



Reflections

**Water for the Environment
in Victoria 2023-24**



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Water for the Environment in Victoria 2023-24

Reflections highlights actions in 2023-24 by the Victorian Environmental Water Holder (VEWH) and our partners to support the health of waterways, landscapes and communities through the Victorian environmental watering program.

Partners who work with us to put the program into action include waterway managers in nine catchment management authorities and Melbourne Water, other environmental water holders, storage managers, land managers, Traditional Owners and scientists. Our stakeholders are those organisations and people with an interest in the environmental watering program.

Water held for the environment in storages helps to support our rivers and wetlands since natural flows were changed by introducing dams, weirs, channels and other infrastructure in many river systems to support 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 floodplain trees
- triggering plant growth in wetlands and on riverbanks, channels and floodplains
- providing feeding and nesting habitats for waterbirds.

Management of water for the environment aims to build resilience and halt declines in species as the climate changes.

Each year watering actions are managed in response to seasonal conditions, including responding to natural events like the floods in 2022-23 and early 2024.

Waterway managers plan with Traditional Owners, stakeholders and communities for shared benefits when environmental flows are delivered, including for cultural values, recreation and social values and activities, community wellbeing and economic benefits.

Photo: Macalister River, by West Gippsland CMA



Cover photo: Glenelg River, by Glenelg Hopkins CMA

Our reflections on 2023-24

Since the intense floods across Victoria in 2022-23, environmental water managers have worked to combine higher natural flows with selective environmental flows to continue building resilience in rivers and wetlands and plants and animals ahead of the next dry period.

Watering actions in the 2023-24 environmental watering program have focused on maintaining the benefits of the wetter-than-average conditions brought by three back-to-back La Niña events.

They aimed to support native animal and plant species to recover after big floods and breed and grow, create favourable conditions for the survival of young waterbirds and juvenile fish, and improve riverbank plant growth and water quality after prolonged high flows, high turbidity and hypoxic blackwater events.

Victoria's climate in 2023-24 reflected the seasonal variability that comes with accelerating climate change, with below-average rainfall for July to September and the lowest rainfall on record statewide in September. Then early summer rainfall was above average for much of the state, before declining to the driest March since 1986. The mean maximum temperature in 2023 was above average, the warmest since 2019.

The situation after the floods was different across the Gippsland, central, western and northern regions. Gippsland's long wet spell continued, with heavy rainfall and flooding in October 2023 and spills from major storages. Increased rainfall and runoff met or exceeded most potential watering actions and the lower Latrobe wetlands were constantly inundated.

In central Victoria bursts of rain in December 2023 and January and April 2024 generated high unregulated flows in river systems. Summer and autumn freshes of environmental water were used outside of these wet periods to supplement low river flows when drier and warmer conditions generated only half the long-term average rainfall.

Floods and high flows in 2022 left the western region in a strong resource position for environmental watering for 2023-24, with Wimmera and Glenelg River allocations at their highest level for a season start since the entitlement process began. Recent experience has demonstrated that western Victoria can encounter drier than average conditions even when other parts of the state have above-average rainfall. Waterway managers in the western region used the available allocations sparingly in 2023-24 to balance good ecological outcomes with conserving environmental water for potentially drier times one or two years ahead.

In northern Victoria waterway managers planned their watering actions in 2023-24 to consolidate and add to environmental benefits linked to the 2022 floods. They modified delivery of water for the environment during the year in response to natural high flow events and environmental triggers. They observed that a combination of natural floods and environmental watering over consecutive years has led to real benefits and built resilience, with plant growth in nutrient-enriched soils on floodplains and in river channels and wetlands, and waterbird breeding and fish breeding in some parts that had not suffered from hypoxic blackwater and carp infestation.

A rare wetland opportunity

Environmental water managers had a rare opportunity in 2023-24 to experience more choice in controlling the watering or drawing down of wetlands, and achieving this at landscape scale as well as at individual sites.

Following on from high flows and overbank flooding that inundated floodplains in 2022, many wetlands were in varying stages of either

- still holding water and remaining full or
- beginning to draw down after inundation or
- having already been drawn down to completely dry out.

The difference between 2023-24 and other years is the ability for water managers to have a much greater say on the number of wetlands in each of these stages. This blend meant they could support a more diverse mosaic of wetlands in different stages than has existed for some time.

Selecting which wetlands to allow to draw down and which to keep topped-up was decided by the specific ecological requirements at the local level. These include providing the optimal watering regime for target vegetation communities, ensuring enough water to support fish populations or successful waterbird breeding, or to dry out a wetland to control a pest species like carp.

Wetlands' proximity to other good sources of food was another factor, to make sure there was enough sustenance for juvenile birds close to sites with high rates of breeding where they had water for food, nesting sites and protection from predators. Maintaining adequate foraging habitat near key waterbird nesting areas had been a priority for environmental water managers in 2023-24.

Deliberately letting wetlands dry out for the next year is an important stage after flooding. The shallow margins of drying wetlands provide abundant foraging places for wading waterbirds and lakebed herbland plants flourish in the muddy bases as wetlands draw down.

Flexible management of the number of wetlands in each of the different stages is not possible in extremely dry conditions, because the big wetland sites that rely on receiving water naturally would generally be dry.



Photo: Reedy Lake, lower Barwon wetlands, by Jake van Dam, Corangamite CMA

Achievements and outcomes 2023-24

These snapshots highlight the program achievements and outcomes of water deliveries for 2023-24.

They resulted from planning and active coordination between program partners, deep engagement with Traditional Owners and communities, and the combined efforts of waterway and land managers to take care of water, land and biodiversity from the top to the bottom of Victoria's catchments.

945,668 megalitres (ML) 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 2023-24.

This includes water managed by these water holders and programs:

- Victorian Environmental Water Holder - 188,362 ML
- Commonwealth Environmental Water Holder (CEWH) - 576,906 ML
- The Living Murray program - 180,400 ML.

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

The VEWH oversaw **delivery of 945,668 ML of environmental water**. The total includes 188,362 ML of water made available by the VEWH, 576,906 ML of water made available by the CEWH and 180,400 ML made available by the Living Murray program.

In northern Victoria, **71% of environmental flows delivered were re-used to meet downstream environmental water needs**. Environmental flows were also 'piggybacked' on water delivered for towns and farms to further increase efficiency.

95% of required potential watering actions were fully or partially achieved. These actions were achieved through environmental flow deliveries, natural river flows or delivery of consumptive water en-route to customers.

Five of the six Ramsar sites that can receive water for the environment were watered. The sixth retained water from the 2022 flooding and did not require environmental water delivery.

100% of Victoria's top 28 recreational fishing river reaches that can receive environmental flows were watered this year.

The VEWH coordinated **delivery of water for the environment to 161 river reaches and wetlands in Victoria**.

At least **263 stakeholders and program partners contributed to planning for environmental flows in 2023-24**.

Traditional Owners partnered in planning and/or delivered **24 watering activities in 8 systems, of which 21 were required and fully or partially achieved**.

Self-determination at Musk Duck wetland

A case study by First People of the Millewa-Mallee Aboriginal Corporation and Mallee CMA

“It’s flourishing, it looks so good.”

Dylan Lawson is standing beside Musk Duck wetland, a 4.7-hectare (ha) wetland in the far north-western corner of Victoria, about 540 metres from the Murray River.

There’s about 100 ML of water for the environment in the wetland in front of him. It’s a peaceful place to be, you can hear the birds calling and, not too far away, there’s people chatting around the campfire.

But it’s more than just water Dylan is looking at – it’s self determination in action, and a demonstration of what true partnerships can deliver.

“I’d never seen water in here, except in the last floods that came through, so it’s been a long time in the making to get water into Musk Duck,” Dylan says. He is a Traditional Owner and an Aboriginal Water Officer from the First People of the Millewa-Mallee Aboriginal

Corporation (FPMMAC), a custodian of this incredible landscape.

The wetland is on Neds Corner Station, a 30,000 ha conservation property that Trust for Nature is transitioning back to the ownership of FPMMAC. The lagoon filled naturally in the 2022 Murray River flood, but after being dry for the previous five years and a hot summer, it didn’t take long for the floodwater to disappear.

In short, Traditional Owners were keen to see water back in Musk Duck wetland. Together with the Mallee Catchment Management Authority (CMA), the Victorian Environmental Water Holder (VEWH) and the Department of Environment, Energy and Climate Action (DEECA), hopes of delivering water for the environment to Musk Duck became a reality.

Water for the environment is water allocated and managed specifically to improve the health of rivers, wetlands

and floodplains. Victoria has a robust process for managing water for the environment and this had to be negotiated sensitively, while respecting the wishes of the Traditional Owners.

FPMMAC worked closely with Mallee CMA, VEWH and DEECA to navigate the watering of Musk Duck, including everything from On-Country meetings to procurement and pre-delivery monitoring of environmental values.

