



Water for the Environment in Victoria 2021-22



Contents

HIGHLIGHTS OF ENVIRONMENTAL WATERING IN 2021-22	1
ACHIEVEMENTS AND OUTCOMES	2
TRADITIONAL OWNER PLANS FOR WATER ON COUNTRY	3
<hr/>	
GIPPSLAND REGION	4
Case Study: Primed for results - birds flock to reviving wetlands	6
<hr/>	
CENTRAL REGION	8
Case study: Native species thrive and introduced species decline following second billabong watering	9
<hr/>	
WESTERN REGION	10
Case study: Water for the environment helping to keep river health alive for community enjoyment	11
<hr/>	
NORTHERN REGION	12
Case study: Water for the environment plays crucial role in preventing extinction of Moira grass at Ramsar-listed wetlands	13
<hr/>	
FINAL REFLECTION	14
<hr/>	
SUMMARY OF WATER FOR THE ENVIRONMENT DELIVERY 2021-22	16

Reflections: Water for the Environment in Victoria, 2021-22

Reflections is an opportunity for the Victorian Environmental Water Holder (VEWH) and its partners to highlight the annual achievements and ongoing environmental outcomes of delivering water for the environment, across the Victorian environmental watering program.

Water held in storages for the environment plays a key role in supporting our rivers and wetlands, since natural flows have been changed through the introduction of dams, weirs, channels and other infrastructure in many river systems to meet important human needs.

Water for the environment looks to provide outcomes such as: cueing fish migration and breeding; improving water quality; improving the condition of established floodplain trees; triggering the growth of wetland plants and providing feeding and nesting habitats for waterbirds.

There are also significant benefits to people when waterways are healthy – such as through increased tourism, recreation, economic prosperity and wellbeing.

Varying conditions required the program to adapt to different needs

The Seasonal Watering Plan 2021-22 outlined how proposed deliveries of water for the environment in each system would be adapted in response to dry, average or wet climatic conditions during the year.

Climatic conditions varied considerably across Victoria between 1 July 2021 and 30 June 2022.

Gippsland was very wet and had widespread floods, northern and central parts of Victoria were slightly wetter than average, but western Victoria remained dry.

Each of these conditions presented a different suite of challenges and opportunities for partners in the Victorian environmental watering program, collaborating to make the best use of available water in rivers and wetlands across the state.

Our Reflections for 2021-22

This year, we reflect on the environmental watering approach undertaken in different parts of Victoria during 2021-22.

We provide an example from northern Victoria that shows how environmental watering program partners have worked together to adapt to prevailing conditions and how decisions taken in 2021-22 build on past watering actions and consider future needs.

A story from West Gippsland Catchment Management Authority (CMA) highlights how environmental watering over the long-term has delivered outcomes for waterbirds, important aquatic vegetation and water quality during very wet conditions in the lower Latrobe wetlands.

And we provide a case study of how plans by Wimmera CMA have considered the social, economic and recreational benefits of water for the environment, informed by their consultation with local communities.

From Melbourne Water, we hear about how monitoring following watering in 2020-22 informed watering in 2021-22, which in turn saw a surge in animal life and great responses from native vegetation.

A snapshot of program achievements and outcomes for 2021-22

In 2021-22, 976,685 megalitres of water for the environment was delivered by partners in the environmental watering program across Victoria, in line with priorities published in the Seasonal Watering Plan 2021-22.

This includes water managed by the following water holders/ programs:

- Victorian Environmental Water Holder – 304,251 megalitres
- Commonwealth Environmental Water Holder (CEWH) – 573,738 megalitres
- The Living Murray (TLM) program – 98,696 megalitres.

These deliveries and the associated volumes for each waterway system are reported in our Summary of Water for the Environment Delivery 2021-22.

