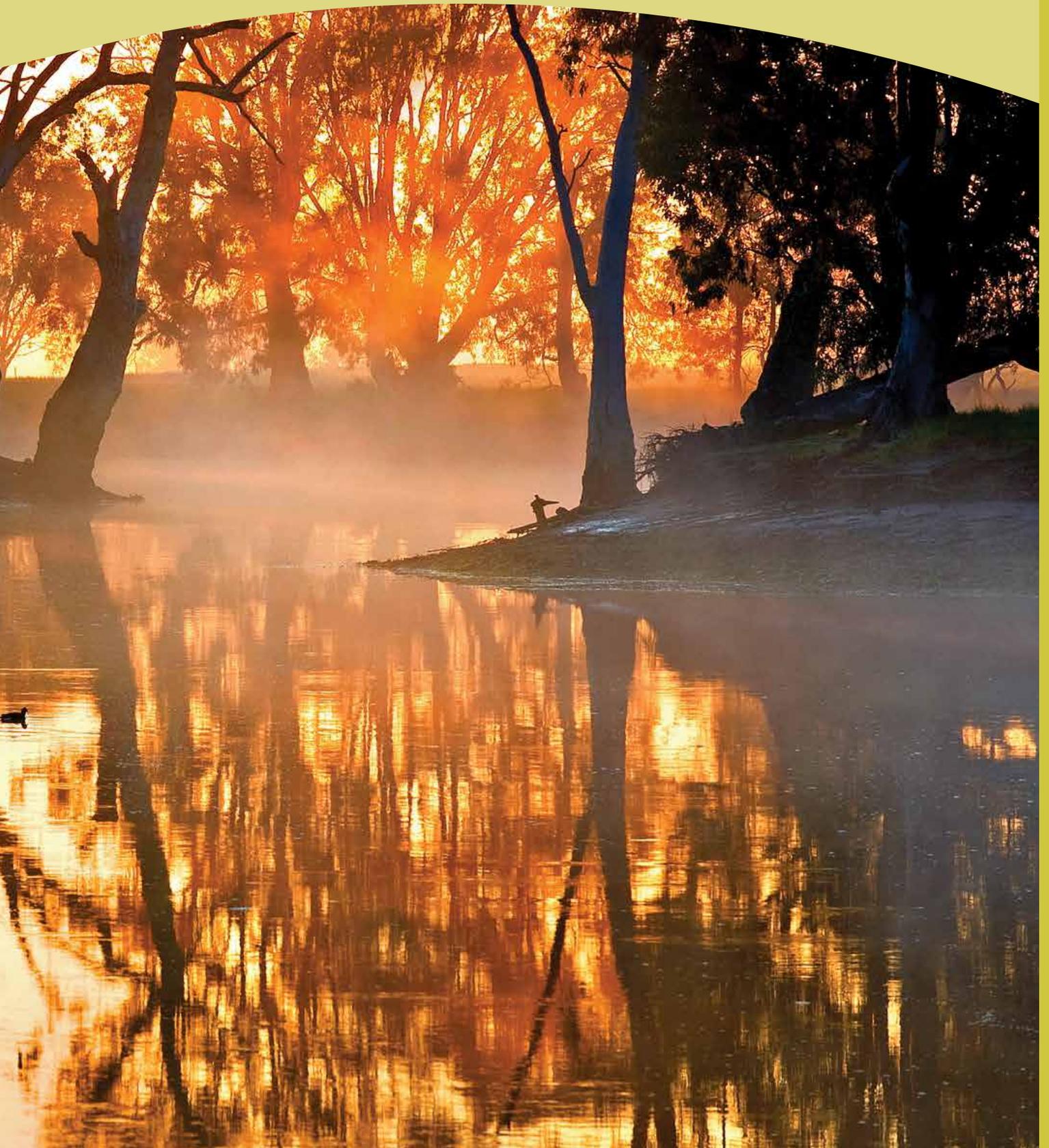


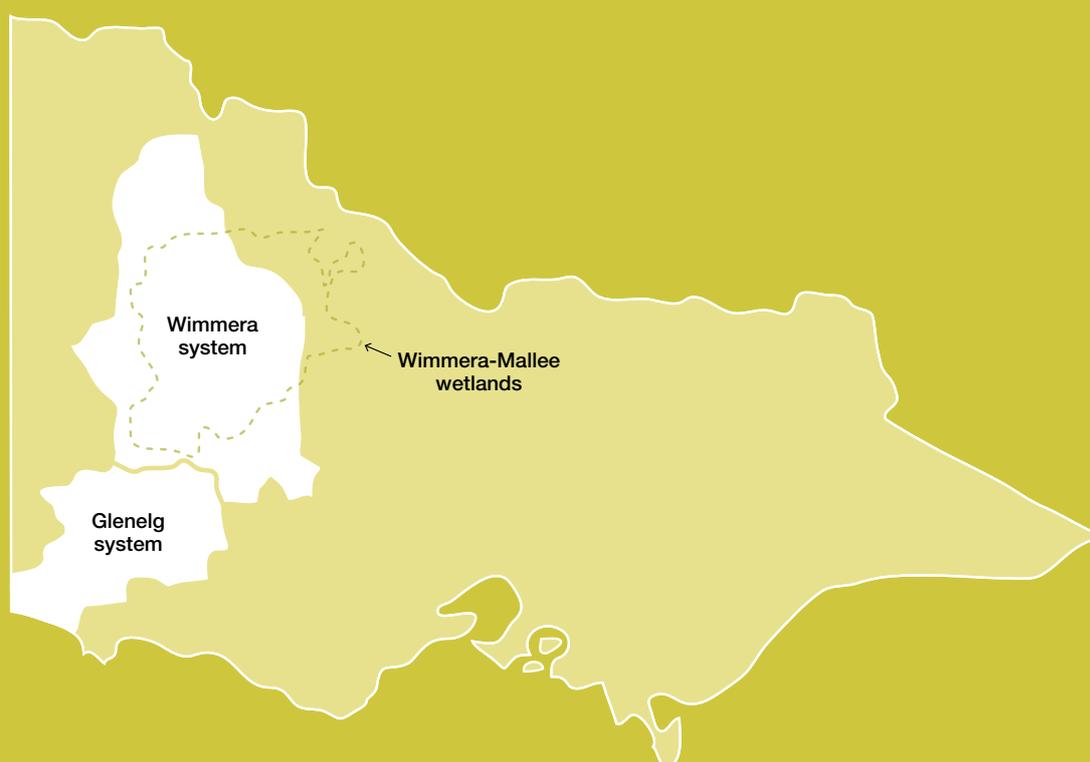
*Sunrise over the Wimmera River, by David Fletcher*

## Section 4

# *Western region*



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## 4.1 Western region overview

The systems in the western region that can receive water from the VEWH's environmental entitlements are the Glenelg River, the Wimmera River system and the Wimmera-Mallee wetlands. The Wimmera River system and Wimmera-Mallee wetlands are part of the Murray-Darling Basin, although the Wimmera River ends in terminal lakes without directly flowing into the Murray River.

Water for the environment in the western region is supplied from the Wimmera-Mallee headworks system. The Wimmera and Glenelg systems share water available under the environmental entitlement and the VEWH works with the Wimmera and Glenelg Hopkins CMAs to determine how the available allocation will be used in each river in a given year. There is an additional volume of water available to the Glenelg River, as a compensation flow account. The Commonwealth Environmental Water Holder (CEWH) also holds entitlement in the Wimmera system that can be used to supply the Wimmera River and lower Mount William Creek systems. Water for the environment available to the Wimmera-Mallee wetlands is provided under the same entitlement but not shared with the Glenelg system. Instead, the water is available for use in small wetlands supplied by the Wimmera-Mallee pipeline across the Wimmera, Mallee and North Central CMA regions.

Environmental values, recent conditions, environmental watering objectives and planned actions for each system in the western region are presented in the system sections that follow this regional overview.

### Traditional Owners in the western region

Traditional Owners in the western region have a deep connection to the region's rivers, wetlands and floodplains.

The Barengi Gadjin Land Council Aboriginal Corporation, Dja Dja Wurrung Clans Aboriginal Corporation and Gunditj Mirring Traditional Owners Aboriginal Corporation are the Registered Aboriginal Parties for the areas incorporating waterways covered by this section of the seasonal watering plan.

Burrandies Aboriginal Corporation (based in South Australia [SA]) represent the Boandik Traditional Owners for the south-west corner of the Glenelg River catchment.

In 2005, the Wotjobaluk, Jaadwa, Jadawadjali, Wergaia and Jupagalk peoples, who are often referred to collectively as the Wotjobaluk Peoples and who are represented by Barengi Gadjin Land Council, were recognised in a Native Title Consent Determination. Barengi Gadjin Land Council also entered into an Indigenous Land Use Agreement with the Victorian and Australian governments in 2005.

In 2007, the Gunditjmarra people were granted nonexclusive native title rights and interests over almost 140,000 ha of vacant Crown land, national parks, reserves, rivers, creeks and sea in Victoria's western district, and the State of Victoria reached an Indigenous Land Use Agreement with the Gunditjmarra People that establishes how they will exercise their rights and interests in the determination area.

In 2013, the Dja Dja Wurrung Clans Aboriginal Corporation entered into a recognition and settlement agreement under the *Traditional Owner Settlement Act 2010* in Victoria. Under the agreement, Dja Dja Wurrung people have rights to access and use water for traditional purposes, providing the take of water does not affect other parties.

The Eastern Maar Aboriginal Corporation is also a Registered Aboriginal Party within the geographic area, but its boundaries do not incorporate waterways managed with water for the environment in this section of the seasonal watering plan.

### Engagement

Seasonal watering proposals are informed by community, stakeholder and program partner engagement, as well as longer-term regional catchment strategies, regional waterway strategies, relevant technical studies (such as environmental flow studies and environmental water management plans). Program partners and other stakeholders help to identify environmental watering priorities and opportunities for the coming year. The strategies and technical reports collectively describe a range of environmental, cultural, economic, social and Traditional Owner perspectives and longer-term integrated catchment and waterway management objectives that influence environmental watering actions and priorities.

The International Association for Public Participation's Public Participation Spectrum (IAP2 Spectrum) has been used to categorise the levels of participation of stakeholders involved in the environmental watering planning process. Table 4.1.1 shows the IAP2 Spectrum categories and participation goals.

**Table 4.1.1 International Association for Public Participation’s Public Participation Spectrum categories and participation goals<sup>1</sup>**

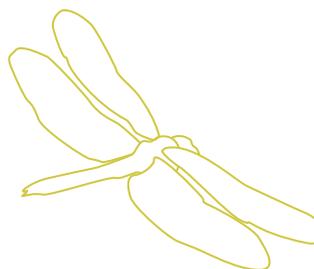
IAP2 level	Engagement goal
Inform	Provide balanced and objective information to assist understanding, alternatives, opportunities and/or solutions
Consult	Obtain feedback on analysis, alternatives and/or decisions
Involve	Work directly throughout a process to ensure that concerns and aspirations are consistently understood and considered
Collaborate	Partner in each aspect of the decision including the development of alternatives and the identification of the preferred solution
Empower	Place final decision making in the hands of the stakeholder

<sup>1</sup> The VEWH has the permission of the International Association for Public Participation to reproduce the IAP2 Spectrum.

Tables 4.1.2, 4.1.3 and 4.1.4 show the partners, stakeholder organisations and individuals with which Glenelg Hopkins CMA, Mallee CMA, North Central CMA and Wimmera CMA engaged when preparing their seasonal watering proposals. This includes engagement conducted as part of developing the seasonal watering proposals as well as engagement during the preparation of key foundational documents that directly informed the proposals. VEWH staff were also consulted for operational information as part of the development of all annual seasonal watering proposals by CMAs.

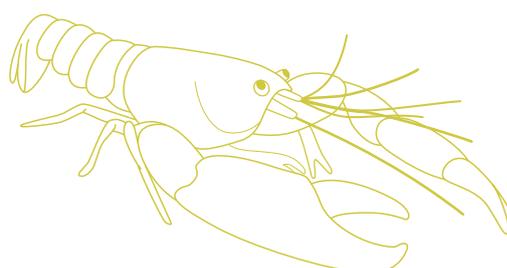
The tables also show the level of engagement between the CMAs and stakeholders of the environmental watering program in the western region based on the CMAs’ interpretations of the IAP2 Spectrum.

The level of engagement differs between organisations and between systems depending on the availability, capacity or interest of stakeholders to participate; the roles and responsibilities of organisations in managing a site or system; and the potential interaction of proposed watering with other activities on the waterway. For example, in the Wimmera region, councils have a strong involvement in environmental flows planning and delivery, because they manage town weir pools in Horsham, Dimboola and Jeparit through which environmental flows must pass. Councils in the Wimmera region have also expressed a strong interest in water for the environment, because of the benefits watering provides the region’s economy, tourism and environment. The Wimmera CMA works with these councils in the planning process and during the year to incorporate any aspirations or concerns. In other parts of the western region, local governments are less involved in management and may only need to be informed of the seasonal watering proposals.



**Table 4.1.2 Partners and stakeholders engaged by Glenelg Hopkins CMA in developing seasonal watering proposals for the Glenelg system and other key foundation documents that have directly informed the proposal**

Partner/stakeholder	Glenelg system
Community groups and environment groups	<b>IAP2 level: Collaborate</b> <ul style="list-style-type: none"> <li>• Friends of the Glenelg River</li> <li>• Glenelg River User Group</li> </ul>
Government agencies	<b>IAP2 level: Collaborate</b> <ul style="list-style-type: none"> <li>• Department of Environment, Land, Water and Planning</li> <li>• Grampians Wimmera Mallee Water</li> <li>• Parks Victoria</li> <li>• Victorian Fisheries Authority</li> <li>• Wimmera Catchment Management Authority</li> </ul>
Landholders/farmers	<b>IAP2 level: Collaborate</b> <ul style="list-style-type: none"> <li>• Individual landholders</li> </ul>
Local businesses	<b>IAP2 level: Inform</b> <ul style="list-style-type: none"> <li>• Balmoral Bush Nursing Centre</li> <li>• Balmoral Post Office</li> <li>• Glenelg River Boat Cruises</li> <li>• Grampians Resort</li> <li>• Nelson Boat and Canoe Hire</li> <li>• Paestan Canoe Hire</li> <li>• Vickery Brothers (sand extraction)</li> </ul>
Recreational users	<b>IAP2 level: Collaborate</b> <ul style="list-style-type: none"> <li>• Balmoral Angling Club</li> <li>• Casterton Angling Society</li> <li>• Dartmoor Angling Club</li> <li>• Individual anglers</li> <li>• South-west Fishing Reports</li> <li>• VRFish</li> </ul>
Traditional Owners	<b>IAP2 level: Collaborate</b> <ul style="list-style-type: none"> <li>• Gunditj Mirring Traditional Owner Corporation</li> <li>• Barengi Gadjin Land Council</li> <li>• Burrendies Aboriginal Corporation</li> </ul>



**Table 4.1.3 Partners and stakeholders engaged by Wimmera CMA in developing the seasonal watering proposal for the Wimmera system and other key foundation documents that have directly informed the proposal**

