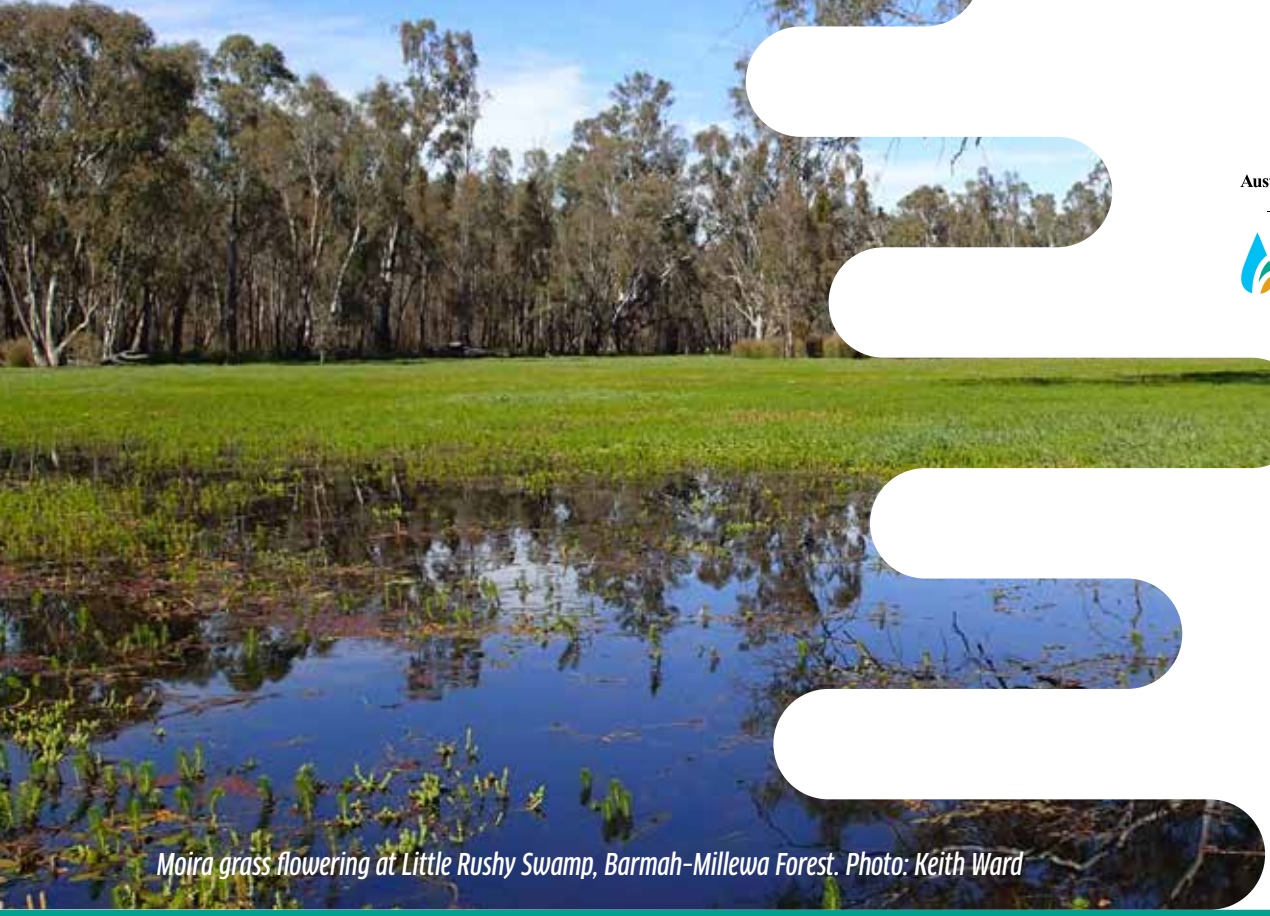

Moira grass flowering at Little Rushy Swamp, Barmah-Millewa Forest. Photo: Keith Ward

Australian Government

MURRAY–DARLING BASIN AUTHORITY

Making the most of water for the environment

The Basin-wide environmental watering strategy

Environmental watering isn't new—it's been happening at some places (like the Macquarie Marshes) since the 1980s, and a lot has been learned about what works. However, Basin states and the Australian Government are now working together to manage the Murray–Darling Basin as a whole connected system; and to achieve more sustainable and efficient use of its water resources for the long-term.

