in 2019-20, 2021-22 and 2025-26. No environmental water was delivered to the complex in 2022-2023 or 2023-2024 due to large-scale natural flooding. In 2024-25, the Reed Bed Swamp complex was allowed to draw down.

Barapa Barapa and Wamba Wemba collaborate with waterway managers to ensure their cultural heritage is protected and that the hydrological needs of important cultural values (such as food and medicinal plant species, scar trees and ring trees) during watering events in Reed Bed Swamp are supported through the timing and duration of planned watering actions.

Table 5.2.8 shows the Barapa Barapa and Wamba Wemba cultural values and uses considered in the planning and managing water for the environment in Guttrum Forest (Reed Bed Swamp complex) in 2026-27.

Table 5.2.8 Barapa Barapa and Wamba Wemba Traditional Owners' cultural values and uses in the Guttrum Forest (Reed Bed Swamp complex)

Values/uses	How this opportunity will be considered in environmental watering in 2026-27
Food, fibre and medicinal plants	• In recent years, Reed Bed Swamp has shown a marked improvement in the abundance and diversity of culturally important plants. In winter 2021, revegetation of plants characteristic of tall marsh, spike sedge wetland and aquatic herbland included several culturally important plants. This revegetation was supported by naturally regenerating species, such as some small individuals or patches of cumbungi, nardoo, joy weed and giant rush, with old man weed becoming abundant across the drawdown area by 2024. Traditional Owners observed an increasing trend in the presence and abundance of culturally important plants, though initially not abundant enough to harvest. • In 2025, Barapa Barapa Traditional Owners reported that plant abundance had reached harvestable levels and that the wetland had, in the words of one Barapa Barapa Traditional Owner, "come back to the way it was when I was a kid. You've got your waterbirds, rushes and the carpet of green (mudflat plants) back." This positive trajectory has continued in 2026, with Traditional Owners expressing enthusiasm for ongoing watering, and opportunities for harvesting and processing old man weed were also highlighted as a key cultural activity of interest.

Values/uses	How this opportunity will be considered in environmental watering in 2026-27
Cultural heritage	• Watering of Reed Bed Swamp supports fringing large old trees, including a couple of ring trees and scar trees. The condition of these trees was seen to improve following previous watering.
Spiritual wellbeing	• The improvement in the condition of the wetland and the presence of water and moisture contribute to a sense of spiritual wellbeing.
Sharing cultural knowledge	• The Traditional Owners provide guidance on which ecological values to prioritise, drawing on their knowledge of the wetland's historical condition and the values it previously supported. • Traditional Owners have been present during the set-up of infrastructure and have been able to advise about avoiding impacts on their cultural heritage.
Employment opportunities	• Traditional Owners want to become more involved in managing their Country through increased employment opportunities (such as ecological and cultural monitoring). This has occurred as part of the previous watering of Reed Bed Swamp.
Cultural landscape	• Maintaining the open water habitat and mudflats underneath will be difficult if the river red gum saplings that germinated in recent floods are not removed. This is important for maintaining the cultural landscape and access to food and medicinal resources.
Cultural practices	• The Traditional Owners have indicated they would like a smoking ceremony to welcome water back to the forest. They said it should be a regular activity when water is delivered each year. It is what their ancestors would have done when the floodwaters arrived, representing a restoration of an important cultural practice. • The Traditional Owners have indicated that they would like to see more opportunities for men and women to return to Country and undertake cultural practices (such as weaving, spear making and carving and discussing the wetlands' health related to women's and men's business). This was a key topic discussed during the Reed Bed Swamp Traditional Owner engagement day in February 2026.

Increasing the involvement of Traditional Owners in managing environmental flows and progressing opportunities towards self-determination in the environmental watering program is a core commitment of the VEWH and its program partners. This is reinforced by legislation and policy commitments, including the *Water Act 1989*, the ***Victorian Aboriginal Affairs Framework***, the 2016 ***Water for Victoria***, the 2022 ***Water is Life: Traditional Owner Access to Water Roadmap***, and, in some cases, agreements under the *Traditional Owner Settlement Act 2010*.

Environmental flows may be planned to align with cultural benefits so long as environmental outcomes are not compromised. Where Traditional Owners are more deeply involved in the planning and/or delivery of environmental water for a particular site, their contributions are acknowledged in **Table 5.2.9** with an icon as pictured below and also explained in **Figure 1.2.3**. The use of this icon is not intended to indicate that these activities are meeting all the needs of Traditional Owners, but it is used in the spirit of valuing that contribution.

Watering planned and/or delivered in partnership with Traditional Owners to support cultural values and uses

Social, recreational and economic values and uses

In planning the potential environmental watering actions in **Table 5.2.9**, North Central CMA considered how environmental flows could support values and uses, including:

- waterway recreation (such as canoeing, fishing, kayaking and swimming)
- waterway recreation and amenity (such as birdwatching, duck hunting, camping, cycling, running and walking)
- community events and tourism (such as visitation during the hunting and fishing seasons, Breakfast with the Birds events [hosted annually by the North Central CMA] and supporting Aboriginal cultural heritage and history-based tours)
- socio-economic benefits (such as ecosystem services like groundwater recharge, flood mitigation, nutrient treatment and carbon storage).

Environmental watering will also support waterbird-related recreational activities (e.g., birdwatching, duck hunting, cycling, running and walking)

Scope of environmental watering

The term 'environmental watering' refers to the active delivery of held environmental water to support particular environmental objectives by altering the flow in a river or the water level in a wetland. While other terms are sometimes used to describe the delivery of environmental water, 'environmental watering' is deliberately used here and in seasonal watering statements to ensure consistency in the legal instruments that authorise the use of water for the environment in Victoria.

Table 5.2.9 describes the potential environmental watering actions in 2026-27, their expected watering effect (that is, the intended physical or biological effects of the watering action) and the longer-term environmental objectives they support. Each environmental objective relies on one or more potential environmental watering actions and their associated physical or biological effects.

Table 5.2.9 Central Murray wetlands potential environmental watering actions, expected watering effects and environmental objectives

Potential environmental watering action	Expected watering effects	Environmental objectives
Hird Swamp (partial fill in autumn)	• Drown terrestrial weeds to limit their growth and extent • Promote the early germination and establishment of aquatic vegetation • Facilitate the early establishment and biomass of waterbugs • Provide habitat for waterbirds, frogs and turtles	**A1**  **B1**  **MI1**  **T1**  **V1, V3, V5, V6**

Potential environmental watering action	Expected watering effects	Environmental objectives
Johnson Swamp (spring/summer through-flow)	• Provide connectivity between Pyramid Creek and Johnson Swamp to provide waterbugs, carbon and nutrient inputs into Pyramid Creek, boosting productivity and providing food resources for fish in Pyramid Creek • Flush carbon and old biofilms within Johnson Swamp to promote new biofilm growth and increase waterbug populations	F2, MI1, CN1
Johnson Swamp (fill in winter/spring)	• Drown terrestrial weeds to limit their growth and reduce their extent • Promote the growth of aquatic vegetation and support the completion of plant life cycles • Continue supporting the growth of river red gums and black box trees • Inundate the wetland and wetland fringe to provide habitat (including breeding habitat) for waterbirds, frogs and turtles • Provide conditions to increase waterbugs and small-bodied native fish populations	A1, B1, B2, F1, MI1, T1, V1, V3, V5, V6
Hird Swamp (top-up as required) **Johnson Swamp (top-up as required)** **McDonalds Swamp (top-up as required)** **Richardson's Lagoon (top-up as required)**	• Provide ongoing habitat for waterbirds to support significant breeding opportunities and allow juveniles to grow and become independent *Trigger: significant bird breeding event*	B2
Kunat Kunat (fill in spring and top-up as required)	• Maintain salinity within 15,000-80,000 EC and water depth to support suitable habitat and breeding conditions for Murray hardyhead, and growing conditions for submerged aquatic plants to provide habitat • Maintain the water depth to provide permanent feeding, foraging and refuge habitat for waterbirds • Provide exposed mudflats over spring and summer to support feeding opportunities for migratory shorebirds	B1, F1, V4, V6
Lake Cullen (top-up in winter/spring)	• Drown terrestrial weeds to limit their growth and reduce their extent • Promote the growth of aquatic vegetation and support the completion of plant life cycles • Inundate the wetland and the wetland fringe to provide habitat for waterbirds, frogs and turtles • Facilitate conditions to increase waterbug productivity, to provide food for waterbirds	A1, B1, MI1, V3, V6

Potential environmental watering action	Expected watering effects	Environmental objectives
Lake Elizabeth (fill in spring and top-up as required) 	• Maintain salinity within 15,000-80,000 EC and water depth to support suitable habitat and breeding conditions for Murray hardyhead and growing conditions for submerged aquatic plants that provide habitat for Murray hardyhead • Maintain the water depth to provide permanent feeding, foraging and refuge habitat for waterbirds • Provide exposed mudflats over spring and summer to support feeding opportunities for migratory shorebirds	 B1 F1  V4, V6
Lake Murphy (partial fill in autumn)	• Drown terrestrial weeds to limit their growth and reduce their extent • Promote the growth of aquatic vegetation and support the completion of plant life cycles • Facilitate the early establishment and proliferation of waterbug populations • Provide wetland habitat for waterbirds and frogs over autumn and winter • Support the growth of planted river red gums and other aquatic and herbland vegetation	A1  B1  MI1  V1, V3, V5, V6
McDonalds Swamp (fill in winter/spring)	• Drown terrestrial weeds to limit their growth and reduce their extent • Promote the growth of aquatic and mudflat vegetation and support the completion of plant life cycles • Inundate the wetland and the wetland fringe to provide habitat (including breeding habitat) for waterbirds, frogs and turtles • Provide conditions suitable for waterbugs that are food for waterbirds, frogs and turtles • Continue supporting the growth of planted river red gums and other aquatic and herbland vegetation	A1  B1, B2  MI1  T1  V1, V2, V3, V5, V6
McDonalds Swamp (partial fill in autumn)	• Drown terrestrial weeds to limit their growth and reduce their extent • Promote the growth of aquatic vegetation and support the completion of plant life cycles • Facilitate the early establishment and proliferation of waterbug populations • Provide wetland habitat for waterbirds, frogs and turtles • Continue supporting the growth of planted river red gums, other aquatic and herbland vegetation	A1  B1  MI1  T1  V1, V3, V5, V6

Potential environmental watering action	Expected watering effects	Environmental objectives
Reed Bed Swamp complex (fill in winter/spring 2026 and spring/summer top-up as required)	• Wet the fringing large old river red gums to support their growth and drown river red gum seedlings within the wetland bed to maintain open water habitat • Promote the growth and re-establishment of aquatic vegetation and tall marsh vegetation at various depths across the wetland • Maintain a sufficient wetland depth to provide reliable feeding and breeding habitat for water-dependent plants and animals, including frogs, turtles and waterbirds	A1, B1, B2, MI1, T1, V2, V3, V5, V6
Reed Bed Swamp complex (partial fill autumn/winter 2027)	• Drown terrestrial weeds and trigger the early germination of aquatic vegetation, which in turn would promote the early establishment of aquatic vegetation • Facilitate the early establishment and proliferation of waterbug populations • Provide wetland habitat for waterbirds, frogs and turtles over autumn and winter • Promote the growth and re-establishment of aquatic vegetation and tall marsh vegetation at various depths across the wetland	A1, B1, MI1, T1, V2, V3, V5, V6
Richardson's Lagoon (fill in winter/spring)	• Drown terrestrial weeds to limit their growth and reduce their extent, including overtopping saplings to prevent their encroachment in the beds of the lagoons • Promote the growth of aquatic and mudflat vegetation and support the completion of plant life cycles • Inundate the wetland and wetland fringe to provide habitat (including breeding habitat) for waterbirds, frogs and turtles • Provide conditions to increase waterbug populations	A1, B1, B2, MI1, T1, V1, V3, V5, V6

Scenario planning

Table 5.2.10 outlines potential environmental watering and expected water use in a range of planning scenarios.

The north central region experienced ongoing dry conditions in 2024-25 and 2025-26, leading to drying wetlands and a significant reduction in wetland habitat, limiting food and resources for waterbirds and other wetland-dependent species. In response to a predicted basin-wide decline in waterbird habitat, wetland watering actions in 2025-26 prioritised maintaining waterbird habitats and supporting revegetation, considering the timing and duration of water deliveries to promote soil moisture, native aquatic vegetation establishment and weed control.

As dry conditions are expected to continue in 2026-27, the risk continues of wetlands drying up and of wetland habitat and food resources being reduced. Also, there is growing concern about the potential arrival of the H5N1 avian influenza in Australia in spring 2026. To address those risks, maintaining diverse waterbird habitats and protecting wetland-dependent species remains a high priority by building on efforts initiated in 2025-26. A diverse waterbird habitat will promote the spread of waterbirds and minimise the number of waterbirds affected by avian influenza if it were to infect a specific location.

For the 2026-27 water year, potential watering actions are included in four planning scenarios for nine wetlands: Hird Swamp, Johnson Swamp, Kunat Kunat, Lake Cullen, Lake Elizabeth, Lake Murphy, McDonalds Swamp, Reed Bed Swamp and Richardson's Lagoon.

Promoting native vegetation and protecting wetlands from invasive weeds are key considerations when determining the timing and duration of water deliveries. In Johnson Swamp, McDonalds Swamp and Lake Cullen, winter/spring deliveries in all planning scenarios help suppress terrestrial weed growth, support the health of river red gums and black box trees and inundate wetland habitats for waterbirds. Particularly, winter/spring deliveries will support North Central CMA's effort to suppress weeds and restore native species in McDonalds Swamp.

The autumn partial fill in Hird Swamp, McDonalds Swamp (in all planning scenarios) and Lake Murphy (in the drought and dry scenarios) will help control terrestrial weeds as well as facilitate the early establishment of waterbugs to provide food for waterbirds over autumn/winter 2027. Similarly, a spring throughflow action in the average and wet planning scenarios connecting Pyramid Creek and Johnson Swamp will support fish populations. This flow will flush biofilms from the swamp and transfer nutrients to the creek, boosting productivity and food resources. The throughflow priority watering action is also expected to support resident fish populations in Pyramid Creek, and it has the potential to cue fish to breed.

Lake Elizabeth and Kunat Kunat (Round Lake) are high-value wetlands as they are critical habitats for Murray hardyhead, a threatened fish species in Victoria. Watering actions in these two wetlands are essential to prevent the irreversible loss of this species, particularly in drought conditions. Spring fills with top-up(s) as required promote the growth of submerged aquatic plants and create favourable breeding conditions for the species. Therefore, the proposed watering actions for Lake Elizabeth and Kunat Kunat (Round Lake)—fill in spring and top up as required in all planning scenarios—are needed every year to maintain permanent critical habitat for the threatened Murray hardyhead.

Triggering actions (top-ups) are planned in Hird Swamp, Johnson Swamp, McDonalds Swamp and Richardson's Lagoon to support waterbird breeding events in 2026-27, if required. Maintaining water levels provides some protection from predation for eggs and fledglings as well as foraging habitat for young birds and adults during this vulnerable stage of their lives. Top-ups in Hird Swamp are planned in the wet scenario if the swamp dries quickly after natural flooding. Spring and summer top-ups (triggering actions) in all planning scenarios in Johnson Swamp and McDonalds Swamp will support breeding events of threatened species (such as Australian bittern and brolgas). Top-ups of Richardson's Lagoon are included in the average and wet planning scenarios to support colonial nesting bird breeding, if required.

The Reed Bed Swamp complex in Guttrum Forest is planned to be filled in winter/spring with top-ups as required in spring and early summer. This watering action will support the growth, abundance and establishment of aquatic vegetation (such as river swamp wallaby-grass); provide reliable feeding and breeding habitat for water-dependent plants and animals, including frogs, turtles and waterbirds; suppress terrestrial weeds; and limit river red gum encroachment. This wetland is expected to draw down and dry out over summer, with some semi-aquatic and mudflat plants persisting into autumn. Reed Bed Swamp will then be partially filled in autumn or winter 2027 in the dry to wet scenarios to prime wetland vegetation, particularly species that are advantaged by a longer inundation period, for a potential winter/spring fill in 2027-28.

Johnson Swamp and the Reed Bed Swamp complex are additional tier 2 watering priorities in some planning scenarios. In tier 2 conditions—when additional water for the environment is available—a spring throughflow in Johnson Swamp in the drought and dry planning scenarios, and a partial autumn fill at Reed Bed Swamp in the drought scenario will provide water and moist conditions and maintain critical drought-refuge habitat for waterbirds.

A priority carryover volume of between 4,000 ML and 6,000 ML is essential to ensure water is available to maintain the habitat of significant species in 2027-28.

Table 5.2.10 Central Murray wetland system environmental watering planning scenarios

Planning scenario	Drought	Dry	Average	Wet
Expected conditions	• Catchment run-off and natural flow into the wetlands are highly unlikely	• Catchment run-off and natural flow into the wetlands are unlikely	• Catchment run-off and natural flow into the wetlands are possible, particularly in winter/spring	• Catchment run-off and natural flow into the wetlands are likely, with potential flooding in some wetlands, particularly in winter/spring
Potential environmental watering – tier 1 (high priorities)	• Hird Swamp (partial fill in autumn)	• Hird Swamp (partial fill in autumn)	• Hird Swamp (partial fill in autumn)	• Hird Swamp (partial fill in autumn) • Hird Swamp (spring/summer top-up as required)
	• Johnson Swamp (fill in winter/spring) • Johnson Swamp (top-up as required)	• Johnson Swamp (fill in winter/spring) • Johnson Swamp (top-up as required)	• Johnson Swamp (fill in winter/spring) • Johnson Swamp (throughflow in spring) • Top up Johnson Swamp (top-up as required)	• Johnson Swamp (fill in winter/spring) • Johnson Swamp (throughflow in spring) • Johnson Swamp (spring top-up as required)
	• Kunat Kunat (fill in spring and top-up as required)	• Kunat Kunat (fill in spring and top-up as required)	• Kunat Kunat (fill in spring and top-up as required)	• Kunat Kunat (fill in spring and top-up as required)
	• Lake Cullen (top-up in winter/spring)	• Lake Cullen (top-up in winter/spring)	• Lake Cullen (top-up in winter/spring)	• Lake Cullen (top-up in winter/spring)
	• Lake Elizabeth (fill in spring and top-up as required)	• Lake Elizabeth (fill in spring and top-up as required)	• Lake Elizabeth (fill in spring and top-up as required)	• Lake Elizabeth (fill in spring and top-up as required)
	• Lake Murphy (partial fill in autumn)	• Lake Murphy (partial fill in autumn)		

Planning scenario	Drought	Dry	Average	Wet
(continued) **Potential environmental watering – tier 1 (high priorities)**	• McDonalds Swamp (fill in winter/spring) • McDonalds Swamp (partial fill in autumn) • McDonalds Swamp (top-up as required)	• McDonalds Swamp (fill in winter/spring) • McDonalds Swamp (partial fill in autumn) • McDonalds Swamp (top-up as required)	• McDonalds Swamp (fill in winter/spring) • McDonalds Swamp (partial fill in autumn) • McDonalds Swamp (top-up as required)	• McDonalds Swamp (fill in winter/spring) • McDonalds Swamp (partial fill in autumn) • McDonalds Swamp (top-up as required)
	• Reed Bed Swamp complex (fill in winter/spring and top-ups in spring/summer, as required)	• Reed Bed Swamp complex (fill in winter/spring and top-ups in spring/summer, as required) • Reed Bed Swamp complex (partial fill in autumn/winter)	• Reed Bed Swamp complex (fill in winter/spring and top-ups in spring/summer, as required) • Reed Bed Swamp complex (partial fill in autumn/winter)	• Reed Bed Swamp complex (fill in winter/spring and top-ups in spring/summer, as required) • Reed Bed Swamp complex (partial fill in autumn/winter)
	• Richardson's Lagoon (fill in winter/spring)	• Richardson's Lagoon (fill in winter/spring)	• Richardson's Lagoon (fill in winter/spring) • Richardson's Lagoon (spring top-up as required)	• Richardson's Lagoon (fill in winter/spring) • Richardson's Lagoon (spring top-up as required)
Potential environmental watering – tier 2 (additional priorities)	• Johnson Swamp (throughflow in spring) • Reed Bed Swamp complex (partial fill in autumn/winter)	• Johnson Swamp (throughflow in spring)		
Possible volume of water for the environment required to achieve objectives	• 19,850 ML (tier 1) • 1,300 ML (tier 2)	• 18,900 ML (tier 1) • 1,000 ML (tier 2)	• 16,850 ML (tier 1)	• 16,050 ML (tier 1)
Priority carryover requirements for 2027-28	• 5,950 ML	• 5,200 ML	• 4,550 ML	• 4,050 ML

5.2.5 Hattah Lakes

System overview

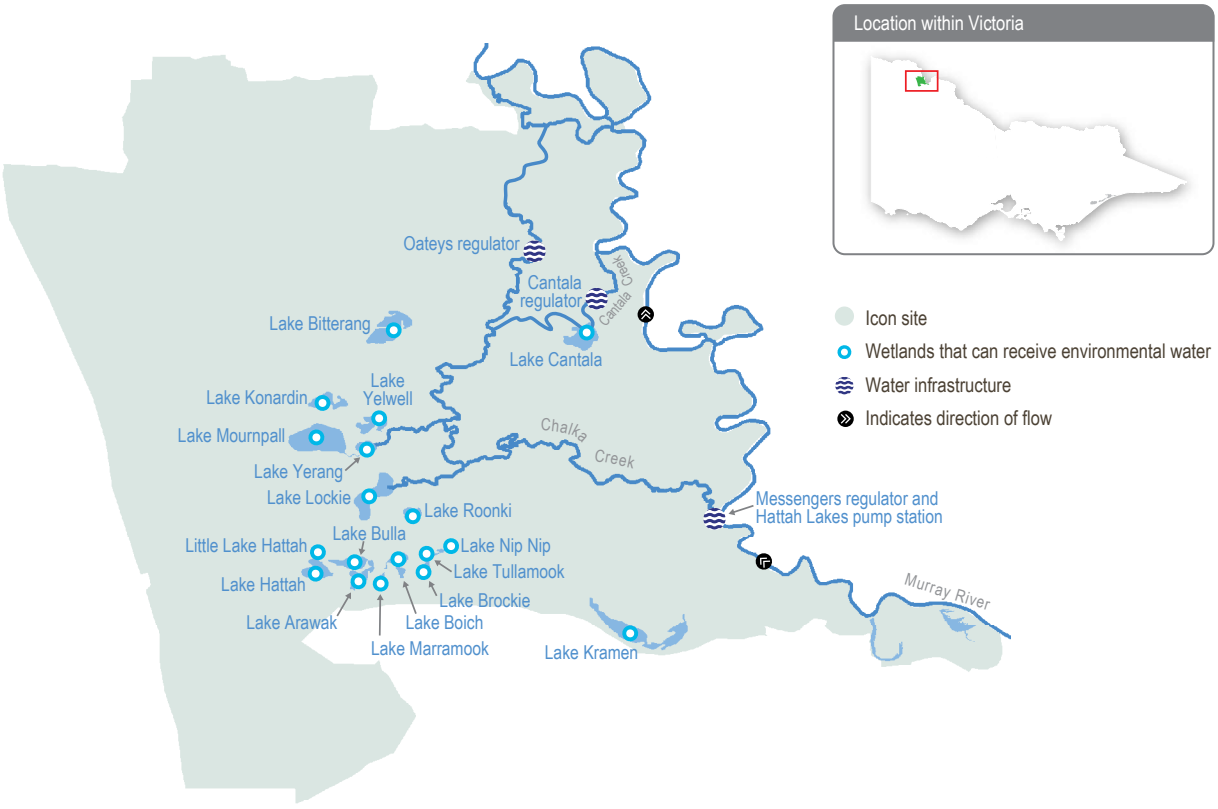
The Hattah-Kulkyne National Park is situated in north-west Victoria, adjacent to the Murray River (Figure 5.2.5). The national park contains a complex of more than 20 semi-permanent or temporary freshwater lakes known collectively as the Hattah Lakes.

The ecology of Hattah Lakes and the surrounding floodplain is strongly influenced by the flooding regimes of the Murray River. The system fills when there is a high flow in the Murray River, and some lakes hold water for several years after floods recede. Regulation of the Murray River has significantly reduced the frequency and duration of small to medium-sized natural floods in the Hattah Lakes system. Over time, this has degraded vegetation communities and reduced the diversity and abundance of animals that use the vegetation and wetlands for habitat and food.

The Hattah Lakes complex can be broadly divided into the southern Hattah Lakes, which contain permanent to semi-permanent wetlands, and the higher-elevation northern Hattah Lakes, which are mostly episodic wetlands.

The Messengers, Oateys and Cantala regulators allow water to flow between the Murray River and the Hattah Lakes. When the flow in the Murray River is about 26,000 ML per day, water begins to flow through the Messengers regulator into Chalka Creek and through the Hattah Lakes complex. A permanent pump station can deliver up to 1,000 ML per day to the southern Hattah Lakes through Chalka Creek. The regulators and pump station are used in combination with several small, constructed levees to deliver a pattern of flooding to the lakes system that is recommended to improve environmental outcomes. Lake Kramen is in the south-east area of Hattah-Kulkyne National Park and is disconnected from the main Hattah Lakes complex. The Hattah Lakes pump station can deliver up to 145 ML per day to Lake Kramen. New infrastructure proposed under the Victorian Murray Floodplain Restoration Project will allow water to reach additional wetlands and floodplain areas in the northern Hattah Lakes.

Figure 5.2.5 Hattah Lakes



Environmental values

Hattah Lakes is home to a diverse range of flood-dependent vegetation that changes with the topography of the landscape. Vegetation types range from wetland communities in low-lying areas that require almost annual flooding to lignum and black box communities situated higher on the floodplain that only need flooding once every four to five years (on average).

A combination of natural flooding and the delivery of environmental flows since 2010 has improved tree canopy health and recruitment of black box and river red gum communities throughout the Hattah Lakes. Woodland birds, including the endangered regent parrot, have benefitted from improved tree health, and when lakes recede after watering, mudflats provide feeding opportunities for shorebirds, and plant germination occurs.

Hattah Lakes provides important waterbird breeding sites in an arid landscape. A total of 34 species of waterbirds are known to breed at the lakes when conditions are suitable. Another six species of waterbirds breed in the surrounding floodplain.

Wetland drought refuge sites are limited in the region, making Hattah Lakes critically important for water-dependent plants, waterbirds and terrestrial animals during dry periods.

Hattah Lakes supports large-bodied native fish species (such as golden perch) and small-bodied wetland species (such as carp gudgeon). Fish move between the lakes and the Murray River when the flow is suitable. They also persist in wetlands that retain water in Hattah Lakes during dry years before re-dispersing during floods.

Environmental objectives in the Hattah Lakes

	A1 – Maintain populations of frogs
	**B1** – Maintain regional waterbird populations by providing conditions for breeding and fledging at least three times every 10 years **B2** – Maintain regional waterbird populations by providing refuge during droughts
	**CN1** – Improve the function of water-dependent ecosystems by 2030 by improving productivity linkages between the river and floodplain/wetland habitats
	**G1** – Maintain a variety of freshwater ecosystem types within the Hattah Lakes icon site, including semi-permanent lakes, persistent temporary wetlands, floodplain woodlands, shrublands and episodic wetlands
	**V1** – Increase the richness of species and the abundance of native water-dependent floodplain and wetland aquatic vegetation by 2030 **V2** – Maintain the extent and improve the condition of river red gum, black box and lignum by 2030, compared to 2006 baseline levels

Traditional Owner cultural values and uses

The Hattah Lakes system is highly significant in terms of Aboriginal cultural values. The system has shared interests from multiple Nations, including Dadi Dadi/Weki Weki, Latji Latji, Nyeri Nyeri, Tati Tati and groups Gilbie Corporation, Munatunga Elders, Murray Valley Aboriginal Corporation and Pearce Family[1].

More than 1,000 archaeological sites at Hattah Lakes are registered on the **Aboriginal Cultural Heritage Register and Information System**. Freshwater lakes and wetlands have long provided focal points for trade and cultural exchanges among the region's Traditional Owners. Local Aboriginal communities maintain strong connections to the land and its resources, including the use of native species for food and medicinal purposes.

Traditional Owners have advised Mallee CMA about watering activities much earlier in the planning process than in previous years. This was in response to feedback from a number of Traditional Owner groups asking to be involved sooner.

Traditional Owners participated in environmental water planning sessions, facilitated by Mallee CMA, from September 2025 to February 2026. Engagement events were held with Gilbie Corporation, Latji Latji Mumthalang, Munatunga Elders and Pearce Family.

Mallee CMA recognises all groups within this area and seeks to engage with each group to ensure their voices are heard and represented when planning for environmental water.

Increasing the involvement of Traditional Owners in managing environmental flows and progressing opportunities towards self-determination in the environmental watering program is a core commitment of the VEWH and its program partners. This is reinforced by legislation and policy commitments, including the *Water Act 1989*, the ***Victorian Aboriginal Affairs Framework***, the 2016 ***Water for Victoria***, the 2022 ***Water is Life: Traditional Owner Access to Water Roadmap***, and, in some cases, agreements under the *Traditional Owner Settlement Act 2010*.

Watering planned and/or delivered in partnership with Traditional Owners to support cultural values and uses

Social, recreational and economic values and uses

In planning for environmental watering at Hattah Lakes, Mallee CMA considered how environmental flows could support values and uses, including:

- water-based recreation (such as fishing, kayaking and swimming)
- riverside recreation and amenity (such as birdwatching, camping, photography and walking)
- community events and tourism (such as educational opportunities, including bushwalking, birdwatching and bug hunting; school educational excursions; and tours involving kayaking, bike riding and camping)
- socio-economic benefits (such as commercial beekeepers who rest bees away from horticultural orchards in native flowering trees around the lakes, multiple ecotourism operators who benefit directly when the lakes contain water, social wellbeing generated by connecting with nature, and social gatherings).

The Hattah Lakes system is a high-profile tourism destination, providing important recreation, amenity and cultural opportunities for tourists and the local community. The Mildura Information Centre recommends and promotes the destination on the Visit Mildura website and through Parks Victoria, the land manager.

The condition of Hattah Lakes directly affects social and economic outcomes for businesses, residents and visitors. When environmental conditions deteriorate, for example, as they did during the Millennium Drought, recreation and tourism-based industries suffer as visitor numbers drop and amenity and other social and cultural values decline. Environmental water deliveries outside times of natural flooding improve environmental conditions and thus amenity and recreational opportunities, and help grow tourism income and jobs.

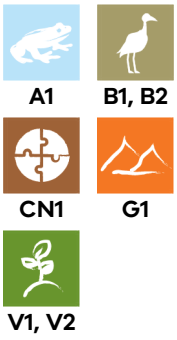
1 The VEWH recognises that some Traditional Owners have self-determined not to appear in this section of the plan.

Scope of environmental watering

The term 'environmental watering' refers to the active delivery of held environmental water to support particular environmental objectives by altering the flow in a river or the water level in a wetland. While other terms are sometimes used to describe the delivery of environmental water, 'environmental watering' is deliberately used here and in seasonal watering statements to ensure consistency in the legal instruments that authorise the use of water for the environment in Victoria.

Table 5.2.11 describes the potential environmental watering actions in 2026-27, their expected watering effect (that is, the intended physical or biological effects of the watering action) and the longer-term environmental objectives they support. Each environmental objective relies on one or more potential environmental watering actions and their associated physical or biological effects.

Table 5.2.11 Hattah Lakes potential environmental watering actions, expected watering effects and environmental objectives

Potential environmental watering action	Expected watering effects	Environmental objectives
Southern Hattah Lakes (top up selected wetlands to 42.5 m AHD during autumn/winter)	• Stimulate the growth and improve the condition of river red gums that fringe wetlands • Provide refuge and feeding habitat for frogs and waterbirds • Inundate dry areas of wetlands to release carbon and nutrients to increase food web productivity • Stimulate the growth of aquatic vegetation • Inundate a variety of types of wetlands at different elevations across Hattah Lakes to increase habitat diversity	
Southern Hattah Lakes (top up selected wetlands to 42.5 m AHD at any time) *Trigger: natural inflows that do not exceed a level of 42.5 m AHD*	• Stimulate the growth and improve the condition of river red gums that fringe wetlands • Provide refuge and feeding habitat for frogs and waterbirds • Inundate dry areas of wetlands to release carbon and nutrients to increase food web productivity • Stimulate the growth of aquatic vegetation • Inundate a variety of types of wetlands at different elevations across Hattah Lakes to increase habitat diversity	

Scenario planning

Table 5.2.12 outlines potential environmental watering and expected water use in a range of planning scenarios.

From 2020 to 2024, Hattah Lakes received inundation by natural high river flows and environmental water via pumping. The southern Hattah Lakes had received five years of regular annual watering before a drying phase was implemented in 2025-26, when no environmental water was delivered. This allowed plants to germinate, grow and set seed to establish dry-phase lakebed herbland. The regular connection and disconnection of creeks, wetland and floodplains also allows for essential nutrient cycling and the exchange of minerals and sediments.

In 2026-27, the aim is to continue the drying phase through until autumn 2027, primarily for the lakebed herbland dominant phase, and to manage non-native species (such as European carp). In autumn/winter, up to 25,000 ML of environmental water is planned to be delivered to the southern lakes in the dry and average planning scenarios. This action would refill the semi-permanent southern lakes system, which will support aquatic vegetation and fringing river red gums and increase habitat and productivity to support water-dependent animals (such as frogs and waterbirds).

In a wet scenario, natural inflows to Hattah Lakes in winter/spring are likely, and would be topped up with an environmental water delivery if needed to achieve the 42.5 m AHD target level at any time of year. If natural inflows exceed 42.5 m AHD, the structures will remain open to optimise the benefits for the environmental objectives at the site and closed to retain as much water as practical, with no environmental water delivery needed.

In the drought scenario, no active watering in 2026-27 is proposed for the southern lakes. A relatively small amount of water will likely remain through winter/spring, providing some temporary refuge, before an expected complete drying of the lakes occurs. Past watering has provided some resilience to avoid loss in a prolonged dry phase into 2027-28. Lake Kramen and the broader northern lakes area are planned to remain dry in all planning scenarios.

Priority carryover into 2027-28 is planned to complement the 2026-27 watering event to the southern lakes by increasing the inundated area and improving conditions across a broader area of the Hattah Lakes system.

Table 5.2.12 Hattah Lakes environmental watering planning scenarios

Planning scenario	Drought	Dry	Average	Wet
Expected conditions	• Year-round low flow in the Murray River and no natural inflow to the Hattah Lakes; substantial wetland drying will occur	• Rare high-flow events in the Murray River and no natural inflow to the Hattah Lakes	• Short periods of high flow in the Murray River with minor spills from storages, most likely in late winter/spring, natural inflow to Hattah Lakes is unlikely	• Lengthy periods of high flow in the Murray River with major spills from storages, resulting in widespread natural inundation of Hattah Lakes and the floodplain
Potential environmental watering – tier 1 (high priorities)	• N/A	• Southern Hattah Lakes (top up selected wetlands to 42.5 m AHD during autumn)	• Southern Hattah Lakes (top up selected wetlands to 42.5 m AHD during autumn)	• Southern Hattah Lakes (top up selected wetlands to 42.5 m AHD at any time; trigger-based)

Planning scenario	Drought	Dry	Average	Wet
Potential environmental watering – tier 2 (additional priorities)	• N/A			
Possible volume of water for the environment required to achieve objectives	• 0 ML	• Up to 25,000 ML		
Priority carryover requirements for 2027-28	• Up to 46,000 ML			

5.2.6 Lower Murray wetlands

System overview

The lower Murray wetlands are home to hundreds of wetlands, primarily concentrated along a 760 km stretch of Murray River frontage between Vinifera and the South Australian border (Figure 5.2.6). The system includes a myriad of interconnected creeks, wetlands and floodplains that are ecologically important and reflect the natural character and attributes of the floodplain. Wetland types are diverse and support a high abundance of water-dependent species across a landscape, which requires regular inundation as part of its natural cycle.

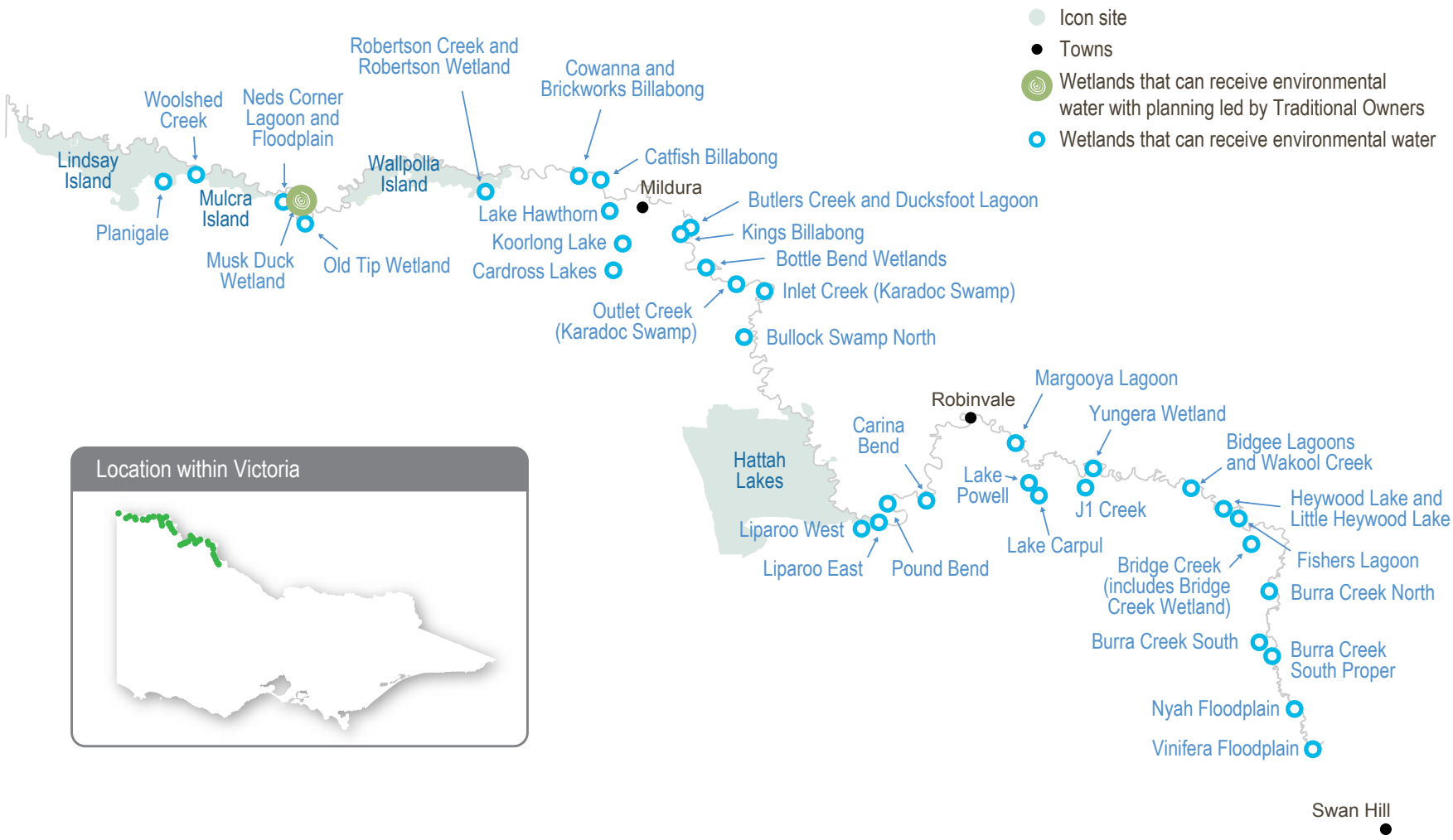
Regulation and diversion of the Murray River flows have substantially reduced the frequency and duration of the high river flow that would naturally inundate the lower Murray wetlands. This change to the water regime has been exacerbated by climate change and has reduced the variety and condition of environmental values associated with billabongs and other floodplain habitats.

In the absence of natural flooding, water for the environment is used to maintain and improve the character of certain wetlands. Every year, priority sites that can be actively managed and where ecological benefits can be achieved are selected to receive water.

Water for the environment can be delivered to some wetlands in the region through direct pumping from the Murray River and/or the use of irrigation supply infrastructure. Most wetlands that receive environmental flows can be managed independently of each other.

