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MURRAY–DARLING BASIN AUTHORITY

Basin annual environmental watering priorities 2022–2023

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Acknowledgement of the Traditional Owners of the Murray–Darling Basin
The Murray−Darling Basin Authority pays respect to the Traditional Owners and their Nations of the Murray−Darling Basin. We acknowledge their deep cultural, social, environmental, spiritual and economic connection to their lands and waters.

The guidance and support received from the Murray Lower Darling Rivers Indigenous Nations, the Northern Basin Aboriginal Nations and our many Traditional Owner friends and colleagues is very much valued and appreciated.

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

Contents

Executive summary

The Murray–Darling Basin Authority (MDBA) has developed Basin annual environmental watering priorities (the priorities) to guide the planning of environmental watering across the Basin in 2022–2023.

The priorities are the actions needed to help achieve the Basin Plan's long-term objectives of protecting and restoring the Basin's rivers, wetlands and floodplains set out in the Basin-wide environmental watering strategy (the strategy).

This report has been prepared for environmental water holders and managers, water planners, and river operators, and has been developed in consultation with the Basin states and the Commonwealth Environmental Water Holder.

During summer and autumn of 2021–2022, the northern Basin experienced the largest natural flows in more than 10 years. A second consecutive year of high rainfall in many catchments has improved connectivity across large areas of the Basin. Storages are close to full in the north and south. Northern Basin environmental conditions have improved markedly from just two years ago. In wetter catchments across the Basin, there have been good responses to high inflows, with extensive waterbird breeding at key sites, vegetation growth including at the Coorong, and recruitment of native fish.

The availability of water for the environment in these wet conditions provides an opportunity to build on the gains of the past year, achieve Basin-scale outcomes and build resilience for drier times.

Not all catchments have benefited from wet conditions. Flooding in parts of the northern Basin has impacted communities, while some areas of the southern Basin remain relatively dry and water has not reached part of the floodplain where some species are struggling to recover from drought. In these areas, we continue to see the impact that constraints on river operations are having on achieving the Basin Plan's objectives for the environment.

Given these conditions and the volume of water in storages, the MDBA has determined the focus for environmental water use in 2022–2023, described in this report and summarised below.

In wetter catchments:

- connecting rivers to achieve Basin-scale / whole-of-system outcomes
- supporting life cycle completion, including fish movement
- building resilience of key habitats and species in response to the changing climate
- directing water and enhancing natural flows into higher areas of the floodplain.

In drier catchments, focus on preventing further decline:

- Continue to support drought recovery where feasible
- top up natural flows.

Overview of the Basin annual environmental watering priorities

Introduction

The priorities guide the annual planning and prioritisation of environmental watering across the Murray–Darling Basin. They represent the annual steps needed to achieve the long-term outcomes in the Basin-wide environmental watering strategy and, through them, the Basin Plan's ecological objectives and targets. The priorities are expressed at a mix of geographic scales from site-specific to Basin-wide, reflecting the ecology of species that are the focus of the strategy.

The priorities represent the areas environmental water managers should focus on for the year ahead. The guidance provided by the priorities helps federal and state environmental water holders and managers across the Basin, who make decisions about when, where and how much water is provided for the environment.

Multi-year priorities, referred to as 'rolling priorities', are also provided to address areas where the pattern of environmental watering is important across multiple years. These work together with the annual priorities. They are complemented by state priorities which have a catchment or local focus and water provided for the environment by the Commonwealth Environmental Water Holder.

Current conditions and climate context for 2022–2023

Prevailing climatic conditions are a major influence on opportunities to use water recovered for the environment under the Basin Plan.

After the three years of above-average warm and dry conditions to early 2020, the Basin has now experienced two consecutive years of above-average rainfall that has supported drought recovery.

According to the Bureau of Meteorology, the Basin experienced above-average temperatures and higher than average rainfall in April (refer Figure 1). Soil moisture across the Basin is now generally in the average to above-average range, noting that some areas in the southern Basin are still below average and a few areas in the north are very much above average.

Public water storages across the Basin were 91% full as of 22 June 2022, up from 58% at the corresponding time the previous year.

The outlook for June to August is for a wetter than average winter with warmer than average temperatures in the south and cooler days in the east. While the La Niña event is expected to end by early winter, a negative Indian Ocean Dipole could develop, which would keep the chances of above average rainfall high.

