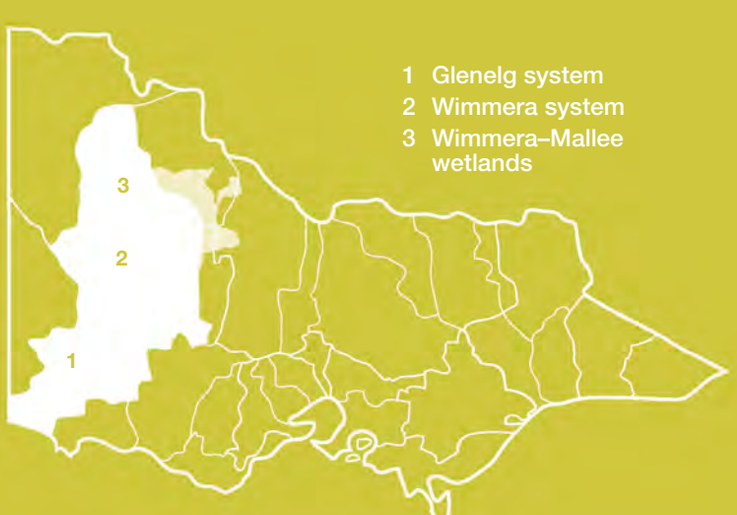
Section 4

Western Region



4.1 Western Region overview

Environmental water in the Western Region is shared between the Wimmera and Glenelg systems and the Wimmera–Mallee wetlands. Important waterways that receive environmental water include sections of the Glenelg, Wimmera and MacKenzie rivers and Mount William, Burnt and Bungalally creeks, as well as priority wetlands formerly supplied by the Wimmera–Mallee channel system.

Environmental water is supplied from the Wimmera–Mallee headworks system which also supplies towns, industries and farms across the Western Region. The complex network of channels and pipelines in the water supply and distribution systems managed by GWMWater enables water to be shifted between storages and delivered in different catchments, including from the Glenelg catchment to the Wimmera catchment.

Waterways in the Western Region are highly valued by local residents and visitors for their environmental and aesthetic values and are widely used for recreational activities such as fishing, camping, swimming, boating, bushwalking and wildlife watching.

Seasonal outlook 2016–17

Inflows to the Wimmera–Mallee headworks system are highly variable. Though the floods in September 2010 and January 2011 significantly boosted streamflows and storage levels, this has been followed by a sequence of dry years. 2015–16 was particularly dry, with some parts of the region experiencing the driest conditions on record.

Conditions in 2016–17 may again be dry, resulting in low environmental water availability, especially in the early part of the season. Due to the very dry catchments, significant and prolonged rainfall will be required to see improvements in streamflows, storage levels and water allocations. This means carryover from 2015–16 will again be essential to maintain basic habitat and functions in key wetlands and rivers in 2016–17.

If dry conditions prevail in 2016–17, environmental watering in the Western Region will be again limited to protecting water quality in the Wimmera and Glenelg systems to maintain habitat for native fish. With low water availability, deliveries will largely be restricted to the summer/autumn period, when water quality risks are highest. There will likely be periods of cease-to-flow in both systems. The focus of environmental watering in the Wimmera–Mallee wetlands will be providing refuges within the dry landscape to support local animals.

The Murray–Darling Basin Plan

The Wimmera system forms part of the larger Murray–Darling Basin and water diversions and environmental water deliveries in this region are also subject to the requirements of the Murray–Darling Basin Plan.

The VEWH's environmental planning and delivery is consistent with the requirements of the Murray–Darling Basin Plan. The potential environmental watering outlined in section 4 fulfils Victoria's obligations under section 8.26 of the plan to identify annual environmental watering priorities for Victoria's water resource areas.

Refer to section 5 for further information about the Murray–Darling Basin Plan.

4.2 Glenelg system

Waterway manager – Glenelg Hopkins Catchment Management Authority

Storage manager – GWMWater

Environmental water holder – Victorian Environmental Water Holder

Environmental values

The lower section of the Glenelg River has been recognised as one of Australia's 15 national biodiversity hotspots due to the high-value aquatic life it supports, including the endangered Glenelg freshwater mussel and Glenelg spiny crayfish. It is also home to platypus and important native fish populations including river blackfish, estuary perch and pygmy perch, some of which migrate long distances upstream from the Glenelg River estuary to complete their lifecycles. Frasers Swamp is another important feature of the upper Glenelg system, supporting a healthy growling grass frog population.

The Glenelg River supports a variety of riparian vegetation communities including the endangered Wimmera bottlebrush. Riparian and floodplain vegetation is comprised of river red gums with paperbark and tea tree understorey.

Social and economic values

The Glenelg system is valued for a wide range of fishing opportunities and several fishing competitions are held on the river throughout the year. Other recreational activities are popular along the river including walking, sightseeing boat cruises, canoeing, bird watching and camping. Many landholders rely on the Glenelg River for stock water and use the productive floodplains for grazing. The river also provides tourism opportunities and supports businesses within townships such as Harrow, Casterton, Dartmoor and Nelson. The waterways in the Glenelg system are places of importance for Traditional Owners and their Nations in the region.

System overview

The Glenelg River supports a wide range of flow-dependent environmental values including rare and threatened plants and animals. Its diversity results from its range of landforms and climate conditions and its connection with the estuary.

The Glenelg River is an integral part of the Wimmera–Mallee headworks system, which supplies towns and properties across the Western Region. The river is regulated at Moora Moora Reservoir and Rocklands Reservoir. Water is also diverted from the Glenelg catchment to the Wimmera catchment by the Moora Moora channel and the Rocklands–Toolondo–Taylors channel and at three weirs on the upper Wannon River. Environmental water is actively managed in the main stem of the Glenelg River below Rocklands Reservoir with passing flows rules in place for the upper Wannon River diversions.

Due to their high environmental value, the priority river reaches are from the Rocklands Reservoir to 5-Mile Outlet (reach 1a), 5-Mile Outlet to the confluence with the Chetwynd River (reach 1b) and from the Chetwynd River to the Wannon River (reach 2). Environmental water in the Glenelg system is released from Rocklands Reservoir for reach 1a via the reservoir wall outlet and for reach 1b via the 5-Mile and 12-Mile outlets, with through-flows delivering water to reach 2. The Glenelg River reach 3 and estuary also benefit from environmental water releases.

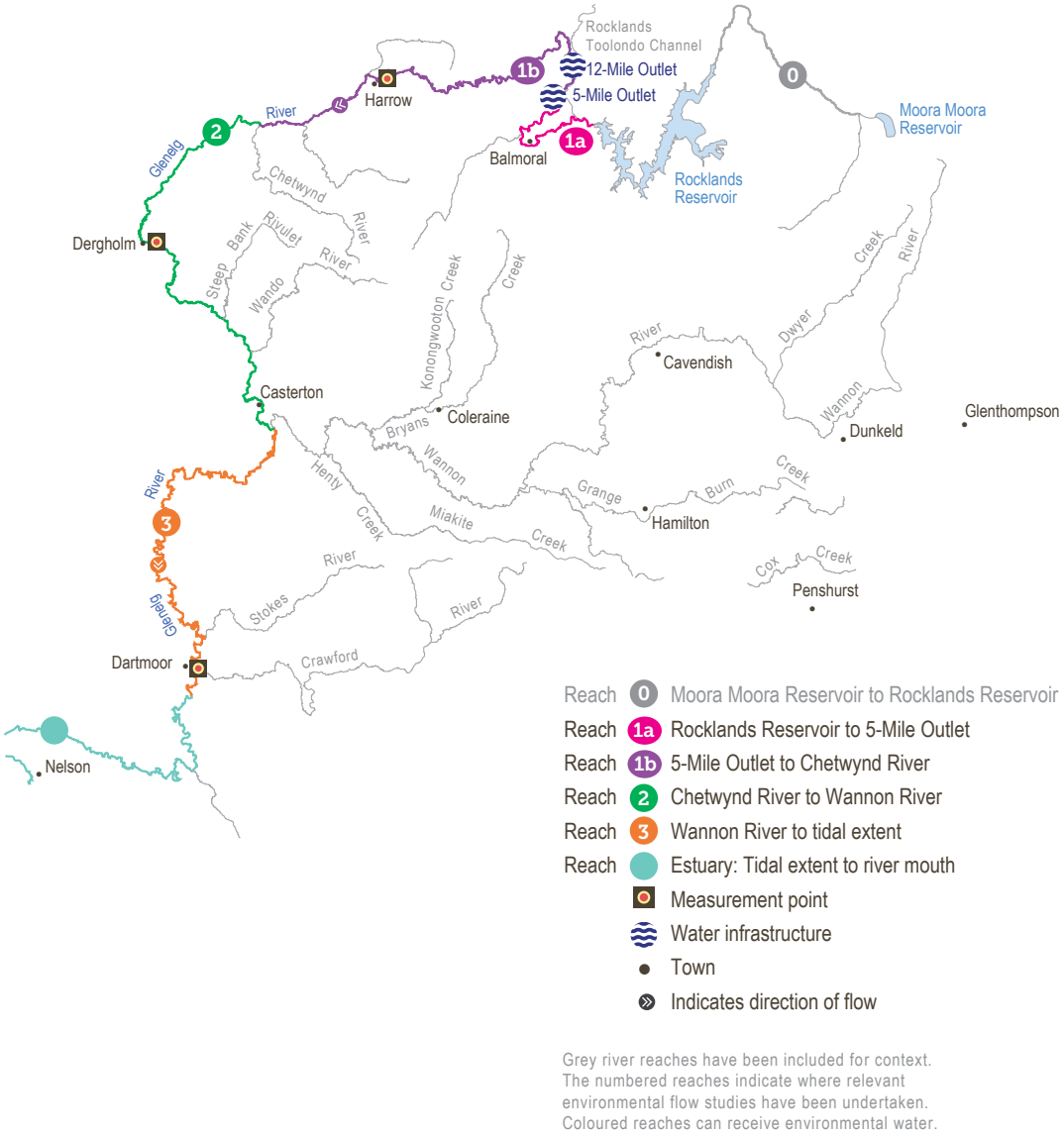
Although not managed for environmental needs, the Glenelg River above Rocklands Reservoir (reach 0) runs mostly through the Grampians National Park and retains significant environmental values. Further work is being undertaken to confirm the flow requirements of this reach. Work is also being undertaken to better understand the role that environmental releases from Rocklands Reservoir play in the health of the Glenelg River estuary (which is listed as a heritage river reach and has been nominated for listing under the Ramsar Convention).

