Water for the Environment

Southern Connected Basin Environmental Watering Committee

Annual Report 2022-23

Acknowledgement of the Traditional Owners of the Murray–Darling Basin

SCBEWC acknowledge and pay respect to the Traditional Owners of the Murray–Darling Basin and their Nations, who have a deep cultural, social, environmental, spiritual and economic connection to their lands and waters.

SCBEWC agencies hope that by continuing to work closely with Traditional Owners and First Nations People we can help in the journey to heal the land, Country and Peoples of the Basin.

Aboriginal people should be aware that this publication may contain images, names or quotations of deceased persons.

Southern Bell Frogs at Chowilla Floodplain (Source: Grace Hodder (DEW)

Cover photo: Dixie Patten (Barapa Barapa) and North Central CMA staff reintroducing locally extinct southern pygmy perch into Reedy Lagoon, Gunbower Forest (Source: David Kleinert*)*

Southern Connected Basin Environmental Watering Committee

Who we are

The key coordination forum for water for the environment delivery in the River Murray and its tributaries.

Why

Water for the environment improves the health and water quality of rivers, wetlands and floodplains. This supports native wildlife including fish, birds and frogs.

Healthy rivers benefit all river users and are vital to our economy as well as underpinning community and cultural health and wellbeing.

Myloc Creek, Koondrook-Perricoota Forest (Source: NSW Forestry Corp)

Our impact

Highlights for the use of water for the environment in 2022-23 included:

- Providing dilution flows as refuge for native fish from low oxygen floodwater, helping mitigate widespread fish deaths.
- Supporting waterbird breeding events through to completion in what was one of the biggest waterbird boom-years in the Basin in decades.
- Contributing to connection flows between the northern and southern Basin, via releases in the Great Darling Anabranch

Environmental water holders and water managers work with First Nations, communities and river operators to plan and shape watering events.

Increased collaboration is improving coordination and outcomes along the length of the River Murray and its tributaries.

Southern Connected Basin Environmental Watering Committee

2022-23 in review

Very Wet conditions

3610 GL water available*

2,664 GL delivered to multiple sites (use & re-use)#

31 coordinated events between water holders

4% of flow at the SA border

Water for the environment still plays an important role in wet years

- Delivering water for the environment during wet years helps enhance the health of rivers and their floodplains and build resilience.
- Strategic use of water for the environment following high natural flows is critical for ensuring water levels are sustained for environmental processes to finish, such as waterbird breeding and fish spawning and recruitment.

Record breaking natural inflows generated largely positive outcomes

- There were a broad range of positive ecological outcomes from the very high flows particularly for floodplain vegetation and waterbirds
- While the ecological outcomes are overwhelmingly positive, there are some environmental downsides. For example, native fish can experience poor water quality and wading waterbirds can see reduced habitat due to high water levels.

Tareena post office, Chowilla Floodplain NSW (Source: P. Teasdale NSW DPIE)

SCBEWC welcome the return to face-to-face engagement

- After several covid-interrupted years SCBEWC welcomed the opportunity to get back out onto Country and into the community to reconnect and recharge.
- SCBEWC held their first ever regional meeting with a field trip to Menindee Lakes. This provided opportunities for people to reconnect face to face and learn about important issues to the local communities

** Water available includes yearly allocations and carryover but does not include Planned Environmental Water (PEW) products.*
 # The volume delivered to sites is sourced from Basin Plan Matter 9.3 annual reporting – see appendices for more details

Southern Connected Basin Environmental Watering Committee 2022-23

Membership
MDBA, CEWH, Cmwth DCCEEW, NSW DCCEEW, VEWH, Vic DEECA, SA DEW, River Operators, MLDRIN

Collaborates
with a range of natural resource & waterway managers

Plans
with local communities including Traditional Owners

Coordinates
the planning and delivery of water for the environment with water holders across the southern connected Basin

Makes shared decisions
on the jointly managed Living Murray water portfolio and program, as well as River Murray Increased Flows from the Snowy and River Murray Unregulated Flow

5 Committee meetings

1 Out-of-session meeting

2 Joint forums with Water Liaison Working Group

3 Working groups: Operations, Monitoring and First Nations Involvement

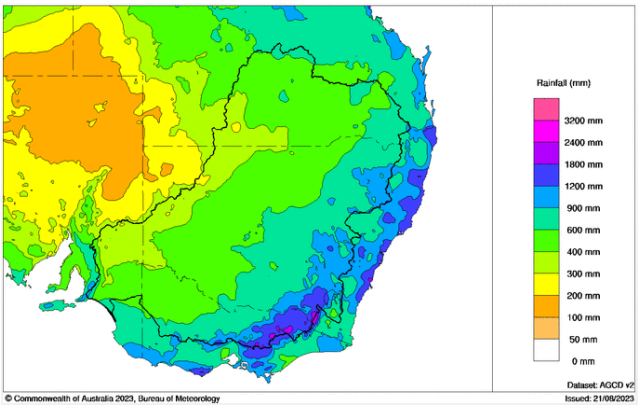
River Murray system includes: the main course of the River Murray and all its effluents and anabranches downstream of Hume Dam to the sea including the Edward–Wakool River system, the Mitta Mitta River downstream of Dartmouth Dam and the Darling River and Great Darling Anabranch downstream of Menindee Lakes.

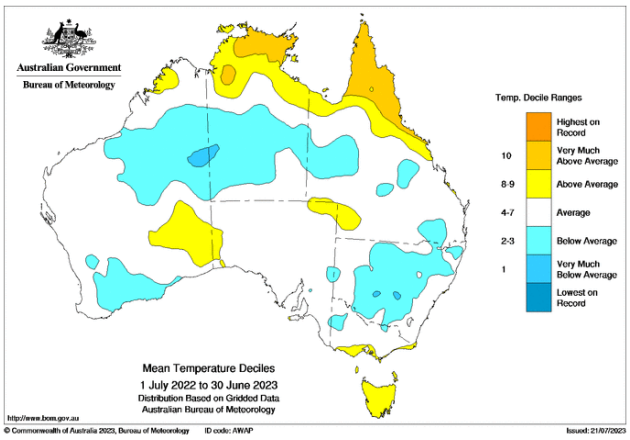
2022-23 in review

2022-23 brought relatively high rainfall and cooler temperatures across the majority of the Murray-Darling Basin. Widespread flooding was experienced across the River Murray system.

Unregulated flows (above SA entitlement) were passing into the lower Murray for the entire year. This has been the case now since July 2021!

Connection between the northern and southern Basin was provided by high flows down the Baaka and the Great Darling anabranch.