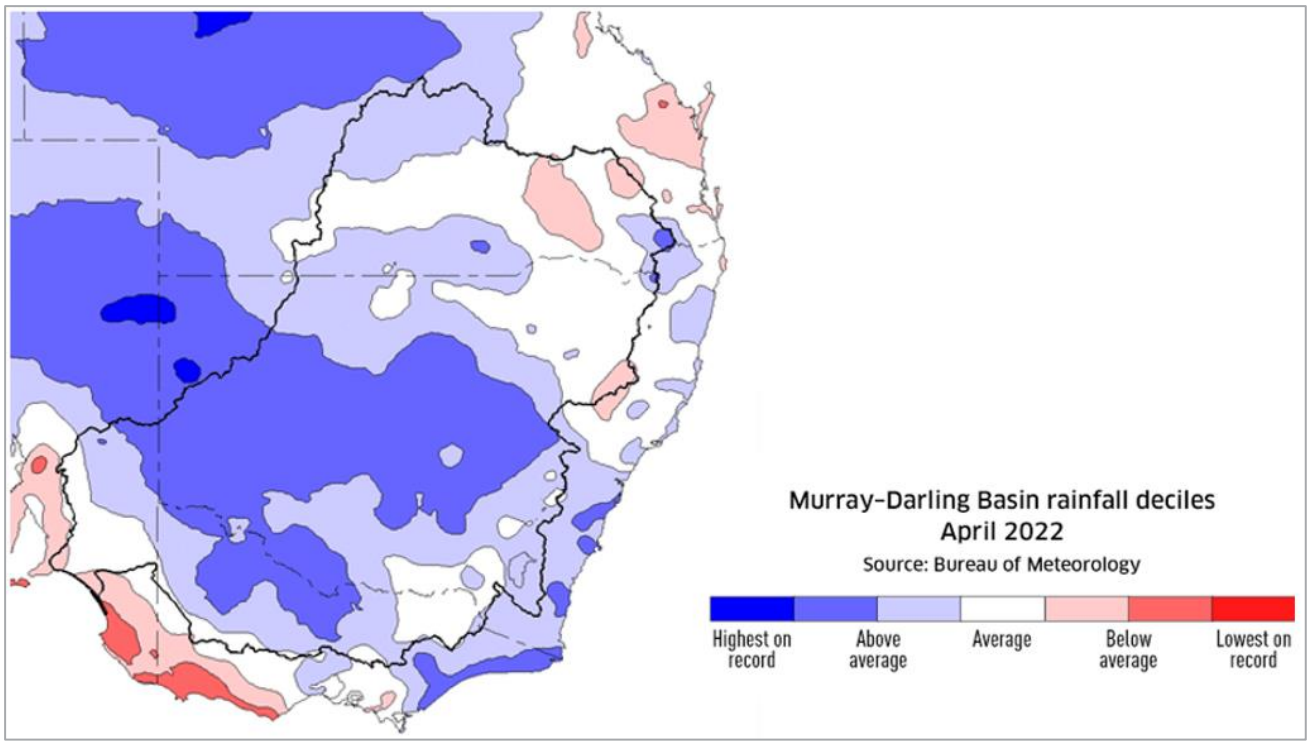

Figure 1: Murray–Darling Basin rainfall deciles for April 2022 (Source: Bureau of Meterology)

Seasonal conditions are always a major influence on the objectives sought from providing water for the environment. The MDBA assesses seasonal conditions for the upcoming water year (the water resource availability scenario) in each Basin catchment based on the past year's climate conditions (rainfall, runoff and soil moisture) and current surface water availability in public water storages in regulated catchments. The Bureau of Meteorology's climate outlook and longer-term forecasts are also considered. In addition, the MDBA consults with environmental water holders and managers.

The priorities are expressed so that they can adapt to the prevailing climatic conditions that will appear throughout the watering year. Identifying which priorities to use will depend on the resource availability scenario and the condition of the area in question. The results of the assessment of the resource availability scenario for conditions as at 1 June 2022 are as follows:

- Very wet – Border Rivers, Gwydir, Namoi, Macquarie–Castlereagh, Lachlan, Lower–Darling and Murrumbidgee
- Wet – Condamine–Balonne, Moonie, Barwon–Darling, Goulburn–Broken, Loddon and Murray
- Moderate – Warrego, Paroo, Ovens and Wimmera–Avoca
- Dry – Campaspe and Eastern Mount Lofty Ranges.

More information on this assessment is provided in Appendix 1.

Basin annual watering priorities for 2022–2023

Basin-wide annual watering priorities and guidance for environmental water holders has been prepared for river flows and connectivity, native vegetation, waterbirds, and native fish. In wetter catchments, the 2022–2023 focus for water for the environment is to connect rivers to achieve Basin-scale and whole-of-system outcomes, support life cycle completion, build resilience, and direct water into higher areas of the floodplain. In drier catchments, the focus is to continue to support drought recovery and top up natural flows.