For the second successive year, a seasonal watering proposal developed by the First People of the Millewa-Mallee Aboriginal Corporation (FPMMAC) is incorporated into this section of the seasonal watering plan. FPMMAC have planned for the delivery of environmental water to Neds Corner Central (comprising Old Tip Wetland, Neds Floodplain and Neds Lagoon) via a temporary pump from the Murray River.

Figure 5.2.6 Lower Murray wetlands



Environmental values

The lower Murray wetlands contain various streams, billabongs, anabranches, wetlands and swamps. When flooded, waterways and wetlands within these systems provide habitat for native fish, frogs, turtles, waterbirds and water-dependent plants. Terrestrial animals (such as woodland birds) also benefit from improved productivity and food resources when anabranch systems are inundated. Large floodplain wetlands can retain water for several years after receiving inflows; they provide important refuges for wetland-dependent species and support terrestrial animals (such as small mammals and reptiles).

The reduced frequency and duration of floods in the Murray River have degraded the water-dependent vegetation communities throughout the lower Murray wetlands. This has, in turn, reduced the diversity and abundance of animals that rely on healthy vegetation for habitat.

Environmental objectives in the lower Murray wetlands

	A1 – Maintain populations of native frogs, including the endangered growling grass frog
	**B1** – Provide feeding and breeding habitat for a range of waterbird species, including threatened and migratory species and colonial nesting species (such as egrets)
	**CN1** – Promote carbon and nutrient cycling to enable wetland processes for food webs
	F1 – Increase populations of Murray hardyhead in permanent wetlands where they are known to persist **F2** – Maintain populations of other native fish in permanent wetlands
	**V1** – Increase the diversity, extent and abundance of wetland plants **V2** – Improve the condition of river red gums, black box and lignum communities

Traditional Owner cultural values and uses

Watering of the lower Murray wetlands supports Traditional Owners' cultural values such as traditional food sources, medicines and important species, and it provides opportunities for teaching, learning and storytelling.

The First People of the Millewa-Mallee Aboriginal Corporation (FPMMAC) is recognised as the Traditional Owner of Country in north-west Victoria that runs south of the Murray River to the Mallee Highway and west from the Calder Highway to the South Australian border, including the Murray-Sunset National Park. FPMMAC is a Registered Aboriginal Party.

There are many sites of cultural significance across the floodplain, including ceremonial grounds, earth oven remains, culturally modified trees, shell middens, song lines, ancestral resting places and story places.

FPMMAC has maintained associations with the Murray River for thousands of generations. Indeed, the river and its surrounds are among the richest sources of Aboriginal archaeological and cultural heritage material in Australia. The floodplain provides vital resources, including food, water, shelter, medicine and tools. The Traditional Owners retain a strong connection to this Country.

FPMMAC has a strong working relationship with Mallee CMA, which involves regular two-way communication, including planning, sharing of knowledge and ongoing discussions. Water in the landscape is critical to the spirituality of the people of the FPMMAC, strengthening their connection to Country. FPMMAC and Mallee CMA have frequent discussions about water, including the planning and delivery of environmental water.

The area from Vinifera to Red Cliffs has shared interests from multiple Nations, including Dadi Dadi/Weki Weki, Latji Latji, Ngintait, Nyeri Nyeri, Tati Tati and Wadi Wadi, as well as groups Gilbie Corporation, Munatunga Elders and Pearce Family[2]. Each Traditional Owner Nation and group has its own cultural identity, practices, beliefs and priorities. Mallee CMA recognises all Traditional Owners within this area and seeks to engage with each group to ensure their voices are heard and represented in planning for environmental water.

Traditional Owners have advised Mallee CMA on watering activities much earlier in the planning process in response to feedback from a number of groups. The proposed 2026-27 watering of the lower Murray wetlands has been discussed during several meetings and events with Traditional Owner groups, including Dadi Dadi/Weki Weki, FPMMAC, Gilbie Corporation, Latji Latji Mumthalang, Munatunga Elders, Njeri Njeri, Pearce Family and Wadi Wadi Nations. Discussions focused on where Traditional Owners would like to see environmental water delivered for 2026-27 and what activities they undertake at each site. The discussions raised a lot of interest in cultural practices to help prioritise areas for environmental water delivery. A range of options for the delivery of environmental flows in 2026-27 were discussed, as were traditional ecological needs in the current climate. Feedback was positive, with groups supporting the proposed environmental watering plan. Drawdown and drying were discussed in depth, and there was a lot of knowledge-sharing before agreement was reached.

Understanding the environmental responses to the 2022-23 Murray River flood and identifying and protecting cultural heritage were key topics for discussion. A common foundation of all groups was the importance of water in wetlands for their cultural spirituality and connection to Country.

Some of the other discussions and comments raised by Traditional Owner groups included:

- the desire to see more native plants and animals in the areas
- increased opportunities for Indigenous Landcare
- training opportunities such as Indigenous ranger programs
- ways to protect and preserve Aboriginal cultural heritage in the landscape
- sharing information and knowledge with the broader community
- increased usage of the lower Murray wetlands by birdwatching groups
- on-Country visits to scope out cultural areas of sensitivity prior to water delivery (especially important post-floods, due to water uncovering sites).

There was a common theme of cultural priorities across different Traditional Owner groups, which included cultural activities, native plants and animals (birds, reptiles, frogs, kangaroos, possums, turtles and fish), fishing, bush foods, endangered plants and animals, carp eradication, scar trees, clay balls, plants of cultural significance, and aquatic vegetation.

Traditional Owner-led seasonal watering proposals for healthy Country

First People of the Millewa-Mallee Aboriginal Corporation

The lower Murray wetlands section includes proposed watering actions for Neds Corner Central for 2026-27, presented by the First People of the Millewa-Mallee Aboriginal Corporation (FPMMAC).

For the second successive year, a seasonal watering proposal has been developed by FPMMAC. The proposal was shaped through conversations with Elders, cultural knowledge holders and community members. Priorities for Country were identified as protecting cultural heritage sites, supporting totem species and continuing cultural practices (such as harvesting bush medicine, hunting, dancing and songlines). This guidance informed the timing and scale of watering actions, with a focus on good water quality, supporting culturally important plants like old man weed and keeping the site as a place where young people can learn on Country.

2 The VEWH recognises that some Traditional Owners have self-determined not to appear in this section of the plan.

> "When this place receives water, Healthy Country comes back to life. The wetland holds clear, steady water, and the plants stand greener and stronger, with old man weed and other cultural species growing the way they should. The air feels cooler and softer, and the whole area carries a sense of calm and balance. Frogs begin calling again, waterbirds return to feed, and the sounds of crow and eagle move across the landscape. It becomes a place where people feel welcomed, where cultural practices can continue, and where Country feels connected and alive."
>
> – FPMMAC seasonal watering proposal

Increasing the involvement of Traditional Owners in managing environmental flows and progressing opportunities towards self-determination in the environmental watering program is a core commitment of the VEWH and its program partners. This is reinforced by legislation and policy commitments, including the *Water Act 1989*, the ***Victorian Aboriginal Affairs Framework***, the 2016 ***Water for Victoria***, the 2022 ***Water is Life: Traditional Owner Access to Water Roadmap***, and, in some cases, agreements under the *Traditional Owner Settlement Act 2010*.

Where Traditional Owners are more deeply involved in the planning and/or delivery of environmental water for a particular site, their contribution is acknowledged in **Table 5.2.13** with an icon, as pictured below and also explained in **Figure 1.2.3**. The use of this icon is not intended to indicate that these activities are meeting all the needs of Traditional Owners, but it is used in the spirit of valuing that contribution.

Watering planned and/or delivered in partnership with Traditional Owners to support cultural values and uses

Social, recreational and economic values and uses

In planning the potential environmental watering actions in **Table 5.2.13**, Mallee CMA considered how environmental flows could support social, recreational and economic values and uses, including:

- water-based recreation (such as canoeing, fishing and kayaking)
- riverside recreation and amenity (such as bike riding, birdwatching, bushwalking, camping, geocaching, photography and running)
- community events and tourism (such as day trips and sightseeing; education programs for school, TAFE and university students; and citizen science projects about birds, frogs and plants)
- socio-economic benefits (such as economic benefits for businesses in the accommodation, beekeeping, food and beverage, ecotourism, hospitality and retail sectors; creating a focal point for socialising; and providing natural, green spaces for the local community).

Environmental watering of the lower Murray wetlands supports a range of direct recreational experiences that are closely linked to the presence of water and healthy wetland condition. When wetlands are watered, they provide attractive settings for birdwatching, recreational fishing, yabbying, kayaking, walking and camping. These activities are consistently identified in surveys of the community as key ways people interact with the wetlands and derive social and wellbeing benefits from them.

Tourism is an important social and economic benefit arising from environmental watering. Many visitors, seeking nature-based experiences, frequent sites managed with environmental water, which supports local accommodation, hospitality, nature-based tourism operators and retail businesses.

At a local scale, the delivery of environmental water provides economic benefits through the use of local contractors and suppliers for pumping, earthworks and operational activities. Engaging local businesses helps retain skills, experience and expenditure within the region and contributes to the ongoing capacity to deliver environmental watering efficiently and effectively.

	Environmental watering will also support water sports activities (e.g., canoeing, kayaking, swimming and boating)
	Environmental watering will also support waterbird-related recreational activities (e.g., twitching, birdwatching)
	Environmental watering will also support angling activities
	Environmental watering will also support peaks in visitation (e.g., camping or other public activities on long weekends or school holidays)

Scope of environmental watering

The term 'environmental watering' refers to the active delivery of held environmental water to support particular environmental objectives by altering the flow in a river or the water level in a wetland. While other terms are sometimes used to describe the delivery of environmental water, 'environmental watering' is deliberately used here and in seasonal watering statements to ensure consistency in the legal instruments that authorise the use of water for the environment in Victoria.

Table 5.2.13 describes the potential environmental watering actions in 2026-27, their expected watering effect (that is, the intended physical or biological effects of the watering action) and the longer-term environmental objectives they support. Each environmental objective relies on one or more potential environmental watering actions and their associated physical or biological effects.

Table 5.2.13 Lower Murray wetlands potential environmental watering actions, expected watering effects and environmental objectives

Potential environmental watering action	Expected watering effects	Environmental objectives
Bidgee Lagoons (fill in autumn)	• Inundate and wet outer fringing lignum and vegetation communities to improve condition • Maintain the health of fringing river red gums and facilitate the longevity of the river red gum population • Provide conditions to support the growth of native aquatic vegetation • Provide a range of habitat for birds and frogs	A1  B1  V1, V2
Bottle Bend Wetland (fill in spring)	• Maintain and increase the health of the adjacent black box • Provide conditions to support the growth of annual aquatic and emergent vegetation • Provide feeding and breeding opportunities for frogs • Maintain feeding and nesting opportunities for non-colonial waterbirds	A1  B1  V1, V2

Potential environmental watering action	Expected watering effects	Environmental objectives
Brickworks Billabong (fill in spring/summer, then top-ups as required)	• Maintain wetland habitat to support Murray hardyhead populations • Maintain and improve the extent and coverage of ruppia • Manage salinity within an acceptable range for Murray hardyhead and rupia • Provide shallow water feeding habitat for waterbirds	B1, F1, V1
Bridge Creek (fill in autumn)	• Inundate and wet outer fringing lignum and vegetation communities to improve condition • Maintain the health of fringing river red gums and black box, and facilitate the longevity of these floodplain tree populations • Provide conditions to support the growth of native aquatic vegetation • Provide a range of habitat for birds and frogs	A1, B1, V1, V2
Brown Swamp (Pound Bend) (fill in autumn)	• Inundate and wet outer fringing lignum and vegetation communities to improve condition • Maintain the health of fringing river red gums and black box, and facilitate the longevity of these floodplain tree populations • Provide a range of habitat for birds and frogs	A1, B1, V2
Bullock Swamp (North and South) (fill in spring)	• Inundate and wet outer fringing lignum and vegetation communities to improve condition • Improve hydrological connectivity for floodplain and wetlands • Maintain the health of the fringing black box and facilitate the longevity of these floodplain tree populations • Provide a range of habitat for birds and frogs	A1, B1, V1, V2
Fishers Lagoon (fill in spring)	• Maintain the health of fringing river red gums and facilitate the longevity of the river red gum population • Provide a range of habitat for birds and frogs	A1, B1, V1
J1 Creek (fill in spring)	• Provide soil moisture to maintain and improve the condition of streamside and floodplain vegetation, specifically river red gum and black box • Provide shallow-water habitat to provide refuge and feeding habitat for wetland-dependent species, including birds and frogs • Stimulate aquatic vegetation growth during inundation • Provide conditions for semi-aquatic lakebed herbland to establish during drawdown • Inundate and wet outer fringing lignum and vegetation communities to improve condition	A1, B1, V1, V2

Potential environmental watering action	Expected watering effects	Environmental objectives
Koorlong Lake (top-ups in spring, then as required)	• Support Murray hardyhead populations • Improve the extent and coverage of ruppia • Manage salinity within an acceptable range for Murray hardyhead and ruppia	F1, V1
Lake Hawthorn (top-ups in spring, then as required)	• Maintain and improve the extent and coverage of ruppia • Provide shallow water feeding habitat for waterbirds	B1, V1
Neds Corner Central (fill in autumn)	• Provide shallow-water habitat to provide refuge and feeding habitat for wetland-dependent species, including birds, frogs and yabbies • Provide conditions for semi-aquatic lakebed herbland to establish during drawdown, including old man weed • Maintain the health of the fringing black box and facilitate the longevity of these floodplain tree populations • Stimulate aquatic vegetation growth during inundation	A1, B1, V1, V2
Outlet Creek (Karadoc Swamp) (fill in autumn)	• Provide soil moisture to maintain and improve the condition of streamside and floodplain vegetation, specifically river red gum, black box and lignum • Provide suitable habitat for native frog species • Provide open water habitat as refuge and feeding and breeding habitat for waterbirds • Maintain significant Moira grass	A1, B1, V1, V2
Robertson Wetland (fill in spring)	• Provide soil moisture to maintain and improve the condition of streamside and floodplain vegetation, specifically river red gum, black box and cane grass • Provide shallow-water habitat to provide refuge and feeding habitat for wetland-dependent species, including birds and frogs • Inundate and wet outer fringing lignum and vegetation communities to improve condition	A1, B1, V2
Sandilong Creek (top-ups as required)	• Provide soil moisture to maintain and improve the condition of streamside and floodplain vegetation • Support re-introduced population of freshwater catfish • Maintain high levels of water quality throughout the creek • Improve hydrological connectivity • Maintain habitat for the resident rakali (water rat) population	F1, V2, PR1

Potential environmental watering action	Expected watering effects	Environmental objectives
Wakool Creek (fill in autumn)	• Provide soil moisture to maintain and improve the condition of streamside and floodplain vegetation, specifically river red gum and lignum • Provide a range of habitat for birds and frogs	A1  B1  V2
Woolshed Creek (fill in spring)	• Provide shallow water feeding habitat for waterbirds • Provide soil moisture to maintain and improve the condition of streamside and floodplain vegetation, specifically river red gum and black box	 B1  V2

Scenario planning

Table 5.2.14 outlines potential environmental watering and expected water use in a range of planning scenarios.

The 2025-26 water year was dry, except for an unseasonally heavy downpour in the Mallee region in late summer that provided local inflows to some wetlands and increased flows in the Murray River over several weeks. Deliveries to Hawthorn Lake and Lake Koorlong were cut short after the rainfall raised water levels by 1 m and 0.7 m, respectively. The remaining actions were completed as planned, except for deliveries to Bottle Bend and Outlet Creek, which were postponed to avoid disruption to infrastructure works.

Mallee CMA assessed a number of factors when prioritising wetland watering in 2026-27. Primary considerations included the current condition of the site relative to expected pre-regulation conditions, the ecological values present, the current hydrological state and comparison of actual and optimal watering regimes at each site. The spread of planned actions across the landscape, including Lindsay, Mulcra and Wallpolla islands and the Hattah Lakes, was also considered. Finally, planning seeks to optimise the environmental benefits of environment water deliveries and associated costs. Some sites require temporary works (such as levees) to facilitate watering, which increases the costs at those sites and may decrease the frequency that they can be watered.

Three permanent wetlands in the lower Murray wetlands rely on environmental watering or natural inundation every year to maintain their environmental values and are high priorities for watering in all planning scenarios in 2026-27. Brickworks Billabong and Koorlong Lake are important sites for endangered Murray hardyhead. Koorlong Lake currently supports a healthy population of Murray hardyhead and requires top-ups each year to maintain salinity levels within the target range for ruppia and successful fish breeding. Hardyhead were reintroduced to Brickworks Billabong in June 2025 following the restoration of wetland and saline habitat, which will be maintained with top-ups in 2026-27. Lake Hawthorn has similar characteristics to Brickworks Billabong and Koorlong Lake, but efforts to establish a Murray hardyhead population in the lake have been unsuccessful. The lake's semi-saline conditions continue to support ruppia and provide foraging habitat for shorebirds. It draws down in summer and autumn and benefits from a spring top-up in all planning scenarios.

Other high priorities in all planning scenarios are Bottle Bend and Brown Swamp wetlands, which have both remained dry since the 2022-23 flood. Watering in 2026-27 will support fringing trees and habitat for birds and frogs, which includes the growling grass frog at Bottle Bend, which is listed as vulnerable under both the Victorian *Flora and Fauna Guarantee Act 1988* and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

FPMMAC plan to water Neds Corner Central in all planning scenarios in 2026-27, in collaboration with Mallee CMA. Having successfully overseen delivery of 13 ML to the neighbouring Musk Duck Wetland in 2025-26, FPMMAC will deliver up to 300 ML to Old Tip Wetland, Neds Floodplain and Neds Lagoon. Cultural outcomes include supporting people to visit and work out on site, including the opportunity for learning and practices (such as weaving and fishing) that will be supported by the watering.

Outlet Creek (Karadoc Swamp) and Bidgee Lagoons are planned to receive water in the dry and average planning scenarios, but they would likely be inundated naturally in wet conditions. Moira grass emerged at Outlet Creek following watering in 2024, and the planned delivery in 2026-27 seeks to maintain this species. Both wetlands provide open water habitat. In contrast, Wakool and Woolshed creeks are narrower systems where modest volumes of environmental water support streamside vegetation.

Spring fills are planned for Robertson Wetland and J1 Creek in the average planning scenario. Robertson Wetland has a low optimum frequency of watering compared to J1 Creek, which is every year. J1 was watered in 2026, and while it would be beneficial to water again, other sites have been prioritised in dry conditions. Roberston Wetland is notable for supporting cane-grass.

Tier 2 priorities include Sandilong Creek, Bridge Creek, Fishers Lagoon and Bullock Swamp North and South. Sandilong Creek is usually watered passively via connection to the Murray. However, the combination of carp screens and high evaporation has meant that inflows have been insufficient to maintain target water levels. The option to deliver additional water by a temporary pump will help maintain water quality for resident animals, including rakali (water rats) and re-introduced catfish. Watering at Bullock Swamp is contingent on a culvert being installed to connect the northern and southern sections. While Bridge Creek is currently meeting its optimum watering frequency, strong interest by Traditional Owners has seen its inclusion in 2026-27. In contrast, Fishers Lagoon is behind its optimum frequency; however, both sites are included in the Restoring Flows to the Mallee Floodplain program, and watering would provide an opportunity to commission new infrastructure.

The Restoring Flows to the Mallee Floodplain program will install new infrastructure, including permanent levees and regulators, at 16 sites across the floodplain. This will reduce the ongoing costs of water delivery at lower Murray wetland sites included in the program: Bottle Bend, Woolshed Creek, Robertson Wetland, Brown Swamp, Outlet Creek, Bidgee Lagoons, Wakool Creek, Fishers Lagoon and Bridge Creek. The program is scheduled for completion by the end of 2026, and any changes in that timeline would have implications for the planned deliveries.

All other wetlands in the lower Murray wetlands will be allowed to draw down to support dry-phase ecosystem processes, as recommended in their management plans.

Table 5.2.14 Lower Murray wetlands environmental watering planning scenarios

Planning scenario	Drought	Dry	Average	Wet
Expected conditions	• The Murray River's natural flow is too low to connect to the wetlands • Very low rainfall year-round and extremely hot and dry conditions in summer/ autumn cause substantial wetland drying • Wetlands rely on environmental water	• Short periods of high flow in the Murray River are possible, but overbank flow to the wetlands is unlikely • There may be low rainfall and a very warm summer/ autumn • Wetlands rely on environmental water	• Sustained periods of high flow in the Murray River in late winter and early spring may wet some low-lying wetlands, but most will rely on environmental water • Local rainfall may be high and provide run-off to some wetlands	• Lengthy periods of high flow and floods with major spills from storages are likely, resulting in widespread wetting of the floodplain and most wetlands • There may be some reliance on environmental water to achieve target water levels • Local rainfall may be high and will provide run-off to most wetlands

Planning scenario	Drought	Dry	Average	Wet
Potential environmental watering – tier 1 (high priorities)	• Bottle Bend Wetland • Brickworks Billabong • Brown Swamp (Pound Bend) • Koorlong Lake • Lake Hawthorn • Neds Corner Central	• Bidgee Lagoons • Bottle Bend Wetland • Brickworks Billabong • Brown Swamp (Pound Bend) • Koorlong Lake • Lake Hawthorn • Neds Corner Central • Outlet Creek (Karadoc Swamp) • Wakool Creek • Woolshed Creek	• Bidgee Lagoons • Bottle Bend Wetland • Brickworks Billabong • Brown Swamp (Pound Bend) • J1 Creek • Koorlong Lake • Lake Hawthorn • Neds Corner Central • Outlet Creek (Karadoc Swamp) • Roberston Wetland • Wakool Creek • Woolshed Creek	• Brickworks Billabong • Brown Swamp (Pound Bend) • Koorlong Lake • Lake Hawthorn • Neds Corner Central
Potential environmental watering – tier 2 (additional priorities)	• Sandilong Creek	• Bridge Creek • Bullock Swamp North and South • Fishers Lagoon • Sandilong Creek	• Bridge Creek • Bullock Swamp North and South • Fishers Lagoon • Sandilong Creek	• Sandilong Creek
Possible volume of water for the environment required to achieve objectives	• 3,600 ML (tier 1) • 100 ML (tier 2)	• 5,800 ML (tier 1) • 4,550 ML (tier 2)	• 6,900 ML (tier 1) • 4,550 ML (tier 2)	• 3,050 ML (tier 1) • 100 ML (tier 2)

5.2.7 Lindsay, Mulcra and Wallpolla islands

System overview

The Lindsay, Mulcra and Wallpolla islands cover over 26,100 ha of Victorian floodplain in the Murray-Sunset National Park (see Figure 5.2.7). These islands form part of the Chowilla Floodplain and the Lindsay-Wallpolla-Mulcra Islands icon site that straddles the Victoria-South Australia-New South Wales border in the mid-Murray River system.

The Lindsay-Mulcra-Wallpolla floodplain is characterised by a network of permanent waterways, small creeks and wetlands. Lindsay River, Potterwalkagee Creek and Wallpolla Creek form the southern boundaries of the site and create large floodplain islands, with the Murray River to the north.

In their natural state, these waterways and wetlands would regularly flow and fill in response to high water levels in the Murray River. Large floods still occur, but major storages in the upper reaches of the Murray River system and extraction for consumptive use have reduced the frequency of small to moderate-sized floods.

Flows in the mid-Murray River system are regulated through a series of weir pools. The weir pools are named after the locks, which form part of the infrastructure at the weirs that allow vessels to navigate from one weir pool to the next. The weir pools are primarily managed as small water storages to ensure adequate water levels for off-stream diversion via pumps and regulated channels.

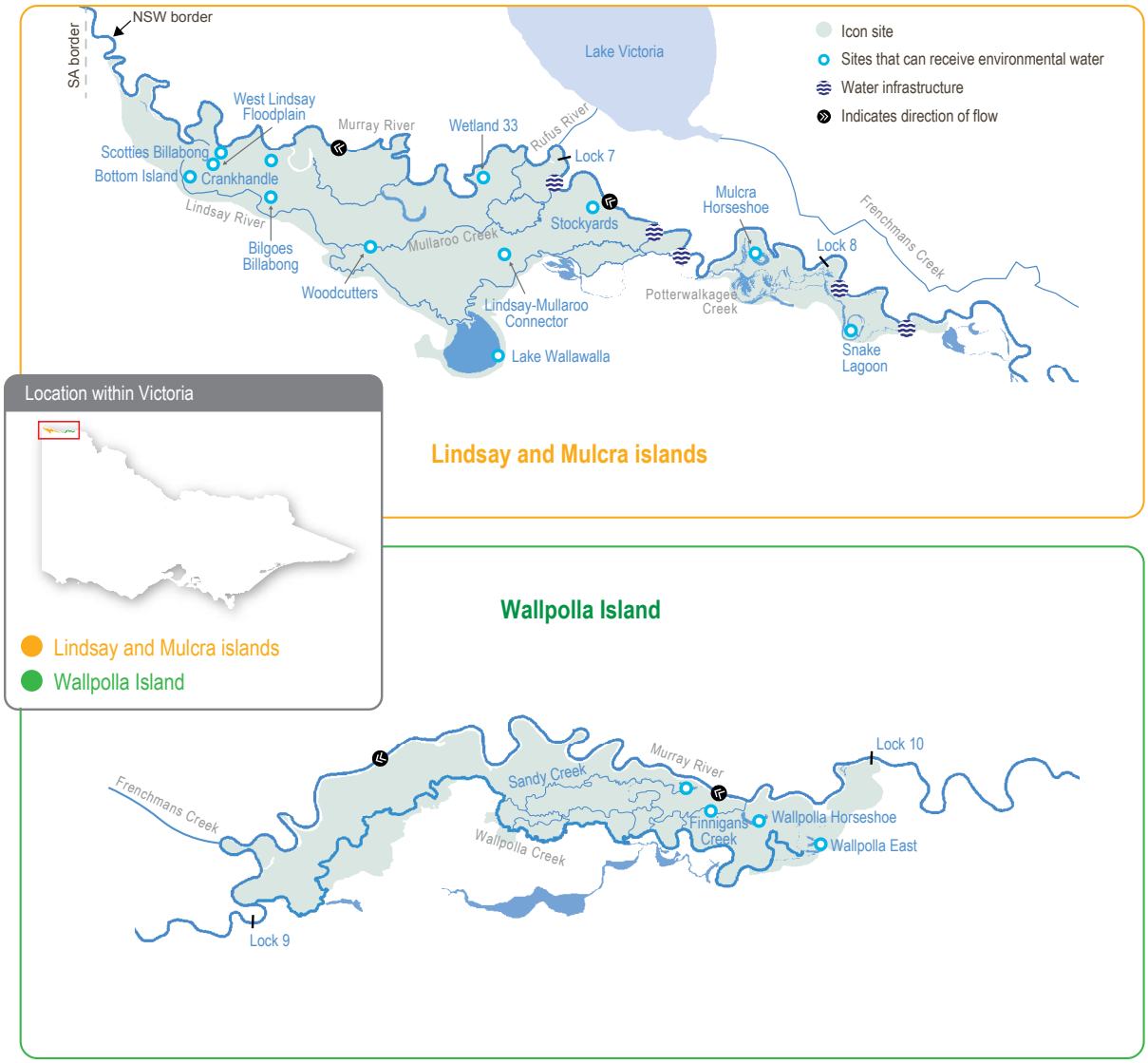
Water is diverted from the lock 9 weir pool in the Murray River to Lake Victoria, where it is stored for later use to meet South Australian water demands. The diversion causes water to bypass Murray River weir pools 7 and 8, and at times it can significantly affect the flow in those reaches.

In recent years, water levels in weir pools 7 and 8 have been managed to achieve ecological benefits in the Murray River channel. For example, weir pool levels have been raised during winter and spring and then lowered during summer and autumn to mimic the seasonal river flow. The raising and lowering provide greater environmental benefits than a stable weir pool because they wet and dry off-channel habitats and create more variable flow patterns in the Murray River and connected floodplain streams. Changes in water levels during appropriate seasons help establish fringing vegetation in shallow margins of the river channel and promote the cycling of nutrients and carbon as conditions fluctuate between wet and dry.

Static weir pool levels and a reduced flow in the Murray River have a significant effect on the flows in the Lindsay River and Potterwalkagee Creek. When the flow increases in the Murray River and/or when water levels in weir pools 7, 8 and 9 are raised above the full supply level, the upper Lindsay River starts flowing (lock 7), the flow to Potterwalkagee Creek increases (lock 8) and Finnigans Creek commences to flow (lock 9). When weir pools are lowered, the flow to the upper Lindsay River and Potterwalkagee and Finnigans creeks ceases. The flow from the Murray into Mullaroo Creek is controlled at the Mullaroo regulator, but the weir pool level does constrain flow rates in some circumstances. Lowering more than 0.5 m below the full supply level makes it difficult to deliver the recommended minimum flow of 600 ML per day that is required to maintain fast-flowing habitat for native fish, especially Murray cod.

Fluctuation of weir pool levels is a major consideration for jurisdictions managing the flow in the Murray River and the anabranch waterways of Lindsay, Mulcra and Wallpolla. Environmental objectives and associated water regimes for the Murray River sometimes conflict with those for the Lindsay, Mulcra and Wallpolla anabranch systems. For instance, fish objectives in the Murray are supported by a faster flow associated with lower weir pool levels, whereas higher weir pool levels are required to deliver flows to the anabranches. Responsible agencies in Victoria and NSW, and the Murray-Darling Basin Authority, collaboratively plan how to effectively manage weir pools and flow to floodplain habitats.

Figure 5.2.7 Lindsay, Mulcra and Wallpolla islands



Environmental values

The Lindsay, Mulcra and Wallpolla islands are formed by three separate anabranch systems that contain various streams, billabongs, large wetlands and swamps. When flooded, waterways and wetlands within these systems provide habitat for native fish, frogs, turtles, waterbirds and water-dependent plants. Terrestrial animals (such as woodland birds) also benefit from improved productivity and food resources when anabranch systems are inundated. Large floodplain wetlands (such as Lake Wallawalla) can retain water for several years after receiving inflows; they provide important refuges for wetland-dependent species and support terrestrial animals (such as small mammals and reptiles).

Mullaroo Creek supports one of the most significant populations of Murray cod in the mid-Murray River system. Mullaroo Creek provides fast-flowing habitat that Murray cod favour, which contrasts with the artificially slow-flowing and still habitats in the nearby Murray River weir pools. Fish in Mullaroo Creek breed and produce juveniles that contribute to populations in adjacent parts of the Murray system (such as in the Darling River in NSW) and the lower Murray River in South Australia. Waterways and wetlands throughout the icon site support several other fish species, including freshwater catfish, golden perch, silver perch, Murray-Darling rainbowfish and unspecked hardyhead.

The reduced frequency and duration of floods in the Murray River have degraded the water-dependent vegetation communities throughout the Lindsay, Mulcra and Wallpolla islands system, which has, in turn, reduced the diversity and abundance of animals that rely on healthy vegetation for habitat.

Environmental objectives in the Lindsay, Mulcra and Wallpolla islands

	A1 – Maintain populations of frogs
	**B1** – Maintain communities and the species diversity of colonial nesting waterbirds, waterfowl and waders that feed on fish **B2** – By 2030, increase populations of colonial nesting waterbirds at Lake Wallawalla and non-colonial waterbirds at Mulcra Horseshoe and Wallpolla Horseshoe
	**CN1** – By 2030, improve the function of water-dependent ecosystems by improving productivity linkages between river and floodplain habitats
	F1 – By 2030, increase the abundance of small-bodied native fish and the spread of age classes for long-lived native fish, compared to 2006 baseline levels
	**V1** – Improve populations of threatened flow-dependent plants **V2** – By 2030, maintain the extent and improve the condition of river red gum, black box and lignum compared to 2006 baseline levels **V3** – By 2030, improve the species richness and abundance of native wetland and floodplain aquatic vegetation functional groups

Traditional Owner cultural values and uses

Aboriginal ancestral occupation across the Lindsay-Mulcra-Wallpolla floodplain dates back tens of thousands of years and is sustained by the rich productivity of the floodplain woodland and wetland systems. Historically, the islands would have been an abundant source of food and water for these communities. The floodplain remains a vital part of community health and wellbeing for Aboriginal communities.

The First People of the Millewa-Mallee Aboriginal Corporation (FPMMAC) is recognised as the Traditional Owner of Country and holds Native Title for the area of north-west Victoria that runs south of the Murray River to the Mallee Highway and west from the Calder Highway to the South Australian border, including the Murray-Sunset National Park.

There are many sites of cultural significance across the floodplain, including ceremonial grounds, earth oven remains, culturally modified trees, shell middens, song lines, ancestral resting places and story places.

FPMMAC has maintained associations with the Murray River for tens of thousands of generations. The river and its surrounds are among the richest sources of Aboriginal archaeological and cultural heritage material in Australia. The floodplain provides vital resources, including food, water, shelter, medicine and tools. The Traditional Owners retain a strong connection to this Country.

FPMMAC has a strong working relationship with the Mallee CMA, which involves regular two-way communication, including planning, sharing of knowledge and ongoing discussions. Water in the landscape is critical to the spirituality of the people of the FPMMAC, strengthening their connection to Country. FPMMAC and Mallee CMA have frequent discussions about water, including the planning and delivery of environmental water.

FPMMAC participated in an environmental water planning event in October 2025, with a strong focus on early and meaningful engagement to inform future planning. Discussions reflected on previous engagements and how these have shaped current activities, before moving to FPMMAC's aspirations for environmental water delivery in 2026-27. The day was marked by a high level of participation and knowledge-sharing from Traditional Owners, particularly around the cultural connection to water and the role it plays in maintaining healthy Country.

Traditional Owners emphasised the importance of supporting aquatic life, including native fish and shellfish, as well as bird and plant communities across priority sites. These discussions enabled more detailed consideration of how environmental water can be used to improve water quality, support habitat and sustain healthy trees and vegetation. Cultural indicators of waterway health (such as the presence of mussels and breeding waterbirds) were highlighted as important measures for future monitoring.

Targeted discussions were also held regarding Lake Wallawalla, a site of high cultural and ecological significance for FPMMAC. Planning has commenced to guide future management of the site, with a strong emphasis on protecting cultural heritage values along the lake edge, dune systems and culturally significant tracks, while maintaining tree health until broader restoration works through the Victorian Murray Floodplain Restoration Project occur. Other priority locations, including Woods Lagoon (Wallpolla Wetland 2) and the Old Bridge site on Wallpolla Island, were identified for future watering to improve aquatic habitat, bank stability and vegetation condition.

Traditional Owner involvement in seasonal watering proposals continues through formal and informal engagement, supported by regular meetings and on-Country discussions with FPMMAC staff and leaders throughout the year. These conversations have expanded to include desired monitoring programs, hands-on involvement in works and monitoring, capacity-building and training opportunities, and opportunities for knowledge-sharing and on-Country activities. Collectively, this engagement has provided valuable guidance for developing a more holistic, culturally informed approach to environmental water planning and delivery.

Watering planned and/or delivered in partnership with Traditional Owners to support cultural values and uses

Social, recreational and economic values and uses

In planning the potential environmental watering actions in **Table 5.2.15**, Mallee CMA has also considered how environmental flows could support other values and uses, including:

- water-based recreation (such as canoeing, kayaking, fishing and yabbying)
- riverside recreation and amenity (such as bushwalking, camping, bird and wildlife watching, four-wheel driving and photography)
- community events and tourism (such as increased and longstanding repeat visitation, ecotourism and educational programs for school, TAFE and university students)
- socio-economic benefits (such as for commercial beekeepers who rest bees around the floodplain, local businesses providing accommodation and hospitality to tourists, researchers and local water delivery contractors).

Tourism is one of the largest industries in the Mallee region, with Murray-Sunset National Park a major attraction for visitors seeking remote, nature-based experiences. The Lindsay, Mulcra and Wallpolla islands attract visitors from Victoria, New South Wales and South Australia, with waterways and wetlands forming focal points for visitation. The presence, extent and condition of water strongly influence visitation patterns and the quality of visitor experiences within this landscape.

Permanent and temporary water in the Murray River, anabranches and wetlands support a wide range of on-site recreational activities, including camping, canoeing, walking, bird and wildlife watching, photography, fishing and yabbying. Environmental watering enhances these uses by maintaining open water, improving wetland condition and supporting increased visibility and activity of waterbirds and aquatic animals. Short-term responses to watering can provide additional recreational opportunities and contribute to peaks in visitation.

Environmental watering also provides direct local economic benefits through the engagement of contractors and suppliers involved in water delivery. Many actions require temporary pumping infrastructure, with installation and operation typically undertaken by Mallee-based businesses that employ local staff and use local goods and services. This supports regional economic activity while enabling the delivery of environmental outcomes across the floodplain.

	Environmental watering will also support water sports activities (e.g., canoeing, kayaking)
	Environmental watering will also support waterbird-related recreational activities (e.g., twitching, birdwatching)
	Environmental watering will also support angling activities
	Environmental watering will also support peaks in visitation (e.g., camping and other public activities on long weekends and school holidays)

Scope of environmental watering

The term 'environmental watering' refers to the active delivery of held environmental water to support particular environmental objectives by altering the flow in a river or the water level in a wetland. While other terms are sometimes used to describe the delivery of environmental water, 'environmental watering' is deliberately used here and in seasonal watering statements to ensure consistency in the legal instruments that authorise the use of water for the environment in Victoria.

Table 5.2.15 describes the potential environmental watering actions in 2026-27, their expected watering effect (that is, the intended physical or biological effects of the watering action) and the longer-term environmental objectives they support. Each environmental objective relies on one or more potential environmental watering actions and their associated physical or biological effects.

Table 5.2.15 Lindsay, Mulcra and Wallpolla islands potential environmental watering actions, expected watering effects and environmental objectives

Potential environmental watering action	Expected watering effects	Environmental objectives
Lindsay Island – Lindsay River North		
Spring low flow (45 ML/day for three months during September to November)	• Provide temporary flowing water to reconnect pools and support dispersal, spawning and recruitment opportunities for native fish • Improve seasonal flow through the upper Lindsay River to improve connectivity between the Murray River and Lindsay River • Provide soil moisture to improve the condition of streamside vegetation • Inundate the littoral zone to improve productivity	F1  CN1  V1, V2, V3
Lindsay Island – Mullaroo Creek		
Year-round low flow (minimum of 600 ML/day)	• Maintain fast-flowing habitat for native fish (such as Murray cod, silver perch and golden perch) • Maintain habitat for aquatic vegetation and maintain soil moisture to maintain the condition of streamside vegetation	F1  CN1  V1, V2,
Elevated spring flow (1,200 ML/day for three months during September to November)	• Increase the extent of fast-flowing water to provide cues for movement and spawning, and improve recruitment opportunities for native fish • Provide improved fish passage between Mullaroo Creek and the Murray River via the Mullaroo Creek regulator fishway • Improve productivity linkages between river and floodplain habitats	
Lindsay Island wetlands		
Scotties Billabong (fill in spring)	• Provide shallow-water habitat to provide refuge and feeding habitat for wetland-dependent species, including frogs and waterbirds • Stimulate aquatic vegetation growth during inundation • Provide soil moisture to maintain and improve the condition of streamside vegetation, specifically river red gum and lignum • Provide conditions for the lakebed herbland to establish during drawdown	A1  B1, B2  V1, V2
Crankhandle (fill in autumn)	• Provide shallow-water habitat to provide refuge and feeding habitat for wetland-dependent species, including frogs and birds • Stimulate aquatic vegetation growth during inundation • Provide low-level inundation and increased soil moisture to maintain and improve the condition of streamside vegetation, specifically lignum • Provide conditions for semi-aquatic lakebed herbland to establish during drawdown	A1  B1, B2  V1, V2

Potential environmental watering action	Expected watering effects	Environmental objectives
Wetland 33 (fill in spring)	• Provide both shallow and deeper freshwater habitat for wetland-dependent species, including waterbirds, frogs and turtles • Maintain the condition of streamside vegetation, including river red gum communities • Provide conditions for the establishment of aquatic plants	A1  B1  CN1  T1  V1, V2, V3
Lindsay-Mullaroo Connector (fill in autumn)	• Provide shallow-water habitat and open water habitat to provide for feeding and breeding for frogs and waterbirds • Stimulate aquatic vegetation growth during inundation • Provide soil moisture to improve the condition of streamside vegetation, specifically lignum, river red gum and black box • Provide conditions for semi-aquatic lakebed herbland to establish during drawdown	A1  B1  CN1  V1, V2, V3
Stockyards (fill in spring)	• Provide shallow-water habitat and open water habitat to provide feeding and breeding habitat for frogs and waterbirds • Stimulate aquatic vegetation growth during inundation • Provide soil moisture to improve the condition of streamside vegetation, specifically river red gum • Provide conditions for semi-aquatic lakebed herbland to establish during drawdown	A1  V1, V2, V3
Mulcra Island – Potterwalkagee Creek		
Spring low flow via the Stoney Crossing regulator (120 ML/day for three months during September to November)	• Provide temporary flowing water to reconnect pools and support dispersal, spawning and recruitment opportunities for native fish • Provide seasonal flowing water habitat and improve connectivity between the Murray River and Potterwalkagee Creek • Maintain soil moisture to improve the condition of streamside vegetation • Provide a productivity pulse through the return of carbon and nutrients to the water column from the channel	A1  CN1 F1  V1, V2, V3

Potential environmental watering action	Expected watering effects	Environmental objectives
Wallpolla Island – Finnigans Creek		
Finnigans Creek (moderate flow pulse during spring)	• Increase the diversity of structural habitat • Promote the recruitment of aquatic plants • Provide connectivity between the Murray River and Wallpolla Creek • Provide conditions for semi-aquatic lakebed herbland to establish during drawdown • Provide soil moisture to improve the condition of streamside vegetation, specifically black box and river red gum • Provide temporary flowing water to reconnect pools and support dispersal, spawning and recruitment opportunities for native fish	A1, CN1, F1, V1, V2, V3
Wallpolla Island wetlands		
Sandy Creek and Lilyponds (fill in spring)	• Provide diversity of structural habitat • Provide an abundance of wetland aquatic vegetation • Provide connectivity between the river and the floodplain • Provide conditions for semi-aquatic lakebed herbland to establish during drawdown • Provide shallow-water habitat and open water habitat to provide feeding and breeding habitat for frogs and waterbirds (including group nesting species) • Provide soil moisture to improve the condition of streamside vegetation, specifically lignum and river red gum	A1, B1, CN1, F1, V1, V2, V3
Wallpolla Horseshoe (fill in spring)	• Provide shallow-water habitat and open water habitat to provide feeding and breeding habitat for frogs and waterbirds (including group nesting species) • Provide habitat to support native fish species • Provide soil moisture to improve the condition of streamside vegetation, specifically river red gum • Promote aquatic and streamside vegetation growth	A1, B1, B2, CN1, F1, V2, V3

Scenario planning

Table 5.2.16 outlines potential environmental watering and expected water use in a range of planning scenarios.