Year-to-year held environmental water allocation

2017-18
1,882 GL (dry year following wet)*

2018-19
1,259 GL (second dry year)*

2019-20
1,181 GL (third dry year)*

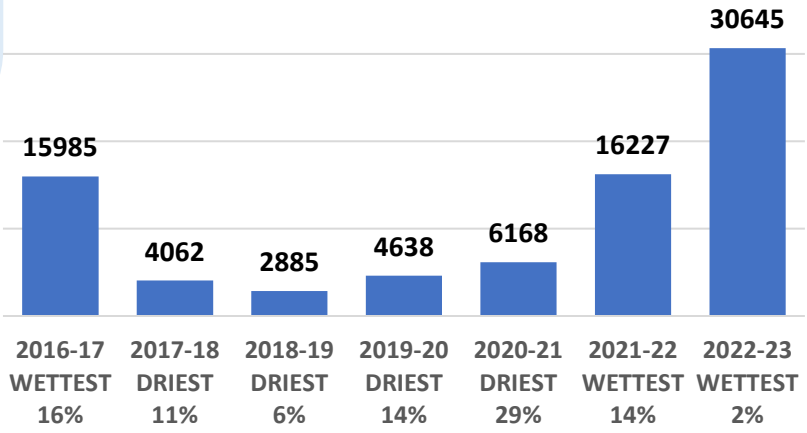
2020-21
2,052 GL (moderate year)*

2021-22
2,380 GL (wet year))*

2022-23
2,508 GL (very wet year) *

High flows watered parts of the landscape that hadn't seen water since at least the 1970's

2022-23 was the **sixth highest** Murray inflow year since 1896



River Murray system inflows (GL) across recent years#

#Inflows include inflows to Menindee Lakes, but excludes Snowy Hydro inflows, inter-valley transfers, managed environmental inflows

*Held Environmental allocations for Southern Basin catchments (excludes Lachlan, carryover, and PEW), from Appendix 'Held environmental water accounts' in MDBA annual water take reports. Latest version here. Volumes may be updated in future reports as data is verified.

SCBEWC plans for all scenarios

Planning for the use of water for the environment occurs at multiple scales, from detailed site plans to southern Basin-scale coordination planning.

In planning water use, environmental water managers work closely with:

- site managers,
- Traditional Custodians,
- community members, and
- river operators

Each year, SCBEWC plans for a range of conditions from very dry to very wet.

Plans are informed by Basin scale and regional annual environmental watering priorities and watering proposals developed by site managers.

Macroinvertebrate sampling in the Coorong (Source: John Kruger/SA DEW)

During the year water for the environment is closely monitored and adapted in real-time in response to on-ground observations.

Detailed planning allows environmental water managers to respond to changing conditions, capitalise on opportunities and mitigate risks.

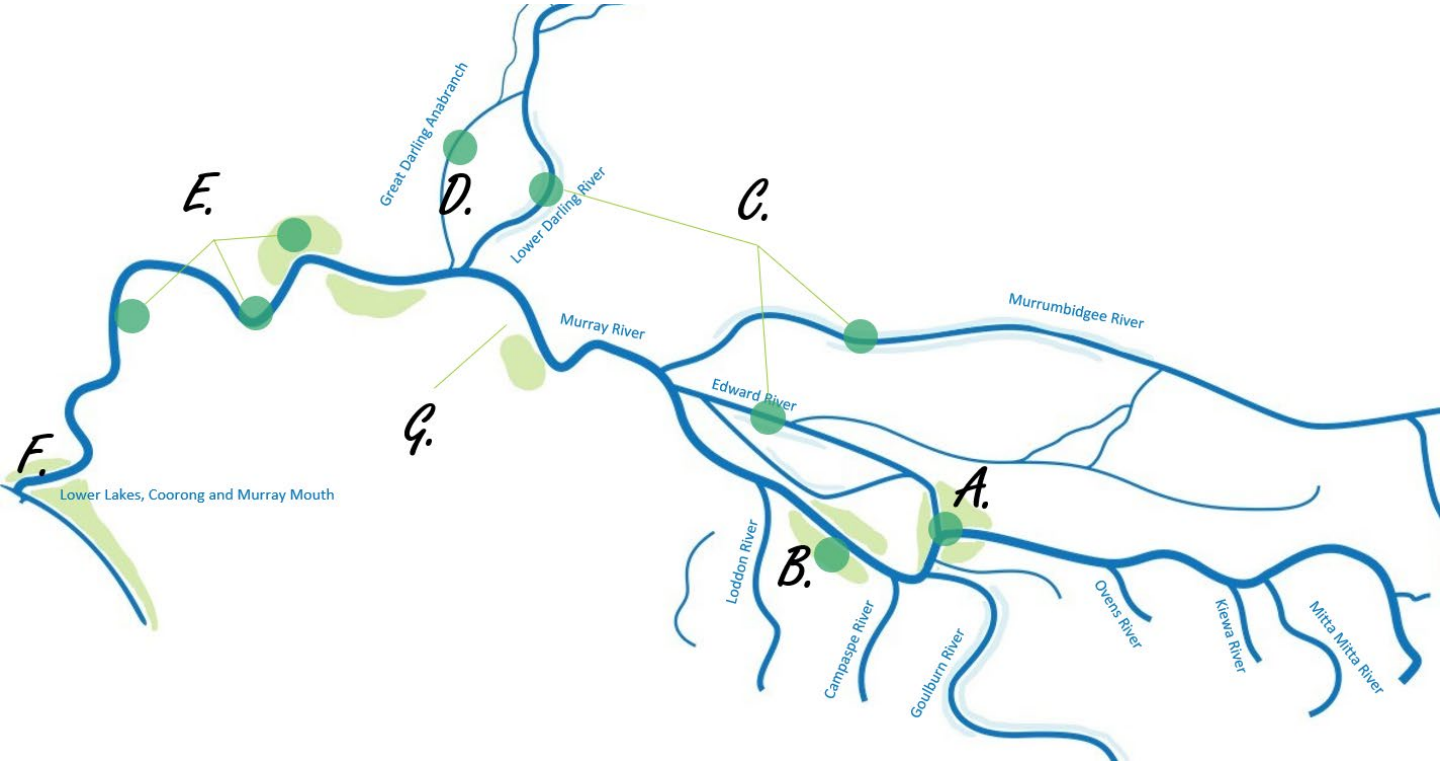
Neimur Regulator, Werai Forest (Source: MDBA)

2022-23 highlights and case studies

2022-23 saw near-record flows in much of the Basin, with inflows into Hume peaking at over 140,000 ML/d in November 2022.