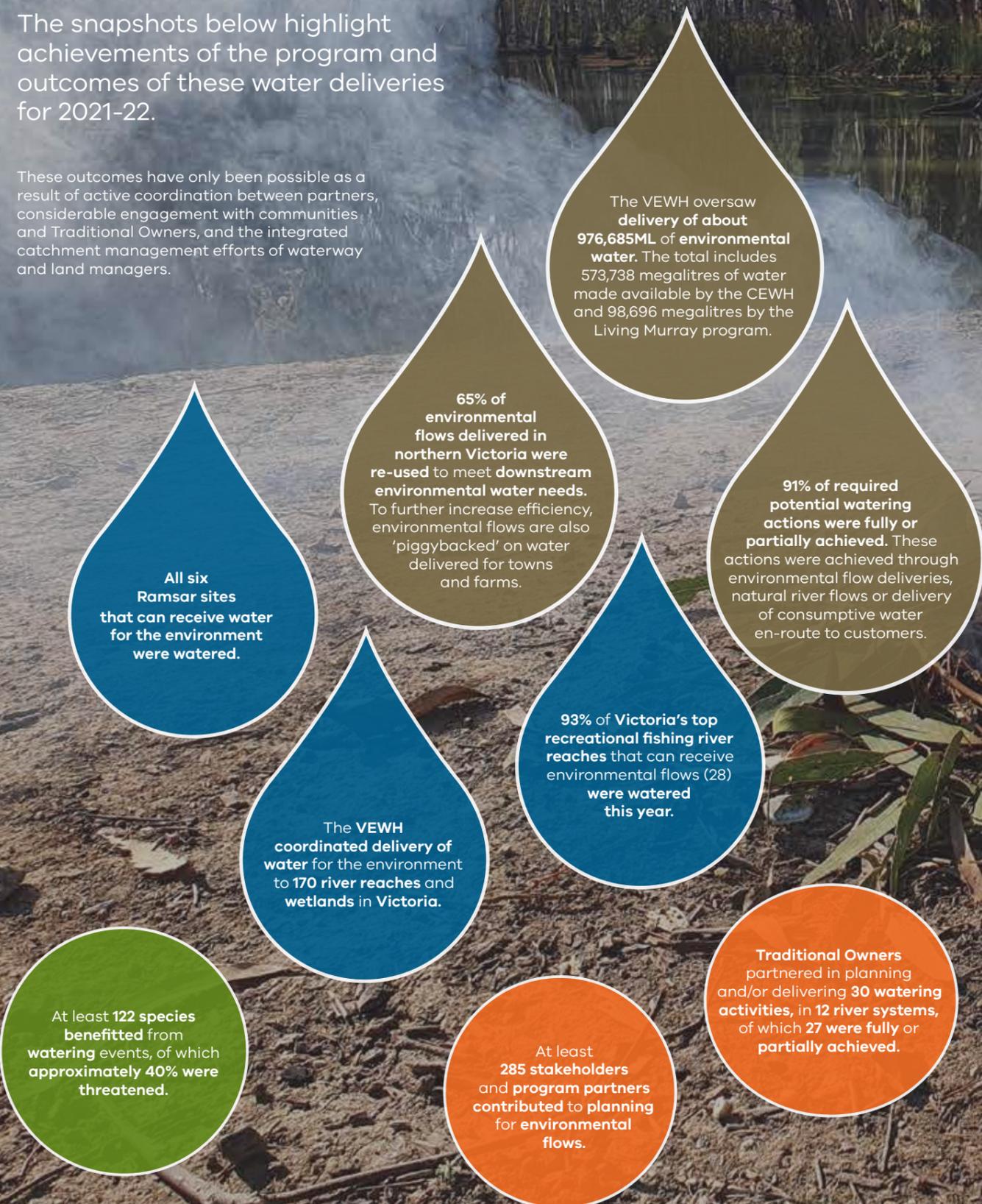


WATER FOR THE ENVIRONMENT

Achievements and outcomes 2021-22

The snapshots below highlight achievements of the program and outcomes of these water deliveries for 2021-22.

These outcomes have only been possible as a result of active coordination between partners, considerable engagement with communities and Traditional Owners, and the integrated catchment management efforts of waterway and land managers.



Traditional Owner plans for water on Country

The VEWH has made a commitment to support Traditional Owner self-determination, agency and decision-making around water management and rights on Country within the environmental watering program.

We practice this in a number of ways including:

- through our partnerships with Department of Environment, Land, Water and Planning (DELWP) in contributing to policy development
- our collaboration with waterway managers in their engagement with Traditional Owners to support cultural objectives from potential water deliveries
- and increasingly, through direct relationship building between the VEWH and Traditional Owners.

Despite COVID-19 restrictions across the state, waterway managers ensured their relationships with Traditional Owner organisations and representatives were maintained through phone calls and on-Country meetings within health restrictions to inform planning.

In 2021-22, waterway managers planned 30 deliveries of water for the environment in partnership with Traditional Owners and their identification of aligned cultural values in 12 river systems.

Of these planned deliveries, 27 were fully or partially achieved, and each of them will help further develop more culturally-informed water planning and practices.

Photo: Smoke over Gunbower Creek, by Nick Stewart from the VEWH

Gippsland region

Gippsland

Very wet climatic conditions

Gippsland had very high rainfall throughout 2021-22 and widespread flooding in both June and November 2021. It was the second consecutive wet year for the region and spills from reservoirs and local catchment run-off meant that most of the environmental watering for the year was delivered naturally, with very little water held for the environment needing to be delivered.

Natural floods fully flushed the lower Latrobe wetlands (Sale Common, Dowd Morass and Heart Morass) with fresh water for the first time since 2010-11, and high flows connected the Latrobe, Thomson and Macalister rivers with their floodplains.

Floodplains are essential to waterway health

Floods are very challenging for local communities and businesses in floodplains and low-lying areas. For rivers however, floodplains are essential to store water, nutrients and sediments, and to return to their rivers the rich organic material critical to sustaining ecosystems and associated environmental outcomes.

The wet conditions in Gippsland in 2021-22 coupled with active environmental watering in previous years, allowed native fish to move throughout the network of rivers to breed, attracted large numbers of waterbirds to the lower Latrobe wetlands, and going forward, will boost the condition of floodplain and wetland plant communities.

Our Reflections 2021-22: Reaping rewards of seeds sown over drier years

Very little water held for the environment was delivered in the Gippsland region during 2021-22, with nature stepping in. However, the strong environmental outcomes observed during this year were achieved as a result of previous years' watering plans, and other catchment management works.