Table 1 sets out the rolling, multi-year priorities for each ecological theme. The full list of rolling multi-year priorities for targeted outcomes under each ecological theme are found in the Basin-wide-environmental watering strategy. Table 2 sets out annual guidance for 2022–2023.

State priorities

Under the Basin Plan, environmental water planning is required at two spatial (Basin-wide and water resource plan area) and temporal (annual and five yearly) scales. Adopting a multi-scale approach recognises that the environmental objectives of the Basin Plan require a mix of local and Basin-scale actions, and that the riverine ecosystem response is based on both real-time flow events and long-term flow trends.

For the MDBA, this means publishing a Basin-wide environmental watering strategy and Basin annual environmental watering priorities. For Basin states, this means publishing long-term environmental watering plans and annual environmental watering priorities. Basin states are required to provide the MDBA with annual environmental watering priorities for each water resource plan area by 31 May each year. The MDBA has received annual priorities from Queensland, New South Wales, Victoria and South Australia that list priorities at a regional scale. The MDBA had regard to these regional priorities as it finalised the Basin priorities.

The 2022–2023 Basin state priorities generally complement the Basin annual priorities in this report. This is the result of consultation on the needs and opportunities for environmental watering within the framework provided by the Basin Plan and the Basin-wide environmental watering strategy. The MDBA and Basin states have different but complementary roles in planning for environmental watering. The MDBA's Basin priorities have a Basin-wide focus. State priorities are more detailed to reflect local and regional needs. Many regional priorities will support and contribute to the expected environmental outcomes outlined in the Basin-wide environmental watering strategy.

Flows and connectivity

The wet conditions over the previous water year have improved both longitudinal and lateral connectivity in many areas of the Basin. Large volumes of unregulated flow have been present in sections of both the northern and southern Basin. The 2021−2022 annual watering priorities had a strong focus on supporting drought recovery across the Basin. This water year has seen an improvement in root zone soil moisture, runoff, and precipitation across most catchments. These

factors combined with high levels of water available in storages indicate that there are likely to be opportunities for environmental water managers in the 2022−2023 water year to deliver large-scale watering events that reach the mid to high floodplain areas in some catchments.

The two overarching priorities for flows and connectivity in the Basin are to support lateral and longitudinal connectivity along the river systems and support freshwater connectivity through and between the Lower Lakes, Coorong and Murray Mouth.

Connecting rivers to their floodplains (lateral connectivity) is critical to support nutrient cycling, floodplain productivity, and movement of biota between river and floodplain. Lateral connectivity is in focus for 2022−2023 due to wet conditions providing opportunities for water managers to piggyback off high flow events. These natural events should be added to where possible to provide for landscape-scale outcomes in some catchments.

Some water managers have observed that their ability to deliver environmental water to the floodplain is limited by constraints or infrastructure works and/or flooding risks, which in turn limits opportunities for lateral connectivity. As highlighted in the Basin-wide environmental watering strategy: "The degree to which these [expected environmental] outcomes can specifically target the lower floodplain will depend on current constraints in each region and the work underway to address them." Work is underway to address some of these issues, but the ongoing inability to deliver environmental water to large areas of floodplain is continuing to impact the outcomes that are achievable with water for the environment. For more information see the MDBA's webpage on Managing Constraints.

Coordinated, large-scale longitudinal connectivity events should aim to enhance connections between the rivers of the Murray–Darling Basin. Connectivity between the northern and southern Basin via the lower Darling should be supported. In the southern Basin, events meet multiple purposes before contributing to flow at the Murray Mouth. These large-scale events should continue to be developed through the Southern Connected Basin Environmental Watering Committee (SCBEWC). In the northern Basin, conversations around downstream connectivity outcomes should occur among water holders, including through the Northern Basin Environmental Watering Group (NBEWG) in regulated catchments (Namoi, Macquarie, Gwydir and Border Rivers) to determine scope for shaping the hydrograph in the Barwon–Darling based on coordinated water delivery.

Native vegetation

Riparian and floodplain vegetation is a critical component of the Basin's rivers, wetlands and landscapes. It provides habitat for many terrestrial and aquatic fauna and supports important ecological functions and ecosystem services. Native vegetation is typically a mix of trees, understorey plants, and water-dependent aquatic plants. The distribution, density and diversity of native vegetation communities varies throughout the Basin, influenced largely by river flows and climate.