Near-record natural flows meant that many wetlands and floodplains received follow up watering after last year, while others had their first drink in nearly 50 years.

The following 7 case studies showcase some of the highlights from the 2022-23 year.



Moira Lake and The Narrows – Barmah-Millewa Forest (Source: K Ward GBCMA)

A. Supporting & monitoring waterbirds in Barmah-Millewa Forest

Water for the environment can be strategically added to fill gaps between natural inflow events, or to extend the duration or magnitude of larger natural flow events. Waterbird breeding events are often triggered by natural flows, but these breeding events may fail if water levels drop before chicks fledge.

In Barmah-Millewa Forest, water managers and ecologists identified that a forecast reduction in river flows in late 2022 would coincide with nesting of Strawnecked and Australian white ibis. This had potential for wetland water levels to drop too low for waterbirds to complete their breeding events. Water for the environment was delivered to keep water levels high enough for waterbirds to complete this critical life-cycle process and allow the new chicks to fledge.

Water for the environment also supported breeding of the cryptic Australasian bittern across the forest, with around 96 bitterns detected during monitoring

Australasian bittern (Source: B Cronin NPWS)

Drones help inform in real time

With near-record flooding across much of the system, access to sites was significantly impacted.

Using exciting new drone technology, water managers in Barmah-Millewa Forest were able to gather real-time monitoring information to determine when and where waterbird breeding events were underway which may require support from water for environment.

Drones were also used to determine when chicks had fledged, the breeding event was finished, and delivery of water for the environment could cease.

A drone takes flight to monitor group nesting waterbirds (Source: M Crawford NPWS)

A mixed breeding event of Straw-necked ibis and Australian white ibis in Boals Deadwood(Source: B Cronin NPWS)

Ibis nesting at Boals Deadwood (Source: T Barlow GBCMA)

B. Gunbower Forest – why watering when it's wet is important

Delivering water for the environment during wet years helps restore and enhance the health of rivers and wetlands, and the plants and animals that rely on them.

The area of Gunbower Forest within the footprint where environmental water can be delivered has only had a drink in seven of the last 20 years, about half the frequency required to support the river red gum floodplain.

Water ribbons (Cycnogeton spp.) along River Track (Source: NCCMA)

The Gunbower Forest river red gums are still recovering from the effects of the Millennium drought. Flooding in 2016 led to increased canopy health, however three hot dry years in a row followed and annual monitoring showed a rapid decline in tree condition. The forest needs to be watered more than it has over the past 20 years to maximise the chance of the river red gums' recovery.

Water for the environment was delivered in June 2023 following the spring 2022 flood event and following from an earlier scheduled flow in winter 2022. These environmental flows support floodplain vegetation between natural flow events.

This provided habitat and food resources for young waterbirds and their parents. Consecutive years of watering events, when possible, helps support long-term outcomes such as improved vegetation condition and increased waterbird populations for Gunbower and other similar floodplain forests.

Australasian darter and chicks, Little Gunbower Complex (Source: D Cook)

Maintaining the health of floodplain forests beyond one seasonal event is vital to support newly-hatched waterbirds to grow and survive to breeding age themselves.

C. Supporting native fish during high flows

When it floods, high flows pick up carbon and nutrients off the floodplain. In cooler conditions, this high nutrient water is a welcome productivity boost to the foodchain, however in hot conditions bacterial breakdown of the nutrients can impact water quality by reducing the amount of dissolved oxygen. This low oxygen water can lead to stress or death of native fish and other aquatic animals.

In many cases, there are very few management options available to help during a low oxygen water event. However, in some scenarios water for the environment can play a role in providing refuge flows for native fish and other animals.

For example, in the Murrumbidgee, good quality water for the environment was strategically released from storage in late 2022 to dilute low oxygen water returning to the river channel from the floodplain. This contributed to avoidance of any reported fish deaths in the lower Murrumbidgee.

In the Edward/Kolety-Wakool system, fresh water was delivered through irrigation escapes to provide small refuges for native fish wherever possible, without exacerbating the floods. While dissolved oxygen levels dropped very low in many parts of the system, fish deaths were nowhere near the magnitude expected from this event and of that experienced during the 2016 floods.

Low oxygen water flowing through Barbers Creek (Source: J. Dyer)

Widespread fish deaths in Lower Darling/Baaka

Low oxygen water returning from the Darling/Baaka floodplain resulted in a tragic widespread fish death event in the Menindee town weir pool in March 2023.

Water for the environment was released in response to try and provide some improved conditions for remaining fish in the weir pool.

This distressing event precipitated a review by the NSW Chief Scientist, with the final report released in September 2023.

Fish death event Menindee town weirpool (Source: NSW DPIE)

D. After the flood: The Great Darling Anabranch

The last two years have seen record high inflows from the northern Basin via the Baawan-Baaka into the Menindee Lakes.

In spring 2021 the Great Darling Anabranch started to flow for the first time in five years. Over summer 2023, flooding flows from the north hit their peak, before dropping back. Environmental water has continued the flow to the Anabranch since late summer 2023.

The two years of flow have:

- Provided continual flow and connectivity from Lake Cawndilla down 480 km of the Great Darling Anabranch to the Murray River.
- Benefitted vegetation, waterbirds, bush birds, aquatic bugs, frogs, yabbies and other animals that live on the floodplain.
- Provided a pathway for juvenile golden perch to migrate from the Basin's north to the south. This is a critical part of their life cycle and is important to maintain viable golden perch populations across the Murray-Darling Basin.

Environmental flows from Lake Cawndilla (Source: J. Dyer, DPE)

Anabranch landholders celebrating the flow; netting surveys of golden perch; tags and receivers used to track fish movement. (Credits: Otis Filley, M. Henderson, DPE; MDBA)

"What a great period for the Great Anabranch of the Darling River. From small flow to minor flooding to major flooding.

Most of the Anabranch lakes filled to levels not seen since 1976.

The health of the whole Anabranch system - fish, yabbies, floodplain and trees - have benefited greatly by this flood event"

(Paul McPherson, Chair, Anabranch Water Trust)

Monitoring is underway and has so far shown:

- Large numbers of juvenile golden perch moving out of Lake Cawndilla into the Anabranch channel.
- Movement of golden perch along the Anabranch, with two tagged fish moving across the connected floodplain to the lower Darling/Baaka.
- Significant waterbird activity, including an Australasian darter and great cormorant breeding colony near Lake Cawndilla.