“I’ve had help from the CMA – Emma Collins and her team – just to be able to get the contractor to come along and be able to pump the water in there, it’s been a good journey along the way,” recounts Dylan.

Emma Collins, who coordinates the Mallee CMA’s watering team, says it’s been a two-way exchange of knowledge.

“Dylan and FPMMAC learnt what we do, the process we follow [to deliver water for the environment] and we learnt what they do and got to understand more about their cultural values,” Emma said.

FPMMAC’s River Rangers, Seed Collection Team and Safe Haven crew will all be involved in monitoring environmental outcomes at Musk Duck wetland, with Mallee CMA, VEWH and DEECA keen to continue to build on the strong partnership established with FPMMAC.

“I just want to be able to see great vegetation around these wetlands, to be able to bring my kids out, tell them stories and showcase what I’ve achieved within First Peoples and what we have done as a whole collective,” Dylan says.

Photo: Musk Duck wetland, by Mallee CMA

Water on Country

The VEWH is committed to increasing the self-determination and agency of Traditional Owners in managing and delivering water for the environment.

We continued to progress this work with Traditional Owners in 2023-24, directly and through waterway managers, with the aid of meaningful relationships and understanding Traditional Owner objectives for water to heal Country. It included five watering trials of sites of ecological and cultural significance on Country which were directed by First Nations to inform Traditional Owner-led seasonal watering proposal guidelines.

A highlight of this year was a joint delivery to the Musk Duck trial site with the First People of the Millewa-Mallee Aboriginal Corporation and the Mallee Catchment Management Authority, who together produced the case study here.



Photo: Dylan Lawson at Musk Duck wetland, by Mallee CMA



Photo: Traditional Owners from FPMMAC at Musk Duck wetland, by Mallee CMA

Gippsland region

Gippsland

Our reflections for 2023-24

Environmental watering before the wet years from 2021 to 2024 has set Gippsland's rivers and wetlands up well to respond to large-scale natural events. There have been native fish recruitment, waterbird breeding and other indicators of good waterway health.

West Gippsland has had flooding and above-average rainfall and streamflow from 2021 to 2023. Rainfall of 100-150 mm in October 2023 caused floods and spills from Thomson Dam, Blue Rock Lake and Lake Glenmaggie.

The Macalister River downstream of Glenmaggie recorded a peak flow of 60,000 ML per day, the sixth highest on record, and there was moderate flooding in the Latrobe and Thomson rivers at Sale.

The Thomson, Macalister and Latrobe rivers had higher-than-average flows and there was sustained inundation of the lower Latrobe wetlands. There were no active environmental water deliveries in 2023-24 in the Latrobe or lower Latrobe wetlands because all planned watering actions were met naturally. Many planned watering actions in the Thomson and Macalister rivers were also met naturally, but some water for the environment was delivered in these two rivers to primarily support native fish breeding and migration.

This year marked three consecutive years of flooding and inundation in the lower Latrobe wetlands, with some floodplain areas in the lower reaches inundated for five or more years. Ecological responses to several years of above-average wet conditions in the Gippsland region include:

- High numbers of tupong and Australian bass detected in the Thomson River in 2023 surveys, with tupong of different size classes found above the Horseshoe Bend fishway, indicating migration upstream.
- Successful breeding of estuary perch, Australian bass and eel in the Latrobe estuary.
- Wetlands remaining fresh with neutral pH and no salt wedge impacts from continued high flows and low salinity levels in Lake Wellington.
- The growth of sensitive freshwater plants, like ribbonweed, also known as eel-weed (*Vallisneria australis*), in Heart Morass and Dowd Morass due to lower salinity.
- Green and golden bell frogs appearing in the western end of Dowd Morass.
- Three consecutive years of successful breeding by little black cormorants, black cormorants, little pied cormorants, pied cormorants and Australasian darter at Dowd Morass colonial bird rookery.
- Cooler than normal temperatures assisting swamp paperbark recovery from sawfly infestation at Dowd Morass.
- Expansion of giant rush at Sale Common, indicating that slower drawdown of water in warmer months has favoured the rush.

Photo: Heart Morass, by West Gippsland CMA

Thomson, Macalister & Latrobe systems

Snowy system



Native fish and paddlers benefit from environmental flows

In 2023-24 the Thomson River received environmental flows in spring, autumn and winter to build on the gains for native fish achieved following several years of high rainfall – and flood – events.

Environmental flows delivered to the Thomson River in 2023-24 aimed to maintain the benefits of recent wet conditions to support native fish species that flourished in 2021 and 2022 through providing migration flow cues and connectivity.

“Strong tupong recruitment in February 2021 was recorded, with the highest catch rates in the 17-year history of the Thomson River sampling, and follow-up good survival rates into 2022,” West Gippsland Catchment Management Authority Environmental Water Officer Dr Stephanie Suter said.

“Surveys in 2023 also detected high numbers of tupong and Australian bass. Tupong of different size classes were also found above the Horseshoe Bend fishway, indicating upstream migration.”

The Horseshoe Bend fishway was completed in 2019, reconnecting Thomson River with an additional 22 kilometres on that waterway, as well as an additional 64 kilometres of the Aberfeldy River.

The river section from the Aberfeldy River to Cowwarr Weir has heritage river status with largely intact native

riparian vegetation and native fish populations.

Tupong and Australian bass weren't the only beneficiaries of water held for the environment in the Thomson River.

Taking advantage of a higher flow event in April 2024 were scores of paddlers, including a group from the Whitehorse Canoe Club who ran a three-day camping trip from Walhalla Rd bridge to Cowwarr Weir, followed by a one-day trip from Walhalla Rd bridge to Coopers Creek.

Perfect conditions for paddling on the Thomson can only be achieved when flows reach a certain height – and for the ‘fresh’ delivery in April 2024, the Whitehorse Canoe Club was ready to benefit from the 800 ML/day environmental flows.

“We love the 800 megalitres that comes down there for that period of time, as it brings the gauge above minimum flow so we can paddle the 38 kilometres down to Cowwarr Weir,” Whitehorse Canoe Club committee member, Sean Marler, said.

“It was fabulous to see so many paddlers enjoying the environmental flows, including families with kids and many first-time visitors to West Gippsland.”

The Whitehorse Canoe Club three-day paddling event was captured by videographer Kris Carson's [3 Day Release on Vimeo](#) in a short film that

depicts how water for the environment can have direct benefits to recreational users.

Mr Marler is a member of the Thomson River Environmental Advisory Group (EWAG) that makes a valuable contribution towards the annual watering proposal that informs the VEWH seasonal watering plan.

He also acts as a conduit to the paddling community by keeping fellow paddlers up to date when environmental flows are planned.

The Thomson River EWAG represents stakeholders, including community members and relevant agencies, on management of water for the environment in the Thomson River.

“While the primary role of the group is to provide a forum for stakeholder views into managing water for the environment, it also has an important role in sharing information about the condition of the river,” Dr Suter said.

“Recreational river users, like kayakers and fishers, are spending time in and on the river and can provide some valuable insights into the changes they see from year to year.”

“While the advisory group itself has no formal decision-making powers, the WGCMA really values its members' contributions in considering all feedback and advice they provide.”

Photo: Whitehorse Canoe Club and friends paddling down to Coopers Creek, by Marcia McKenzie



Central region

Central

Our reflections for 2023-24

After high natural flows in river systems over the last few years, waterway managers adapted to seasonal changeability in 2023-24 that brought warmer temperatures, drier conditions and low rainfall, except for intense bursts of spring and early summer rain.

Most planned watering actions built on the benefits of recent wet years to increase resilience ahead of a return to dry conditions.

The Tarago Reservoir continuously spilled through winter and spring, maintaining flows even during below-average rainfall. The focus for 2023-24 was on delivering environmental flows for important diadromous fish species like the threatened Australian grayling and tupong, short-finned eel and common galaxias.

Rainfall in December, January and April led to unregulated flows in the *Birrarung* (Yarra) system achieving several environmental watering actions, including summer/autumn freshes and inundation of lower Yarra billabongs and Yering Backswamp.

Then with prolonged dry conditions for most of autumn 2024, environmental water freshes and flows were used to preserve water quality, build on the benefits of the last few years' naturally high flows and safeguard against future dry conditions.

Monitoring for the 2023 Native Fish Report Card found Australian grayling recruits, juveniles and adults, indicating fish migration into the system and detecting all three age classes for the first time in seven years of sampling.

Wurundjeri Woi Wurrung Cultural Heritage Aboriginal Corporation's Narrap Rangers tagged another 13 eels in Bolin Bolin Billabong, studied eel migration with ARI scientists and began analysing data from a total of 23 tagged eels. The rangers also surveyed birds across the lower and middle billabongs with Birdlife Australia and carried out plant, frog and environmental DNA surveys with the University of Melbourne. The results of vegetation surveys at Yering Backswamp in December 2023 have been used to produce a new five-year management plan for the site outlining watering actions in 2024-25.