Over the previous five to 10 years, deliveries of water for the environment alongside other catchment management works have helped sustain critical plant and animal communities. This has helped them to survive drier periods so they were in the numbers and condition they needed to be, ready to rebound and make the most of this good season.

Ongoing deliveries of water for the environment of the lower Latrobe wetlands have meant the program has been able to maintain and improve several water-dependent plant and animal species at risk.

This has helped improve their resilience, ready to flourish in the good conditions of 2021-22.

Water deliveries, combined with other water and land management activities, have also controlled the growth of introduced plants and pest animal species and kept in check a growing salinity problem affecting vast areas of the wetlands.

Thomson, Macalister & Latrobe systems

Snowy system

Photo: Royal Spoonbill at Dowd Morass, by West Gippsland CMA

Primed for results - birds flock to reviving wetlands

The results of a spectacular breeding season were on show across the lower Latrobe wetlands in autumn 2022 with the water humming with scores of waterbirds, fish, frogs and eels.

The booming season was a great indicator of the ongoing recovery of these internationally-significant landscapes, with help from water for the environment.

The lower Latrobe wetlands, located just outside of Sale in East Gippsland, include Sale Common, Dowd Morass and Heart Morass and form part of the broader Gippsland Lakes Ramsar site.

Each of the wetlands provide an important function for native plants and animals. Put simply, Dowd Morass is the housing estate where everyone lives, Heart Morass is the supermarket where everyone goes shopping, and Sale Common is the holiday destination.



A shared responsibility to care for these wetlands

The freshwater fringing wetlands to the Gippsland Lakes play a vital ecological role but the legacy of upstream river modifications, water extraction, poor land management practices and climate extremes had seen large sections of the lower Latrobe wetlands become increasingly brackish and saline.

But, over the last decade, water and land managers and local communities have worked together to repair the wetlands, including the introduction of water entitlements held for the environment.

After over 10 years of delivering water for the environment to the lower Latrobe wetlands, Sale Common saw Australasian Bittern return in 2019 for the first time since the 1990s. Heartened, community members began water quality monitoring in 2020 focussing on Heart Morass where a lot of land management improvements were underway.

Monitoring showed adaptive water and land management at Heart Morass had improved water quality. Shifting the pH dial towards neutral and salinity levels towards freshwater primed the wetland to respond in full splendour to the natural flooding that occurred during 2021.

“Good rainfall and natural flows complement long-term deliveries of water for the environment to revive rivers and floodplains, providing life support for native plants and animals,” VEWL Co-CEO, Beth Ashworth, said.

The 2021 floods flushed freshwater through the system and out into Lake Wellington, building on the groundwork deliveries of water for the environment had established.

“Over the past years, we’ve been managing water for the environment through drought and fire seasons. This has essentially laid the groundwork to allow the environment to flourish when these natural flows came through,” West Gippsland CMA Environmental Water Officer, Adrian Clements, said.

Conditions throughout 2021-22

The Latrobe catchment experienced above-average temperatures throughout most of 2021-22 and above-average rainfall during early winter and throughout spring (particularly during November) 2021 for a second consecutive year.

Significant flooding in June 2021 was followed by several smaller floods in late winter and spring. These floods as well as other high-flow events in the Latrobe, Macalister and Thomson rivers flushed the lower Latrobe wetlands for the first time since 2010-11, and salinity in Lake Wellington was at its lowest since 2004.

Water for the environment prepared for and complemented natural flows for the lower Latrobe wetlands.

In addition to providing critical freshwater habitat for the diversity of waterbirds in the wetlands, changes in water levels influence the type of food available for each species to forage for at different times of the year – whether that’s picking worms from the mud in lower water levels in summer or chasing moths through the reeds at higher levels in spring. Variation in the water flow also helps maintain the vegetation at the right height at the right time for bird nesting.

Environmental watering has been particularly important in sustaining waterbirds and vegetation during drier years, so they’re in better condition and numbers to keep breeding and flourishing when conditions get better.

“We manage water for the environment within a bigger picture of keeping things going in dry times so the environment can have a ‘boom cycle’ when nature delivers rains such as in the past year,” Dr Clements said.

“Despite the wet year, we continued to plan for environmental flows on key waterways and simply adjusted them to suit the rainfall conditions. Water for the environment when it’s wet is important to build strong and resilient rivers and wetlands to prepare them for future dry years,” he said.

Successful outcomes showing results of years of planning water and land management

In 2021-22, alongside the Australasian Bittern return, there were over 300 nests spotted and attributed to Australasian Darter and colonial waterbirds including Royal Spoonbill, Yellow-billed Spoonbill, Little Pied Cormorant, and Little Black Cormorant. This is the largest breeding event since 2012.

In addition, increased numbers of Musk Ducks have been seen in the lower Latrobe wetlands – this freshwater-dependent species is culturally significant to the Gunaikurnai Traditional Owners.

Monitoring in March 2022 revealed another boom year for native animal breeding events in the wetlands including endangered Growling Grass Frog and Green and Golden Bell Frog recorded for the first time breeding at Heart Morass. Also responding to the natural and environmental flows have been freshwater-dependent vegetation not seen at these sites in decades, such as Eel Grass (also known as Ribbon Weed).