Edge of the great cormorant colony in Lake Cawndilla (Source: G. Bonsen, DPE)

E. Lower Murray Floodplains

In late 2022, high natural flows in the River Murray saw some parts of the Lower Murray floodplain get their first drink since 1956. This watered some very dry blackbox country, filled wetlands and lagoons throughout the system, and allowed the floodplain to come alive with plants and animals.

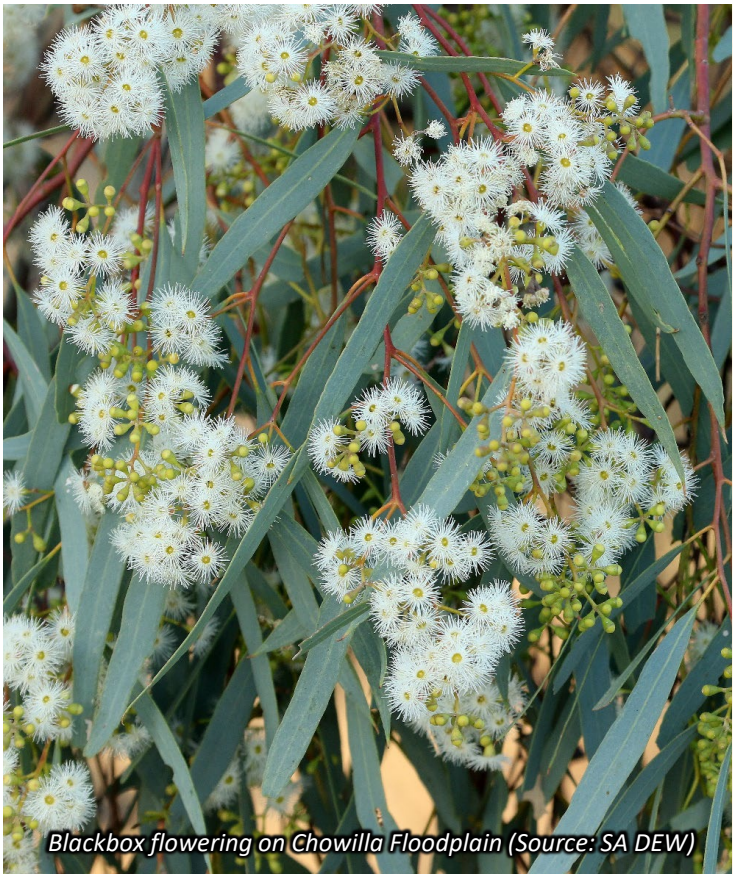
Water for the environment plays a critical role for improving the areas of the floodplain where it can be delivered. However the scale of outcomes is quite different to the extent of natural inundation in big flood events. We know from monitoring results that sites which receive both natural inundation and water for the environment are more resilient than those which receive natural flooding only.

Managed floodplain inundation footprint at Chowilla (left) and the peak of 2022 natural flooding (right) (Source: SA DEW)

Clever ways to maximise environmental outcomes

In 2022-23 environmental water managers partnered with river operators to trial strategic management of Lake Victoria to better shape the unregulated flows passing into the Lower Murray.

In the lead up before peak flows arrived, and in the recession following the peak, river operators adjusted the flow rate entering South Australia for improved environmental outcomes. Any resource 'cost' to overall water availability in Lake Victoria from these operations was borne by environmental water managers.



Blackbox flowering on Chowilla Floodplain (Source: SA DEW)

F. Coorong's ecology gets a freshen up from floodwaters

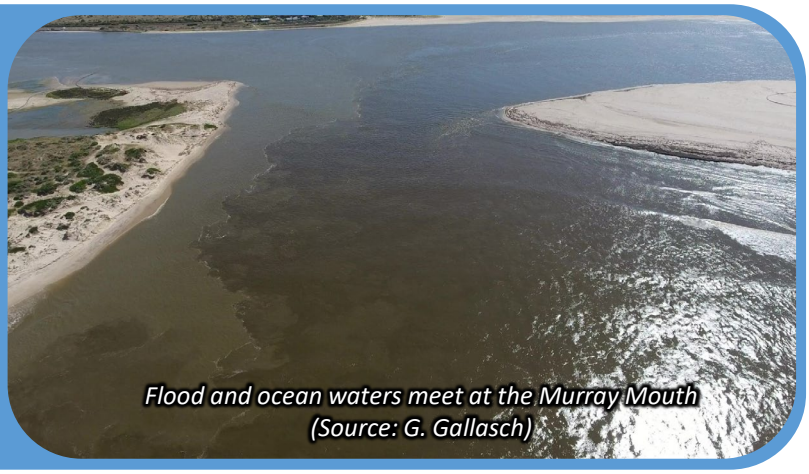
The Coorong was full and very fresh over summer thanks to the very high natural flows. This resulted in a dramatic change to the ecology from the pre-flood conditions:

- Average salinity in the South Lagoon was half that of the previous autumn.
- These deeper, fresher conditions supported widespread growth of *Ruppia tuberosa*
- The distribution of fish extended further into the south lagoon, with highest ever fish densities recorded at some sites.
- Invertebrates also recorded a southerly increase in abundance and diversity, with less salt-tolerant species like worms and snails recorded in southern areas.

Qifeng Ye holding a greenback flounder (Source: SARDI Aquatic Sciences)

Barrage flows

Flow out the barrages peaked at 118,000 ML/d in late January 2023, passing an annual total of 16,900 GL (equivalent to nearly 34 Sydney Harbours) to the Coorong and the Southern Ocean. This is the greatest annual volume of water through the barrages since the 1970s.



Flood and ocean waters meet at the Murray Mouth (Source: G. Gallasch)

Ruppia tuberosa (Photo: SARDI Aquatic Sciences)

While most parts of the Coorong's ecology improved, the waterbird response was markedly different. Around 70,000 less waterbirds were recorded in the Coorong in January 2023 compared to the previous year, in part due to the very high water levels covering the Coorong's mudflats. This meant that migratory waders were not able to access food, resulting in substantially reduced numbers.

As conditions dry off across the Basin in 2023-24, the Coorong is expected to have a relatively high abundance of food and habitat which should see a return to larger numbers of waterbirds.

9. Getting back out onto country

Several years of pandemic and flood impacts have made travel difficult across the Murray-Darling Basin for Traditional Owners, community, and agency staff alike.

In 2022-23 there were several opportunities for face-to-face meetings and site visits providing an opportunity to learn, yarn with old friends and build new relationships.

TLM Forum participants at Hattah Lakes (Source: MDBA)

The Living Murray (TLM) Forum, May 2023

In May 2023, a face-to-face TLM Forum was held for the first time in two years. The event was attended by over 20 First Nations people representing multiple Nations along the Murray, together with many agency staff from the different TLM Icon Sites.