Partner/stakeholder	Wimmera system
Community groups and environment groups	<p><b>IAP2 level: Consult</b></p> <ul style="list-style-type: none"> <li>• Lake Lonsdale Action Group</li> <li>• Yarriambiack Creek Advisory Committee</li> <li>• Friends of Bungalally and Burnt Creek</li> </ul>
Government agencies	<p><b>IAP2 level: Collaborate</b></p> <ul style="list-style-type: none"> <li>• Commonwealth Environmental Water Office</li> <li>• Department of Environment, Land, Water and Planning – Grampians Region</li> <li>• Glenelg Hopkins CMA</li> <li>• Grampians Wimmera Mallee Water</li> </ul>
	<p><b>IAP2 level: Involve</b></p> <ul style="list-style-type: none"> <li>• Hindmarsh Shire Council</li> <li>• Horsham Rural City Council</li> </ul>
	<p><b>IAP2 level: Consult</b></p> <ul style="list-style-type: none"> <li>• Northern Grampians Shire Council</li> <li>• Parks Victoria</li> <li>• Victorian Fisheries Authority</li> <li>• Yarriambiack Shire Council</li> </ul>
Landholders/farmers	<p><b>IAP2 level: Inform</b></p> <ul style="list-style-type: none"> <li>• Wimmera community members, especially landholders</li> </ul>
Recreational users	<p><b>IAP2 level: Consult</b></p> <ul style="list-style-type: none"> <li>• Natimuk and District Field and Game</li> <li>• VRFish</li> <li>• Natimuk Lake Water Ski Club</li> <li>• Dimboola Water Ski Club</li> <li>• Dimboola Fishing Classic</li> <li>• Horsham Triathlon Committee</li> <li>• Wimmera Anglers' Association</li> <li>• Dimboola Rowing Club</li> <li>• Jeparit Anglers' Club</li> <li>• Hindmarsh Ski Club</li> <li>• Horsham Fishing Competition Committee</li> <li>• Canoeing Victoria</li> </ul>
Technical experts	<p><b>IAP2 level: Collaborate</b></p> <ul style="list-style-type: none"> <li>• Arthur Rylah Institute (Department of Environment, Land, Water and Planning)</li> </ul>
Traditional Owners	<p><b>IAP2 level: Collaborate</b></p> <ul style="list-style-type: none"> <li>• Barengi Gadjin Land Council</li> </ul>

**Table 4.1.4 Partners and stakeholders engaged by Mallee CMA, North Central CMA and Wimmera CMA seasonal watering proposals for the Wimmera-Mallee wetlands and other key foundation documents that have directly informed the proposals**

Partner/stakeholder	Wimmera Mallee wetlands
Community groups and environment groups	<p><b>IAP2 level: Inform</b></p> <ul style="list-style-type: none"> <li>Local Landcare groups</li> </ul>
Government agencies	<p><b>IAP2 level: Collaborate</b></p> <ul style="list-style-type: none"> <li>Commonwealth Environmental Water Holder</li> <li>Department of Environment Land, Water and Planning (Crown Land Management)</li> <li>Grampians Wimmera Mallee Water</li> <li>Parks Victoria</li> </ul>
	<p><b>IAP2 level: Inform</b></p> <ul style="list-style-type: none"> <li>Buloke Shire Council</li> <li>Yarriambiack Shire Council</li> </ul>
Landholders/ farmers	<p><b>IAP2 level: Collaborate</b></p> <ul style="list-style-type: none"> <li>Landholders</li> </ul>
	<p><b>IAP2 level: Inform</b></p> <ul style="list-style-type: none"> <li>Birchip Cropping Group</li> <li>Community members</li> </ul>
Local businesses	<p><b>IAP2 level: Inform</b></p> <ul style="list-style-type: none"> <li>Wimmera Mallee Tourism</li> </ul>
Recreational users	<p><b>AP2 level: consult</b></p> <ul style="list-style-type: none"> <li>Natimuk and District Field and Game</li> </ul>
	<p><b>IAP2 level: Inform</b></p> <ul style="list-style-type: none"> <li>Cokum community group</li> <li>Green Lake Regional Park</li> <li>Ouyen Lake Project</li> <li>Lake Tchum Committee</li> <li>Wimmera Bushwalking Club</li> </ul>
Technical experts	<p><b>IAP2 level: Collaborate</b></p> <ul style="list-style-type: none"> <li>Mallee CMA Land and Water Advisory Committee</li> </ul>
	<p><b>IAP2 level: Involve</b></p> <ul style="list-style-type: none"> <li>Arthur Rylah Institute (Department of Environment, Land, Water and Planning)</li> </ul>
Traditional Owners	<p><b>IAP2 level: Collaborate</b></p> <ul style="list-style-type: none"> <li>Barenji Gadjin Land Council</li> <li>Dja Dja Wurrung Clans Aboriginal Corporation</li> </ul>

## Community benefits from environmental watering

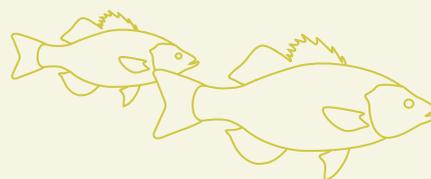
Healthy rivers and wetlands support vibrant and healthy communities. By improving the health of rivers, wetlands and floodplains, environmental flows also provide benefits to communities.

The VEWH and its program partners consider Aboriginal cultural, social and recreational values and uses of waterways when planning for environmental watering activities. Through engagement with community representatives, waterway managers aim to determine where community benefits from environmental flows can be optimised, while achieving environmental priorities for the year ahead.

Healthy waterways provide community benefits (such as providing nice places to walk, picnic or fish recreationally and sustaining healthy Country for Aboriginal communities).

Community benefits can sometimes be enhanced by modifying environmental flows (such as timing a flow to support a community rowing or fishing event), provided the environmental objective is not compromised.

The VEWH and its partners seek to deliver these benefits throughout the water year, though the opportunities can depend on the weather, climate or environmental conditions, water availability and the way the system is being operated to deliver water for other purposes.



### How have Traditional Owners' values and uses of waterways been considered?

In recognition of the cultural importance of water, caring for Country and their long-standing traditional ecological knowledge, Traditional Owners are increasingly working with waterway managers to plan for and deliver environmental flows. The following are examples in the western region:

- repeating the successful watering of Ranch Billabong at Dimboola. The Barengi Gadjin Land Council highlighted Ranch Billabong as a significant site during an Aboriginal Waterways Assessment in 2017. Water for the environment was delivered to the site in 2018–19 and 2019–20 to reduce salinity, improve the condition of vegetation and native wildlife and improve its suitability for Traditional Owner gatherings and events (such as earth oven and bark canoe re-creations)
- building on the achievements of the Towards Cultural Flows project (an ongoing partnership between Glenelg Hopkins CMA, Gunditj Mirring Traditional Owners Aboriginal Corporation, Barengi Gadjin Land Council and Burrandies Aboriginal Corporation in south-eastern SA), Traditional Owners and Glenelg Hopkins CMA will continue to identify opportunities for environmental flows to support cultural values and uses in the Glenelg River
- Glenelg Hopkins CMA will liaise with Traditional Owners about the timing of a summer fresh in the Glenelg River to align with the Johnny Mullagh Cup cricket match held in Harrow; the match is played by Aboriginal descendants of the first Australian international team that toured England in 1868.

Where participation of Traditional Owners in the planning and delivery of water for the environment has explicitly identified particular flows supporting cultural outcomes, these are identified in the system sections.

### How have economic, recreational and social values and uses of waterways been considered?

Environmental outcomes provide some direct economic, recreational, social benefits to communities. Waterway managers, in consultation with communities, have identified numerous opportunities to support these community benefits, including activities such as tourism, fishing, birdwatching, boating, and hunting. Examples in the western region include:

- improving fishing opportunities throughout the upper and middle reaches of the Glenelg catchment, where environmental flows support numerous fishing competitions and the Balmoral, Casterton and Dartmoor angling clubs
- keeping the Wimmera River flowing through late spring and summer/autumn, supporting many community activities including water-skiing at the Horsham and Dimboola Weir pools, the Dimboola (rowing) Regatta, the Wimmera River Duck Race (to raise money for the Wimmera Health Care Group) and the Horsham, Dimboola and Jeparit fishing competitions.

Investigations into the socio-economic benefits of water for the environment in waterways in the Wimmera over the last three years have indicated that Horsham and Dimboola continue to be hot-spots for recreational enjoyment along the Wimmera River. Results have also shown an increase in expenditure for locations along the Wimmera River over the three-year period. Physical and mental health benefits were also quantified and results demonstrate that the Wimmera River at Jeparit, Horsham and Dimboola is a key contributor.

Feedback from local landholders and the community is that they enjoy and support the delivery of environmental water to the Wimmera-Mallee wetlands. In a landscape characterised by a very dry climate and defined by hot, hard, farming work, these wetlands provide refuge for wildlife as well as local people by providing opportunities for swimming, boating, picnicking and walking, and venues for functions, meals, meetings and other community-based activities.

Summaries of the social, recreational and economic values considered are provided for each system. Where the timing or management of planned environmental flows may be modified to align with a community benefit, these are identified alongside the potential watering actions.

### Integrated catchment management

Altered water regimes are one of many threats to the health of Victoria's waterways. To be effective, environmental flows need to be part of an integrated approach to catchment management. Many of the environmental objectives for water for the environment in the western region will not be fully met without simultaneously addressing issues such as barriers to fish movement, high nutrient loads, loss of stream bank vegetation and invasive species.

Victorian and Australian government agencies, Traditional Owners, community groups and private landowners collectively implement a wide range of programs that aim to protect and improve the environmental condition and function of land, soils and waterways throughout Victoria's catchments.

Examples of complementary programs that are likely to support environmental watering outcomes in the western region include:

- major works recently completed by Glenelg Hopkins CMA to improve fish passage at Sandford Weir, Dergholm Gauge and Warrock will be used in combination with delivery of water for the environment to facilitate the movement of migratory fish from the estuary to the upstream reaches of the Glenelg and Wannon rivers
- installation of artificial wetland pontoons in the Dimboola weir pool and walking tracks to manage recreational access along the Wimmera River to reduce bank erosion
- weed and rabbit control by Wimmera CMA to prevent bank erosion in the upper Wimmera catchment to improve water quality, stream form and increase native biodiversity
- stock-exclusion fencing along priority waterways by Wimmera and Glenelg Hopkins CMAs throughout the Wimmera and Glenelg catchments, to support the re-establishment of streamside and in-stream vegetation, with over 2,000 km of fencing along the Glenelg River alone
- carp management activities in both the Wimmera and Glenelg systems to reduce the number of carp and to build understanding about their behaviour in both rivers to facilitate better environmental watering outcomes
- extensive installation of large woody fish habitat in Glenelg River reach 2 using red gum trunks and root balls to restore complex habitat
- control of invasive species and stock exclusion fencing in the Wimmera-Mallee wetlands.

For more information about integrated catchment management programs in the western region, refer to the Glenelg Hopkins, Wimmera, North Central and Mallee CMA's regional catchment strategies and regional waterway strategies.

### Risk management

During the development of the seasonal watering proposals for the Glenelg, Wimmera and Wimmera-Mallee wetland systems, environmental watering program partners assessed risks associated with potential environmental watering actions for 2020–21 and identified appropriate mitigating strategies. Risks and mitigating actions are continually assessed by program partners throughout the year (see subsection 1.3.6).

## Seasonal outlook 2020–21

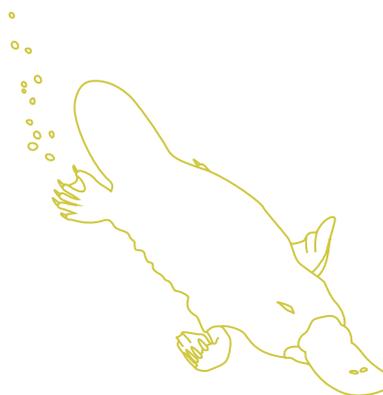
Rainfall across the western region in 2019–20 was below the long-term average for the third consecutive year. Despite the overall dry conditions, there were some periods of higher rainfall that contributed flow to the Wimmera and Glenelg rivers. Winter rain caused the Wimmera River above Huddlestons Weir to flow for the first time in more than a year, which met the planned watering actions in the Wimmera and Glenelg systems for the first few months of 2019–20. Water for the environment was needed to supplement flows in the Wimmera and Glenelg systems from October 2019 onwards. Continuous flow was maintained in the Glenelg River between Rocklands Reservoir and to the top of the estuary at Dartmoor throughout 2019–20 and periodic flow in the Wimmera River to Dimboola. However, environmental watering in some parts of the MacKenzie River, Burnt Creek and Mount William Creek was lower than planned, due to release limits at selected storages.

Water storages across the Wimmera-Mallee headworks were collectively below 30 percent of capacity at the end of April 2020. The VEWH received 42 percent allocation against its environmental entitlement in 2019–20. The CEWH did not receive any allocation in 2019–20, but all remaining carryover held from previous years' allocations was delivered in the Wimmera River and Mount William Creek during summer 2019–20.

Above-average rainfall and above-average temperatures are predicted for the western region in winter 2020, but the Wimmera-Mallee headworks storages will need significant inflows before any allocations are made to the environmental entitlement. The storage manager has indicated that entitlement holders will only receive low volumes of allocations in 2020–21 under drought, dry and average scenarios, and they are unlikely to receive full allocations even under a wet scenario.

If environmental allocations do not significantly increase in winter/spring 2020, environmental water for the rest of 2020–21 will be managed in line with drought or dry scenarios in both the Wimmera and Glenelg systems. The focus will be on delivering minimum low flow and small freshes as needed to maintain continuous river flow where possible, to maintain refuge pools where continuous flow cannot be achieved and to protect water quality. Carryover from 2019–20 will be critical in supporting these watering actions. If system inflows deliver higher environmental allocations, environmental water may be used to deliver winter/spring freshes and low flow in the Glenelg River through to reach 2, deliver additional winter/spring freshes in the Wimmera River and extend the summer/autumn low flow and freshes through to reach 3 of the MacKenzie River. Winter/spring inflows to the Wimmera-Mallee headworks storages will need to be well above average, to allow wet-scenario watering actions to be delivered in 2020–21.

The Wimmera-Mallee wetlands entitlement is not likely to receive any allocation in 2020–21 under drought, dry or average scenarios, so managed environmental deliveries to those sites will rely on carryover from 2019–20. The continuing focus of environmental watering in the Wimmera-Mallee wetlands will be to provide refuge and maintain habitat in the dry landscape, to support local plants and animals.



## 4.2 Glenelg system



**Waterway manager** – Glenelg Hopkins Catchment Management Authority

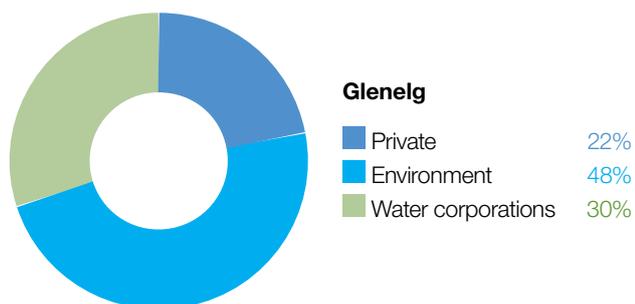
**Storage manager** – GMMWater

**Environmental water holder** – Victorian Environmental Water Holder

### *Did you know...?*

The Glenelg River, known as *Bochara* in Dhawurd Wurrung, *Pawur* in Bunganditj and *Bogara* in Wergaia-Jadawadjali, features in creation stories from south-western Victoria and is a traditional boundary between the Gunditjmara, Boandik and Jadawadjali people.

The Wimmera-Mallee headworks system captures run-off from both the Wimmera and Glenelg catchments. Entitlements to water held in this system cannot be accounted for separately in the two river basins, therefore this figure shows the proportion of entitlements across both systems.



**Proportion of water entitlements held across the Wimmera and Glenelg basins held by private users, water corporations or environmental water holders at 30 June 2019.**



*Top: Glenelg River at Harrow, by Glenelg Hopkins CMA  
Above: Tupong, by Glenelg Hopkins CMA*

### System overview

The Glenelg River rises in the Grampians and flows west through Harrow and then south to Casterton and Dartmoor. The Glenelg River estuary flows west from Dartmoor and passes through South Australia for a short distance before returning to Victoria and flowing into the sea at Nelson. At over 500 km, the Glenelg River is one of the longest rivers in Victoria.

