


The Pulse of 2015–16


In the Gwydir, Junction of the Warrego and Darling, and Lachlan rivers


Scientific monitoring and evaluation of environmental water use helps all water users to better understand flow regimes and their various components. This work is helping to improve understanding about how flows relate to the health and diversity of fish and bird populations, vegetation and ecosystems as well as water quality and river hydrology (water flow and water connectivity to wetlands and floodplains).

Junction of Warrego and Darling rivers (Toorale)

 An outbreak of the floating aquatic weed *Azolla* in part of the Darling River channel was dispersed following flows in spring 2015 which included environmental water, preventing potential decline in water quality.

Flows in the Darling River supported connectivity and provided native fish with access to habitats such as snags and anabranches. These flows helped maintain water quality throughout the year.

 There was a notable increase in fish populations such as the bony herring and spangled perch in the Warrego River in March 2016, compared to October 2015. Environmental flows upstream of Toorale contributed to connectivity along the length of the river and supported breeding and recruitment of native fish including bony herring, spangled perch, golden perch and Hyrtl's catfish.

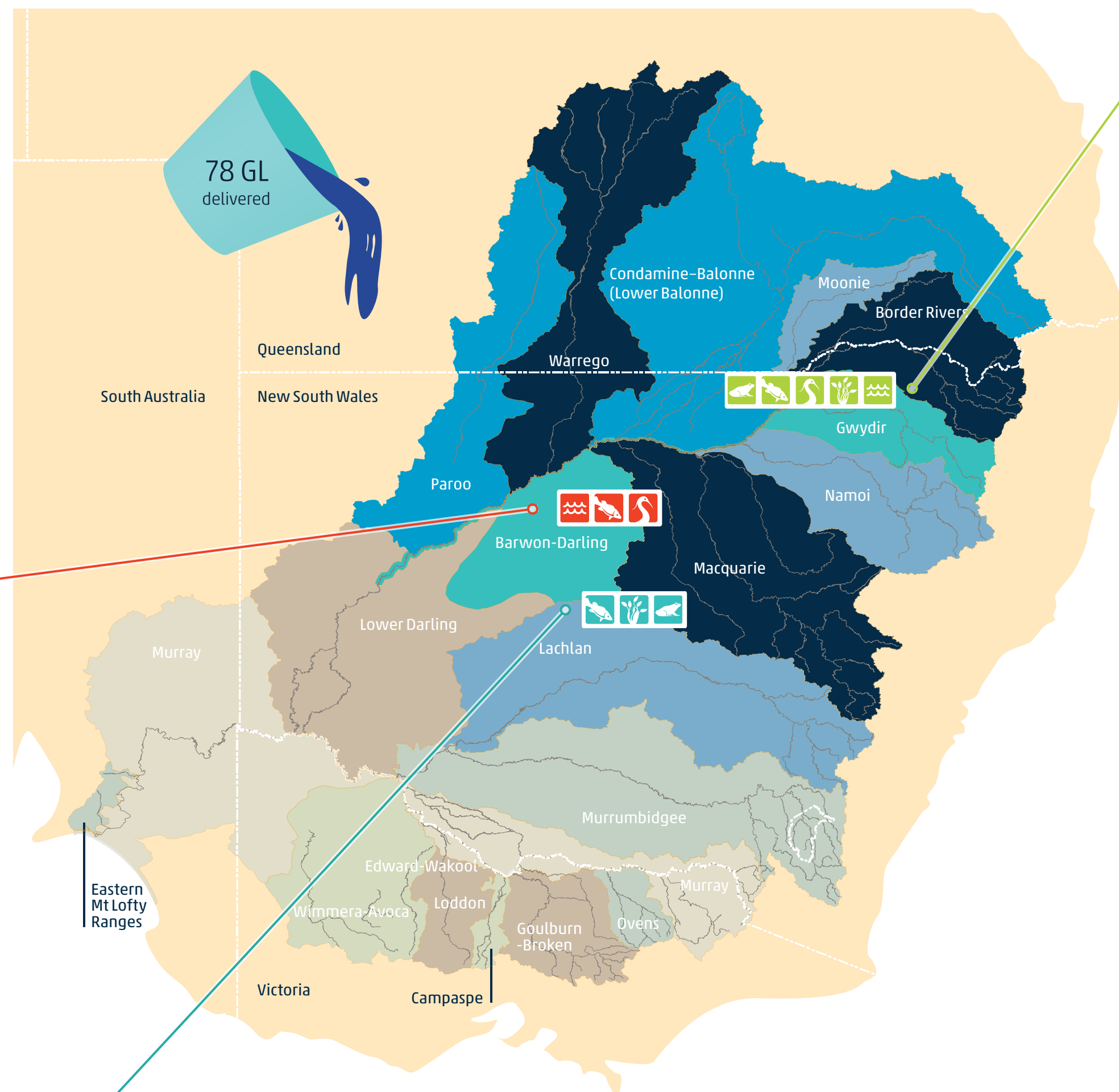
 87 species of birds were seen in the Warrego River and the Western Floodplain, including three species listed under international migratory bird agreements; the wood sandpiper, common sandpiper and eastern great egret. Waterbird numbers and diversity were higher in drought refuge sites along the Warrego.