In addition, fishers noted a marked increase in Estuary Perch and Australian Bass indicating breeding and migration events in 2020-21. For the Australian Bass, Australia’s longest-lived fish species, this was the largest breeding event in the Latrobe system since the 1980s.

Delivering water for the environment has prepared these important wetlands for the ‘boom times’. Environmental flows will continue to be delivered in response to emerging conditions. Coupled with robust water quality monitoring and strong community participation, the future of the lower Latrobe wetlands is in safe hands.

Photo: Sale Common in July 2021, by West Gippsland CMA



Central region

Central

Slightly wetter than average climatic conditions

Central Victoria had slightly wetter than average conditions for the second consecutive year in 2021-22.

Frequent rain events filled many of the region's reservoirs and caused some reservoirs in the Tarago, Yarra, Werribee, Moorabool and Barwon systems to spill.

These spills and other natural river flows achieved many of the planned watering actions for the year, and more. These large flows provide significant environmental benefit that cannot be achieved with the limited amount of water for the environment available in the central region. They helped to flush salt and pollutants through waterways and provided good conditions for fish movement and breeding.

Our Reflections 2021-22:

Water for the environment was delivered into important areas which don't receive adequate natural flows, even in wetter conditions. These included the lower Barwon wetlands – to top up Reedy Lake and Hospital swamps – and into Annulus Billabong on the Birrarung (Yarra) River near Ivanhoe, in Melbourne.

Water for the environment was also coupled with urban and irrigation water deliveries to help meet environmental needs, where they weren't achieved by natural flows.

For example, water was provided to boost low flows to the Upper Barwon River, to supplement summer freshes and autumn low flows in the Tarago and Werribee Rivers. It was also provided to boost a mix of high and low flows in the Yarra.

Photo: Djirri Djirri women's dance group at Annulus Billabong celebration event, by Melbourne Water



Native species thrive and introduced species decline following second billabong watering

The billabongs on the Birrarung (Yarra) River floodplains are an integral part of a complex and functioning ecosystem, that through river regulation and pressures of a growing capital city, often do not receive enough water to meet critical ecological needs.

Billabongs are bodies of water formed when a river changes course or after floodwaters go down. The Annulus Billabong on the Birrarung has immense environmental value for the plants and animals that depend on it and is a site of cultural significance for the Wurundjeri Woi-Wurrung people.

The nearby area is also highly valued for recreation including walking and cycling.

In 2021, the Annulus Billabong received a helping hand from water for the environment held by the VEWH as part of the Yarra Environmental

Entitlement to support the plants and animals that call it home. The water was delivered to take advantage of high natural flows and to capitalise on the benefits of a 2020 environmental watering.

Melbourne Water as the waterway manager for the Birrarung River built on information gained from environmental watering the previous year which recommended a follow-up delivery of water for the environment.

The watering aim was to suppress weeds, encourage the growth of native vegetation while stopping the growth of terrestrial species in the billabong, and build a better understanding of the billabong's watering needs going forward.

Timing the watering to coincide with higher natural flows was a bonus to lift the fill level to where it would likely be in natural flood conditions prior to urbanisation and river regulation - the

last time the Billabong was full was 2011.

Monitoring during and after the 2021 environmental water delivery was undertaken by Melbourne University and the Wurundjeri Woi Wurrung Cultural Heritage Corporation's Narrap team, observing exciting results. Watering led to a swift response through an abundance of frogs, ducks and swamp wallabies. Further monitoring in summer as the billabong began to naturally dry showed there was a strong positive response from native vegetation and weed suppression.

These watering events have given the Narrap team and Melbourne Water a great opportunity to see what happens when the Annulus Billabong is filled, and will be important to help determine its watering and management needs into the future.



Above: Annulus Billabong - Birrarung (Yarra) River, by Melbourne Water

Western region

Western

Continuing dry climatic conditions

La Niña had little impact in western Victoria during 2021-22.

Several large rain events delivered natural flows in both the Wimmera and Glenelg rivers during winter and spring, but the rain generally missed the catchments that feed the region's reservoirs.

Inflows to the region's reservoirs were below the long-term average for the fifth year in a row, and total inflows over the last four years have been equivalent to the worst period of the Millennium Drought.

Our Reflections for 2021-22: Environmental water entitlements have a key role in tougher times

While waterway managers in other parts of the state were delivering flows in line with their planning for average or wet conditions, Wimmera CMA and Glenelg-Hopkins CMA were delivering flows in line with their plans for very dry conditions.

Water for the environment was used sparingly in the Wimmera and Glenelg systems and only when needed to maintain low flows, prevent drying of important refuge pools and reduce the risk of poor water quality. Reserving unused water for future years was also a priority as insurance against continuing dry conditions.

The Wimmera and Glenelg rivers' environmental entitlement was only created in 2010 and therefore wasn't available to mitigate some of the worst effects of the Millennium Drought.

This highlights the critical role of water entitlements for the environment to help adaptively manage through challenging dry times.

The diligent use of the water for the environment entitlement over the last four dry years has helped to prevent extensive drying of rivers, hyper-saline conditions and widespread fish deaths – such as those in the Wimmera and Glenelg systems during the Millennium Drought.