First Nations attendees discussed how they could be better connected and have opportunities to listen, learn and gain a greater understanding of other's water needs for Country. A key outcome was a desire to collaborate across TLM icon sites and to form partnerships to support Indigenous Facilitators to visit each other's Country for Cultural knowledge exchange projects.

SCBEWC field trip

The first face-to-face regional SCBEWC meeting was held in Mildura in November 2022 and included a field trip to the Menindee Lakes.

SCBEWC members were able to see the lakes full and meet with community members to learn about some of the challenges and opportunities in the region.

Monitoring and adapting


Chowilla Floodplain (Source: MDBA)

Monitoring undertaken as part of The Living Murray (TLM) shows that sites which receive water for the environment over consecutive years have improved their condition, helping to build resilience for dry times. Conversely, areas that can't be watered remain in poor condition or are showing decline.

In 2022-23, state partner agencies delivered over 80 TLM monitoring projects. This included condition monitoring to assess site health over time, and intervention monitoring to measure ecological responses to interventions and inform the management of water for the environment.

This monitoring is used by environmental water managers to report on and evaluate outcomes of watering actions and to improve the delivery of water for the environment in subsequent years. Monitoring reports are shared for each location on the MDBA website.

TLM MONITORING
Site condition through time

	Barmah Millewa Forest	Gunbower Forest	Koondrook Perricoota Forest	Hattah Lakes	LindsayMulcra Wallpolla Islands	Chowilla	Lower Lakes, Coorong, Murray Mouth
2021/22	B	A	D	A	B	B	B
2020/21	B	B	D	A	B	C	C
2019/20	B	B	D	A	B	C	C
2018/19	B	A	D	B	B	B	C
2017/18	A	B	D	A	B	B	C
2016/17	A	B	C	A	B	A	B
2015/16	B	B	D	A	B	C	C
2014/15	B	B	D	A	-	C	B
2013/14	C	B	D	B	C	C	B
2012/13	C	B	D	C	C	C	B
2011/12	C	C	D	B	B	C	B
2010/11	B	B	D	C	C	B	D
2009/10	C	C	D	D	D	C	D
2008/09	D	C	D	D	D	C	D
2007/08	D	D	D	D	D	-	D

Sites with environmental works/years where works used

A - Excellent	B - Good	C - Fair	D - Needs attention
Most (75-100%) of ecological objectives have been met.	More than half (50-74%) of ecological objectives have been met.	Fewer than half (25-49%) of ecological objectives have been met.	Few (0-24%) of ecological objectives have been met.

NOTE: Objectives vary between sites and therefore this table should be interpreted as how individual sites are faring over time as apposed to a comparison between sites.

Barmah-Millewa uses regulators to deliver water into the forest, and LLCCMM uses barrage gates to deliver water to the Coorong. Both are used in most years, except extreme drought years

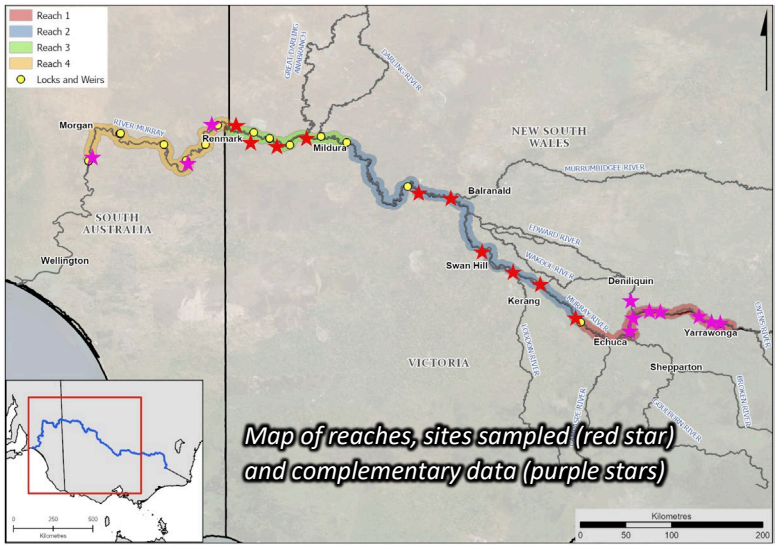
River Murray Monitoring Plan

The River Murray Monitoring Plan (2021–22 to 2025–26) was developed by SCBEWC to inform adaptive management of coordinated water delivery in the River Murray.

The plan covers approximately 2000 kilometres of river and builds on existing monitoring programs by filling gaps and bringing the results from different projects together.

Underpinned by current science, the plan is focussed on two themes: productivity and large-bodied native fish.

Reports are available here.



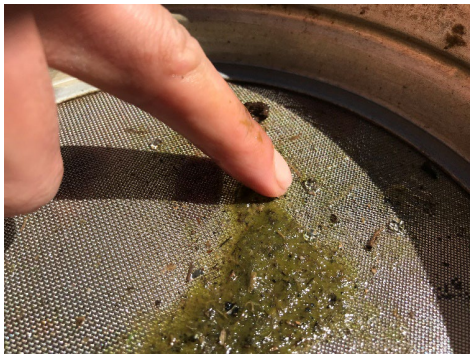
Map of reaches, sites sampled (red star) and complementary data (purple stars)

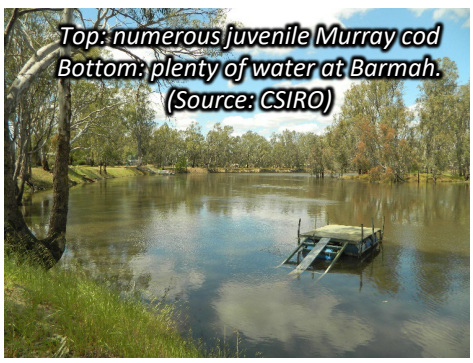
Creation stories recall the creation and formation of the River Murray.

Aboriginal Nations along the River Murray have occupied and managed the region for thousands of generations. These Nations continue their connection to the river today.

First Nations and Scientists are now working together to identify opportunities to jointly monitor matters of cultural interest as part of the River Murray Monitoring Plan.


Indigenous weir constructed by the JIG crew in-situ at the Pollack Swamp (Source: Dan Hutton)




Top: numerous juvenile Murray cod
Bottom: plenty of water at Barmah.
(Source: CSIRO)

High flows in 2022-23 wetted and reconnected parts of the floodplain for the first time in decades. This activated large loads of organic material and contributed to a significant productivity response, including low oxygen water and fish kills.