Environmental watering objectives in the Glenelg system
Maintain a healthy and diverse mix of riverside plant life
Protect and boost populations of native fish including the threatened variegated pygmy perch
Provide flows for fish to move upstream and downstream and between the river and the ocean, encouraging fish (such as eel, bream, estuary perch and tupong) to spawn
Maintain a wide range of waterbugs to provide energy, break down organic matter and support the river's food chain
Move built-up sand on the river bed to provide healthy habitat pools and places to shelter for fish, platypus and other water animals (such as the critically endangered Glenelg freshwater mussel and endangered Glenelg spiny crayfish)

Recent conditions

The Glenelg catchment was extremely dry in 2015–16. Low rainfall and inflows meant water allocations were only 16 percent and passing flows from Rocklands Reservoir were severely reduced. Management of environmental water focused on maintaining water quality at key locations and reducing risks to plants and animals from the prolonged dry conditions in the river.

Figure 4.2.1 The Glenelg 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 water carried over from 2014–15 was critical to support flows in 2015–16. Along with low passing flows, low environmental water availability meant that no winter or spring watering was possible. In response to deteriorating water quality, environmental water was released to the Glenelg River in late October 2015, with two subsequent freshes released in December and February.

Water quality was improved as a result of all three freshes. Only a limited length of river could be watered as the losses for all deliveries were very high due to the dry conditions. Releases directly downstream of Rocklands Reservoir only reached Balmoral and releases from the 5-Mile and 12-Mile outlets reached Dergholm at much reduced rates compared to a wetter year. The river effectively ceased to flow at Casterton from November to May with environmental releases only temporarily connecting discreet refuge pools to boost water quality.

Water quality was monitored at key sites in reaches 1b and 2 to inform and monitor the impact of environmental flow releases. Although results demonstrated that each delivery did improve water quality, salinity steadily increased through the year.

Fish moved to refuge pools as the river ceased to flow and the river became a series of disconnected pools. A priority objective for flow management, given the low water availability in 2015–16, was to avoid critical losses of native fish. Fish abundance remained high during fish surveys undertaken in early 2016 with diversity at sampling sites reflecting previous sampling efforts.

Vegetation in and along the Glenelg River has been especially impacted by prolonged cease-to-flow conditions with key habitat areas drying out and increased grazing pressure in riparian areas through 2015–16.

Scope of environmental watering

Potential environmental watering actions and their environmental objectives are shown in Table 4.2.1.

Table 4.2.1 Potential environmental watering actions and objectives for the Glenelg system

Potential environmental watering	Environmental objectives
Summer/autumn freshes targeting reach 1a (2 freshes of 60 ML/day for 2–3 days each in December–May)	• Provide variable flows during low-flow season to support waterbugs, diverse habitats and water quality • Facilitate localised scouring of sand for fish habitat • Maintain condition of emergent vegetation by wetting lower banks • Flush pools to prevent water quality decline during low flows
Summer/autumn freshes targeting reaches 1b (2 freshes of 100 ML/day for 2–3 days each in December–May)	
Summer/autumn freshes targeting reach 2 (2 freshes of 150 ML/day for 2–3 days each in December–May)	
Summer/autumn baseflows targeting reach 1a (10 ML/day or natural in December–May)[1]	• Protect against rapid water quality decline over low-flow period • Maintain edge habitats, pools and shallow water habitat availability for fish, waterbugs and platypus • Maintain a near-permanent inundated stream channel to prevent excessive in-stream terrestrial species growth and promote in-stream vegetation
Summer/autumn baseflows targeting reach 1b (15 ML/day or natural in December–May)[1]	
Summer/autumn baseflows targeting reach 2 (25 ML/day or natural in December–May)[1]	
Winter/spring freshes targeting reach 1b (1–5 freshes of 250 ML/day for 1–5 days in June–November)[2]	• Wet benches to improve condition of emergent vegetation and maintain habitat diversity • Increase the baseflow water depth and connectivity to provide stimulus and opportunity for fish movement • Facilitate localised scouring of sand for fish habitat • Maintain pools and inundate benches to improve in-stream habitat and vegetation diversity
Winter/spring freshes targeting reach 2 (1–5 freshes of 300 ML/day for 1–5 days in June–November)	
Winter/spring baseflows targeting reach 1a (60 ML/day or natural in June–November)[1, 3]	• Provide desirable water quality conditions for fish, waterbugs and aquatic vegetation • Maintain seasonality of flows and improve habitat diversity by increasing wetted area from summer period • Maintain shallow water habitat availability for fish and waterbugs and facilitate annual dispersal of juvenile platypus
Winter/spring baseflows targeting reach 1b (100 ML or natural per day in June–November)[1, 3]	
Winter/spring baseflows targeting reach 2 (160 ML/day or natural in June–November)[1, 3]	

1 Cease-to-flow events occur naturally in the Glenelg system and may be actively managed. In the most recent flows study, the recommendation is that cease-to-flow events should occur as infrequently as possible and not exceed the duration of events that might have occurred naturally, to reduce stress on environmental values. Cease-to-flow events should be followed with a fresh.

2 Winter/spring freshes in reach 1a are important to the health of the Glenelg River but due to operational constraints and potential flooding risks achievement relies solely on natural events.

3 Passing flows provided under the environmental entitlement generally provide winter/spring baseflows. However, if passing flows are reduced, managed environmental water releases may be required to supplement them or to ensure appropriate rates of rise and fall and provide appropriate conditions in fresh events.

Scenario planning

Table 4.2.2 outlines the potential environmental watering and expected water usage under a range of planning scenarios.

It is unlikely that there will be sufficient environmental water available to deliver all potential environmental watering actions in 2016–17. Tier 1 watering actions are those that can be delivered with the available water. Tier 2 watering actions include the water required to meet the remaining actions recommended by the scientific flow study under different climatic scenarios. While the actions are similar in each climatic scenario, the magnitude, duration and/or frequency differ between scenarios: therefore the volume required under each scenario also differs.

Due to the prolonged dry conditions in the region and associated low flows, water quality is likely to remain poor and pose a risk to aquatic species. Environmental water will help to minimise but not completely mitigate these impacts. As the dry conditions continue, the condition of the plants and animals in the system is likely to deteriorate, and the ability of the plants and animals to survive and recover will be reduced.

Under most scenarios, there will likely be periods of cease-to-flow in summer. Where possible, the duration of these cease-to-flow periods will be carefully managed and monitored to minimise adverse impacts and inform environmental water releases. The priority is to protect water quality and refuge pools to ensure habitat is available for native fish and other animals (such as platypus) in the warmer months (when the risks are highest). Winter watering will only be possible if there are significant inflows and allocations in the early part of the water year.