The Glenelg River is an integral part of the Wimmera-Mallee headworks system, which supplies towns and properties across the western region. Moora Moora Reservoir and Rocklands Reservoir, in the upper Glenelg catchment and three weirs on the upper Wannon River, are all used to divert water from the Glenelg system to the Wimmera catchment. Water for the environment is actively managed in the Glenelg River below Rocklands Reservoir. Passing flow rules are in place for the Glenelg River and upper Wannon River.

The priority reaches of the Glenelg River that can be targeted by environmental flow releases are Rocklands Reservoir to 5-Mile Outlet (reach 1a), 5-Mile Outlet to the confluence with the Chetwynd River (reach 1b), Chetwynd River to the Wannon River (reach 2) and Wannon River to the tidal extent just below the confluence with Crawford River (reach 3). Water for the environment in the Glenelg system is released from Rocklands Reservoir for reach 1a via the reservoir wall outlet and for reaches 1b, 2 and 3 via the 5-Mile and 12-Mile outlets.

The Glenelg River estuary benefits from releases of water for the environment to upstream reaches, but releases do not currently target the estuary. The Glenelg Hopkins CMA is investigating the influence of managed environmental water on the Glenelg River estuary, which is listed as a heritage river reach and a site of international significance under the Ramsar Convention.

Trial releases were delivered from Moora Moora Reservoir above Rocklands Reservoir (reach 0) in 2017–18, 2018–19 and 2019–20. The results of that trial will be analysed to inform future decisions about potential environmental water use in reach 0.

### Environmental values

The Glenelg River starts in the Grampians (Gariwerd) National Park and flows to the sea through the Lower Glenelg National Park. The lower reaches of the Glenelg River are part of a landscape recognised as one of Australia's 15 national biodiversity hotspots, and the Glenelg Estuary and Discovery Bay site is Australia's most recent listing under the Ramsar Convention.

The Glenelg River supports a range of rare and unique aquatic life including the endangered Glenelg freshwater mussel and Glenelg spiny crayfish. It is also home to platypus and populations of native fish including river blackfish, estuary perch, kooyang (short-finned eel), tupong and three species of pygmy perch including the threatened variegated and Yarra pygmy perches. Some of these fish species migrate long distances to and from the Glenelg River estuary to complete their life cycles.

Frasers Swamp is another important feature of the upper Glenelg system, and is home to a healthy growing grass frog population.

The Glenelg River supports a variety of streamside vegetation communities and species including the endangered Wimmera bottlebrush. Streamside and floodplain vegetation is comprised of river red gum woodlands with paperbark, bottlebrush and tea tree understorey.

### Environmental watering objectives in the Glenelg River



Protect and increase populations of native fish



Maintain deep pool habitats and connectivity along the river



Maintain the platypus population



Maintain the health and increase the abundance of in-stream and streamside vegetation (such as river red gums and Wimmera River bottlebrush)

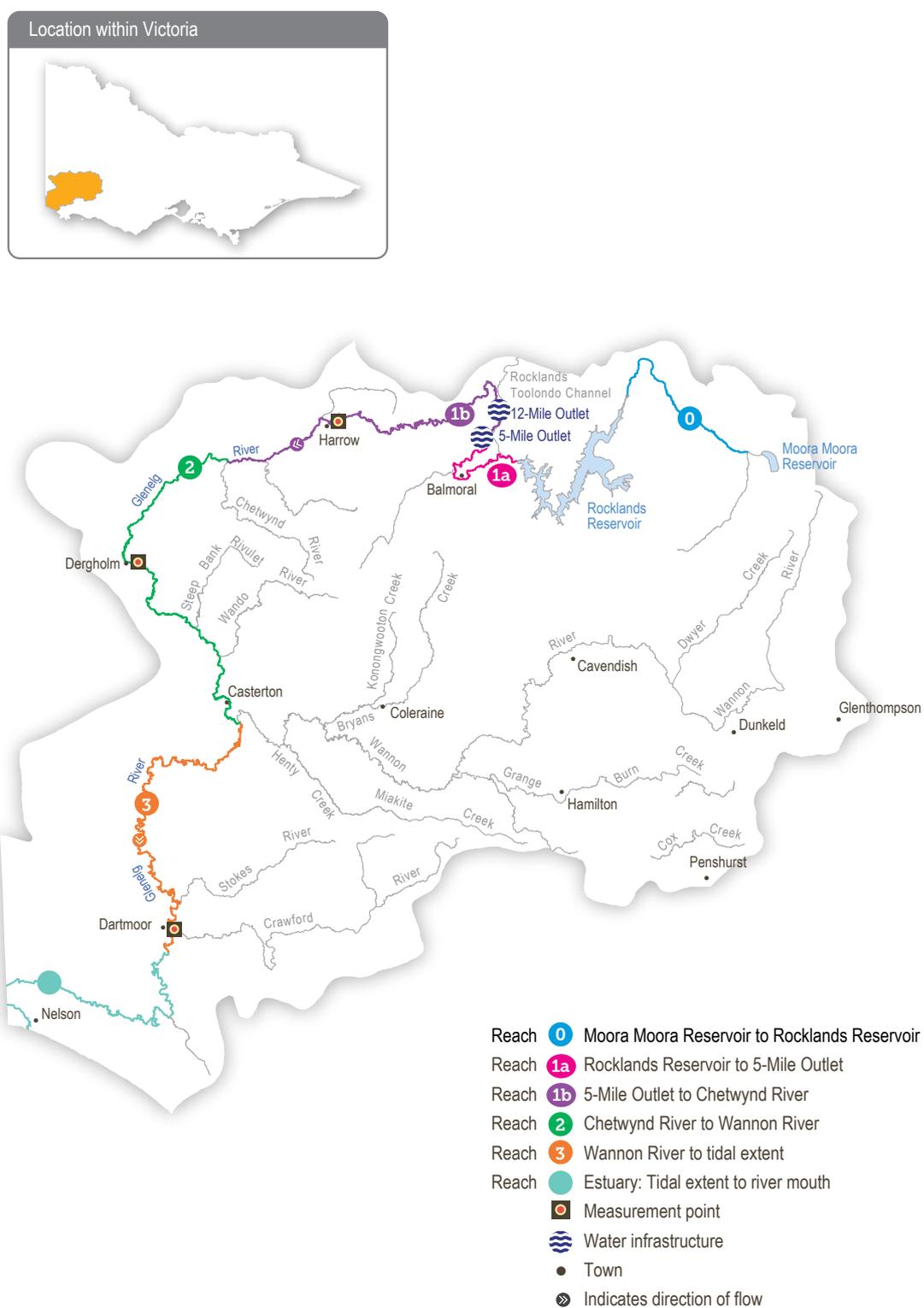


Maintain a wide range and large number of waterbugs to provide energy, break down organic matter and support the river's food chain



Maintain water quality for native fish, waterbugs, aquatic vegetation and other water-dependent animals

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.

### Traditional Owner cultural values and uses

The Glenelg River, known as *Bochara* in Dhawuard Wurrung, *Pawur* in Bunganditj and *Bogara* in Wergaia-Jadawadjali languages, is a significant feature in the cultural landscape of south-western Victoria. The river features in creation stories from the region. *Bochara-Bugara-Pawur* continues to be an important place for Traditional Owners, who have inhabited the area for thousands of years, using the rich resources available along the river and associated habitats.

In planning for environmental flows in the Glenelg River, Gunditj Mirring Traditional Owners Aboriginal Corporation, Barengi Gadjin Land Council, Burrandies Aboriginal Corporation and Glenelg Hopkins CMA have considered:

- supporting the health of cultural heritage sites, such as scar trees and the health of native plants which are sources of traditional foods and medicines
- improved health and abundance of totem species and their habitat resulting from environmental watering also has benefits for Traditional Owner spiritual wellbeing
- supporting contemporary cultural events (such as the Johnny Mullagh Cup).

Aboriginal peoples across the Glenelg catchment have retained a strong identity and connection to the traditional lands for which they have custodial rights and responsibilities. Traditional Owner values in the *Bochara-Bugara-Pawur* system align strongly with environmental values. Traditional Owner values are holistic and interrelated.

These values are bound up in the health of the river system overall, and the Country that the river is part of. Traditional Owner wellbeing is connected to the health of the river and the Country.

The Season Flows Calendar (Figure 4.2.2) illuminates flow regimes along one reach of the Glenelg River (reach 1b 5-Mile Outlet to Chetwynd River) and aligns them with corresponding environmental events and observations.

The value of the calendar is in its clear visual depiction of Traditional Owner knowledge, developed over many generations, of how varying flows correspond to seasonal conditions and broader environmental patterns. It is planned to embed the six seasons in the flow recommendations and scenario planning in the Glenelg Hopkins CMA watering proposal in future years.

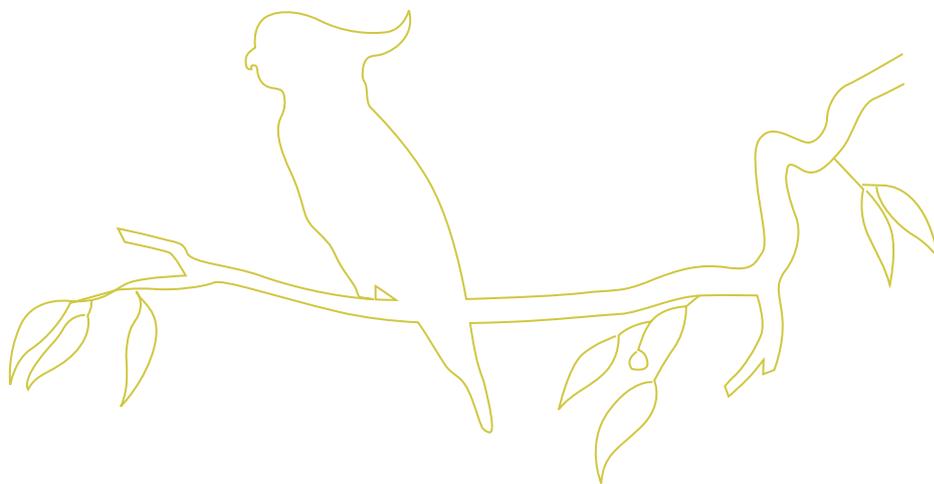
The seasonal calendar arises from the six seasons of Gunditjmarra country and was produced by Gunditj Mirring Traditional Owners Aboriginal Corporation. The northern part of the river upstream of Harrow area is in Jadawadjali Country and the south west part of the system is in Boandik Country. The calendar reflects seasonal flow conditions recognised by all the Traditional Owner groups.

Waterway managers are seeking opportunities to increase the involvement of Traditional Owners in environmental water planning and management. 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 4.2.1 with an icon.



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

The timing of the summer fresh is planned to support the annual Jonny Mullagh Cup cricket match between the Gunditj Mirring and Barengi Gadjin Traditional Owners. The fresh will improve water quality in swimming holes and improve amenity for the Traditional Owners attending the cricket event, which is an important cultural event held on the river.



Right: Figure 4.2.2 Seasonal Flows Calendar

# Glennelg River Environmental Flow Seasonal Calendar

Reach 1b Harrow

- 6 seasons of Gunditjmara Country
- Flow component and rate
- Flow asset and objective



This is the first attempt at incorporating Aboriginal values and knowledge into environmental watering for the Glennelg River. Please note that the information provided is not exhaustive, further work is still required to ensure that all Aboriginal and environmental values are considered appropriately for the Glennelg River.

### Social, recreational and economic values and uses

In planning the potential watering actions in Table 4.2.1, Glenelg Hopkins CMA considered how environmental flows could support values and uses including:

- water-based recreation (such as canoeing and fishing)
- riverside recreation and amenity (such as camping)
- community events and tourism (such as the Johnny Mullagh Cup and visitation)
- socio-economic benefits (such as diverters for irrigation, domestic and stock uses).

If the timing or management of planned environmental flows may be modified to align with a community benefit, this is acknowledged in Table 4.2.1 with an icon.

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

Environmental flow releases support the spawning and recruitment of popular angling species like estuary perch and bream. Local anglers continue to report increased fish activity associated with the delivery of freshes, improving fishing opportunities in the river. Releases support numerous fishing competitions including those of the Balmoral, Casterton and Dartmoor angling clubs.

The planning of the summer fresh improves accessibility, water quality and amenity for canoeists planning trips on the Glenelg River over the summer holiday period.

Summer and spring freshes provide a freshening flow which improves conditions at popular riverside campgrounds in the upper reaches of the Glenelg River including Fulham Reserve near Balmoral and the Johnny Mullagh Reserve at Harrow.

### Recent conditions

The Glenelg region had near-average rainfall and above-average temperatures during 2019–20, with large rain events during winter/spring and throughout autumn contributing flows via tributaries below Rocklands Reservoir. Inflows into the Wimmera-Mallee headworks tracked well below average, although milder conditions meant that evaporation losses were lower than normal over summer/autumn. On 1 April 2020, allocations reached 42 percent for the year for the Wimmera-Glenelg environmental entitlement. These allocations supplemented the 28,515 ML of environmental water carried over from 2018–19.

Natural flow in the Glenelg River provided required low flow and freshes during winter/spring 2019. These natural flows meant a proportion of prescribed passing flows could be withheld in winter and released in spring to meet Glenelg River flow objectives. Water for the environment was released from Rocklands Reservoir between November 2019 and May 2020 to maintain low flow and deliver summer/autumn freshes to provide habitat for native fish, platypus and waterbugs, allow fish and platypus to disperse and support instream and streamside vegetation. A trial watering event from Moora Moora Reservoir to the upper Glenelg River (reach 0) was delivered in November and December 2019, to better understand how managed flows could be used to support plant, waterbug and animal populations above Rocklands Reservoir.

All of the high-priority potential watering actions for the Glenelg River below Rocklands Reservoir were met in 2019–20 through natural flows, passing flows, managed environmental flows or a combination of these. Continuous flows were maintained through the whole system, and several freshes were delivered during summer and autumn to flush pools and improve the quality of habitat for native fish and platypus. Different release patterns were trialled from Rocklands Reservoir, 5-Mile Outlet and 12-Mile Outlet during summer/autumn 2019–20 to understand the most efficient way of meeting environmental flow targets.

Low storage levels across the Wimmera-Mallee headworks mean that if dry conditions persist, environmental watering actions in the Glenelg River during 2020–21 will primarily focus on protecting water quality and refuge habitat in reaches 1 and 2, to prevent significant declines in native fish and platypus populations.

### Scope of environmental watering

Table 4.2.1 describes the potential environmental watering actions in 2020–21, their functional watering objectives (that is, the intended physical or biological effect 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 functions.

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

Potential environmental watering action	Functional watering objectives	Environmental objectives
Summer/autumn low flow in reach 1a (10 ML/day or natural during December to May)	<ul style="list-style-type: none"> <li>Protect against rapid water quality decline over the low-flow period</li> <li>Maintain edge habitats, pools and shallow-water habitat for fish, waterbugs and platypus</li> <li>Maintain a near-permanent wetted stream channel to promote the growth of in-stream vegetation and prevent encroachment by terrestrial plants</li> </ul>	
Summer/autumn low flow in reach 1b (15 ML/day or natural during December to May/Big Dry to Early Wet*)		
Summer/autumn low flow in reach 2 (25 ML/day or natural during December to May)		
Summer/autumn low flow in reach 3 (80 ML/day or natural during January to April)		
Summer/autumn freshes in reach 1a (two freshes of 60 ML/day for two to three days during December to May) 	<ul style="list-style-type: none"> <li>Scour sand from pools to increase the quality and quantity of fish and waterbug habitat</li> <li>Wet emergent vegetation on the lower banks to improve its condition and prevent the encroachment of terrestrial species</li> <li>Flush pools to improve water quality and lower temperatures</li> <li>Provide sufficient flow to allow native fish and platypus to access habitat</li> </ul>	
Summer/autumn fresh in reach 1b (two freshes of 100 ML/day for two to three days during December to May/Big Dry to Early Wet*) 		
Summer/autumn fresh in reach 2 (two freshes of 150 ML/day for two to three days during December to May) 		
Summer/autumn fresh in reach 3 (two freshes of 150 ML/day for three days each or natural during January to April) 		

\* The six seasons of Gunditjmarra country match to reach 1b watering, as Figure 4.2.2 shows.