Environmental watering actions on the Moorabool River adapted the available water to varying conditions and used flows efficiently for priority watering. Rainfall in the upper Barwon River area was below average for nine months, including July, August and September

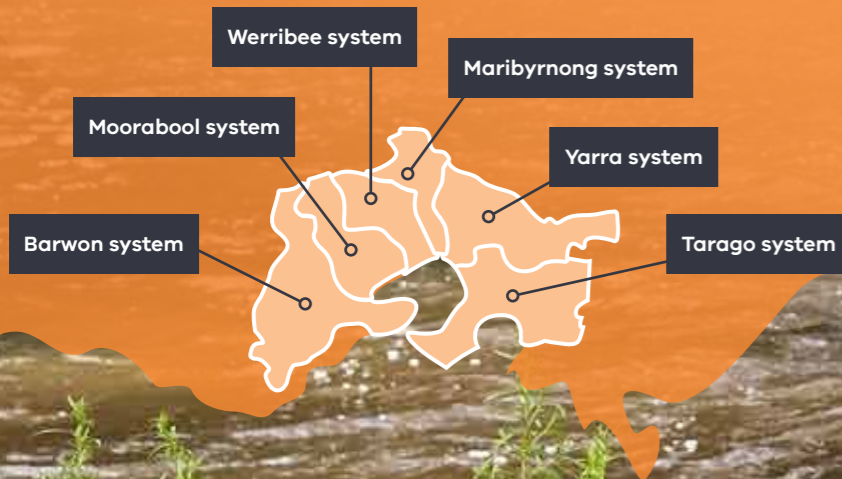
- a time of the year when rainfall is usually at its highest. In the east and west branches of the upper Barwon environmental water was used to maintain ecological conditions and prevent cease-to-flow events during the dry season.

Watering at the Lower Barwon wetlands aimed to draw down Reedy Lake and Hospital Swamps, give salt-tolerant plants a chance to recover from freshwater inflows and flooding, and support the breeding success of Australasian bittern and colonial nesters.

High unregulated inflows and widespread flooding during 2022-23 in the Werribee system did not significantly change the limited volume of environmental water available and storage capacity for the system in 2023-24. But the VEWH and waterway managers took advantage of arrangements after the floods to store extra environmental water in Merrimu Reservoir so that 2023-24 could start with almost 400 ML for ecological benefits in Pyrites Creek and potentially reuse in the lower Werribee River.

Tupong were observed to have moved downstream in response to a flow pulse delivered in June 2023 and platypus surveys in the lower Werribee River detected juvenile male platypus, indicating there was successful breeding in the 2023-24 year.

Photo: Upper Yarra River at Warburton, by Melbourne Water



High value citizen science

The prospect of a return to drier times after the intense wet conditions of 2022-23 means that long-term data and local knowledge help to assess how environmental watering contributes to better water quality and waterway health.

The Corangamite CMA has a longstanding established partnership with citizen scientists whose efforts and data as 'eyes on the ground' supplement monitoring and surveys by environmental scientists and ecologists from research organisations including Arthur Rylah Institute.

The CMA's citizen science program supports local communities to build and widely share knowledge about their catchment. The CMA manages the data, supports and trains volunteers, has an active feedback loop so volunteers know how their observations are used, and attends citizen science events to connect environmental flows with waterway health.

Programs include WaterWatch, EstuaryWatch, the Barwon Estuary Monitoring Program Phase 2, the eDNA platypus survey with Upper Barwon Landcare Network, National Waterbug Blitz, the environmental monitoring Fluker Post Project and photopoint monitoring of the Lower Barwon wetlands.

The CMA also has a direct link to the vast amount of knowledge on local river systems through advocacy groups like People for a Living Moorabool and Friends of the Barwon River, Landcare networks such as Upper Barwon Landcare Network, Moorabool Landcare Network and Geelong Landcare Network, Geelong Field Naturalists Club and local hunting groups such as Geelong Field & Game.

Volunteers from WaterWatch have been monitoring Victoria's waterways for the past 31 years, providing a valuable baseline of information from water testing and long-term data collected well before environmental entitlements existed. EstuaryWatch volunteers have been monitoring their sites for 18 years.

"We have made a concerted effort with the Barwon and Moorabool, our flagship rivers where we have environmental entitlements, to incorporate citizen science into our project work" said Rose Jackson, Project Officer in Estuaries and Environmental Water at CCMA.

"We have a citizen science project officer in all our team meetings to tell us what's been observed in WaterWatch monthly monitoring, long-term testing and environmental DNA (eDNA) testing to see how the creatures we aim to support with environmental flows are going."



Photo: Photopoint bird monitoring at Reedy Lake, by Corangamite CMA

Measuring change over time

The Barwon Basin Water Quality 2021-2024 report highlights the work of citizen scientists on the Moorabool and Barwon rivers with data contributed by 45 volunteers.

Water quality indicators including pH, electrical conductivity, turbidity, phosphorus and dissolved oxygen levels were interpreted using objectives in the Victorian Environmental Reference Standards. The waterbug community of a site was assessed using a simple biotic index that uses the pollution tolerance levels of different waterbug types to create a site score and water quality rating for the river.

Data was compared with the 2011-2020 report to measure change over time. It shows how the Moorabool's water quality changed from before 2011 when high salinity was common because of water extraction and reduced flows from the Millennium Drought.

After 2011 the introduction of environmental flows, especially over summer to autumn, helped lower salinity and improve dissolved oxygen levels. Compared with 2020 results for water quality and waterbug measurements, waterway values in 2024 have been maintained or improved. Factors influencing this include higher-than-average rainfall and the environmental flows to improve the river's overall water quality.



Photo: Environmental DNA sampling on upper Barwon River at Birregurra, by Corangamite CMA

Detecting the elusive platypus

Environmental DNA is a non-invasive sampling technique that detects genetic material from a target species secreted in water in the surrounding environment. It is useful for assessing scarce and elusive species like platypus and for fish and growling grass frogs.

In April this year local citizen science volunteers and staff from Corangamite CMA and the Upper Barwon Landcare Network collected water samples at 17 survey sites and used eDNA techniques to target the juvenile dispersal period for platypus. Platypus DNA was detected throughout the upper Barwon River and 53 per cent of the sites surveyed returned positive results.

The proportion of sites where platypus were detected was higher than previous surveys, with detections at several sites where they had not been found before.

The upper Barwon waterways have been greatly modified by land clearing, invasive species, stock access, altered flow regimes and climate change. Maintaining fish and platypus populations is an ecological objective of the Upper Barwon Environmental Entitlement, and eDNA results are valuable for confirming their presence in reaches where environmental water can have an impact.

Mapping and observing birds

eBird is a citizen science platform where users research and record bird species in certain areas and there is an eBird map of hotspots along the Moorabool River, Barwon River and the lower Barwon wetland complex.

Local bird groups, field naturalists, hunters and amateur ornithologists often visit the Lower Barwon wetlands where migratory and resident birds nest, and their 'eyes on the ground' observations of elusive birds provide valuable data on bird breeding and nesting stages.

The wetlands form part of the internationally significant Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site, with its long history and strong living cultural connection with Wadawurrung Traditional Owners, the traditional custodians of Wadawurrung Country, including the Lower Barwon.

Reedy Lake and Hospital Swamps are part of the wetlands complex and are managed as separate water bodies under the Barwon River

Environmental Entitlement, with different watering regimes to adapt to changing seasons and maintain their ecological character. Drawdowns are informed by waterbird monitoring for breeding and are managed with a gradual approach to maintain water levels or allow a gentle drop at the wetlands while waterbird breeding is under way.

Bringing cultural values to water quality monitoring

Wadawurrung Traditional Owners Aboriginal Corporation (WTOAC), WaterWatch and Corangamite CMA are involved in efforts to bring cultural and environmental values together in waterway management as Traditional Owners test water quality on the Moorabool River.