Water for the environment is critical for supporting the survival of native fish species. Especially where landscapes are highly degraded, targeted environmental water flows trigger breeding and spawning, and reconnect river sections so fish can move up and down stream to seek food and mates. The flows are also planned to help maintain river levels high enough to keep fish habitats such as logs and vegetation under water and have adequate water quality for their general health and survival.



Photo: Wimmera River, by Wimmera CMA and Just My Luck Fishing

Water for the environment helping to keep river health alive for community enjoyment

In western Victoria in 2021-22, water storages remained low again in spite of recurrent La Niña events elsewhere. Storage inflows over the previous four years were comparable to the worst of the Millennium Drought.

The continuing dry conditions in western Victoria highlighted how water for the environment can help sustain environmental, social and economic benefits for the Glenelg and Wimmera regions.

By providing minimum flows at critical times, CMA partners and the VEWH helped maintain water quality for fish, platypus and aquatic plants in both systems. This in turn has provided significant social and economic benefit for communities that live in the Glenelg and Wimmera catchments, including providing habitat for fish populations and the highly-popular fishing events in the region and other social activities.

In the Glenelg River, as part of a long-term catchment management plan by the Glenelg Hopkins CMA, deliveries of water for the environment over the last 10 years have supported good recruitment and survival of River Blackfish and the survival of adult Estuary Perch and Tupong. These outcomes are monitored by the Arthur Rylah Institute (ARI) as part of the Victorian Environmental Flows and Assessment Program (VEFMAP).



A Wimmera fish tale

This season water for the environment delivered to the Wimmera River supplemented natural flows to maintain water levels and support water quality in the Horsham, Dimboola and Jeparit weir pools, in turn supporting fish health.

Good fish stocks are important if the Wimmera region is going to continue to attract visitors to premier fishing events. Economic studies have reported that the Wimmera region benefits economically from a healthy Wimmera River.

Over \$800,000 is generated in economic activity by the Horsham and Jeparit fishing contests and the Dimboola barefoot water-ski tournament, which involve over 4,500 people. These benefits are underpinned by water for the environment and a healthy Wimmera River¹.

The value of a healthy Wimmera River is being celebrated by a growing number of keen anglers sharing their recognition of the work that's put into the system including environmental watering to complement natural flows and support fish populations.

For example, Nathan Keonig and his son Bryce share their love of the region's top fishing spots on the Just My Luck Fishing YouTube channel, and acknowledge the benefits of water for the environment.

The continued support that water for the environment has provided regionally through promoting fish populations and managing to assist water quality needs has played a strong part to ensure western Victoria's local communities can continue to host economy-boosting events even in drier times.



Above: Bryce with his catch on Wimmera River, Wimmera CMA and Just My Luck Fishing

"The environmental flows for the Wimmera River are important for each and every community along its banks. Fresh water and flowing rivers help the native fish spawn to ensure great fishing for years to come. Fishing in the Wimmera River draws people to the region and in turn creates more tourism dollars for our local businesses. A healthy river helps drive healthy tourism."

Nathan Keonig



Photo: Wimmera River, by Wimmera CMA and Just My Luck Fishing

¹ The annual report commissioned by the Wimmera Development Association "Economic Value: Selected Wimmera River Events for 2022", reviewed the 2021-22 Horsham and Jeparit fishing contests and the Dimboola barefoot water-ski tournament, and found there was over \$800,000 generated in economic activity and involved over 4,500 people.

Northern region

Northern

Average to wet climatic conditions

Rainfall across northern Victoria during 2021-22 was either close to or above the historical long-term average.

After four years of dry conditions, higher inflows to reservoirs boosted water allocations to all water users and increased opportunities for environmental watering during the year. Hume Dam on the Murray River spilled several times, but there was no widespread flooding.

Periods of high rainfall delivered high flows in many rivers throughout northern Victoria and extra water was released into the Murray River from Hume Reservoir at certain times to manage identified flood risks. These natural river flows and operational releases partially met planned environmental watering actions for the region's rivers and inundated some wetlands on low-lying parts of the Murray River floodplain downstream of Swan Hill.

Water for the environment was released to fully meet planned watering actions in rivers and wetlands, many of which would have naturally filled if the water wasn't captured in upstream reservoirs.

Our Reflections 2021-22: Working together to maximise opportunities

The VEWH and its partners closely consider the interactions between the Goulburn, Campaspe and Loddon systems and the Murray River into which they flow – as well as the activities of storage managers to meet customer demand and mitigate flood risks. These interactions can be very complex in years such as 2021-22 when flow conditions varied significantly between catchments and changed suddenly. Such conditions also create opportunities that are not available in drier years, for example:

- the VEWH has unregulated entitlements in several systems that allow water to be diverted into wetlands and floodplain habitats for environmental benefit when river flows are naturally high and relevant storages are full.
- 'return flows' – water for the environment that passes through a targeted river or wetland and is subsequently used for environmental outcomes at other sites further downstream – are a key means to get the most efficient results from the water available.

Collaboration is also key to maximising outcomes for the environment, for instance trialling using both environmental flows and exclusion fencing for pest species has shown an immediate positive response from the threatened species, Moira grass (*Pseudoraphis spinescens*).