The 2025-26 water year was dry, except for a record-setting downpour in the Mallee region in late summer that provided local inflows to some wetlands and increased flows in the Murray over several weeks. However, this had little impact on environmental water deliveries: anabranch diversions to Mullaroo and Potterwalkagee creeks proceeded as planned, and wetland watering via temporary pumps continued in a dry planning scenario.

Other factors did affect the implementation of the seasonal watering plan in the islands. Autumn deliveries to the Lindsay-Mullaroo Connector and Wetland 33 were cancelled due to high diesel prices, which made them poor value for money. If necessary, watering in 2026-27 will be adaptively managed to account for fluctuating costs.

The Restoring Flows to the Mallee Floodplain (RFMF) infrastructure works are scheduled to be completed in 2026 and include works at Websters Lagoon, Snake Lagoon extension and Scotties Billabong, though only the latter is planned to receive environmental water in 2026-27. The RFMF infrastructure will reduce the cost of delivery to sites by removing the need for temporary earthworks. RFMF sites were treated as normal during planning: that is, their priority was not increased or decreased.

The foremost consideration for scenario planning and prioritisation for 2026-27 is the current environmental condition of the landscape. Despite localised improvement in condition, much of the landscape was dry prior to floods in 2022, which was reflected in condition monitoring. This was potentially exacerbated by many sites not meeting their required watering regimes over more than 10 years. Sites chosen for 2026-27 focus on those that are behind their watering regimes.

Deliveries via temporary pumps

Most wetlands and creeklines across the Lindsay, Mulcra and Wallpolla islands have experienced dry-phase periods since flooding in 2022-23, and many remain below the optimum watering frequency after a round of watering in 2025-26. The program for 2026-27 seeks to further remedy this by watering up to seven wetlands across Lindsay and Wallpolla islands. Planning seeks to optimise the environmental benefit of environment water deliveries and associated costs. Some sites require temporary works (such as levees) to facilitate watering, which increases costs at those sites and may decrease the frequency that they can be watered.

The following table shows the priority wetlands across Lindsay, Mulcra and Wallpolla islands, their current frequency of watering (in years) and their optimum frequency for watering.

Wetland	Current frequency	Optimum frequency
Scotties Billabong	5 in 10	7 in 10
Crankhandle	5 in 10	7 in 10
Wetland 33	6 in 10	7 in 10
Lindsay–Mullaroo Connector	6 in 10	8 in 10
Stockyards	5 in 10	7 in 10
Sandy Creek and Lilyponds	7 in 10	Sandy Creek: 8 in 10; Lilyponds: 7 in 10
Wallpolla Horseshoe	8 in 10	9 in 10

Wallpolla Horseshoe is the highest priority for watering in 2026-27 in all climate scenarios. The spring fill will support native vegetation and animals, including fish, frogs and waterbirds, as well as the aquatic revegetation works conducted by Traditional Owners in 2025-26.

Crankhandle, Lindsay-Mullaroo Connector, Sandy Creek and Lilyponds, Scotties Billabong and Wetland 33 are also priorities, with watering planned in the dry and average planning scenarios. Crankhandle, Lindsay-Mullaroo Connector, Scotties Billabong and Wetland 33 have been in a dry phase since overbank flooding in 2022-23, which allowed for nutrient cycling and pest management, but they are now behind their optimal watering regime. Watering of Sandy Creek and Lilyponds will maintain its watering regime and build on the outcomes of watering in 2025-26. In addition to providing a diversity of aquatic habitats, the action improves connectivity between the Murray River and Wallpolla Creek.

Stockyards is planned for watering in the average planning scenario only, although it is expected to be inundated naturally in a wet scenario. Stockyards remains under its optimum frequency despite being watered in 2025-26. Watering in 2026-27 will build on outcomes of earlier actions, which included some species (such as jerry-jerry and dwarf brooklime) that are uncommon and listed in the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

Currently, there are no priority carryover requirements identified for Lindsay, Mulcra and Wallpolla islands in 2027-28. It is expected that an adaptive watering program of similar scope to 2026-27 will be planned, and carryover requirements will be established as information becomes available.

Anabranch watering

Mullaroo Creek provides some of the best-flowing habitat in the southern basin for fish breeding, particularly for Murray cod, according to the ongoing dedicated monitoring program. Given the reduction of the main Murray channel to a series of weir pools, adjacent flowing habitat is particularly valuable and justifies watering across all planning scenarios every year. Baseflows are delivered throughout the year at standard weir 7 operating levels, but delivery of the spring pulse requires levels above the full supply level for up to several months.

The environmental objectives for Lindsay River and Potterwalkagee Creek require a flow in eight or nine of every 10 years to maintain soil moisture for streamside vegetation and replenish and connect deep pools for dispersal and recruitment of native fish. In most years, this is achieved through delivery of a low flow in spring, but every second or third year, a higher-magnitude flow during winter, spring and early summer enhances connectivity through the waterways and with the Murray River. The occasional delivery of higher-magnitude flows in Potterwalkagee Creek also enables delivery of water to the floodplain on Mulcra Island. From mid-late summer through to the end of autumn, weir pool levels typically prevent the flow from entering both anabranches.

In the drought, dry and average planning scenarios, the lock 7 weir pool will be held at or slightly above full supply level during spring to deliver a spring low flow into the northern section of Lindsay River. The lower reaches of Lindsay River downstream of the confluence with Mullaroo Creek will incidentally receive flows of operational and environmental water.

In drought, dry and average planning scenarios, the lock 8 weir pool will be held at or slightly above full supply level during spring, and the Stoney Crossing regulator will be managed to provide a minor flow into Potterwalkagee Creek during this time. There will be no flow in Potterwalkagee from summer to winter in these planning scenarios, consistent with the natural flow regime. In a wet scenario, high flows in the Murray River are likely to deliver natural flows through all sections of the Potterwalkagee Creek and inundate parts of the adjacent floodplain for extended periods in winter, spring and early summer.

In 2025-26, delivery to Finnigans Creek via a temporary pump was halted when levels in lock 9 became higher than in the creek. The temporary levee was removed, allowing water to flow via gravity into the waterway. Adapting to this, Mallee CMA plan a small increase above the full supply level in lock 9 during spring in the dry and average planning scenarios. This way, environmental objectives can be met in a more natural way, and delivery costs will be avoided. For instance, connectivity between the Murray River and Wallpolla Creek will be improved, allowing dispersal from isolated pools.

Table 5.2.16 Lindsay, Mulcra and Wallpolla islands environmental watering planning scenarios

Planning scenario	Drought	Dry	Average	Wet
Expected conditions	• Year-round low flow in the Murray River and no natural floodplain wetting • Weir pools will be maintained at full supply level in spring and drawn down below full supply level during summer, autumn and winter • Substantial wetland drying will occur	• Rare high-flow events in the Murray River and no natural floodplain wetting • Weir pools will be raised in spring and drawn down below full supply level in summer, autumn and winter • Substantial wetland drying will occur	• Short periods of high flow, most likely in spring/summer, provide minor wetting of the floodplain • Weir pool levels will be maintained at full supply level or raised in winter/spring and summer and drawn down in summer, autumn and winter	• Long periods of high flow, with major spills from storages resulting in widespread wetting of the floodplain and wetting of most wetlands • Weirs would be removed to allow the passage of natural flow
Lindsay Island				
Potential environmental watering – tier 1 (high priorities)	• Spring low flow (Lindsay River North) • Year-round low flow (Mullaroo Creek) • Elevated spring flow (Mullaroo Creek)	• Spring low flow (Lindsay River North) • Year-round low flow (Mullaroo Creek) • Elevated spring flow (Mullaroo Creek) • Crankhandle (top up in autumn) • Lindsay-Mullaroo connector (fill in autumn) • Scotties Billabong (fill in spring) • Wetland 33 (fill in spring)	• Spring low flow (Lindsay River North) • Year-round low flow (Mullaroo Creek) • Elevated spring flow (Mullaroo Creek) • Crankhandle (top up in autumn) • Lindsay-Mullaroo connector (fill in autumn) • Scotties Billabong (fill in spring) • Stockyards (fill in spring) • Wetland 33 (fill in spring)	• Year-round low flow (Mullaroo Creek) • Elevated spring flow (Mullaroo Creek)
Mulcra Island				
Potential environmental watering – tier 1 (high priorities)	• Spring low flow (Potterwalkagee Creek)	• Spring low flow (Potterwalkagee Creek)	• Spring low flow (Potterwalkagee Creek)	

Planning scenario	Drought	Dry	Average	Wet
Wallpolla Island				
Potential environmental watering – tier 1 (high priorities)	• Wallpolla Horseshoe (fill in spring)	• Moderate spring pulse (Finnigans Creek) • Sandy Creek and Lilyponds (fill in spring) • Wallpolla Horseshoe (fill in spring)	• Moderate spring pulse (Finnigans Creek) • Sandy Creek and Lilyponds (fill in spring) • Wallpolla Horseshoe (fill in spring)	• Wallpolla Horseshoe (fill in spring)
Possible volume of water for the environment required to achieve objectives	• 400 ML (tier 1) • N/A (tier 2)	• 3,650 ML (tier 1) • N/A (tier 2)	• 4,450 ML (tier 1) • N/A (tier 2)	• 400 ML (tier 1) • N/A (tier 2)
Priority carryover requirements for 2027-28	• 0 ML			

5.3 Ovens system

Waterway manager – North East Catchment Management Authority

Storage manager – Goulburn-Murray Water

Environmental water holder – Commonwealth Environmental Water Holder

System overview

The Ovens River rises in the steep, forested mountains of the Great Dividing Range near Mount Hotham and flows about 150 km to join the Murray River in the backwaters of Lake Mulwala (Figure 5.3.1). The system has two small water storages: Lake Buffalo on the Buffalo River and Lake William Hovell on the King River. The regulated reaches of the Ovens system include the Buffalo and King rivers below these storages and the Ovens River from its confluence with the Buffalo River to the Murray River.

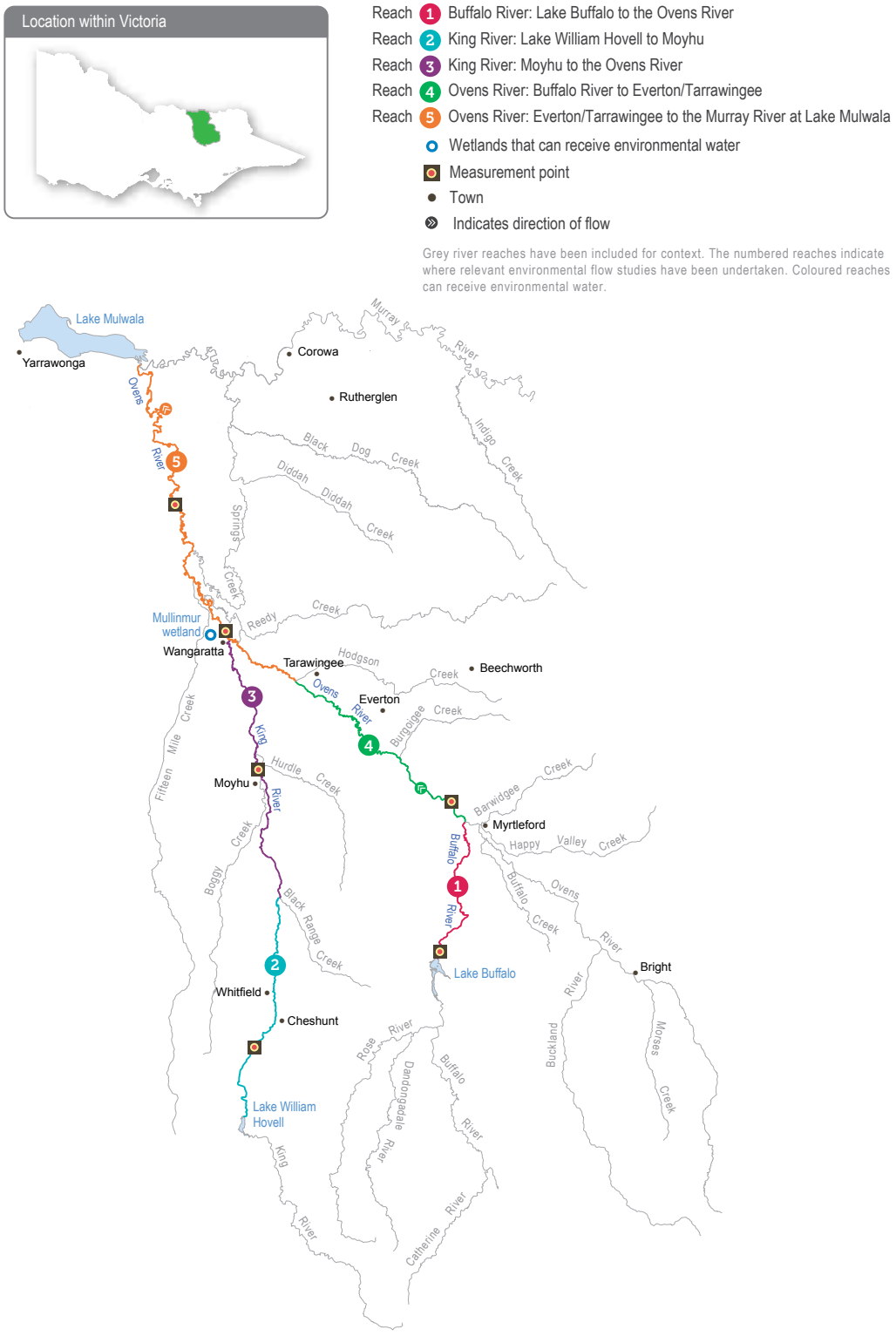
As its storages are small and spill regularly, the Ovens system maintains a large proportion of its natural flow regime, particularly in winter/spring. However, the storages and licensed water extractions throughout the system can restrict the flow in drier years, and parts of the system can become flow-stressed during summer and autumn.

The Ovens River flows into Lake Mulwala on the Murray River; the lake is the largest weir pool on the Murray regulated system. The Ovens River's flow contributes to the reliability and variability of the flow in the Murray River and supports many downstream uses, including irrigation, urban supply and watering of iconic floodplain sites (such as Barmah Forest).

Water for the environment is held in Lake Buffalo and Lake William Hovell and can be released when the storages are not spilling. Five reaches in the Ovens system can benefit from releases of water for the environment. While all are important, a relatively small volume (123 ML) of water is available, and it is insufficient to meet most environmental flow objectives. In recent years, private landowners have donated some of their annual water allocations to the VEWH to use in the King River. The Taungurung Land and Waters Council has also transferred their annual allocation to the VEWH to be delivered to the King River to heal Country.

The water transfers are used selectively to deliver the greatest possible environmental benefit. Water for the environment is most commonly used in the Ovens system to deliver critical flow events in reaches immediately below the two main storages, or it is used in conjunction with operational water releases to influence the flows of the Buffalo River and the lower Ovens River. It may also be used to top up Mullinmur Wetland in Wangaratta.

Figure 5.3.1 Ovens system



Environmental values

The diverse aquatic habitat and abundant food resources associated with the Ovens system support many native fish species, including Murray cod, trout cod, golden perch, Macquarie perch, two-spined blackfish and unspecked hardyhead. The Buffalo River provides valuable habitat for large-bodied fish species during part of their breeding cycle, while trout cod have an extensive range within the system and are found as far up the King River as Whitfield. A distinctive feature of the Ovens system relative to more heavily regulated rivers is the lack of high summer flow. The absence of a high summer flow is particularly important to native fish populations, where the presence of 'slackwater habitat' facilitates successful native fish recruitment, reducing the likelihood of larvae being swept downstream, whilst also being rich in food resources.

Projects to recover trout cod and Macquarie cod populations in the lower Ovens system have been successful. No stocking of trout cod has occurred in the Ovens system since 2006, but successive annual surveys along the lower Ovens indicate that the system is supporting the recruitment and survival of this species throughout its life cycle. Macquarie perch was first stocked in the Ovens River in 2011, with the most recent event occurring in 2025. Annual surveys conducted by the Arthur Rylah Institute on the Ovens River since 2017 indicate fish are surviving to maturity. In January 2024, the Victorian Fisheries Authority banned the take of Macquarie perch across Victoria to protect their population.

The lower Ovens wetland complex contains over 1,800 wetlands. It is listed as nationally significant in the ***Directory of Important Wetlands in Australia*** and is home to various waterbirds, including egrets, herons, cormorants and bitterns. The streamside zones of river channels throughout the Ovens system support some of Victoria's healthiest river red gum forests and woodlands, while the wetlands support various aquatic and semi-aquatic vegetation communities.

Water for the environment has been delivered to Mullinmur Wetland at Wangaratta in 2019-20, 2024-25 and 2025-26. This site has been the focus of several environmental improvement projects recently, including carp removal, a revegetation program and the stocking of native fish, including the endangered freshwater catfish, in December 2019 and November 2024. In February 2026, La Trobe University undertook its first turtle survey at Mullinmur Wetland and found abundant populations of the eastern long-necked turtle, the critically endangered Murray River turtle and the endangered broad-shelled turtle.

Environmental objectives in the Ovens system

	F1 – Maintain abundance and diversity of large- and small-bodied native fish species associated with main channel habitats **F2** – Maintain abundance and diversity of large- and small-bodied native fish species associated with floodplain habitats
	**MI1** – Maintain abundance and diversity of waterbug assemblages in pool, riffle and edge habitats
	**PR1** – Maintain aquatic mammal (platypus and rakali [water rat]) populations and structures
	**V1** – Maintain the extent, condition and floristic diversity of submerged vascular vegetation (e.g., water ribbons, milfoils) **V2** – Maintain the extent, condition and floristic diversity of fringing emergent non-woody plants (e.g., rushes, reeds, sedges)
	WQ1 – Maintain water quality

Traditional Owner cultural values and uses

The Ovens system is within the recognised Registered Aboriginal Party and Recognition and Settlement Agreement boundary of the Taungurung Land and Waters Council (TLaWC) and the Yorta Yorta Nation Aboriginal Corporation (YYNAC). The Ovens system is also an area of significance to the Bangarang, Dhuduroa and Waywurru people.

TLaWC's water knowledge group, Baan Ganalina (Guardians of Water), supports increasing Taungurung influence in water management, building internal capacity and advancing Taungurung water rights.

Taungurung have developed a water chapter as a sub-strategy of its Country Plan, *Baan Dhumba-Dji-Ngan Mundak Gunga (We must speak to protect water)*. It lists several objectives, including increasing and strengthening Taungurung voices, increasing water literacy and capacity and returning water to disconnected wetlands. The future delivery of water for the environment by TLaWC on Taungurung Country would help achieve some of these objectives.

The Yorta Yorta Nation Aboriginal Corporation's ***Yorta Yorta Whole-Of-Country Plan 2021-2030*** outlines objectives for Yorta Yorta Country, including for the Ovens River, and it identifies the lower Ovens River as a high priority for management actions. The Country Plan's objectives aim to support more culturally informed planning for water in the lower Ovens River in the future.

TLaWC donated its 39 ML entitlement in the King River system to support environmental objectives as part of its goal of healing and caring for Country in 2026-27. The council's allocation has been released from Lake William Hovell seven times as an environmental flow (2020-2026) in partnership with the North East CMA, Goulburn-Murray Water and the VEWH to provide additional water to the King River and assist in healing Country.

Planned environmental flows may be modified to align with cultural benefits so long as environmental outcomes are not compromised.

Increasing the involvement of Traditional Owners in managing environmental flows and progressing opportunities towards self-determination in the environmental watering program is a core commitment of the North East CMA, the VEWH and its program partners. This is reinforced by legislation and policy commitments, including the *Water Act 1989*, the ***Victorian Aboriginal Affairs Framework***, the 2016 ***Water for Victoria***, the 2022 ***Water is Life: Traditional Owner Access to Water Roadmap***, and, in some cases, agreements under the *Traditional Owner Settlement Act 2010*.

Where Traditional Owners are more deeply involved in the planning and/or delivery of environmental water for a particular site, their contribution is acknowledged in **Table 5.3.1** with an icon, as pictured below and also explained in **Figure 1.2.3**. The use of this icon is not intended to indicate that these activities are meeting all the needs of Traditional Owners, but it is used in the spirit of valuing that contribution.

Watering planned and/or delivered in partnership with Traditional Owners to support cultural values and uses

Social, recreational and economic values and uses

In planning the potential environmental watering actions in **Table 5.3.1**, North East CMA considered how environmental flows could support values and uses, including:

- water-based recreation (such as kayaking, boating and fishing)
- riverside recreation and amenity (such as camping and visitation for mental/physical health and wellbeing)
- community events and tourism (such as providing a setting for community gatherings, outdoor school learning, sporting events and citizen science projects)
- socio-economic benefits (such as businesses used by anglers and stock and domestic uses that rely on water quality, supported by deliveries of water for the environment when the natural flow is at its lowest from November to March).

Environmental flows may be delivered to Mullinmur Wetland in late spring, summer or early autumn to re-establish submerged aquatic vegetation, improve water quality and support native fish at the site. The water is expected to sustain other benefits to the local community (such as recreation and amenity). The Mullinmur Wetland site is owned by the Roman Catholic Trust and managed by Wangaratta Landcare and Sustainability Incorporated. An education hub provides a space for environmental education for students from Galen Catholic College and the Borinya Wangaratta Community Partnership School and other people from the local community, including a team of Waterwatch citizen scientists. These volunteers have been involved in monitoring changes in conditions for plant and fish species to inform deliveries of water for the environment.

The Ovens system is valued for its recreational fishing, boating, swimming, camping, sightseeing and waterway-based tourism, as well as by the communities that centre on these waterways.

	Environmental watering will also support water sports activities (e.g., canoeing, kayaking, rowing, swimming, water skiing) by boosting flow during the late summer and early autumn low-flow period
	Environmental watering will also support waterbird-related recreational activities (e.g., twitching, birdwatching) by connecting wading and foraging habitat
	Environmental watering will also support angling activities by boosting flow during the late summer and early autumn low-flow period to provide a flow cue to trigger native fish movement to source new food and habitat requirements
	Environmental watering will also support peaks in visitation (e.g., camping and other public activities on long weekends and school holidays) by improving water quality and aesthetics

Scope of environmental watering

The term 'environmental watering' refers to the active delivery of held environmental water to support particular environmental objectives by altering the flow in a river or the water level in a wetland. While other terms are sometimes used to describe the delivery of environmental water, 'environmental watering' is deliberately used here and in seasonal watering statements to ensure consistency in the legal instruments that authorise the use of water for the environment in Victoria.

Table 5.3.1 describes the potential environmental watering actions in 2026-27, their expected watering effect (that is, the intended physical or biological effects of the watering action) and the longer-term environmental objectives they support. Each environmental objective relies on one or more potential environmental watering actions and their associated physical or biological effects.

Table 5.3.1 Ovens system potential environmental watering actions, expected watering effects and environmental objectives

Potential environmental watering action	Expected watering effects	Environmental objectives
Buffalo River: targeting reach 1		
Summer/autumn low-flow variability (greater than 70 ML/day for two days during February to April)	• Provide a diversity of microhabitats within the river channel for large- and small-bodied native fish • Provide sufficient depth across the channel to facilitate native fish movement to source food and habitat requirements • Cover riffle zones and provide shallow habitat for native fish and waterbugs and foraging areas for aquatic mammals	F1, MI1, PR1
Autumn low-flow fresh (≥430 ML/day for three days during March to April)	• Provide a diversity of microhabitats within the river channel for large- and small-bodied native fish • Maintain acceptable dissolved-oxygen levels in pools to support aquatic life • Provide a flow cue to trigger native fish movement to source new food and habitat requirements between the Buffalo and Ovens rivers • Provide flow variability to maintain floristic diversity and elevational zonation of streamside vegetation • Provide downstream dispersal of plant propagules (e.g., seed and plant fragments) and scour attached epiphytes • Maintain an adequate depth of water in the channel to support the long-term recruitment and survival of submerged aquatic plants (e.g., water ribbons and milfoils) and streamside emergent non-woody plants (e.g., rushes, reeds and sedges) • Scour fine sediments from the substrate to promote the renewal of food resources for waterbugs (such as benthic biofilms) • Support the dispersal of juvenile platypus in autumn	F1, MI1, PR1, V1, V2, WQ1
King River: targeting reaches 2 and 3		
Summer/autumn low-flow variability (greater than 60 ML/day for two to four days during February to April)	• Provide a diversity of microhabitats within the river channel for large- and small-bodied native fish • Provide a sufficient depth across the channel to facilitate native fish movement to source food and habitat requirements • Cover riffle zones and provide shallow habitat for native fish and waterbugs and foraging areas for aquatic mammals	F1, MI1, PR1
Mullinmur Wetland		
Mullinmur Wetland (up to 20 ML) top-up during November to April	• Maintain the water level within the wetland to support the growth and recruitment of aquatic vegetation • Maintain habitat and water quality for native fish movement to source food and habitat requirements • Maintain acceptable dissolved-oxygen levels in pools to support aquatic life	F1, V1, WQ1

Scenario planning

Table 5.3.2 outlines potential environmental watering and expected water use in a range of planning scenarios.

The weather and inflows into storages greatly affect how water for the environment will be used in the Ovens system. In the drought and dry scenarios, the highest priority will be to use available water for the environment to introduce some variability to the summer/autumn low flow to limit the duration of extremely low-flow or cease-to-flow events that can stress native fish and waterbugs.

In the average and wet planning scenarios, the objective is to provide a greater flow to support fish movement and breeding and increase the abundance and diversity of waterbugs. At this time, there is not enough water for the environment to deliver the recommended autumn fresh in full, so releases would need to coincide with and add to operational water releases. All the potential environmental watering actions for the Ovens system are expected to be met naturally in the wet planning scenario.

Due to the small volume of water for the environment available, there is limited opportunity to vary the potential environmental watering actions each year for each planning scenario. However, allocation water donations (such as those by Taungurung Land and Waters Council and a private donor in the King River) help to increase the effectiveness of some potential watering actions. The same environmental entitlements are available this year as last year, so the opportunities remain largely unchanged.

Water for Mullinmur Wetland is a priority in the drought and very dry planning scenarios, as it is unlikely the wetland would have connected naturally to the Ovens River. It is a tier 2 priority in the dry and average planning scenarios to prevent poor water quality and/or fish deaths.

The proposed action to top up Mullinmur Wetland in 2026-27 will be considered if it is needed to prevent the wetland from completely drying or if native fish are at risk due to poor water quality.

Table 5.3.2 Ovens system environmental watering planning scenarios

Planning scenario	Drought	Very Dry	Dry	Average	Wet
Expected conditions	• Very low flow through summer and autumn • No bulk water release	• Very low flow through summer and autumn • No bulk water release	• Possible winter/ early spring natural fresh • Low flow through summer and autumn • Bulk water release may occur in the Buffalo	• High winter/ spring natural freshes • Moderate flow in summer and autumn with occasional natural freshes • Bulk water release is likely in the Buffalo • Overbank event is possible to water Mullinmur naturally	• High natural freshes and moderate/ high flow throughout most of the year • Bulk water release is likely in the Buffalo • Overbank event likely to water Mullinmur naturally
Expected availability of water for the environment	• 123 ML (73 ML held in Lake Buffalo and 50 ML held in Lake William Hovell)				

Planning scenario	Drought	Very Dry	Dry	Average	Wet
Buffalo River – reach 1					
Potential environmental watering – tier 1 (high priorities)	• Summer/ autumn low flow variability	• Summer/ autumn low flow variability	• Summer/ autumn low flow variability • Autumn low flow fresh	• Summer/ autumn low flow variability • Autumn low flow fresh	• Summer/ autumn low flow variability • Autumn low flow fresh
Potential environmental watering – tier 2 (additional priorities)	• Autumn low flow fresh	• Autumn low flow fresh	• N/A	• N/A	• N/A
King River – reach 2 and reach 3					
Potential environmental watering – tier 1 (high priorities)	• Summer/ autumn low flow variability	• Summer/ autumn low flow variability	• Summer/ autumn low flow variability	• Summer/ autumn low flow variability	• Summer/ autumn low flow variability
Mullinmur Wetland					
Potential environmental watering – tier 1 (high priorities)	• Spring/ summer/ autumn top-up	• Spring/ summer/ autumn top-up	• N/A	• N/A	• N/A
Potential environmental watering – tier 2 (additional priorities)	• N/A	• N/A	• Spring/ summer/ autumn top-up	• Spring/ summer/ autumn top-up	• N/A
Possible volume of water for the environment required to achieve objectives	• 123 ML (tier 1)	• 123 ML (tier 1)	• 103 ML (tier 1) • 20 ML (tier 2)	• 103 ML (tier 1) • 20 ML (tier 2)	• 123 ML (tier 1)

5.4 Goulburn system

Waterway manager – Goulburn Broken Catchment Management Authority

Storage manager – Goulburn-Murray Water

Environmental water holders – Victorian Environmental Water Holder (including the Living Murray program) and Commonwealth Environmental Water Holder

The Goulburn system includes the Goulburn River and Goulburn wetlands.

5.4.1 Goulburn River

System overview

The Goulburn is Victoria's largest river basin, covering over 1.6 million ha or 7.1 per cent of the state (Figure 5.4.1). The Goulburn River flows for 570 km from the Great Dividing Range upstream of Woods Point to the Murray River east of Echuca. It is an ancient, iconic river rich with environmental, cultural and recreational values.

There are several environmental water holders in the Goulburn system. The Commonwealth Environmental Water Holder (CEWH) holds the largest volume, and the use of Commonwealth Water Holdings is critical to achieving outcomes in the Goulburn River, as well as priority environmental sites further downstream. Water for the environment held on behalf of the Living Murray program may assist in meeting objectives in the Goulburn system en route to icon sites in the Murray system. Water held by the VEWH in the Goulburn system is primarily used to meet environmental objectives in the Goulburn River and the Goulburn wetlands, but it can also be used to support environmental objectives at downstream sites along the Murray River and in South Australia.

The construction and operation of Lake Eildon and Goulburn Weir have significantly altered the natural flow regime of the Goulburn River. Water harvesting during wet periods and releases to meet irrigation and other consumptive demands during dry periods means the flow below these structures is typically low in winter/spring and high in summer/autumn. This is the reverse of the natural seasonal flow pattern. Land use changes and the construction of small dams and drainage schemes have further modified the Goulburn River's flow regime. Levees and other structures prevent water from inundating the floodplain and from filling many natural wetlands and billabongs. Several tributaries, including the Acheron, Yea and Broken rivers, join the Goulburn River downstream of Lake Eildon and can add some flow variation to the river's regulated flows. Large floods that cause the Goulburn River's storages to fill and spill are also important for the overall flow regime and its associated environmental values.

The priority environmental flow reaches in the Goulburn River are:

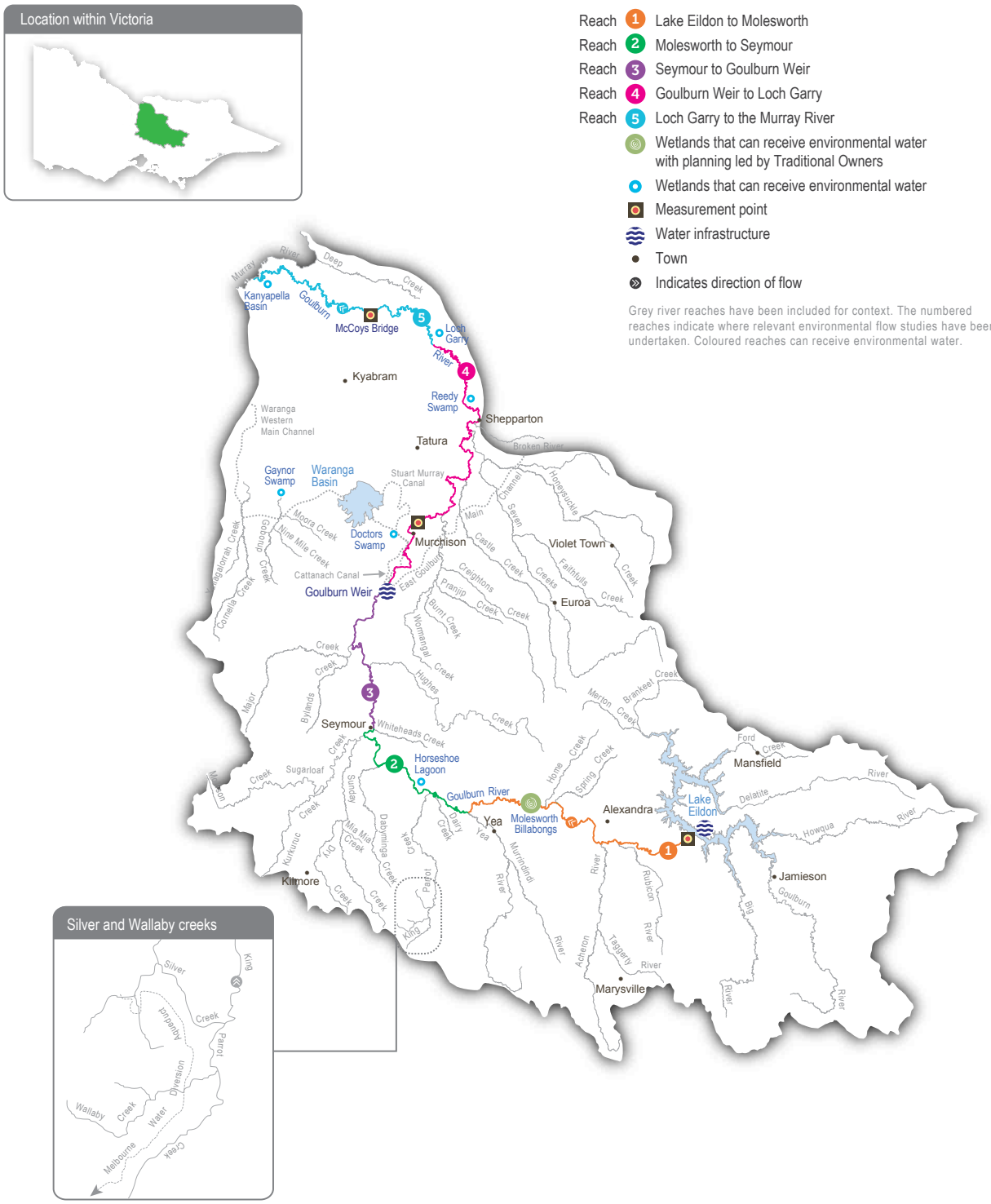
- mid-Goulburn River (reaches 1 to 3), which extends from downstream of Lake Eildon to Goulburn Weir
- lower Goulburn River (reaches 4 and 5) starting downstream of Goulburn Weir to the Murray confluence.

From early spring to late autumn, large volumes of water are delivered from Lake Eildon to Goulburn Weir to supply the irrigation system. During that period, the flow in the mid-Goulburn River is usually well above the recommended environmental flow targets. Deliveries of water for the environment have the most benefit in the mid-Goulburn River (especially in reach 1, immediately downstream of Lake Eildon) outside the irrigation season when releases from Lake Eildon are often much lower than natural flow.

Environmental flow targets in the lower Goulburn River can sometimes be met by the coordinated delivery of operational water being transferred from Lake Eildon to the Murray River. These inter-valley transfers (IVTs) generally occur during the irrigation season, from spring to autumn. IVTs in the Goulburn River can significantly exceed the environmental flow recommendations for summer and early autumn, historically damaging bank vegetation and eroding riverbanks. A revised Goulburn to Murray trade rule and operating plan was introduced in 2022-23 to reduce further damage to the lower Goulburn River from a prolonged, static high flow over summer and autumn.

Wet conditions between 2021-22 and 2023-24 resulted in low IVT demand, with small volumes of IVTs delivered, mainly as baseflows and a small autumn pulse in 2024. 2024-25 was the first year that a summer IVT pulse and multiple months of an average baseflow of 1,100 ML per day were delivered since the introduction of the Goulburn to Murray trade rule. Dry conditions continued in 2025-26, and IVT deliveries, including multiple IVT pulses, dominated the summer flow. Environmental monitoring continues to be undertaken to assess the impact of the operating rules on the ecology of the lower Goulburn River.

Figure 5.4.1 Goulburn system



Environmental values

The Goulburn River and its tributaries support a range of native fish (including golden perch, silver perch, Murray cod, trout cod, Macquarie perch and freshwater catfish), turtles, platypus and rakali (water rats). Aquatic vegetation, scour holes and woody debris within the channel provide high-quality habitat for adult and juvenile fish. River red gums are a dominant feature of the streamside zone along the length of the Goulburn River. These trees shade the river and provide habitat for many species, including the squirrel glider. Leaves that fall from the river red gums provide carbon that supports riverine food webs, and dead trees that fall into the river provide a surface for biofilms and waterbugs and habitat for fish. Birds (such as egrets, herons and cormorants) use trees along the river to roost and feed, while frogs benefit from shallow vegetated habitats at the edge of the river channel and in adjacent wetlands.

The Goulburn system is an important conservation area for threatened species. Several wetlands in the Goulburn catchment are formally recognised for their conservation significance. Tributaries of the mid-Goulburn River between Lake Eildon and Goulburn Weir host some of the last remaining Macquarie perch populations in the Murray-Darling Basin. Freshwater catfish occur in lagoons connected to reach 3 of the Goulburn River, and in 2025, catfish were reintroduced at multiple locations along the lower Goulburn River. eDNA analysis and citizen science monitoring programs also indicate the Goulburn River supports a strong population of platypus, which are now classified as vulnerable under Victoria's *Fauna and Flora Guarantee Act 1988*. Monitoring in recent years shows that environmental flows in the lower Goulburn River trigger golden perch and silver perch to spawn. However, the extent to which these spawning events contribute to local and wider southern basin populations is unknown. Self-sustaining populations of Murray cod have been confirmed, and trout cod are extending their range in the lower Goulburn River.