This is a big task. The Basin spans five states and territories and has a highly variable climate. Water is often scarce, with drought a common feature. Achieving sustainability means careful balancing of the needs of people—we need our farms and other industries dependent upon the water—with the need to restore and maintain the health of the environment. Healthy ecosystems help us—they contribute to cleaner air and water, play a role in nutrient cycling, provide places for cultural and recreational activities, and support fisheries and tourism.

To support people and industries to transition to a future with less water, the Australian Government is investing in water savings infrastructure and on-farm efficiency projects. With the water saved, together with environmental water that has been purchased by governments, a portfolio of water is being set aside to be used to restore the health of the Basin's important ecosystems. Because of the significant investment and effort by Basin communities in water savings and purchase projects, it is critical that this water is used efficiently and wisely.

The Basin-wide environmental watering strategy builds on the Basin Plan. It guides the work of governments, water holders and environmental managers. It sets out the expected outcomes (at a Basin scale) that should be achievable with the environmental water; and efficient and effective strategies to achieve them.

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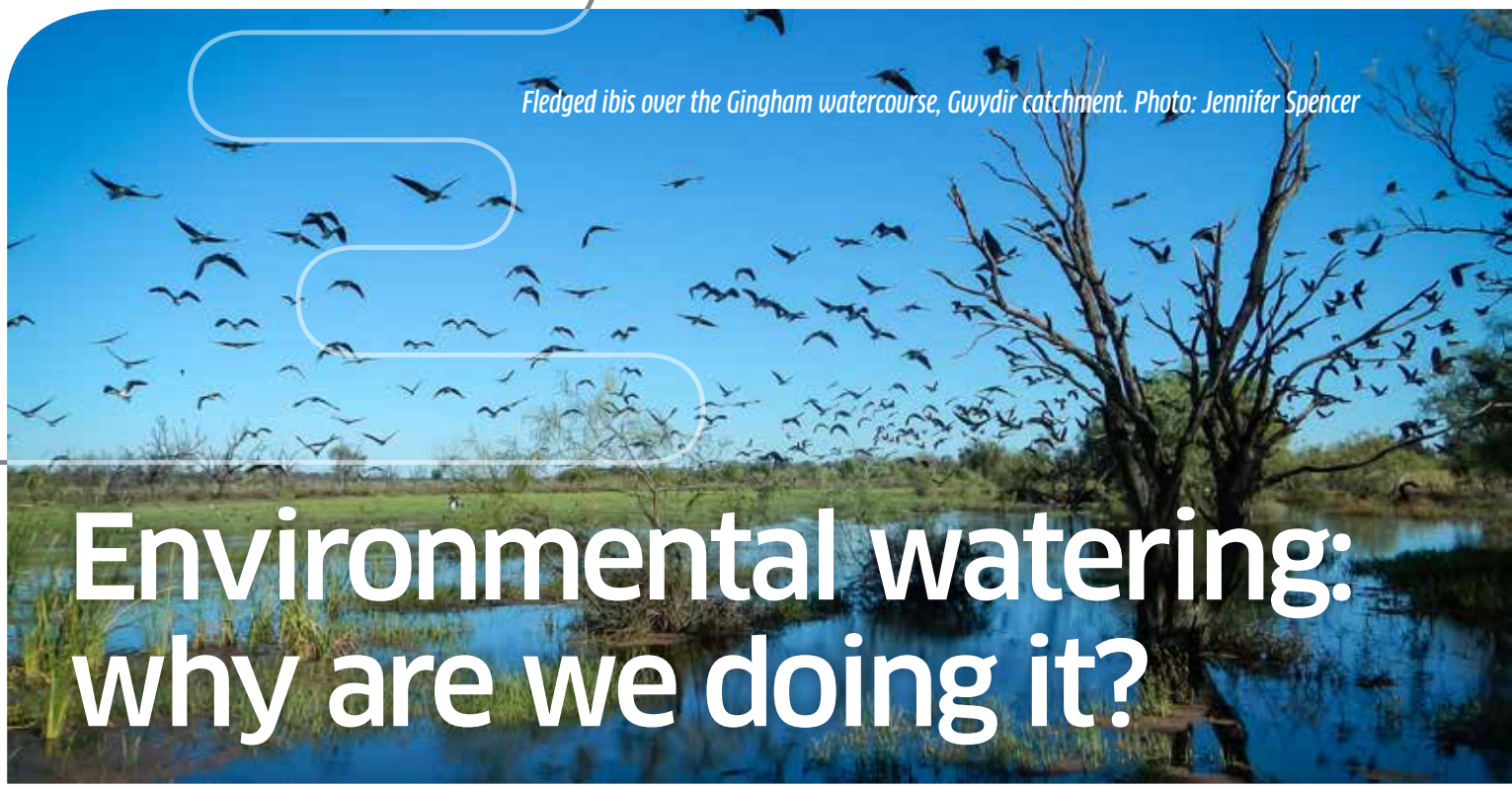