If wet conditions eventuate, the priority will be increasing the magnitude, frequency and duration of planned watering actions and providing or supplementing flows in the winter/spring period. Natural river flows and passing flows are also likely to contribute to achieving these objectives. Reserving water for carry over into the 2017–18 water year will also be a priority if wetter conditions eventuate.

Table 4.2.2 Potential environmental watering for the Glenelg system under a range of planning scenarios

Planning scenario	Extreme drought	Drought	Dry	Average	Wet
Expected availability of environmental water[1]	• 6,334 ML carryover • 5,000 ML VEWH • 0 ML CEWH[2] • 11,334 ML total[3]	• 6,334 ML carryover • 7,839 ML VEWH • 0 ML CEWH[2] • 14,173 ML total[3]	• 6,334 ML carryover • 17,979 ML VEWH • 0 ML CEWH[2] • 24,313 ML total[3]	• 6,334 ML carryover • 30,553 ML VEWH • 0 ML CEWH[2] • 36,887 ML total[3]	• 6,334 ML carryover • 45,560 ML VEWH • 0 ML CEWH[2] • 51,894 ML total[3]
Expected river conditions	• No passing, compensation or unregulated flows	• No passing, compensation or unregulated flows	• Restricted passing and compensation flows and no unregulated flows	• Some passing, compensation and unregulated flows, particularly in winter/spring	• Some passing, compensation and unregulated flows
Potential environmental watering – tier 1 (high priorities)[4]	• Summer/autumn freshes reach 1b • Summer/autumn freshes reach 2 • Summer/autumn baseflows reach 1b • Summer/autumn freshes reach 1a • Winter/spring freshes reach 1b	• Summer/autumn freshes reach 1b • Summer/autumn freshes reach 2 • Summer/autumn baseflows reach 1b • Summer/autumn freshes reach 1a	• Summer/autumn freshes reach 1b • Summer/autumn freshes reach 1a • Winter/spring freshes reach 1b • Summer/autumn freshes reach 2 • Spring/summer/ autumn baseflows reach 1b	• Summer/autumn freshes reach 1b • Summer/autumn freshes reach 1a • Winter/spring freshes reach 1b • Summer/autumn freshes reach 2 • Summer/autumn baseflows reach 1b • Summer/autumn baseflows reach 1a • Summer/autumn baseflows reach 2	• Summer/autumn freshes reach 1b • Summer/autumn freshes reach 1a • Winter/spring freshes reach 1b • Summer/autumn freshes reach 2 • Summer/autumn baseflows reach 1b • Summer/autumn baseflows reach 1a • Summer/autumn baseflows reach 2 • Winter/spring baseflows
Potential environmental watering – tier 2 (additional priorities)	• Summer/autumn baseflows reach 1b • Summer/autumn baseflows reach 1a • Summer/autumn baseflows reach 2 • Winter/spring baseflows reach 1a • Winter/spring baseflows reach 1b • Winter/spring freshes reach 2 • Winter/spring baseflows reach 2	• Summer/autumn baseflows reach 1a • Summer/autumn baseflows reach 1b • Winter/spring freshes reach 1b • Summer/autumn baseflows reach 2 • Winter/spring baseflows reach 1a • Winter/spring baseflows reach 1b • Winter/spring freshes reach 2 • Winter/spring baseflows	• Spring/summer/ autumn baseflows reach 1b • Summer/autumn baseflows reach 1a • Winter/spring baseflows reach 1b • Winter/spring baseflows reach 1a • Summer/autumn baseflows reach 2 • Winter/spring freshes reach 2 • Winter/spring baseflows reach 2	• Summer/autumn baseflows reach 2 • Winter/spring baseflows reach 1a • Winter/spring baseflows reach 1b • Winter/spring baseflows reach 2	• N/A
Possible volume of environmental water required to achieve objectives[5]	• 5,600 ML (tier 1) • 33,700 ML (tier 2)	• 7,087 ML (tier 1) • 47,793 ML (tier 2)	• 12,157 ML (tier 1) • 39,973 ML (tier 2)	• 18,443 ML (tier 1) • 17,967 ML (tier 2)	• 23,450 ML (tier 1)

1 Environmental water in the Wimmera–Glenelg system is shared between the Glenelg and Wimmera systems. The volumes specified show the likely availability across the shared systems and include 5,000 ML of allocation expected to be available through trade in 2016–17.

2 Commonwealth environmental water is only available for use in the Wimmera system.

3 This volume is a forecast of the total water likely to be available under the VEWH entitlement in 2016–17, including carryover water and the forecast allocation for the complete water year. The forecast opening allocation for each climate scenario is 0 ML under all scenarios, meaning the only water available is likely to be the carryover of about 6,300 ML at the start of the water year.

4 As the entitlement is shared between the Wimmera and Glenelg catchments, planning for tier 1 for each CMA has included a simplifying assumption that half of the expected allocations will be available to each CMA. A prioritisation process will be undertaken in consultation with the Wimmera and Glenelg Hopkins CMAs to determine the potential watering actions that will be undertaken in each system in the 2016–17 year.

5 Environmental water requirements for tier 2 actions are additional to tier 1 requirements.

Risk management

In preparing its seasonal watering proposal, Glenelg Hopkins CMA considered and assessed risks and identified mitigating strategies relating to implementing environmental watering. Risks and mitigating actions are continually reassessed by program partners throughout the water year (see section 1.3.6).

Engagement

Table 4.2.3 shows the partners, stakeholder organisations and individuals with which Glenelg Hopkins CMA engaged when preparing the Glenelg system seasonal watering proposal.

Seasonal watering proposals are informed by longer-term regional waterway strategies, environmental water management plans and environmental flow studies, which incorporate environmental, cultural, social and economic considerations.

Table 4.2.3 Partners and stakeholders engaged in developing the Glenelg system seasonal watering proposal

Stakeholder engagement
• Aboriginal groups (Gunditj Mirring Traditional Owner Aboriginal Corporation and Barengi Gadjin Land Council) • Parks Victoria • Glenelg Hopkins CMA Advisory Group (including representatives of stakeholder groups and landholders in the region) • Recreational groups: Balmoral Angling Club, Casterton Angling Society, VRFish, Dartmoor Angling Club, Warrnambool Offshore and Light Game Club, individual anglers • Community members and landholders (through direct engagement) • GWMWater • Wimmera CMA • Victorian Environmental Water Holder

Glenelg River, by Chloe Wiesenfeld, Victorian Environmental Water Holder

4.3 Wimmera system

Waterway manager – Wimmera Catchment Management Authority

Storage manager – GWMWater

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

Environmental values

The Wimmera River and its tributaries boast a wide range of environmental and social values. The Wimmera system is home to many significant plant and animal species including one of Victoria's few self-sustaining populations of freshwater catfish. It also contains self-sustaining endemic fish species including the flat-headed gudgeon and Australian smelt.

The MacKenzie River contains the only stable population of platypus in the Wimmera and also supports good populations of native fish, waterbugs, threatened Glenelg spiny crayfish and turtles. Particularly in dry times, it provides diverse habitat and refuge for these populations.

Protecting and restoring riparian vegetation communities is an environmental water objective for the Burnt and Bungalally creeks. Upper Burnt Creek contains an important native fish community and a population of threatened western swamp crayfish. Burnt Creek in particular provides habitat corridors for both aquatic and terrestrial species. Mount William Creek is a priority reach to assist in maintaining the creek's important populations of river blackfish, southern pygmy perch and threatened western swamp crayfish, in both the upper and lower sections.

Social and economic values

The Wimmera system offers many popular recreational activities including walking, boating, rowing, waterskiing, fishing and camping. It also provides important amenity for Wimmera residents in what is a very dry landscape. There are several events held on the waterways including the annual Kanamaroo Festival, the Horsham Triathlon, the Dimboola Rowing Regatta and the Horsham, Jeparit and Dimboola fishing competitions on the Wimmera River. The waterways in the Wimmera system continue to be important for Traditional Owners and their Nations in the region.

System overview

The Wimmera River commences in the Pyrenees Range near Elmhurst and receives flows from several tributaries including the MacKenzie River and the Mount William, Burnt and Bungalally creeks. All of these can receive environmental water, as can the Wimmera River downstream of lower Mount William Creek. Just east of Mt Arapiles the Wimmera River swings to the north and continues through Dimboola and Jeparit to Lake Hindmarsh, one of Victoria's largest freshwater lakes. During exceptionally wet periods, Lake Hindmarsh overflows into Outlet Creek and on to Lake Albacutya, an internationally recognised Ramsar-listed wetland extending to the Wirrengren Plain in the southern Mallee.