Environmental objectives in the Goulburn River

	**CN1** – Provide sufficient rates of carbon and nutrient production and processing to support native fish and waterbug communities
	F1 – Increase the abundance, spatial distribution and size class diversity of key native fish species
	**G1** – Maintain substrate surfaces to support ecological processes **G2** – Maintain the diversity of the channel form (e.g., shallow and deep water habitats)
	**MI1** – Maintain abundant and diverse waterbug communities to support riverine food webs
	**PR1** – Increase the self-sustaining platypus population
	**T1** – Maintain the self-sustaining turtle population
	**V1** – Increase the abundance of aquatic and flood-tolerant plants in the river channel and on the lower banks to provide shelter and food for animals and stabilise the riverbank **V2** – Increase the abundance of aquatic and flood-tolerant plants in low-lying and connected wetlands
	WQ1 – Minimise the risk of low-dissolved-oxygen blackwater

Traditional Owner cultural values and uses

The Goulburn River flows through Taungurung Country and Yorta Yorta Country.

Each year, Goulburn Broken CMA consults with the Taungurung Land and Waters Council (TLaWC) and the Yorta Yorta Nation Aboriginal Corporation (YYNAC) about plans for environmental watering in the Goulburn River. Consultation takes the form of formal and informal discussions.

TLaWC and YYNAC are members of the Goulburn Environmental Water Advisory Group and the Goulburn and Broken Operational Advisory Group. Both groups meet frequently throughout the year and share technical, operational and other information (such as recreational and cultural values) to support environmental water management and decision-making in the Goulburn River.

In 2023, Goulburn Broken CMA met with the TLaWC water knowledge group Baan Ganalina (Guardians of Water) to discuss environmental flow recommendations for *Waring* (reaches 1 to 3 of the Goulburn River).

Baan Ganalina supports flows that would help to reinstate a more natural water regime that better reflects the size, timing and variability of natural inflows to this part of the river, including off-channel areas.

> "These flow recommendations will help support *Waring* (Goulburn River), which is such an important part of Taungurung identity. It's good to see how Goulburn Broken CMA has used peer-reviewed articles to show the effects on important animals like platypus and shared this knowledge. The river is a work in progress, but together with the Goulburn Broken CMA, we will continue to seek ways to heal Country despite the harm it has suffered. Baan Ganalina hopes to see the proposed higher winter flows and looks forward to taking an ongoing role in monitoring their effects."
>
> – Baan Ganalina 2023

TLaWC communicated outcomes for *Waring* that align with Taungurung objectives and responsibilities to heal and care for Country include connecting wetlands that support valued species at appropriate times. This helps to protect intangible and tangible cultural heritage and values, including traditional food and medicine plants. Planned flows will also support ongoing efforts by Taungurung and program partners to care for the river and its floodplain, including investigations into rehabilitating degraded significant sites.

A YYNAC representative contributed to the 2020 ***Kaiela (Lower Goulburn River) Environmental Flows Study***, which has influenced environmental flows in the lower Goulburn River since 2021-22.

Both YYNAC and TLaWC attend the Goulburn and Broken Operational Advisory Group and participate in multiple Goulburn River monitoring programs with scientists. The advisory group shares technical and operational information to support environmental water management and decision-making in the Goulburn River and lower Broken Creek.

Increasing the involvement of Traditional Owners in managing environmental flows and progressing opportunities towards self-determination in the environmental watering program is a core commitment of the VEWH and its program partners. This is reinforced by legislation and policy commitments, including the *Water Act 1989*, the ***Victorian Aboriginal Affairs Framework***, the 2016 ***Water for Victoria***, the 2022 ***Water is Life: Traditional Owner Access to Water Roadmap***, and, in some cases, agreements under the *Traditional Owner Settlement Act 2010*.

Where Traditional Owners are more deeply involved in the planning and/or delivery of environmental flows for a particular site, their contribution is acknowledged in **Table 5.4.1** with an icon (as explained below). The use of this icon is not intended to indicate that these activities are meeting all the needs of Traditional Owners, but it is used in the spirit of valuing that contribution.

Watering planned and/or delivered in partnership with Traditional Owners to support cultural values and uses

Social, recreational and economic values and uses

In planning the potential watering actions in **Table 5.4.1**, Goulburn Broken CMA considered how environmental flows could benefit other values and uses, such as:

- water-based recreation (such as boating, canoeing, fishing, gaming, hunting and kayaking)
- riverside recreation and amenity (for landholders and visitors)
- community events and tourism (such as paddling and boating businesses)
- socio-economic benefits (such as improving water quality for stock and domestic uses, irrigation diverters and water supply for settlements on the Goulburn River).

Environmental flows may be planned to align with a social or recreational objective so long as environmental objectives are not compromised. This is indicated in **Table 5.4.1** by an icon, as pictured below and explained in **Figure 1.2.3**.

	Watering planned to support water sports activities (e.g., kayaking, canoeing)
	Watering planned to support angling activities
	Watering planned to support peaks in visitation (e.g., camping and other public activities on long weekends and school holidays)

The Goulburn River provides numerous recreational and economic benefits. Environmental flows support native fish populations by providing fish passage and habitat and encouraging fish migration and spawning, which in turn benefits recreational anglers. Following community feedback, the timing of targeted environmental flow events in September (mid-Goulburn) and November/December (lower Goulburn), where possible, is planned to reduce impacts on river access around the opening of different fishing seasons, benefiting anglers and local businesses. Other high-recreation periods are also considered when planning environmental flows.

Scope of environmental watering

The term 'environmental watering' refers to the active delivery of held environmental water to support particular environmental objectives by altering the flow in a river or the water level in a wetland. While other terms are sometimes used to describe the delivery of environmental water, 'environmental watering' is deliberately used here and in seasonal watering statements to ensure consistency in the legal instruments that authorise the use of water for the environment in Victoria.

Table 5.4.1 describes the potential environmental watering actions in 2026-27, their expected watering effect (that is, the intended physical or biological effects of the watering action) and the longer-term environmental objectives they support. Each environmental objective relies on one or more potential environmental watering actions and their associated physical or biological effects.

Table 5.4.1 Goulburn River potential environmental watering actions, expected watering effects and environmental objectives

Potential environmental watering action	Expected watering effects	Environmental objectives
Goulburn River reach 1		
Year-round low flow (400-2,000 ML/day)	• Maintain habitat for small-bodied native fish • Maintain adequate foraging habitat for platypus and reduce the risk of predation • Provide habitat and food for turtles • Wet and maintain riffles to provide habitat for biofilms and waterbugs • Additional benefits when the flow is above 800 ML/day: – scour fine sediment from the gravel bed and riffle substrate – maintain existing beds of in-channel vegetation – provide connection to low-lying, off-stream wetland habitats, which increases food resources (waterbugs) available for fish and native animals	F1, G1, MI1, PR1, T1, V1
Winter fresh (one fresh of more than 8,000 ML/day for five to 10 days during July to August)	• Encourage female platypus to select a nesting burrow higher up the bank to reduce the risk of greater flow later in the year flooding the burrow when juveniles are present • Scour bed sediments to maintain pools and change in-channel complexity for improved habitat • Inundate aquatic vegetation in connected wetlands to avoid exposure to frost • Connect larger off-stream wetlands to the river channel to provide habitat for small-bodied native fish • Increase foraging conditions for platypus and turtles • Increase the availability of habitat to support waterbug life cycles	F1, G1, G2, MI1, PR1, T1, V1, V2
Autumn/winter/ spring fresh(es) (one to three freshes of more than 5,000 ML/day for five to 10 days during May to November)	• Scour fine sediment from the gravel bed and riffle substrates • Maintain existing beds of in-channel vegetation • Optimise the time off-stream wetland habitats are available for small-bodied native fish and platypus • Increase foraging conditions for platypus and turtles • Increase the availability of habitat to support waterbug life cycles	F1, G1, MI1, PR1, T1, V1, V2

Potential environmental watering action	Expected watering effects	Environmental objectives
Spring fresh (one fresh of more than 8,000 ML/day for five to 10 days during September to November) 	• Maintain mid-Goulburn off-stream habitat for small-bodied native fish and platypus • Scour bed sediments to maintain pools and change in-channel complexity for improved habitat • Maintain existing beds of aquatic vegetation, both in-channel and in connected wetlands • Connect larger off-stream wetlands to the river channel to provide habitat for small-bodied native fish • Increase foraging conditions for platypus and turtles • Increase the availability of habitat to support waterbug life cycles • Increase soil moisture in banks and connected wetlands to improve the condition of existing native vegetation	F1, G1, G2, MI1, PR1, T1, V1, V2
Goulburn River reach 4 and 5		
Year-round low flow (500-1,000 ML/day) 	• Provide a slow, shallow habitat required for the recruitment of larvae/juvenile fish and habitat for adult small-bodied fish • Provide deep water habitat for large-bodied fish • Submerge snags and littoral vegetation to provide habitat for fish and waterbugs and a substrate for biofilms to grow • Provide habitat and food for turtles • Maintain habitat for aquatic vegetation and water the root zone of low-bank vegetation • Vary flow within a specified range to encourage plankton production for food, disrupt biofilms and maintain water quality • Provide a low, variable flow to enable vegetation to establish, to protect against notching and bank erosion	CN1, F1, MI1, PR1, T1, V1, V2, WQ1
Winter/autumn fresh (one fresh of up to 10,000 ML/day with more than four days above 7,300 ML/day during July to August and May to June)	• Wash organic matter and carbon (e.g., leaf litter) into the channel • Provide connectivity to off-channel habitats and through the river for fish dispersal and greater food resources • Scour bed sediments to maintain pools and change in-channel complexity for improved habitat • Provide cues for platypus to nest higher up the bank • Provide sediment and plant propagules from tributary inflows after large rain events to encourage the establishment of new plants • Drown terrestrial vegetation on low banks and trigger the recruitment of native, flood-tolerant streamside vegetation • Improve waterbug habitat and food availability by scouring fine sediments	CN1, F1, G1, G2, PR1, MI1, V1, V2

Potential environmental watering action	Expected watering effects	Environmental objectives
Early spring fresh (one fresh of up to 10,000 ML/day with more than seven days above 7,300 ML/day during September to October)	• Wash organic matter and carbon (e.g., leaf litter) into the channel • Provide connectivity to off-channel habitats and through the river for fish dispersal and greater food resources • Scour bed sediments to maintain pools and change in-channel complexity for improved habitat • Increase soil moisture in banks to improve the condition of existing native vegetation • Provide sediment and plant propagules from tributary inflows after large rain events to encourage the establishment of new plants • Drown terrestrial vegetation on low banks and trigger the recruitment of native flood-tolerant streamside vegetation • Improve waterbug habitat and food availability by scouring fine sediments and biofilms from hard substrates	CN1, F1, G1, G2, MI1, V1, V2
Late spring fresh (one fresh of more than 6,600 ML/day for two days during October to December)	• Stimulate the spawning of golden and silver perch • Scour bed sediments to maintain pools and change in-channel complexity for improved habitat • Improve waterbug habitat and food availability by scouring fine sediments and biofilms from hard substrates	F1, G1, G2, MI1
Autumn fresh (one fresh of more than 5,700 ML/day for one to seven days during March to May)	• Cue fish to move into and through the system to increase their abundance and dispersal • Scour bed sediments to maintain pools and change in-channel complexity for improved habitat • Increase soil moisture in banks to maintain and increase the abundance of existing vegetation • Scour old biofilm from hard substrates to allow new biofilm growth to improve food and habitat for waterbugs	F1, G1, G2, MI1, V1
Environmental risk mitigation flow: slow the recession of unregulated flow or releases from Goulburn Weir, and pass mid-Goulburn freshes (up to 6,000 ML/day)	• Provide organic matter and carbon (e.g., leaf litter) to the channel • Minimise the risk of bank erosion associated with a rapid reduction in the water level • Transport and deposit seed, plant propagules and sediment on the riverbank • Minimise the risk of low-dissolved-oxygen blackwater after natural events	CN1, G1, V1, WQ1

Scenario planning

Table 5.4.2 outlines potential environmental watering and expected water use in a range of planning scenarios.

The environmental flows study for the Goulburn River recommends a range of watering actions needed in most years to achieve the target environmental outcomes. Drier conditions throughout the Goulburn catchment meant allocations of water for the environment at the end of summer 2026 were the lowest since 2019-20. Water availability at the end of 2025-26 is expected to be high enough to meet all high-priority watering actions in the average and wet climate scenarios, but the supply of water for the environment in the drought and dry planning scenarios will not be sufficient to deliver winter and autumn freshes in 2026-27.

The highest-priority potential watering actions in the Goulburn River in 2026-27 will be those that prevent water quality issues and damage to river ecology following severe bushfires in the catchment throughout summer 2026. About 140,000 hectares of the catchment were impacted by the Longwood and Trawool fires, and it is expected to take multiple years for the affected areas to recover. Intense rainfall over these areas is likely to cause soil, debris and ash to flow into the Goulburn River and its tributaries, leading to poor water quality and affecting in-stream habitat. Delivery of environmental freshes and ecological risk mitigation flows are planned to flush the system of poor water quality during a low-oxygen blackwater event. Other high-priority watering actions aim to increase the extent and improve the composition and condition of streamside vegetation within the channel. Unnaturally high IVT flows have severely damaged native vegetation on the banks of the lower Goulburn River during the irrigation seasons from 2017 to 2021, and large spring and summer floods in 2022-23 and 2023-24 limited the recovery of this vegetation. Drier conditions and the introduction of operating rules on IVTs between 2024 and 2026 may have allowed some recovery of bank vegetation, but scientific advice and monitoring results indicate that it will take multiple years for the lower-bank vegetation to fully recover from these severe disturbances.

The most important flows for bank vegetation in the Goulburn River are a year-round low flow and freshes during spring. The variable target range for the low flow aims to minimise erosion and inundate enough of the channel to support in-stream vegetation and to expose the lower parts of the bank for sustained periods during the warmer growing season to avoid drowning streamside vegetation. Freshes delivered between late autumn and spring are needed to periodically wet higher parts of the bank to improve the growth and recruitment of native plants at the water's edge and deter the growth of terrestrial species. Where possible, these freshes will be delivered by passing tributary inflows from the mid-Goulburn River to the lower Goulburn reaches, so that seeds, sediments and nutrients carried from natural tributary flows are transported and deposited along the banks of rivers throughout the system.

A year-round low flow and freshes may be partially or fully achieved through the natural flow in the wetter planning scenarios, and operational releases (such as IVTs) may help meet environmental flow targets in the drier planning scenarios. Goulburn-Murray Water generally diverts a proportion of the natural high flow from Goulburn Weir into the Waranga Basin. These operational transfers can cause the flow rate in the lower Goulburn River to drop rapidly after a natural high-flow event, and ecological risk mitigation flows will be used as required to slow the recession of natural spills at Goulburn Weir to reduce the risk of bank slumping.

A continuing priority for environmental watering in 2026-27 will be to support native fish objectives. Significant declines in small-bodied native fish populations in the Goulburn River and other connected systems were observed following the 2022 and 2023 floods. These declines are likely due to a range of factors, including low-oxygen blackwater, the temporary loss of slow-flowing littoral habitat within the channel and an increase in the proliferation of carp in the Murray River and its tributaries. Annual monitoring suggests there are healthy populations of most larger fish species, but there has been little recruitment of some native species (such as golden and silver perch) in recent years. Late spring freshes are known to trigger golden and silver perch spawning in the lower Goulburn River. While these species do not need to spawn every year, a late spring fresh has not been delivered in the lower Goulburn River since 2023, so delivering this event is a high priority in all climate scenarios in 2026-27.

Autumn freshes provide a flow cue for native fish to move into the Goulburn system from the Murray system and rejuvenate native bank vegetation following dry conditions. Delivering an autumn fresh in 2027 is a high priority in the average planning scenario to support bank vegetation. It is a lower priority (tier 2) in the drought and dry planning scenarios, when the supply of water for the environment will be limited, and in the wet planning scenario, when more frequent unregulated flow events are likely to keep vegetation in good condition. However, an autumn fresh may still be delivered in wet conditions to support native fish outcomes, based on scientific advice at the time.

The final focus for environmental watering in the Goulburn River in 2026-27 will be to maintain minimum flows in reach 1 (immediately downstream of Lake Eildon) during winter when there are no irrigation releases and deliver multiple freshes in winter and spring in average and wet conditions to reinstate some natural flow variation and connect floodplain wetlands between reach 1 and reach 3. Collectively, these flows will maintain in-channel habitat through the mid-Goulburn system and provide opportunities for fish and platypus to access off-channel habitats for feeding and breeding. The freshes may be met with the natural flow in average and wet conditions. Delivering a winter fresh in reach 1 is also important in the average and wet planning scenarios to optimise platypus breeding by providing them with a cue to nest higher in the bank, but it will be a lower priority (tier 2) in drought and dry conditions due to low supply of water for the environment.

Carrying over water to meet minimum low-flow objectives from July to September 2026 is an important consideration in the drought and dry planning scenarios, but less so in the average and wet planning scenarios, given likely higher early-season allocations.

Table 5.4.2 Goulburn River environmental watering planning scenarios

Planning scenario	Drought	Dry	Average	Wet
Expected conditions	• Very few or no large natural-flow events • Blackwater could be an issue if there is a large rain event in the warmer months • IVT delivered at maximum rates under the Goulburn operating rules	• One to two short-duration, natural flow events are likely to provide small winter/spring freshes • Blackwater could be an issue if there is a large rain event in the warmer months • IVT delivered at maximum rates under the Goulburn operating rules	• Large natural-flow events will provide low flow for most of the year and will likely provide winter/spring freshes • Blackwater could be an issue if there is a large rain event in the warmer months • IVT delivered at moderate/low rates under the Goulburn operating rules	• Large natural-flow events will provide low flow and multiple freshes and/or overbank flow events in winter/spring • Blackwater could be an issue if there is a large rain event in the warmer months • IVT delivered at low rates under the Goulburn operating rules
Expected availability of water for the environment	• 173 GL	• 304 GL	• 528 GL	• 528 GL
Goulburn River (targeting reach 1)				
Potential environmental watering – tier 1 (high priorities)	• Year-round low flow • Spring fresh		• Year-round low flow • Winter fresh • Autumn/winter/spring freshes • Spring fresh	
Potential environmental watering – tier 2 (additional priorities)	• Winter fresh		• N/A	

Planning scenario	Drought	Dry	Average	Wet
Goulburn River (targeting reaches 4 and 5)				
Potential environmental watering – tier 1 (high priorities)	• Year-round low flow • Ecological risk mitigation flows • Early spring fresh • Late spring fresh	• Year-round low flow • Ecological risk mitigation flows • Early spring fresh • Late spring fresh	• Year-round low flow • Ecological risk mitigation flows • Winter/autumn fresh • Early spring fresh • Late spring fresh • Autumn fresh	• Year-round low flow • Ecological risk mitigation flows • Winter/autumn fresh • Early spring fresh • Late spring fresh
Potential environmental watering – tier 2 (additional priorities)	• Winter/autumn fresh • Autumn fresh	• Winter/autumn fresh • Autumn fresh	• N/A	• Autumn fresh
Possible volume of water for the environment required to achieve objectives	• 141 GL (tier 1) • 117 GL (tier 2)	• 170 GL (tier 1) • 117 GL (tier 2)	• 292 GL (tier 1) • N/A	• 209 GL (tier 1) • 46 GL (tier 2)
Priority carryover requirements for 2027-28	• 30 GL	• 50 GL	• N/A	

5.4.2 Goulburn wetlands

System overview

Within the Goulburn Broken catchment, there are about 2,000 natural wetlands identified, but only seven—Doctors Swamp, Gaynor Swamp, Horseshoe Lagoon, Kanyapella Basin, Loch Garry, Reedy Swamp and Molesworth Billabongs—have received water for the environment through the VEWH's entitlement (Figure 5.4.1). Several other small wetlands in the Goulburn catchment have been watered under a separate arrangement through the Murray-Darling Wetlands Working Group.

Doctors Swamp, Gaynor Swamp, Kanyapella Basin, Loch Garry and Reedy Swamp can receive water for the environment through irrigation supply infrastructure. The volume of water that can be delivered to each wetland depends on the infrastructure's physical capacity and the seasonal allocation. Water for the environment can be delivered from the Goulburn River to Horseshoe Lagoon and Molesworth Billabongs via a temporary pump.

Since 2025, the VEWH has been facilitating the submission of Traditional Owner-led seasonal watering proposals, in recognition of Traditional Owner rights to self-determined care for Country. For the Goulburn wetlands, a seasonal watering proposal by the Taungurung Land and Waters Council for Molesworth Billabongs was incorporated into this seasonal watering plan for the second consecutive year.

Environmental values

Many natural wetlands across the Goulburn catchment, including Doctors Swamp, Gaynor Swamp, Kanyapella Basin, Loch Garry and Reedy Swamp, are formally recognised for their conservation significance. The Goulburn wetlands support a range of plant communities from river red gum swamps to cane grass wetlands.

Doctors Swamp is one of Victoria's most intact red gum swamps, supporting over 80 wetland plant species.

Gaynor Swamp is a cane-grass wetland situated on paleosaline soils, formed from historic oceans. When wet, the wetland supports thousands of waterbirds, including brolga and intermediate egrets. Gaynor Swamp is more saline than other wetlands in the region when water levels are low, and it attracts a different group of feeding waterbirds as it draws down. The red-necked avocet is one of the most significant species that feed on exposed mudflats at Gaynor Swamp.

Horseshoe Lagoon is a paleochannel of the Goulburn River with tall marsh, floodway pond, herbland and floodplain streamside woodland vegetation communities. The lagoon supports numerous waterbird species and is home to three turtle species, including the broad-shelled turtle.

Kanyapella Basin is a shallow freshwater marsh that provides habitat for numerous plant and animal species, including the threatened intermediate egret. Historically, it has been a popular breeding site for ibis, herons and cormorants.

Loch Garry is a paleochannel of the Goulburn River that provides deep open water habitat. Shallow, vegetated wetland depressions, red gum forest and sand ridges surround the channel. It is an important site for waterbird feeding and roosting and a drought refuge for eastern great egrets, musk ducks, nankeen night herons and royal spoonbills.

Molesworth Billabongs is an off-channel billabong complex on the *Waring* (Mid-Goulburn River) floodplain that contains culturally significant vegetation species, including threatened vegetation communities. Recent monitoring confirmed that the billabongs support flathead galaxias, a species listed as vulnerable under the *Victorian Flora and Fauna Guarantee Act 1988* and as critically endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

Reedy Swamp contains a mosaic of vegetation types, including tall marsh, floodway pond herbland and rushy riverine swamp. It is a vital drought refuge, a nesting site for colonial waterbirds and a stopover feeding site for migratory birds (such as sharp-tailed sandpiper and marsh sandpiper).

Environmental objectives in the Goulburn wetlands

	A1 – Maintain the frog population and provide suitable habitat
	**B1** – Provide breeding habitat for waterbirds **B2** – Provide feeding and roosting habitat for waterbirds
	F1 – Maintain the fish population and provide suitable habitat
	**T1** – Maintain the abundance of freshwater turtle populations
	**V1** – Increase the diversity and cover of native wetland plant species consistent with the ecological vegetation class benchmark **V2** – Reduce the cover and diversity of invasive plants

Traditional Owner cultural values and uses

The Goulburn wetlands span the lands of two Traditional Owner groups, represented by the Taungurung Land and Waters Council (TLaWC) and the Yorta Yorta Nation Aboriginal Corporation (YYNAC). Gaynor Swamp, Molesworth Billabongs and Horseshoe Lagoon are on Taungurung Country. TLaWC has been involved in environmental water planning for Gaynor Swamp and Horseshoe Lagoon for several years and in delivering water for the environment at Horseshoe Lagoon since 2021. This year, for the second consecutive year, TLaWC prepared a Traditional Owner-led seasonal watering proposal for Molesworth Billabongs.

Doctors Swamp, Kanyapella Basin, Loch Garry and Reedy Swamp are on Yorta Yorta Country. YYNAC has been involved in planning for environmental flows at these wetlands for several years, including participating in developing environmental water management plans.

In February 2026, Goulburn Broken CMA discussed 2026-27 water for the environment priorities for the Goulburn wetlands with the Goulburn Broken Technical Reference Group, including wetland specialists Rhonda Butcher and Damien Cook. Representatives of TLaWC, YYNAC, the VEWH and the Department of Energy, Environment and Climate Action also attended this meeting.

TLaWC has identified that water for the environment supports cultural values by protecting intangible cultural heritage and valued species, including traditional food and medicine plants. Participation in environmental water planning by TLaWC and the TLaWC water knowledge group Baan Ganalina (Guardians of Water) is furthering Taungurung Traditional Owners' capacity to fulfil their obligations to care for Country. This includes working to restore a more natural watering regime to significant sites and rehabilitating habitat for native species. This work contributes to reconnecting the Taungurung community to Country by supporting and securing access for Taungurung contemporary cultural practices and uses, teaching places, camping sites and other places of cultural importance.

The Taungurung people have an interest in rehabilitating floodplain wetlands associated with *Waring* (Goulburn River reaches 1 to 3). TLaWC monitors biocultural values and habitat conditions at several disconnected wetlands as part of its ongoing Reading Water Country program. The monitoring findings inform seasonal watering proposals and planning for water for the environment. TLaWC is working with partners to improve habitat conditions for native species in the area, and healthy Country assessments provide important information about cultural objectives and indicators.

In 2017, TLaWC undertook an Aboriginal Waterways Assessment at Horseshoe Lagoon and Molesworth Billabongs. In 2019, it helped develop the environmental water management plan before the first environmental water delivery to Horseshoe Lagoon in winter 2019. In 2021 and 2022, TLaWC staff and Baan Ganalina coordinated the delivery of environmental water to Horseshoe Lagoon via a portable pump. This year's planned environmental water delivery to one of the four Molesworth Billabongs would see the third watering at the site since the 2022 floods, which revitalised the billabong complex and provided refuge for flathead galaxias. TLaWC is continuing to develop and refine efforts to heal the wetlands in line with Taungurung biocultural objectives and in collaboration with partners, including Parks Victoria and the Goulburn Broken CMA. This has included the reintroduction of aquatic plant species that are either missing or in low numbers at Horseshoe Lagoon to boost their diversity and abundance, the installation of a 'floating island' to support turtle breeding at the site, and weed management and native plantings at Molesworth Billabongs.

Gaynor Swamp is a pilot site under the Corop Cultural Waterscape Program, a project being led by TLaWC to establish culturally led, collaborative governance for the waterscape with government and community partners. The VEWH has funded an upgrade of the regulating structure to allow water to be adaptively delivered in response to environmental requirements and conditions (for example, bird breeding events or plant growth and flowering).

For Yorta Yorta people, water for the environment supports many cultural values. At Doctors Swamp, it supports nardoo (a food source), native grasses, old man weed (that has medicinal uses), sedges and rushes (for basket weaving), as well as a wide range of bird and animal species. At Loch Garry, water for the environment supports culturally important food, fibre and medicinal plants. A flow delivered to Loch Garry in April 2020 initiated a resurgence of these plants and giant rush, which provided nesting opportunities for important bird species. Loch Garry is rich in cultural values: stone scatters, scar trees and significant sand hills in the higher elevations.

Kanyapella Basin is important for the Yorta Yorta people's cultural and spiritual connections. It supports the health of cultural values in the landscape (such as the Creation Story and traditional food and medicine plants). Before the delivery of environmental flows in winter 2020, Yorta Yorta people conducted a cultural burn at the site, helping to enable direct delivery of the water and help the growth of old man weed.

Increasing the involvement of Traditional Owners in planning and managing environmental flows and progressing opportunities towards self-determination in the environmental watering program is a core commitment of the VEWH and its program partners. This is reinforced by legislation and policy commitments, including the *Water Act 1989*, the ***Victorian Aboriginal Affairs Framework***, the 2016 ***Water for Victoria***, the 2022 ***Water is Life: Traditional Owner Access to Water Roadmap***, and, in some cases, agreements under the *Traditional Owner Settlement Act 2010*.

Planned environmental flows may be modified to align with a community benefit so long as environmental outcomes are not compromised. This is indicated in **Table 5.4.3** by an icon, as pictured below and also explained in **Figure 1.2.3**. The use of this icon is not intended to indicate that these activities are meeting all the needs of Traditional Owners, but it is used in the spirit of valuing that contribution.

Watering planned and/or delivered in partnership with Traditional Owners to support cultural values and uses

Traditional Owner-led seasonal watering proposals for healthy Country

Taungurung Land and Waters Council (TLaWC)

The Goulburn wetlands include proposed watering actions for Molesworth Billabongs for 2026-27, presented by the Taungurung Land and Waters Council (TLaWC). The vision of TLaWC is to support the ongoing connection of the Taungurung people to Country and their ancestors, and to meet cultural obligations to care for Country. To achieve this vision, TLAWC aims to restore the Molesworth Billabongs through a combination of actions, including through the delivery of water for the environment to support water-dependent species and to help suppress invasive weeds.

> "Baan Ganalina will gather and discuss what is happening at the billabongs regularly during the first few years of watering, and we (will) make decisions together about whether water should be delivered or not. As time goes on, we will learn more and more about what the billabongs need from us to heal."
>
> – TLAWC Molesworth Billabongs seasonal watering proposal

The billabongs support several important biocultural and ecological values that will be strengthened through the provision of environmental water.

Social, recreational and economic values and uses

In planning the potential environmental watering actions in **Table 5.4.4**, consideration has been made to how environmental water deliveries could support social, recreational and economic values and uses, including:

- water-based recreation (such as canoeing)
- recreation and amenity adjacent to waterways (such as birdwatching, camping, cycling, hiking, photography and walking)
- community events and tourism (such as birdwatching events, the Nature Scripts Initiative and outdoor classroom learning).

Environmental watering of wetlands increases the number of visitors and opportunities for them, including for birdwatching, photography, walking, camping, and hunting (state game reserves have been reclassified as wildlife reserves).

Table 5.4.3 shows the social, recreational and economic values that the 2026-27 potential watering actions in the Goulburn catchment could support.

Table 5.4.3 Goulburn wetlands social, recreational and economic benefits of environmental watering

Wetland	Beneficiary	Value	How have these benefits been considered?
Doctors Swamp	• Birdwatchers • Local landholders • Photographers • Walkers	• Environmental water provides opportunities for activities such as walking, birdwatching and photography	• Watering could result in an increased number of plants and animals, providing opportunities for naturalists/ photographers
Gaynor Swamp	• Birdwatchers • Duck hunters • Local landholders • Photographers • Walkers	• Environmental water provides opportunities for activities such as walking, birdwatching and photography	• Watering of the site promotes the growth of wetland plants that are beneficial for roosting and foraging for waterbirds
Horseshoe Lagoon	• Birdwatchers • Campers • Local landholders • Photographers • Walkers	• Environmental watering provides opportunities for activities such as walking, birdwatching and photography	• Watering of the site promotes the growth of wetland plants that are beneficial for roosting and foraging for waterbirds
Kanyapella Basin	• Birdwatchers • Local landholders • Photographers • Walkers	• Environmental water provides opportunities for activities such as walking, birdwatching and photography	• Watering could result in an increased number of plants and animals, providing opportunities for naturalists/ photographers
Loch Garry	• Birdwatchers • Duck hunters • Photographers • Walkers	• Environmental water provides opportunities for activities such as walking, birdwatching and photography	• Watering of the site promotes the growth of wetland plants that are beneficial for roosting and foraging for waterbirds
Molesworth Billabongs	• Birdwatchers • Caravan park visitors • Photographers • Walkers	• Environmental watering provides opportunities for activities such as walking, birdwatching and photography	• Watering could result in improved amenity and an increased number of plants and animals, providing opportunities for naturalists/ photographers and for general wellbeing through spending time in nature

Watering planned to support waterbird-related recreational activities

Scope of environmental watering

The term 'environmental watering' refers to the active delivery of held environmental water to support particular environmental objectives by altering the flow in a river or the water level in a wetland. While other terms are sometimes used to describe the delivery of environmental water, 'environmental watering' is deliberately used here and in seasonal watering statements to ensure consistency in the legal instruments that authorise the use of water for the environment in Victoria.

Table 5.4.4 describes the potential environmental watering actions in 2026-27, their expected watering effect (that is, the intended physical or biological effects of the watering action) and the longer-term environmental objectives they support. Each environmental objective relies on one or more potential environmental watering actions and their associated physical or biological effects.

Table 5.4.4 Goulburn wetlands potential environmental watering actions, expected watering effects and environmental objectives

Potential environmental watering action	Expected watering effects	Environmental objectives
Doctors Swamp (fill in late winter/spring 2026 if dry for at least 6 months prior)	• Promote frog breeding opportunities (notably Sloane's froglet, listed under the *Environment Protection and Biodiversity Conservation Act 1999*) • Promote waterbird breeding opportunities (target species include Australasian bittern, musk duck, blue-billed duck) • Maintain Red Gum Swamp Ecological Vegetation Class	A1, B1, B2, V1, V2
Gaynor Swamp (top-up, trigger-based) *Trigger: waterbird breeding*	• Promote feeding and roosting habitat to promote waterbird breeding opportunities; target species include brolga	B1, B2
Horseshoe Lagoon (top-up, trigger-based) *Trigger: waterbird breeding*	• Provide feeding and roosting habitat to support waterbird breeding	B1, B2
Kanyapella Basin (partial fill in late winter/spring 2026 if dry for at least 6 months prior)	• Promote feeding and roosting habitat for waterbirds • Maintain floristic diversity	B2, V1, V2
Kanyapella Basin (partial fill in autumn 2027)	• Promote feeding and roosting habitat for waterbirds • Maintain floristic diversity	B2, V1, V2
Loch Garry (fill in spring 2026)	• Provide refuge and habitat for freshwater catfish • Provide feeding and roosting habitat to promote waterbird breeding opportunities • Maintain floristic diversity	B1. B2, F1, V1, V2

Potential environmental watering action	Expected watering effects	Environmental objectives
Molesworth Billabongs (fill in spring 2026 and top-up as required)	• Provide refuge and habitat for flat-headed galaxias • Maintain and improve native vegetation • Control exotic weeds	F1 V1, V2
Reedy Swamp (fill or top-up in winter/spring 2026 if required, and top-up as required over summer/autumn)	• Prime substrate for the planting of aquatic species to maintain floristic diversity • To ensure the establishment and survival of revegetated wetland plants (for summer and autumn top-ups) • Promote waterbird breeding opportunities	B1 V1, V2

Scenario planning

Table 5.4.5 outlines potential environmental watering and expected water use in a range of planning scenarios.

Five Goulburn wetlands are planned to receive water for the environment in 2026-27 across all planning scenarios, with Doctors Swamp, Kanyapella Basin, Loch Garry, Molesworth Billabongs and Reedy Swamp to receive fills. More water for the environment will be required in drying conditions and less in wet conditions.

Doctors Swamp has remained mostly dry since February 2024, with minor inflows received in early 2026, leading to a planned autumn delivery to support waterbirds, frogs and vegetation outcomes. If the autumn 2026 watering does not proceed due to delivery constraints, it is planned to fill the wetland in late winter/spring 2026 to maintain the growth of the River Red Gum EVC and representative populations of native frog communities.

Kanyapella Basin will receive environmental water during late winter/spring 2026 and autumn 2027 from both the north-east Warrigal Creek and north-west Yambuna Creek regulators. This will provide waterbird habitat and breeding opportunities and encourage floristic diversity by building on the 2025 delivery.

The watering at Loch Garry during late winter/spring aims to support the catfish population, maintain floristic diversity and provide waterbird habitat and breeding opportunities.

The watering at Molesworth Billabongs will build on the initial delivery in 2025 and the subsequent top-up in autumn 2026. Flathead galaxias, a species listed under the *Victorian Flora and Fauna Guarantee Act 1988* and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, were recently discovered during TLaWC-led monitoring and translocated to a surrogate site and a hatchery to protect the species as Molesworth Billabongs began to draw down. Watering at Molesworth Billabongs will primarily target one of the four billabongs as part of an initial trial to understand the complex's hydrology and ecology better.

Reedy Swamp may receive an autumn 2026 watering to support aquatic plantings at the site as part of a revegetation and habitat improvement plan. Complex woody debris and habitat structures for waterbirds, turtles and fish have been constructed in depauperate areas. Wetland planting will be undertaken in 2026-27, and annual follow-up plantings will occur until 2028 to ensure the successful establishment of aquatic vegetation. Reedy Swamp has only recently dried as of January 2025, after being wet for over 61 months. Whether the autumn 2026 watering is achieved or not, it is planned to partially fill Reedy Swamp in the later winter/spring of 2026-27 to shallowly inundate the wetland, prime the substrate for revegetation works, and deliver environmental water in summer and autumn 2027 to maintain these values.

Environmental water delivery to Gaynor Swamp and Horseshoe Lagoon is only planned in average or wet scenarios and only if natural inundation provides suitable conditions for waterbird breeding. If this occurs, environmental water deliveries will be used to maintain natural inundation levels where required to support successful waterbird breeding. Gaynor Swamp and Horseshoe Lagoon have filled multiple times in recent years due to natural floods and high rainfall periods, and the priority for these sites in 2026-27 will be to allow them to remain dry to support dry-phase ecosystem processes, including nutrient cycling. Drying the wetlands will also help control pest species, including European carp at Horseshoe Lagoon and cumbungi at Gaynor Swamp. It is recommended that Gaynor Swamp remain dry for four years to combat cumbungi expansion. Relative to other sites in the system, Gaynor Swamp and Horseshoe Lagoon are a lower priority for environmental water delivery in the average and wet scenarios and will likely fill naturally in a wet planning scenario. Limiting delivery to Gaynor Swamp in 2026-27 will also support the planned upgrade of the regulating structure.

No end-of-year carryover target has been set for the Goulburn wetlands, because seasonal allocations are expected to meet environmental watering requirements in 2027-28.

Table 5.4.5 Goulburn wetlands environmental watering planning scenarios

Planning scenario	Drought	Dry	Average	Wet
Expected conditions	• Catchment run-off and natural flow into the wetlands are highly unlikely	• Catchment run-off and natural flow into the wetlands are highly unlikely	• Some catchment run-off and natural flow into some of the wetlands are likely, particularly in winter/spring	• Catchment run-off and natural flow into the wetlands are likely to fill or partially fill the wetlands, particularly in winter/spring
Potential environmental watering – tier 1 (high priorities)	• Doctors Swamp • Kanyapella Basin • Loch Garry • Molesworth Billabongs • Reedy Swamp	• Doctors Swamp • Kanyapella Basin • Loch Garry • Molesworth Billabongs • Reedy Swamp	• Doctors Swamp • Kanyapella Basin • Loch Garry • Molesworth Billabongs • Reedy Swamp	• Doctors Swamp • Kanyapella Basin • Loch Garry • Molesworth Billabongs • Reedy Swamp
Potential environmental watering – tier 2 (additional priorities)	• N/A	• N/A	• Gaynor Swamp • Horseshoe Lagoon	• Gaynor Swamp • Horseshoe Lagoon
Possible volume of water for the environment required to achieve objectives	• 7,700 ML (tier 1)	• 7,700 ML (tier 1)	• 7,890 ML (tier 1) • 580 ML (tier 2)	• 6,190 ML (tier 1) • 480 ML (tier 2)
Priority carryover requirements for 2026-27	• N/A			

5.5 Broken system

Waterway manager – Goulburn Broken Catchment Management Authority

Storage manager – Goulburn-Murray Water

Environmental water holders – Victorian Environmental Water Holder and Commonwealth Environmental Water Holder

The Broken system includes the Broken River, upper Broken Creek, lower Broken Creek and the Broken wetlands.

5.5.1 Broken River and upper Broken Creek

System overview

The Broken River is a tributary of the Goulburn River, rising in the Wellington-Tolmie highlands and flowing northwest to Benalla and then west for a total distance of 190 km before it joins the Goulburn River near Shepparton (Figure 5.5.1). Lake Nillahcootie is the main storage on the Broken River. It is about 36 km upstream of Benalla and harvests water from the river to support stock and domestic supply, and irrigated agriculture. The main tributaries of the Broken River are Hollands Creek, Ryans Creek and Lima East Creek.

Lake Nillahcootie has a storage capacity that is about half the mean annual flow of its upstream catchment, so it fills in most years. The operation of Lake Nillahcootie has modified the river's natural flow pattern: the winter/spring flow is less than natural because a large proportion of inflow is harvested, while the summer/autumn flow is greater than natural because water is released to meet downstream irrigation demands. These impacts are most pronounced in the reach between Lake Nillahcootie and Hollands Creek. Below Hollands Creek, the river retains a more natural flow pattern due to flows from unregulated tributaries, although the total annual flow is considerably less than natural. The catchment has been extensively cleared for agriculture, including dryland farming (such as livestock grazing and cereal cropping) and irrigated agriculture (such as dairy, fruit and livestock).

Water is released from Lake Nillahcootie to meet downstream demand and the minimum-flow requirements specified under the bulk entitlement for the Broken River system. Releases from storage may be less than 30 ML per day, as tributary inflows immediately below the storage (such as from Back Creek) can supply much of the minimum-flow requirements specified in the bulk entitlement.