Photo: Barmah-Millewa Forest, by Goulburn Broken CMA

Water for the environment plays crucial role in preventing extinction of Moira grass at Ramsar-listed wetlands

The 2021-22 delivery of water for the environment to the Barmah-Millewa Forest was another step in a journey spanning more than 10 years to restore Moira grass on the floodplains, which in 2009 had fallen to just five percent of its original coverage.

Barmah-Millewa Forest is the largest and most intact freshwater floodplain system on the Murray – and the largest river red gum forest in Australia, which makes it the biggest ecosystem of its type in the world. The forest's floodplains provide critical habitat for threatened turtles, frogs and many waterbirds and insects.

Recognised internationally under the Ramsar convention, the Living Murray icon site is also one of the last strongholds of Moira grass in Victoria.

In 2009, it became clear that without multi-year environmental flow deliveries the floodplain grass was predicted to become locally extinct as early as 2026.

Knowledge built up over decades of scientific studies had indicated manipulating the watering regime and controlling large, introduced herbivore grazing pressure was the most effective management option – and the science had indicated what specific watering the Moira grass needed.

That watering requirement has been proven, 13 years on. Monitoring has confirmed that Moira grass responds best to regular inundation at about 0.5 metres in spring, with water staying on the Moira grass plains for a minimum of three months, followed by a drying cycle no earlier than December.

There have been further learnings along the way. Environmental water holders and waterway managers have each year assessed what management has the best chance to increase the frequency of flowering years, the size of the area covered by the grass, and to create a grass thatch thick enough to weather drying cycles.

The winter-spring 2021 delivery of environmental flows was the fifth time the water had been managed to replicate natural flows onto the floodplain through winter and spring, by opening water regulator structures regardless of river levels. This method of delivery has allowed the floodplain water to connect with the river more gradually and monitoring has



Above: Top Lake Exclusion Fence in Barmah-Millewa Forest showing extensive Moira grass coverage where grazing animals have been excluded, by Keith Ward at Goulburn Broken CMA

confirmed the watering technique results in strong Moira grass growth and flowering.

Water for the environment deliveries were paused when natural flows were greater than 15,000ML/d downstream of Yarrowonga so as to prevent third party impacts.

Approximately 60 percent of Barmah and Millewa forest floodplain (55 percent of the forest reserve) was inundated from the peak spring natural flood event. Although water for the environment alone can only be delivered up to a level that inundates around 17 percent of the floodplain (15 percent of the reserve), its importance lay in slowing natural flood peak recession and maintaining duration of ponding to permit critical ecosystem responses to be achieved.

Recent strategies have tested the value of exclusion fencing to keep out feral horses. The naturally open Moira grass plains are like nature's own cleared and irrigated pasture – with the nutritious grass highly attractive to grazing animals. Feral horses are considered to be highly destructive through their grazing, browsing and trampling pressure. They rapidly crop the grass to ground level when floodwaters subside and eat the stems even when it is dry.

Grazing pressure removes flower heads and therefore has a direct impact on re-seeding, and also frequently sees entire plants consumed. To test the impact of grazing and protect the regenerating Moira grass from horses, exclusion fencing was trialled, with monitoring

from May 2021 showing in one site an increase in coverage of 2000 percent when combined with environmental watering over a 12-month period.

This great result further informed the 2021-22 environmental watering proposal.

The delivery of around 200,000ML to Barmah Forest (with around 140,000 ML of the volume delivered returned to the river for downstream use) achieved the outcomes as without the delivery, river regulation would have otherwise prematurely dropped the desired water level before Moira grass have flowered and waterbirds had fledged.

"The once extensive Moira grass marshlands are showing substantial improvement with active management, specifically by fencing remnant patches to exclude large herbivores, and improved delivery of environmental water to support plant vigour and recruitment," Goulburn Broken CMA Environmental Water Reserve Manager, Keith Ward, said.

Before the Murray River was regulated, the Barmah-Millewa Forest would have experienced more frequent flooding with high flows from rainfall in winter and spring. Without environmental water, the Moira grass would only have been achieved the right levels of inundation four to five times in the last 13 years (compared to eight to nine times if river regulation had not been in place over that same period).

A final reflection

For many regions, the wetter conditions in 2021-22 will help the health of our waterways continue to recover from extensive degradation caused by the Millennium Drought.

It provided the right conditions to build fish, bird, frog, turtle and platypus numbers so they're more able to survive the increasingly variable climate conditions projected ahead.

"Recent wet conditions have provided a boost for improving and maintaining waterway health in many Victorian regions," VEWH Co-CEO, Beth Ashworth, said.

"Thanks to all partners in the Victorian environmental watering program for their hard work.

"Together, over the years we have helped to build ecological resilience and provide life support during tougher seasons.

"This watering year, higher natural flows in many areas combined with some selective environmental flows have seen many threatened native animal and plant species successfully breed and grow," she said.