Water in the Wimmera system is stored in three on-stream reservoirs—Lake Wartook on the MacKenzie River, Lake Lonsdale on Mount William Creek and Lake Bellfield on Fyans Creek—and in several off-stream storages: Taylors Lake, Lake Fyans and Toolondo Reservoir. The channel system enables water movement between storages and from the Glenelg to the Wimmera system. Inter-basin transfers of water can occur from the Glenelg system, from Rocklands Reservoir via Rocklands-Toolondo Channel and from Moora Moora Reservoir via the Moora Channel to the Wimmera system. Water from the system is also delivered to towns and several Wimmera–Mallee wetlands in the Loddon, Avoca and Mallee catchments.

Passing flows are provided to the Wimmera River and to Mount William and Fyans creeks. Where possible, environmental water releases will be combined with passing flows, unregulated flows and the delivery of consumptive water en route, to optimise environmental outcomes.

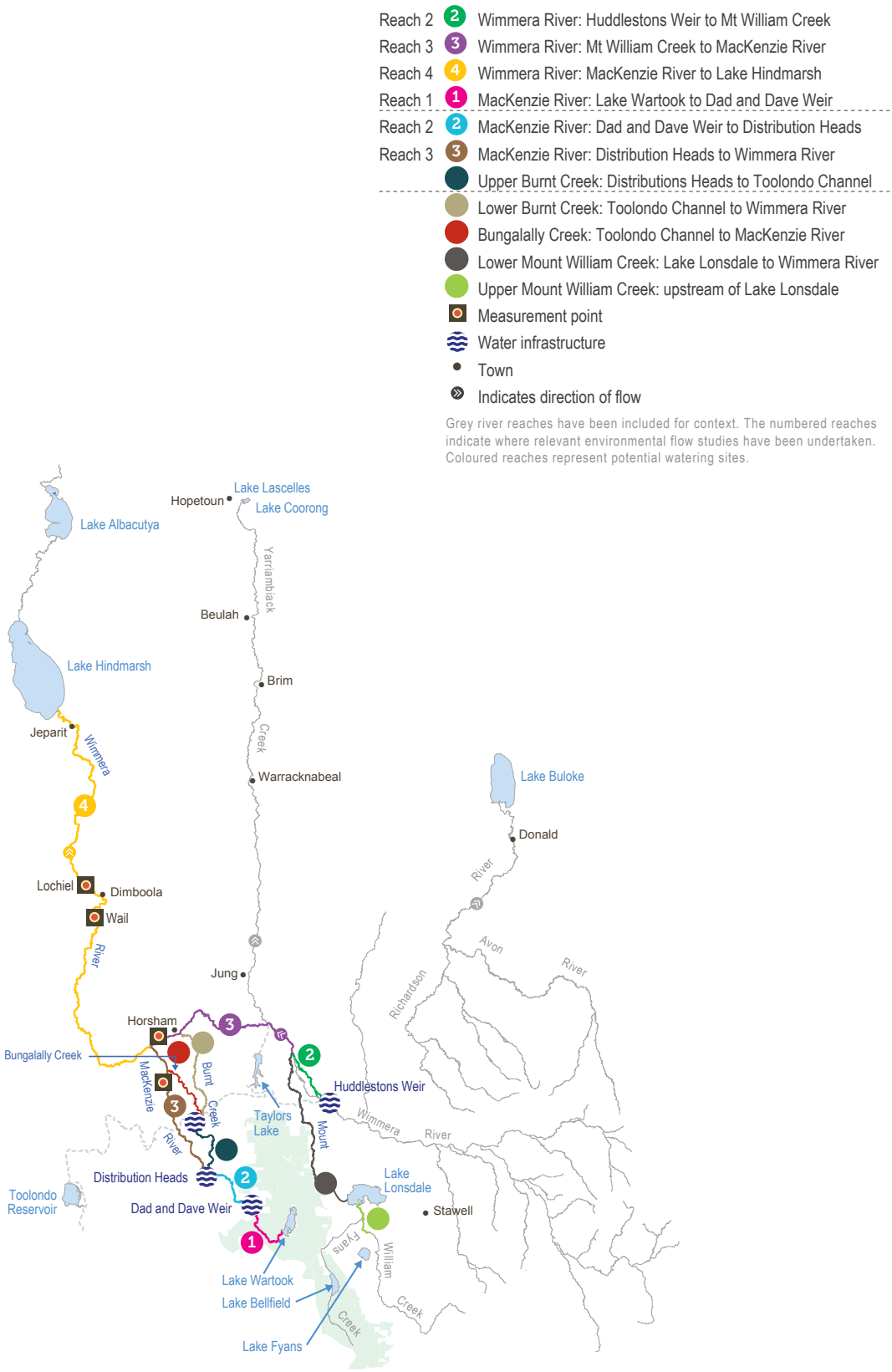
Priority reaches for environmental watering in the Wimmera system are the Wimmera River reach 4, MacKenzie River reaches 2 and 3, upper and lower Mount William Creek, upper and lower Burnt Creek and Bungalally Creek, due to the range of environmental values they support.

Yarriambiack Creek, a distributary of the upper Wimmera River, has historically received some flows during high-flow events in the Wimmera River. However, the creek now receives more flows due to modifications to the offtake. This reduces the effectiveness of environmental water deliveries to the high-priority reaches of the Wimmera River. In line with past practice during dry years, flows entering the creek may be blocked to ensure watering objectives in the Wimmera River are not compromised.

Environmental watering objectives in the Wimmera system

	Restore, protect and boost diverse populations of native fish including one of Victoria's few self-sustaining populations of freshwater catfish
	Maintain water quality to provide suitable conditions for fish and other water-dependent plants and animals
	Provide flows to support platypus, maximising habitat in which they can rest, breed, feed and allow dispersal to other areas
	Improve the condition, abundance and diversity of aquatic, emergent and riparian vegetation
	Support communities of waterbugs which provide energy, break down dead organic matter and support the river's food chain

Figure 4.3.1 The Wimmera system



Recent conditions

This year the Wimmera system has had the driest inflows on record, with environmental water releases making up the majority of flows for the lower Wimmera River as well as other waterways during drier months. Allocations to June 2016 were low (16 percent) and there were no passing flows in the Wimmera system. As a result, actions in 2015–16 relied heavily on environmental water carried over from 2014–15. Given the low water availability, the focus in 2015–16 was on maintaining water quality as much as possible, to maximise the habitat available for plants and animals in the dry climate by maintaining drought refuges.

With the limited water available, watering in the Wimmera system commenced in October 2015 and was restricted to two freshes for the Wimmera River, one top-up for Mokepilly pool on upper Mount William Creek and summer/autumn baseflows for MacKenzie River, with some through-flows to upper Burnt Creek. There was not enough environmental water in 2015–16 to deliver flows to reach 3 of the MacKenzie River, the lower Wimmera River downstream of Dimboola Weir, lower Burnt Creek, Bungalally Creek or lower Mount William Creek.

Despite the dry conditions, the fish community in the Wimmera River is withstanding the stresses of drought with a good diversity found this year and evidence of catfish recruitment over a series of years. The western swamp crayfish in Mt William Creek at Mokepilly is a notable discovery as well as the southern pygmy perch recruitment there in 2015. Recent bird surveys have found a high diversity of birds along the lower Wimmera River indicating the importance of providing open water and habitat in the dry landscape.

While environmental flow targets were not achieved due to the limited water availability, the releases helped maintain water quality and habitat availability for aquatic species. In March 2016, an adult male platypus and a juvenile female platypus were found in the MacKenzie River, indicating the continued growth of the platypus population in this river.

Scope of environmental watering

Potential environmental watering actions and their environmental objectives are shown in Table 4.3.1.