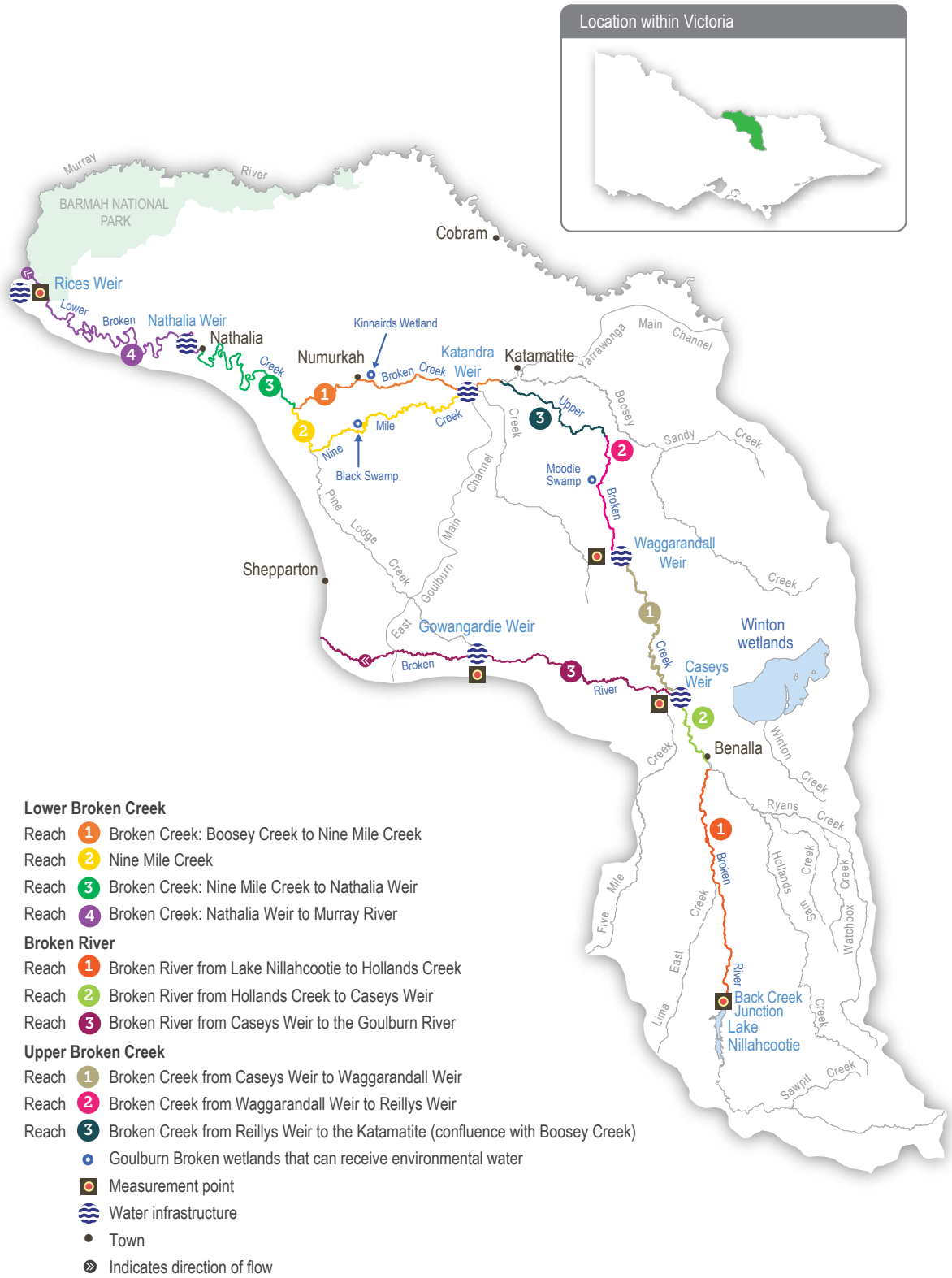
Upper Broken Creek is defined as the 89-km stretch of creek from the Broken River (at Caseys Weir) to the confluence with Boosey Creek near Katamatite. Upper Broken Creek flows across a flat riverine plain and has naturally low run-off from its local catchment. It receives flood flows from the Broken River, although river regulation, earthworks and road construction have reduced the frequency of these floods.

Upper Broken Creek has been regulated for more than a century. Before 2007, water was diverted into upper Broken Creek at Caseys Weir to meet local demand, but recent water-saving projects have reduced the demand on the creek. There is now a low flow year-round between Caseys Weir and Waggarandall Weir. The flow below Waggarandall Weir is more variable and experiences regular cease-to-flow periods. These changes have reduced the amount of permanent aquatic habitat.

Delivery of water for the environment to the Broken River is primarily constrained by the small volume of Water Holdings in the Broken system. Environmental water holders can trade water into the Broken system from other trading zones, subject to relevant limits and conditions, to meet environmental needs.

The bulk entitlement for the Broken system held by Goulburn-Murray Water stipulates that a minimum environmental flow—also known as passing flow—is to be maintained in the Broken River when natural flows enter the system. The bulk entitlement also allows Goulburn-Murray Water and Goulburn Broken CMA to agree to reduce the minimum passing flow and to accumulate unused volumes for later releases, which will provide a greater environmental benefit. Accumulated passing flow is the first volume lost when the storage spills. Environmental flows in upper Broken Creek are constrained by available supply volume, channel capacity and the need to avoid flooding low-lying, adjacent land.

Figure 5.5.1 Broken system



Grey river reaches have been included for context. The numbered reaches indicate where relevant environmental flow studies have been undertaken. Coloured reaches can receive environmental water.

Environmental values

The Broken River retains one of the best examples of healthy in-stream vegetation in a lowland river in the region. A range of native submerged and emergent plant species, including eelgrass, common reed and water ribbons, populate the bed and margins of the river. These plants provide habitat for a range of animals, including small-bodied and large-bodied native fish. Murray cod, Macquarie perch, golden perch, silver perch, river blackfish, mountain galaxias, southern pygmy perch and Murray-Darling rainbowfish all occur in the Broken River. The river also supports a platypus population.

Upper Broken Creek is dominated by unique box streamside vegetation and remnant plains grassy woodland. The creek and its streamside zone support numerous threatened species, including brolga, Australasian bittern, buloke and ridged water-milfoil. Much of the region's high-quality native vegetation is set aside as a natural features reserve. Upper Broken Creek supports a variety of native fish species, including carp gudgeon, Murray cod, river blackfish and Murray-Darling rainbowfish, as well as platypus, rakali (water rats) and common long-necked turtle.

The Broken River and upper Broken Creek are listed in the ***Directory of Important Wetlands in Australia***.

Environmental objectives in the Broken River and upper Broken Creek

	F1 – Maintain native fish populations
	**G1** – Turn over bed sediments and scour around large wood to maintain in-channel habitat diversity
	**MI1** – Maintain waterbug diversity and abundance
	**PR1** – Maintain platypus populations
	**V1** – Maintain in-stream vegetation
	WQ1 – Maintain water quality

Traditional Owner cultural values and uses

The Broken River flows through the lands of the Taungurung and the Yorta Yorta peoples. Broken Creek is in Yorta Yorta Country. Water for the environment in the Broken system supports the health of cultural values and landscapes, including intangible cultural heritage, valued species and traditional food and medicine plants.

The Taungurung Land and Waters Council (TLaWC) and the Yorta Yorta Nation Aboriginal Corporation (YYNAC) are members of the Broken Environmental Water Advisory Group. Each year, Goulburn Broken CMA discuss plans for environmental watering in the Broken River and upper Broken Creek with TLaWC and YYNAC. Both groups support the proposed watering actions.

TLaWC plans to assess cultural values and objectives for the Broken River through healthy Country assessments, such as Aboriginal Waterway Assessments. These will help the Council develop more specific cultural objectives for the Broken River system and culturally informed recommendations for water for the environment.

In 2021, YYNAC provided the following statement about the cultural values of the Broken River system, including Broken Creek.

> "The Broken River (and Broken Creek) holds many cultural values. Common reed contained within the slack water provides important material for tools while also providing refuge for culturally important fish species (large- and small-bodied). The river also has significant stands of old-growth river red gum containing important habitat and exhibiting scars made from carving out canoes and coolamons."

The proposed 2026-27 watering actions aim to support native fish, in-stream vegetation and fringing vegetation, which YYNAC has identified as important cultural values. Goulburn Broken CMA will continue to collaborate with both YYNAC and TLaWC to identify opportunities for watering actions to support cultural values and objectives.

Increasing the involvement of Traditional Owners in managing environmental flows and progressing opportunities towards self-determination in the environmental watering program is a core commitment of the VEWH and its program partners. This is reinforced by legislation and policy commitments, including the *Water Act 1989*, the ***Victorian Aboriginal Affairs Framework***, the 2016 ***Water for Victoria***, the 2022 ***Water is Life: Traditional Owner Access to Water Roadmap***, and, in some cases, agreements under the *Traditional Owner Settlement Act 2010*.

Watering planned and/or delivered in partnership with Traditional Owners to support cultural values and uses

Social, recreational and economic values and uses

In planning the potential environmental watering actions, Goulburn Broken CMA considered how environmental flows could support values and uses, including:

- water-based recreation (such as canoeing, fishing and swimming)
- riverside recreation (such as birdwatching, bushwalking, camping and picnicking)
- green and blue spaces important to the community for wellbeing and mental health due to the otherwise dry environment
- community events and tourism
- socio-economic benefits (such as maintaining the volume of water in the lower sections to optimise the efficiency of deliveries of consumptive water, maintain water quality for irrigation, stock and domestic use and support terrestrial and waterbirds that help control agricultural pests).

Due to the small volume of environmental water available in the Broken system, there is little opportunity to design and deliver watering actions that directly accommodate social, recreational and economic values and uses. However, the potential watering actions do directly support social, recreational and economic values and uses by maintaining a low flow and water quality where possible.

	Environmental watering will also support water sports activities (e.g., canoeing and swimming) by maintaining a low flow and water quality
	Environmental watering will also support bird-related recreational activities (e.g., birdwatching, bushwalking, camping and picnicking) by providing habitat for waterbirds and woodland birds
	Environmental watering will also support angling activities by maintaining habitat for native fish and providing cues for movement and spawning
	Environmental watering will also support peaks in visitation (e.g., camping and other public activities on long weekends and school holidays) by maintaining a low flow and water quality

Scope of environmental watering

The term 'environmental watering' refers to the active delivery of held environmental water to support particular environmental objectives by altering the flow in a river or the water level in a wetland. While other terms are sometimes used to describe the delivery of environmental water, 'environmental watering' is deliberately used here and in seasonal watering statements to ensure consistency in the legal instruments that authorise the use of water for the environment in Victoria.

Table 5.5.1 describes the potential environmental watering actions in 2026-27, their expected watering effects (that is, the intended physical or biological effects of the watering action) and the longer-term environmental objectives they support. Each environmental objective relies on one or more potential environmental watering actions and their associated physical or biological effects.

Table 5.5.1 Broken River and upper Broken Creek potential environmental watering actions, expected watering effects and environmental objectives

Potential environmental watering action	Expected watering effects	Environmental objectives
Upper Broken Creek[1] – reach 1 (compliance points – Waggarandall Weir, Caseys Weir)		
Year-round low flow (5-10 ML/day)	• Maintain aquatic habitat and connections between weir pools for native fish and platypus • Inundate benthic surfaces and large wood located at the bottom of the channel, which serves as habitat for waterbugs • Maintain water quality (specifically dissolved-oxygen levels) for native fish, platypus and waterbugs • Maintain habitat for in-stream and fringing vegetation	**F 1**  **MI1**  **PR1**  **V1**  **WQ1**

Potential environmental watering action	Expected watering effects	Environmental objectives
Year-round fresh (trigger-based, of 20-50 ML/day for ten days)[2] *Triggers:* • *low dissolved oxygen* • *low or cease-to-flow river conditions* • *high water temperatures*	• Increase flow and flush pools to improve water quality and dissolved-oxygen levels	 WQ1
Broken River – reaches 1, 2 and 3 (compliance points – Back Creek Junction, Caseys Weir, Gowangardie Weir)		
Year-round low flow (15-100 ML/day)[3]	At 15 ML/day: • Provide a minimum longitudinal connection along the length of the river and habitat for native fish, aquatic plants, platypus and waterbugs • Maintain water quality and dissolved-oxygen levels for native fish, platypus and waterbugs At 30-100 ML/day: • Increase habitat for in-stream and fringing vegetation, and prevent terrestrial vegetation from colonising the stream bed • Enhance riffles, pools and slackwater to increase the diversity of hydraulic habitat for native fish, aquatic plants, platypus and waterbugs • Improve water quality and dissolved-oxygen levels for native fish, platypus and waterbugs	 F 1  MI1  PR1  V1 WQ1
Summer/autumn fresh (one fresh of 400-500 ML/day for two to five days during December to May)	• Scour sediments around large wood, turn over bed sediments, replenish biofilms and maintain aquatic plant habitat • Provide flow cues to stimulate native fish to breed and migrate • Increase food resources for native fish, platypus and waterbugs	 F 1  G1  MI1  PR1  V1

1 Potential watering actions in upper Broken Creek will be delivered at lower magnitudes if insufficient water is available to achieve the target magnitude.

2 The compliance point is Caseys Weir. The maximum volume that can be diverted from Caseys Weir to Broken Creek is about 20 ML/day. Higher flows may be possible during very dry periods.

3 30-100 ML/day is the recommended flow required to ensure optimal habitat and water quality is achieved in the Broken River. When water availability is low, a flow may need to be delivered at 15 ML per day to provide the minimum habitat and water quality requirements to sustain populations of fish, platypus and vegetation while conserving enough water to deliver throughout the year.

Scenario planning

Table 5.5.2 outlines potential environmental watering and expected water use in a range of planning scenarios.

The small environmental Water Holding restricts the scope of watering actions that can be delivered in the Broken River system. The proposed actions for 2026-27 are similar to those delivered in previous years.

There are two sets of watering actions: one for upper Broken Creek and another for the Broken River. Delivering a flow to upper Broken Creek is a higher priority because it has no tributary inflows and relies more on operational water deliveries and water for the environment. The potential watering actions for upper Broken Creek require less water than those for the Broken River. Any environmental flows delivered to upper Broken Creek will pass through reaches 1 and 2 of the Broken River, where they will provide some environmental benefit.

All potential watering actions in the Broken River and upper Broken Creek are required across all planning scenarios, but there is not likely to be enough supply to meet those demands. The expected supply is only sufficient to partially deliver a summer low flow through upper Broken Creek in drought and dry planning scenarios, and to fully deliver it in the average and wet planning scenarios. Year-round low-flow requirements for the Broken River are typically met by passing and operational flows in the expected conditions of the average and wet planning scenarios. Achieving the remaining required watering actions requires additional supply (for example, via trade) if not provided by natural flow events.

The main environmental watering objective in upper Broken Creek is to maintain a low flow year-round to maintain connectivity and water quality and habitat for native fish, platypus and waterbugs. Maintaining an adequate flow is particularly important during spring and summer when native fish, platypus and waterbugs are most active, and plants are actively growing. Though the flow may not reach lower Broken Creek in drier conditions, ecological values may be protected in weir pools. The year-round, trigger-based fresh will be used to help prevent low-dissolved-oxygen events, which can result in fish deaths. Goulburn Broken CMA will monitor water quality conditions in upper Broken Creek and seasonal forecasts, and it may limit the use of water for low flows during low-risk periods to conserve water for additional trigger-based freshes if necessary.

A year-round low flow (in all planning scenarios) and a summer/autumn fresh (in the average and wet planning scenarios) are needed to support Broken River environmental objectives. However, there is little capacity to influence these with environmental water, especially in the drought and dry planning scenarios. Any environmental allocation water in the drought or dry planning scenarios will be prioritised to deliver a flow to upper Broken Creek. Additional supply would be required to supplement operational deliveries and any natural tributary inflows in the Broken River in these planning scenarios. In the average and wet planning scenarios, increased operational deliveries and tributary inflows will help meet the recommended year-round low flow in the Broken River (hence tier 1), but the recommended minimum low flows may not be met in the dry or drought planning scenarios (tier 2).

Carryover requirements have not been identified for the upper Broken Creek and Broken River. The preferred course is to use available water in 2026-27 and reassess conditions and water availability closer to 2027-28.

Table 5.5.2 Broken River and upper Broken Creek environmental watering planning scenarios

Planning scenario	Drought	Dry	Average	Wet
Expected conditions	• Limited or no unregulated flow in the Broken River or upper Broken Creek • Low releases of operational water in the Broken River • Likely low and cease-to-flow events throughout the year in all reaches	• Low, unregulated flow in the Broken River • Low or no unregulated flow in upper Broken Creek • Low releases of operational water in the Broken River and upper Broken Creek • Possible low and cease-to-flow events throughout the year in all reaches	• High winter/spring flow in the Broken River • Increased releases of operational water in the Broken River • Periods of unregulated flow in upper Broken Creek	• High winter/spring flow in the Broken River • Increased releases of operational water in the Broken River • Periods of unregulated flow in upper Broken Creek with some winter/spring freshes
Expected availability of water for the environment	• 0 ML	• 100 ML	• 647 ML	• 647 ML
Upper Broken Creek – reach 1				
Potential environmental watering – tier 1 (high priorities)	• N/A	• Year-round low flow (partially delivered)		
Potential environmental watering – tier 2 (additional priorities)	• Year-round low flow • Year-round fresh (as required)	• Year-round low flow (remaining volume) • Year-round fresh (as required)		
Broken River – all reaches				
Potential environmental watering – tier 1 (high priorities)	• N/A		• Year-round low flow	
Potential environmental watering – tier 2 (additional priorities)	• Year-round low flow		• Broken River summer or autumn fresh	

Planning scenario	Drought	Dry	Average	Wet
Possible volume of water for the environment required to achieve objectives[1]	• 4,076-6,176 ML (tier 2)	• 100 ML (tier 1) • 4,039-6,139 ML (tier 2)	• 647 ML (tier 1) • 3,401-6,755 ML (tier 2)	• 647 ML (tier 1) • 3,401-6,755 ML (tier 2)
Priority carryover requirements for 2027-28	• N/A			

1 Assumes only one year-round fresh delivered in upper Broken Creek.

5.5.2 Lower Broken Creek

System overview

The lower Broken Creek system is within Yorta Yorta Country, and their cultural connection is evident throughout the landscape. The lower Broken Creek system includes the section of Broken Creek that flows from the confluence of Boosey Creek near Katamatite to the Murray River and Nine Mile Creek, which is an anabranch of lower Broken Creek that flows from the East Goulburn Main Channel to below Numurkah (Figure 5.5.1).

Lower Broken and Nine Mile creeks have been regulated for over a century. Before regulation, the creeks would have had most of their flow in winter/spring, then contracted to isolated pools or dried out during summer/autumn. The adjacent floodplain would have flooded regularly as well. The creeks now have numerous weirs that maintain a relatively constant water level from mid-August until mid-May to support irrigated agriculture and little flow during the non-irrigation season. These modifications have altered how native species use the creek, favouring invasive species (such as arrowhead). Previously, native fish would have moved into the creek when it flowed and returned to the Murray River as it dried.

Both creeks now provide year-round habitat for native fish, and fish passage structures allow fish to move between weir pools. Water for the environment supports these permanent fish habitats by providing flows to trigger fish movement, support fish passage, encourage the growth of native plants, promote in-stream productivity, control water quality and flush concentrations of the water fern azolla as necessary.

The irrigation channel network delivers regulated water from the Goulburn and Murray systems to lower Broken Creek. Lower Broken Creek is operated separately from upper Broken Creek and the Broken River, both of which are supplied from Lake Nillahcootie.

Environmental water can be provided to lower Broken Creek via the Goulburn system through the East Goulburn Main Channel and to the Murray system via the Yarrawonga Main Channel. Water is released into lower Broken Creek from several irrigation regulators along its length. The main priority for environmental flows in the lower Broken Creek system is a minimum flow throughout the year to maintain suitable habitat for native fish. Particular attention is paid to reaches 1 and 2 during the non-irrigation season when the flow can stop. The next priority is to deliver freshes in winter/spring to trigger fish movement and spawning, maintain water quality and manage azolla accumulations in reaches 3 and 4. Rices Weir is the measurement point for environmental flows in lower Broken Creek.

Operational water releases—inter-valley transfers (IVTs) from the Goulburn to the Murray or Barmah Narrows bypass flows delivered to meet downstream demands—partly or wholly meet some environmental flow targets for lower Broken Creek. These operational deliveries mainly occur during peak irrigation demand, from spring to autumn. Water for the environment may be used to supplement operational releases and deliver recommended flow components that operational releases do not meet.

Environmental values

Lower Broken Creek and Nine Mile Creek support a diverse native fish community, including the threatened Murray cod, golden perch, silver perch, unspecked hardyhead, freshwater catfish and Murray-Darling rainbowfish.

Sections of lower Broken and Nine Mile creeks have been reserved as state parks and natural feature reserves. The associated floodplain and wetland habitats support box-dominated grassy woodland communities and numerous species of state and national conservation significance, including river swamp wallaby grass.

Environmental objectives in lower Broken Creek

	F1 – Protect and increase native fish populations, including threatened Murray cod, golden perch, silver perch and small-bodied species
	**MI1** – Increase the diversity and abundance of the waterbug population
	**PR1** – Protect the platypus and rakali (water rat) populations, particularly outside the irrigation season
	**T1** – Protect turtle populations, particularly outside the irrigation season
	**V1** – Avoid the excessive build-up of azolla **V2** – Increase the cover and condition of native in-stream and littoral vegetation communities
	WQ1 – Maintain dissolved-oxygen levels suitable for aquatic animals

Traditional Owner cultural values and uses

The lower Broken Creek system is within Yorta Yorta Country, and their cultural connection is evident throughout the landscape.

Yorta Yorta Nation Aboriginal Corporation (YYNAC) and Goulburn Broken CMA are in open and ongoing dialogue about water for the environment in lower Broken Creek. YYNAC continues to support the proposed watering actions and has contributed to the management and planning of environmental flows for this system by drafting watering proposals.

In 2021, YYNAC provided the following statement about the cultural values of the Broken River system, including lower Broken Creek.

> "The Broken River (and Broken Creek) hold many cultural values. Common reed contained within the slack water provides important material for tools, while also providing refuge for culturally important fish species (large and small-bodied). The creek also has significant stands of old-growth river red gum containing important habitat and exhibiting scars made from carving out canoes and coolamons."

YYNAC has raised concerns about the regulation of flows in all their waterways, which affects their Country and cultural knowledge. YYNAC continues to pursue the Yorta Yorta people's inherent rights to water for Country, aiming to improve their spiritual, cultural, environmental, social and economic needs, in line with the ***Yorta Yorta Whole-Of-Country Plan 2021-2030***.

Goulburn Broken CMA will continue to work with the Yorta Yorta people to identify how the management of water for the environment can better support cultural values.

Increasing the involvement of Traditional Owners in planning and managing environmental flows and progressing opportunities towards self-determination in the environmental watering program is a core commitment of the VEWH and its program partners. This is reinforced by legislation and policy commitments, including the *Water Act 1989*, the ***Victorian Aboriginal Affairs Framework***, the 2016 ***Water for Victoria***, the 2022 ***Water is Life: Traditional Owner Access to Water Roadmap***, and, in some cases, agreements under the *Traditional Owner Settlement Act 2010*.

Social, recreational and economic values and uses

In planning the potential watering actions in **Table 5.5.3**, Goulburn Broken CMA considered how environmental flows could support social, recreational and economic values and uses, including:

- water-based recreation (such as canoeing, fishing, game hunting and kayaking)
- riverside recreation and amenity (such as aesthetic values that can be important for people's mental health and wellbeing)
- community events and tourism socio-economic benefits (such as consumptive water users, Goulburn-Murray Water irrigators and diverters and Goulburn Valley Water potable water customers).

The lower Broken Creek system generally has a narrow streamside zone with residential and farming properties adjoining or overlooking it. The creek system runs through the townships of Katamatite, Wunghnu, Numurkah and Nathalia. Consequently, these communities have a direct connection with the creek, which provides important aesthetic and amenity values. The creeks are also important recreational areas, including for fishing, canoeing, kayaking and passive recreation.

> "The Broken and Nine Mile creeks are important in regard to being one of the most accessible waterways in Victoria for fishing, family picnics and camping."
>
> – Nathalia community member

The expected benefits of delivering water for the environment in lower Broken Creek and Nine Mile Creek in 2026-27 include winter flows, which support amenity and maintain adequate depths for canoeing and fishing in the lower reaches. Environmental flows support native fish populations by providing fish passage and habitat and encouraging fish migration and spawning, which in turn benefits recreational anglers. Environmental flows may be planned to align with social or recreational values.

The lower Broken Creek system is the source of consumptive water for irrigation, stock and domestic uses for more than 70 diverters and urban water for Nathalia. The creek can be prone to poor water quality due to elevated colour, mineral concentrations and/or low-dissolved-oxygen events. Delivery of baseflows during the warmer months can support water quality for consumptive users.

	Environmental watering will also support water sports activities (e.g., canoeing, kayaking, swimming) as a result of maintaining baseflows through spring, summer and autumn
	Environmental watering will also support waterbird-related recreational activities (e.g., birdwatching) by maintaining aquatic habitat and good water quality, particularly as a result of maintaining baseflows through spring, summer and autumn
	Environmental watering will also support angling activities by maintaining baseflows and water quality through spring, summer and autumn, and delivering freshes to support fish movement and spawning
	Environmental watering will also support peaks in visitation (e.g., camping or other public activities on long weekends or school holidays) by maintaining baseflows through spring, summer and autumn, without impacting amenity

Scope of environmental watering

The term 'environmental watering' refers to the active delivery of held environmental water to support particular environmental objectives by altering the flow in a river or the water level in a wetland. While other terms are sometimes used to describe the delivery of environmental water, 'environmental watering' is deliberately used here and in seasonal watering statements to ensure consistency in the legal instruments that authorise the use of water for the environment in Victoria.

Table 5.5.3 describes the potential environmental watering actions in 2026-27, their expected watering effect (that is, the intended physical or biological effects of the watering action) and the longer-term environmental objectives they support. Each environmental objective relies on one or more potential environmental watering actions and their associated physical or biological effects.

Table 5.5.3 Lower Broken Creek potential environmental watering actions, expected watering effects and environmental objectives

Potential environmental watering action	Expected watering effects	Environmental objectives
Winter low flow (20-40 ML/day during May to August)	• Provide native fish with passage through fish ladders (at 40 ML/d) • Provide suitable foraging habitat for platypus and rakali (water rats), and support the conditioning of females in preparation for the breeding season • Provide habitat for turtles, including protection from exposure during their winter dormancy • Provide flowing-water habitat and avoid winter drying of weir pools for fish, vegetation, waterbugs, platypus and turtles • Maintain water over submerged aquatic plants so they are protected from drying and frost • Reduce the stagnation of weir pools to maintain water quality	F1, MI1, PR1, T1, V2, WQ1
Spring/summer/ autumn low flow (200-450 ML/day during August to May)	• Provide habitat for aquatic plants and animals, including native fish, platypus, rakali (water rats), turtles and waterbugs • Support the movement and recruitment of fish • Maintain native in-stream and littoral vegetation communities through water level variability • Maintain dissolved-oxygen levels in summer	F1, MI1, PR1, T1, V2, WQ1
Winter/spring fresh(es) (one to three freshes of 300-450 ML/day for one to two weeks during July to November)	• Flush and mobilise azolla if it has accumulated to maintain water quality • Trigger the movement and spawning of fish • Encourage the germination and growth of littoral and in-stream vegetation • Reduce the stagnation of weir pools to maintain water quality	F1, V1, V2, WQ1

Scenario planning

Table 5.5.4 outlines potential environmental watering and expected water use in a range of planning scenarios.

The high degree of regulation in the lower Broken Creek system means flow patterns in the lower Broken and Nine Mile creeks are the same in all planning scenarios. Water for the environment will primarily be used in the lower Broken Creek system to guard against a reduced flow during the non-irrigation season.

Potential watering actions in all planning scenarios include maintaining a flow above 20 ML per day outside the irrigation season, ameliorating sudden fluctuations in irrigation demand during the irrigation season and delivering spring freshes to trigger fish movement, improve water quality or flush excessive accumulations of azolla. Delivering spring freshes in 2026-27 in all planning scenarios is important to trigger the movement and spawning of native fish in the system and help the fish community recover from past low-dissolved-oxygen blackwater events. Low flows and freshes throughout the year will also support native fish, which are being restocked as part of a recovery project.

Goulburn Broken CMA will monitor water quality throughout the year, and it may ask to increase spring/summer/autumn low flows to the upper end of the recommended range in **Table 5.5.3** if dissolved-oxygen levels drop below 4.0 mg/L. The total volume of water required for the environment to achieve planned watering actions in 2026-27 will vary depending on operational deliveries (including IVTs) and the size and duration of any unregulated flow events. A carryover target of 5,000 ML applies in all planning scenarios to ensure a minimum low flow and a small fresh can be delivered early in 2027-28.

Table 5.5.4 Lower Broken Creek environmental watering planning scenarios

Planning scenario	Drought	Dry	Average	Wet
Expected conditions	• No unregulated flow	• Some unregulated flow in winter • No unregulated flow throughout the irrigation season (mid-August to May) • No diversion of unregulated Murray River flow is available	• Unregulated flow in winter/spring • Unregulated flow is unlikely from October to May • Diversion of unregulated Murray River flow is available from mid-August to October	• Unregulated flow is likely in winter/spring • Unregulated flow is possible from November to May • Diversion of unregulated Murray River flow available from mid-August to November
Potential environmental watering – tier 1 (high priorities)	• Winter low flow • Spring/summer/autumn low flow • Winter/spring freshes			
Possible volume of water for the environment required to achieve objectives	• 80,000 ML			
Priority carryover requirements for 2027-28	• 5,000 ML			

5.5.3 Broken wetlands

System overview

Of some 3,600 natural wetlands in the Goulburn Broken region, only three in the Broken catchment have infrastructure that allows them to receive environmental water: Black Swamp, Kinnairds Wetland and Moodie Swamp (Figure 5.5.1).

All three wetlands are on the Country of the Yorta Yorta people. Their knowledge and practice are evident throughout the landscape; for example, Black and Moodie Swamps have evidence of old cooking mounds around their perimeter. Kinnairds Wetland and Black Swamp are red gum swamps near Numurkah. Moodie Swamp is a cane grass wetland adjacent to upper Broken Creek at Waggarandall that provides excellent breeding habitat for brolgas.

The water regimes of these wetlands are influenced by their position in the landscape. The development and operation of the Shepparton Irrigation Area and Murray Valley Irrigation District have changed the natural flow paths and the timing, frequency, volume and duration of natural flooding to these and other wetlands in the region.

While Black Swamp and Kinnairds Wetland can receive water from the Goulburn and Murray systems, respectively, Moodie Swamp relies on the limited supply available in the Broken system. Moodie Swamp actions are planned in the context of competing demands in upper Broken Creek and Broken River. When water availability is limited, actions in upper Broken Creek will likely be given precedence.

Also, under existing agreements, irrigation deliveries have priority within the channel system, which can limit the volume of water that can be delivered to the wetlands. The VEWH, waterway managers and storage managers adjust the timing and rate of environmental deliveries where possible to optimise environmental outcomes within the current system constraints.

The VEWH and the CEWH have co-invested in improved delivery infrastructure at Kinnairds and Moodie swamps, allowing more efficient and adaptive delivery of environmental water to the sites.

Environmental values

Moodie Swamp, Kinnairds Wetland and Black Swamp support diverse vegetation communities ranging from river red gum to cane grass. The wetlands contain state and nationally threatened vegetation classes and species, including ridged water-milfoil and river swamp wallaby grass. The wetlands also provide food resources and breeding habitat for bird species of high conservation significance, including eastern great egret, Latham's snipe, white-bellied sea eagle, Australasian bittern, brolga and Australasian shoveler. Many of these species are listed in international agreements and conventions. Moodie Swamp also supports Sloane's froglet, listed in the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*. The following environmental objectives are relevant to the Broken wetlands.

Environmental objectives in the Broken wetlands	
	A1 – Provide breeding habitat for frogs
	**B1** – Provide breeding habitat for waterbirds **B2** – Provide feeding and roosting habitat for waterbirds
	**CN1** – Restore carbon and nutrient cycling within the wetlands to increase ecosystem productivity
	**V1** – Improve the cover, diversity, recruitment/regeneration and growth of native wetland plant species, consistent with ecological vegetation class benchmarks **V2** – Reduce the cover and diversity of exotic plant species **V3** – Maintain populations of ridged water-milfoil **V4** – Maintain populations of river swamp wallaby grass

Traditional Owner cultural values and uses

Moodie Swamp, Kinnairds Wetland and Black Swamp support various native plants and animals that provide many cultural values and uses for the Yorta Yorta people. Black Swamp and Kinnairds Wetland support multiple varieties of nardoo (a food source), native grasses, herbs (such as old man weed, which has medicinal uses) and sedges and rushes (used for basket weaving). Basket-weaving sedges also grow at Moodie Swamp. Evidence of oven mounds and clay balls has also been observed at Black and Moodie Swamp (**Table 5.5.5**).

Increasing the involvement of Traditional Owners in managing environmental flows and progressing opportunities towards self-determination in the environmental watering program is a core commitment of the VEWH and its program partners. This is reinforced by legislation and policy commitments, including the *Water Act 1989*, the ***Victorian Aboriginal Affairs Framework***, the 2016 ***Water for Victoria***, the 2022 ***Water is Life: Traditional Owner Access to Water Roadmap***, and, in some cases, agreements under the *Traditional Owner Settlement Act 2010*.

Goulburn Broken CMA will continue to work with the Yorta Yorta people to identify how the management of water for the environment can better support cultural values.

Table 5.5.5 Traditional Owner cultural values and uses, Broken wetlands

Wetland	Connection to wetland	Value	How have these benefits been considered?
Black Swamp	• Evidence of middens, clay balls and oven mounds at the site • Food and medicinal sources	• Environmental water provides a connection to Country, food, medicine and fibres for Traditional Owners	• Cultural values at the site include knowledge-sharing and increased resources (such as food and medicine plants)
Moodie Swamp	• Evidence of oven mounds and scar trees • Food and basket-weaving sedges grow at the site	• Environmental water provides a connection to Country, food and fibres for Traditional Owners	• Cultural values at the site include knowledge-sharing and increased resources (such as food and medicine plants)
Kinnairds Wetland	• Connection to Country • Food, medicinal resources and fibre grow at the site	• Environmental water provides a connection to Country, food, medicine and fibres for Traditional Owners	

Social, recreational and economic values and uses

When planning potential environmental watering actions, Goulburn Broken CMA considers how environmental flows could support values and uses, including:

- water-based recreation (such as canoeing)
- riverside recreation and amenity (such as birdwatching, camping, picnicking, photography, walking and hunting)
- community events and tourism
- socio-economic benefits (such as tourism, which greatly contributes to the local economy).

Environmental watering of the Broken wetlands can provide ancillary social, recreational and economic benefits, particularly by improving opportunities for passive recreation (such as birdwatching, walking and photography), as well as aesthetic enjoyment for local communities and landholders. At some sites, the increased presence of waterbirds and wetland vegetation can indirectly support tourism, local recreation and broader environmental benefits (such as pest control and soil aeration on neighbouring properties). Local landholders are advocates for Moodie Swamp and the brolgas and waterbirds that live there. The site is aesthetically pleasing to landholders, and waterbirds (such as ibis) move onto neighbouring properties at times to feed on pests and aerate the soil. These are all environmentally beneficial for the landholders.

While these outcomes are recognised during planning and communicated via engagement activities, environmental watering actions are designed and prioritised to meet environmental objectives and are not modified to accommodate social, recreational or economic values.

Environmental watering will also support waterbird-related recreational activities (e.g., twitching, birdwatching) by providing habitat for waterbirds and woodland species

Scope of environmental watering

The term 'environmental watering' refers to the active delivery of held environmental water to support particular environmental objectives by altering the flow in a river or the water level in a wetland. While other terms are sometimes used to describe the delivery of environmental water, 'environmental watering' is deliberately used here and in seasonal watering statements to ensure consistency in the legal instruments that authorise the use of water for the environment in Victoria.

Table 5.5.6 describes the potential environmental watering actions in 2026-27, their expected watering effect (that is, the intended physical or biological effects of the watering action) and the longer-term environmental objectives they support. Each environmental objective relies on one or more potential environmental watering actions and their associated physical or biological effects.

Table 5.5.6 Broken wetlands potential environmental watering actions, expected watering effects and environmental objectives

Potential environmental watering action	Expected watering effects	Environmental objectives
Black Swamp (fill in spring)	• Promote the growth and improve the condition of Red Gum Swamp Ecological Vegetation Class (EVC) vegetation, targeting spring-growth species (such as water nymph) • Provide breeding habitat for frogs • Provide breeding, feeding and roosting habitat for waterbirds	A1, B1, B2, V1, V2
Black Swamp (fill in autumn)	• Promote the growth and improve the condition of Red Gum Swamp EVC, targeting autumn-growth species (such as river swamp wallaby grass) • Provide breeding habitat for frogs • Provide breeding, feeding and roosting habitat for waterbirds	A1, B1, B2, V1, V2, V4
Kinnairds Wetland (fill in spring)	• Promote the growth and improve the condition of Red Gum Swamp EVC and Plains Grassy Wetland EVC vegetation, targeting spring-growth plant species (such as slender and ridged water-milfoils) • Provide habitat for frogs • Provide feeding and roosting habitat for waterbirds	A1, B2, V1, V2, V3

Potential environmental watering action	Expected watering effects	Environmental objectives
Kinnairds Wetland (fill in autumn)	• Promote the growth and improve the condition of Red Gum Swamp EVC and Plains Grassy Wetland EVC vegetation, targeting autumn-growth plant species, including ridged water-milfoil • Provide habitat for frogs • Provide feeding and roosting habitat for waterbirds	A1  B2  V1, V2, V3
Moodie Swamp (fill in spring)	• Maintain water levels from autumn 2026 watering to sustain frog and bird breeding events, and enable aquatic vegetation to complete its life cycle, including ridged water-milfoil	A1  B1  V1, V2, V3

Scenario planning

Table 5.5.7 outlines potential environmental watering and expected water use in a range of planning scenarios.

All three wetlands received environmental water in 2025-26. Kinnairds and Black Swamp have since dried and, barring natural inundation, will require deliveries in 2026-27 to meet their optimum regime. Both wetlands are planned to receive spring and autumn fills to support frog, bird and vegetation objectives. Spring watering will benefit plant species such as water nymph, while river swamp wallaby grass is targeted in autumn.

Moodie Swamp is planned to receive a spring fill in 2026-27 to build on water delivered in autumn 2026, contingent on water availability. This will support any continuing bird breeding events and allow species (such as ridged water-milfoil) to complete their life cycles. All actions are high priorities, but Moodie Swamp actions are tier 2, as they are dependent on water being available in the Broken system, where modest amounts of environmental water are held. Opening allocations can be very low, and there are competing demands from upper Broken Creek and Broken River.

The volume required for the planned actions decreases from the drought to wet planning scenarios, as evaporation will be lower and soil moisture will be higher in wetter scenarios. In a wet scenario, wetlands are likely to receive natural inflows but may require top-ups to achieve the desired environmental outcomes.

There are presently no carryover requirements for 2027-28. Any water carried over in the Broken system reduces allocation water in the following year, so carryover will be carefully assessed closer to the end of 2026-27.

Table 5.5.7 Broken wetlands environmental watering planning scenarios

Planning scenario	Drought	Dry	Average	Wet
Expected conditions	• Catchment run-off and natural flow into the wetlands are highly unlikely	• Catchment run-off and natural flow into the wetlands are highly unlikely	• Some catchment run-off and natural flow into some of the wetlands are likely, particularly in winter/spring	• Catchment run-off and natural flow into the wetlands are likely to fill or partially fill the wetlands, particularly in winter/spring
Potential environmental watering – tier 1 (high priorities)[1]	• Black Swamp (fill in spring) • Black Swamp (fill in autumn) • Kinnairds Wetland (fill in spring) • Kinnairds Wetland (fill in autumn)			
Potential environmental watering – tier 2 (additional priorities)[2]	• N/A	• Moodie Swamp (fill in spring)		
Possible volume of water for the environment required to achieve objectives	• 960 ML (tier 1) • N/A (tier 2)	• 860 ML (tier 1) • 500 ML (tier 2)	• 760 ML (tier 1) • 250 ML (tier 2)	• 500 ML (tier 1) • 100 ML (tier 2)
Priority carryover requirements for 2027-28	• N/A			

1 Black Swamp and Kinnairds Wetland receive water from the Goulburn and Murray systems.

2 Moodie Swamp receives environmental water from the Broken system, which has limited resources.

5.6 Campaspe system

Waterway manager – North Central Catchment Management Authority

Storage manager – Goulburn-Murray Water

Environmental water holders – Victorian Environmental Water Holder (including the Living Murray program) and Commonwealth Environmental Water Holder

The Campaspe system includes the Campaspe and Coliban rivers.