**Table 4.2.1 Potential environmental watering actions and objectives for the Glenelg River (continued)**

Potential environmental watering action	Functional watering objectives	Environmental objectives
Winter/spring fresh in reach 1b (one to five freshes of 250 ML/day for one to five days during June to November/Big Wet to Fattening Up*) 	<ul style="list-style-type: none"> <li>Wet benches to improve the condition of emergent vegetation and maintain habitat diversity</li> <li>Provide adequate depth for fish passage and cue fish movement</li> <li>Provide triggers for platypus burrow selection</li> <li>Scour sand from pools to improve the quality of fish habitat</li> </ul>	
Winter/spring fresh in reach 2 (one to five freshes of 300 ML/day for one to five days during June to November) 	<ul style="list-style-type: none"> <li>Wet vegetation in the river channel and on the channel benches to support recruitment and growth</li> </ul>	
Winter/spring low flow in reach 1a (60 ML/day or natural during June to November)	<ul style="list-style-type: none"> <li>Maintain water quality for fish and waterbugs</li> <li>Wet aquatic vegetation to maintain its condition and prevent encroachment by terrestrial species</li> <li>Maintain shallow-water habitat for fish, waterbugs and platypus</li> </ul>	
Winter/spring low flow in reach 1b (100 ML/day or natural during June to November/Big Wet to Fattening Up*)		
Winter/spring low flow in reach 2 (160 ML/day or natural during June to November)		
Winter/spring low flow in reach 3 (400 ML/day or natural during July to December)	<ul style="list-style-type: none"> <li>Wet benches to increase habitat and allow widespread fish passage and keep the estuary mouth open (based on estuary mouth flows)</li> </ul>	

\* The six seasons of Gunditjmara country match to reach 1b watering, as Figure 4.2.2 shows.

### Scenario planning

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

The highest priority under all conditions is to provide summer/autumn low flow in reach 1b and reach 2 to maintain connectivity and water quality between pool habitats above Casterton. This is the only flow that is expected to be delivered under the drought scenario.

Increased water availability under dry, average and wet scenarios will allow summer/autumn low flow to be delivered to reach 1a to provide additional swamp habitat and connection for native fish and frogs, and summer/autumn freshes may also be delivered in reaches 1b and 2. These freshes are a high priority as they provide a cue for fish movement, allow native fish and platypus to disperse and wet streamside vegetation.

Under dry and wet conditions, delivering summer/autumn freshes in reaches 1a and reach 3 are a high priority to increase the habitat availability for native fish and platypus to move throughout the river system. Under average and wet conditions, delivering winter/spring low flow in reach 1a is a high priority, to support swamp habitat for native fish and frogs because it receives little natural flow even during wet years.

Delivering winter/spring freshes in reaches 1b and reach 2 is a high priority in the average scenario, to trigger native fish movement and platypus burrow selection in years when breeding is likely. Providing winter/spring low flow in reach 1b under wet conditions will increase habitat for native fish and platypus, which will also help breeding success. The magnitude and/or duration of some freshes may be increased in the average and wet scenarios to extend the benefit of specific events further downstream.

If more water is available, the next priorities under all scenarios will be to deliver summer/autumn low flow through to the end of reach 3. Under the dry and average scenarios, additional priorities will be to provide winter/spring low flow in reach 1b, with summer/autumn freshes through to reach 3 in average conditions only. Delivering winter/spring freshes through to reach 2 under the dry and wet scenarios is a high priority, to support streamside vegetation and provide additional flows to increase access for native fish and platypus to feeding and breeding habitat.

Reserving water for carryover into the 2021–22 water year will be a priority under all scenarios, to ensure sufficient water is available to deliver the highest-priority flows during summer and autumn 2022. The volume carried over against the Wimmera-Glenelg environmental entitlement will be decided in consultation with the Wimmera and the Glenelg Hopkins CMAs during the year, and it will be based on use during 2020–21, seasonal conditions and seasonal outlooks for 2021–22.

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

Planning scenario	Drought	Dry	Average	Wet
Expected river conditions	<ul style="list-style-type: none"> <li>Low volumes of passing, compensation and natural flow</li> </ul>	<ul style="list-style-type: none"> <li>Some passing, compensation and natural flow</li> </ul>	<ul style="list-style-type: none"> <li>Some passing, compensation and significant natural flow, particularly in winter/spring</li> </ul>	<ul style="list-style-type: none"> <li>Passing, compensation and natural flow meet some watering requirements in winter/spring</li> </ul>
Expected availability of water for the environment <sup>1</sup>	<ul style="list-style-type: none"> <li>19,600 ML</li> </ul>	<ul style="list-style-type: none"> <li>36,635 ML</li> </ul>	<ul style="list-style-type: none"> <li>50,426 ML</li> </ul>	<ul style="list-style-type: none"> <li>60,160 ML</li> </ul>
Potential environmental watering – tier 1a (high priorities) <sup>2</sup>	<ul style="list-style-type: none"> <li>Summer/autumn low flow reach 1b</li> <li>Summer/autumn low flow reach 2</li> </ul>	<ul style="list-style-type: none"> <li>Summer/autumn low flow reach 1a</li> <li>Summer/autumn low flow reach 1b</li> <li>Summer/autumn low flow reach 2</li> <li>Two summer/autumn freshes reach 1a</li> <li>Two summer/autumn freshes reach 1b</li> <li>Two summer/autumn freshes reach 2</li> <li>Two summer/autumn freshes reach 3</li> </ul>	<ul style="list-style-type: none"> <li>Summer/autumn low flow reach 1a</li> <li>Summer/autumn low flow reach 1b</li> <li>Summer/autumn low flow reach 2</li> <li>Three winter/spring freshes reach 1b</li> <li>Three winter/spring freshes reach 2</li> <li>Two summer/autumn freshes reach 1b</li> <li>Two summer/autumn freshes reach 2</li> <li>Winter/spring low flow reach 1a</li> </ul>	<ul style="list-style-type: none"> <li>Summer/autumn low flow reach 1a</li> <li>Summer/autumn low flow reach 1b</li> <li>Summer/autumn low flow reach 2</li> <li>Two summer/autumn freshes reach 1a</li> <li>Two summer/autumn freshes reach 1b</li> <li>Two summer/autumn freshes reach 2</li> <li>Two summer/autumn freshes reach 3</li> <li>Winter/spring low flow reach 1a</li> <li>Winter/spring low flow reach 1b</li> </ul>
Potential environmental watering – tier 1b (high priorities with shortfall) <sup>2</sup>	<ul style="list-style-type: none"> <li>Summer/autumn low flow reach 1a</li> <li>Summer/autumn low flow reach 3</li> <li>Two summer/autumn freshes reach 1a</li> <li>Two summer/autumn freshes reach 1b</li> <li>Two summer/autumn freshes reach 2</li> <li>Two summer/autumn freshes reach 3</li> </ul>	<ul style="list-style-type: none"> <li>Summer/autumn low flow reach 3</li> <li>Two winter/spring freshes reach 1b</li> <li>Two winter/spring freshes reach 2</li> <li>Winter/spring low flow reach 1a</li> <li>Winter/spring low flow reach 1b</li> </ul>	<ul style="list-style-type: none"> <li>Summer/autumn low flow reach 3</li> <li>Two summer/autumn freshes reach 1a</li> <li>Two summer/autumn freshes reach 3</li> <li>Winter/spring low flow reach 1b</li> </ul>	<ul style="list-style-type: none"> <li>Five winter/spring freshes 1b</li> <li>Five winter/spring freshes reach 2</li> <li>Summer/autumn low flow reach 3</li> </ul>

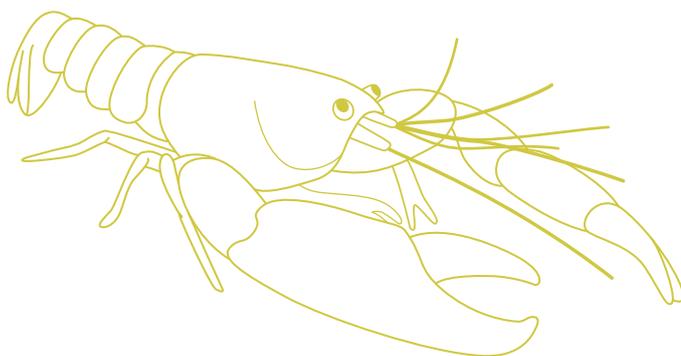
**Table 4.2.2 Potential environmental watering for the Glenelg River under a range of planning scenarios** *(continued)*

Planning scenario	Drought	Dry	Average	Wet
Potential environmental watering – tier 2 (additional priorities) <sup>2</sup>	<ul style="list-style-type: none"> <li>• Two winter/spring freshes reach 1b</li> <li>• Two winter/spring freshes reach 2</li> <li>• Winter/spring low flow reaches 1a</li> <li>• Winter/spring low flow reaches 1b</li> <li>• Winter/spring low flow reaches 2</li> </ul>	<ul style="list-style-type: none"> <li>• Winter/spring low flow reach 2</li> <li>• Winter/spring low flow reach 3</li> </ul>	<ul style="list-style-type: none"> <li>• Winter/spring low flow reach 2</li> <li>• Winter/spring low flow reach 3</li> </ul>	<ul style="list-style-type: none"> <li>• Winter/spring low flow reach 2</li> <li>• Winter/spring low flow reach 3</li> </ul>
Possible volume of environmental water required to achieve objectives <sup>3</sup>	<ul style="list-style-type: none"> <li>• 8,977 ML (tier 1a)</li> <li>• 9,918 ML (tier 1b)</li> <li>• 35,063 ML (tier 2)</li> </ul>	<ul style="list-style-type: none"> <li>• 13,635 ML (tier 1a)</li> <li>• 26,313 ML (tier 1b)</li> <li>• 12,190 ML (tier 2)</li> </ul>	<ul style="list-style-type: none"> <li>• 23,651 ML (tier 1a)</li> <li>• 14,644 ML (tier 1b)</li> <li>• 19,813 ML (tier 2)</li> </ul>	<ul style="list-style-type: none"> <li>• 26,523 ML (tier 1a)</li> <li>• 17,420 ML (tier 1b)</li> <li>• 12,349 ML (tier 2)</li> </ul>

<sup>1</sup> Environmental water in the Glenelg and Wimmera systems held by the VEWH is shared between the Wimmera and Glenelg river systems. Additionally, entitlement held by the Commonwealth Environmental Water Holder may become available in the Wimmera system. A prioritisation process will be undertaken with the Wimmera and Glenelg Hopkins catchment management authorities to share available resources during 2020–21.

<sup>2</sup> Potential watering actions are not listed in priority order.

<sup>3</sup> Environmental water requirements for tier 2 actions are additional to tier 1 requirements.



## 4.3 Wimmera system



**Waterway manager** – Wimmera Catchment Management Authority

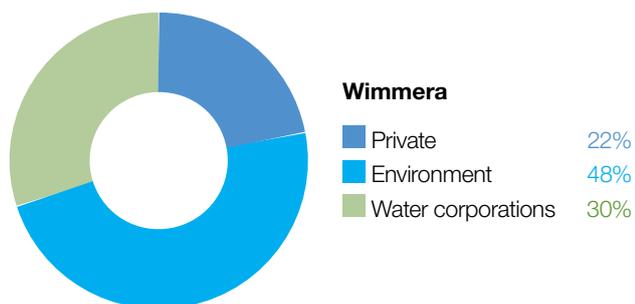
**Storage manager** – GMMWater

**Environmental water holders** – Victorian Environmental Water Holder, Commonwealth Environmental Water Holder

### *Did you know...?*

The Wimmera River is known as *Barringgi Gadyin* to the Wotjobaluk Traditional Owners and is a key feature of the local creation stories.

The Wimmera-Mallee headworks system captures run-off from both the Wimmera and Glenelg catchments. Entitlements to water held in this system cannot be accounted for separately in the two river basins, therefore this figure shows the proportion of entitlements across both systems.



**Proportion of water entitlements held across the Wimmera and Glenelg basins held by private users, water corporations or environmental water holders at 30 June 2019.**

*Top: Wimmera River at O'Bree's Crossing, by Greg Fletcher, Wimmera CMA*

*Above: White neck heron, by Jenny Stephens*

### System overview

The Wimmera River rises in the Pyrenees Range near Elmhurst and flows through Horsham, Dimboola and Jeparit before terminating at Lake Hindmarsh, which is Victoria's largest freshwater lake and the first of a series of terminal lakes. The Wimmera River receives flows from several regulated tributaries including the MacKenzie River and the Mount William and Burnt creeks. These tributaries, Bungalally Creek and the Wimmera River below Mount William Creek can receive environmental flows. In exceptionally wet periods, Lake Hindmarsh may overflow into Outlet Creek and on to Lake Albacutya, which is an internationally recognised Ramsar-listed wetland. There are numerous wetlands beyond Lake Albacutya as well, which have not filled with water for decades.

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). A channel system enables water to be moved between several storages. Water can also be transferred from Rocklands Reservoir in the Glenelg system to the Wimmera system via the Rocklands-Toolondo Channel and from Moora Moora Reservoir via the Moora Channel. The connected storages and channels are collectively called the Wimmera-Mallee system headworks, and harvested water is used for towns and stock and domestic supply throughout the Wimmera catchment and parts of the Avoca, Hopkins, Loddon, Glenelg and Mallee catchments. Passing flows are provided to the Wimmera River and to lower Mount William and Fyans creeks.

Priority reaches in the Wimmera system that can receive water for the environment are Wimmera River reaches 3 and 4, MacKenzie River reaches 2 and 3, upper and lower Mount William Creek, upper and lower Burnt Creek and Bungalally Creek.

Yarriambiack Creek is a distributary of the upper Wimmera River that would have naturally received some flows during high-flow events. Modifications to the Yarriambiack Creek offtake increase flow rates in Yarriambiack Creek compared to what would have naturally happened, but they reduce the flow rates to the high-priority reaches of the Wimmera River. During very dry years, flows entering Yarriambiack Creek may be blocked to ensure watering objectives in the Wimmera River are not compromised.

Two wetlands in the Wimmera system have been included in the environmental watering program in recent years.

Dock Lake, one of the Wimmera's large terminal lakes near Horsham, would have naturally filled when the nearby Green Lake filled and overflowed, due to high flow in small creeks that flow from the northern edge of the Grampians. In the 1930s, Dock Lake was modified to allow it to be used as a water storage for irrigation supply in the Wimmera-Mallee system. Dock Lake was removed from the supply system after the completion of the Wimmera-Mallee pipeline in 2010. In late 2016, flooding in the catchment partially filled Dock Lake when Green Lake filled and overflowed. Managed water deliveries can now only be delivered through a small channel from Green Lake, when there is enough water in Green Lake to gravity-feed Dock Lake.

Ranch Billabong, near Dimboola, is located on land managed by Barengi Gadjin Land Council Aboriginal Corporation. The billabong system was disconnected from the Wimmera River by changes to a road that traverses land between the river and the billabong. The roadworks and river regulation in the Wimmera River have significantly altered the natural water regime of Ranch Billabong. Restoring habitat for native animal and plant communities at Ranch Billabong is an important outcome for the environment, Traditional Owners and their Nations.