A key priority in the northern Basin in 2021−2022 was to inundate Narran Lakes to support lignum swamps that provide important waterbird breeding habitat. By January 2022, approximately 250 GL of environmental water was delivered to Narran Lakes, which inundated the lakes and triggered lignum flowering. In the Macquarie Marshes, a main priority was to extend the duration of inundation events. The wetlands of the Macquarie Marshes support a wide range of vegetation

communities, including river red gum, coolabah and black box woodlands, lignum swamps and cumbungi and water couch grasslands. The Commonwealth Environmental Water Office (CEWO) and the NSW Government supplemented natural flows to help support recovery of wetland vegetation.

A large natural flood event inundated at least 100,000 hectares of the Gwydir River floodplain in winter/spring. The entire mapped extent of cumbungi rushland, lignum shrubland and marsh club-rush sedgelands was inundated, resulting in the highest vegetation cover since the CEWO's Long-term Intervention Monitoring project started in June 2014. A series of pulses over spring/summer capitalised on these flows, helping to maintain good vegetation condition.

In the southern Basin, a key priority was to extend inundation on higher parts of the floodplain, to help support parched forests and woodlands. In the Murrumbidgee catchment, above average rainfall helped support outcomes for non-woody vegetation at key wetlands. In the Nimmie-Caira wetlands, cumbungi is recovering, with cover now similar to the year 2000. Monitoring is also showing an increase in the extent of tall spike rush and spiny mud grass.

Between August 2021 and February 2022, a total of 253 GL had been delivered to low wetlands along the River Murray. A key objective of the Murray wetland flow was to trigger germination of Moira grass and other wetland vegetation in the Barmah–Millewa Forest. As wet conditions persisted, flows continued to be provided to help support the growth and germination of vegetation. Early outcomes show that Moira grass populations along the River Murray are thriving. However, the health of floodplain trees including river red gum communities is reaching a critical threshold, having not received their inundation requirements since 2016, reinforcing the need to address constraints along the River Murray.

In the Coorong, *Ruppia tuberosa* (ruppia) communities provide key habitat for fish and food for macroinvertebrates and waterbirds, including shorebirds and migratory species. The Basin-wide environmental watering strategy specifies long-term objectives aimed at improving the extent of ruppia and its resilience. The health and resilience of ruppia communities are largely driven by seasonally appropriate salinity and water levels, which directly influence germination and reproduction rates.

Persistent dry conditions preceding the 2021−2022 water year meant that supporting recovery and reproduction of ruppia was imperative. Environmental watering priorities focused on managing salinity and water levels by increasing the volume of flows to the Coorong. High rainfall between November 2021 and February 2022 saw coordination of approximately 3,800 GL of mostly unregulated flows reach the Coorong as part of the Murray Wetland Flow. Direct releases from Lake Victoria in November 2021 helped to ensure barrage flows remained high through mid-late summer, which was critical in keeping Coorong water levels high and allowing ruppia to flower, seed and form turions. Early monitoring reports suggest this has helped boost growth of aquatic vegetation, which is supporting black swan breeding.

Extended periods of high flows in 2021−2022 triggered flowering in many vegetation communities, including lignum shrublands, grasslands and black box woodlands across many sites. In 2022−2023, management of environmental water should focus on providing flows to support continued growth and recruitment where germination is likely to occur, such as lignum shrublands at Narran Lakes. In the Lower Murray, managers should focus on meeting inundation requirements of river red gum and

black box communities higher up on the floodplain if suitable conditions occur. In the Coorong, water levels should be managed to support resilience of ruppia by providing conditions for continued growth and reproduction.

Waterbirds

Waterbird populations are effective indicators of general ecosystem health in the Basin, with more than 120 species supported, including at nationally and internationally important sites. Since waterbird population peaks were recorded in the 1980s, populations have declined.

Only a small fraction of environmental water use under the Basin Plan has been specifically for waterbirds. Delivering environmental water at the required duration and flow for colonial breeders is operationally challenging, while large flows are needed to water the wetlands at the end-of-system that support shorebirds. In recognition of these challenges, innovative approaches have been developed to secure better outcomes for waterbirds, and these should continue in 2022–23 where conditions allow for it.

Wetter conditions in several catchments in 2021−2022 created ideal circumstances to support widespread breeding events. For the first time in 10 years, waterbirds were breeding at Narran Lakes (a Ramsar site) in the 2022 breeding season, with at least 12 colonial nesting species breeding at the two colony sites. This includes sightings of threatened and rarely seen species, such as freckled duck, black-necked stork, blue-billed duck and great crested grebe. For the first time in 20 years, the Macquarie Marshes, Gwydir Wetlands and Narran Lakes have all had large waterbird breeding events underway concurrently throughout late summer and autumn. Building on these wetter conditions by using environmental water to extend inundation will improve foraging habitats and support additional waterbird breeding in 2022−2023.