Table 4.3.1 Potential environmental watering actions and objectives for the Wimmera system

Potential environmental watering	Environmental objectives
Wimmera River (reach 4)	
Summer/autumn baseflows (15 ML/day or natural in December–May)[1]	• Maintain edge habitats in deeper pools and runs, and shallow water habitat availability for waterbugs and native fish from the local area • Maintain near-permanent inundated stream channel for riparian vegetation and to prevent excessive in-stream terrestrial species growth
Winter/spring baseflows (30 ML/day in June–November)	• Provide flows variability to maintain diversity of habitats
Summer/autumn freshes (1–3 freshes of 70 ML/day for 2–7 days in December–May)	• Provide variable flows during low-flow season for waterbugs, fish movement and to maintain water quality and diversity of habitat
Winter/spring freshes (1–5 freshes of 70 ML/day for 1–4 days in June–November)	• Increase the baseflow water depth to provide stimulus for fish movement • Provide flow variability to maintain water quality and diversity of fish habitats
Moderate winter/spring freshes (1–3 freshes of 200 ML/day for 1–3 days in June–November[2])	• Wet lower benches, entraining organic debris and promoting diversity of habitat
Higher winter/spring freshes (1–2 freshes of up to 1,300 ML/day for 2–3 days in June–November)	• Flush surface sediments from hard substrates to support waterbugs • Wet higher benches, entraining organic debris and promoting diversity of habitat
MacKenzie River (reach 2 and 3)	
Year-round baseflows (of 2–27 ML/day or natural, year-round)[1]	• Maintain edge habitats and deeper pools and runs for waterbugs • Maintain inundated stream channel to protect and restore riparian and floodplain vegetation communities (including the Wimmera bottlebrush) and support aquatic vegetation for fish habitat • Maintain sufficient area of pool habitat for intact fish communities and shallow water habitats for small-bodied fish • Facilitate annual dispersal of juvenile platypus into the Wimmera River

Potential environmental watering	Environmental objectives
Summer/autumn freshes (3–4 freshes of 5–50 ML/day for 2–7 days each in December–May)	• Provide variable flows during low-flow season for waterbugs, for fish movement and to maintain water quality and diversity of habitat
Winter/spring freshes (5 freshes of 35–55 ML/day for 2–7 days in June–November)	• Stimulate fish movement and maintain water quality and habitat diversity
Higher winter/spring freshes (1–5 freshes of up to 130–190 ML/day for 1–4 days in June–November)	• Stimulate fish movement and maintain water quality • Flush surface sediments from hard substrates to support waterbugs • Wet higher benches, entraining organic debris and promoting diversity of habitat
Burnt Creek	
Year-round baseflows targeting upper Burnt Creek (1 ML/day or natural, year-round)[1]	• Maintain edge habitats and deeper pools and runs for waterbugs • Maintain inundated stream channel to protect and mimic riparian and floodplain vegetation communities and prevent excessive streambed colonisation by terrestrial vegetation species • Maintain sufficient area of pool habitat for intact fish communities and shallow water habitats for small-bodied fish
Summer/autumn freshes targeting upper Burnt Creek (3 freshes of 30 ML/day for 2–7 days each in December–May)	• Prevent decline in water quality by flushing pools during low flows
Winter/spring freshes targeting upper Burnt Creek (1–5 freshes of 55 ML/day for 3–7 days in June–November)	• Provide variable flows for fish movement and diversity of habitat • Flush surface sediments from hard substrates for waterbugs
Higher winter/spring freshes targeting upper Burnt Creek (1–3 freshes of up to 160 ML/day for 1–3 days in June–November)	• Disturb biofilms present on rocks or woody debris to support waterbugs
Year-round fresh targeting lower Burnt Creek (1 fresh of 45 ML/day or natural for 2 days at any time)	• Inundate riparian vegetation to maintain condition and facilitate recruitment • Entrain organic debris in the channel to support waterbugs • Maintain structural integrity of channel
High-flow fresh targeting lower Burnt Creek (1 fresh of 90 ML/day for 1 day in August–November)	• Inundate floodplain vegetation to maintain condition and facilitate recruitment • Entrain organic debris from the floodplain to support waterbugs • Maintain floodplain geomorphic features
Mount William Creek	
Top-up of upper Mount William Creek pools	• Maintain habitat for native fish
Year-round baseflows targeting lower Mount William Creek (5 ML/day or natural, year-round)[1]	• Maintain edge habitats and shallow water habitat for waterbugs and endemic fish • Maintain inundated stream channel to protect and restore riparian and floodplain vegetation communities and prevent excessive streambed colonisation by terrestrial vegetation species
Summer/autumn freshes targeting lower Mount William Creek (3 freshes of 20–30 ML/day for 2–7 days in December–May)	• Prevent decline in water quality by flushing pools during low flows • Provide variable flows during low-flow season for waterbugs, for fish movement and to maintain water quality and diversity of habitat
Winter/spring freshes targeting lower Mount William Creek (1–5 freshes of up to 100 ML/day for 1–7 days in June–November)	• Wet benches, entrain organic debris and promote habitat diversity • Flush surface sediments from hard substrates to support waterbugs
Higher winter/spring freshes targeting lower Mount William Creek (1–3 freshes of up to 500 ML/day for 1–3 days in June–November)	• Wet highest benches, entrain organic debris and promote habitat diversity
Bungalally Creek	
Year-round fresh (1 fresh of 60 ML/day for 2 days at any time)	• Inundate riparian zone to maintain condition and facilitate recruitment for riparian vegetation communities • Maintain structural integrity of channel and prevent loss of channel capacity

1 Cease-to-flow events occur naturally in the Wimmera system and may be actively managed. In the most recent flow study, the recommendation is that cease-to-flow events should occur as infrequently as possible and not exceed the duration of events that might have occurred naturally, to reduce stress on environmental values. Cease-to-flow events should be followed with a fresh lasting at least seven days.

2 Dependent on catchment conditions, the timing of this fresh may vary to optimise environmental outcomes.

A study exploring the feasibility of creating a refuge pool in an anabranch of the Wimmera River near Jeparit Weir is now underway. Once the study is complete, the site may be considered as an additional potential environmental watering action.

Scenario planning

Table 4.3.2 outlines the potential environmental watering and expected water usage under a range of planning scenarios.

It is unlikely that there will be sufficient environmental water available to deliver most potential environmental watering actions in 2016–17. Tier 1 watering actions represent those able to be delivered with the available water. Tier 2 watering actions include the water required to meet the remaining actions recommended by the scientific flow study under different climatic scenarios. While the actions are similar in each climatic scenario, the magnitude, duration and/or frequency differ between scenarios: therefore the volume required under each scenario also differs.

Due to the prolonged dry conditions in the region and associated low flows, water quality is likely to remain poor. This poses risks to aquatic species. Environmental water will help to minimise but not completely mitigate these risks.

Under most scenarios, there will likely be periods of cease-to-flow. The priority is to protect water quality and refuge pools in rivers and creeks to ensure habitat is available for native fish and other animals (such as platypus) during the warmer months (when risks are highest). Winter watering will only be possible if there are significant inflows and allocations in the early part of the water year.

Dry conditions can limit the opportunity to deliver some environmental watering actions due to infrastructure constraints or water quality issues in the Wimmera system. For example, opportunities to deliver environmental flows to lower Mount William Creek are restricted under dry conditions because Lake Lonsdale is expected to remain empty, as was the case at the start of 2016–17. Wimmera CMA and the VEWH will work closely with GWMWater to maximise environmental outcomes within the constraints posed by dry conditions.

If wet conditions eventuate, the priority will be increasing the magnitude, frequency and duration of planned watering actions and providing flows in the winter/spring period. Natural river flows and passing flows are also likely to contribute to achieving these objectives.

Reserving water to carry over into the 2017–18 water year will also be a priority if wetter conditions eventuate.

Table 4.3.2 Potential environmental watering for the Wimmera system under a range of planning scenarios

Planning scenario	Extreme drought	Drought	Dry	Average	Wet
Expected availability of environmental water entitlements[1]	• 6,334 ML carryover • 5,000 ML VEWH • 0 ML CEWH[2] • 11,334 ML total[3]	• 6,334 ML carryover • 7,839 ML VEWH • 0 ML CEWH[2] • 14,173 ML total[3]	• 6,334 ML carryover • 17,979 ML VEWH • 0 ML CEWH[2] • 24,313 ML total[3]	• 6,334 ML carryover • 30,553 ML VEWH • 0 ML CEWH[2] • 36,887 ML total[3]	• 6,334 ML carryover • 45,560 ML VEWH • 0 ML CEWH[2] • 51,894 ML total[3]
Expected river conditions	• No passing or unregulated flows	• No passing or unregulated flows	• Restricted passing and no unregulated flows	• Some passing and unregulated flows particularly in winter/spring	• Some passing flows and unregulated flows
Potential environmental watering – tier 1 (high priorities)[4]					
MacKenzie River reaches 2 & 3	• Summer/autumn freshes • Winter/spring freshes	• Summer/autumn freshes • Winter/spring freshes	• Summer/autumn freshes and baseflows • Winter/spring freshes and baseflows	• Summer/autumn freshes and baseflows • Winter/spring freshes and baseflows	• Summer/autumn freshes and baseflows • Winter/spring freshes and baseflows
Wimmera River reach 4	• Summer/autumn freshes • Winter/spring freshes	• Summer/autumn freshes • Winter/spring freshes	• Summer/autumn freshes and baseflows • Winter/spring freshes and baseflows	• Winter/spring freshes and baseflows summer/autumn freshes and baseflows	• Summer/autumn freshes and baseflows • Winter/spring freshes and baseflows
Upper Burnt Creek	• Summer/autumn freshes • Winter/spring freshes	• Summer/autumn freshes • Winter/spring freshes	• Summer/autumn freshes and baseflows • Winter/spring freshes and baseflows	• Summer/autumn freshes and baseflows • Winter/spring freshes and baseflows	• Summer/autumn freshes and baseflows
Upper Mt William Creek	• Pool top-ups	• Pool top-ups	• Pool top-ups	• Pool top-ups	• N/A
Lower Burnt Creek	• N/A	• N/A	• N/A	• N/A	• Winter/spring freshes and baseflows