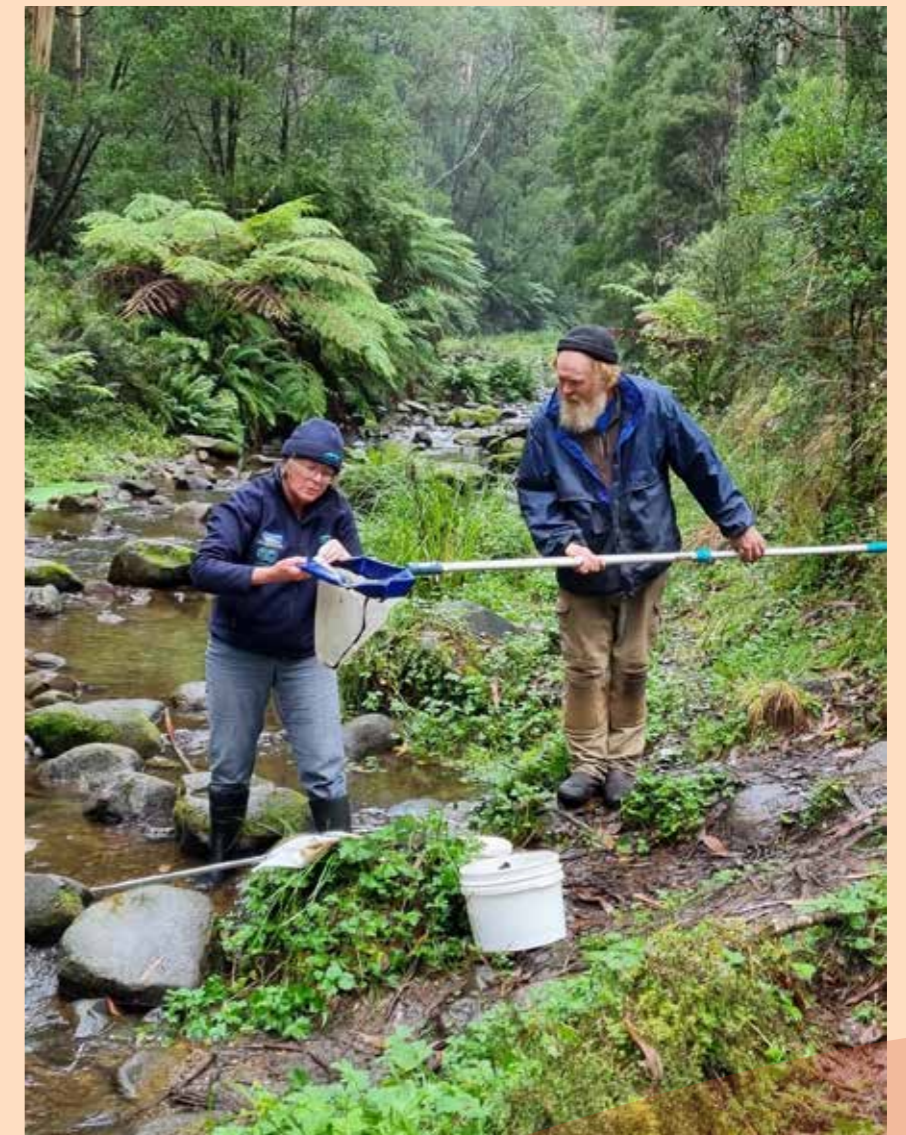
Their monitoring includes gathering data on conditions during and after WTOAC-led trial waterings in 2024 of the east and west branches of the Moorabool River in February and the

Duridwarrah wetland in March, and surveying waterbugs and sampling water quality in the river's east branch.

The trial waterings, managed and released by WTOAC, used 300 megalitres made available by Barwon Water and Central Highlands Water. They involved the VEWH and Corangamite CMA to make sure the releases complemented existing flows and environmental water releases and made the most of cultural and environmental outcomes.

WTOAC's water quality monitoring started after a community fishing day several years ago. It developed into a program of science and data collection to measure the cultural values of environmental water releases, with the first water quality monitoring report released in 2021 in partnership with the CMA.

Photo: WaterWatch waterbug survey at upper Barwon River, by Corangamite CMA



Environmental water's 'life support' for the Werribee

A return to drier times and the ongoing need to preserve water for the environment for when it is essential meant deliveries of environmental flows in the 2023-24 watering year in the lower Werribee River returned to 'business as usual' after a wetter-than-average previous year.

Four autumn environmental flows were delivered in the Werribee River to support the waterway in response to prolonged dry conditions and warmer temperatures. Werribee River tributary Pyrites Creek received baseflows, three freshes and one high flow event during spring 2023.

These environmental flows acted as crucial 'life support' for the waterways and are vital to the system, even following wetter years.

Water for the environment provides critical support for plants and animals in the highly valued Werribee River, with the small volume of water available each year working hard to protect core ecological requirements and prevent species loss.

The 'business as usual' watering strategy in 2023-24 contrasted with the previous year when above-average rainfall saw Melbourne Water deliver a rare additional environmental flow to try to cue movement of tupong, an iconic native fish that needs to migrate downstream into the sea to breed.

The effect of the flow was monitored collaboratively by Arthur Rylah Institute fish scientists, Bunurong Traditional Owners and Melbourne Water, who tagged and tracked the native fish species to understand real time migration patterns.

The research discovered tupong had moved from the Werribee River into Port Phillip Bay in association with both the targeted environmental flow release in June 2023 and several subsequent natural high flow events in July and August 2023.

Unfortunately, the small volume of water available in the Werribee and the need to prioritise this water to prevent critical species loss through summer/autumn freshes means there is currently very limited ability to deliver flows in winter/or increase environmental flow deliveries in summer/autumn.

The Werribee catchment has the lowest average annual rainfall (450 mm) of any catchment in southern Victoria. The maximum

amount of environmental water available yearly under current entitlements is around 2,500 megalitres (ML), but it's rare for inflows to be high enough to provide this.

The annual volume allocated to the environment depends greatly on seasonal conditions and storage levels. On average, in dry years around 370 ML is available, in a normal rainfall year the VEWH receives about 1,420 ML and in a wet year we may receive as much as 2,500 ML.

Environmental flows play a crucial role in supporting the growth and recruitment of plants that depend on water, and even though the environmental entitlement is small, it contributes to flushing silt and scouring biofilms to improve water quality and habitat, benefiting native fish, frogs, and waterbugs.

The environmental water entitlement in the Werribee system helps to maintain existing plants and animals. Only in wetter years, when natural flows meet a larger proportion of critical low flow requirements, can water for the environment be used for a wider range of environmental benefits such as promoting the breeding of native fish, or the growth of plants to increase depleted populations.

A big focus in the Werribee system is to work on long-term solutions to recover additional water for the environment to influence a larger range of the waterways in the Werribee catchment.



Photo: Education session with John Forrester, Werribee Riverkeeper, by Werribee Riverkeeper Association

The Victorian Government's *Central and Gippsland Region Sustainable Water Strategy (2022)* recognised that the Werribee River has an environmental water deficit of 12,000 ML a year, with additional water urgently needed to prevent further decline, improve water quality, support native fish, and provide habitat for a regionally significant platypus population.

The strategy has a policy of returning 2,000 ML to the environment in the Werribee system to support critical ecological needs in the short term, with this return slated for 2024. Up to an additional 10,000 ML is earmarked for recovery by 2032. This water recovery would enable environmental watering actions in the Werribee River to stretch further, more often.

Caring for the Werribee

Several passionate volunteer groups in the Werribee catchment work to preserve and boost the natural values of the river system. The Werribee Riverkeeper Association is active in revegetating areas, carrying out citizen science and advocating strongly for the platypus and other plants and animals. Volunteers recently monitored frogs with Melbourne Water at three lower Werribee billabongs, which identified opportunities for future environmental watering and complementary management actions like weed control and revegetation.

Photo: Bungeys Hole on lower Werribee River, by Melbourne Water



Western region

Western

Our reflections for 2023-24

Variable conditions that veered from high rainfall, floods and high river flows to the driest on record in parts of the western region caused waterway managers to use their available allocations of environmental water with an eye on the predicted return of much drier conditions.

Wimmera River allocations were at their highest level for a season start since the entitlement process began, bringing confidence to new year watering actions. No environmental flows were delivered until October 2023 because high rainfall and runoff from the wet catchment had generated natural flows, and storages remained above 90 per cent until January 2024.

Although the floods and high flows put the catchment in a strong position for environmental watering, Wimmera CMA took a moderate approach to conserve available water to meet predicted dry periods in the later part of 2023-24.

The eighth round of fish surveys for the Wimmera River angler report card in January 2024 used electrofishing to

record 636 fish caught at eight sites, indicating that water quality and flows have maintained fish numbers since 2023.

The focus was on golden perch and freshwater catfish, with observations of Murray cod, silver perch, flathead gudgeon, common galaxias and Australian smelt, as well as carp, goldfish and redfin. Monitoring in the Wimmera and Glenelg Rivers has indicated an increase in carp breeding that is attributed to the larger summer flows in 2022.

The small wetlands supplied with water for the environment by the Wimmera-Mallee Pipeline offered vital pockets of habitat for local plants and animals. Most wetlands maintained better condition from the natural fill of 2022-23, and with increased plant coverage they provide feeding and resting areas for local waterbirds, as well as some birds that may move through the Wimmera region en-route to more significant feeding or breeding areas.

Rain generated unregulated flows along the entire MacKenzie River from July until early October 2023 and conditions from July allowed Lake Wartook to refill and spill during the wet spring.

Weather patterns in the Glenelg River catchment briefly shifted to produce above-average rainfall in December 2023 and January 2024, and this met environmental flow objectives and altered planned releases of environmental water.

As inflows dropped off again in the first six months of 2024, the driest on record in parts of the Glenelg River catchment, environmental water was required to sustain plants, animals, fish, waterbugs and water quality in the system.