River Murray productivity monitoring for 2022-23 was due to finish at the end of January 2023, however the program was extended until June 2023 to collect additional data to measure changes in productivity as floodwaters receded. This information was used to:

- compare productivity dynamics through the cycle of a large natural flood to environmental water pulses;
- inform potential management actions to mitigate future impacts of receding floodwaters;
- inform how future environmental water deliveries may be planned to enhance environmental benefits of natural high flows.

Opportunities to improve

Government agencies are working together to integrate water for the environment into the everyday management of the River Murray system. There are several policy and operational issues still being worked through that impact the delivery of water for the environment and limit the outcomes that can be achieved.

The current status of these challenges can be found in the MDBA's Basin Plan Report Card and include:

- **Constraints relaxation** to allow water for the environment to reach low-lying floodplain areas and some of the Basin's key environmental assets
- Adapting and improving **pre-requisite policy measures** to better protect environmental flows from re-regulation and extraction
- Implementation of the **Sustainable Diversion Limit Adjustment projects** to allow Basin Plan environmental outcomes to be achieved with less water
- Completion and accreditation of all **Water Resource Plans** that set out the rules for the use of all water, including water for the environment

Some of the **opportunities to improve** SCBEWC identified in managing water for the environment in 2022-23 include.

Inclusion of First Nations voices

SCBEWC agencies are working with Traditional Custodians to increase First Nations involvement in water for the environment at both site and system scales, however these partnerships still have a long way to evolve and mature.

Water quality response policy clarification

Poor water quality can arise under many scenarios but particularly in prolonged wet or dry conditions. The role of environmental water versus other operational flows in responding to water quality emergencies is an area identified as requiring further clarification.

Operations and delivery issues in 2022-23

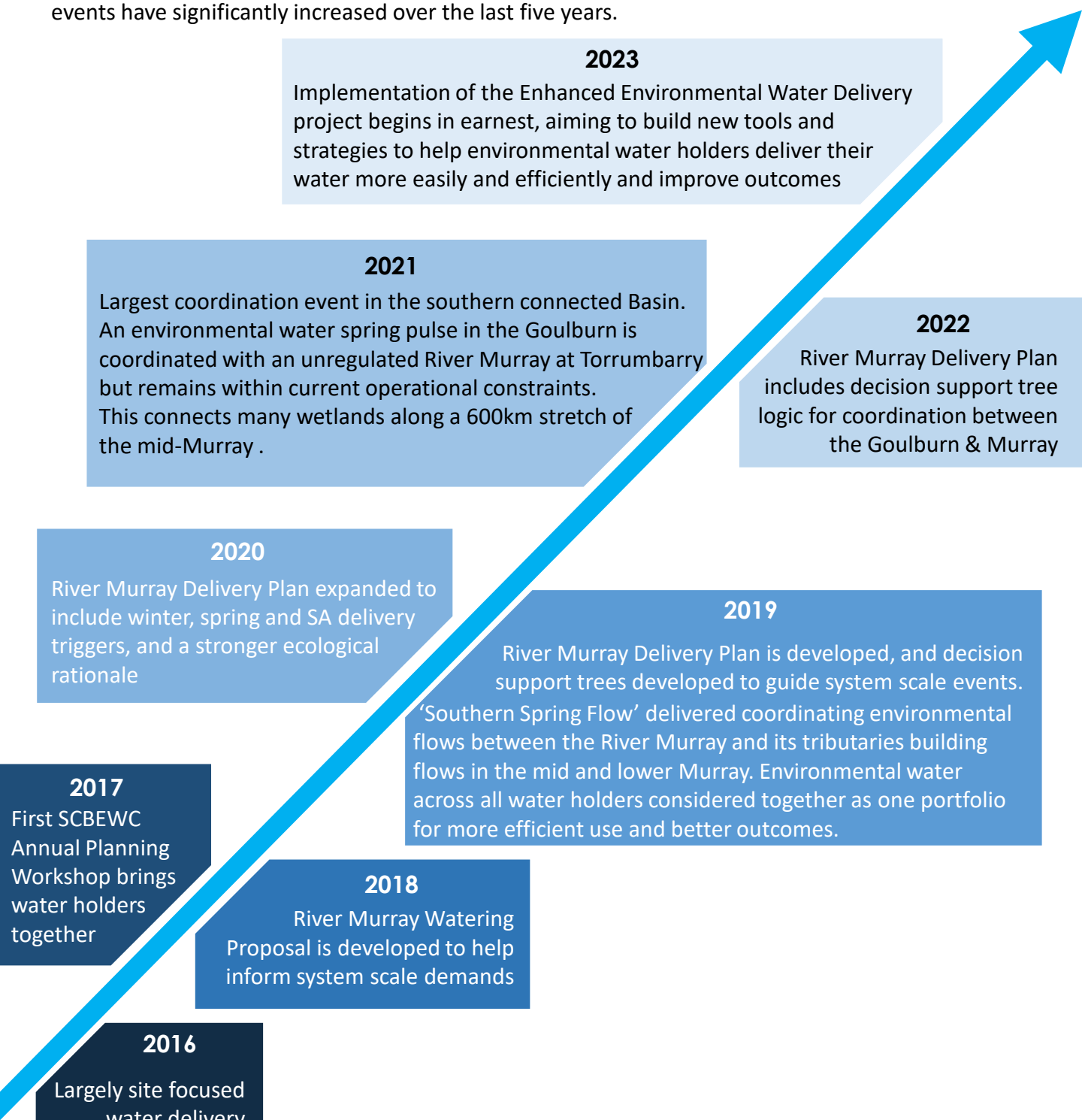
1. Very wet conditions produced long periods of unregulated flow exceeding channel capacity constraints which precluded water for the environment use in many parts of the system.
2. Water for the environment delivery at Koondrook-Perricoota remains challenging. The TLM environmental works are currently unable to be fully utilised due to potential third-party property impacts and liability issues.
3. Environmental water releases from Hume Dam are limited to a relatively low rate of 3.0m at Tocumwal gauge (around 13,500 ML/d downstream of Yarrawonga Weir)

Appendix – Growth in coordination over time

Environmental water holders continue to work together and with river operators to improve the coordinated delivery of water for the environment.

Since 2016, environmental water management across the southern connected Basin has evolved from largely site-based to now include large-scale coordinated watering events to improve downstream and system-wide connectivity outcomes.

The number, scale, ambition, efficiency, and most importantly outcomes of coordinated watering events have significantly increased over the last five years.