Fledged ibis over the Gingham watercourse, Gwydir catchment. Photo: Jennifer Spencer

Environmental watering: why are we doing it?

The Basin's environment includes thousands of kilometres of rivers, more than 30,000 wetlands and dependent native plants. Many of these wetlands are of international importance for migratory waterbirds (Ramsar-listed), so we have an obligation to protect them. The water-dependent vegetation is important for shelter, food and meeting the breeding needs of many species, particularly fish and waterbirds.

Because we've built dams and weirs and now divert a lot of water out of the system (e.g. for irrigation and towns), many rivers don't flow the way they used to. There's less water flowing in rivers in general (and about 75% less down the River Murray to where it meets the sea at the Ramsar-listed Coorong and Lakes Albert and Alexandrina). With less flushing flows out to sea, the rivers get too salty at times for organisms. There's also fewer times when rainfall leads to rivers swelling and delivering water (and nutrients) onto riverside areas (instead flow is mostly captured). These things, combined with the effects of periodic (and sometimes decade-long) drought, have led to declining ecosystems.

The Basin Plan (our new basin-wide management plan) is about finding a better balance—not looking to return to a 'natural' system. Rather, we want to return some particular types of flow in rivers (see opposite). These flows are known to be critical in the life-cycles of plants and animals. The water delivery will be carefully managed for certain purposes—like stimulating fish or waterbird breeding at the right times of year, flushing salt, or improving the health of plants like river red gum that need periodic inundation. Such watering will only occur in parts of the Basin where it is both *important* and *possible*. This is primarily on low-level floodplains very close to rivers; and where there won't be significant impacts to people or infrastructure that can't be overcome.

The Basin-wide environmental watering strategy is a guide. Environmental water managers make the day-to-day decisions on what to water and when; in line with the strategy but taking into account climate, priorities and how much environmental water is currently available. These decisions are made in consultation with various waterway managers and local landholders.

Where does the water come from?

The *Commonwealth Environmental Water Holder* manages the Commonwealth's environmental water portfolio. Commonwealth water holdings are the direct result of government purchases of entitlements and *substantial investment* in more efficient water infrastructure in the Murray–Darling Basin. The NSW, Victorian and South Australian governments also have environmental water holdings, and the Murray–Darling Basin Authority manages a portfolio of holdings through *The Living Murray* program.

Increasingly, the various water holders and land and water managers (sometimes farmers or environmental groups) are jointly contributing water from their holdings and coordinating releases from dams so that larger volumes can be diverted through sections of rivers. This increases efficiency by making it possible to achieve several desired environmental responses as the water moves through the river system.