High volumes of water flowing in the Glenelg River during the 2022 floods had triggered successful tupong migration and spawning, and most tupong detected in Victorian Environmental Flows Monitoring Assessment Program (VEFMAP) surveys in 2024 were juvenile fish, indicating high survival rates in spring and summer 2023-24.

This also demonstrates that environmental water releases can be used to benefit native fish species by sustaining connectivity, access to submerged vegetation and favourable foraging habitats. Collectively environmental flows increase the chances of positive recruitment for juvenile fish, along with complementary measures like fish passage works that enable fish to migrate, forage and breed.

Climate and rainfall patterns in the Glenelg catchment have been highly variable since 2010, with consecutive dry years followed by flood events. Western Victoria's climate outlook issued in June 2024 is for an increased chance of lower-than-average rainfall and a drier outlook for the catchment in 2024-25.

Photo: MacKenzie River near Tatlocks Bridge, by Sarina Loo, the VEWH



Wimmera system

Wimmera-Mallee wetlands

Glenelg system

Have catfish, will travel

Environmental flow releases in the Glenelg River over the last decade have helped to support a population of healthy freshwater catfish that is now boosting stocks of the endangered fish species 'way up north'.

Long-term surveys of the Glenelg River under the Victorian Environmental Flows Monitoring and Assessment Program show improved recruitment, abundance and distribution of targeted native fish species like tupong, common galaxias and river blackfish. Increased flows in the system along with barrier removal are likely important drivers of these improvements in native fish populations.

Environmental water releases can be used as a management tool to benefit native fish species by sustaining connectivity, increasing habitat, providing access to submerged vegetation and drought refuge pools.

Without environmental water, flow conditions in the Glenelg (particularly extreme low flows) would have resembled the latter half of the Millennium Drought frequently from 2012 onwards. Reducing these extreme low flow conditions has been especially beneficial for native fish species in the Glenelg, with greater abundance of fish species seen since 2016, when environmental water began to be used to augment summer low flows.

Recent fish survey data showed that there was an increase in recruitment for some species following flooding in 2022 and responding to changes in conditions during 2023-24 has been important for better chances of positive outcomes for these juvenile fish.

After wet conditions early in winter 2023 the region experienced little rainfall, with the 2023-24 water year the driest on record. Water managers acted to adjust releases of environmental water and adaptively managed tools at hand, including delivering high volumes of passing flows to sustain the values of the Glenelg River.

Water held for the environment and used to maintain flow and connectivity to support native fish since the end of the Millennium Drought has also improved the condition and increased numbers of a 'visiting' species - freshwater catfish.

The Glenelg is a long way from the natural range of freshwater catfish,

but it supports a healthy surrogate population that is presumed to have escaped from stocked farm dams. This population has been growing in the Glenelg and is highly valued, with the species in very low abundance and considered threatened across its natural range in the Murray-Darling Basin.

After confirming that the genetic diversity of the population was suitable for translocation, a plan was hatched to get some of these charismatic fish back where they belong.

In November 2023, 80 catfish were caught from the Glenelg River as part of a joint effort between recreational fishers from the Casterton Angling Society, Glenelg Hopkins CMA (GHCMA) and the Victorian Fisheries Authority (VFA), building on a carp-catching competition that the CMA had been sponsoring for some years. These individuals were then driven 400 km north and released into the Little Murray River with the aim of rebuilding what was historically a healthy freshwater catfish population.

Following that successful trial, another two-day catfish fishing competition was held at Casterton in March 2024. This time more agencies joined the party, with North Central CMA able to provide funding from the Murray-Darling Basin Authority's Native Fish Recovery Strategy.

The 102 catfish caught on this occasion were distributed to four locations in northern Victoria.

The Little Murray River received another bunch, along with the Lower Broken Creek. Fish were also released into Lake Sambell in Beechworth and Harcourt Park wetland in Bendigo to establish new populations. More fishing competitions and translocations are planned for the future, with the next Invitational Carp Competition in Casterton scheduled for November 2024.

Freshwater catfish do not move very far and if they are lost from a particular area it can be difficult and take a long time for them to recolonise naturally. Dr Taylor Hunt from the VFA, who masterminded the translocations, explains their importance: "These catfish were mature adult fish, which means they are more resilient to predation and breed quicker."

"By creating new catfish populations and boosting existing ones, we are building resilience and reducing their risk of extinction."

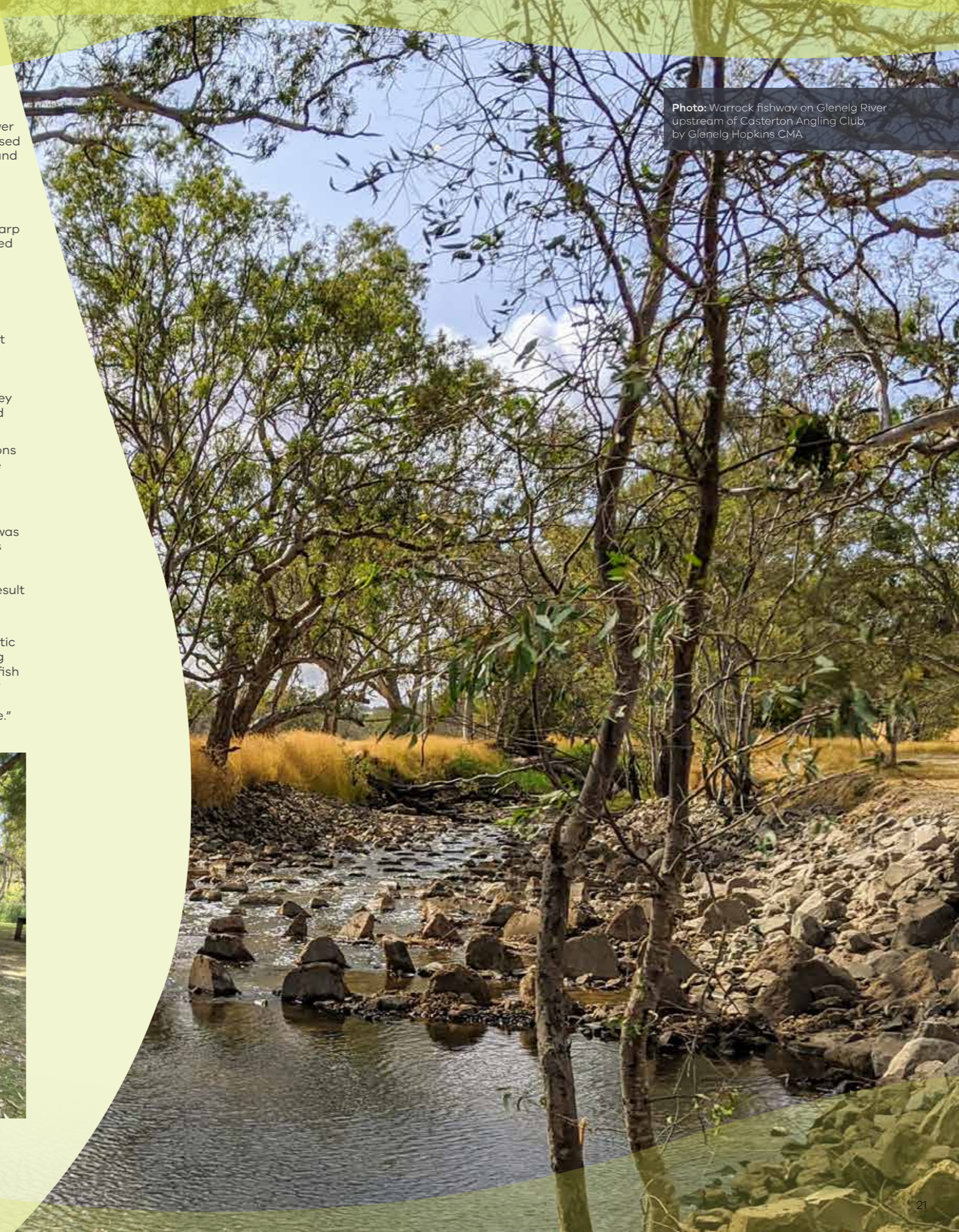
Alex Lewis, Water Resources Coordinator from GHCMA, said it was satisfying to see his organisation's work to improve the health of the Glenelg River and engage with the local community to have a good result for fish populations so far away.

"The fishing competitions and translocations have been a fantastic example of many partners working together to get a great result. Catfish are a fascinating species, but they don't belong in the Glenelg - it's brilliant to see them heading home."



Photo: Riley and Matt Hameka with their catch at the Casterton Angling Society catfish competition in 2024, by Dr Taylor Hunt, Victorian Fisheries Authority

Photo: Warrock fishway on Glenelg River upstream of Casterton Angling Club, by Glenelg Hopkins CMA



Northern region

Northern

Our reflections for 2023-24

In the wake of the record-breaking floods and high natural river flows in Victoria's north through spring and summer of 2022-23, water for the environment has been important for recovery and to build on the gains made over consecutive wet years. Environmental flows have helped river and wetland health in the face of modified river systems and climate change.