Appendix – Water delivery over time

Water is allocated to environmental water licences by the same state processes as other water users. The largest influence on this process is the climatic conditions experienced.

Wetter years see higher inflows, greater allocations, and usually more water delivered for the environment. In drier years, there is less water for the environment delivered, however it makes a proportionately larger contribution to river flows along the Murray and into South Australia.

Environmental Water delivery over the last 5 years in the Southern Basin

Above average
Murray inflow conditions
(26% AEP^)

13,208 GL
water
available*

12,945 GL
total delivered**

9% of flow
to the SA
border

2018-19	2019-20	2020-21	2021-22	2022-23
Dry (94% AEP)	**Dry** (86% AEP)	**Moderate** (71% AEP)	**Wet** (14% AEP)	**Very wet** (2% AEP)
1928 GL	**1838 GL**	**2578 GL**	**3253 GL**	**3610 GL**
1674 GL	**2038 GL**	**3279 GL**	**3000 GL**	**2954 GL**
23% SA flow	**25% SA flow**	**24% SA flow**	**8% SA flow**	**4% SA flow**

^AEP = Annual Exceedance Probability: the probability that a given flow or rainfall event will be exceeded in any one year.

* Water available includes yearly allocations, carryover, and RMIF, but excludes PEW.

** Environmental water use includes return flows which are used and reused at multiple points

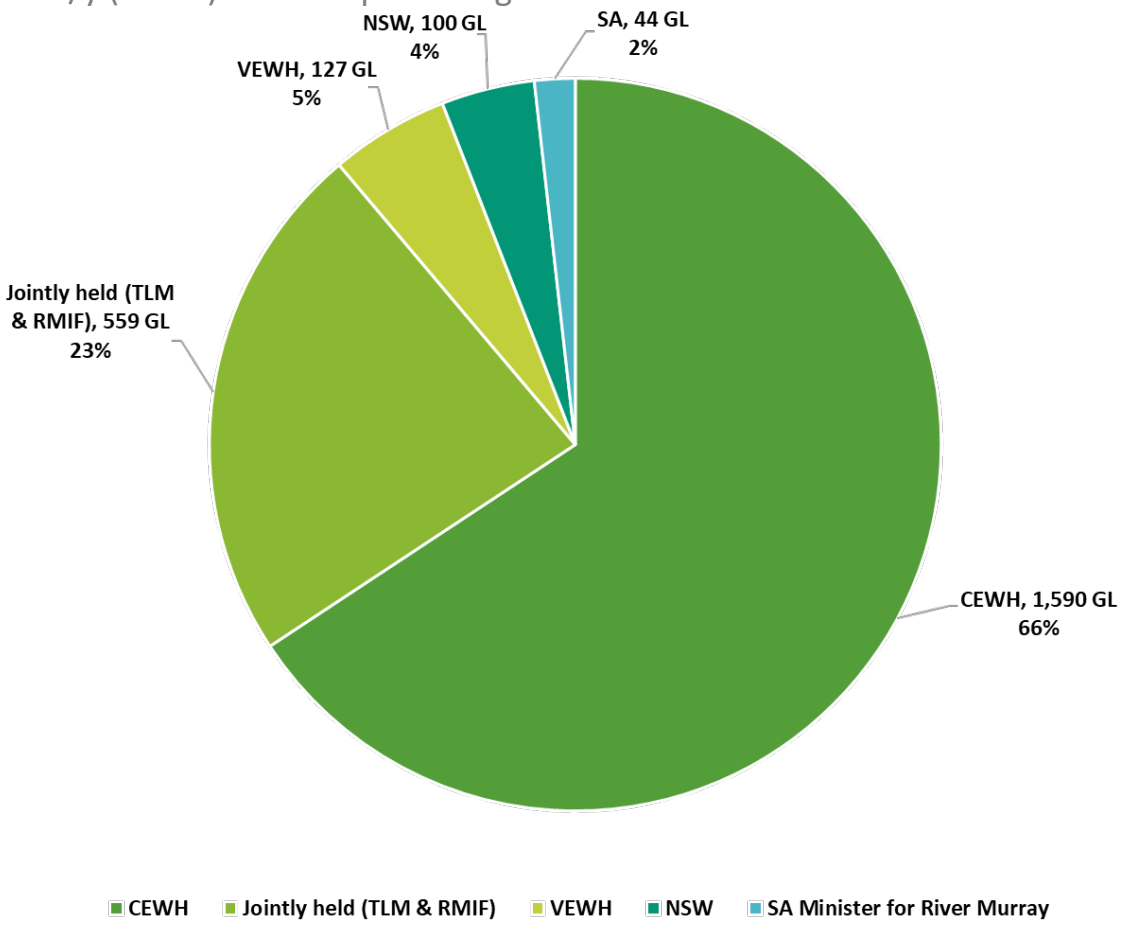
Appendix - Who holds and manages water for the environment

At 30 June 2022 the total volume of water for the environment held in the Murray-Darling Basin is 3,053 GL/year.

Of this, 2,420 GL/year is available for use in the southern connected Basin (79 percent).

Importantly, these volumes are in Long-term Diversion Limit Equivalent (LTDLE) volume terms – which is equivalent to a long-term average. Annual allocations in wet years can total more than 3,053 GL, while allocations in relatively dry years will be less than 3,053 GL.

HEW entitlements in the Southern Connected Basin by manager as at 30 June 2022 in GL/y (LTDLE) and as a percentage of total



Total long-term average volume of water for the environment held by each water holder in the southern connected basin as at June 30, 2022.

Water holders include:
CEWH: Commonwealth Environmental Water Holder
VEWH: Victorian Environmental Water Holder
NSW DPE: New South Wales Department of Planning and Environment
SA: South Australia Minister for Environment and Water
Jointly held: The Living Murray (TLM): Commonwealth, VIC, NSW, and SA
Jointly held: River Murray Increased Flows (RMIF) : VIC and NSW

Appendix – Water delivery by location

Table of 2022-23 Held Environmental Water use (GL) in the Southern Connected Basin. Figures drawn from Basin Plan Annual Reporting, Matter 9.3.