Colonial waterbirds need specific conditions to complete their breeding cycle and this year's conditions have been ideal. Large waterbird colonies have been breeding because of natural flows, and this has been supported by targeted environmental watering to maintain water levels and encourage adult birds to remain with chicks and nests.

The Lowbidgee and Lachlan wetlands have followed successful waterbird breeding events in 2020−2021 with another large event recorded in 2021−2022. Substantial rain events have contributed to overbank flooding, triggering significant numbers of colonial waterbird breeding in the Lowbidgee, including Nimmie-Caira, Yanga National Park and the Great Cumbung Swamp. Large numbers of straw-necked ibis, pelicans and other colonial nesting species have been observed nesting in the area. To support this year's fledglings, environmental water managers should supplement residual water in the landscape to create foraging habitat, as well as refuge sites for endangered species such as Australasian bittern and Australian painted snipe.

Despite the significant flooding and breeding events across 2021−2022 due to the La Niña event, the Basin's waterbird populations are still low compared to the peaks of the 1980s. Response to the wetter conditions has been positive; however, populations will need continued favourable conditions to recover from the preceding extended dry period. Some wetlands in southern Victoria and in South Australia have not received the significant rain or flow events as occurred in the north.

The diversity and numbers of waterbirds breeding and foraging across wetlands in the North Central Victorian catchment rose for a second consecutive year after water managers supplemented a high-river flow event with environmental water to extend flooding, which prompted breeding. The delivery of a comparatively small volume of water to wetlands in the area played a large part in creating conditions for colonial waterbird breeding and foraging habitat in a landscape that is otherwise dry.

Waterbird populations in the Lower Lakes continued to be low for small wading birds, according to counts in January and March 2022. Waterbirds may have dispersed due to the more favourable conditions in the northern Basin but most of the species in lower abundance are not likely to move to inland wetlands. Colonial nesting species in the Lower Lakes included four cormorant species, royal spoonbills and ibis.

At the Coorong, there was a good breeding season for the Australian pelican, extending into the late summer. However, the Coorong also supported fewer waterbirds than in previous years, in particular small wading birds. This included lower counts of grey teal, hoary-headed grebes and whiskered terns, as well as avocet and banded stilts. Flow management to the Coorong in 2021−2022 supported higher water levels and fresher salinities, increasing food resources for many waterbird species (particularly small fish, ruppia and invertebrates). If similar flow conditions are experienced in 2022−2023, similar operations can favour waterbirds.

Environmental water managers should continue to support dry floodplains in the south that have not received flows from 2021–2022 rain events to create foraging habitat for young-of-year birds and continue to protect refuge sites from further decline.

Native fish

The Basin has more than 60 species of native fish, including freshwater, estuarine, marine, and migratory fish. Many of these freshwater species are unique to the Basin. To help improve environmental outcomes for native fish, flows that improve movement opportunities, hydrodynamic diversity and fish habitat will allow fish to complete their life cycle and build resilience. During these moderate to wet conditions in most catchments, it is crucial that water managers create opportunities to build resilience in native fish populations, including increased water depth and water quality, so they can survive the inevitable return of dry or drought conditions.

The wet conditions for much of the Basin during the 2021−2022 water year have resulted in recruitment and breeding of many native fish species. Conditions have generated large natural recruitment events for golden perch in the northern Basin and dispersal to the Menindee Lakes nursery habitat; recruitment of golden perch in the lower Murray; recruitment of Murray cod in many catchments; a boom of bony herring (a key food source for large-bodied fish); and localised recruitment of important, but less common, species such as freshwater catfish, Murray hardyhead, and southern pygmy perch. Estuarine fish in the Lower Lakes, Coorong and Murray Mouth have recruited from increased flows through the barrages.

While the focus for environmental watering remains on recovering the native fish community from the impacts of previous droughts, bushfires and fish deaths, there are many opportunities for environmental water managers to also build resilience in fish populations. For example, in moderate

water availability conditions, it would be beneficial to provide follow-up connectivity flows in the northern Basin catchments. These connectivity events have previously been used to mitigate very dry conditions; however, providing connectivity in a moderate scenario is also ecologically sound. Connectivity flows will aid distribution and rebuild fish populations following large-scale recruitment in 2021−2022. Providing water to support connectivity, productivity and fish recruitment will help build resilience in native fish populations, including by providing flows that allow connectivity through the barrages to support the recruitment of diadromous fish in the Lower Lakes, Coorong and Murray Mouth.