In 2023-24, environmental water has been used to build resilience for dry years ahead through watering actions designed to sustain environments for waterbird and native fish breeding, help maintain the condition of wetlands, target the germination of diverse plants in rivers and wetlands, and support fish recruitment and movement.

Condition monitoring at the Hattah Lakes and Lindsay-Mulcra Wallpolla icon sites for 20 years provides high-quality long-term data for fish, waterbird, vegetation and floodplain health from environmental watering, as well as positive developments after wetter conditions and floods.

These include:

- black box and river red gum recruits surviving well and substantial fruiting loads from many river red gum and black box trees across the Hattah Lakes
- abundant numbers of yellow garland lily (*Calostemma luteum*) and garland lily (*Calostemma purpureum*), both listed under the *Flora and Fauna Guarantee Act 1988*, responding positively to current conditions, along with Australian hollyhock (*Malva weinmanniana*), growing at a record-breaking height of over three metres
- endangered button rush (*Cyperus leptocarpus*) and sandhill spurge (*Phyllanthus lacunellus*) recorded for the first time within the Living Murray understorey vegetation
- black cormorants recorded breeding at Lake Mournpall, along with a positive trend in waterbird numbers across key wetland sites including threatened eastern great egrets, Australian wood ducks, black swans, great cormorants, Australasian darters and great crested grebes
- widespread records of freshwater catfish in autumn fish surveys.

Water for the environment, floods in spring 2022 and 2023 and reduced grazing pressure have combined to extend the recovery and growth of floodplain grass species in the iconic Barmah-Millewa Forest. The depth and length of the flooding, the largest in six years, has contributed to the strong regrowth of floodplain species like Moira grass, river swamp wallaby-grass and warrego summer-grass. Environmental watering has aimed to prevent the complete loss of Moira grass, which had been in decline since 1930, and to protect other floodplain grass species for their recovery.

This year marked the first vegetation responses at floodplain scale beyond the trial exclusion plots that were fenced progressively from 2017 to 2020 to protect Moira grass from feral animals. Monitoring at one site from May 2021 showed an increase in coverage of 2,000 per cent when combined with environmental watering over a 12-month period.

Water for the environment was used twice in 2023-24 to bridge natural flood peaks so the forest did not drain prematurely during the normal flood period. This resulted in continuous six-to seven-month inundation of the Moira grass plains which is closer to the natural flood regime on that part of the lower floodplain marshlands. Apart from the strength in Moira grass recovery, endangered river swamp wallaby-grass also showed expanded growth in areas where it was thought to have been lost.

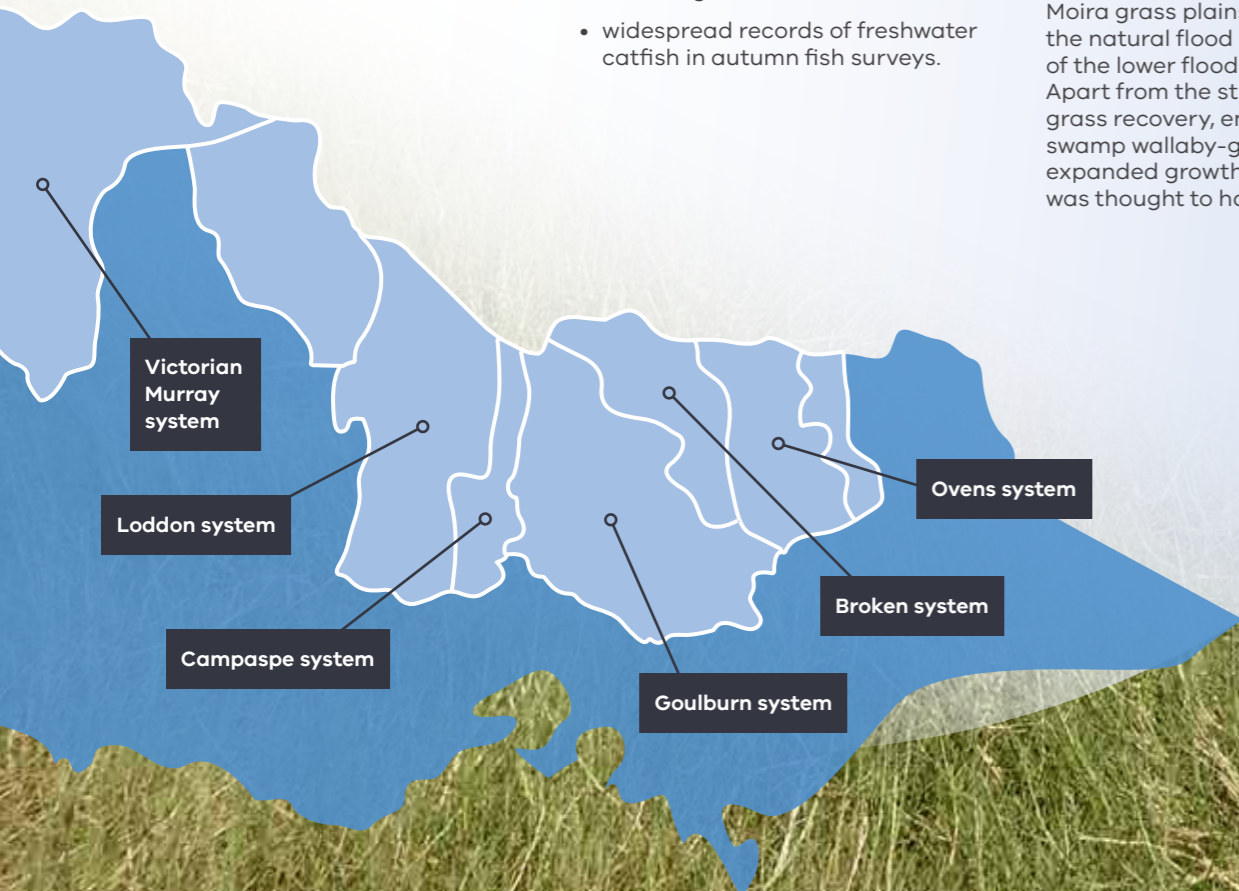


Photo: Moira grass in Barmah-Millewa Forest, by Keith Ward, Goulburn Broken CMA



Photo: Doctors Swamp by Jo Geddes, Goulburn Broken CMA.

Perennial species such as basket sedge are thriving on the Gunbower floodplain after the 2022 floods and follow-up natural and environmental water inflows in 2023. The basket sedge is a culturally important plant to Traditional Owners and this growth has enabled the weaving of traditional pieces.

High flows in the Murray River and large-scale overbank flooding in spring/summer 2022 inundated the entire Mallee floodplain to a far greater extent than was possible through pumped water delivery alone.

Increased efforts across the environmental watering program over consecutive years for all Mallee sites have built resilience into the system and generated benefits, with increases in waterbirds and frogs and waterbird and fish breeding across the catchment.

After such significant inundation in 2022, many wetland sites were chosen to have a drawdown phase during 2023-24, with some likely to enter a fully dry phase.

Combined with planned watering sites, drying these waterbodies created a mosaic of habitat types supporting a wider range of species across the landscape including

- aquatic and semi aquatic vegetation and plants growing on exposed mudflats
- waterbird species feeding on fish in deep water
- waders that use shallow water for feeding and exposed mud flats favoured by shorebirds.

Drying wetlands also targeted eradication of pest fish such as carp, effectively resetting sites and limiting pest fish intrusion during future water deliveries.

Wetlands chosen for environmental water delivery during 2023-24 included those that had been dry for many years before flooding, were behind in their watering regime and located higher on the floodplain. Extra sites including Musk Duck wetland and Lake Powell were added to the watering program because of natural inundation during the winter/spring pulse in 2023.

As overbank flooding had caused significant changes in the landscape, Mallee CMA is carrying out extensive field surveys and working with Traditional Owners to reduce adverse effects on surrounding land and cultural heritage during future water deliveries.

After severe catchment-wide flooding in October 2022 there have been three overbank events in the Lower Goulburn, including an unseasonal overbank event in January from heavy rainfall and flow from the mid-Goulburn catchment.

The prolonged sequence of overbank flows has built resilience in the Goulburn and its floodplain with native vegetation thriving in the river channel, wetlands and floodplain floor.

Macroinvertebrate numbers have increased in both years, but blackwater events have had a potential negative impact on fish populations. Monitoring results have indicated smaller numbers of small-bodied fish, and anecdotal evidence is that two years of high releases from Eildon Reservoir may have had a negative impact on platypus breeding in reach 1 of the Goulburn River.