### Environmental values

The Wimmera system is home to many plant and animal species. It supports populations of native fish such as flat-headed gudgeon, obscure galaxias, river blackfish, southern pygmy perch and Australian smelt. Populations of the critically endangered Wimmera bottlebrush occur along the MacKenzie River and several other locations near the Grampians.

The Wimmera River supports abundant native fish, waterbird, turtle, frog and rakali (water rat) populations and one of Victoria's few self-sustaining populations of freshwater catfish.

The MacKenzie River contains the only population of platypus in the Wimmera system and supports locally-important populations of native fish including river blackfish and southern pygmy perch. It also supports threatened Glenelg spiny crayfish and western swamp crayfish and turtles. During dry periods, the middle and upper reaches of the MacKenzie River maintain regular flow (due to managed releases from Lake Wartook for urban supplies and environmental watering) and provide refuge for these populations.

Vegetation along Burnt and Bungalally creeks provide habitat corridors for terrestrial wildlife, and upper Burnt Creek contains an important native fish community and a population of threatened western swamp crayfish. Mount William Creek supports regionally-important populations of river blackfish and southern pygmy perch and rakali (water rats).

Dock Lake is a natural wetland that was modified and used as part of the Wimmera-Mallee headworks system until 2010. When it is wetted, Dock Lake supports large populations of feeding and breeding waterbirds. It also supports frogs and small-bodied native fish.

Ranch Billabong is a small wetland near Dimboola that supports river red gums, a variety of aquatic plant species, waterbirds and frogs.

### Environmental watering objectives in the Wimmera system



Protect and increase populations of native fish including one of Victoria's few self-sustaining populations of freshwater catfish



Maintain the frog population by providing feeding and breeding habitat



Maintain channel capacity and diversity as well as prevent colonisation of waterways by terrestrial plant species



Maintain and increase the resident platypus population by providing places to breed and feed, as well as opportunities for juveniles to disperse



Maintain the turtle population by providing feeding and breeding habitat



Improve the condition, abundance and diversity of aquatic, emergent and streamside vegetation



Increase the waterbird population by providing roosting, feeding and breeding habitat in floodplain wetlands

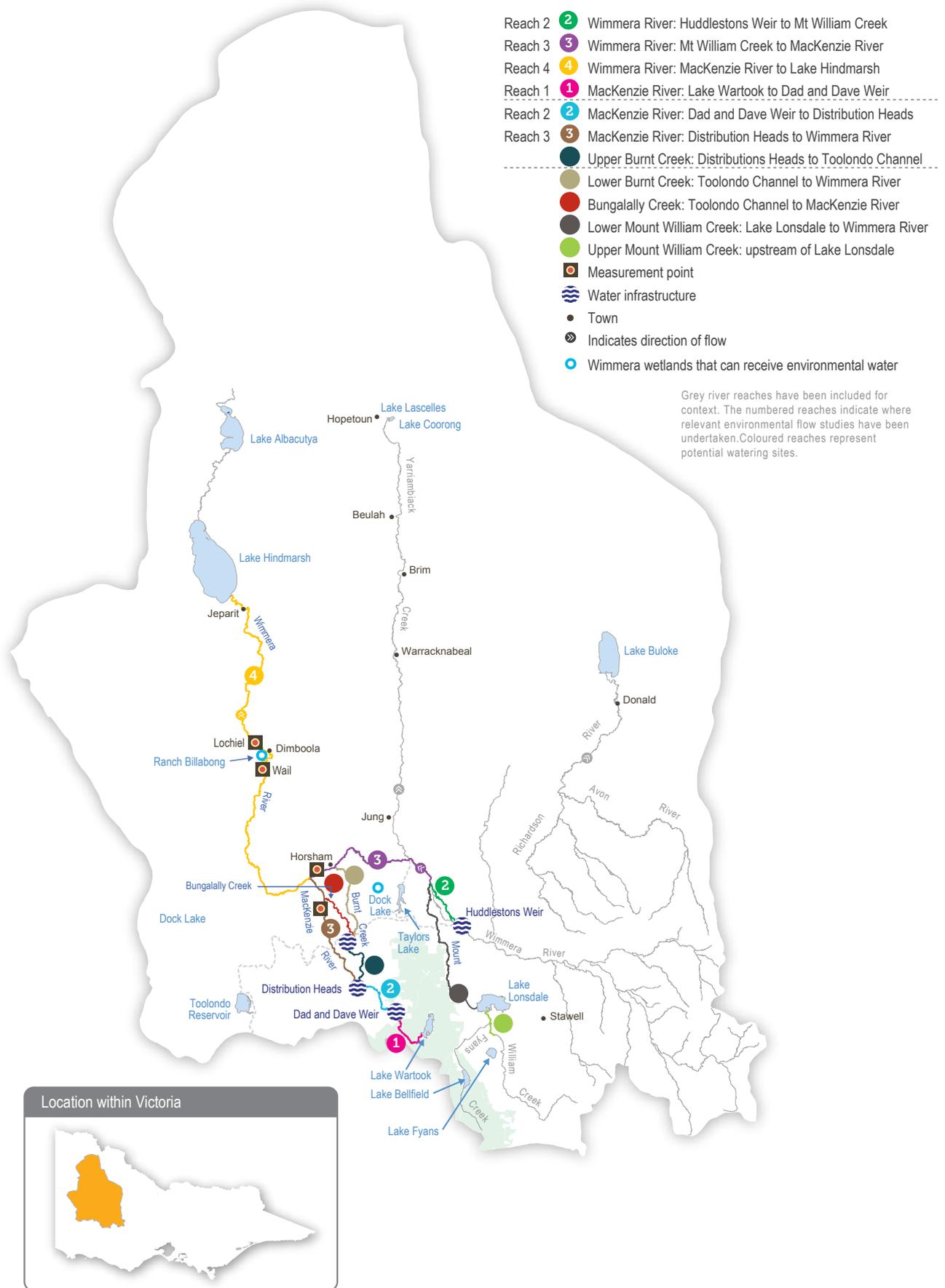


Increase the abundance and diversity of waterbugs, which break down dead organic matter and support the waterway's food chain  
Maintain the crayfish population by providing feeding and breeding habitat



Maintain and improve water quality to provide suitable conditions for waterbugs, native fish and other water-dependent plants and animals

Figure 4.3.1 The Wimmera system



### Traditional Owner cultural values and uses

The waterways within the Wimmera are important to the Wotjobaluk people and heritage values exist throughout the landscape. Native Title is held along much of the lower Wimmera River, reinforcing the cultural significance of these values. In planning for environmental flows in the Wimmera River, Barengi Gadjin Land Council and Wimmera CMA have considered these values as well as contemporary cultural events such as the Wotjobaluk festival.

Waterway managers are seeking opportunities to increase the involvement of Traditional Owners in environmental water planning and management. 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 4.3.1 with an icon.



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

In the Wimmera system, Wimmera CMA and Barengi Gadjin Land Council, on behalf of the Wotjobaluk people, work in partnership to provide a variety of Aboriginal environmental outcomes at Ranch Billabong. The delivery of environmental water at Ranch Billabong, aims to return a more natural flooding regime, restore indigenous plant and animal habitats, control selected weed species and improve the site's amenity and suitability for gatherings and events, such as earth oven and bark canoe recreations.

### Social, recreational and economic values and uses

In planning the potential watering actions in Table 4.3.1, Wimmera CMA considered how environmental flows could support values and uses including:

- water-based recreation (such as fishing, rowing, water skiing and paddle boating)
- riverside recreation and amenity (such as running and walking)
- community events and tourism (such as fishing competitions at Dimboola, Jeparit and Horsham; Dimboola [rowing] Regatta; Kannamaroo Festival at Horsham, Wimmera River Duck Race; Peter Taylor Memorial Barefoot Water Ski Tournament and Night Jump at Dimboola; and general visitation).

If the timing or management of planned environmental flows may be modified to align with a community benefit, this is acknowledged in Table 4.3.1 with an icon.



Watering planned to support angling activities



Watering planned to support water sports activities (e.g. rowing, water skiing)

Water for the environment can be used to temporarily raise water levels in the Horsham and Dimboola weir pools to improve conditions for community events including fishing competitions and water-skiing and rowing events. Following the events, the environmental water is released, to continue to improve ecological objectives downstream.

### Recent conditions

The Wimmera region has had below-average rainfall and above-average temperatures for most of the last three years. Near-average rainfall in winter 2019 caused the upper Wimmera River (measured at Glenorchy) to flow for the first time in more than a year, and it contributed notable inflows into the Mount William Creek catchment including Lake Lonsdale. Much of spring and the first months of summer were drier than average, which meant inflows to storages across the Wimmera-Mallee headworks system were well below average for the 2019–20 water year, but the second half of summer and autumn were slightly wetter than average and mild temperatures limited evaporation losses. The Wimmera-Glenelg environmental entitlement received 42 percent allocation in 2019–20. The Commonwealth Environmental Water Holder (CEWH) did not receive any allocation in the Wimmera system for the third year in a row. CEWH water that was allocated in 2016–17 was carried over and used to support environmental outcomes in the Wimmera River and in Mount William Creek in 2018–19 and 2019–20.

Natural flow during winter and early spring 2019 provided low flow and some freshes which met some of the minimum environmental flow requirements in the Wimmera River, MacKenzie River and Burnt Creek. Passing flows from Lake Lonsdale were suspended in winter to conserve water for drier conditions predicted for spring and summer. The accumulated water was used to meet environmental flow requirements in the Wimmera River and in Mount William Creek in spring 2019.

Water for the environment was delivered from mid-October 2019 to June 2020, in line with very dry climate conditions to maintain low flow and small freshes in Wimmera River below Dimboola and to top up Ranch Billabong. Small volumes were also delivered to Mount William Creek, the MacKenzie River and upper Burnt Creek in line with drought conditions due to limited water availability in Lake Lonsdale and Lake Wartook. Environmental watering in summer and autumn 2020 primarily aimed to maintain habitat for native fish, platypus and waterbugs and to protect water quality. Without significant rain in winter and spring 2020, water quality and habitat quality in the Wimmera system will decline and there will be a greater reliance on water for the environment to protect critical refuges. There is less environmental water carried over from 2019–20 compared to the previous three years and under drought, very dry and dry seasonal conditions water availability in 2020–21 will be limited to only meeting the highest-priority demands (tier 1a) in the Wimmera system.

### Scope of environmental watering

Table 4.3.1 describes the potential environmental watering actions in 2020–21, their functional watering objectives (that is, the intended physical or biological effect of the watering action) and the longer-term environmental objective(s) they support. Each environmental objective relies on one or more potential environmental watering actions and their associated physical or biological functions.

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

Potential environmental watering action	Functional watering objectives	Environmental objectives
<b>Wimmera River (reaches 2 &amp; 3)</b>		
Winter/spring low flow (100 ML/day during June to November)	<ul style="list-style-type: none"> <li>Provide fish passage to allow fish to move through the reach</li> <li>Maintain soil moisture for streamside vegetation and a near-permanent wetted stream channel for aquatic vegetation</li> <li>Prevent the growth of terrestrial plants in the stream bed</li> </ul>	 
<b>Wimmera River (reach 4)</b>		
Summer/autumn low flow (15 ML/day or natural during December to May)	<ul style="list-style-type: none"> <li>Maintain edge habitats in deeper pools and in-stream habitat to support native fish populations and waterbugs</li> <li>Maintain soil moisture for streamside vegetation and near-permanent wetted stream channel for aquatic vegetation and to prevent the growth of terrestrial plants in the stream bed</li> </ul>	  
Winter/spring low flow (30 ML/day during June to November)	<ul style="list-style-type: none"> <li>Maintain access to habitat for native fish, waterbugs and in-stream vegetation</li> </ul>	  
Summer/autumn fresh (one to five freshes of 70 ML/day for one to four days during December to May)  	<ul style="list-style-type: none"> <li>Flush pools to prevent decline of water quality and maintain habitat for fish and waterbugs</li> <li>Provide fish passage to allow fish to move through the reach</li> </ul>	  
Small winter/spring fresh (one to three freshes of 70 ML/day for one to five days during June to November)  	<ul style="list-style-type: none"> <li>Increase water depth to provide stimulus for fish movement</li> <li>Provide flow variability to maintain water quality and diversity of fish habitats</li> </ul>	 
Large winter/spring fresh (one to three freshes of 200 ML/day for one to three days during June to November)	<ul style="list-style-type: none"> <li>Wet lower benches, entrain organic debris and increase habitat availability for waterbugs and fish</li> </ul>	 
<b>MacKenzie River (reach 2)</b>		
Summer/autumn low flow (two ML/day or natural during December to May)	<ul style="list-style-type: none"> <li>Maintain edge habitats and deeper pools and runs for waterbugs, platypus and fish</li> <li>Maintain soil moisture for streamside vegetation and a near-permanent wetted stream channel for aquatic vegetation</li> <li>Prevent the growth of terrestrial plants in the stream bed</li> </ul>	   
Winter/spring low flow (27 ML/day or natural during June to November)	<ul style="list-style-type: none"> <li>Facilitate the annual dispersal of juvenile platypus into the Wimmera River</li> </ul>	

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

Potential environmental watering action	Functional watering objectives	Environmental objectives
Summer/autumn fresh (two to four freshes of five to 50 ML/day for two to seven days during December to May)	<ul style="list-style-type: none"> <li>Provide variable flows in the low-flow season for fish movement</li> <li>Maintain water quality and increase habitat availability for waterbugs and platypus</li> </ul>	
Winter/spring fresh (five freshes of 55 ML/day for two to seven days during June to November)	<ul style="list-style-type: none"> <li>Stimulate and facilitate fish and platypus movement by increasing flow rates and water depth</li> <li>Maintain water quality and improve habitat quality for waterbugs</li> <li>Maintain soil moisture for streamside vegetation and a near-permanent wetted stream channel for aquatic vegetation</li> <li>Prevent the growth of terrestrial plants in the stream bed</li> </ul>	
<b>MacKenzie River (reach 3)</b>		
Year-round low flow (10 ML/day or natural, year-round)	<ul style="list-style-type: none"> <li>Maintain edge habitats and deeper pools and runs for waterbugs</li> <li>Maintain soil moisture for streamside vegetation and a near-permanent wetted stream channel for aquatic vegetation</li> <li>Prevent the growth of terrestrial plants in the stream bed</li> <li>Maintain pool habitat for native fish and crayfish populations</li> <li>Facilitate the dispersal of juvenile platypus into the Wimmera River during autumn/winter</li> </ul>	
Summer/autumn freshes (three to four freshes of 35 ML/day for two to seven days each during December to May)	<ul style="list-style-type: none"> <li>Provide variable flows in the low-flow season for fish movement</li> <li>Maintain water quality and increase habitat availability for waterbugs</li> </ul>	
Small winter/spring fresh (one to five freshes of 35 ML/day for two to seven days during June to November)	<ul style="list-style-type: none"> <li>Stimulate fish movement by increasing flow rates and water depth and increase habitat availability for platypus and waterbugs</li> <li>Maintain water quality</li> <li>Maintain soil moisture for streamside vegetation and a near-permanent wetted stream channel for aquatic vegetation</li> </ul>	
Large winter/spring fresh (one fresh of 190 ML/day for one to two days during June to November)	<ul style="list-style-type: none"> <li>Disturb biofilms present on rocks or woody debris, to stimulate new growth and provide food for waterbugs</li> <li>Maintain water quality</li> <li>Maintain soil moisture for streamside vegetation and a near-permanent wetted stream channel for aquatic vegetation</li> <li>Stimulate fish movement by increasing flow rates and water depth and increase habitat availability for platypus</li> </ul>	