Supporting the dispersal of golden perch recruits from the Menindee Lakes is another important aspiration. This will help to build resilience and recover the golden perch populations in the southern Basin. Ideally, this watering would allow fish movement up and downstream of Menindee Lakes, including up and downstream in the River Murray. This should include providing watering and operational solutions to create opportunities for juvenile fish to move upstream past Lock and Weir 11 and Lock and Weir 15 on the River Murray. This will support the movement of golden perch populations that struggle to recruit naturally in the heavily regulated catchments upstream of those structures.

Increasing productivity in river systems will further support native fish recovery and resilience. Providing an appropriate sequence and size of flows across all catchments will improve productivity, leading to greater recruitment and survival success. While large flows allow fish to move and disperse, it is also important to provide small freshes to enhance productivity. Modest flows at the right time can also have positive outcomes for flow cued and/or dependent fish species. It is also important to continue to provide environmental water to off-channel habitats to protect habitat quality and support the recruitment of populations of threatened small-bodied native fish species such as Murray hardyhead, southern pygmy perch, olive perchlet and the southern purple-spotted gudgeon.

Recent rainfall has improved the Basin's recovery from drought but deficiencies remain in South Australia and some areas of Victoria. Water managers will need to continue to consider appropriate flows for drought recovery of native fish in some catchments.

First Nations environmental watering objectives

The MDBA recognises the ongoing connection to Country of First Nations people across the Basin, and respectfully acknowledges Traditional Owners and Custodians, as well as the role of First Nations science, expertise, knowledge and values in achieving a healthy river systems.

To address First Nations environmental watering objectives, the MDBA and CEWO partnered with the Northern Basin Aboriginal Nations (NBAN) and the Murray Lower Darling Rivers Indigenous Nations (MLDRIN) in 2019−2020 under the First Nations Environmental Water Guidance (FNEWG) Project. This project provided an opportunity to share information, collaborate and include First Nations outcomes directly into current water management to improve the health of Country.

MLDRIN and NBAN developed their own guidance for environmental water managers using different approaches to reflect the differences in climate, water management and cultural diversity in the northern and southern Basin. This guidance was incorporated into the Basin priorities for 2020–2021.

Efforts to further develop First Nations' environmental watering objectives for annual and long-term planning, (i.e. the next Basin watering strategy update) have been hampered by COVID-19 and resource constraints. However, First Nations representatives have participated in meetings of SCBEWC and NBEWG that focus on deciding how and when to provide water for the environment.

Basin governments are also working with First Nations groups to achieve Aboriginal environmental outcomes, as reflected in their regional and catchment plans for 2022−2023.

In addition to this, the MDBA has reported on First Nations participation in environmental watering as part of its obligations under Section 175 of the *Water Act 2007* (Cwlth). More detailed information on how First Nations have been involved in planning for the delivery of environmental water can be found here.

The MDBA, CEWO and Basin governments remain committed to strengthen direct engagement with First Nations to empower their participation in environmental water planning and delivery.

Rolling multi-year watering priorities

Table 1: Rolling multi-year watering priorities

Watering Priorities	Flows and connectivity (FC)	Native Vegetation (V)	Waterbirds (B)	Native Fish (F)
Basin – Rolling Priorities (multi-year) (R)	**RFC1.** Manage water to maximise lateral and longitudinal connectivity along the river systems and provide opportunities for high ecological productivity. **RFC2.** Support freshwater connectivity through and between the Lower Lakes, Coorong and Murray Mouth.	**RV1**. Allow opportunities for growth of non-woody wetland vegetation. **RV2.** Allow opportunities for growth of non-woody riparian vegetation. **RV3.** Maintain the extent, improve condition and promote recruitment of forests and woodlands. **RV4.** Maintain the extent and improve the condition of lignum shrublands. **RV5.** Expand the extent and improve the condition of Moira grass in Barmah–Millewa Forest. **RV6.** Expand the extent and improve resilience of *Ruppia tuberosa* in the southern Coorong.	**RB1.** Maintain the diversity and improve the abundance of the Basin's waterbird population. **RB2.** Maintain the abundance of key shorebird species in the Lower Lakes and Coorong.	**RF1.** Support Basin-scale population recovery of native fish by reinstating flows that promote ecological processes across local, regional and system scales in the southern connected Basin. **RF2.** Improve flow regimes and connectivity in northern Basin rivers to support native fish populations across local, regional and system scales. **RF3.** Support viable populations of threatened native fish, maximise opportunities for range expansion and establish new populations.