Planning scenario	Extreme drought	Drought	Dry	Average	Wet
Bungalally Creek	• N/A	• N/A	• N/A	• N/A	• Fresh any time of year
Potential environmental watering – tier 2 (additional priorities)					
MacKenzie River reaches 2 & 3	• Summer/autumn freshes and baseflows • Winter/spring freshes and baseflows	• Summer/autumn freshes and baseflows • Winter/spring freshes and baseflows	• Summer/autumn freshes and baseflows • Winter/spring freshes and baseflows	• Winter/spring freshes and baseflows	• N/A
Wimmera River reach 4	• Summer/autumn freshes and baseflows • Winter/spring freshes and baseflows • Winter/spring moderate freshes	• Summer/autumn freshes and baseflows • Winter/spring freshes and baseflows • Winter/spring moderate freshes	• Summer/autumn freshes and baseflows • Winter/spring freshes and baseflows • Winter/spring moderate freshes • Winter/spring higher freshes	• Summer/autumn freshes and baseflows • Winter/spring freshes and baseflows • Winter/spring moderate freshes • Winter/spring higher freshes	• Summer/autumn freshes and baseflows • Winter/spring freshes and baseflows • Winter/spring moderate freshes • Winter/spring higher freshes
Upper Burnt Creek	• Summer/autumn freshes and baseflows • Winter/spring freshes and baseflows	• Summer/autumn freshes and baseflows • Winter/spring freshes and baseflows	• Summer/autumn freshes and baseflows • Winter/spring freshes and baseflows • Winter/spring higher freshes	• Summer/autumn freshes and baseflows • Winter/spring freshes and baseflows • Winter/spring higher freshes	• Summer/autumn freshes and baseflows • Winter/spring freshes and baseflows • Winter/spring higher freshes
Upper Mt William Creek	• Pool top-ups	• Pool top-ups	• Pool top-ups	• Pool top-ups	• Pool top-ups
Lower Mount William Creek	• Year-round baseflows • Summer/autumn freshes • Winter/spring freshes	• Year-round baseflows • Summer/autumn freshes • Winter/spring freshes	• Year-round baseflows • Summer/autumn freshes • Winter/spring freshes • Winter/spring higher freshes	• Year-round baseflows • Summer/autumn freshes • Winter/spring freshes • Winter/spring higher freshes	• Year-round baseflows • Summer/autumn freshes • Winter/spring freshes • Winter/spring higher freshes
Lower Burnt Creek				• Fresh any time of year	• Fresh any time of year • August–November high flow fresh
Bungalally Creek				• Fresh any time of year	• Fresh any time of year
Possible volume of environmental water required to achieve objectives[5]	• 5,667 ML (tier 1) • 36,570 ML (tier 2)	• 7,087 ML (tier 1) • 40,143 ML (tier 2)	• 12,157 ML (tier 1) • 46,666 ML (tier 2)	• 18,443 ML (tier 1) • 40,480 ML (tier 2)	• 25,947 ML (tier 1) • 41,766 ML (tier 2)

1 Environmental water in the Wimmera–Glenelg system is shared between the Glenelg and Wimmera systems. The volumes specified show the likely availability across the shared systems and include 5,000 ML of allocation expected to be available through trade in 2016–17.

2 Commonwealth environmental water is only available for use in the Wimmera system.

3 This volume is a forecast of the total water likely to be available under the VEWH entitlement in 2015–16, including carryover water and the forecast allocation for the complete water year. The forecast opening allocation for each climate scenario is 0 ML under all scenarios, meaning the only water available is likely to be carryover water of about 6,300 ML at the start of the water year.

4 As the entitlement is shared between the Wimmera and Glenelg catchments, planning for tier 1 for each CMA has included a simplifying assumption that half of the expected allocations will be available to each CMA. A prioritisation process will be undertaken in consultation with the Wimmera and Glenelg Hopkins CMAs to determine the potential watering actions that will be undertaken in each system in the 2016–17 year.

5 Environmental water requirements for tier 2 actions are additional to tier 1 requirements.

Risk management

In preparing its seasonal watering proposal, Wimmera CMA considered and assessed risks and identified mitigating strategies relating to implementing environmental watering. Risks and mitigating actions are continually reassessed by program partners throughout the water year (see section 1.3.6).

Engagement

Table 4.3.3 shows the partners and stakeholder organisations with which Wimmera CMA engaged when preparing the Wimmera system seasonal watering proposal. Other stakeholders and individuals are consulted throughout the year to assist the Wimmera CMA in implementing the seasonal watering plan.

Seasonal watering proposals are informed by longer-term regional waterway strategies, environmental water management plans and environmental flow studies, which include environmental, cultural, social and economic considerations.

Table 4.3.3 Partners and stakeholders engaged in developing the Wimmera system seasonal watering proposal

Stakeholder engagement
• Glenelg Hopkins CMA • Local governments (including Horsham Rural City Council and Hindmarsh Shire Council) • GWMWater • Victorian Environmental Water Holder

Wimmera River, by Chloe Wiesenfeld, Victorian Environmental Water Holder

4.4 Wimmera–Mallee wetlands

Waterway managers – Mallee, North Central and Wimmera catchment management authorities

Storage manager – GWMWater

Environmental water holder – Victorian Environmental Water Holder

Environmental values

There is great variation in the character of wetlands in the Wimmera–Mallee system. Though generally much smaller in size than other wetlands that receive environmental water in the Northern, Central and Gippsland regions, wetlands in the Wimmera–Mallee system provide important habitat, feeding and breeding opportunities for a range of waterbirds and animals in a predominantly dry landscape. Rare and vulnerable vegetation species (such as spiny lignum, ridged water milfoil and cane grass) are also present in some wetlands.

The Wimmera–Mallee wetlands include a wide range of wetland types (such as freshwater meadows, open freshwater lakes and freshwater marshes). This diversity is important to provide a range of different open-water habitats for the plants and animals in the western part of the state. They also vary in size, consist of many different vegetation communities and are home to native waterbird populations including brolgas, egrets, blue-billed ducks, freckled ducks, Australian painted snipes and glossy ibis. The wetlands provide a valuable source of water for other native animals including the vulnerable growling grass frog, turtles and many other species that rely on these wetlands as drought refuges and drinking holes.

Social and economic values

These wetlands are highly valued by the community and provide places for recreational activities including canoeing, yabbying, duck and quail hunting and bird watching.

Environmental watering objectives in the Wimmera–Mallee wetlands
Provide watering holes for native animals across the landscape
Strengthen and maintain plant life in and around the wetlands, including to provide shade, shelter and food for native animals
Provide habitat and food for frogs and turtles
Create shallow and deep wetlands to provide habitat for a wide range of waterbirds

System overview

The Wimmera–Mallee wetlands include 51 wetlands on public and private land spread across the dry north-west area of Victoria. Historically, the wetlands received water from the open channel system before the Wimmera–Mallee pipeline was completed. As part of the pipeline project, all stock and domestic supply dams were replaced with tanks and the open channel distribution system was replaced by pipeline. The project achieved significant water savings for environmental watering of the area's flow-stressed rivers, creeks and waterways and created regional development opportunities; but it also substantially reduced the open water in the formerly channel-supplied areas. To mitigate the loss of open water in the landscape, a 1,000 ML environmental entitlement was created to supply to wetlands (some with associated dams) that were previously supplied through the old channel system; the entitlement is supplied via the Wimmera–Mallee pipeline system. A project was completed to identify priority wetlands to be connected to the pipeline system, and all 51 wetlands are now connected to the pipeline.