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

Potential environmental watering action	Functional watering objectives	Environmental objectives
<b>Upper Burnt Creek</b>		
Year-round low flow (one ML/day or natural, year-round)	<ul style="list-style-type: none"> <li>Maintain edge habitats and shallow-water habitat for waterbugs</li> <li>Maintain soil moisture for streamside vegetation and near-permanent wetted stream channel for aquatic vegetation and to prevent the growth of terrestrial plants in the stream bed</li> <li>Maintain a sufficient area of pool habitat for native fish and crayfish populations</li> </ul>	
Summer/autumn freshes (three freshes of 30 ML/day for two to seven days during December to May)	<ul style="list-style-type: none"> <li>Prevent a decline in water quality by flushing pools in the low flow season</li> <li>Allow fish to move throughout the reach</li> <li>Flush sediments from hard substrates to increase biofilm production and food for waterbugs</li> </ul>	
Small winter/spring fresh (one to five freshes of 55 ML/day for three to seven days during June to November)	<ul style="list-style-type: none"> <li>Allow fish to move throughout the reach</li> <li>Flush sediments from hard substrates to increase biofilm production and food for waterbugs</li> </ul>	
Large winter/spring fresh (one to three freshes of 160 ML/day for one to three days during June to November)	<ul style="list-style-type: none"> <li>Disturb biofilms present on rocks or woody debris, to stimulate new growth and provide food for waterbugs</li> <li>Allow fish to move throughout the reach</li> <li>Wet streamside vegetation to maintain plant condition and facilitate recruitment</li> </ul>	
<b>Lower Burnt Creek</b>		
Bankfull fresh (one fresh of 45 ML/day for two days at any time)	<ul style="list-style-type: none"> <li>Wet streamside vegetation to maintain plant condition and facilitate recruitment</li> <li>Move organic debris in the channel to support waterbugs</li> <li>Maintain the structural integrity of the channel</li> </ul>	
Overbank fresh (one fresh of 90 ML/day for one day during August to November)	<ul style="list-style-type: none"> <li>Wet floodplain vegetation to maintain plant condition and facilitate recruitment</li> <li>Move organic debris from the floodplain to support waterbugs in channel</li> <li>Maintain the structural integrity of the floodplain</li> </ul>	
<b>Bungalally Creek</b>		
Bankfull (one fresh of 60 ML/day for two days at any time)	<ul style="list-style-type: none"> <li>Wet the streamside zone to maintain its condition and facilitate the recruitment of streamside vegetation communities</li> <li>Maintain the structural integrity of the channel and prevent the loss of channel capacity</li> </ul>	
<b>Upper Mount William Creek</b>		
Top-up pools (winter/spring and summer/autumn)	<ul style="list-style-type: none"> <li>Maintain habitat for native fish and waterbugs</li> <li>Maintain water quality</li> <li>Trigger native fish spawning</li> </ul>	

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

Potential environmental watering action	Functional watering objectives	Environmental objectives
<b>Lower Mount William Creek</b>		
Year-round low flow (five ML/day or natural)	<ul style="list-style-type: none"> <li>Maintain edge habitats and shallow-water habitat for waterbugs and endemic fish</li> <li>Maintain soil moisture for streamside vegetation and near-permanent wetted stream channel for aquatic vegetation and to prevent the growth of terrestrial plants in the stream bed</li> </ul>	
Summer/autumn freshes (three freshes of 20-30 ML/day for two to seven days during December to May)	<ul style="list-style-type: none"> <li>Prevent a decline in water quality by flushing pools during low flow</li> <li>Provide variable flows and increase habitat availability during the low-flow season for waterbugs and fish</li> </ul>	
Winter/spring fresh (one to five freshes of 100 ML/day for one to seven days during June to November)	<ul style="list-style-type: none"> <li>Wet benches to entrain organic debris and increase habitat availability for native fish</li> <li>Flush surface sediments from hard substrates to support waterbugs</li> <li>Wet the streamside zone to maintain its condition and facilitate the recruitment of streamside vegetation communities</li> </ul>	
<b>Dock Lake</b>		
Winter/spring partial fill	<ul style="list-style-type: none"> <li>Maintain and improve the diversity and abundance of wetland vegetation</li> <li>Support feeding and breeding habitat for waterbirds, frogs, waterbugs and turtles</li> </ul>	
<b>Ranch Billabong</b>		
Top-ups (winter/spring and summer/autumn) 	<ul style="list-style-type: none"> <li>Maintain and improve wetland vegetation diversity and abundance</li> <li>Improve water quality for frogs and waterbirds</li> </ul>	

### Scenario planning

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

If dry conditions continue in the Wimmera system, the type of environmental watering actions that can be delivered to individual reaches will likely be influenced by water availability in the storages directly above each target reach. This is especially true for the MacKenzie River, Burnt Creek and Mount William Creek, which rely on water from Lake Wartook and Lake Lonsdale. Management in the Wimmera system necessitates for periods of cease-to-flow in the rivers and creeks, with additional or longer periods without flow in drier conditions, and planned continuous flows during wetter conditions when there is additional water available through rainfall runoff and allocations made to the environment.

The highest-priority (tier 1a) watering actions are to deliver summer/autumn low flow, summer/autumn freshes, winter/spring low flow in MacKenzie River reaches 2 and 3, upper Burnt Creek, Wimmera River reach 4 and to provide top-ups to Ranch Billabong. These flows aim to improve water quality and provide habitat for native fish, platypus, crayfish and waterbugs.

Under extreme dry, very dry and dry scenarios, flows in tributaries will mostly target reach 2 of the MacKenzie River and upper Burnt Creek to protect habitat for native fish, platypus and instream vegetation. While these flows will not target reach 3 of the MacKenzie River, flows delivered in reach 2 may pass into the upper sections of reach 3 of the MacKenzie River and top up small refuge pools for native fish and waterbugs throughout 2020–21. During winter and spring, flows may be delivered through to reach 3 to support native vegetation and allow some fish and platypus to move between the MacKenzie River and Wimmera River. Small flows are also planned to be delivered to maintain refuge habitats in upper Mount William Creek under dry conditions. Environmental flows will not directly target lower Burnt Creek under dry conditions but flows from upper Burnt Creek will likely pass into the reach. Under drought and very dry conditions, water quality and a lack of water availability in Lake Lonsdale is likely to prevent the targeted delivery of water for the environment to lower Mount William Creek, although it may receive some water en route to the Wimmera River or passing flows if available. Under average or wet scenarios environmental water may be used to deliver bankfull flows to Bungalally Creek and lower Burnt Creek and to partially fill Dock Lake.

If more water is available, the next highest priority — tier 1b watering actions — will be to increase the duration of low flow to reduce the number of cease-to-flows and increase the magnitude and/or frequency of freshes in reach 4 of the Wimmera River, reach 3 of MacKenzie River, upper Burnt Creek and lower Mount William Creek.

Reserving water for carryover into the 2021–22 water year will be a priority under all scenarios, to ensure sufficient water to deliver the highest-priority flows during summer and autumn 2022. The volume carried over against the Wimmera-Glenelg environmental entitlement will be decided in consultation with the Wimmera and Glenelg Hopkins CMAs during the year, and it will be based on use during 2020–21, environmental conditions and seasonal outlooks for 2021–22.

With drier conditions expected in the western region, waterway managers are exploring contingency measures (such as using the Wimmera-Mallee pipeline network) to pipe water for the environment directly into critical refuges sites in some river systems.

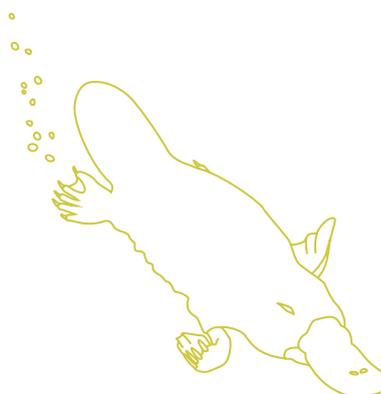


Table 4.3.2 Potential environmental watering for the Wimmera system under a range of planning scenarios

Planning scenario	Extreme drought	Drought	Dry	Average	Wet
Expected river conditions	<ul style="list-style-type: none"> <li>No passing flows or unregulated flows</li> </ul>	<ul style="list-style-type: none"> <li>Some passing flows and minor contributions from unregulated flows</li> </ul>	<ul style="list-style-type: none"> <li>Some passing flows and minor contributions from unregulated flows</li> </ul>	<ul style="list-style-type: none"> <li>Passing and unregulated flows particularly in winter/spring</li> </ul>	<ul style="list-style-type: none"> <li>Passing flows and unregulated flows year-round</li> </ul>
Expected availability of water for the environment <sup>1</sup>	• 19,600 ML	• 23,656 ML	• 36,635 ML	• 50,426 ML	• 60,160 ML
<b>Potential environmental watering – tier 1a (high priorities)</b>					
Wimmera River reach 4	<ul style="list-style-type: none"> <li>Summer/autumn low flow</li> <li>One summer/autumn fresh</li> <li>Winter/spring low flow</li> <li>One small winter/spring freshes</li> </ul>	<ul style="list-style-type: none"> <li>Summer/autumn low flow</li> <li>Two summer/autumn freshes</li> <li>Winter/spring low flow</li> <li>Two small winter/spring freshes</li> </ul>	<ul style="list-style-type: none"> <li>Summer/autumn low flow</li> <li>Three summer/autumn freshes</li> <li>Winter/spring low flow</li> <li>Two small winter/spring freshes</li> </ul>	<ul style="list-style-type: none"> <li>Summer/autumn low flow</li> <li>Three summer/autumn freshes</li> <li>Winter/spring low flow</li> <li>Three small winter/spring freshes</li> </ul>	<ul style="list-style-type: none"> <li>Summer/autumn low flow</li> <li>Five summer/autumn freshes</li> <li>Winter/spring low flow</li> <li>Three small winter/spring freshes</li> </ul>
MacKenzie River reach 2	<ul style="list-style-type: none"> <li>Summer/autumn low flow</li> <li>Three summer/autumn freshes</li> <li>Winter/spring low flow</li> <li>One winter/spring fresh</li> </ul>	<ul style="list-style-type: none"> <li>Summer/autumn low flow</li> <li>Three summer/autumn freshes</li> </ul>	<ul style="list-style-type: none"> <li>Summer/autumn low flow</li> <li>Four summer/autumn freshes</li> </ul>	• N/A	• N/A
MacKenzie River reach 3	• N/A	<ul style="list-style-type: none"> <li>Winter/spring low flow</li> <li>Five small winter/spring fresh</li> </ul>	<ul style="list-style-type: none"> <li>Winter/spring low flow</li> <li>Five small winter/spring freshes</li> </ul>	<ul style="list-style-type: none"> <li>Summer/autumn low flow</li> <li>Four summer/autumn freshes</li> <li>Winter/spring low flow</li> <li>Five small winter/spring freshes</li> </ul>	<ul style="list-style-type: none"> <li>Summer/autumn low flow</li> <li>Four summer/autumn freshes</li> <li>Winter/spring low flow</li> <li>Five small winter/spring freshes</li> </ul>
Upper Burnt Creek	<ul style="list-style-type: none"> <li>Summer/autumn low flow</li> <li>Winter/spring low flow</li> </ul>	<ul style="list-style-type: none"> <li>Summer/autumn low flow</li> <li>Winter/spring low flow</li> <li>Three summer/autumn freshes</li> <li>One small winter/spring fresh</li> </ul>	<ul style="list-style-type: none"> <li>Summer/autumn low flow</li> <li>Three summer/autumn freshes</li> <li>Winter/spring low flow</li> <li>Two small winter/spring freshes</li> </ul>	<ul style="list-style-type: none"> <li>Summer/autumn low flow</li> <li>Three summer/autumn freshes</li> <li>Winter/spring low flow</li> <li>Two small winter/spring freshes</li> </ul>	<ul style="list-style-type: none"> <li>Summer/autumn low flow</li> <li>Three summer/autumn freshes</li> <li>Winter/spring low flow</li> <li>Three small winter/spring freshes</li> </ul>
Lower Burnt Creek	• N/A	• N/A	• N/A	• Bankfull	• Bankfull
Upper Mount William Creek	• Top-ups	• Top-ups	• Top-ups	• N/A	• N/A

**Table 4.3.2 Potential environmental watering for the Wimmera system under a range of planning scenarios** (continued)

Planning scenario	Extreme drought	Drought	Dry	Average	Wet
Lower Mount William Creek	<ul style="list-style-type: none"> <li>N/A</li> </ul>	<ul style="list-style-type: none"> <li>N/A</li> </ul>	<ul style="list-style-type: none"> <li>Three summer/autumn freshes</li> <li>Summer/autumn low flow</li> <li>Three winter/spring freshes</li> <li>Winter/spring low flow</li> </ul>	<ul style="list-style-type: none"> <li>Three summer/autumn freshes</li> <li>Summer/autumn low flow</li> <li>Five winter/spring freshes</li> <li>Winter/spring low flow</li> </ul>	<ul style="list-style-type: none"> <li>Three summer/autumn freshes</li> <li>Summer/autumn low flow</li> <li>Five winter/spring freshes</li> <li>Winter/spring low flow</li> </ul>
Bungalally Creek	<ul style="list-style-type: none"> <li>N/A</li> </ul>	<ul style="list-style-type: none"> <li>N/A</li> </ul>	<ul style="list-style-type: none"> <li>N/A</li> </ul>	<ul style="list-style-type: none"> <li>Bankfull</li> </ul>	<ul style="list-style-type: none"> <li>Bankfull</li> </ul>
Dock Lake	<ul style="list-style-type: none"> <li>N/A</li> </ul>	<ul style="list-style-type: none"> <li>N/A</li> </ul>	<ul style="list-style-type: none"> <li>N/A</li> </ul>	<ul style="list-style-type: none"> <li>Partial fill</li> </ul>	<ul style="list-style-type: none"> <li>Partial fill</li> </ul>
Ranch Billabong	<ul style="list-style-type: none"> <li>Top-ups</li> </ul>	<ul style="list-style-type: none"> <li>Top-ups</li> </ul>	<ul style="list-style-type: none"> <li>Top-ups</li> </ul>	<ul style="list-style-type: none"> <li>Top-ups</li> </ul>	<ul style="list-style-type: none"> <li>Top-ups</li> </ul>
<b>Potential environmental watering – tier 1b (high priorities with shortfall)</b>					
Wimmera River reach 4	<ul style="list-style-type: none"> <li>N/A</li> </ul>	<ul style="list-style-type: none"> <li>One summer/autumn fresh</li> <li>Increased duration winter/spring low flow</li> <li>One large winter/spring freshes</li> </ul>	<ul style="list-style-type: none"> <li>Increased duration summer/autumn low flow</li> <li>Two summer/autumn freshes</li> <li>Increased duration winter/spring low flow</li> <li>One large winter/spring freshes</li> </ul>	<ul style="list-style-type: none"> <li>Increased duration summer/autumn low flow</li> <li>Two summer/autumn freshes</li> <li>Increased duration winter/spring low flow</li> <li>Two large winter/spring freshes</li> </ul>	<ul style="list-style-type: none"> <li>Increased duration winter/spring low flow</li> <li>Three large winter/spring freshes</li> </ul>
Mackenzie River reach 3	<ul style="list-style-type: none"> <li>N/A</li> </ul>	<ul style="list-style-type: none"> <li>Increased duration winter/spring low flow</li> <li>One large winter/spring freshes</li> </ul>	<ul style="list-style-type: none"> <li>Increased duration summer/autumn low flow</li> <li>Three large summer/autumn freshes</li> </ul>	<ul style="list-style-type: none"> <li>Increased duration summer/autumn low flow</li> <li>Increased duration winter/spring low flow</li> <li>One large winter/spring freshes</li> </ul>	<ul style="list-style-type: none"> <li>Increased duration summer/autumn low flow</li> <li>Increased duration winter/spring low flow</li> <li>One large winter/spring freshes</li> </ul>
Upper Burnt Creek	<ul style="list-style-type: none"> <li>N/A</li> </ul>	<ul style="list-style-type: none"> <li>Increased duration summer/autumn low flow</li> <li>Increased duration winter/spring low flow</li> </ul>	<ul style="list-style-type: none"> <li>Increased duration summer/autumn low flow</li> </ul>	<ul style="list-style-type: none"> <li>Increased duration summer/autumn low flow</li> <li>Increased duration and magnitude summer/autumn freshes</li> <li>Increased duration winter/spring low flow</li> <li>Large winter/spring freshes</li> </ul>	<ul style="list-style-type: none"> <li>Increased duration summer/autumn low flow</li> <li>Increased duration and magnitude summer/autumn freshes</li> <li>Increased duration winter/spring low flow</li> <li>Large winter/spring freshes</li> </ul>