5.6.1 Campaspe River

System overview

Natural inflows in the upper Campaspe River catchment are harvested into Lake Eppalock, located near the townships of Axedale and Heathcote. The main tributaries of the Campaspe River are the Coliban River, McIvor and Wild Duck creeks above Lake Eppalock and Mount Pleasant, Forest and Axe creeks below Lake Eppalock (Figure 5.6.1).

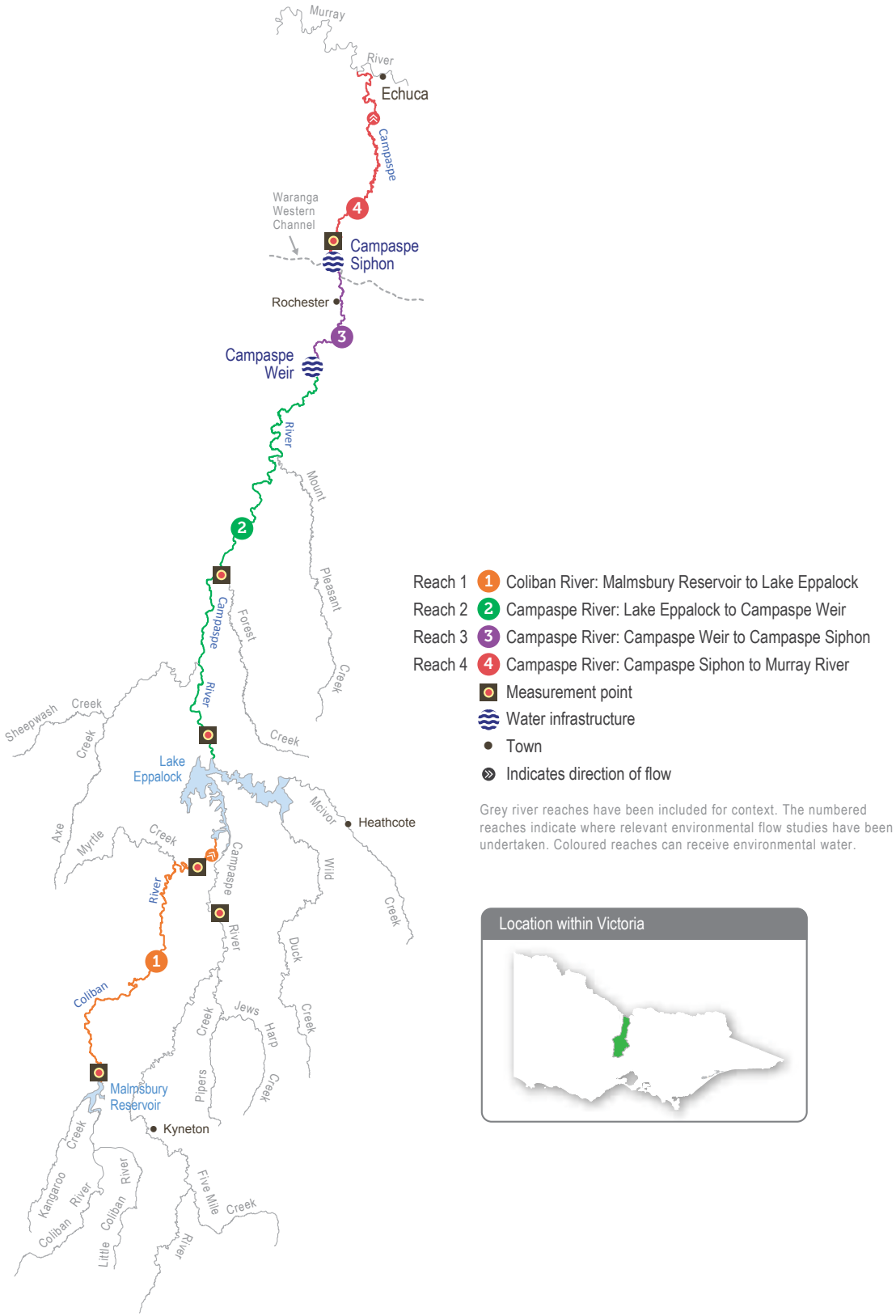
Below Lake Eppalock, the major in-stream structure is the Campaspe Weir, built to divert water to the Campaspe Irrigation District. It is no longer used for water diversion but is a barrier to fish migration. Gates on the weir provide some degree of control over the flow, but large flows spill over the weir. The Campaspe Siphon, just below Rochester, is part of the Waranga Western Channel, which carries water from the Goulburn system to western Victoria. Water can be released from the Waranga Western Channel into the lower reaches of the Campaspe River, or water can potentially be pumped from the river into the Waranga Western Channel. The siphon is another barrier to fish migration during low-to-moderate flow.

The flow below Lake Eppalock is mainly influenced by releases from storage and by the operation of the Campaspe Weir and the Campaspe Siphon. The Campaspe's major tributary (the Coliban River) flows through the three Coliban Water storages (the Upper Coliban, Lauriston and Malmsbury reservoirs) before reaching Lake Eppalock. Water for the environment is held and released from Lake Eppalock, with some limited ability to regulate the flow further downstream at the Campaspe Weir.

Water for the environment is released from Lake Eppalock to support aquatic plants and animals in and along the Campaspe River. It can be supplemented with water for the environment delivered via the Waranga Western Channel at the Campaspe Siphon, providing flexibility to meet environmental demands in reach 4. Water for the environment is primarily used in the Campaspe River to improve the magnitude and variability of flow during winter and spring, but it is also used to deliver a critical flow in summer and autumn that is not met or exceeded by operational deliveries. Primary flow measurement points are at Barnadown (reach 2) and below the Campaspe Siphon (reach 4).

Goulburn-Murray Water transfers operational water from Lake Eppalock or through the Waranga Western Channel to Murray River customers and downstream storages (such as Lake Victoria). These inter-valley transfers (IVTs) usually occur in summer and autumn and, depending on the rate of delivery, can either support or compromise environmental flow objectives. High IVT flows delivered when the Campaspe River would naturally have a low flow may reduce suitable habitat for juvenile fish, which rely on protected, shallow areas of water near the edge of the river channel. Sustained high IVT flows in summer can also drown recruiting streamside vegetation. Storage managers and North Central CMA have worked cooperatively to increase the positive effects and reduce the harmful effects of IVTs on native plants and animals in the Campaspe River. For example, IVTs are sometimes delivered in a pattern that meets summer low-flow and fresh requirements, reducing demand on the environmental entitlement. IVTs have also been released in a pattern to support native fish migration from the Murray River into reach 4 of the Campaspe River without affecting delivery to downstream users.

Figure 5.6.1 Campaspe system



Environmental values

The Campaspe River below Lake Eppalock provides important habitat for native fish species, including Murray cod, silver perch, golden perch, Murray-Darling rainbowfish and flathead gudgeon. Murray-Darling rainbowfish were presumed lost from the system during the Millennium Drought. However, since 2011, they have been recorded at many sites on the Campaspe River and are now abundant below Elmore. In recent years, there have been trial reintroductions of river blackfish, catfish, trout cod and southern pygmy perch. Environmental flows help native fish migrate and disperse throughout the Campaspe system.

Platypus, rakali (water rats), turtles and frogs are also present along the length of the Campaspe River. The streamside vegetation zone is narrow and dominated by large, mature river red gum trees that support wildlife (such as the swift parrot and squirrel glider).

Environmental objectives in the Campaspe River

	F1 – Protect and increase native fish populations **F2** – Facilitate the recolonisation of reintroduced native fish species (including trout cod, blackfish and catfish)
	**G1** – Maintain substrate surfaces to support ecological processes
	**MI1** – Increase the diversity and biomass of waterbugs
	**PR1** – Protect the platypus population
	**V1** – Maintain adult river red gums and increase the recruitment of immature trees **V2** – Maintain the extent and increase the diversity of streamside vegetation **V3** – Increase the extent of in-stream aquatic plants
	WQ1 – Maintain water quality in deep pools and prevent stratification **WQ2** – Reduce the risk of low-oxygen blackwater events in summer

Traditional Owner cultural values and uses

Djaara, Taungurung and Yorta Yorta Nation are the First Peoples of the Campaspe River, and we acknowledge their rights to practice their culture and identity as Traditional Owners, to maintain their relationship with the river and natural resources on or depending on their land, and to protect places and areas of importance on their land. The Traditional Owner people have rights as the primary guardians, keepers and knowledge holders of Aboriginal cultural heritage and knowledge.

North Central CMA has engaged with DJAARA, Taungurung and Yorta Yorta as part of the ongoing management of water for the environment on the Campaspe River and other north central waterways.

Table 5.6.1 summarises the Djaara and Taungurung Nations' values and uses of the Campaspe River and how these have been considered in the development of the *2026-27 Campaspe Seasonal Watering Plan*. More specific information for each Nation is in the relevant sections below.

Dja Dja Wurrung Clans Aboriginal Corporation (trading as DJAARA)

Dhelkunya Dja: Dja Dja Wurrung Country Plan 2014-2034 describes Djaara's (Dja Dja Wurrung People's) aspirations around the management of rivers and waterways and articulates Djaara's support for reinstating environmental flows as an overall objective for the management of Gatjin (water) on Djandak (Country), setting a baring (pathway) for DJAARA to become the environmental water manager on Djaara Country and a baring for Djaara Lore to inform water-management decisions. This transition is being progressed by working in partnership with authorities and the community to manage water for a healthy, sustainable future. DJAARA have a unique opportunity, as the first owners of the land and water that includes the Campaspe River, to apply ancient Djaara cultural principles and management practices to the current water management context.

Empowering DJAARA to manage water in the catchment enables DJAARA to provide overarching guidance to holistically manage water to meet environmental, social and economic values. Cultural values do not sit as another competing value and use of the water; rather cultural values provide the lens for all values to be viewed through and met. Enhancing cultural values, uses and practices in the Campaspe River are enabling environmental, social and economic values to be supported.

Through implementation of ***Dhelkunyangu Gatjin (Working together to heal water) Djaara Gatjin Strategy***, facilitated by the Wanggal Partners Group which has representation by the North Central CMA and water management agencies operating on Djaara Djandak (Country) continue to work to support DJAARA's increased engagement in planning and delivering of environmental water, including identifying opportunities for DJAARA to play a greater role in its management and administration and transfer of environmental water entitlements to DJAARA.

Through previous years of engagement, the Kapa Gatjin (to know water) Advisory Group have expressed their aspirations and environmental objectives for the Campaspe River. Kapa Gatjin Advisory Group have shared the importance of native fish, turtles, medicine plants, pest control and emphasised that they expect to be respected and involved in environmental water management going forward. However, due to limited resources across six systems occurring on Djandak there is not adequate funding to appropriately engage with Djaara and the Kapa Gatjin members to provide meaningful input or review seasonal watering proposals. For the development of the 2026-27 seasonal watering proposals, DJAARA determined the direction in which it would prioritise these limited resources, focusing primarily on phase one of the trial of the joint management of environmental water on Dindilong Yaluk (Coliban River) by co-authoring the 2026-27 seasonal watering proposal with North Central CMA, as well as being involved with scenario planning for the Loddon and Campaspe systems. In future years, DJAARA's focus will be on strengthening and expanding these joint management arrangements across additional systems.

Table 5.6.1 summarises, from previous years' engagement, Kapa Gatjin's aspirations and values for the Campaspe River. Djaara emphasise that it is not possible to include all of their cultural water aspirations, uses, values, and places of cultural importance into one document. Djaara's values are diverse and complex and can widely differ between family and clan groups. The interests and beliefs of Djaara are multifaceted and cannot be defined through a single standpoint or response.

Taungurung

Taungurung Land and Waters Council (TlaWC) staff have advised North Central CMA that the proposed watering actions are consistent with Taungurung biocultural objectives as identified during discussions with the Taungurung water knowledge group Baan Ganalina (Guardians of Water) over a number of previous years. This year's actions have been assessed by TLaWC in consultation with Baan Ganalina members and the Taungurung community, and were formally endorsed by Taungurung elders, knowledge holders and the community during the Taungurung Caring for Biik Forum held in April 2026.

The consideration of this year's proposed watering actions builds on a number of earlier discussions between North Central CMA and Baan Ganalina, as well as ongoing biocultural monitoring and assessment activities at seven sites on the Campaspe River by TLaWC, enabled by funding provided by the North Central CMA.

On 4-5 September 2019, North Central CMA met with Baan Ganalina for a two-day field tour of the Campaspe River and for a workshop to identify biocultural values and express Taungurung objectives for healing and caring for the Campaspe River in line with cultural obligations and priorities. In line with values and objectives identified by knowledge holders during this process and building on the ecological and cultural assessment undertaken on the Campaspe in 2019 in collaboration with Dja Dja Wurrung, commencing in 2022 Biik crew members have monitored seven sites on the river monthly to maintain connection to Country and support the collection of biocultural knowledge. This information has been synthesised through ongoing collaborative discussions with Baan Ganalina to develop the cultural objectives presented in this section.

Baan Ganalina have highlighted the importance of native animals, including fish, frogs, platypus, waterbirds, mussels and crustaceans, and identified the importance of overstorey, mid-layer and aquatic vegetation in creating healthy habitat. The group has emphasised the principle of 'right way water'—right time, right place, right amount—to ensure flow is at varying and seasonally appropriate levels, and the importance of reconnecting backwaters, maintaining water quality and preventing flows that might erode or damage cultural sites. In addition, the group emphasised the need for ongoing involvement in water management decisions going forward to allow for cultural values and objectives to be incorporated.

TLaWC has identified that this method of ongoing engagement is needed so that initial objectives identified in the initial cultural waterway assessment process can be built upon over subsequent years through an iterative process of refinement in response to cultural direction and priorities. This requires regular assessments on the river with the provision of needed funding.

Table 5.6.1 responds to priorities identified by Taungurung knowledge holders at this point of time in response to the ongoing assessment of the health of Country, and it does not reflect a complete picture of Taungurung knowledge, values and objectives regarding the Campaspe River. Funding sources will need to be identified for the ongoing monitoring of the health of Country by Baan Ganalina and Biik crew members. North Central CMA continues to work with TLaWC and Baan Ganalina to support the assessment and monitoring of biocultural values on the Campaspe River.

Yorta Yorta First Nations Peoples

Yorta Yorta First Nations people's participation in environmental water planning and delivery is facilitated by the Yorta Yorta Nation Aboriginal Corporation (YYNAC). The Campaspe River is an important part of Yorta Yorta Country, supporting cultural practices, connection to Country, and the passing on of knowledge. Yorta Yorta Nation seeks to see the river managed in a way that keeps it healthy and functioning, including more natural flow patterns, good water quality, and a strong, connected river and floodplain system. This includes supporting culturally important species such as Murray cod, golden perch, freshwater turtles, and waterbirds, as well as vegetation like river red gum and native aquatic plants, particularly across the lower floodplain and connected wetland areas.

Yorta Yorta Nation seek meaningful inclusion in the management and monitoring of the Campaspe River system on Country, including seasonal monitoring and site visits focusing on water quality, vegetation condition and the presence of culturally significant species. This approach brings together cultural knowledge and scientific methods to better guide watering decisions, ensuring environmental watering in the Campaspe River is culturally informed and supports Yorta Yorta aspirations for caring for Country.

Table 5.6.1 Traditional Owner cultural values and uses, Campaspe River

Traditional Owner Group	Values/uses/objectives/ opportunities	How will this opportunity be considered environmental watering in 2026-27
Kapa Gatjin and Baan Ganalina	• Protection of culturally significant sites (such as scar trees)	• Deliveries of water for the environment will include ramp-up and ramp-down rates that are at the lower end of the environmental flow recommendations to minimise the risks of erosion and bank slumping • More work is required to locate and document cultural assets that may be impacted by river flows
Kapa Gatjin	Objectives • A Djaara-led water for the environment program and management plan that provides guidance for water for the environment, among other water entitlements and flows • Overarching holistic monitoring and management of waterways and flows to optimise outcomes for the environment and other values, maximising the value delivered through the program	• Through DJAARA being supported with a greater role to perform monitoring and planning activities, and through activating a DJAARA/North Central CMA joint management approach for environmental water planning and delivery
Baan Ganalina	• Flow regime reflects the principle of 'right way water' • Environmental water releases should mimic natural flow regimes and respond to top-up / natural flow events • Backwaters are connected to maintain the health of the river	• Deliveries of water for the environment, where feasible, should be delivered consistent with antecedent conditions and seasonality, and be respectful of natural cycles and the needs of Country • Winter and spring flows should reflect the climatic condition experienced at the time of delivery: lower in dry years and higher in average to above-average rainfall years • Summer freshes and winter high-flow events should be delivered to coincide with forecast rainfall events, if possible
Kapa Gatjin	• Promote the growth of traditional food, fibre and medicine plants such as water ribbons, water pepper and juncus	• Deliveries of water for the environment will include summer/autumn freshes and winter/spring high flows to wet up margins of the riverbank to promote in-stream and fringing vegetation
Baan Ganalina	• Maintain or improve the diversity and abundance of native vegetation species assessed by the health and abundance of species, utilising indicator species, such as water ribbon (food) and juncus (fibre), to assess the overall health of Country	• Deliveries of water for the environment will include summer/autumn freshes and winter/spring high flows to wet up margins of the riverbank to promote bank, in-stream and fringing vegetation

Traditional Owner Group	Values/uses/objectives/ opportunities	How will this opportunity be considered environmental watering in 2026-27
Kapa Gatjin	• Improve the vegetation and prevent the encroachment of terrestrial weeds	• Winter/spring high flows to prevent terrestrial vegetation establishing on the lower bank
Kapa Gatjin and Baan Ganalina	• Healthy water: improved water quality	• Delivery of the recommend flow regime will lead to improved water quality • Delivery of winter/spring high flow will reduce the risk of a blackwater event over summer
Kapa Gatjin and Baan Ganalina	• Improve native fish populations	• A number of water for the environment deliveries will protect and improve native fish populations, such as summer/autumn freshes for large-bodied fish movement, and steady spring flows to prevent Murray cod nest abandonment
Baan Ganalina and Kapa Gatjin	• Maintain and improve platypus populations	• Connect low flow for movement • A summer/autumn fresh in April reduces predation during juvenile dispersal • A winter/spring low flow would allow male platypus to move long distances during the breeding season • Timing of a spring high flow to prevent burrow inundation during the breeding season

Social, recreational and economic values and uses

The Campaspe River provides a diverse range of social, recreational and economic values, shown in **Table 5.6.2**. Recreation and tourism activities include camping, fishing, water sports, birdwatching and duck hunting. These activities directly benefit the local and wider regional economies. A shared benefit identified during the 2016-2024 Victoria Environmental Flow Monitoring and Assessment Program is the increased abundance of native fish in the Campaspe River, including fish breeding events. This is an ecological benefit that also satisfies social, recreational, economic and cultural objectives.

Although not explicitly measured, the river is also likely to provide indirect economic benefits through ecosystem services (such as groundwater recharge and carbon storage). The delivery of environmental water aims to support these shared economic, social and cultural benefits as long as they do not compromise the environmental objectives of watering or impose extra demands on the Environmental Water Reserve: that is, require additional environmental water.

In planning the potential environmental watering actions in **Table 5.6.3**, North Central CMA considered how environmental flows could support values and uses, including:

- water-based recreation (such as canoeing, kayaking, fishing and water sports)
- riverside recreation and amenity (such as birdwatching, bushwalking, camping, cycling, duck hunting and picnicking)
- community events and tourism (such as visitors travelling to canoe and kayak on the river)
- socio-economic benefits (such as diversions for irrigation, domestic and stock uses; local and regional economic benefits from increased visitation; ecosystem services [such as carbon storage, groundwater recharge and water quality regulation]; lower salinity management costs, lower blackwater and blue-green algae risks for landholders; and contributions to community enjoyment, health and recuperation).

Environmental flows may be planned to align with a social or recreational objective so long as environmental objectives are not compromised. This is indicated in **Table 5.6.3** by an icon, as pictured below and also explained in **Figure 1.2.3**. For example, there are many places along the Campaspe River where visitors like to camp. Aysons Reserve is a popular camping site near Elmore, and it draws hundreds of campers during school holiday periods. Where possible, freshes are delivered outside of peak visitation periods (such as the March and April long weekends) to ensure the flow is not too high for campers and water-related activities.

	Watering is planned to support peaks in visitation (e.g., camping or other public activities on long weekends or school holidays)
	Environmental watering will also support water sports activities (e.g., canoeing, kayaking and swimming) by providing river flows and improved water quality for these popular recreational activities along the river
	Environmental watering will also support angling activities; environmental water deliveries associated with maintaining water quality and the movement or dispersal of fish benefit recreational anglers by encouraging fish to move through the system, promoting fish health and providing angling opportunities

Table 5.6.2 Campaspe system social, recreational and economic benefits of environmental watering

Waterway	Beneficiary	Connection to the river	Values/uses/objectives/ opportunities
Campaspe River	• VRFish • Recreational fishers	• Anglers have a close connection to the river and an interest in maintaining its health	• Flows associated with the movement or dispersal of fish benefit recreational anglers by encouraging fish to move through the system, promoting fish health and providing recreational opportunities for anglers
	• Diverters (domestic and stock, agricultural), recreational users and Traditional Owners	• Diverters along the river rely on environmental water deliveries to ensure they have usable water for household and agricultural business uses and that the river can support recreational activities.	• Many of the potential watering actions target water quality • Low flows and freshes improve water quality for diverters to benefit their households
Campaspe River reach 3 & 4	• Powered and unpowered boat users	• Rochester Weir (reach 3) and the Campaspe Weir Pool (reach 2) are popular locations for water-based recreational uses, including fishing and boating • Environmental flows released assist to maintain water quality and water levels within the weirs and promote a healthy riverine environment	• Water for the environment provides river flow and improves water quality for canoeing, which is a popular recreational activity along the river

Waterway	Beneficiary	Connection to the river	Values/uses/objectives/ opportunities
Campaspe reach 2	• Unpowered boating	• Canoers and kayakers have a close connection to the river and an interest in maintaining its health and the provision of water for recreation	• Canoeing and kayaking are popular recreational activities along the river, in particular at Rocky Crossing (reach 2) • Local kayakers are notified of high river flows and schedule kayaking trips on the high flows
Campaspe reaches 2-4	• Campers	• Campers have a close connection to the river, and an interest in maintaining its health and aesthetic values	• There are many places along the Campaspe where visitors can camp • Aysons's Reserve is a very popular camping site near Elmore and draws hundreds of campers during the Christmas school holiday period • Other sites include Doaks Reserve, Runnymede Nature Reserve, Bryant's Lane and Spencer Road Reserve for recreational activities • Campers are drawn to healthy, flowing waterways with good water quality from environmental water
Campaspe reaches 2-4	• Passive recreation	• Bushwalkers and cyclists have a close connection to the river and an interest in maintaining its health and aesthetic values	• Many local councils provide picnic facilities and walking and cycling tracks that provide opportunities for passive recreation • The river is a key feature of these opportunities and contributes to the wellbeing of the community, visitors and the local economy

Scope of environmental watering

The term 'environmental watering' refers to the active delivery of held environmental water to support particular environmental objectives by altering the flow in a river or the water level in a wetland. While other terms are sometimes used to describe the delivery of environmental water, 'environmental watering' is deliberately used here and in seasonal watering statements to ensure consistency in the legal instruments that authorise the use of water for the environment in Victoria.

Table 5.6.3 describes the potential environmental watering actions in 2026-27, their expected watering effect (that is, the intended physical or biological effects of the watering action) and the longer-term environmental objectives they support. Each environmental objective relies on one or more potential environmental watering actions and their associated physical or biological effects.

Table 5.6.3 Campaspe River potential environmental watering actions, expected watering effects and environmental objectives

Potential environmental watering action	Expected watering effects	Environmental objectives
Campaspe River (targeting reach 4)		
Winter/spring low flow (50-200 ML/ day during June to November)	• Maintain longitudinal connectivity to allow native fish to disperse within reaches • Provide foraging opportunities across a wide range of habitats for female platypus to develop fat reserves before breeding • Maintain water quality by preventing pools from stratifying • Discourage terrestrial plants from colonising the lower sections of the riverbank and low benches in the channel • Maintain in-stream aquatic vegetation • Maintain soil moisture in the riverbank to water established river red gums and woody shrubs • Provide a variety and large abundance of habitats for high waterbug productivity, supporting food webs A greater-volume flow will: • help establish littoral vegetation • facilitate long-distance movement by male platypus, especially in the August to October breeding season • facilitate greater movement of large-bodied native fish	F1, MI1, PR1, V1, V2, WQ1
Winter/spring fresh(es) (one to two freshes of 1,000-1,600 ML/day for two to seven days during July to November)	• Enable plants growing on the water's edge to become established low on the bank and limit colonisation by terrestrial plant species • Provide sufficient velocity to scour accumulated sediment from pools and scour biofilms • Promote the local movement of adult fish to access alternative habitats and trigger migration from the Murray River • Flush accumulated leaf litter from the banks and low benches to reduce the risk of blackwater events during high river flow in summer • Maintain soil moisture for established river red gum and woody shrubs (such as bottlebrush and tea tree) • Maintain connectivity to allow native fish to move and access new habitat • Encourage female platypus to select nesting burrows higher up the bank to reduce the risk of a high flow later in the year flooding burrows when juveniles are present • Redistribute fine sand on benches and bars in the river channel • Scoured aged biofilms from hard surfaces, including submerged wood	F1, F2, G1, MI1, PR1, V1, V2, WQ2

Potential environmental watering action	Expected watering effects	Environmental objectives
Summer/autumn low flow (50-60 ML/day[1] at the Campaspe Siphon during December to May) 	• Maintain slackwater habitats for zooplankton and nursery habitats for native fish • Maintain the water depth and prevent stratification in deep pools in summer to maintain habitat for native fish and platypus • Help establish in-stream and littoral vegetation • Inundate a variety of habitats to facilitate the growth of biofilms and support waterbug productivity • Allow platypus to move between pools safely while foraging, and ensure there is adequate food for lactating females Reducing the flow to 20 ML/day in reaches 2 and 3 in autumn will expose mudflats and encourage the recruitment of some fringing vegetation	
Summer/autumn freshes (three freshes of 100-200 ML/day for two to five days during December to May) 	• Promote the germination, growth and survival of fringing emergent aquatic plants, including phragmites, reeds and sedges, by inundating the lower banks and low benches to wet the soil • Promote the local movement of adult fish to access alternative habitats and trigger migration from the Murray River • Increase longitudinal connectivity to allow native fish to access new habitats • Wet submerged wood and flush fine silt and old biofilms to promote new biofilm growth and increase waterbug productivity for native fish and platypus • Facilitate the downstream dispersal of juvenile platypus in April/May to colonise other habitat areas	
Year-round fresh (trigger-based, 50-300 ML/day as required) *Triggers:* • *dissolved-oxygen level below 5 mg/L* • *low or cease-to-flow river conditions* • *high water temperatures* 	• Destratify pools and improve water quality (increase dissolved-oxygen levels) along the river in reach 4, ensuring there is adequate dissolved oxygen to support aquatic animals (such as native fish and platypus)	

1 The reach 4 flow will target 50-60 ML per day. However, reducing the flow to 20-30 ML per day at reaches 2 and 3 may be considered in autumn to expose the river's mudflats and promote native vegetation recruitment. To achieve these two flow rate targets, water for the environment from the Goulburn River would be delivered to reach 4 at the Campaspe Siphon via the Waranga Western Channel.

Scenario planning

Table 5.6.4 outlines potential environmental watering and expected water use in a range of planning scenarios.

Flood events in 2022 and 2024, which caused frequent and prolonged inundation of the Campaspe River and its surrounding floodplain, reduced the diversity and abundance of many streamside and littoral vegetation species on the lower section of the bank and reduced in-stream vegetation biomass. Positive outcomes from these flood events were also observed. The upper banks and tops of banks benefitted from the higher flows by removing terrestrial and agricultural vegetation. Although the floods were a natural disturbance event for the river, the benefits of previous years of environmental watering built system resilience, helping the river rebound quickly. Dry conditions and low inflows to Lake Eppalock occurred throughout 2025-26; however, the availability of water for the environment was high. This meant all priority watering actions could be delivered, which helped improve the condition of the Campaspe River and build resilience ahead of drier climatic conditions.

The environmental water supply outlook for 2026-27 is expected to be low in the drier planning scenarios, so planned environmental watering actions are likely to be delivered at magnitudes relative to observed conditions. In the drought and dry planning scenarios, delivering a critical low flow is the highest-priority action to maintain water quality and prevent catastrophic conditions for aquatic plants and animals. Low water availability in a drought scenario means the timing of a winter/spring low flow needs to be prioritised. It would therefore be delivered only during late spring, as temperatures begin to increase. Delivering a winter/spring fresh is a high priority in the dry planning scenario, but it will not be possible in a drought scenario due to low water availability. All other watering actions in the drier planning scenarios are proposed as tier 2, due to low water availability.

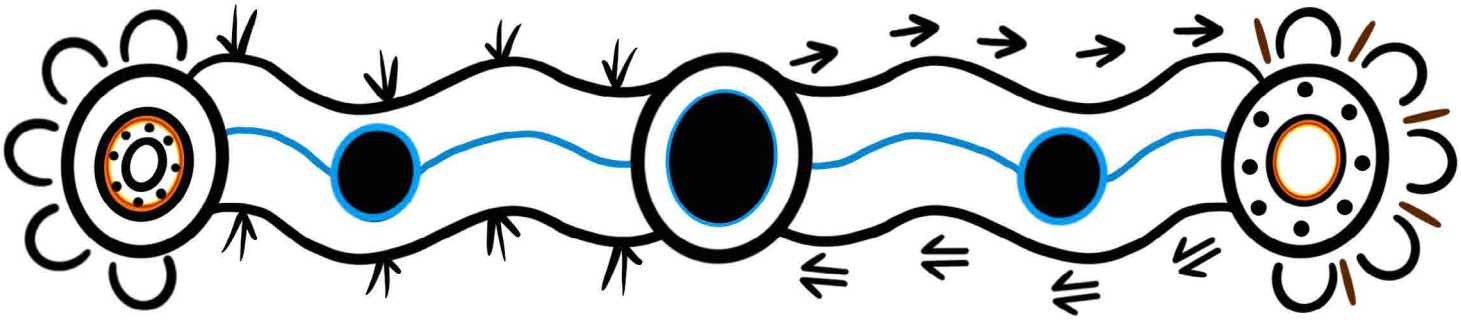
In the average-wet scenario, delivery of water for the environment aims to improve the composition and condition of native plants growing along the water's edge and to support the continued recovery from the 2022 and 2024 flood damage. Some watering actions will likely be achieved naturally in the average-wet planning scenario. This means that water for the environment can be used to deliver freshes and a winter/spring low flow at the higher end of their recommended magnitudes to help increase populations and improve the condition of platypus, native fish and native vegetation.

North Central CMA will monitor water levels and quality throughout the year and deliver trigger-based freshes in any planning scenario if needed to improve poor water quality, providing enough water for the environment is available. Delivering this action is typically required on short notice in response to water-quality triggers in reach 4. Delivering this action at short notice relies on the availability of water for the environment from the Goulburn River to be delivered to reach 4 at the Campaspe Siphon via the Waranga Western Channel.

The carryover target of 9,500 ML in the drought and dry planning scenarios is based on the volume required to deliver a priority summer/autumn low flow during 2027-28 if dry or drought conditions continue. This carryover volume is likely to be achieved through environmental water from the Goulburn system delivered via the Waranga Western Channel, or through trade into the Campaspe system. No carryover targets are set for the average-wet planning scenario, as early-season allocations in 2027-28 will likely be sufficient to meet summer/autumn low-flow environmental flow demands.

Table 5.6.4 Campaspe River environmental watering planning scenarios

Planning scenario	Drought	Dry	Average-wet
Expected conditions	• Little to no natural flow from tributaries and local run-off • Low passing flow • Operational water deliveries	• Some natural flow from tributaries and local run-off • Increased passing flow • Operational water deliveries	• Moderate-to-high natural flow from tributaries and local run-off • Increased passing flow • Operational water deliveries • An expected spill of Eppalock Reservoir
Expected availability of water for the environment	• 14,000 ML	• 20,000 ML	• 39,000 ML
Campaspe River (targeting reach 4)			
Potential environmental watering – tier 1 (high priorities)	• Winter/spring low flow (lower magnitude, October to November) • Summer/autumn low flow	• Winter/spring low flow (lower magnitude) • Summer/autumn low flow • Winter/spring fresh (one fresh of lower magnitude for two to four days)	• Winter/spring low flow (up to full magnitude) • Winter/spring fresh(es) (one to two freshes of upper magnitude for two to five days) • Summer/autumn low flow • Summer/autumn freshes (three freshes up to full magnitude)
Potential environmental watering – tier 2 (additional priorities)	• Winter/spring low flow (lower magnitude June to September) • Winter/spring fresh (one fresh of lower magnitude and lower duration) • Summer/autumn freshes (three freshes of lower magnitude and lower duration) • Year-round fresh (if required)	• Winter/spring low flow (middle magnitude) • Summer/autumn freshes (three freshes of upper magnitude and lower duration) • Year-round fresh (if required)	• Winter/spring fresh(es) (two freshes of upper magnitude for seven days) • Year-round fresh (if required)
Possible volume of water for the environment required to achieve objectives	• 14,000 ML (tier 1) • 16,000 ML (tier 2)	• 20,000 ML (tier 1) • 12,000 ML (tier 2)	• 32,500 ML (tier 1) • 10,000 ML (tier 2)
Priority carryover requirements for 2027-28	• 9,500 ML		• N/A



> **"Along the waterways, women and men gather to share knowledge, culture and connection to Country, keeping tradition strong for future generations."**
>
> *– Image above by Andrew Saunders*

5.6.2 Dindilong Yaluk (Coliban River)

Djaara (Dja Dja Wurrung People) are the Traditional Custodians of Djandak (Dja Dja Wurrung Country).

The proposal on which this section of this year's seasonal watering plan is based was developed in partnership between Dja Dja Wurrung Clans Aboriginal Corporation (DJAARA) and North Central CMA as part of a Joint Management of Environmental Water trial. As this approach to management of flows in Dindilong Yaluk develops, DJAARA and the CMA aspire to develop a shared vision which aims to unite Djaara's cultural values and knowledge, community perspectives, and the CMA's contemporary ecological knowledge.

This joint management partnership brings together Djaara's deep knowledge from caring for Djandak for thousands of years and the North Central CMA's contemporary expertise in managing environmental water in the Dindilong Yaluk system. Together, this approach strengthens how Djandak is cared for, integrating cultural knowledge and modern water science for the benefit of all.

It is envisaged Djaara's knowledge, language and ecological understanding and the CMA's technical, scientific, policy and regulatory expertise will be shared to enable:

- development of a joint vision for Dindilong Yaluk and developing cultural objectives alongside ecological objectives
- shared decision-making through shared governance
- co-design and co-delivery of a community engagement program
- co-design and co-delivery of a cultural and ecological monitoring program.

For DJAARA and the North Central CMA, the vision for Dindilong Yaluk is of a living waterway aligned with the DJAARA seasonal calendar, whose flow rhythms reflect the patterns that sustained the river for millennia.

One of DJAARA's cultural objectives is the reinstatement of cultural place names and Djali (language) when referring to Dindilong Yaluk. Where possible, this plan does so; however, as a legislated planning document, it is also necessary to maintain consistent and clear references to the language used in the establishing documentation. For that reason, the name Coliban River is used in the system overview and scenario planning sections below.

System overview

Dindilong Yaluk (Coliban River) is rich in cultural significance, and the catchment is a living, cultural landscape pulsating with the presence of Ngurar Balak (Ancestors). To Djaara, the river system is an intricate web of Dreaming stories, Lore and ceremonies that breathe life into the land. This deep connection is rooted in the knowledge that all things possess a murrup (spirit), from the gatjin (water) that flows through the veins of the earth to the birds, plants and ancient stones.

The Coliban River is the major tributary of the Campaspe River and flows into Lake Eppalock. It is highly regulated, with three storages (Upper Coliban, Lauriston and Malmsbury reservoirs) that primarily harvest water for urban use (**Figure 5.6.1**).

Since these reservoirs were built, the lower Coliban River no longer receives the flows it requires to be a healthy and flowing waterway. The Coliban River is recognised as being flow-stressed, with current flows estimated at around half those of pre-regulation. The small amount of environmental water provided by the passing flows specified in the Campaspe River bulk entitlement holds the waterway in poor health and is insufficient to maintain and improve the ecological and cultural values.

An important distinction between the Coliban River and other regulated Victorian systems is the lack of irrigation demand. It is acknowledged that water released from storages for the purpose of irrigation is extracted downstream, however, irrigation water provides some ecological benefit to the length of the river that it travels before extraction. In the absence of any irrigation demand below Malmsbury Reservoir, the river relies on passing flows to maintain connectivity and achieve ecological, cultural and recreational benefits.

The VEWH does not hold any environmental entitlements in the Coliban system, but the passing flow can be managed—for example, it can be accumulated and released when most needed—to help reduce some risks associated with a critically low summer/autumn flow, including low dissolved-oxygen levels in the river between Malmsbury Reservoir and Lake Eppalock. The CEWH hold an additional 30 ML entitlement in the Coliban system, which has never been delivered. The North Central CMA, DJAARA, DEECA and the CEWH are having ongoing conversations about the use of the entitlement, with the CEWH expressing that they may seek to use the entitlement in the future to contribute to the watering actions outlined in the seasonal watering plan.

Image below by Andrew Saunders

Environmental values

Dindilong Yaluk provides habitat for Watjarang (platypus), rakali (water rats), Dum (frogs) and small-bodied native fish (such as flat-headed gudgeon, Australian smelt and mountain, common, and obscure galaxias). It also contains a diverse range of waterbugs supported by stands of emergent and submergent aquatic vegetation. It is bordered by remnant patches of streambank shrubland vegetation and woodland containing Biyal (river red gum), callistemon, woolly tea tree and inland wirilda, which provide habitat for terrestrial animals.

Environmental objectives in Dindilong Yaluk/Coliban River

	F1 – Maintain the abundance and diversity of small-bodied native fish
	**MI1** – Maintain an adequate diversity and biomass of waterbugs to break down dead organic matter and supply the river's food chain
	**PR1** – Maintain the Watjarang (platypus) population
	**V1** – Maintain the cover and diversity of gatjin malak (aquatic plants) **V2** – Maintain the cover and diversity of fringing vegetation while limiting encroachment into the middle of the channel **V3** – Maintain streamside woody vegetation and facilitate recruitment
	WQ1 – Maintain gatjin (water) quality to support aquatic life and ecological processes

DJAARA cultural values and uses

Cultural values form a lens through which all other values can be understood and achieved. Strengthening cultural values and uses supports the continuation of culture in Dindilong Yaluk, simultaneously supporting environmental and social outcomes. The joint management approach considers cultural values as an integral thread that connects and enhances environmental and social values.

DJAARA have conducted Aboriginal Waterways Assessments (AWAs) on Dindilong Yaluk since 2017. AWAs are an opportunity for Djaara water knowledge holders to be out on Country, discuss the current condition of Djandak from a Djaara lens and share the cultural values and uses of the location. Djaara provide recommendations from these AWAs on how to heal Djandak and people.

Table 5.6.5 describes DJAARA cultural objectives. DJAARA will continue to refine this list based on changes in Djandak and work conducted by DJAARA in the region to identify and understand values. **Table 5.6.6** provides a snapshot of some cultural values as stated in Aboriginal Water Assessments of Dindilong Yaluk and associated workshops conducted by DJAARA. It is anticipated that the delivery of environmental water will help to support these cultural objectives and values.

"It's a story of my life, growing up around the river. The background colours are the sky, river and earth. The footsteps represent the path of my life, the water holes the meeting spots, and the outside of the path representing the ancestors and their cemeteries. I love fishing, so the Murray cod is on it too, a big part of our culture."