Brolgas at Toorale Station. Credit: L. Copeland




Popular pastime at Toorale Station




Lachlan

 Native fish populations benefited from high flows created by the combination of water released from storage under "translucent flow" arrangements and environmental flows. Seven native fish species spawned including Australian smelt, Murray cod, carp gudgeon and flat-headed gudgeon. However, there was no evidence (eggs or larvae) that golden perch responded to environmental water in 2015–16. The timing of flows in relation to unseasonably high river temperatures may have contributed to this.

 Improvements in foliage cover, decreased dead canopy and the health of native riverbank and wetland vegetation such as red-gum and black box trees occurred at sites that were inundated.


When a storage has reached a certain capacity, a small amount of water is allowed to flow through river systems to replicate a natural response to rainfall. This is known as translucent flow – a type of planned environmental water event intended to restore natural medium to high flows, seasonality, and flow variability. However, they are independent of Commonwealth environmental water flows. Translucent flows are triggered according to specific rules that apply to individual storages as per State water sharing plans. For further information, please refer to www.water.nsw.gov.au/watermanagement/water-sharing/environmental-rules/rivers#flows


 Small flows delivered to the Booligal Wetlands helped the breeding of four species - the spotted marsh frog, barking marsh frog, eastern sign-bearing froglet and the great banjo frog. Successful recruitment of the spotted marsh frog and the great banjo frog also occurred in Murrumbidgeil Swamp.



Straw-necked ibis eggs. Credit: J. Spencer

Gwydir

 Four frog species, the broad-palmed rocket frog, spotted marsh frog, barking marsh frog, and eastern sign-bearing froglet, bred in the wetlands of the lower Gwydir system in response to environmental water.


 For the first time since 2013, a population of threatened olive perchlet was seen in large numbers in the Gwydir. Environmental water was critical to maintaining flow into the Gingham Waterhole where the olive perchlet were observed.


Three other threatened species were also seen including Murray cod, silver perch and the freshwater catfish. This confirms that positive ecological outcomes can be achieved by using relatively small amounts of environmental water at critical times, particularly during periods of low or no river flow.


The western population of the olive perchlet was once widespread throughout the Murray-Darling system of South Australia, Victoria, western New South Wales and southern Queensland. This population has suffered a serious decline and is now found only at a few sites in the Darling River drainage.



Olive perchlet. Credit: Murray-Darling Basin Authority

 59 waterbird species were recorded, including five species listed under the *NSW Threatened Species Conservation Act 1995*; the brolga, magpie goose, black-tailed godwit, black falcon and black-necked stork. These birds benefited from habitat maintained using environmental water. Small-scale waterbird breeding was supported for 16 species; however, as expected, the overall abundance and breeding activity was smaller than the wetter conditions in 2014–15.