**Table 4.3.2 Potential environmental watering for the Wimmera system under a range of planning scenarios** (continued)

Planning scenario	Extreme drought	Drought	Dry	Average	Wet
Upper Mount William Creek	<ul style="list-style-type: none"> <li>N/A</li> </ul>	<ul style="list-style-type: none"> <li>Top-ups</li> </ul>	<ul style="list-style-type: none"> <li>N/A</li> </ul>	<ul style="list-style-type: none"> <li>N/A</li> </ul>	<ul style="list-style-type: none"> <li>N/A</li> </ul>
Lower Mount William Creek	<ul style="list-style-type: none"> <li>N/A</li> </ul>	<ul style="list-style-type: none"> <li>One summer/autumn fresh</li> <li>Summer/autumn low flow</li> <li>One winter/spring fresh</li> </ul>	<ul style="list-style-type: none"> <li>Increased duration and magnitude summer/autumn freshes</li> <li>Increased duration summer/autumn low flow</li> <li>Two winter/spring freshes</li> <li>Increased duration winter/spring low flow</li> </ul>	<ul style="list-style-type: none"> <li>Increased duration and magnitude winter/spring freshes</li> <li>Increased duration winter/spring low flow</li> </ul>	<ul style="list-style-type: none"> <li>Increased duration and magnitude winter/spring freshes</li> <li>Increased duration winter/spring low flow</li> </ul>
<b>Potential environmental watering – tier 2 (additional priorities)</b>					
Wimmera River reaches 2 & 3	<ul style="list-style-type: none"> <li>N/A</li> </ul>	<ul style="list-style-type: none"> <li>N/A</li> </ul>	<ul style="list-style-type: none"> <li>N/A</li> </ul>	<ul style="list-style-type: none"> <li>Winter/spring low flow</li> </ul>	<ul style="list-style-type: none"> <li>Winter/spring low flow</li> </ul>
Wimmera River reach 4	<ul style="list-style-type: none"> <li>N/A</li> </ul>	<ul style="list-style-type: none"> <li>N/A</li> </ul>	<ul style="list-style-type: none"> <li>Increased duration summer/autumn low flow</li> </ul>	<ul style="list-style-type: none"> <li>Increased duration summer/autumn low flow</li> <li>One large winter/spring fresh</li> </ul>	<ul style="list-style-type: none"> <li>Increased duration summer/autumn low flow</li> <li>One large winter/spring fresh</li> </ul>
MacKenzie River reach 3	<ul style="list-style-type: none"> <li>N/A</li> </ul>	<ul style="list-style-type: none"> <li>N/A</li> </ul>	<ul style="list-style-type: none"> <li>Increased duration summer/autumn low flow</li> <li>One summer/autumn fresh</li> </ul>	<ul style="list-style-type: none"> <li>Increased duration summer/autumn low flow</li> <li>Increased duration and magnitude summer/autumn freshes</li> </ul>	<ul style="list-style-type: none"> <li>Increased duration summer/autumn low flow</li> <li>Increased duration and magnitude summer/autumn freshes</li> </ul>
Lower Mount William Creek	<ul style="list-style-type: none"> <li>N/A</li> </ul>	<ul style="list-style-type: none"> <li>N/A</li> </ul>	<ul style="list-style-type: none"> <li>Increased duration summer/autumn low flow</li> </ul>	<ul style="list-style-type: none"> <li>Increased duration summer/autumn low flow</li> </ul>	<ul style="list-style-type: none"> <li>Increased duration summer/autumn low flow</li> </ul>
Possible volume of environmental water required to achieve objectives <sup>2</sup>	<ul style="list-style-type: none"> <li>10,000 ML (tier 1a)</li> </ul>	<ul style="list-style-type: none"> <li>11,900 ML (tier 1a)</li> <li>6,680 ML (tier 1b)</li> </ul>	<ul style="list-style-type: none"> <li>18,300 ML (tier 1a)</li> <li>11,810 ML (tier 1b)</li> <li>3,135 ML (tier 2)</li> </ul>	<ul style="list-style-type: none"> <li>25,215 ML (tier 1a)</li> <li>14,890 ML (tier 1b)</li> <li>15,670 ML (tier 2)</li> </ul>	<ul style="list-style-type: none"> <li>29,445 ML (tier 1a)</li> <li>14,265 ML (tier 1b)</li> <li>15,635 ML (tier 2)</li> </ul>

<sup>1</sup> Environmental water in the Wimmera and Glenelg systems held by the VEWH is shared between the Wimmera and Glenelg river systems. Additionally, entitlement held by CEWH may become available in the Wimmera system. A prioritisation process will be undertaken with the Wimmera and Glenelg Hopkins CMAs to share available resources during 2020–21.

<sup>2</sup> Water for the environment requirements for tier 2 actions are additional to tier 1 requirements.

## 4.4 Wimmera-Mallee wetlands



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

**Storage manager** – GMMWater

**Environmental water holder** – Victorian Environmental Water Holder



### *Did you know...?*

In 2019, Mallee CMA worked with eager citizen scientists to roll out a bird-monitoring program at some Wimmera-Mallee Pipeline wetlands. The data collected was loaded onto the BirdLife Australia national database, to make it available to a global audience.

*Top: Crow Swap, by Michael Gooch*

*Above: Galah's at Crow Swamp, by Michael Gooch*

### System overview

The Wimmera-Mallee wetlands include 52 wetlands on public and private land spread across north-west Victoria. Historically, the deeper areas of these wetlands received water most years from the open channels associated with the Wimmera-Mallee Domestic and Stock Channel System.

The Wimmera-Mallee Pipeline Project (WMPP) replaced stock and domestic supply dams with tanks, and the open-channel distribution system with pipelines, to improve water efficiency. A portion of the water savings from the WMPP was converted to an environmental entitlement to improve the condition of the area's flow-stressed rivers, creeks and wetlands; the rest was used to create regional development opportunities and boost the reliability of supply for other users. The WMPP reduced the amount of open-water habitat in areas that were formerly supplied by the open-channel system, so a separate 1,000 ML environmental entitlement was created to water wetlands that were previously supplied through the channel system. There are 52 priority wetlands that can receive water from this environmental entitlement.

Water for the environment can only be delivered to the wetlands when there is sufficient capacity in the Wimmera-Mallee pipeline system, which can be affected by demand from other pipeline customers. The North Central, Mallee and Wimmera CMAs work closely with GWMWater and land managers (including Parks Victoria, the Department of Environment, Land, Water and Planning and private landowners) to take account of pipeline capacity constraints when ordering environmental deliveries to wetlands.

### Environmental values

There are a wide range of wetland types in the Wimmera-Mallee wetlands system including freshwater meadows, open freshwater lakes and freshwater marshes. This diversity provides a range of different wetland habitats for plants and animals across the Wimmera-Mallee region. The wetlands also vary in size and consist of many different vegetation communities, and some are home to native waterbird populations including brolgas, egrets, blue-billed ducks, freckled ducks, Australian painted snipes and glossy ibis. The wetlands are used by the vulnerable growling grass frog, turtles and many other native animals that may use them as drought refuges and drinking holes. Rare and vulnerable vegetation species (such as spiny lignum, ridged water milfoil, chariot wheel and cane grass) are also present in some wetlands.

### Environmental watering objectives in the Wimmera-Mallee wetlands



Maintain and increase the population of frogs



Maintain and increase the population of turtles



Provide watering holes for native animals and terrestrial birds across the landscape



Maintain and improve the condition of aquatic and fringing plants including lignum, river red gum and black box communities

Improve the diversity of vegetation communities by providing watering regimes to support plant life cycles in and around the wetlands



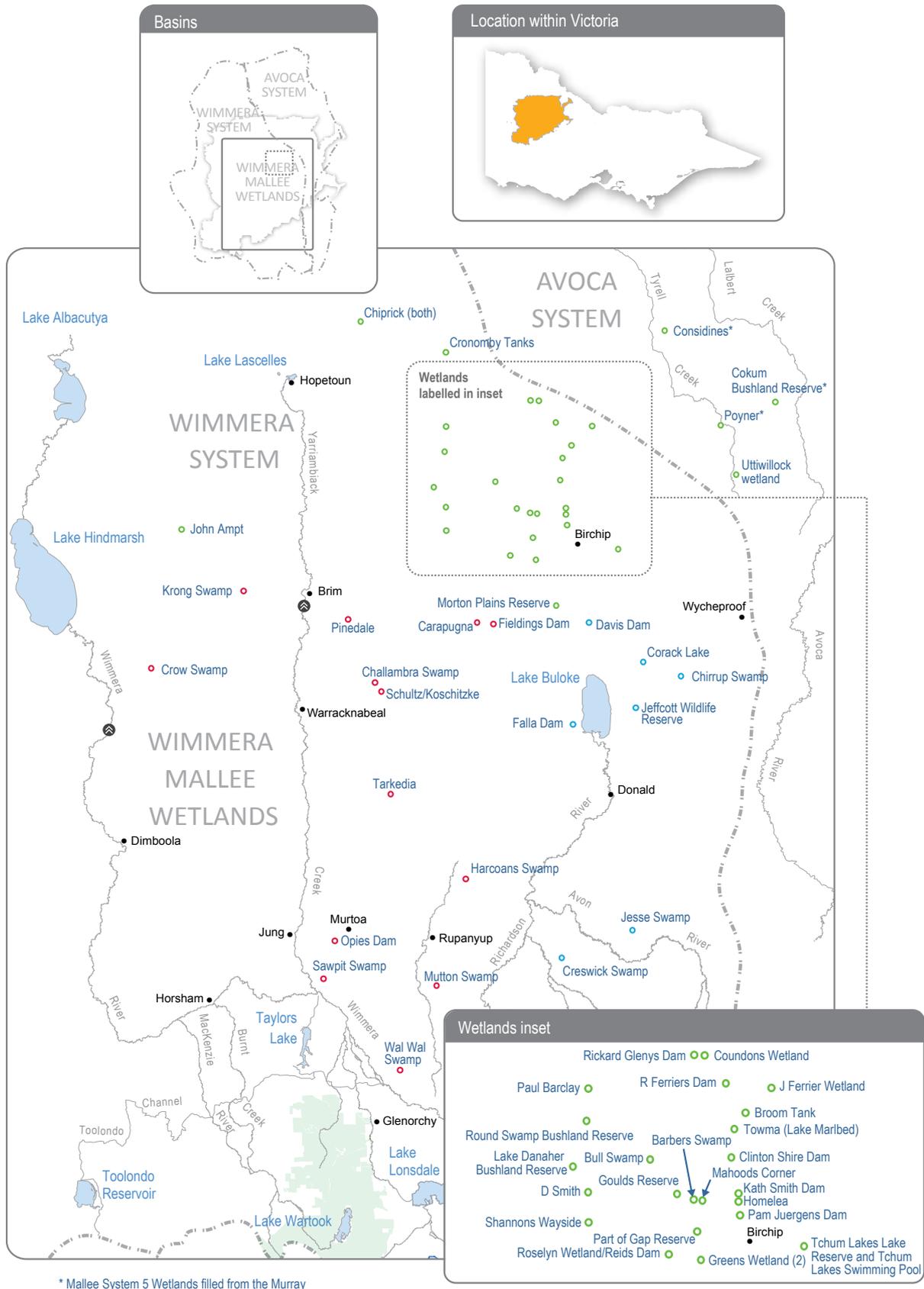
Maintain and increase populations of waterbirds and other native birds by providing resting, feeding and breeding habitat



Maintain the population of waterbugs

Figure 4.4.1 The Wimmera-Mallee wetlands

- Mallee CMA wetlands that can receive environmental water
- North Central CMA wetlands that can receive environmental water
- Wimmera CMA wetlands that can receive environmental water
- Town
- ⊗ Indicates direction of flow



### Traditional Owner cultural values and uses

Spanning a broad geographic area, several Wimmera-Mallee wetlands show indications of the long-standing cultural heritage and importance of these sites to the various Traditional Owners of the region, including but not limited to those represented by the Barengi Gadjin Land Council and the Dja Dja Wurrung Clans Aboriginal Corporation. Some of the sites have artefacts and scar trees recorded in or adjacent to them and could benefit from further cultural surveys to better inform environmental water management at those sites.

### Social, recreational and economic values and uses

In planning the potential watering actions in Table 4.4.1, the Mallee, North Central and Wimmera CMAs have considered how environmental flows could support values and uses including:

- water-based recreation (such as fishing, kayaking, swimming and yabbying)
- riverside recreation and amenity (such as birdwatching, duck and quail hunting, picnicking and walking)
- community events and tourism (such as citizen science including the monitoring of birds and bats).

### Recent conditions

The Wimmera-Mallee region received below-average rainfall and had above-average temperatures throughout 2017–18, 2018–19 and 2019–20. The dry conditions experienced over the last three years have delivered low inflows to storages in the Wimmera-Mallee headworks system, and as a result the Wimmera-Mallee Pipeline wetland environmental entitlement received no allocation in 2019–20. All environmental water deliveries to the wetlands in 2019–20 were supported by water that was carried over from previous years.

Rainfall during winter 2019 provided local run-off that topped up some wetlands, but most wetlands relied on deliveries of environmental water via the Wimmera-Mallee pipeline to provide their required water regime.

Water for the environment was delivered to 30 of the 41 wetlands planned under a dry scenario in 2019–20: 13 wetlands in the Mallee CMA area, 11 in the Wimmera CMA area and six in the North Central CMA area. Deliveries were made in winter/spring 2019 and autumn/winter 2020. Some wetlands received water once during 2019–20, while others received multiple deliveries to maintain their water-dependent values.

Remote, motion-sensor cameras and visual surveys at some wetlands have found that water for the environment delivered to Wimmera-Mallee wetlands provided feeding and breeding habitat for many animals (such as eastern long-necked turtles, frogs, yabbies, broilga, egrets, herons, ducks, grebes, stilts and other water and woodland birds). Many wetlands had vigorous growth of aquatic and semi-aquatic plants including nardoo, water milfoil, water ribbons, lignum and cane grass. The condition of black box trees, chariot wheels (a nationally threatened forb species) and lignum plants near watered wetlands also improved.

### Scope of environmental watering

Table 4.4.1 describes the potential environmental watering actions in 2020–21, their functional watering objectives (that is, the intended physical or biological effect of the watering action) and the longer-term environmental objective(s) they support. Each environmental objective relies on one or more potential environmental watering actions and their associated physical or biological functions.