Aspiration: We are trying to achieve improvement in the health of the river system — through more natural and variable flows

Fish, birds and vegetation are important indicators of the general health of the rivers, wetlands and floodplains

River flows and connectivity

Vegetation

Waterbirds

Fish

Expected outcomes:

With the additional water available for environmental watering under the Basin Plan, assisted by the Basin-wide environmental watering strategy, we expect to achieve:

Maintained base flows:
- at about 60% of natural levels

Improved overall flow:
- 10% more into the Barwon–Darling
- 30% more into the River Murray
- 30–40% more to the Murray mouth (and it open to the sea 90% of the time)

Maintained connectivity in areas where it is relatively unaffected:
- between rivers and floodplains in the Paroo, Moonie, Nebine, Warrego and Ovens

Improved connectivity with bank-full and/or low floodplain flows:
- by 30–60% in the Murray, Murrumbidgee, Goulburn and Condamine–Balonne
- by 10–20% in remaining catchments

Maintain the Lower Lakes above sea level

Maintenance of the current extent of:
- about 360,000 hectares of river red gum; 409,000 ha of black box; 310,000 ha of coolibah forest and woodlands; and existing large communities of lignum
- non-woody communities near or in wetlands, streams and on low-lying floodplains

Maintained condition of lowland floodplain forests and woodlands of:
- river red gum
- black box
- coolibah

Improved condition of:
- southern river red gum

Maintained current species diversity of:
- all current Basin waterbirds
- current migratory shorebirds at the Coorong

Increased abundance:
- 20–25% increase in waterbirds by 2024

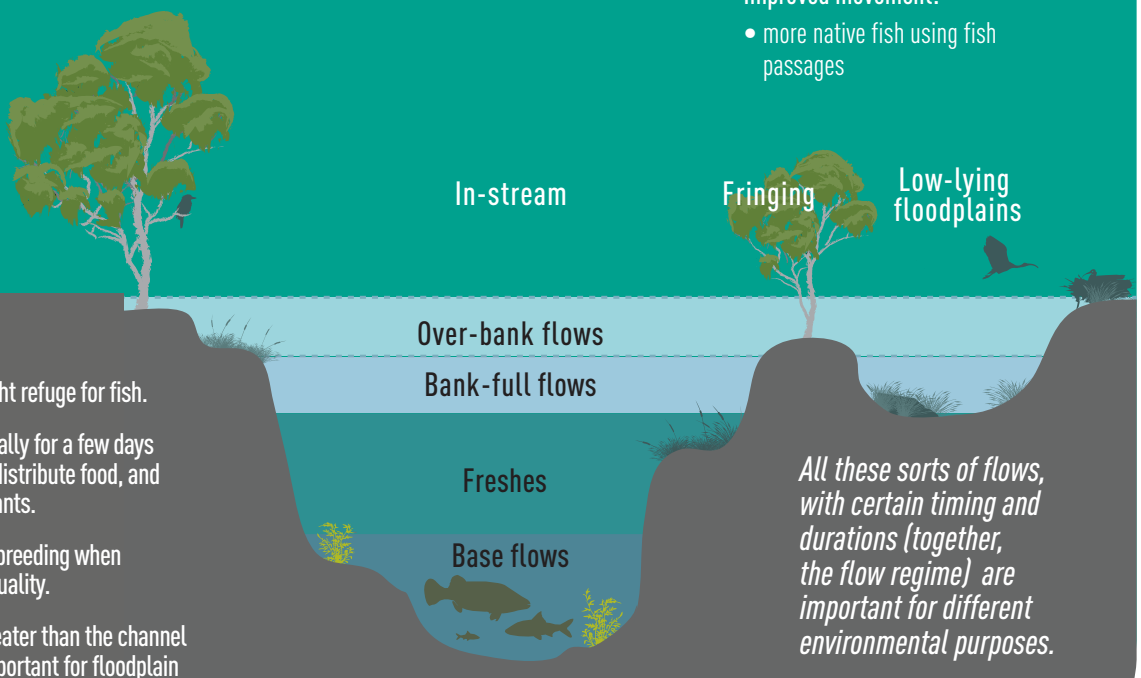
Improved breeding:
- up to 50% more breeding events for colonial nesting waterbird species
- a 30–40% increase in nests and broods for other waterbirds

Improved distribution:
- of key short- and long-lived fish species across the Basin

Improved breeding success for:
- short-lived species (every 1–2 years)
- long-lived species in at least 8/10 years at 80% of key sites
- mulloway in at least 5/10 years

Improved populations of:
- short-lived species (numbers at pre-2007 levels)
- long-lived species (with a spread of age classes represented)
- Murray cod and golden perch (10–15% more mature fish at key sites)

Improved movement:
- more native fish using fish passages



Important types of flows

Base flows: provide long-term drought refuge for fish.