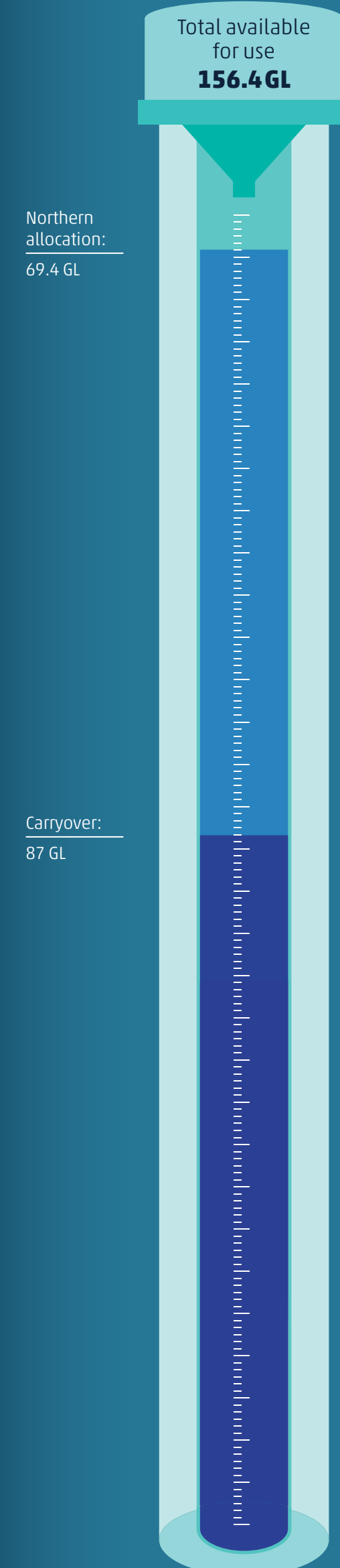
 Wetland vegetation improvements from previous watering years were maintained through a dry year with small but significant contributions of environmental water. These wetland vegetation species included water couch, spike-rush, tussock rush, lignum and river cooba, and floodplain species such as coolibah and river red gum. Significantly, areas of water couch meadow that received environmental water were shown to have reduced coverage of lippia, an invasive weed species.

 Environmental water was released down the lower Gwydir, Gingham, Mehi and Carole channels in April 2016 providing critical connection between isolated refuge pools, sustaining native fish, invertebrate and other aquatic animal communities.



Pink-eared and blue-billed ducks

Water availability in 2015–16 in the Northern Basin



For further information on environmental water management, in the unregulated rivers of the Northern Basin refer to www.environment.gov.au/water/cewo/publications/restoring-protecting-northern-basin-2016-17

The Pulse of 2015–16

In the Murrumbidgee, Edward-Wakool, Goulburn and Murray rivers

Scientific monitoring and evaluation of environmental water use helps all water users to better understand flow regimes and their various components. This work is helping to improve understanding about how flows relate to the health and diversity of fish and bird populations, vegetation and ecosystems as well as water quality and river hydrology (water flow and water connectivity to wetlands and floodplains).

Murray River

Environmental water reduced salinity levels in the Lower Murray Channel, Lower Lakes, Coorong and Murray Mouth. It also transported nutrients throughout the river system, providing food for aquatic plants and animals. Environmental water provided 100 per cent of flows between November 2015 and June 2016 into the Coorong.

Using environmental water to raise weir pools in the Lower Murray provided higher connections between the floodplain and the river, which in turn provided more fish food. In years of relatively low flow, changes in weir pool levels in conjunction with environmental water use can maximise ecological benefits between the river and floodplain, such as nutrient exchange and wetting of fringing vegetation.