Recent conditions

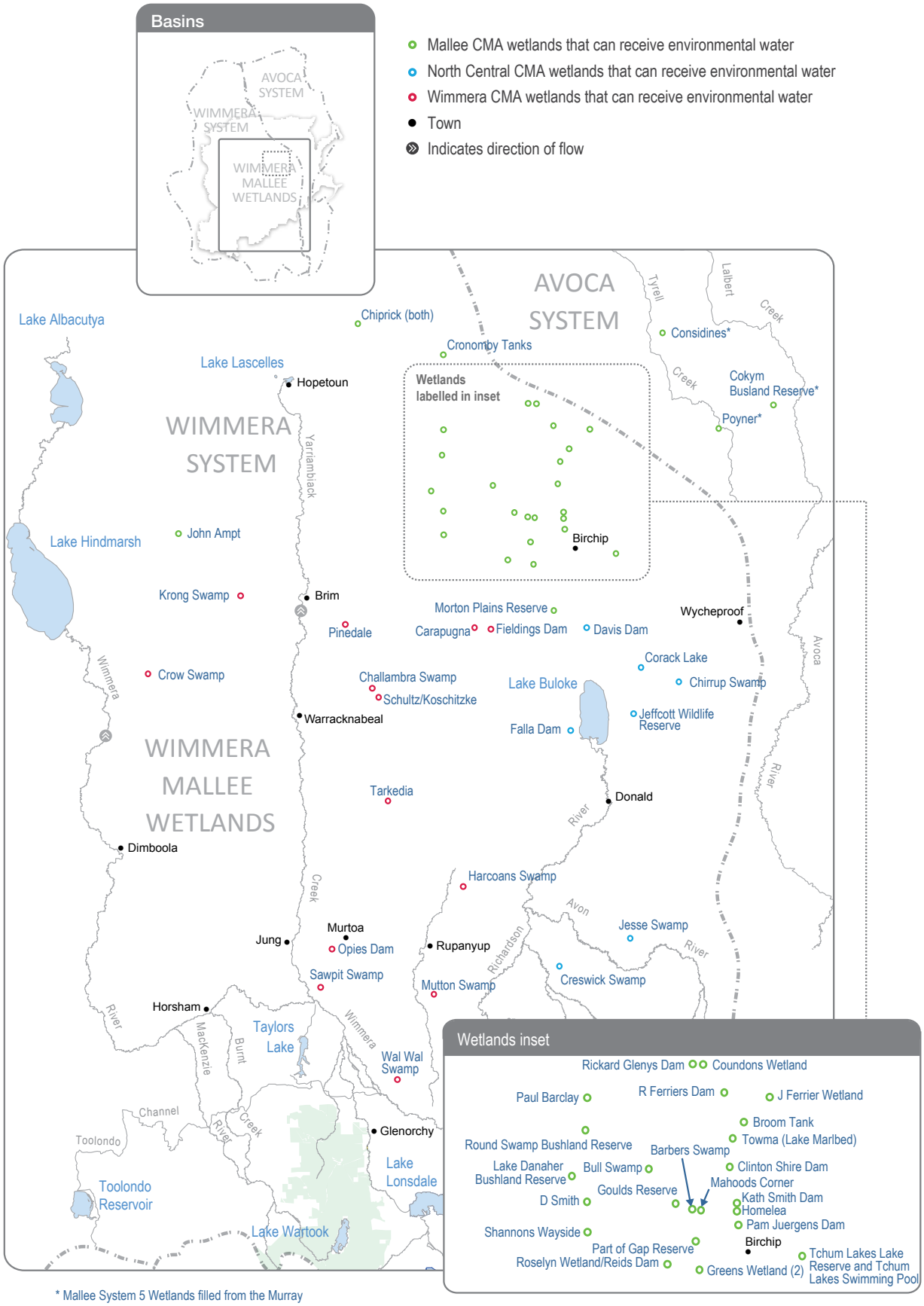
The Wimmera–Mallee region was very dry in 2015–16 with no allocation made to the wetland environmental entitlement. Despite this, carryover from previous years meant there was still environmental water available for use in 2015–16.

Deliveries were made to 40 wetlands in 2015–16: 24 wetlands in the Mallee area, seven in the north-central area and nine in the Wimmera area. Deliveries were made in spring 2015 and autumn 2016, with some wetlands receiving water once and others receiving water twice.

Given the dry conditions, watering was mostly of smaller parts of the wetlands to provide drought refuge in the landscape. There was some delivery of water into the main wetland areas at Cokum Bushland Reserve, Corack Lake and Jesse Swamp in spring 2015. Water was delivered to these wetlands to support vegetation growth and increase wetland type diversity, providing feeding opportunities for shallow wading birds and breeding habitat for frogs and turtles.

Many different animals (such as brolgas, wedge-tailed eagles, herons, ibis, yabbies, parrots, ducks, turtles, frogs, kangaroos and wallabies) used the Wimmera–Mallee wetlands in 2015–16. Vegetation (both submerged in the wetlands and on the banks) responded well at the wetlands that were watered and is contributing to improvement in the environmental conditions at these wetlands.

Figure 4.4.1 The Wimmera–Mallee wetlands



* Mallee System 5 Wetlands filled from the Murray

Scope of environmental watering

Potential environmental watering actions and their environmental objectives are shown in Table 4.4.1. The watering actions for these wetlands will typically be in spring or autumn but may occur at any time of the year depending on environmental need and seasonal conditions.

Table 4.4.1 Potential environmental watering actions and objectives for the Wimmera–Mallee wetlands

Potential environmental watering	Environmental objectives
North Central wetlands	
Davis Dam	• Support black box and cane grass vegetation • Provide drought refuge and a watering point for animals
Creswick Swamp	• Support a diversity of aquatic plants including re-established marbled marshwort • Provide refuge, feeding and breeding opportunities for frog and turtles
Chirrup Dam	• Provide drought refuge and a watering point for animals (particularly frogs and turtles) to facilitate recolonisation of Chirrup Swamp when it is naturally inundated
Corack Lake	• Provide conditions that support an abundance of aquatic plants • Provide refuge and nursery habitat for turtles and frogs • Provide variety of feeding conditions for waterbirds (such as drawdown zones and shallows)
Falla Dam	• Maintain as a drought refuge for turtles and frogs
Jeffcott Wildlife Reserve	• Maintain the diversity of aquatic plants • Provide refuge and breeding conditions for water-dependent species (such as frogs, waterbugs, turtles and waterbirds)
Jesse Swamp	• Promote native aquatic plant growth including re-establishment of marbled marshwort • Provide shallow foraging habitat for waterbirds (including brolgas) and feeding opportunities for frogs
Wimmera wetlands	
Carapugna	• Retain water in the wetland to sustain animals (especially frogs and wetland and woodland birds) • Sustain and where possible increase the abundance of wetland plants, especially threatened species
Challambra Swamp	
Crow Swamp	
Fieldings Dam	
Krong Swamp	
Mutton Swamp	
Pinedale	
Sawpit Swamp	
Schultz/Koschitzke	
Tarkedia	
Wal Wal Swamp	
Harcoans Swamp	
Opies Dam	
Mallee wetlands	
Barbers Swamp	• Maintain the health of fringing lignum and black box communities • Provide suitable feeding and breeding habitat for various waterbird guilds
Bull Swamp	
Cokum Bushland Reserve	
Tchum Lakes Lake Reserve (North Lake - Wetland)	
Tchum Lakes Swimming Pool (North Lake – Dam)	
Broom Tank	• Maintain the health of fringing lignum and black box communities • Improve the diversity and quality of wetland vegetation communities
Poyner	
Towma (Lake Marlbed)	
Clinton Shire Dam	• Maintain the health of fringing lignum and black box communities • Provide watering points for terrestrial and aerial animals
Pam Juergens Dam	

Potential environmental watering	Environmental objectives
Goulds Reserve	• Maintain the health of fringing lignum and black box communities
Greens Wetland (2)	
J Ferrier Wetland	
Part of Gap Reserve	
Roselyn Wetland	
Newer Swamp	
Mahoods Corner	• Provide suitable feeding and breeding habitat for various waterbird guilds • Improve the diversity and quality of wetland vegetation communities
Shannons Wayside	
Chiprick (both)	• Provide watering points for terrestrial and aerial animals
D Smith Wetland	
Homelea Wetland	
John Ampt	
Kath Smith Dam	
Paul Barclay	
R Ferriers Dam	
Rickard Glenys Dam	
Considines	• Maintain the health of fringing lignum and black box communities • Provide watering points for terrestrial and aerial animals • Improve the diversity and quality of wetland vegetation communities
Coundons Wetland	• Maintain the health of fringing lignum and black box communities • Maintain habitat opportunities for turtles and frogs • Provide watering points for terrestrial and aerial animals
Cronomby Tanks	• Maintain the health of fringing lignum and black box communities • Maintain habitat opportunities for turtles and frogs
Lake Danaher Bushland Reserve	• Maintain the health of fringing lignum and black box communities • Maintain habitat opportunities for turtles and frogs • Improve the diversity and quality of wetland vegetation communities
Morton Plains Reserve	• Maintain the health of fringing lignum and black box communities • Improve the diversity and quality of wetland vegetation communities • Provide suitable feeding and breeding habitat for various waterbird guilds

Scenario planning

Table 4.4.2 outlines the potential environmental watering and expected water usage under a range of planning scenarios.