Freshes: (a rise in river height, generally for a few days after rain): allow fish movement , redistribute food, and provide soil moisture for riverside plants.

High (bank-full) flows: often trigger breeding when sustained, and important for water quality.

Over-bank flows: (water volumes greater than the channel capacity): recharge wetlands and important for floodplain vegetation, fish and waterbirds, as well as productivity.

All these sorts of flows, with certain timing and durations (together, the flow regime) are important for different environmental purposes.

How do we do it?

Years of environmental watering experience shows that the best results are achieved when we:

- **listen to communities**: local land managers, community groups and Traditional Owners know what conditions are like: where's water needed most? How are the fish doing?
- **mimic nature**: ecosystems are adapted to natural patterns (like golden perch spawning best after spring/summer rain causes flow pulses). Using environmental water (in the absence of rain) to mimic such natural patterns is most likely to produce desired environmental responses
- **work together**: e.g. being efficient and achieving multiple results with the same delivery of environmental water; or pooling water toward larger-scale outcomes
- **think holistically**: e.g. water being delivered for irrigation or other purposes can potentially also contribute to environmental benefit, if the preceding strategies are considered while planning.

These techniques are encapsulated in the Basin-wide environmental watering strategy. Additionally, early each year the MDBA, other water managers and river operators get together and consider environmental water needs across the Basin. They take into account the condition of sites; current and forecasted climate; history of watering; and the water available to be used. They also talk to other interested groups like Aboriginal and irrigation representatives, local governments and landholders. Annual environmental watering priorities are then set as a guide (and published by the MDBA in June). However, decisions on exactly what goes ahead and when are made over shorter time-scales by environmental water managers after considering local conditions and needs; and the feasibility of delivering water to a particular site. Local 'on-ground' knowledge is important in determining the amount of water, timing and likely outcomes. Once an action is agreed, environmental water 'parcels' are then released from dams at certain times and places. The flow travels down the river (sometimes meeting another coordinated release from another storage—see case study below).

Importantly, regardless of conditions, this action can only be carried out in certain circumstances. It must not affect significant structures like bridges or damage property. It can't reduce water availability for critical human needs or meeting water allocations to irrigators.

Case study: Watering the Gunbower Forest

Gunbower Forest is an internationally important river red gum wetland. Spanning 20,000 hectares, it is home to many plants and animals. The forest also contains sites of Aboriginal cultural significance and is popular for recreational activities such as kayaking, fishing and bushwalking.

This project required the collaboration of Victorian and New South Wales government agencies, the North Central Catchment Management Authority and the MDBA. It also involved scientists and researchers, including the Murray–Darling Freshwater Research Centre. Sixty-two gigalitres (GL) of environmental water was allocated to this event — 41 GL from The Living Murray and 21 GL from the Victorian Environmental Water Holder. (1 gigalitre equals 1 billion litres.)

Environmental watering of the forest commenced in late May 2014 and concluded in December. This period of inundation was carefully managed so as to provide the most benefit to the forest's animals and plants—including the iconic river red gums, which were much in need of a drink! Afterward, much of the water was then released to flow back into the River Murray—bringing carbon and nutrients with it—and was therefore of benefit to river health (e.g. providing food for macroinvertebrates and stimulating the growth of aquatic plants, which in turn are food for other animals).

The response of fish to these actions was monitored. Results show that the flooded forest created good conditions for small-bodied native fish (such as Australian smelt and carp gudgeons). They bred in enormous numbers. Through monitoring at the fish lock (constructed as part of the project) it was demonstrated that, once the watering concluded, these fish moved off the floodplain and back into Gunbower Creek and the River Murray. It is estimated that 14,000 such native fish moved out of the forest in just one day! These fish will be food for Murray cod and golden perch, as well as waterbirds.

Other good outcomes are expected for several years. The water remaining in wetlands and billabongs provides important habitat for many aquatic species, including frogs and turtles.