After the floods, delivery of water for the environment resumed in the Campaspe River to support the recovery of vegetation, fish, waterbugs and platypus. These flows continued in 2023-24 when a spring fresh was delivered, as well as three smaller autumn freshes. Low flows were provided in winter, spring and autumn.

However, river protection is not just about adding water. It is also about revegetation, fencing, pest management, removal of stock, and many other activities. The North Central CMA Caring for Campaspe Project has worked with the community and Campaspe landholders since the 2011 floods to protect and restore the riverbanks.

The native fish population remained stable in the Broken River, where a

VEFMAP field survey in May 2024 recorded Murray cod, golden perch, Macquarie perch, silver perch, river blackfish, Australian smelt and Murray Darling rainbow fish.

Prolonged high flows in the Loddon River in 2022 had affected plants in the river and on the banks, so a spring high flow was a priority in 2023-24 to vary water levels and support the reestablishment of plants.

Environmental water, including donations from Taungurung Land and Waters Council and a private donor, was released into the King River in late April 2024 to provide variability to low flows. Environmental water was also released in the Buffalo River in late March to coincide with an operational water release to contribute to an autumn low flow fresh.



Photo: Yellow-billed spoonbill, by Goulburn Broken CMA



Photo: Bladderwort at Reedy Lagoon, by North Central CMA



Photo: Water ribbons, lesser joyweed and spike rush in Gunbower Forest, by North Central CMA

Watering wetlands for birds to thrive

The scale of waterbird breeding across the southern Murray-Darling Basin following the 2022 floods strongly influenced planning and delivery of water for the environment in the northern region in 2023-24.

The central Murray wetlands are a good example, where the North Central Catchment Management Authority planned for several environmental objectives at a landscape scale, including supporting birds to thrive and grow in these known high value habitats.

North Central CMA's environmental watering actions for 2023-24 deliberately focused on providing the right conditions for the waterbirds that had spread across the landscape in 2022, as they consolidated in wetlands that could continue providing the necessary habitat and food sources for juvenile birds to thrive, with the help of environmental watering.

"Regional waterbird monitoring including Eastern Australia Surveys is

pointing to a bottleneck in recruitment and the need to support juvenile waterbirds two to three years after fledging," North Central CMA Central Murray Wetlands System Coordinator, Peter O'Toole, said.

To complement central Murray wetland sites which received water for the environment, several wetlands were deliberately drawn down, offering foraging opportunities for wading waterbirds and shorebirds that feast in shallow wetland margins.

The 2023-24 central Murray wetland environmental watering actions – including when to water and when to let wetlands draw down – responded to research and learnings following other big flood events like the 2011 floods, where there were large waterbird breeding events but not a strong survival rate through to breeding age.

Specific research¹ on the needs of waterbirds, using royal spoonbills as the test species, has helped inform what the birds need to thrive.

The research used information about how far birds travel, what they eat and what they need at a landscape perspective, which is helping inform water management decisions beyond individual sites, giving waterbirds more choices and hopefully, a greater chance to survive.

The central Murray wetlands can support high waterbird numbers under the right conditions, providing diverse feeding and habitat.

"Supporting waterbirds was a key rationale for watering in 2023-24 across the catchment," Peter said.

North Central CMA took a landscape-scale approach to its central Murray wetlands watering. The wetlands are to the north of the catchment, in an area about 80 kilometres wide and placed roughly 50 kilometres either side of key breeding sites.

"It was important that habitat was provided for newly-fledged waterbirds to help ensure individuals were able to mature into the breeding population," Peter said.

1. VEWH Prioritisation Project: Stage 2 final report, royal spoonbill requirements, distribution and habitat mapping, Heather McGinness, Art Langston, Shane Brooks, 2020



Photo: Great egrets at Johnson Swamp by Peter O'Toole, North Central CMA



Photo: Pied stilt nest with eggs at *Kunat Kunat*, by Nyil Khwaja of ARI

"With the central Murray wetlands we aimed to have a mix of wetlands receiving top ups, and some wetlands starting to dry, to provide a smorgasbord for young birds to choose from."

Kunat Kunat (Round Lake) and Lake Elizabeth received two deliveries of water for the environment, including a large delivery each in autumn 2024, aimed to provide permanent feeding, foraging and refuge habitat for waterbirds, as well as support the Murray hardyhead populations.

North Central CMA observed more than one thousand waterbirds at *Kunat Kunat* including curlew sandpiper, musk duck, Australasian shoveler, blue-billed duck and hardhead, and almost 900 black swans at Lake Elizabeth. These sightings were confirmed in February when surveys through the Wetland Monitoring and Assessment Program recorded more than 1,020 birds representing 21 species, including 652 grey teal, 10 blue-billed duck, eight musk duck, five sharp-tailed sandpiper and three hardhead.

At Barapa Swamp, located nearby in Gunbower Forest, although water quality started to deteriorate coinciding with high temperatures in summer 2024, waterbird numbers stayed strong, and birds such as yellow-billed spoonbills used the shallower parts of the swamp to feed.

Interestingly, waterbird numbers at *Kunat Kunat* in the previous year had been a bit lower than usual, thought to be due to the large amount of habitat available across the region provided by the natural flooding and wetter conditions across the landscape. The return of higher numbers of birds to the wetland in

2023-24 demonstrates how waterbirds move among different wetlands when there is greater choice.

At Lake Elizabeth, 2,255 waterbirds were recorded in February 2024, including an impressive 890 black swans. Both *Kunat Kunat* and Lake Elizabeth receive consistent and well-timed environmental water deliveries to support the vulnerable Murray hardyhead.

Why waterbird populations are vulnerable

Many waterbirds depend on floodplain inundation for large breeding events, at a scale that can currently only be achieved through natural floods. Research has shown substantial decline in waterbird populations in south-east Australia over the past 40 to 50 years, even after prolific bird breeding events. Studies following the 2011 floods in northern Victoria showed that despite the significant bird breeding that comes from flood events, many young birds didn't survive to breeding age and therefore populations are not growing.



Photo: Red-capped plover at Lake Elizabeth, by Ben Vasic of ARI

Research, including from CSIRO Senior Research Scientist Heather McGinness, has indicated that high mortality of juvenile birds in the one to three years after breeding may be one of the reasons there hadn't been significant recovery of waterbird populations.

It can take two to four years before chicks become breeding adults, and while some mortality may be through predation and changed landscapes, supporting suitable foraging habitat will help the young birds get enough food, where they need it.

VEWH Executive Manager of Planning and Delivery, Dr Andrew Sharpe, agrees.

"We're not getting many significant waterbird breeding events naturally so when they do happen with these natural floods it's important to help them be as successful as they can, and that's where environmental watering on the back of those floods is valuable," Andrew said.

"The VEWB and North Central CMA have worked together looking at the quantity of available wetland habitats. In a flood year the whole floodplain goes under and you've got water everywhere, but the year after that it's contracted and as little as 20 per cent of those wetlands may have water in them."

"Regulation means one to three years after floods you get a much more rapid decline in available waterbird foraging habitat than in natural conditions. So even if you get successful breeding during a flood, there might not be enough food for them in subsequent years to enable the birds to survive to breeding age."

Decisions on how and when to use water for the environment to meet specific waterbird requirements will hopefully lead to greater survival rates after large floods.



Photo: One of three common greenshanks at Lake Elizabeth, by Nyil Khwaja of ARI

A final reflection

The environmental watering program has focused on the efficient and effective use of Victoria's environmental water holdings in the 2023-24 year to meet the increasingly variable seasonal conditions brought on by accelerating climate change.

The VEWH, waterway managers and other program partners continued adapting to challenges that include a drying climate, warmer average temperatures and more intense and unseasonal rainfall, which have all occurred over the past few years.

Victoria's rainfall oscillated between below-average for July to September and the lowest on record statewide in September, then early summer rainfall was above-average for much of the state, before declining to the driest March since 1986.

After the La Niña pattern brought four wet years with record floods, environmental flows outlined in the VEWH's annual seasonal watering plan were used in 2023-24 to build on the gains from the wet years. They focused on improving conditions for native plants and animals, including birds and fish, and building resilience in rivers and wetlands ahead of the next dry period.

Watering actions in some systems have aimed to support native fish populations to recover from the major impacts of extended hypoxic blackwater conditions and floods in 2022-23 and early 2024, and to help riverbank plants recover from high flows and inundation and protect the banks from erosion.

Some wetlands have been managed to support important dry-phase waterbird feeding, juvenile waterbird foraging and plant growth across the landscape, while others were topped up to sustain native fish and plants.

Waterway managers in nine catchment management authorities (CMAs) and Melbourne Water, as the VEWH's pivotal program partners,

have engaged Traditional Owners, stakeholders and communities in planning to realise the maximum shared benefits for recreation, wellbeing and cultural values that can be supported by water for the environment. That planning also considers how environmental flows can support activities like boating, canoeing, fishing, birdwatching, camping, relaxing in nature and tourism.