Environmental water delivery to the wetlands relies on capacity in the Wimmera–Mallee pipeline system. CMAs work closely with GWMWater and land managers (including Parks Victoria, the Department of Environment, Land, Water and Planning and landowners) to manage around these capacity constraints and deliver environmental water to these wetlands.

The wetlands considered for potential environmental watering in 2016–17 have been determined after assessing their scientific watering requirements and watering history and considering climatic conditions, water availability and the likely capacity in the Wimmera–Mallee pipeline system.

Under drought conditions, the specific wetlands are planned to receive a small volume of water, in many cases topping up water levels from previous environmental watering. As conditions become wetter, the number of sites and extent of watering increases, with some wetland watering also aiming to inundate some of the surrounding vegetation. As a result, the expected water use increases as resources and conditions improve.

Due to the lower reliability of environmental water in the Wimmera–Mallee wetland system, carrying over water following wetter periods is considered important to assist in managing supply during dry times. A critical carryover volume of 134–218 ML has been identified, depending on the scenario.

Table 4.4.2 Potential environmental watering for the Wimmera–Mallee wetlands under a range of planning scenarios

Planning scenario	Drought	Dry	Average	Wet
Expected catchment conditions	• No rainfall or catchment inflows are likely to contribute to water levels in the wetlands	• No rainfall or catchment inflows are likely to contribute to water levels in the wetlands	• Some localised catchment inflows may contribute to water levels in some wetlands	• Catchment inflows are likely to contribute to water levels in the wetlands
Expected availability of environmental water	• 623 ML carryover • 0 ML allocation • 623 ML available	• 623 ML carryover • 0 ML allocation • 623 ML available	• 623 ML carryover • 50 ML allocation • 673 ML available	• 623 ML carryover • 1,000 ML allocation • 1,623 ML available
Potential environmental watering	• Barbers Swamp • Broom Tank • Bull Swamp • Carapugna • Challambra Swamp • Chirrup Swamp • Chiprick (both) • Clinton Shire Dam • Cokum Bushland Reserve[1] • Considines[1] • Corack Lake • Creswick Swamp • Cronomby Tanks • Crow Swamp • D Smith Wetland • Fieldings Dam • Greens Wetland (2) • Homelea • J Ferrier Wetland • Jeffcott Wildlife Reserve • Jesse Swamp • John Ampt • Lake Danaher Bushland Reserve • Mahoods Corner • Morton Plains Reserve • Mutton Swamp • Opies Dam • Part of Gap Reserve • Paul Barclay • Pinedale • Poyner[1] • R Ferriers Dam • Rickard Glenys Dam • Roselyn Wetland/Reids Dam • Newer Swamp • Schultz/Koschitzke • Shannons Wayside • Tarkedia Dam • Towma (Lake Marlbed) • Wal Wal Swamp	• Barbers Swamp • Broom Tank • Bull Swamp • Carapugna • Challambra Swamp • Chirrup Swamp • Chiprick (both) • Clinton Shire Dam • Cokum Bushland Reserve[1] • Considines[1] • Corack Lake • Creswick Swamp • Cronomby Tanks • Crow Swamp • D Smith Wetland • Davis Dam • Falla Dam • Fieldings Dam • Greens Wetland (2) • Homelea • J Ferrier Wetland • Jeffcott Wildlife Reserve • Jesse Swamp • John Ampt • Kath Smith Dam • Lake Danaher Bushland Reserve • Mahoods Corner • Morton Plains Reserve • Mutton Swamp • Opies Dam • Pam Juergens Dam • Part of Gap Reserve • Paul Barclay • Pinedale • Poyner[1] • R Ferriers Dam • Rickard Glenys Dam • Roselyn Wetland/Reids Dam • Newer Swamp • Schultz/Koschitzke • Shannons Wayside • Tarkedia Dam • Tchum Lakes Lake Reserve (North Lake - Wetland) • Tchum Lakes Swimming Pool (North Lake - Dam) • Towma (Lake Marlbed) • Wal Wal Swamp	• Barbers Swamp • Broom Tank • Bull Swamp • Carapugna • Challambra Swamp • Chirrup Swamp • Chiprick (both) • Clinton Shire Dam • Cokum Bushland Reserve[1] • Considines[1] • Corack Lake • Coundons Wetland • Creswick Swamp • Cronomby Tanks • Crow Swamp • D Smith Wetland • Davis Dam • Falla Dam • Fieldings Dam • Goulds Reserve • Greens Wetland (2) • Homelea • J Ferrier Wetland • Jeffcott Wildlife Reserve • Jesse Swamp • John Ampt • Kath Smith Dam • Lake Danaher Bushland Reserve • Mahoods Corner • Morton Plains Reserve • Mutton Swamp • Opies Dam • Pam Juergens Dam • Part of Gap Reserve • Paul Barclay • Pinedale • Poyner[1] • R Ferriers Dam • Rickard Glenys Dam • Roselyn Wetland/Reids Dam • Newer Swamp • Sawpit Swamp • Schultz/Koschitzke • Shannons Wayside • Tarkedia Dam • Tchum Lakes Lake Reserve (North Lake - Wetland) • Tchum Lakes Swimming Pool (North Lake - Dam) • Towma (Lake Marlbed) • Wal Wal Swamp	• Barbers Swamp • Broom Tank • Bull Swamp • Carapugna • Challambra Swamp • Chirrup Swamp • Chiprick (both) • Clinton Shire Dam • Cokum Bushland Reserve[1] • Considines[1] • Corack Lake • Coundons Wetland • Creswick Swamp • Cronomby Tanks • Crow Swamp • D Smith Wetland • Davis Dam • Falla Dam • Fieldings Dam • Goulds Reserve • Greens Wetland (2) • Harcoans • Homelea • J Ferrier Wetland • Jeffcott Wildlife Reserve • Jesse Swamp • John Ampt • Kath Smith Dam • Krong Swamp • Lake Danaher Bushland Reserve • Mahoods Corner • Morton Plains Reserve • Mutton Swamp • Opies Dam • Pam Juergens Dam • Part of Gap Reserve • Paul Barclay • Pinedale • Poyner[1] • R Ferriers Dam • Rickard Glenys Dam • Roselyn Wetland/Reids Dam • Newer Swamp • Sawpit Swamp • Schultz/Koschitzke • Shannons Wayside • Tarkedia Dam • Tchum Lakes Lake Reserve (North Lake - Wetland) • Tchum Lakes Swimming Pool (North Lake - Dam) • Towma (Lake Marlbed) • Wal Wal Swamp
Possible volume of environmental water required to achieve objectives	• 137 ML	• 293 ML	• 656 ML	• 861 ML
Priority carryover requirements	• 134 ML	• 141 ML	• 141 ML	• 218 ML

1 Water supplied to these wetlands in supply system 5 is made available from GWMWater allocations.

Risk management

In preparing its seasonal watering proposal, the Wimmera, Mallee and North Central CMAs considered and assessed risks and identified mitigating strategies relating to implementing environmental watering. Risks and mitigating actions are continually reassessed by program partners throughout the water year (see section 1.3.6).

Engagement

Table 4.4.3 shows the partners, stakeholder organisations and individuals with which the Wimmera, Mallee and North Central CMAs engaged when preparing the Wimmera–Mallee wetlands seasonal watering proposal.

Seasonal watering proposals are informed by longer-term regional waterway strategies, environmental water management plans and environmental flow studies, which incorporate environmental, cultural, social and economic considerations.

Table 4.4.3 Partners and stakeholders engaged in developing the Wimmera–Mallee wetlands seasonal watering proposal

Partner and stakeholder engagement
All CMAs
• GWMWater • Parks Victoria • Victorian Environmental Water Holder
Mallee CMA
• Mallee CMA Aboriginal Reference Group, an advisory committee to Mallee CMA comprising Aboriginal representatives from across the region • Mallee CMA Land and Water Advisory Committee, an advisory group to Mallee CMA comprising community members from across the region • Landholders with wetlands on their properties in the Mallee • Barenji Gadjin Land Council • Department of Environment, Land, Water and Planning • North Central and Wimmera CMAs
North Central CMA
• Wimmera–Mallee Wetlands Environmental Water Advisory Group comprising community members; interest groups; North Central CMA Community Consultative Committee representatives; a North Central CMA Board member; Department of Environment, Land, Water and Planning and the VEWH • North Central CMA Community Consultative Committee, a community advisory group to the North Central CMA Board • Landholders with wetlands on their properties in the North Central area • Landcare groups • Barenji Gadjin Land Council • Department of Environment, Land, Water and Planning • Mallee and Wimmera CMAs
Wimmera CMA
• Landholders with wetlands on their properties in the Wimmera area • North Central and Mallee CMAs

Hattah-Kulkyne National Park, by David Blom