– Image by Alex Cooper

Table 5.6.5 Dindilong Yaluk cultural objectives

• Support the maintenance of cultural values in **Table 5.6.6** by meeting the water requirements of those values
• Weaving grasses, food and fibre plants, and medicine plants harvested by Djaara
• The management of invasive plants and animals
• Conducting of Djandak Wi (cultural burns) along the riverbank, where appropriate, in collaboration with the Djandak Wi team
• Support abundance of large-bodied native fish, including Wulk (blackfish), Giranal (perch) and Bandjal (Murray cod)
• Native trees being harvested for artefact-making including boomerangs, woomeras, shields, clapsticks and coolamons by Djaara
• Scars being placed on trees as signage to mark elements in the landscape and being visited by local community, schools, for tours
• The river being accessible for culture and ceremony, and accessed by the local community
• Strengthen cultural knowledge transfer on Country by bringing elders, knowledge holders and young people together on the river to share stories and knowledge
• Reinstatement of cultural place names and Djali (language) when referring to Dindilong Yaluk
• DJAARA leadership and cultural governance

Environmental watering will also support the ancestral spiritual connection of Djaara by supporting hunting, fishing and gathering in accordance with the terms and conditions specified in the Natural Resource Agreement and Traditional Owner Land and Natural Resource Agreement.

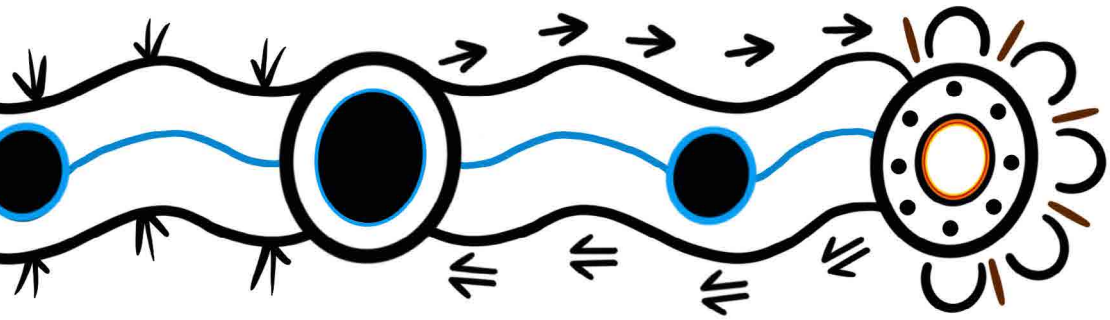


Table 5.6.6 Cultural values of Dindilong Yaluk from Aboriginal Water Assessments completed in the area

Theme/ category	Quotes/data	Cultural value
Murrun Djaa (animals)	• "Evidence of kangaroos, birds, water insects" • "Non-native fish driving out natives. Mosquito fish nip at natives until they get infections and die" • "Water flow is regulated, therefore, fish are minimal" • "No fish, barely any macroinvertebrates; seems isolated from the rest of the Coliban; no habitats for fish in water (water too low); no deep pools or pockets"	• Balam Balam (common brown butterfly) • Bees • Birds: black cockatoo, gang gang cockatoo, Wiran (red tail black cockatoo), kookaburra, Bundjil, magpies, Waa (crow), willie wagtail, mopoke (tawny frogmouth), galah, dusky woodswallow • Djalup (mussels) • Dusky woodswallow • Duwan (brush-tailed phascogale) • Gurri (kangaroos) • Native fish • Possums • Rakali (water rats) • Waterbirds • Waterbugs • Watjarang (platypus) • Wulk (river blackfish) • Wurkuk murmura (blue ringtail damselfly)
Malak (plants)	• "Some native trees (redgum, blackwood, yellow box) and abundance of kangaroo grass nearby indicates good Country" • "Revegetation: more native trees, food and fibre, cool burn. Take care of blackberries and willows. Cater for fish and native fauna." • "Very big old, spaced gum trees. Some shrubs: not sure what they are. Kangaroo apple shrub." • "Weeds destroying natives" • "Some native plants, more weeds" • "This section of the river seems to be polluted by rubbish/overgrown foliage"	• A diversity of animals • Biyal (river red gum) • Buwatj (kangaroo grass) • Cherry ballart • Darrk (Manna gum) • Dhurunguk Gurrka (kangaroo apple) • Malaki Gatjin (water plants) • Mutjang (blackwood) • Ngamakiyi galk (candlebark) • Various other medicinal, food and fibre plants • Wayi Galk (golden wattle) • Yellow box • Yulawil bunu (prickly teatree)
Gatjin	• "...but water needs to be cleaned, and the falls need to be maintained" • "With the right water flows, aquatic life could be abundant" • "The water is important to community as it is on Djaara Country, and we need to make sure our water is cleaned so we are not sending dirty water downstream"	• Deep pools • In-stream features (riffles, snags) • Pass on clean water • Water flow • Water quality

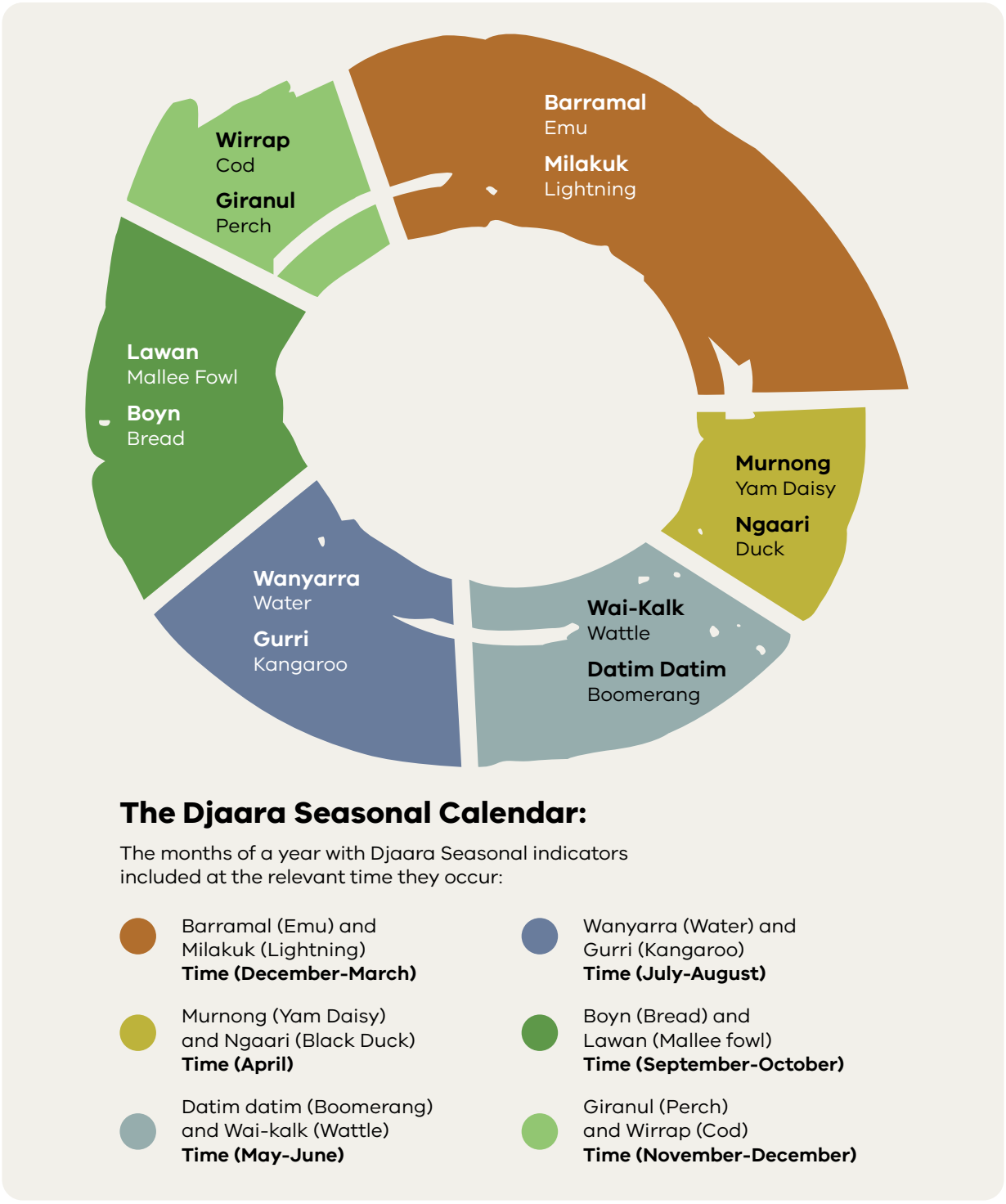
Theme/ category	Quotes/data	Cultural value
Continuing Culture	• "Cool burns" • "Waterways are significant places as we spent the majority of our time along them fishing, hunting and gathering" • "Sites need to be burnt for cleansing purposes" • "We managed and conserved the landscape and waterways for thousands of generations. We built fish traps and animal habitats for breeding" • "We need to manage the waterways as our old people did. Caring for Country brings health and spirited benefits. Also benefits for the wider community to understand cultural values." • Consider farmers as custodians and build a culture of stewardship	• Djandak Wi (cultural burns) • Fishing and hunting • Manage Country appropriately • Relationships with all stakeholders
Cultural heritage	• "Waterways are significant places for Aboriginal people. Water is the resource of life. We swim in it, drink it, bathe in it, cook in it and are created in it!" • "Water is sensitive as it holds emotion and reacts. It is sad to see the waterway so overgrown with introduced plants and fish." • "Spirit place, you could feel the presence of the ancestors" • "The water spirit is trapped because of blockages that are preventing river flow."	• Cultural landscape • Gatjin murrup (water spirit) • Murrup (spirit) • Tangible cultural heritage

DJAARA Seasonal Calendar

DJAARA's seasonal calendar (**Figure 5.6.2**) is a cultural and ecological guide that reflects how Djandak changes across the six Djaara seasons. For Djaara, seasons are not fixed dates on a calendar but a fluid knowledge system guided by the behaviour and signals of the land itself. By being in sync with DJAARA's seasonal calendar and reading cues (such as flowering cycles, animal movements and rainfall patterns), we can work towards delivering environmental water at the right time, in the right way and at the right place.

The Scope of environmental watering section below incorporates both the western and Djaara seasons.

Figure 5.6.2 Djaara seasonal calendar with six seasons



Where Traditional Owners are more deeply involved in the planning and/or delivery of environmental water for a particular site, their contribution is acknowledged in **Table 5.6.7** with an icon, as pictured below and also explained in **Figure 1.2.3**. The use of this icon is not intended to indicate that these activities are meeting all the needs of Traditional Owners, but it is used in the spirit of valuing that contribution.

	Watering planned and/or delivered in partnership with Traditional Owners to support cultural values and uses

Social, recreational and economic values and uses

In planning the potential environmental watering actions, North Central CMA and DJAARA considered how environmental flows could support values and uses, including:

- water-based recreation (such as swimming, canoeing and fishing)
- riverside recreation and amenity (such as socialising, relaxing, birdwatching, bushwalking, camping and cycling)
- socio-economic benefits, including tourism to Malmsbury, diversions for domestic and stock uses, benefits to the local and regional economies from recreational activities, ecosystem services (such as carbon storage, groundwater recharge and water-quality regulation), lower salinity costs and blackwater and blue-green algae risks for landholders, and contributions to community enjoyment and health.

	Environmental watering will also support water sports and activities by providing adequate water levels at local swimming holes, with provision of the summer/autumn low flows and elevated water levels and freshening of water quality with summer/autumn freshes
	Environmental watering will also support bird-related recreational activities by providing a water source that supports waterbird and bush bird breeding and feeding along streamside areas
	Environmental watering may also support angling activities by encouraging dispersal through the system, promoting healthy fish populations and providing recreational fishing opportunities
	Environmental watering will also support peaks in visitation by maintaining the health and aesthetic value of the river, thus creating a desire for locals and tourists to spend time on it

Scope of environmental watering

The term 'environmental watering' refers to the active delivery of held environmental water to support particular environmental objectives by altering the flow in a river or the water level in a wetland. While other terms are sometimes used to describe the delivery of environmental water, 'environmental watering' is deliberately used here and in seasonal watering statements to ensure consistency in the legal instruments that authorise the use of water for the environment in Victoria.

Table 5.6.7 describes the potential environmental watering actions in 2026-27, their expected watering effect (that is, the intended physical or biological effects of the watering action) and the longer-term environmental objectives they support. Each environmental objective relies on one or more potential environmental watering actions and their associated physical or biological effects.

Table 5.6.7 Dindilong Yaluk (Coliban River) potential environmental watering actions, expected watering effects and environmental objectives

Potential environmental watering action	Expected watering effects	Environmental objectives
Dindilong Yaluk (Coliban River) targeting reach 1		
Winter/spring low flow (2-15 ML/day during June to November) **This is in Wanyarra (water), Gurri (kangaroo), Boyn (bread), Lawan (Mallee fowl), Giranul (perch) and Wirrap (cod) time**	• Increase wet areas for native aquatic and streamside plants while limiting terrestrial species encroaching on the river channel • Increase the flow to mix water in pools to prevent stagnation and a decline in water quality • Increase the channel area for habitat for waterbugs • At 7-10 ML/day, the effects above plus: – maintain a connected river that allows small-bodied native fish and platypus to disperse throughout the reach	F1, MI1, PR1, V1, V2, WQ1
Winter/spring fresh (one fresh up to 160 ML/day for three to five days during July to September) **This is in Wanyarra (water), Gurri (kangaroo), Boyn (bread) and Lawan (Mallee fowl) time**	• Encourage platypus and rakali (water rats) to place breeding burrow entrances at a higher elevation on the riverbank to prevent inundation • Wet lower banks and benches to support fringing and emergent vegetation • Clear sediment and biofilms from hard substrates at the bottom of the channel to increase productivity • Increase productivity to promote macroinvertebrate populations • Increase the water depth to facilitate the movement of fish	F1, MI1, PR1, V1, V2
Summer/autumn low flow (2-10 ML/day during December to May) **This is in Giranul (perch), Wirrap (cod), Barramul (emu), Milakuk (lightning), Murnong and Ngaari (duck) time**	• Wet the channel to maintain in-stream aquatic and fringing vegetation • Maintain aquatic habitat that supports waterbugs, native fish and platypus • Maintain the water quality, including dissolved-oxygen levels • At 7-10 ML/day, the effects above plus: – maintain up to 6 cm of water depth between pools for native fish movement and to maintain pool depths	F1, MI1, PR1, V1, V2, WQ1

Potential environmental watering action	Expected watering effects	Environmental objectives
Pulsed summer/ autumn low flow (5-15 ML/day for up to 14 days during December to May, trigger-based) *Triggers may include:* • *dissolved-oxygen level below 3 mg/L* • *cease-to-flow river conditions (at gauge 406215 – Coliban River @ Lyal)* • *high water temperatures (above 25°C)* **This is in Giranul (perch), Wirrap (cod), Barramul (emu), Milakuk (lightning), Murnong and Ngaari (duck) time**	• Improve water quality, including dissolved-oxygen levels • Maintain refuge habitat for aquatic animals, including fish and platypus	F1, PR1, WQ1
Small summer/ autumn fresh(es) (one to two freshes of 25-50 ML/day for three to five days during December to May) **This is in Giranul (perch), Wirrap (cod), Barramul (emu), Milakuk (lightning), Murnong and Ngaari (duck) time**	For a 25-50 ML/day event: • Maintain the water depth through riffle-run habitats of 8-20cm to maintain water quality and habitat for waterbugs	F1, MI1, PR1, V1, V2, V3, WQ1

Potential environmental watering action	Expected watering effects	Environmental objectives
Large summer/ autumn fresh (one fresh of 160 ML/day for three to five days during December to May) **This is in Giranul (perch), Wirrap (cod), Barramul (emu), Milakuk (lightning), Murnong and Ngaari (duck) time**	For a 160 ML/day event, the effects above plus: • Maintain the water depth through riffle-run habitats of 45-60cm to: – increase the water depth to facilitate the movement of fish and platypus – clean sediment and biofilms from the river substrates – wet the benches and low banks to promote the growth and recruitment of fringing vegetation	F1, MI1, PR1, V1, V2, V3, WQ1

Scenario planning

Table 5.6.8 outlines potential environmental watering and expected water use in a range of planning scenarios.

The potential environmental flows required for the Coliban River include a low flow and freshes in all planning scenarios, but the magnitude of particular flows and the number and duration of freshes that can be delivered vary across planning scenarios, due to the available supply and the expected contribution of the natural flow in the system. If supply is limited, a low flow will be delivered at the lower end of the recommended magnitude to maintain some connecting flow for a more extended period. Freshes will be delivered where possible to facilitate the dispersal of platypus and fish and clean biofilms from in-stream surfaces.

In all planning scenarios, the highest-priority potential watering action in the Coliban River is the summer/autumn low flow to maintain sufficient habitat for native fish, platypus and waterbugs. Natural baseflow and tributary inputs help maintain some flow in the Coliban River during winter and spring each year, but long sections of the river contract to a series of pools or completely dry during late summer and autumn, especially in drought and dry years. Deliveries of water for the environment in summer and autumn help to maintain water quality, especially when dissolved-oxygen levels are low. They also maintain the depth of pools in the upper reaches to help sustain populations of native fish and platypus.

In the drought scenario, environmental water management focuses on avoiding catastrophic events and maintaining the platypus population. Experience during the Millennium Drought indicates that due to the system's relatively high position in the landscape, small storage inflows may continue until early January each year, albeit at very low rates. This will provide an opportunity during the spring/early summer period to reduce the passing flow below Malmsbury Reservoir and bank the withheld flows for use later in the summer to continue the low flow and increase the duration of low flows during 2026-27.

In 2025-26, the passing flow released from Malmsbury Reservoir was managed at a flow rate close to 4 ML per day, allowing any additional water to accrue in the account. Some of the 835 ML of accrued water was then used to deliver an autumn fresh.

Any remaining water carried over from 2025-26 will be used to help maintain a continuous low flow in all planning scenarios in 2026-27. If a continuous flow cannot be maintained, shorter, pulsed flows may be delivered to maintain pool habitats for native fish and platypus. These trigger-based pulses will most likely be needed in the drought and dry planning scenarios. Where possible, summer and autumn freshes will be delivered to facilitate the movement of fish and platypus and support fringing vegetation. We plan to deliver freshes in March or April to support the dispersal of juvenile platypus. In average-wet conditions, a winter fresh will be delivered in August to September if supply allows.

The fresh aims to encourage platypus to select burrow entrances at higher riverbank elevations, minimising the risk of burrow inundation and drowning of young during September to November from any unregulated storage spill.

An aspirational carryover target of 720 ML has been set for all planning scenarios to supply a high-potential summer and autumn low flow in 2027-28. This target is unlikely to be achieved in most years due to the limited availability of water for the environment in the Coliban system and annual variations in climatic conditions. The carryover target will be revised throughout the year based on climatic forecasts, the risk of spills and the extent to which priority actions for 2026-27 have been met. For example, if forecasts indicate a high likelihood of dry conditions in 2027-28, setting aside supply for carryover might become a higher priority than delivering a second summer/autumn fresh in 2026-27. Alternatively, if Malmsbury Reservoir is predicted to spill, delivering at least one summer/autumn fresh in 2026-27 will be a higher priority than achieving the full 720 ML carryover target.

Table 5.6.8 Dindilong Yaluk (Coliban River) environmental watering planning scenarios

Planning scenario	Drought	Dry	Average–wet
Expected conditions	• Little to no natural flow	• Some natural inflows	• Extended periods of natural flow, including some high-flow events and potential reservoir spills
Expected availability of water for the environment	• 1,715 ML	• 1,837 ML	• 2,892 ML
Coliban River – reach 1 (Malmsbury Reservoir to Lake Eppalock)			
Potential environmental watering – tier 1 (high priorities)	• Winter/spring low flow (2-5 ML/day) • Summer/autumn low flow (1-5 ML/day) • Summer/autumn fresh(es) (up to two freshes, 25 ML/day for three to five days)	• Winter/spring low flow (2-10 ML/day) • Summer/autumn low flow (2-10 ML/day) • Summer/autumn fresh(es) (up to two freshes, 25-50 ML/day for three to five days)	• Winter/spring low flow (2-15 ML/day) • Summer/autumn low flow (2-10 ML/day) • Summer/autumn fresh(es) (up to two freshes, 25-160 ML/day for three to five days)
Potential environmental watering – tier 2 (additional priorities)	• Pulsed summer/ autumn low flow (trigger-based)	• Pulsed summer/ autumn low flow (trigger-based)	• Winter/spring fresh (one fresh, up to 160 ML/day for three days)
Possible volume of water for the environment required to achieve objectives	• 1,660 ML (tier 1) • 210 ML (tier 2)	• 1,795 ML (tier 1) • 210 ML (tier 2)	• 2,665 ML (tier 1) • 782 ML (tier 2)
Priority carryover requirements for 2027-28	• 0-720 ML		

5.7 Loddon system

Waterway manager – North Central Catchment Management Authority

Storage manager – Goulburn-Murray Water

Environmental water holders – Victorian Environmental Water Holder and Commonwealth Environmental Water Holder

The Loddon system includes the Loddon River system (including Serpentine and Pyramid creeks), the Boort wetlands and Birchs Creek subsystems.

5.7.1 Loddon River system (including Serpentine and Pyramid creeks)

System overview

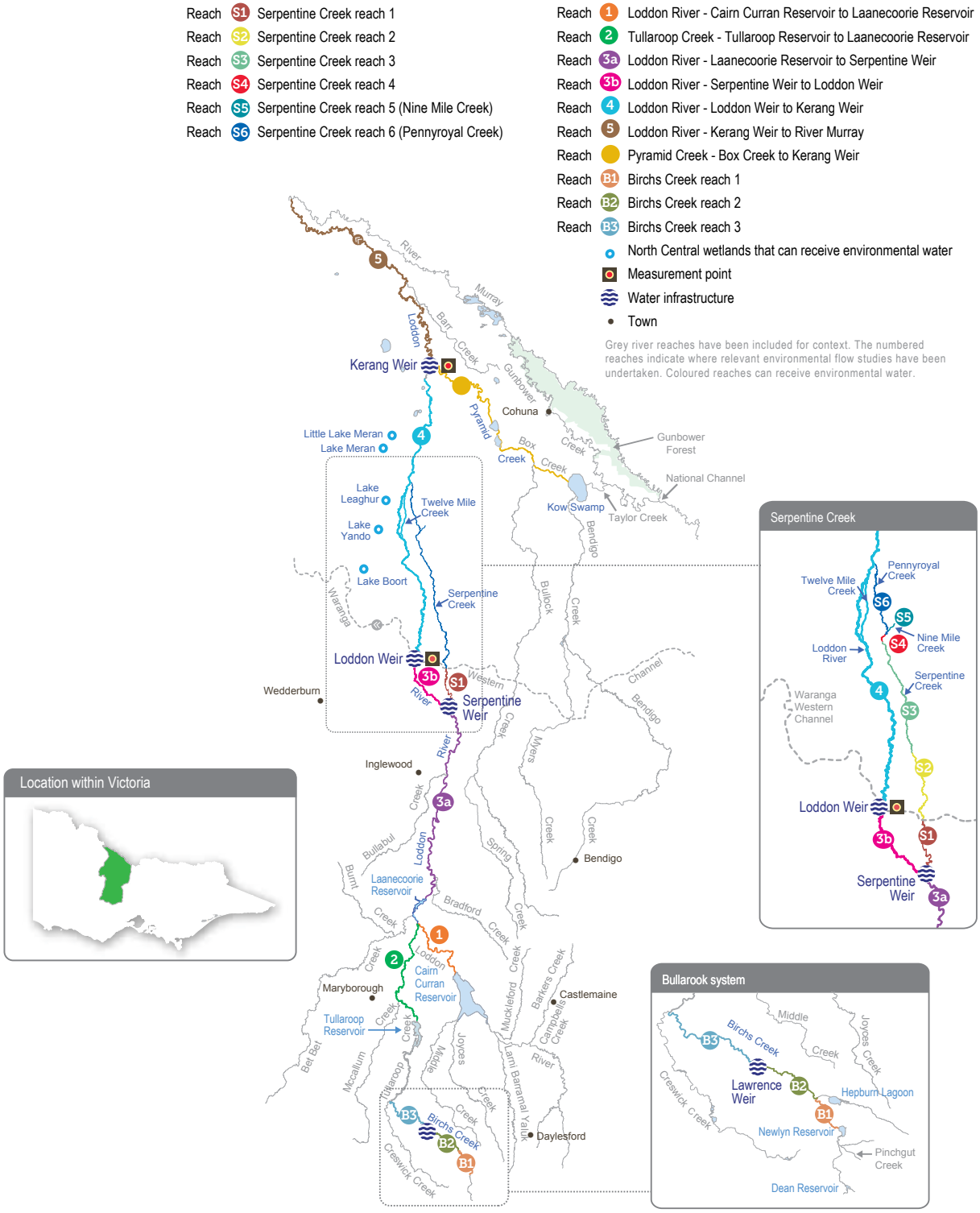
The Loddon River flows from the Great Dividing Range in the south to the Murray River in the north (Figure 5.7.1). The middle section of the Loddon River is characterised by many distributary streams and anabranches that carry water away from the river onto the floodplain. Pyramid Creek joins the lower Loddon River at Kerang, at which point the Loddon becomes part of the Murray River floodplain.

The two main storages on the Loddon River are Cairn Curran Reservoir and Tullaroop Reservoir. Laanecoorie Reservoir is a smaller storage used to regulate water released from the larger upstream storages. The operation of the Bridgewater, Serpentine, Loddon and Kerang weirs regulates the Loddon River's flow downstream of Laanecoorie Reservoir.

Water for the environment can be delivered to the Loddon River from Cairn Curran or Tullaroop reservoirs or from the Goulburn system via the Waranga Western Channel, which intersects with the Loddon River at Loddon Weir. Water is provided to Pyramid Creek through releases from Kow (Ghow) Swamp, which receives water diverted from the Murray River at Torrumbarry Weir. Water is diverted from the Loddon River to the Loddon Valley Irrigation Area to supply agriculture and to Serpentine Creek to support environmental values and supply agriculture.

The highly regulated nature of the Loddon system presents both challenges and opportunities for the effective management of water for the environment. The ability to manipulate the timing of releases at multiple locations can help achieve environmental outcomes at discrete locations. However, coordinating environmental and consumptive flows is difficult through the irrigation season, especially when irrigation demand is high or the flow in the river is highly variable. These issues can constrain the timing and delivery of water for the environment or lead to a flow that exceeds the recommended flow rates above Loddon Weir. The structures for managing irrigation water also form barriers in the waterway that restrict native fish movement throughout the river and make it difficult to meet environmental objectives.

Figure 5.7.1 Loddon system



Environmental values

The Loddon system supports platypus, rakali (water rats) and several native fish species (such as Murray cod, golden perch, silver perch, river blackfish and Murray-Darling rainbowfish). Streamside vegetation varies in condition depending on the recent water regime, the extent of clearing and historic and current land management practices. The remaining relatively intact areas support a variety of woodland birds and other native animals. Important plant species across the system include cane grass, tangled lignum, black box and river red gum.

Although fish populations in the Loddon system are affected by the many barriers caused by weirs and reservoirs, many species are still found throughout the catchment. Native fish are most abundant and diverse in the upper catchment. River blackfish are found in Serpentine Creek, and Murray-Darling rainbowfish are found in the middle and lower sections of the Loddon River.

The highest-priority reach for water for the environment is from Loddon Weir to Kerang Weir. The reach does not carry irrigation water and relies heavily on environmental flows to maintain its environmental condition. Environmental flows to this reach aim to maintain water quality, increase the abundance and diversity of native fish and improve the condition of in-stream and streamside vegetation. Environmental flows are delivered to the upper Loddon River and Serpentine Creek to maintain or increase populations of river blackfish and platypus.

Pyramid Creek and the lower Loddon River support large-bodied fish (such as golden perch, Murray cod and silver perch) and are important corridors for fish migration between the Loddon, Murray and Gunbower Creek systems. Engineering works in recent years to provide fish passage at the Chute and Kerang Weir on the Loddon River, the Box Creek regulator on Pyramid Creek, Taylors Creek Weir on Taylors Creek, Fish Point Weir and Little Murray Weir on the Little Murray River have been important in reopening these migration routes. The Arthur Rylah Institute has monitored fish movement and populations in Pyramid Creek and the lower Loddon River since 2017. The monitoring indicates that the combined flows in the lower Loddon River and Pyramid Creek stimulate native fish movement through the fishways.

Environmental objectives in the Loddon River system

	**CN1** – Maintain productive and dynamic food webs **CN2** – Maintain the diversity and abundance of biofilms
	F1 –Increase the small-bodied and large-bodied native fish populations **F2** – Provide habitat for fish to feed and breed and opportunities for movement between habitats
	**G1** – Improve the channel form and features, including deep pools and benches **G2** – Maintain the condition of suitable substrate to maintain ecosystem processes **G3** – Engage flood runners, distributary channels, anabranches and backwaters
	**MI1** – Maintain the diversity and increase the abundance of waterbugs and waterbug functional feeding groups
	**PR1** – Increase the populations and recruitment of platypus **PR2** – Maintain stable rakali (water rat) populations in the long term
	**V1** – Maintain the condition of streamside and floodplain vegetation **V2** – Maintain and increase the extent of in-stream vegetation
	WQ1 – Maintain water quality to support aquatic animals and minimise the occurrence of blackwater events

Traditional Owner cultural values and uses

Dja Dja Wurrung (Djaara People), Barapa Barapa and Wamba Wemba people are the First Peoples of the Loddon River. North Central CMA acknowledges their rights to practice their culture and identity as Traditional Owners, to maintain their relationship and care for the river and the natural resources on their land, and to protect places and areas of importance to their land.

Djaara, represented by the Dja Dja Wurrung Clans Aboriginal Corporation (trading as DJAARA), are recognised as the Traditional Owners in the upper part of the Loddon catchment. The 2013 Recognition and Settlement Agreement between DJAARA and the State of Victoria provides DJAARA with the right to participation, employment and incorporation of Traditional Ecological Knowledge into natural resource management.

The Barapa Barapa and Wamba Wemba people are recognised as Traditional Owners in the lower part of the catchment.

In the upper part of the catchment, DJAARA's Kapa Gatjin (to know water) Advisory Group and North Central CMA work together to identify opportunities and sites where environmental water can support Djaara objectives for the Loddon River. A key aspiration is for Djaara to be more involved in managing and administering environmental water, with the aim of owning and managing it in future. DJAARA's ***Dhelkunyangu Gatjin (Working together to heal water) Djaara Gatjin Strategy*** sets a baring (pathway) for DJAARA to become the environmental water manager on Djaara Country and a baring for Djaara Lore to inform water management decisions. This transition is being progressed by working in partnership with authorities and the community to manage water for a healthy, sustainable future.

In the lower part of the catchment, the Barapa Barapa and Wamba Wemba Traditional Owners have communicated their cultural objectives for the Loddon River and other waterways in the Barapa Barapa Healthy Country Plan 2018-2021. Objectives that relate to the Loddon River system include:

- all wetlands surrounding the Murray River, Gunbower Forest, Loddon River and associated lakes will have good plant life and healthy native fish (cod and yellow belly), mussels and turtle populations by 2033
- by 2033, the Murray, Gunbower and Loddon rivers and associated lakes will have enough water, their water quality is improving, and the water will be clear for most of the year in good years
- Barapa people are actively involved in water management
- there are fewer fish and plant deaths from toxic blackwater events.

In planning for environmental flows in the Loddon River system, North Central CMA has considered how the Loddon system can be managed to support the cultural values, priorities, and uses of the Djaara, Barapa Barapa, and Wamba Wemba people, as shown in **Table 5.7.1**.

Table 5.7.1 Previously shared Traditional Owner values and uses in the Loddon River system

Waterway and/or reach	Traditional Owner group	Values/uses/objectives/ opportunities	How this opportunity will be considered in 2026-27
Loddon River: Cairn Curran to Durham Ox, Tullaroop Creek and Serpentine Creek reach 1	DJAARA	Objectives • A Djaara-led environmental watering program and management plan that provides guidance for environmental water, among other water entitlements and flows • Overarching holistic monitoring and management of waterways and flows to optimise outcomes for the environment and other values, maximising the value delivered through the environmental watering program	By DJAARA being supported with a greater role to perform monitoring and planning activities, and by activating a DJAARA/North Central CMA joint management approach for environmental water planning and delivery
Loddon River: Durham Ox to the Little Murray River, Serpentine Creek, Pyramid Creek	Barapa Barapa & Wamba Wemba	• Healthy plant and fish life (Murray cod, golden perch) and other aquatic life (turtles, mussels) • Active involvement in water management on Country • The Barapa Barapa and Wamba Wemba are the Traditional Owners in the northern part of the Loddon catchment, and artifacts of cultural practices are present throughout the Loddon and Pyramid systems and their floodplains. The rivers and floodplains are valued as food and fibre sources and sites of cultural significance (such as scar trees, camp sites, meeting places and burial places).	• Flows designed to support food and fibre species of cultural value and facilitate cultural activities • Environmental water management assists with preservation of values held highly by Traditional Owner groups, including native fish, turtles and potentially crayfish (yabbies)

Increasing the involvement of Traditional Owners in managing environmental flows and progressing opportunities towards self-determination in the environmental watering program is a core commitment of the VEWH and its program partners. This is reinforced by legislation and policy commitments, including the *Water Act 1989*, the ***Victorian Aboriginal Affairs Framework***, the 2016 ***Water for Victoria***, the 2022 ***Water is Life: Traditional Owner Access to Water Roadmap***, and, in some cases, agreements under the *Traditional Owner Settlement Act 2010*.

Social, recreational and economic values and uses

The Loddon River system and Boort wetlands provide a diverse range of social, recreational and economic values. Recreation and tourism activities include camping, fishing, powered and non-powered boating, water sports, birdwatching and hunting.

In planning the potential environmental watering actions in **Table 5.7.2**, North Central CMA considered how environmental flows could support values and uses, including:

- water-based recreation (such as fishing, powered and non-powered boating, water skiing and water sports)
- riverside recreation and amenity (such as birdwatching, bushwalking, camping and cycling)
- community events and tourism (such as water skiing competitions at Bridgewater and associated visitation)
- socio-economic benefits (such as diverters for domestic and stock uses, local and regional economic benefits from increased visitation and ecosystem services, including carbon storage, groundwater recharge and nutrient recycling).

Environmental flows may be planned to align with a social or recreational objective so long as environmental objectives are not compromised. This is indicated in **Table 5.7.2** by an icon, as pictured below and also explained in **Figure 1.2.3**. Bridgewater Weir pool is a nationally recognised waterskiing location, with national competitions held annually. North Central CMA will work with Goulburn-Murray Water to manage the delivery of low-flow rates and the timing of freshes over summer/autumn to optimise conditions for the annual water skiing competition at the Bridgewater Weir pool, where possible.

Environmental watering will also support water sports activities (e.g., canoeing, kayaking, rowing, swimming, water skiing) by providing flows that provide suitable conditions for water sports (such as at the Bridgewater Weir Pool)

Scope of environmental watering

The term 'environmental watering' refers to the active delivery of held environmental water to support particular environmental objectives by altering the flow in a river or the water level in a wetland. While other terms are sometimes used to describe the delivery of environmental water, 'environmental watering' is deliberately used here and in seasonal watering statements to ensure consistency in the legal instruments that authorise the use of water for the environment in Victoria.

Table 5.7.2 describes the potential environmental watering actions in 2026-27, their expected watering effect (that is, the intended physical or biological effects of the watering action) and the longer-term environmental objectives they support. Each environmental objective relies on one or more potential environmental watering actions and their associated physical or biological effects.

Table 5.7.2 Loddon River system potential environmental watering actions, expected watering effects and environmental objectives

Potential environmental watering action	Expected watering effects	Environmental objectives
Loddon River (targeting reach 4)		
Winter/spring low flow (25-100 ML/day during June to November)[1]	At 25 ML/day in drought and when storages are below 60 GL: • a low flow will provide a depth of at least 7 cm in the channel in riffle and run habitats, maintaining connectivity between pools At 50 ML/day: • a low flow will provide a minimum level of continuous flow through the reach and maintain water quality and adequate depth in pools to provide habitat for aquatic plants, waterbugs, fish and rakali (water rats) At 100 ML/day: • increase the water depth for fish, platypus and rakali (water rat) dispersal (especially for male juvenile platypus) to colonise new breeding territory in winter and provide foraging habitat • prevent silt and fine sediment from settling on submerged wood and other hard surfaces • inundate a variety of habitats to increase the growth of biofilms and support waterbug productivity • inundate native fringing bank vegetation to support seed germination and growth, and prevent the encroachment of exotic terrestrial plants in the river channel	CN2, F1, G2, MI1, PR1, V1, V2, WQ1
Winter/spring low-flow trial(s) (one to three trials of 100-200 ML/day for 10-30 days during June to November if triggered by an unregulated flow event)	• Increase the water depth to support the movement of platypus and native fish between reaches to access new habitat	F2, PR1
Winter/spring high flow (one high flow of 400-450 ML/day for six to ten days during August to November)[2]	• Provide sufficient velocity to scour accumulated sediment from pools and scour biofilms, promoting the growth of new biofilms and increasing waterbug productivity • Flush accumulated organic matter from the banks, benches, flood runners and anabranches to increase productivity and reduce the risk of a blackwater event in summer • Wet the banks to promote the recruitment and growth of streamside and emergent vegetation • Stimulate native fish movement and breeding	CN1, F1, F2, G1, G3, MI1, V1, V2, WQ1

Potential environmental watering action	Expected watering effects	Environmental objectives
Summer/autumn low flow (25-50 ML/day during December to May)[3]	At 25 ML/day: • provide a depth of at least 7 cm in the channel in riffle and run habitats to maintain connectivity between pools; this will only wet about 50% of the channel width • maintain aquatic communities through summer and ensure connectivity between habitats; this will not maintain flowing conditions in the Loddon River west branch At 50 ML/day: • maintain an adequate depth in pools for aquatic plants and to provide habitat for waterbugs, fish and rakali (water rats) • provide a continuous flow through all reaches • maintain water quality throughout most of the reach, except the Loddon River west branch during warm weather • wet the banks and shallow riffles to support the growth of in-stream and fringing non-woody vegetation	F1, MI1, PR2, V1, V2, WQ1
Summer/autumn low-flow trial (50-100 ML/day for six weeks during December to May)	• Maintain water quality and help prevent low-oxygen blackwater events • Prevent the emigration of native fish species due to poor water quality	F1, F2, WQ1
Summer/autumn freshes (three freshes of 100 ML/day for three days during December to May)	• Increase the water level to promote seed germination and the growth of fringing emergent aquatic plants • Increase connectivity between deep pools to promote the local movement of fish and prompt the dispersal of juvenile platypus in autumn • Generate sufficient force to flush fine sediment and old biofilms from submerged wood and other hard surfaces, promoting the growth of new biofilms and increasing waterbug productivity • Freshen water quality and reoxygenate pools	CN1, CN2, F2, MI1, PR1, V1, WQ1
Autumn high flow (one high flow of 400 ML/day for six days[4] **during March to April)**	• Trigger and facilitate the upstream movement of golden perch, silver perch and Murray cod older than one year • Facilitate the dispersal of juvenile platypus • Generate sufficient force to flush fine sediment and old biofilms from submerged wood and other hard surfaces, promoting the growth of new biofilms and increasing waterbug productivity	CN1, CN2, F2, G2, MI1, PR1

Potential environmental watering action	Expected watering effects	Environmental objectives
Year-round fresh (trigger-based, 100-200 ML/day for three to five days as required) *Triggers:* • *dissolved-oxygen level below 5 mg/L* • *low or cease-to-flow river conditions* • *high water temperatures*	• Destratify pools and improve water quality (increase oxygen levels) along the river in reach 4, ensuring there is adequate oxygen to support aquatic animals (such as native fish and platypus)	 WQ1
Pyramid Creek and Loddon River (targeting reach 5)		
Year-round low flow (90-300 ML/day at Box Creek regulator)	At 90 ML/day: • the low flow will maintain connectivity between pools, maintain water quality at a level that can support fish and waterbugs and provide habitat for aquatic animals At 200 ML/day: • increase longitudinal connectivity to allow native fish and platypus to access new habitats • improve water quality by reducing salinity levels • increase the wetted area to maintain and promote the growth of fringing emergent (non-woody) vegetation along the lower banks of the channel At 300 ML/day: • facilitate greater movement for large-bodied native fish • increase hydrodynamic diversity and improve the quality of flowing habitats	 F1, F2  MI1  PR1  V1 WQ1
Winter/spring high flow (one high flow of 650 ML/day at Kerang Weir for six to ten days during August to November)[5]	• Trigger the migration, spawning and recruitment of native fish species, including Murray cod • Maintain connectivity between habitats and improve water quality • Provide sufficient energy to flush accumulated sediment from pools and substrates	 CN1 F1, F2  G1 WQ1
Autumn high flow (one high flow of 650 ML/day at Kerang Weir for six days during March to April)[6]	• Trigger and facilitate the upstream movement of golden perch, silver perch and Murray cod older than one year • Maintain connectivity between habitats and improve water quality • Facilitate platypus dispersal • Provide sufficient energy to flush accumulated sediment from pools and substrates	 CN1 F1, F2  G1  PR1 WQ1

Potential environmental watering action	Expected watering effects	Environmental objectives
Serpentine Creek (targeting reach 1)[7]		
Winter/spring low flow (10-30 ML/ day during June to November)	At 10 ML/day: • maintain connectivity between pools to allow the dispersal of small-bodied and medium-bodied native fish • provide a sufficient flow to maintain water quality by oxygenating pools • maintain foraging habitat for platypus • maintain the wetted area to support in-stream aquatic vegetation (such as water ribbons, eel weed and milfoil) At 20-30 ML/day: • maintain habitat for larger native fish and facilitate movement for aquatic animals • wet exposed roots, woody debris, emergent vegetation and leaf packs to provide habitat for aquatic animals • inundate low benches, banks and some secondary channels to help increase waterbug productivity and native fish breeding, including river blackfish breeding • provide flow variability to maintain the diversity of the fringing vegetation	
Winter/spring fresh (one fresh of 40-120 ML/ day for two days during August to November)	At 40 ML/day: • provide connectivity for fish and waterbugs to access different habitat areas • transport organic matter that has accumulated in the channel to facilitate its breakdown and incorporation into the food web, with a low risk of low-oxygen blackwater • wet the banks to promote the recruitment and growth of streamside and emergent vegetation At 120 ML/day: • maintain the channel form and scour pools • encourage female platypus to select nesting burrows higher up the bank to reduce the risk of a greater flow later in the year flooding burrows with juveniles in them • flush accumulated leaf litter from the banks and low benches to reduce the risk of blackwater events during summer	

Potential environmental watering action	Expected watering effects	Environmental objectives
Summer/autumn low flow (10-20 ML/day during December to May)	At 10 ML/day: • provide connectivity between pools to allow the dispersal of small-bodied and medium-bodied native fish • provide a sufficient flow to maintain water quality by oxygenating pools • maintain foraging habitat for platypus • maintain the wetted area to support in-stream aquatic vegetation (such as water ribbons, eel weed and milfoil) At 20 ML/day: • maintain habitat for larger native fish and facilitate the movement of aquatic animals • wet exposed roots, leaf packs and woody debris to provide habitat for aquatic animals	F1, MI1, PR1, V2, WQ1
Summer/autumn freshes (two to three freshes of 40 ML/day for two days during December to May)	• Maintain the channel form by inundating the benches • Generate sufficient force to flush fine sediment and old biofilms from submerged wood and other hard surfaces, promoting the growth of new biofilms, increasing waterbug productivity and replenishing the food supply for aquatic animals • Increase connectivity between pools to promote the local movement of fish and prompt the dispersal of juvenile platypus in autumn • Provide flow variability to maintain the diversity of fringing vegetation (such as emergent aquatic plants) • Freshen the water to improve its quality by diluting salt, reoxygenating the water and flushing poor-quality water in pools, transporting accumulated nutrients and carbon downstream	CN1, CN2, F1, G1, MI1, PR1, V2, WQ1

1 A winter/spring low flow of 50 ML per day is below the passing flow magnitude in most planning scenarios and can result in the VEWH banking passing flow savings for use in other potential watering actions. The combined volume in the Cairn Curran and Tullaroop reservoirs must exceed 60,000 ML to enable passing flow savings.