The VEWH advocates for and supports Traditional Owner agency and self-determination in the management and delivery of water held for the environment, through meaningful relationships, understanding Traditional Owner objectives for water to heal Country and watering sites of ecological and cultural significance.

In 2023, the VEWH Commission committed to fund several trials led by Traditional Owner groups and involving the VEWH and waterway managers to progress self-determination in the environmental watering program.

"The environmental watering program works closely with people on the ground to understand how river systems are reacting to climate, operations and environmental watering, and how they are valued," said VEWH CEO Dr Sarina Loo.

"The listening and learning from Traditional Owners, scientists and community members is essential as we plan seasonal watering each year and target watering actions to achieve the best possible outcome for the environment and communities."

"Thanks to our program partners, including Traditional Owners, and stakeholders for their hard work and support in protecting the environmental health of our waterways, and the plants and animals that depend on it, as we meet the challenges of climate change."

Photo: Macalister River, by West Gippsland CMA

Summary of water for the environment delivery 2023-24

System	Site	Total (ML)	VEWH (ML)	TLM (ML)	CEWH (ML)
GIPPSLAND REGION					
Latrobe system	Latrobe River	-	-	-	-
	Lower Latrobe wetlands	Water may be diverted into Heart Morass, Dowd Morass and Sale Common from the Latrobe River ⁱ			
Thomson system	Thomson River	24,679.0	24,679.0	-	-
Macalister system	Macalister River	9,755.0	9,755.0	-	-
Snowy system	Snowy River	N/A ⁱⁱ			
GIPPSLAND REGION TOTAL		34,434.0	34,434.0		
CENTRAL REGION					
Yarra system	Yarra River	18,980.0	18,980.0	-	-
	Yering Backswamp	26.0	26.0	-	-
Tarago system	Tarago River	453.0	453.0	-	-
Werribee system	Werribee River	780.0	780.0	-	-
	Pyrites Creek	435.1	435.1	-	-
Maribyrnong system	Upper Jacksons Creek	261.9	261.9	-	-
Moorabool system	Moorabool River	2,437.0	2,437.0	-	-
	Upper Barwon River	666.8	666.8	-	-
Barwon system	Lower Barwon wetlands	Water may be diverted into Reedy Lake and Hospital Swamps from the Barwon River ⁱ			
CENTRAL REGION TOTAL		24,039.8	24,039.8	-	-
WESTERN REGION					
Glenelg system	Glenelg River	21,692.0	21,692.0	-	-
Wimmera system	Wimmera River	7,868.1	5,105.8	-	2,762.3
	Upper Mount William Creek	160.0	160.0	-	-
	MacKenzie River	4,744.0	4,744.0	-	-
	Burnt Creek	311.8	311.8	-	-
	Barbers Swamp	1.1	1.1	-	-
	Broom Tank	2.0	2.0	-	-
	Bull Swamp	8.6	8.6	-	-
	Carapugna	10.5	10.5	-	-
	Challambra Swamp	3.6	3.6	-	-
	Chiprick	9.5	9.5	-	-
Wimmera-Mallee wetlands system	Chirrup Swamp	1.1	1.1	-	-
	Clinton Shire Dam	3.8	3.8	-	-
	Cokum Bushland Reserve	3.6	3.6	-	-
	Considines	1.8	1.8	-	-
	Coundons Wetland	0.8	0.8	-	-
	Creswick Swamp	1.7	1.7	-	-
	Cronomby Tanks	7.0	7.0	-	-
	Crow Swamp	8.7	8.7	-	-
	D Smith Wetland	1.1	1.1	-	-
	Davis Dam	1.7	1.7	-	-
	Falla Dam	1.4	1.4	-	-
	Fieldings Dam	1.6	1.6	-	-
	Greens Wetland	1.8	1.8	-	-
	Harcoans Swamp	6.3	6.3	-	-
	J Ferrier Wetland	7.0	7.0	-	-
	Jeffcott Wildlife Reserve	1.6	1.6	-	-
	Jesse Swamp	1.3	1.3	-	-
John Ampt	2.4	2.4	-	-	
Kath Smith Dam	0.7	0.7	-	-	
Lake Danaher Bushland Reserve	3.5	3.5	-	-	

System	Site	Total (ML)	VEWH (ML)	TLM (ML)	CEWH (ML)
WESTERN REGION (CONT.)					
Victorian Murray system	Mahoods Corner	1.4	1.4	-	-
	Morton Plains Reserve	2.5	2.5	-	-
	Mutton Swamp	6.2	6.2	-	-
	Opies Dam	0.6	0.6	-	-
	Pam Juergens Dam	0.7	0.7	-	-
	Paul Barclay	3.2	3.2	-	-
	Pinedale	5.1	5.1	-	-
	R Ferriers Dam	4.9	4.9	-	-
	Rickard Glenys Dam	3.5	3.5	-	-
	Roselyn Wetland/ Reids Dam	10.5	10.5	-	-
	Sawpit Swamp	7.2	7.2	-	-
	Schultz/Koschitzke	2.3	2.3	-	-
	Tarkedia Dam	4.2	4.2	-	-
	Tchum Lakes Lake Reserve (North Lake - Wetland)	111.4	111.4	-	-
	Uttwillock Wetland	8.3	8.3	-	-
	Wal Wal Swamp	3.0	3.0	-	-
	WESTERN REGION TOTAL		35,045.1	32,282.8	-
NORTHERN REGION					
Victorian Murray system	Barmah Forest	212,160.4	36,480.9	45,679.5	130,000.0
	Gunbower Forest	18,468.9	-	18,468.9	-
	Gunbower Creek	9,938.4	3,198.8	-	6,739.6
	Hattah Lakes ⁱⁱⁱ	89.0	-	89.0	-
	Kunat Kunat (Round Lake)	333.8	333.8	-	-
	Lake Elizabeth	577.6	577.6	-	-
	Lake Hawthorn	381.6	381.6	-	-
	Lake Powell	1,128.8	1,128.8	-	-
	Musk Duck Wetland (Neds Corner East)	98.4	98.4	-	-
	Bilgoes Billabong	69.1	-	69.1	-
	Snake Lagoon extension	109.8	-	109.8	-
	Murray River via Great Darling Anabranch ⁱⁱⁱ	54,467.0	-	-	54,467.0
	Murray River via Lake Victoria ⁱⁱⁱ	47,647.0	-	-	47,647.0
Ovens system	Ovens River	73.0	-	-	73.0
	King River	145.0	95.0	-	50.0
Goulburn system	Goulburn River	382,346.3	16,936.1	102,414.9	262,995.3
	Broken River	778.0	468.7	-	309.3
Broken system	Lower Broken Creek	75,343.1	3,053.2	10,095.5	62,194.4
	Upper Broken Creek	1,768.9	440.2	-	1,328.7
Campaspe system	Campaspe River	27,125.4	19,074.4	3,473.2	4,577.8
	Coliban River	283.2	283.2	-	-
Loddon system	Loddon River	17,670.6	13,908.6	-	3,762.0
	Pyramid Creek	12.0	12.0	-	-
	Serpentine Creek	1,134.3	1,134.3	-	-
NORTHERN REGION TOTAL		852,149.7	97,605.7	180,399.9	574,144.1
Total water use		945,668.6	188,362.2	180,399.9	576,906.4

ⁱ 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.

ⁱⁱ 211,030 ML of water for the environment delivered to the Snowy River by the New South Wales Department of Industry between 1 May 2023 and 30 April 2024. This water is authorised and delivered by NSW and therefore is not included in the regional or statewide totals presented in this table.

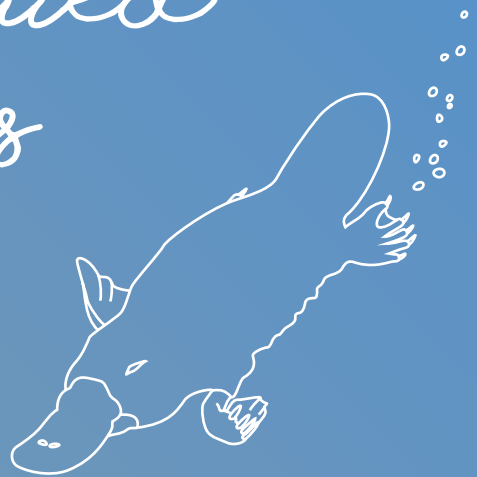
ⁱⁱⁱ Water delivered at Hattah Lakes was for testing and maintenance of the Hattah pump station. Environmental water was not delivered to the Hattah Lakes Icon Site during 2023-24.

ⁱⁱⁱⁱ Water available in the Victorian Murray system was delivered to achieve non-Victorian environmental objectives for the Great Darling Anabranch and Lake Victoria in partnership with New South Wales, South Australia and other delivery agencies.



Photo: Musk Duck wetland,
by Mallee CMA

water for healthy
waterways, valued
by communities



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