Annual guidance 2022–2023

Table 2: Annual guidance for 2022–23 to achieving the Priorities

Watering Priorities	Flows and connectivity (FC)	Native Vegetation (V)	Waterbirds (B)	Native Fish (F)
Annual Guidance – North (AN)	**ANFC1**. Support cross-border and inter-valley connectivity opportunities (where necessary, coordinate through NBEWG). **ANFC2.** Manage water recession at sites where there is an active bird breeding event (e.g. Narran Lakes, Gwydir Wetlands, Macquarie Marshes). **ANFC3.** Support connectivity between the northern and southern Basin via the lower Darling–Baaka.	**ANV1.** Support riparian vegetation in key wetlands of the northern Basin. **ANV2.** Support continued recovery of lignum shrublands at Narran Lakes and other key sites in the northern Basin. **ANV3.** Continue to support recovery of core wetland vegetation and emerging vegetation by supplementing natural flows at key sites in the Macquarie Marshes. **ANV4.** Support inundation of the Warrego Floodplain.	**ANB1.** Continue to support colonial nesting waterbird breeding and recruitment triggered by natural flows in the Narran Lakes, Macquarie Marshes and Gwydir Wetlands. **ANB2.** Support foraging and nesting of waterbirds by ensuring shallow-water and shoreline habitat.	**ANF1.** Water to support building resilience of native fish populations, productivity, and refuge waterhole habitats. **ANF2.** Provide water to support recruitment and subsequent dispersal of juveniles to improve native fish populations. **ANF3.** Provide water to support both lateral and longitudinal connectivity to allow for dispersal and building resilience in native fish populations.

Watering Priorities	Flows and connectivity (FC)	Native Vegetation (V)	Waterbirds (B)	Native Fish (F)
				ANF4. Provide small pulses (freshes) to support productivity and movement of native fish including at reintroduction sites of relocated fish.
Annual Guidance – South (AS)	**ASFC1.** Piggyback off high-flow events to deliver additional water to low-lying floodplains and extend the event duration. Use existing environmental works to deliver this water where available. **ASFC2.** Coordinate and plan event releases to achieve multiple benefits along the length of the Murray (where necessary, coordinate through SCBEWC).	**ASV1.** Provide flows to low-lying wetlands to support germination and growth of Moira grass and other non-woody vegetation communities at key sites in the mid-Murray region. **ASV2.** Provide flows to meet critical inundation requirements for river red gum communities in the mid-Murray, including Barmah–Millewa Forest, which haven't received water since 2016.	**ASB1.** Maintain foraging and roosting habitat at refuge locations, with a focus on drier areas of the southern Basin. Support breeding and recruitment where naturally triggered. **ASB2**. In moderate conditions, maintain waterbird breeding habitat in 'event ready' condition. Support breeding where it is naturally triggered. Where conditions permit, trigger and provide ongoing support for small-scale breeding	**ASF1**. Provide water for the lower Darling–Baaka to support survival and dispersal of young cohorts of Murray cod and golden perch (including if required in the Darling Anabranch). **ASF2.** Ensure winter, spring and summer flows through the barrages and barrage fishways to support migration and progressive recovery of diadromous fish including lamprey and congolli.

Watering Priorities	Flows and connectivity (FC)	Native Vegetation (V)	Waterbirds (B)	Native Fish (F)
	ASFC3. Deliver moderate to large-scale watering events where possible (including Icon sites) to target higher floodplain areas. **ASFC4.** Increase flows to the barrages to improve water quality and trigger cues for migratory fish movement.	**ASV3.** Increase inundation higher on the floodplain to support parched and stressed forests and woodlands at key sites in the lower-Murray region. **ASV4.** Provide flows to improve the health of black box communities higher on the floodplain across the Lower Murray region, including Chowilla Floodplain and Lindsay–Mulcra Wallpolla islands. **ASV5.** Promote growth and encourage reproduction of *Ruppia tuberosa* by managing water and salinity levels.	across functional groups, including the wetlands of the Lowbidgee that have shown a strong response to natural flows. **ASB3.** Maintain waterbird habitat including productive shorebird habitat and foraging availability in the Lower Lakes, Coorong and Murray Mouth – allowing for varying requirements within the different habitats offered by the Coorong and Lower Lakes.	**ASF3.** Maintain fast-flowing habitats to cue and facilitate movement and recruitment of native fish. **ASF4.** Provide off-channel habitat to support the entire life cycle of threatened small-bodied native fish including at reintroduction sites of translocated threatened fish.