2 In the dry, average and wet planning scenarios, the high flow of this event is planned to be delivered for six to seven days, but there is a three-day ramp-up and six-day ramp-down period. It is planned to be delivered naturally in the wet planning scenario.

3 The summer/autumn low-flow rate in May is below the passing-flow magnitude in most planning scenarios and can result in the VEWH banking passing-flow savings for use in other potential watering actions. The combined volume in Cairn Curran and Tullaroop reservoirs must exceed 60,000 ML to enable passing-flow savings.

4 In the dry, average and wet planning scenarios, the high flow of this event is planned to be delivered for six days, but there is a three-day ramp-up and six-day ramp-down period. It is planned to be delivered naturally in the wet scenario.

5 Winter/spring and autumn high flows are planned to occur at the same time in the Loddon River and Pyramid Creek, with the peaks timed to meet at Kerang Weir. 650 ML per day is the total combined target at Kerang Weir.

6 Winter/spring and autumn freshes are planned to occur at the same time in the Loddon River and Pyramid Creek, with the peaks timed to meet at Kerang Weir. 650 ML per day is the total combined target at Kerang Weir.

7 The flow delivered from Serpentine Weir may be restricted to manage end-of-system outfalls to avoid third-party impacts until an alternate solution is found.

Scenario planning

Table 5.7.3 outlines potential environmental watering and expected water use in a range of planning scenarios.

Due to dry conditions and low storage volumes leading into 2026-27, there are three planning scenarios in the Loddon system which account for the combined volume of Cairn Curran Reservoir and Tullaroop Reservoir dropping below 60 GL (or 60,000 ML). If it does, the operational passing flow rate would be reduced from 77 ML per day in the cooler months and 14 ML per day in the warmer months to 14 ML per day all year. The reduction in the operational passing flow means that water for the environment is required to make up a much greater portion of the targeted flow rate, greatly affecting the potential watering actions that may be delivered.

Loddon River

In the Loddon River, the delivery of a continuous, year-round low flow, three summer/autumn freshes and a fresh to respond to poor water quality are high priorities in all planning scenarios to maintain habitat for native fish, platypus and native vegetation and prevent poor water quality.

A flow of 50 ML per day is preferred during summer and autumn to minimise the risk of poor water quality during warm weather. In the drought and dry planning scenarios, the summer/autumn low flow will be reduced to 25 ML per day to conserve water supplies. A 25 ML per day flow is unlikely to maintain water quality throughout the reach but is likely to provide connectivity for aquatic animals to find refuge elsewhere. If storages are below 60 GL, 25 ML per day will be maintained all summer/autumn; above 60 GL, the lower rate will only be delivered in April and May when there is a lower water-quality risk. Reducing the passing flow to 25 ML per day in May (in consultation with Goulburn-Murray Water) can accrue additional water that will be used to supplement flows in 2027-28.

In the drought, dry and average planning scenarios, delivering the winter/spring low flow at 50-77 ML per day between June and November is a high priority to create a transition flow between the warmer and cooler seasons. In a wet scenario, the flow will be increased to 100 ML per day. Delivering the winter/spring low flow at a greater magnitude aims to improve the condition of vegetation higher up the bank, improve water quality and increase the abundance of native fish and platypus. If additional water becomes available during winter and spring, the magnitude may be increased in the drought, dry and average planning scenarios.

Coordinated winter/spring high flows in the Loddon River and Pyramid Creek are a high priority in all except the drought planning scenarios, where supply will be limited. They would trigger the upstream movement of native fish from the Murray system for feeding and breeding and remove accumulated organic matter on the banks and benches. They will be delivered for a shorter duration in the dry planning scenario and rely on spare capacity within the Waranga Western Channel irrigation network to use water from the Goulburn system. Winter/spring high flows are expected to be achieved with natural flow in wet conditions.

An autumn high flow will likely be delivered in average and wet conditions to cue the movement and dispersal of juvenile golden perch and silver perch from the Murray River into the Loddon River, Pyramid Creek and Gunbower Creek. This flow is intended to be coordinated with a similar flow in Pyramid Creek. It will be a high priority if there are large numbers of young native fish in the mid-Murray system, and it is not expected to be delivered during drought conditions.

Fish ecologists have recommended trialling different flow rates to improve fish outcomes in the Loddon River if sufficient water is available. The first trial involves increasing the winter/spring flow to 200 ML per day after an unregulated event to improve fish passage past low-level barriers. The second trial aims to increase the summer/autumn low flow to 100 ML per day during the warmest months—likely in January and February, or if hot conditions are forecast at other times—to reduce the risk of fish emigration. It will also test whether adaptive flow management can lessen water quality issues in the mid-Loddon River. The trial has been included in annual planning since 2022-23 and is proposed to be delivered as a high priority only in the wet planning scenario, due to the likelihood of low allocations and ongoing dry conditions in 2026-27. A review of the trial is also being carried out at the end of 2025-26 to inform future planning. Continuation of the trial will be contingent on the findings of the review and will be implemented only if appropriate monitoring is in place to assess its effects and inform adaptive management.

Pyramid Creek

Pyramid Creek is regionally significant for native fish. Fish populations in Pyramid Creek have increased since the Millennium Drought, and removing fish barriers has made it a dispersal corridor for fish moving between the Murray River, Kow (Ghow) Swamp and Gunbower Creek. Maintaining an adequate low flow to allow fish to remain in Pyramid Creek all year (including during the non-irrigation season) and delivering high flows to cue and facilitate fish movement at key times of the year are high priorities in all planning scenarios.

Modelling conducted as part of the FLOWS study indicates that maintaining a low flow of at least 200 ML per day throughout the year in Pyramid Creek is optimal for resident fish populations, but a flow of about 90 ML per day should provide minimum habitat requirements. Operational flow during the irrigation season usually provides a flow of about 300 ML per day, and water for the environment will likely be used to maintain a flow of 200 ML per day for as long as possible during the irrigation shutdown period.

The winter/spring high flow in Pyramid Creek is a high priority in all planning scenarios. It has a target flow rate of 650 ML per day at Kerang Weir and is coordinated with a release in the Loddon River to cue and facilitate fish movement between the Murray River and the Loddon system during their breeding season. A similar-sized event in autumn is recommended for the average and wet planning scenarios when large numbers of juvenile fish are likely to migrate from the Murray River into the Loddon system. The autumn high flow may also facilitate the dispersal of juvenile platypus in years following successful spring breeding.

Serpentine Creek

In Serpentine Creek, the main priority will be to maintain a low flow throughout the year to provide habitat for native fish, waterbugs, rakali (water rats) and platypus. Delivering freshes in summer/autumn to improve water quality, allow fish and platypus movement and improve the condition of streamside vegetation is also a high priority. Winter/spring freshes that flush organic material from the bank to improve productivity and reduce the risk of low-oxygen blackwater in summer are a high priority in all climate scenarios, but they are delivered at a lower magnitude in the drought and dry planning scenarios.

These flows are needed in all planning scenarios, but will likely be delivered at the lower end of the recommended range to avoid inundating private property at the end of the system. Lower-magnitude flows are expected to maintain connectivity between habitats, but will not provide as much habitat complexity for aquatic plants and animals as environmental flows delivered at the upper end of the recommended range.

Carryover of 3,000 ML is prioritised into 2027-28 in the drought, dry and average planning scenarios. If conditions are drier, this water will ensure delivery of the priority summer/autumn freshes and a summer low flow in the Loddon River. No carryover targets are set in the wet planning scenario, meaning water allocated in 2027-28 will be required to achieve priority actions identified for that year.

Table 5.7.3 Loddon River system environmental watering planning scenarios

Planning scenario	Drought	Dry	Average	Wet
Expected conditions	• Negligible contributions from unregulated reaches and tributaries of the Loddon River • Consumptive water deliveries in the irrigation season (but not in reach 4) • Combined volume in storages below 60 GL • Passing flow reduced to 14 ML/day all year	• Small inflows from unregulated reaches and tributaries of the Loddon River contributing to a low flow • Consumptive water deliveries in the irrigation season (but not in reach 4) • Combined volume in storages below 60 GL • Passing flow reduced to 14 ML/day all year	• The natural flow will provide a low flow and multiple freshes, most likely in winter/spring • Consumptive water deliveries in the irrigation season (but not in reach 4) • Combined volume in storages below 60 GL estimated until spring • Passing flow reduced to 14 ML/day until spring • Spills from Loddon storages are unlikely	• Spills from Loddon system storages will provide an extended-duration high flow • Overbank flow is most likely in winter/spring
Expected availability of water for the environment	• 18,730 ML	• 21,280 ML	• 27,700 ML	• 23,040 ML
Loddon River (targeting reach 4)				
Potential environmental watering – tier 1 (high priorities)	• Winter/spring low flow (delivered at 50 ML/day) • Winter/spring high flow (one high flow for six days) • Summer/autumn low flow (delivered at 25 ML/day) • Summer/autumn freshes (three freshes) • Year-round fresh if triggered	• Winter/spring low flow (delivered at 50 ML/day) • Winter/spring high flow (one high flow for six days) • Summer/autumn low flow (delivered at 25 ML/day) • Summer/autumn freshes (three freshes) • Year-round fresh if triggered	• Winter/spring low flow (delivered at 77 ML/day, 50 ML/day in June and November) • Winter/spring high flow (one high flow for seven days) • Summer/autumn low flow (delivered at 50 ML/day) • Summer/autumn freshes (three freshes) • Autumn high flow (one high flow) • Year-round fresh if triggered	• Winter/spring low flow (delivered at 100 ML/day) • Winter/spring high flow (one high flow for ten days) • Summer/autumn low flow (delivered at 50 ML/day) • Summer/autumn low flow trial • Summer/autumn freshes (three freshes) • Autumn high flow (one high flow) • Year-round fresh if triggered

Planning scenario	Drought	Dry	Average	Wet
Potential environmental watering – tier 2 (additional priorities)	• Winter/spring low flow (delivered at 77 ML/day) • Winter/spring high flow (one high flow for six days) • Summer/ autumn low flow (delivered at 50 ML/day)	• Winter/spring low flow (delivered at 77 ML/day) • Summer/ autumn low flow (delivered at 50 ML/day) • Autumn high flow (one high flow)	• Winter/spring low flow (delivered at 100 ML/day) • Winter/spring low-flow trial, if triggered • Summer/ autumn low flow trial	• Winter/spring low-flow trial, if triggered
Possible volume of water for the environment required to achieve objectives	• 10,650 ML (tier 1) • 14,300 ML (tier 2)	• 15,750 ML (tier 1) • 13,500 ML (tier 2)	• 16,200 ML (tier 1) • 4,950 ML (tier 2)	• 13,800 ML (tier 1) • 2,000 ML (tier 2)
Pyramid Creek and Loddon River (targeting reach 5)				
Potential environmental watering – tier 1 (high priorities)	• Year-round low flow • Winter/spring high flow (one high flow)	• Year-round low flow • Winter/spring high flow (one high flow)	• Year-round low flow • Winter/spring high flow (one high flow) • Autumn high flow (one high flow)	• Year-round low flow • Winter/spring high flow (one high flow) • Autumn high flow (one high flow)
Possible volume of water for the environment required to achieve objectives	• 4,000 ML (tier 1)	• 4,000 ML (tier 1)	• 6,000 ML (tier 1)	• 6,000 ML (tier 1)

Planning scenario	Drought	Dry	Average	Wet
Serpentine Creek (targeting reach 1)				
Potential environmental watering – tier 1 (high priorities)	• Winter/spring low flow (delivered at 10 ML/day) • Winter/spring fresh (one fresh delivered at 40 ML/day) • Summer/autumn low flow (delivered at 10 ML/day) • Summer/autumn freshes (two freshes)		• Winter/spring low flow (delivered at 10 ML/day) • Winter/spring fresh (one fresh delivered at 120 ML/day) • Summer/autumn low flow (delivered at 10 ML/day) • Summer/autumn freshes (three freshes)	
Potential environmental watering – tier 2 (additional priorities)	• Summer/autumn freshes (three freshes)		• Winter/spring low flow (delivered at 30 ML/day)	
Possible volume of water for the environment required to achieve objectives	• 1,320 ML (tier 1) • 70 ML (tier 2)		• 1,530 ML (tier 1) • 5,200 ML (tier 2)	• 1,220 ML (tier 1) • 4,500 ML (tier 2)
Priority carryover requirements for 2027-28	• 3,000 ML			• N/A

5.7.2 Boort wetlands

System overview

The Boort wetlands are on the floodplain west of the Loddon River, below Loddon Weir. They consist of temporary and permanent freshwater lakes and swamps: Lake Boort, Lake Leaghur, Lake Yando, Little Lake Meran and Lake Meran (Figure 5.7.1). Together, the Boort wetlands cover over 800 ha. Numerous other wetlands in the district are not currently managed with environmental water.

The natural watering regimes of wetlands throughout the broader Loddon system have been substantially modified by the construction of levees and channels across the floodplain and by constructing and operating reservoirs and weirs along the Loddon River. Water is delivered to the Boort wetlands through Loddon Valley Irrigation Area infrastructure.

Water for the environment is shared between the Boort wetlands and the Loddon River system. Channel capacity constraints sometimes limit the ability to deliver water for the environment to the wetlands. The VEWH and North Central CMA work with the storage manager (Goulburn-Murray Water) to best meet environmental objectives within capacity constraints.

Environmental values

The Boort wetlands provide habitat for a range of plant and animal species. At Lake Yando, 12 rare plant species have been recorded, including jerry-jerry and water nymph. Bird species recorded at Lake Boort, Lake Leaghur and Lake Meran include the white-bellied sea eagle, Latham's snipe and eastern great egret. Little Lake Meran is a swampy woodland with black box trees on the higher wet margins and river red gums fringing the waterline.

Environmental objectives in the Boort wetlands

	A1 – Increase the size and diversity of native frog populations, including by enhancing breeding opportunities
	**B1** – Support a high diversity of wetland birds by enhancing feeding and breeding conditions
	F1 – Increase the large and small-bodied fish populations
	**MI1** – Increase the diversity and biomass of waterbugs
	**T1** – Maintain freshwater turtle populations, in particular Murray River turtles
	**V1** – Rehabilitate and increase the extent of emergent and aquatic vegetation (aquatic herblands, tall marsh), intermittent swampy woodland and riverine chenopod woodland **V2** – Maintain the health and restore the distribution of river red gums and associated understorey species **V3** – Maintain the extent and restore the health of black box vegetation on the fringes of the wetlands **V4** – Maintain the extent of spiny flat sedge

Traditional Owner cultural values and uses

In planning for environmental flows in the Boort wetlands, North Central CMA works with Barapa Barapa and Wamba Wemba Traditional Owners and the Dja Dja Wurrung Clans Aboriginal Corporation (trading as DJAARA).

Lake Boort is within the Dja Dja Wurrung Registered Aboriginal Party (RAP) boundary and is home to Djaara (Dja Dja Wurrung people). A key aspiration for Djaara is to be more involved in managing and administering environmental water, with the aim of owning and managing it in future. DJAARA's ***Dhelkunyangu Gatjin: Working together to heal water: Djaara Gatjin Strategy*** sets a baring (pathway) for DJAARA to become the environmental water manager on Djaara Country and a baring for Djaara Lore to inform water management decisions. This transition is being progressed by working in partnership with authorities and the community to manage water for a healthy, sustainable future.

DJAARA have expressed that the resources allocated to managing environmental water on Djandak do not include sufficient allowance to appropriately engage with Djaara members, for them to meaningfully articulate cultural values and the Djaara cultural lens, to establish watering objectives to guide environmental water management or for the review of the six seasonal watering proposals on Djandak. For the development of the 2026-27 seasonal watering proposals, DJAARA determined the direction in which they would prioritise these limited resources, focusing primarily on phase one of the trial of joint management of environmental water on Dindilong Yaluk (Coliban River) by co-authoring the 2026-27 seasonal watering proposal with the North Central CMA, as well as being involved with scenario planning for the Loddon and Campaspe systems.

The Djaara Nation Statement in the Victorian Government's 2022 ***Water is Life: Traditional Owner Access to Water Roadmap*** and ***Dhelkunya Dja: Dja Dja Wurrung Country Plan 2014-2034*** also describe Djaara's objectives for managing gatjin (water) on Djandak (Country) and articulate Djaara's support for reinstating environmental flows as an overall management objective.

Table 5.7.4 Barapa Barapa and Wamba Wemba Traditional Owners' cultural values and uses in the Boort wetlands

Values/uses	What environmental watering aims to do
Cultural plants and cultural practices	• Water for the environment and natural flooding support culturally important plants in the Boort wetlands and allow the continuation of cultural practices, including harvesting of food, medicinal and weaving plants • Water for the environment supports the growth of cultural plants that enable a continuation of cultural practices (harvesting nardoo at Yando Swamp, also known as Lake Yando) • Barapa Barapa and Wamba Wemba Traditional Owners value cultural plants at the Boort wetlands, as they provide opportunities for cultural practices to continue • Barapa Barapa and Wamba Wemba Traditional Owners recognise the value of resources that occur on the drawdown after inundation of wetlands, providing food for animals and cultural plants (such as old man weed). This aspiration can be supported by allowing wetlands to draw down naturally after receiving water to expose mudflats. This is a consideration at Little Lake Meran, Yando Swamp and Lake Leaghur. • Having a diversity of habitat and vegetation responses is a priority for Barapa Barapa and Wamba Wemba Traditional Owners. They highlighted the importance of having a range of water depths across wetlands, which creates a more diverse vegetation response and results in a range of resources becoming available over a longer timeframe. • Barapa Barapa Traditional Owners have undertaken revegetation activities as part of the Decision Support Tool Revegetation Project at Lake Leaghur. There are also opportunities for Traditional Owners to be involved with monitoring and revegetation at other wetlands. • Deliveries of water for the environment can be managed in future, so revegetated areas at Lake Leaghur are provided with an appropriate water regime (plants receive water but are not drowned) to ensure their ongoing survival and opportunities for natural recruitment.
Cultural animals and cultural practices	• Environmental flows can support the preservation and improvement of cultural animals (totem species). Environmental flows will also aim to ensure that culturally important animals (food sources, such as black swans) have sufficient feeding and breeding habitat to build their populations.
Healthy Country	• Providing drought refuge habitat for frogs, turtles and birds and maintaining areas with healthy habitat is a high priority for Barapa Barapa and Wamba Wemba Traditional Owners. Current conditions provide for this, but once wetlands dry out, they feel it is important to ensure that water is delivered to healthy areas to elicit a good vegetation response and to support wetland animals. • Future environmental water deliveries will ensure there is water in high-potential Boort wetlands regardless of whether natural flooding occurs. This will provide refuge habitat for waterbirds, woodland birds, turtles and frogs and ensure high-quality feeding and breeding habitat is available.
Cultural heritage	• Cultural heritage artefacts are common at Boort wetlands as they have been important gathering sites for Traditional Owners. The loss of fringing trees and changes to natural watering regimes have left sediments around these wetlands exposed for prolonged periods, resulting in some cultural artefacts being uncovered. • Delivering water for the environment can support the growth of fringing red gums and tall marsh, reduce erosion at these wetlands and help keep cultural heritage artefacts covered.

Table 5.7.5 Djaara values and uses in the Boort wetlands

Values & uses	What environmental watering aims to do
• Environmental water management helps preserve the historical and contemporary values Djaara hold highly, including promoting a sense of place and spiritual connection. Lake Boort is a priority in the Dja Dja Wurrung Country Plan.	• The drawdown after the 2024 flood will continue to be monitored
Objectives • A Djaara-led environmental watering program and management plan that provides guidance for environmental water, among other water entitlements and flows • Overarching holistic monitoring and management of waterways and flows to optimise outcomes for the environment and other values, maximising the value delivered through the program	• DJAARA supported to perform monitoring and planning activities • Activation of a DJAARA/North Central CMA joint management approach to environmental water planning and delivery

Increasing the involvement of Traditional Owners in planning and managing environmental flows and progressing opportunities towards self-determination in the environmental watering program is a core commitment of the VEWH and its program partners. This is reinforced by legislation and policy commitments, including the *Water Act 1989*, the ***Victorian Aboriginal Affairs Framework***, the 2016 ***Water for Victoria***, the 2022 ***Water is Life: Traditional Owner Access to Water Roadmap***, and, in some cases, agreements under the *Traditional Owner Settlement Act 2010*.

Social, recreational and economic values and uses

In planning the potential environmental watering actions in **Table 5.7.6**, North Central CMA considered how environmental flows could support values and uses, including:

- water-based recreation (such as fishing and water sports)
- waterway recreation and amenity (such as birdwatching, camping and duck hunting)
- community events and tourism (such as attracting locals and visitors for birdwatching and hunting)
- socio-economic benefits (such as aesthetic benefits for landholders, groundwater recharge and appropriate water levels and quality for flood mitigation, nutrient treatment and carbon storage).

The Boort wetlands provide a diverse range of these values, which directly benefit the local economy as well as economies in the wider region.

Lake Meran is a hub for recreation, with locals and tourists visiting year-round for camping, swimming, water skiing and fishing. While water for the environment is delivered to support ecological values at Lake Meran, it also supports these recreational uses. When water is present, each of the Boort wetlands is also a popular site for other activities (such as birdwatching).

Although not explicitly measured, the wetlands are also likely to provide indirect economic benefits through carbon storage and other ecosystem services. The delivery of environmental water aims to support these shared economic, social and cultural benefits, provided they do not compromise the environmental objectives of watering or impose additional demands on the Environmental Water Reserve (that is, require additional environmental water).

	Watering planned to support water sports activities (e.g., canoeing, kayaking, rowing, swimming and water skiing)
	Watering planned to support waterbird-related recreational activities
	Watering planned to support angling activities
	Watering planned to support peaks in visitation (e.g., camping and other public activities on long weekends and school holidays)

Scope of environmental watering

The term 'environmental watering' refers to the active delivery of held environmental water to support particular environmental objectives by altering the flow in a river or the water level in a wetland. While other terms are sometimes used to describe the delivery of environmental water, 'environmental watering' is deliberately used here and in seasonal watering statements to ensure consistency in the legal instruments that authorise the use of water for the environment in Victoria.

Table 5.7.6 describes the potential environmental watering actions in 2026-27, their expected watering effect (that is, the intended physical or biological effects of the watering action) and the longer-term environmental objectives they support. Each environmental objective relies on one or more potential environmental watering actions and their associated physical or biological effects.

Table 5.7.6 Boort wetlands potential environmental watering actions, expected watering effects and environmental objectives

Potential environmental watering action	Expected watering effects	Environmental objectives
Lake Meran		
Top-up (maintain the water level between 77.3 m and 77.8 m AHD) 	• Maintain refuge and promote the recruitment of freshwater turtles, in particular Murray River turtles • Provide feeding and breeding opportunities for waterbirds • Allow herbland species above the high-water mark to germinate and complete their life cycles	 A1 B1 T1 V1
Lake Yando		
Fill (in late winter to spring) 	• Drown terrestrial weeds to limit their growth and reduce their extent • Support the growth of aquatic vegetation and the completion of plant life cycles • Support the growth of river red gums and herbland revegetation • Provide wetland habitat for waterbirds, frogs and turtles • Provide conditions suitable for waterbugs and small-bodied native fish, which are an important food source for waterbirds	 A1 B1 MI1 T1 V1, V2

Potential environmental watering action	Expected watering effects	Environmental objectives
Top-up (as required during spring/ summer/autumn to support bird breeding events and provide waterbird refuge)	• Provide habitat for waterbirds to support breeding opportunities and allow juveniles to grow feathers	**B1**

Scenario planning

Table 5.7.7 outlines potential environmental watering and expected water use in a range of planning scenarios.

Below-average rainfall and above-average temperatures across the Boort region in 2025-26 have meant the Boort wetlands have mostly been drawn down or allowed to completely dry out as part of a planned dry-phase cycle.

Lake Boort and Lake Leaghur were completely drawn down during 2025-26 and are now supporting important dry-phase ecosystem functions. These wetlands will not be considered for environmental watering until winter/spring 2027 or 2028 in line with the optimal watering regime. Little Lake Meran held some water at the end of summer 2026, but it is continuing to draw down as part of its planned dry-phase cycle and will not require water for the environment until winter/spring 2028. Lake Meran held enough water to achieve environmental objectives for most of 2025-26, but it required a top-up in autumn to maintain the required water level of 77.3 m AHD.

Environmental water delivery to Lake Yando is a priority in all planning scenarios. A fill in late winter or early spring will promote aquatic and semi-aquatic vegetation communities and maintain river red gums in the bed of the wetland. This delivery will also provide high-quality resting and feeding opportunities for waterbirds and act as a drought refuge as wetlands in the district dry out. In the drier climate scenarios, capacity constraints in the Loddon Valley Irrigation Area in spring due to high irrigation demand may mean that filling Lake Yando could take multiple weeks if the environmental water supply to the wetland is interrupted. If waterbird breeding is observed at Lake Yando, a top-up will be a high priority to maintain appropriate habitat for nesting birds to ensure nestlings can safely grow feathers and disperse. This action could result from either a faster-than-anticipated drawdown in hot, dry conditions or late-season breeding. In the context of the drying landscape around the Boort wetlands, a top-up may also be delivered to maintain suitable refuge for waterbirds over summer and autumn as available habitat is reduced at a landscape scale.

Delivering top-ups to Lake Meran is required in all planning scenarios to ensure that the lake does not fall below 77.3 m AHD. This will ensure that suitable habitat is maintained for turtles and waterbirds, while also allowing higher areas of the wetland to fully dry out, allowing fringing vegetation species to complete their life cycles. It is anticipated that this action will be required for at least the next two years and for up to four years.

In wetter scenarios, Lake Yando and Lake Meran are likely to receive natural inflows that would fill or partially fill the wetlands, negating the need for deliveries of water for the environment.

Priority carryover is required in all planning scenarios to ensure partial fills at Lake Meran can be carried out in 2027-28 to maintain a water level of 77.3 m AHD.

Table 5.7.7 Boort wetlands environmental watering planning scenarios

Planning scenario	Drought	Dry	Average	Wet
Expected conditions	• No natural inflow to wetlands	• Minimal natural inflow to wetlands from local catchment run-off is possible	• Moderate inflow from local catchment run-off, but little, if any, inflow from nearby creeks or flood runners	• Extended durations of high flow and overbank flow from creeks and flood runners, which fill most wetlands
Expected availability of water for the environment	• 18,730 ML	• 21,280 ML	• 27,700 ML	• 23,040 ML
Lake Meran				
Potential environmental watering – tier 1 (high priorities)	• Partial fill (as required to maintain water level between 77.3 m and 77.8 m AHD)			
Lake Yando				
Potential environmental watering – tier 1 (high priorities)	• Fill (in late winter to spring) • Top up (as required during spring/summer/autumn)			
Possible volume of water for the environment required to achieve objectives	• 2,800 ML			
Priority carryover requirements for 2027-28	• 2,000 ML			

5.7.3 Birchs Creek

System overview

Birchs Creek is a tributary of the Loddon River located in the southernmost part of the catchment. The creek rises in the ranges northeast of Ballarat and flows northwest through Newlyn and Smeaton before joining Tullaroop Creek near Clunes (Figure 5.7.1). The lower parts of the catchment are extensively cleared, where the creek meanders through an incised basaltic valley. The creek supports a regionally significant platypus community and a vulnerable population of river blackfish.

Birchs Creek is part of the broader Bullarook system, which contains two small storages—Newlyn Reservoir and Hepburn Lagoon—that provide water for irrigation and urban supply. The storages fill and spill during winter or spring in years with average or above-average rainfall. The VEWH holds water for the environment in Newlyn Reservoir, but none in Hepburn Lagoon.

Birchs Creek receives tributary inflows from Rocky Lead, Langdons, Lawrence and Tourello creeks. Groundwater provides a reliable baseflow to the downstream reaches of Birchs Creek in most years.

The VEWH is allocated 100 ML in Newlyn Reservoir on 1 December each year, provided that seasonal determinations in the Bullarook system are at least 20 per cent. Any unused allocation from 1 December can be carried over until 30 November of the following water year, but if Newlyn Reservoir spills from 1 July to 30 November, the volume held for carryover is lost. Any water remaining on 30 November is forfeited. When seasonal determinations are below 20 per cent, the VEWH does not receive an allocation, and the system's resources are used to protect essential human needs.

Environmental values

Birchs Creek supports threatened aquatic plants, and its deep pools provide habitat for aquatic animals during dry periods. The creek contains native fish, including regionally significant populations of river blackfish and mountain galaxias, as well as flathead gudgeon and Australian smelt. Recent monitoring indicates that platypus are present throughout the entire creek.

Environmental objectives in Birchs Creek

	F1 – Maintain the abundance and diversity of small-bodied and medium-bodied native fish, including river blackfish, mountain galaxias, flathead gudgeon and Australian smelt
	**MI1** – Maintain the waterbug population and the diversity of functional groups to drive productive and dynamic food webs
	**PR1** – Maintain the platypus population
	**V1** – Maintain the diversity and abundance of in-stream aquatic plants **V2** – Maintain a diverse variety of native fringing plants and communities of plants growing on the water's edge
	WQ1 – Maintain water quality to support aquatic life and environmental processes

Traditional Owner cultural values and uses

Birchs Creek is on the Country of the Djaara people, represented by the Dja Dja Wurrung Clans Aboriginal Corporation (DJAARA). The 2013 Recognition and Settlement Agreement between DJAARA and the State of Victoria provides DJAARA with the right to participation, employment and incorporation of Traditional Ecological Knowledge into natural resource management. In November 2023, DJAARA launched ***Dhelkunyangu Gatjin: Working together to heal water: Djaara Gatjin Strategy***, setting a baring (pathway) for DJAARA to become the environmental water manager on Djaara Country and a baring for Djaara Lore to inform water-management decisions. This transition is being progressed by working in partnership with authorities and the community to manage water for a healthy, sustainable future.

DJAARA's participation in the Tullaroop Catchment Restoration Project Reference Group and the associated on-ground works in Birchs Creek provides an opportunity for DJAARA's input to the environmental water program in Birchs Creek.

The Djaara Nation Statement in ***Water is Life: Traditional Owner Access to Water Roadmap*** and the ***Dhelkunya Dja: Dja Dja Wurrung Country Plan 2014-2034*** also describe Djaara objectives for managing water on their Country. In planning for environmental flows in Birchs Creek, DJAARA and North Central CMA have identified the creek as a potential site for future projects. ***Dhelkunya Dja: Dja Dja Wurrung Country Plan 2014-2034*** can provide the foundation to identify and integrate cultural values, as shown in **Table 5.7.8**, into Bullarook system environmental water planning.

Table 5.7.8 Traditional Owner cultural values and uses, Birchs Creek (all reaches)

Values/uses/objectives/opportunities	How this opportunity will be considered in environmental watering in 2026-27
Objectives • An environmental watering program and management plan that provides guidance for environmental water among other water entitlements and flows • Overarching holistic monitoring and management of waterways and flows to optimise outcomes for the environment and other values, maximising the value delivered through the environmental water program	• Through DJAARA being supported with a greater role to perform monitoring and planning activities and being provided the opportunity to contribute and review the seasonal watering proposal

Note: The Traditional Owner group is DJAARA with the Kapa Gatjin (to know water) Advisory Group being DJAARA representatives.

Increasing the involvement of Traditional Owners in managing environmental flows and progressing opportunities towards self-determination in the environmental watering program is a core commitment of the VEWH and its program partners. This is reinforced by legislation and policy commitments, including the *Water Act 1989*, the ***Victorian Aboriginal Affairs Framework***, the 2016 ***Water for Victoria***, the 2022 ***Water is Life: Traditional Owner Access to Water Roadmap***, and, in some cases, agreements under the *Traditional Owner Settlement Act 2010*.

Social, recreational and economic values and uses

In planning the potential environmental watering actions in **Table 5.7.9**, North Central CMA considered how environmental flows could support values and uses, including:

- water-based recreation (such as fishing)
- riverside recreation and amenity (such as cycling and walking, particularly in Newlyn, Smeaton and Clunes, and improved amenity at key community spaces like Andersons Mill)
- improved water quality (such as for domestic and stock use)
- socio-economic benefits (such as increased tourism and visitation to key community spaces).

	Watering will support angling activities by creating conditions that support recreational angling species
	Watering will support peaks in visitation (e.g., camping and other public activities on long weekends and school holidays) by improving riverside amenity

Scope of environmental watering

The term 'environmental watering' refers to the active delivery of held environmental water to support particular environmental objectives by altering the flow in a river or the water level in a wetland. While other terms are sometimes used to describe the delivery of environmental water, 'environmental watering' is deliberately used here and in seasonal watering statements to ensure consistency in the legal instruments that authorise the use of water for the environment in Victoria.

Table 5.7.9 describes the potential environmental watering actions in 2026-27, their expected watering effect (that is, the intended physical or biological effects of the watering action) and the longer-term environmental objectives they support. Each environmental objective relies on one or more potential environmental watering actions and their associated physical or biological effects.

Table 5.7.9 Birchs Creek potential environmental watering actions, expected watering effects and environmental objectives

Potential environmental watering action	Expected watering effects	Environmental objectives
Birchs Creek (targeting reach 2)		
Winter fresh (one fresh of 27 ML/ day for three days during June)	• Maintain and support the growth and germination of streamside vegetation by increasing soil moisture and depositing sediment on the bank and benches • Scour old biofilms and organic matter that have accumulated in the channel, and cycle nutrients throughout the creek • Improve water quality by freshening refuge pools and providing connectivity between pools for fish and platypus movement	F1, MI1, PR1, V1, V2, WQ1
Summer/autumn freshes (three freshes of 10-15 ML/ day for three days during December to May)	• Increase the water depth to maintain and support seed germination and the growth of in-stream aquatic vegetation • Expand riffle and run areas to provide waterbug habitat • Top up pools to refresh water quality (particularly dissolved-oxygen levels) and increase connectivity between pools for fish and platypus movement	F1, MI1, PR1, V1, WQ1

Scenario planning

Table 5.7.10 outlines potential environmental watering and expected water use in a range of planning scenarios.

Water for the environment in Birchs Creek is primarily used to deliver winter/spring freshes and summer/autumn freshes, where these are not met by the natural flow or consumptive water deliveries. The available volume of water for the environment is insufficient to deliver any other environmental flows recommended for the system.

The environment did not receive an allocation in December 2025, so no carryover is available to deliver winter/spring freshes in 2026 in any planning scenario. However, winter/spring freshes will likely be delivered naturally by reservoir spills in average and wet conditions.

In the drought and dry planning scenarios, the environment is also unlikely to receive an allocation in December 2026, as seasonal determinations in the Bullarook system are expected to be below 20 per cent. In these planning scenarios, the operational passing flow in the creek will be managed to protect critical human and environmental needs.

Summer/autumn freshes may be prioritised in average and wet conditions, if required, to avoid critical loss of environmental values when the system is likely under the greatest stress. Summer/autumn freshes should be delivered at the upper magnitude where possible, either by augmenting natural or consumptive flows or using water for the environment to deliver greater-magnitude freshes after one fresh has been met naturally. If not required to deliver summer/autumn freshes, allocation may be reserved to deliver a winter fresh in June 2027, or alternatively carried over to deliver a winter/spring fresh in 2027-28 before the water is forfeited on 30 November 2027.

Table 5.7.10 Birchs Creek environmental watering planning scenarios

Planning scenario	Drought	Dry	Average	Wet
Expected conditions	• The reservoir is unlikely to spill • Extremely low flow in winter/spring • Limited irrigation releases due to low allocations	• The reservoir is unlikely to spill • Low flow in winter/spring • Moderate irrigation releases	• Reservoir spills are certain in winter/spring • Some natural flow through summer/autumn • Groundwater contributes to baseflow throughout the year	• Reservoir spills are certain in winter/spring • Natural flow through summer/autumn • Groundwater contributes to baseflow throughout the year
Expected availability of water for the environment	• 0 ML		• 100 ML (2026 allocation)	
Birchs Creek (targeting reach 2)				
Potential environmental watering – tier 1 (high priorities)	• N/A		• Summer/autumn freshes (three freshes)	• Summer/autumn freshes (three freshes) • Winter fresh (one fresh)

Planning scenario	Drought	Dry	Average	Wet
Potential environmental watering – tier 2 (additional priorities)	• N/A		• Winter fresh (one fresh)	• N/A
Possible volume of water for the environment required to achieve objectives	• N/A	• 100 ML (tier 1) • 100 ML (tier 2)	• 0 ML (tier 1)	
Possible volume of water for the environment required to achieve objectives	• N/A	• 100 ML (tier 1) • 100 ML (tier 2)	• 0 ML (tier 1)	