Photo: Goulburn Weir, by Andrew Sharpe from the VEWH



Summary of water for the environment delivery 2021-22

System	Site	Total (ML)	VEWH (ML)	TLM (ML)	CEWH (ML)	Other (ML)	
GIPPSLAND REGION							
Latrobe system	Latrobe River	-	-	-	-	-	
	Heart Morass	Water was diverted into Heart Morass from the Latrobe River*					-
	Dowd Morass	Water was diverted into Dowd Morass from the Latrobe River*					-
	Sale Common	Water was diverted into Sale Common from the Latrobe River*					-
Thomson system	Thomson River	18960.0	18960.0	-	-	-	
	Heyfield wetlands	-	-	-	-	-	
Macalister system	Macalister River	390.0	390.0	-	-	-	
Snowy system	Snowy River~	293,300.0	-	-	-	293,300.0	
GIPPSLAND REGION TOTAL		19,350.0	19,350.0				
WESTERN REGION							
Glenelg system	Glenelg River*	15,087.0	15,087.0	-	-	-	
	Wimmera River*	8,868.9	8,868.9	-	-	-	
Wimmera system	MacKenzie River	2,885.4	2,885.4	-	-	-	
	Burnt Creek	109.4	109.4	-	-	-	
Wimmera-Mallee wetlands	Upper Mount William Creek	135.0	135.0	-	-	-	
	Ranch Billabong	6.0	6.0	-	-	-	
	Barbers Swamp	3.9	3.9	-	-	-	
	Broom Tank	1.0	1.0	-	-	-	
	Carapugna	12.9	12.9	-	-	-	
	Challambra Swamp	4.7	4.7	-	-	-	
	Chirrup Swamp	0.4	0.4	-	-	-	
	Clinton Shire dam	2.6	2.6	-	-	-	
	Cokum bushland reserve	3.5	3.5	-	-	-	
	Considines	4.2	4.2	-	-	-	
	Corack Lake	3.4	3.4	-	-	-	
	Creswick Swamp	2.7	2.7	-	-	-	
	Cronomby Tanks	6.1	6.1	-	-	-	
	Crow Swamp	5.1	5.1	-	-	-	
	D Smith Wetland	0.7	0.7	-	-	-	
	Davis Dam	1.1	1.1	-	-	-	
	Falla Dam	1.8	1.8	-	-	-	
	Fieldings Dam	1.1	1.1	-	-	-	
	Greens wetland	1.4	1.4	-	-	-	
	Harcoans Swamp	4.7	4.7	-	-	-	
	J Ferrier Wetland	2.3	2.3	-	-	-	
	Jeffcott Wildlife Reserve	3.4	3.4	-	-	-	
	Jesse Swamp	3.0	3.0	-	-	-	
	John Ampt	2.1	2.1	-	-	-	
	Mahoods Corner	1.2	1.2	-	-	-	
	Morton Plains Reserve	1.6	1.6	-	-	-	
	Mutton Swamp	4.3	4.3	-	-	-	
	Paul Barclay	3.0	3.0	-	-	-	
Pinedale	1.7	1.7	-	-	-		
Poyner	1.0	1.0	-	-	-		
R Ferriers Dam	6.3	6.3	-	-	-		
Rickard Glenys Dam	0.3	0.3	-	-	-		
Roselyn Wetland/Reids Dam	2.9	2.9	-	-	-		
Sawpit Swamp	9.0	9.0	-	-	-		
Schultz/Koschitzke	2.8	2.8	-	-	-		
Tarkedia Dam	1.3	1.3	-	-	-		
Towma (Lake Marlbed)	1.2	1.2	-	-	-		
Uttiwillock Wetland	4.6	4.6	-	-	-		
Wal Wal Swamp	2.2	2.2	-	-	-		
WESTERN REGION TOTAL		27,207.2	27,207.2				

~ Water delivered to the Snowy River by the New South Wales Department of Industry between 1 May 2021 and 30 April 2022. This water is authorised and delivered by NSW and therefore is not included in the regional or statewide totals presented in this table.

* Includes actively managed passing flows delivered in the Glenelg River (5,287.0 ML), Wimmera River (1751.8 ML) enabled under the *Wimmera & Glenelg River Environmental Entitlement 2010*, and Coliban River (213.8 ML) enabled under the *Bulk Entitlement (Campaspe System- Coliban) Conversion Order 1999*.

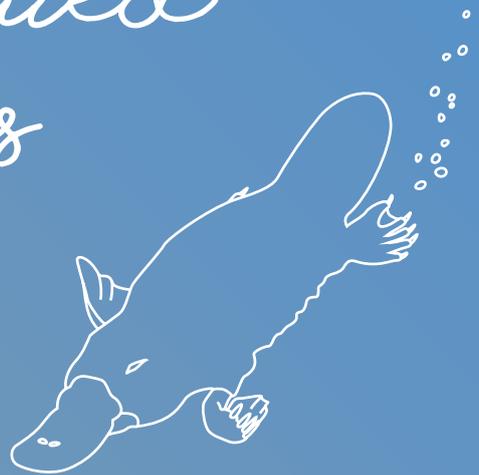
** Goulburn River includes flows in reach 4, reach 5 and reach 1.

* The VEWH's environmental entitlements in the lower Latrobe and lower Barwon wetlands allow diversion of water from the Latrobe and Barwon rivers into the wetlands at any time when specific river height triggers are met. The entitlements do not consist of a set volume and the volume of water diverted into the wetlands is not measured.

Environmental flows in these sites were achieved by manipulation of water levels in Murray River weir pools. Environmental water is supplied by the Commonwealth Environmental Water Holder and accounted 50.50 between Victoria and NSW. Only the Victorian component has been included in the regional and statewide totals presented in this table.