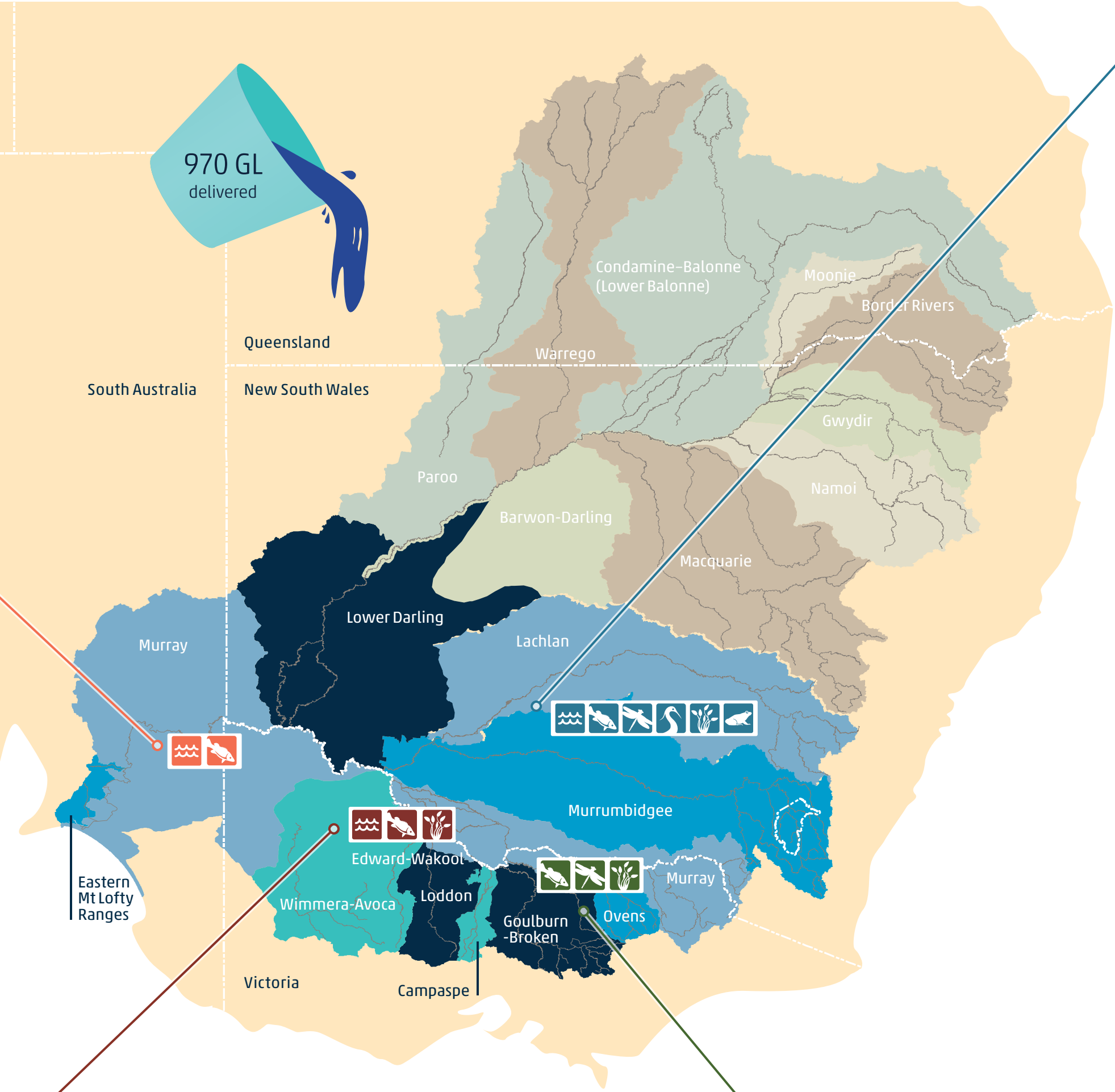
Due to low flows, there was little spawning and recruitment of golden and silver perch in the Lower Murray. Compared to the previous year, the number and diversity of small-bodied fish remained high; however, there was an increase in the number of exotic goldfish and common carp.

For the second consecutive year, small Murray cod were found in the Lower Murray, indicating successful recruitment. The contributing conditions that supported this recruitment remain unclear.

Otolith (ear bone) analysis of fish in the lower Murray shows that the population is made up of fish from all over the southern connected Murray-Darling Basin, including from the Darling and Upper Murray Rivers. This highlights the importance of providing connectivity and passageway between these parts of the system to support a healthy fish population.



Murray cod. Credit: Murray-Darling Basin Authority.



Edward-Wakool

Water delivered to the Barmah-Millewa forests and nearby floodplains was reused along the length of the Murray River, including the Edward-Wakool system resulting in connectivity between the Yallakool Creek and parts of the Wakool River. The timing of these flows was early enough in the season that carbon inputs from the floodplain to the river channels were achieved without causing water quality issues in the Edward-Wakool system.