Appendix 1 – Resource Availability Scenario

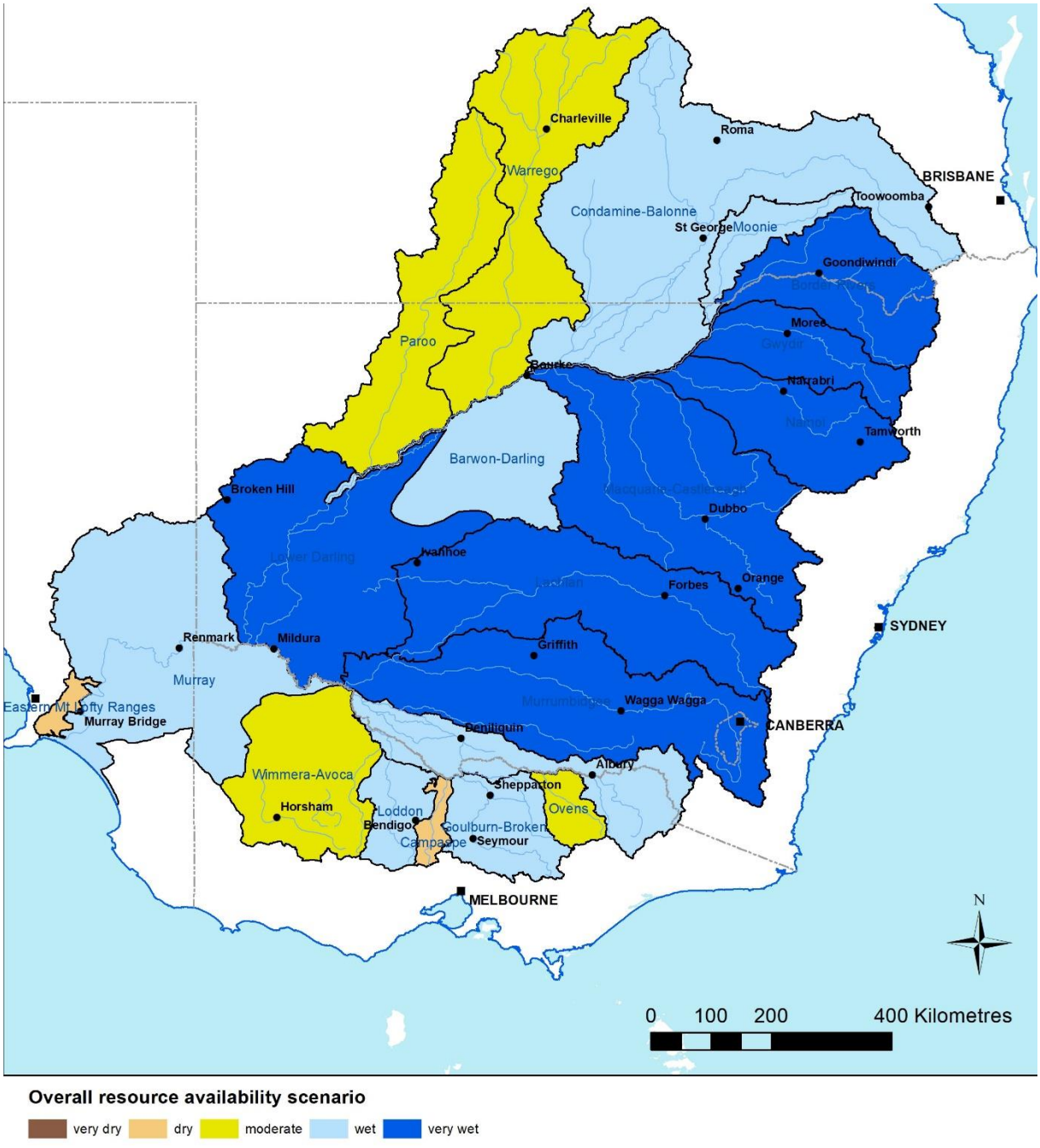

Figure 2: Water Resource Availability Scenario as at 1 June 2022 (Source: MDBA) One of the key steps in developing the environmental watering priorities is determining the water resource availability scenarios (RAS). The MDBA calculates the RAS using the Guidelines for the method to determine priorities for applying environmental water. The calculation is based on indicators of antecedent climate conditions over the previous year (rainfall, runoff and soil moisture) and surface water availability in public dams of regulated systems.

Office locations – *First Nations Country*
Adelaide – *Kaurna Country*
Canberra – *Ngunnawal Country*
Goondiwindi – *Bigambul Country*
Griffith – *Wiradjuri Country*
Mildura – *Latji Latji Country*
Murray Bridge – *Ngarrindjeri Country*
Toowoomba – *Jarowair and Wakka Wakka Country*
Wodonga – *Dhudhuroa Country*

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