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

Potential environmental watering action	Functional watering objectives	Environmental objectives
<b>North Central wetlands</b>		
Chirrup Swamp	<ul style="list-style-type: none"> <li>Provide a permanent water source for refuge and to support feeding and breeding opportunities for frogs, waterbirds and turtles</li> </ul>	 
Corack Lake	<ul style="list-style-type: none"> <li>Provide a permanent water source for refuge and nursery habitat for turtles and frogs</li> <li>Maintain varying depths of water to support aquatic and fringing plants' life cycles</li> <li>Maintain varying depths of water to support a variety of feeding habitats for waterbirds</li> </ul>	  
Creswick Swamp	<ul style="list-style-type: none"> <li>Maintain varying depths of water to support the life cycle of aquatic plants including threatened marbled marshwort</li> <li>Provide a permanent water source for refuge and to support feeding and breeding opportunities for frogs and turtles</li> <li>Maintain water levels to prolong wetting and ensure successful waterbird breeding events, if they start</li> </ul>	   
Davis Dam	<ul style="list-style-type: none"> <li>Wet black box and rare cane grass to allow plants to complete their life cycles and to support juvenile plants</li> <li>Provide a semi-permanent water source to support refuge and feeding and breeding opportunities for frogs</li> <li>Provide a permanent water source for refuge and to support feeding and breeding opportunities for waterbirds and terrestrial species</li> </ul>	  
Falla Dam	<ul style="list-style-type: none"> <li>Provide a permanent water source for refuge and to support feeding and breeding opportunities for frogs, waterbirds and terrestrial species</li> <li>Stimulate frog and turtle breeding by providing a deep, permanent water source in spring</li> <li>Stimulate aquatic and fringing vegetation growth in winter/spring</li> </ul>	    
Jeffcott Wildlife Reserve	<ul style="list-style-type: none"> <li>Maintain a minimum depth of water to support the life cycles of aquatic plants</li> <li>Provide a permanent water source for refuge and to support feeding and breeding opportunities for frogs, waterbugs, waterbirds and turtles</li> </ul>	    
Jesse Swamp	<ul style="list-style-type: none"> <li>Maintain varying depths of water to support aquatic and fringing plant life cycles</li> <li>Provide a permanent water source for refuge and to support feeding and breeding opportunities for frogs, waterbirds and terrestrial species</li> </ul>	   

Table 4.4.1 Potential environmental watering actions and objectives for the Wimmera-Mallee wetlands (continued)

Potential environmental watering action	Functional watering objectives	Environmental objectives
<b>Wimmera wetlands</b>		
Carapugna	<ul style="list-style-type: none"> <li>Provide a permanent water source for refuge and to support feeding and breeding opportunities for frogs, waterbirds and terrestrial species</li> <li>Stimulate aquatic and fringing vegetation growth and allow plants including chariot wheels, ridged water milfoil, black box and spiny lignum to complete their life cycles</li> </ul>	   
Challambra Swamp		
Crow Swamp		
Fieldings Dam		
Harcoans Swamp		
Mutton Swamp		
Opies Dam		
Pinedale		
Sawpit Swamp		
Schultz/Koschitzke		
Tarkedia Dam		
Wal Wal Swamp		
<b>Mallee wetlands</b>		
Barbers Swamp	<ul style="list-style-type: none"> <li>Provide a permanent water source for refuge and to support feeding and breeding opportunities for waterbirds and terrestrial species</li> <li>Stimulate aquatic and fringing vegetation growth and allow the plants including ridged water milfoil, black box and spiny lignum to complete their life cycles</li> </ul>	  
Morton Plains Reserve		
Tchum Lakes Lake Reserve (North Lake – wetland)		
Tchum Lakes Swimming Pool (North Lake – dam)		
Goulds Reserve		
Lake Danaher Bushland Reserve		
Cokum Bushland Reserve	<ul style="list-style-type: none"> <li>Stimulate aquatic and fringing vegetation growth and allow the plants including ridged water milfoil, black box and spiny lignum to complete their life cycles</li> </ul>	 
Part of Gap Reserve		
Rickard Glenys Dam		
Broom Tank	<ul style="list-style-type: none"> <li>Stimulate aquatic and fringing vegetation growth and allow the plants including black box and lignum to complete their life cycles</li> <li>Provide a permanent water source for refuge and to support feeding and breeding opportunities for waterbirds and terrestrial species</li> </ul>	  
Clinton Shire Dam		
Greens Wetland		
J Ferrier Wetland		
Considines	<ul style="list-style-type: none"> <li>Provide a permanent water source for refuge and to support feeding and breeding opportunities for frogs and turtles</li> </ul>	 
Cronomby Tanks		
Newer Swamp	<ul style="list-style-type: none"> <li>Stimulate aquatic and fringing vegetation growth and allow the plants including black box and lignum to complete their life cycles</li> </ul> 	

**Table 4.4.1 Potential environmental watering actions and objectives for the Wimmera-Mallee wetlands** (continued)

Potential environmental watering action	Functional watering objectives	Environmental objectives
Mahoods Corner R Ferriers Dam Shannons Wayside Chiprick Coundons Wetland D Smith Wetland Homelea Wetland John Ampt Kath Smith Dam Pam Juergens Dam Paul Barclay Poyner	<ul style="list-style-type: none"> <li>Provide a permanent water source for refuge and to support feeding and breeding opportunities for waterbirds and terrestrial species</li> </ul>	
Roselyn Wetland Uttiwillock Wetland	<ul style="list-style-type: none"> <li>Stimulate aquatic and fringing vegetation growth and allow the plants including black box and lignum to complete their life cycles</li> <li>Provide a permanent water source for refuge and to support feeding and breeding opportunities for waterbirds, frogs, turtles and terrestrial species</li> </ul>	
Towma (Lake Marlbed)	<ul style="list-style-type: none"> <li>Stimulate aquatic and fringing vegetation growth and allow the plants including black box and lignum to complete their life cycles</li> <li>Provide a permanent water source for refuge and to support feeding and breeding opportunities for frogs, turtles and terrestrial species</li> </ul>	

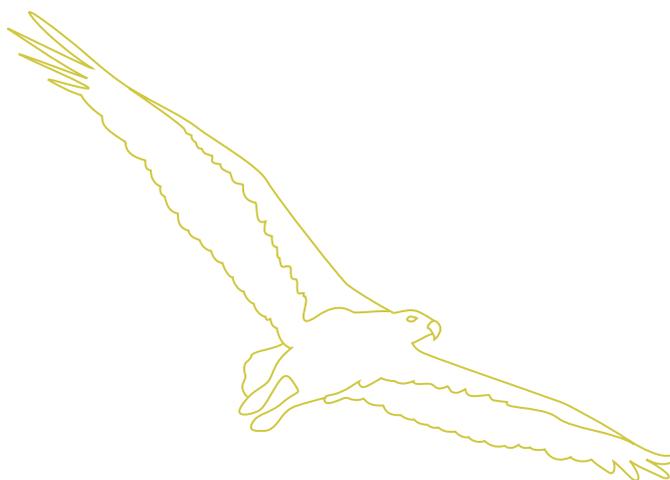
### Scenario planning

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

The potential watering actions in 2020–21 have been determined by considering the environmental values, watering requirements and recent watering histories of the Wimmera-Mallee wetlands, as well as available water supply and ability to deliver water to individual sites. The list of wetlands to be watered under each scenario was determined according to the following principles.

Under drought conditions, the highest priority is to provide permanent water in the deeper sections of the wetlands, to provide drought refuge for waterbirds, frogs, turtles and terrestrial animals across the landscape and to support the growth and lifecycles of wetland plants. Under wetter scenarios, water for the environment may be delivered, depending on capacity in the pipeline system, to water larger areas of the wetland. Large rainfall events and catchment inflows may partially or fully fill some wetlands, and water for the environment may be used to top up, fill or over-top wetlands to improve fringing wetland plant growth and provide additional habitat for waterbirds, frogs and turtles.

Allocations to the environmental entitlement to supply the wetlands in the Wimmera-Mallee wetland system is highly variable, and the ability to carry over unused water from one year to another allows waterway managers and the VEWH to effectively manage the systems in dry periods. The North Central, Mallee and Wimmera CMAs and the VEWH have determined that between 122 and 130 ML should be carried over at the end of 2020–21, to support critical environmental demands in 2021–22.



**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 river conditions	<ul style="list-style-type: none"> <li>No catchment inflows to the wetlands are expected</li> </ul>	<ul style="list-style-type: none"> <li>No catchment inflows to the wetlands are expected</li> </ul>	<ul style="list-style-type: none"> <li>Some localised catchment inflows may increase water levels in some wetlands</li> </ul>	<ul style="list-style-type: none"> <li>Catchment inflows are likely to increase water levels in most wetlands</li> </ul>
Expected availability of water for the environment	<ul style="list-style-type: none"> <li>700 ML</li> </ul>	<ul style="list-style-type: none"> <li>700 ML</li> </ul>	<ul style="list-style-type: none"> <li>900 ML</li> </ul>	<ul style="list-style-type: none"> <li>1,700 ML</li> </ul>
Potential environmental watering <sup>1</sup>	<ul style="list-style-type: none"> <li>Barbers Swamp</li> <li>Bull Swamp</li> <li>Carapugna</li> <li>Challambra Swamp</li> <li>Chirrup Swamp</li> <li>Cokum Bushland Reserve</li> <li>Considines</li> <li>Corack Lake</li> <li>Creswick Swamp</li> <li>Cronomby Tanks</li> <li>Crow Swamp</li> <li>D Smith Wetland</li> <li>Fieldings Dam</li> <li>Goulds Reserve</li> <li>Greens Wetland</li> <li>Harcoans Swamp</li> <li>J Ferrier Wetland</li> <li>Jeffcott Wildlife Reserve</li> <li>Jesse Swamp</li> <li>Mahoods Corner</li> <li>Morton Plains Reserve</li> <li>Mutton Swamp</li> <li>Opies Dam</li> <li>Paul Barclay</li> <li>Pinedale</li> <li>Poyner</li> <li>R Ferriers Dam</li> <li>Rickard Glenys Dam</li> <li>Roselyn Wetland</li> <li>Sawpit Swamp</li> <li>Schultz/Koschitzke</li> <li>Tarkedia Dam</li> <li>Uttiwillock Wetland</li> <li>Wal Wal Swamp</li> </ul>	<ul style="list-style-type: none"> <li>Barbers Swamp</li> <li>Broom Tank</li> <li>Bull Swamp</li> <li>Carapugna</li> <li>Challambra Swamp</li> <li>Chirrup Swamp</li> <li>Cokum Bushland Reserve</li> <li>Considines</li> <li>Corack Lake</li> <li>Coundons Wetland</li> <li>Creswick Swamp</li> <li>Cronomby Tanks</li> <li>Crow Swamp</li> <li>D Smith Wetland</li> <li>Falla Dam</li> <li>Fieldings Dam</li> <li>Goulds Reserve</li> <li>Greens Wetland</li> <li>Harcoans Swamp</li> <li>Homelea Wetland</li> <li>J Ferrier Wetland</li> <li>Jeffcott Wildlife Reserve</li> <li>Jesse Swamp</li> <li>Kath Smith Dam</li> <li>Mahoods Corner</li> <li>Morton Plains Reserve</li> <li>Mutton Swamp</li> <li>Opies Dam</li> <li>Pam Juergens Dam</li> <li>Part of Gap Reserve</li> <li>Paul Barclay</li> <li>Pinedale</li> <li>Poyner</li> <li>R Ferriers Dam</li> </ul>	<ul style="list-style-type: none"> <li>Barbers Swamp</li> <li>Broom Tank</li> <li>Bull Swamp</li> <li>Carapugna</li> <li>Challambra Swamp</li> <li>Chirrup Swamp</li> <li>Cokum Bushland Reserve</li> <li>Considines</li> <li>Corack Lake</li> <li>Coundons Wetland</li> <li>Creswick Swamp</li> <li>Cronomby Tanks</li> <li>Crow Swamp</li> <li>D Smith Wetland</li> <li>Falla Dam</li> <li>Fieldings Dam</li> <li>Goulds Reserve</li> <li>Greens Wetland</li> <li>Harcoans Swamp</li> <li>Homelea Wetland</li> <li>J Ferrier Wetland</li> <li>Jeffcott Wildlife Reserve</li> <li>Jesse Swamp</li> <li>Kath Smith Dam</li> <li>Mahoods Corner</li> <li>Morton Plains Reserve</li> <li>Mutton Swamp</li> <li>Newer Swamp</li> <li>Opies Dam</li> <li>Pam Juergens Dam</li> <li>Paul Barclay</li> <li>Pinedale</li> <li>Poyner</li> </ul>	<ul style="list-style-type: none"> <li>Barbers Swamp</li> <li>Broom Tank</li> <li>Bull Swamp</li> <li>Carapugna</li> <li>Challambra Swamp</li> <li>Chirrup Swamp</li> <li>Clinton Shire Dam</li> <li>Cokum Bushland Reserve</li> <li>Considines</li> <li>Corack Lake</li> <li>Coundons Wetland</li> <li>Creswick Swamp</li> <li>Cronomby Tanks</li> <li>Crow Swamp</li> <li>D Smith Wetland</li> <li>Falla Dam</li> <li>Fieldings Dam</li> <li>Goulds Reserve</li> <li>Greens Wetland</li> <li>Harcoans Swamp</li> <li>Homelea Wetland</li> <li>J Ferrier Wetland</li> <li>Jeffcott Wildlife Reserve</li> <li>Jesse Swamp</li> <li>Kath Smith Dam</li> <li>Mahoods Corner</li> <li>Morton Plains Reserve</li> <li>Mutton Swamp</li> <li>Newer Swamp</li> <li>Opies Dam</li> <li>Pam Juergens Dam</li> <li>Paul Barclay</li> <li>Part of Gap Reserve</li> <li>Pinedale</li> </ul>

<sup>1</sup> Wetlands are listed in alphabetical order rather than order of priority.

**Table 4.4.2 Potential environmental watering for the Wimmera-Mallee wetlands under a range of planning scenarios**  
(continued)

Planning scenario	Drought	Dry	Average	Wet
Potential environmental watering (continued)		<ul style="list-style-type: none"> <li>• Rickard Glenys Dam</li> <li>• Roselyn Wetland</li> <li>• Sawpit Swamp</li> <li>• Schultz/Koschitzke</li> <li>• Tarkedia Dam</li> <li>• Uttiwillock Wetland</li> <li>• Wal Wal Swamp</li> </ul>	<ul style="list-style-type: none"> <li>• R Ferriers Dam</li> <li>• Rickard Glenys Dam</li> <li>• Roselyn Wetland</li> <li>• Sawpit Swamp</li> <li>• Schultz/Koschitzke</li> <li>• Shannons Wayside</li> <li>• Tarkedia Dam</li> <li>• Tchum Lakes (wetland)</li> <li>• Uttiwillock Wetland</li> <li>• Wal Wal Swamp</li> </ul>	<ul style="list-style-type: none"> <li>• Poyner</li> <li>• R Ferriers Dam</li> <li>• Rickard Glenys Dam</li> <li>• Roselyn Wetland</li> <li>• Sawpit Swamp</li> <li>• Schultz/Koschitzke</li> <li>• Shannons Wayside</li> <li>• Tarkedia Dam</li> <li>• Tchum Lakes (wetland)</li> <li>• Uttiwillock Wetland</li> <li>• Wal Wal Swamp</li> </ul>
Possible volume of environmental water required to achieve objectives	<ul style="list-style-type: none"> <li>• 162 ML</li> </ul>	<ul style="list-style-type: none"> <li>• 201 ML</li> </ul>	<ul style="list-style-type: none"> <li>• 392 ML</li> </ul>	<ul style="list-style-type: none"> <li>• 543 ML</li> </ul>
Priority carryover requirements	<ul style="list-style-type: none"> <li>• 122 to 130 ML</li> </ul>			