Native fish diversity and condition was maintained. Growth of the Murray cod population (those not released from hatcheries) remained steady in 2015–16 indicating that spawning is resulting in successful recruitment.

There has been gradual improvement in the diversity and cover of riverbank and aquatic plants at sites in Yallakool Creek and the mid Wakool River that have consistently received environmental water over the past five years.



Lake Eildon



Fishing on the Murray River. Credit: Murray-Darling Basin Authority.

Goulburn River

Long-distance movements of golden perch were detected frequently, with one fish travelling around 600km from the Goulburn River, through the Murray River and to the junction of the Wakool River in two months. These results highlight the importance of hydrological and biological connectivity in the management of flow and habitat for golden perch across catchments.

Over the past two years, endangered trout cod have been found below Shepparton, which may indicate a recent expansion in range since 2003 when they were only found further upstream.

Spawning was detected for five native fish including the Murray cod, Australian smelt, carp gudgeon, flathead gudgeon and Murray River rainbowfish.

Large numbers of young carp were found in a reach of the Lower Goulburn River close to the Murray. It is not known whether this breeding was enhanced by the delivery of environmental water in early spring to support plants on the riverbank, or whether carp spawned in the Murray and moved into the Lower Goulburn River.

Murrumbidgee

Environmental water was delivered to around 16,000 hectares on the Lowbidgee floodplain, supporting water quality.

Native fish numbers in wetlands increased from the previous year. The delivery of water to wetlands coincided with spawning in at least nine native species of fish including the critically endangered silver perch (EPBC Act). In wetlands, carp gudgeon, Australian smelt and bony herring successfully recruited, and Murray cod juveniles were seen in the Nimmie-Caira for the first time since monitoring began in 2008.

Watering supported wetland and refuge habitats and maintained water quality in the Nimmie-Caira, Redbank and mid-Murrumbidgee wetlands. This stimulated micro-invertebrate populations, which support wetland and riverine foodwebs, increasing food supply for fish, frogs, turtles, waterbirds and other animals.

Waterbirds such as threatened Australasian bitterns (EPBC Act), freckled ducks and magpie geese were recorded foraging and nesting, with some breeding in wetlands where environmental water had been contributed.

Nine aquatic plant communities and 43 water-dependent species were recorded across 12 wetlands. In Yarradda Lagoon important water dependant native species, including spiny mud grass, tall-spike rush and fringe lily re-established following successive years of environmental watering.

Breeding activity for six frog species (plains froglet, barking marsh frog, inland banjo frog, perons tree frog, southern bell frog and spotted marsh) was recorded. The Vulnerable southern bell frog was recorded at Yarradda Lagoon for the first time since the 1970s.

Commonwealth environmental flows occurred in the Mid-Murray and Lower Murray, from Hume Dam through to the Coorong, Lower Lakes and Murray Mouth to support the management of Australia's wetlands of international importance (Ramsar listed wetlands) and sites that support nationally threatened species including Barmah-Millewa forests, Hattah Lakes, and wetlands throughout the Victorian-NSW Mallee region, South Australian Riverland, Lower Lakes and Coorong. These flows sought to support in-channel, wetland and low elevation floodplain habitat, thereby improving the condition, movement and recruitment of native fish (including Murray cod, silver and golden perch), the condition of riparian and wetland vegetation and the managed export of salt from the River Murray.

Although macroinvertebrate numbers declined in 2015–16, environmental water may have buffered against the effects of the particularly dry conditions, as reduction in numbers was less severe in the Goulburn River following environmental water use, than in the nearby Broken River which received no environmental water.

Spring environmental flows improved native vegetation abundance and diversity along areas of riverbank. This builds on past efforts to improve and re-establish aquatic and semi-aquatic plants through consistent flows of environmental water during spring.

Carefully managed declines in environmental flows can allow a layer of mud to be deposited onto the riverbank that provides an ideal location for the germination and growth of new plants. This activity will be a focus of future monitoring in the interests of continuing to support plants and manage bank erosion.

Water availability in 2015–16 in the Southern Basin