System	Site	Total (ML)	VEWH (ML)	TLM (ML)	CEWH (ML)	Other (ML)	
CENTRAL REGION							
Yarra system	Yarra River	26,917.0	26,917.0	-	-	-	
	Annulus Billabong	28.0	28.0	-	-	-	
	Yering Backswamp	-	-	-	-	-	
Tarago system	Tarago River	951.0	951.0	-	-	-	
Werribee system	Werribee River	792.0	792.0	-	-	-	
	Pyrites Creek	1,470.1	1,470.1	-	-	-	
Maribyrnong system	Upper Jackson Creek	314.5	314.5	-	-	-	
Moorabool system	Moorabool River	2,563.0	2,563.0	-	-	-	
Barwon system	Reedy Lake^	Water was diverted into Reedy Lake from the Barwon River^					
	Hospital Swamps^	Water was diverted into Hospital Swamps from the Barwon River^					
	Upper Barwon	849.2	849.2	-	-	-	
CENTRAL REGION TOTAL		33,884.8	33,884.8				
NORTHERN REGION							
Victorian Murray system	Barmah Forest	205,312.5	92,892.5	4,476.0	107,944.0	-	
	Boals Deadwood	5,603.1	1,724.1	3,879.0	-	-	
	Gunbower Forest	2,946.1	2,530.0	416.1	-	-	
	Gunbower Forest - Yarran Creek	1,125.0	-	1,125.0	-	-	
	Gunbower Forest - Little Reedy, Greens and Corduroy	9,166.9	1,030.0	8,136.9	-	-	
	Gunbower Forest - Reedy Lagoon	2,604.0	321.0	2,283.0	-	-	
	Gunbower Forest - Black Swamp	1,462.6	162.7	1,299.9	-	-	
	Gunbower Forest - Little Gunbower Lagoon	3,207.9	376.7	2,831.2	-	-	
	Gunbower Creek	10,149.4	8,079.7	-	2,069.7	-	
	Hattah Lakes	46,138.7	30,248.3	15,890.4	-	-	
	Lindsay-Mullaroo Connector	208.9	-	208.9	-	-	
	Lindsay River, Mullaroo Creek, Potterwalkagee Creek and Mulcra Island#	4,094.5	-	-	4,094.5	4,094.5	
	Crankhandle	800.0	-	800.0	-	-	
	Lake Wallawalla	10,005.5	-	10,005.5	-	-	
	Johnsons Swamp	1,500.0	1,500.0	-	-	-	
	Lake Elizabeth	824.0	824.0	-	-	-	
	Lake Murphy	3,306.2	3,306.2	-	-	-	
	McDonalds Swamp	350.0	350.0	-	-	-	
	Richardsons Lagoon	1,392.3	1,392.3	-	-	-	
	Kunat Kunat (Round Lake)	409.4	409.4	-	-	-	
	Wirra-Lo wetland complex	110.8	110.8	-	-	-	
	Muringa wetlands	26.7	26.7	-	-	-	
	Guttrum Forest	654.3	654.3	-	-	-	
	Brickworks Billabong	198.7	198.7	-	-	-	
	Burra Creek South	941.7	941.7	-	-	-	
	Burra Creek South Proper	70.1	70.1	-	-	-	
	Lake Hawthorn	177.2	177.2	-	-	-	
	Lake Koorlong	-	-	-	-	-	
	Robertson Creek	723.2	723.2	-	-	-	
	Ovens system	Ovens River	73.0	-	-	73.0	-
		King River	142.0	92.0	-	50.0	-
	Goulburn system	Doctors Swamp	427.0	427.0	-	-	-
		Gaynor Swamp	901.1	901.1	-	-	-
Kanyapella basin		1,000.0	1,000.0	-	-	-	
Loch Garry		980.0	980.0	-	-	-	
Broken system	Horseshoe Lagoon	519	519	-	-	-	
	Goulburn River**	447,371.8	23,908.9	47,185.9	376,277.0	-	
	Broken River	509.6	254.8	-	254.8	-	
Campaspe system	Lower Broken Creek	69,915.4	-	-	69,915.4	-	
	Upper Broken Creek	1,247.4	644.6	-	602.8	-	
	Kinnairds Wetland	195.0	195.0	-	-	-	
	Moodie Swamp	1,006.2	503.1	-	503.1	-	
Loddon system	Black Swamp	80.0	80.0	-	-	-	
	Campaspe River	34,420.0	25,664.0	158.0	8,598.0	-	
Loddon system	Coliban River*	-	213.8	-	-	-	
	Loddon River	13,792.8	10,437.5	-	3,355.3	-	
	Serpentine Creek	954.0	954.0	-	-	-	
	Pyramid Creek	968.1	968.1	-	-	-	
	Lake Meran	7,713.6	7,713.6	-	-	-	
Lake Boort	770.0	770.0	-	-	-		
NORTHERN REGION TOTAL		896,242.6	223,809.1	98,695.9	573,737.5		
Total water use		976,684.6	304,251.1	98,695.9	573,737.5		

water for healthy
waterways, valued
by communities



Victorian Environmental Water Holder

T: (03) 9637 8951

E: general.enquiries@vewh.vic.gov.au

W: www.vewh.vic.gov.au