Site or watering event description	Primary ecological purpose	TLM	CEWH	VEWH	NSW	SA	TOTAL
Barmah-Millewa	Vegetation;Lateral connectivity;Waterbirds	55.6	145.3	7.7	5.7	0	214.3
Broken System	Fish;Vegetation	0	48.8	2.3	0	0	51.1
Campaspe System	Fish	0	1.1	13.0	0	0	14.1
Darling Anabranch	Lateral connectivity	0	60.0	0	0.2	0	60.2
Goulburn System	Longitudinal connectivity;Fish;Vegetation	37.5	167.9	15.6	0	0	221.0
Gunbower Creek	Fish	0	1.1	8.7	0	0	9.9
Gunbower Forest	Vegetation	35.8	0	9.2	0	0	45.0
Hattah Lakes	Other;Vegetation	19.3	0	10.1	0	0	29.3
Koondrook-Perricoota Forest: Pollack	Waterbirds	0	2.1	0	0	0	2.1
Loddon System	Fish;Vegetation;Waterbirds	0	3.4	16.1	0	0	19.4
Lower Darling	Fish	83.0	88.4	0	32.0	0	203.5
Lower Lakes, Coorong and Murray Mouth	End of system flows;Other	354.9	764.1	0	0	43.8	1,162.8
Murrumbidgee System	Fish;Longitudinal connectivity;Other;Waterbirds	60.0	232.6	0	78.5	0	371.1
Niemur; Yallakool-Wakool	Fish;Longitudinal connectivity	0.2	230.9	0	23.6	0	254.6
Other NSW Murray Wetlands and Creeks	Waterbirds	0	0	0	0.9	0	0.9
Other Victorian Murray Wetlands	Waterbirds;Fish;Vegetation	0	0	2.4	0	0	2.4
Ovens River	Longitudinal connectivity	0	0.1	0.1	0	0	0.2
SA River Murray use from upstream e-water	Fish;Ecosystem processes;Longitudinal connectivity;Other; Vegetation	0	0.2	0	0	1.7	2.0
TOTAL		**646.4**	**1746.0**	**85.3**	**140.9**	**45.5**	**2,664.0**

Appendix – Jointly held water portfolio overview

The Living Murray (1006.3 GL was available for use)

Location	Entitlement volume (GL)	Net carryover (GL)	Allocation (%)	Allocation (GL)	Available (carryover + allocation) (GL)
NSW Murray High Security	5.1	0.0	100%	5.1	5.1
NSW Murray General Security	83.0	36.7	110%	91.3	91.3
NSW Murrumbidgee General Security	85.0	25.5	100%	85.0	85.0
NSW Lower Darling High Security	0.5	0.0	100%	0.5	0.5
NSW Lower Darling General Security	47.8	2.9	100%	47.8	47.8
Vic Murray High Reliability	21.9	8.7	100%	21.9	27.6
Vic Murray Low Reliability	101.8	101.8	100%	101.8	87.7
Victoria Goulburn High Reliability	45.2	19.2	100%	45.2	64.3
Victoria Goulburn Low Reliability	157.0	11.5	100%	157.0	149.9*
Victoria Campaspe High Reliability	0.1	0.0	100%	0.1	0.1
Victoria Campaspe Low Reliability	5.0	0.0	100%	5.0	4.5*
South Australia Murray Valley	45.0	0.0	100%	0.0	45.0
SUB-TOTAL	**597.5**	**206.3**	N/A	**605.8**	**609.0**
Supplementary & unregulated licences	397.3	N/A	N/A	397.3	397.3
GRAND TOTAL	**994.8**	**206.3**	N/A	**1003.1**	**1006.3**

Carryover is the net available after start of year adjustments (such as for evaporation).
Available is the net available after deductions such as for spillable water account and volumes above max allocation.
Supplementary and unregulated licence allocation based on volume delivered.
** Volume available is less than total entitlement due to Victorian valley cap rules.*

River Murray Increased Flows

Location	RMIF carryover in River Murray Storages at beginning of 2022-23 (GL)*	RMIF made available in River Murray Storages during 2022-23 (GL)^	RMIF used in 2022-23 (GL)	RMIF in River Murray Storages at the end of 2022-23 (GL)	RMIF in Snowy storages (as at 1 May 2023) (GL)#
NSW Murray	56.0	19.5	0.0	75.5	129.0
Victorian Murray	56.0	19.5	5.0	70.5	129.0
TOTAL	**112.0**	**39.0**	**5.0**	**146.0**	**258**

**RMIF carryover associated with release of additional water by Snowy Hydro in 2022-23.*
^RMIF made available in River Murray Storages during 2022-23 associated with release of additional water by Snowy Hydro during the Snowy Water Year between 1 May 2022 and 30 April 2023 (and classified as RMIF available in Hume from May 2023).

Appendix – Estimated unregulated flow delivery 2022-23

While sites were eligible to receive River Murray Unregulated Flows (RMUF) in 2022-23, many sites can access unregulated flows using other mechanisms unique to each state. Unregulated flows, including RMUF were delivered to sites in NSW (via 'prior rights') and South Australia. In Victoria, numerous Victorian sites received water during unregulated conditions using TLM and VEWH unregulated flow entitlements.

The sites listed in the below table are where unregulated flows are understood to have been *actively* managed (e.g. via regulators/pumping). This is not a complete list of everywhere that got inundated due to higher natural flows.

State	Site	Vol (ML)
Vic	Gunbower Creek	8,745.5
Vic	Gunbower Forest (Hipwell Rd)	24,175.0
Vic	Johnson Swamp	782.3
Vic	Kunat Kunat (Round Lake)	194.3
Vic	Lake Cullen	2,284.2
Vic	Lake Elizabeth	645.5
Vic	Mcdonalds Swamp	150.3
Vic	Muringa wetlands	3.3
Vic	Wirra-lo wetlands (Bunyip Swamp East)	12.6
Vic	Wirra-lo wetlands (Bunyip Swamp West)	7.0
Vic	Wirra-lo wetlands (Cattleyard Creek)	8.9
Vic	Hattah Lakes	24,038.3
Vic	Pyramid Creek	44.7
SA	Chowilla / Weir 6	17,750
SA	Pike / Weir 5	1,815
SA	Weir 2 raising	402
SA	Various wetlands	41,664
NSW	Wingillie	403
NSW	Gol Gol Lake	6,000
NSW	Gol Gol Swamp	13,500

Thank you

The effective management of water for the environment relies on the contributions and efforts of many land and water organisations and communities across the southern Basin.

Australian Government

Commonwealth Environmental Water Holder

NSW GOVERNMENT Planning and Environment

VICTORIAN ENVIRONMENTAL WATER HOLDER

Australian Government | MURRAY–DARLING BASIN AUTHORITY

Government of South Australia
Department for Environment and Water

GOULBURN-MURRAY WATER

VICTORIA State Government | Energy, Environment and Climate Action

Australian Government
Department of Climate Change, Energy, the Environment and Water

SA Water

WaterNSW

GOULBURN BROKEN CATCHMENT MANAGEMENT AUTHORITY

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