

Murray Darling Basin – water quality and dissolved oxygen results

Multiple agencies are undertaking water quality monitoring to review dissolved oxygen conditions across NSW, identify potential risks to ecological communities, implement mitigating measures and respond to the mass fish death event in the Darling River. This update provides a summary of information collected up to 13 April 2023.

On 16 and 17 March there were mass fish deaths in the reach of the Darling River between Lake Wetherell Main Weir and Menindee town. On 28 March additional fish deaths were reported in the Darling River between Menindee town and Menindee Creek, with tens to hundreds of dead Golden Perch and Silver Perch observed. On Thursday 6 April and up to 12 April, there have been reports of tens to hundreds of Bony Herring and small numbers of Carp dying in the reach below Lake Wetherell toward the town of Menindee.

There remains a high risk of further fish deaths as fish in an already stressed condition succumb to increased competition for depleting food resources and cooler temperatures. This is particularly the case for Bony Herring, which boomed during the recent floods and are now in poor condition being more susceptible to environmental stresses like low oxygen levels and temperature extremes, including cooler temperatures.

To maintain an oxygenated flow in the Darling River through Menindee township, releases of water from the Lake Pamamaroo outlet are continuing. Releases from Lake Menindee are being reduced to assist in the flow of water from Lake Pamamaroo past Menindee town and to manage flow targets further downstream.

These operational measures are assisting with dissolved oxygen levels downstream of Menindee Main Weir and Lake Pamamaroo outlet. Recent water quality monitoring recorded oxygen levels above 4 mg/L during the day in the surface water near Menindee township. As a general guide, native fish and other large aquatic organisms require at least 2 mg/L of dissolved oxygen to survive, but may begin to suffer if levels are below 4 to 5 mg/L for prolonged periods.

The progression of poor quality water around mid-March, from Menindee down the lower Darling River, resulted in additional deaths of fish downstream, including thousands of Bony Herring and hundreds of large-bodied native fish, including Golden Perch, Silver Perch and Murray Cod. This front of low dissolved oxygen water reached Pooncarie on 26 March and has now progressed downstream past Burtundy Weir. Dissolved oxygen levels have been improving gradually at these locations. Further fish deaths are still a possibility in the lower Darling River from Pooncarie through to Wentworth in coming weeks.

To report any further incidents of dead fish, fish struggling or starting to gasp at the water surface, or crayfish exiting the water, please call the NSW Department of Primary Industries Fisheries' Fishers Watch Phonenumber 1800 043 536 or fill in a fish kill protocol and report form at: www.dpi.nsw.gov.au/fishing/habitat/threats/fish-kills-2019-2020/info-sheet

Dissolved oxygen levels – Darling River at Menindee

Water quality data indicates reasonable dissolved oxygen levels in water released to the Darling River from Lake Pamamaroo, but longitudinal dissolved oxygen monitoring has demonstrated progressive reduction in dissolved oxygen levels downstream past Menindee town to the Menindee Creek junction. These low dissolved oxygen levels resulted in the deaths of large-bodied native fish between Menindee town and Menindee Creek on 28 March, and there is an ongoing risk of further fish deaths in this area. Releases from both Lake Pamamaroo and Lake Menindee continue to be managed day-by-day to minimise the risk of hypoxia-related fish deaths in the lower Darling River.

Figure 1 is a Google Earth image showing the location and results from the survey of dissolved oxygen levels down the Darling River on 13 April from Lake Pamamaroo to Menindee town. The results show that there was a gradual decrease in oxygen levels with distance down the Darling River, with the lowest result (3.92 mg/L) recorded at Menindee.



Figure 1: Google Earth image showing dissolved oxygen results (mg/L) from the Lake Pamamaroo outlet to Menindee town – 13 April

Six longitudinal surveys of dissolved oxygen have been undertaken down this reach of the Darling River over recent weeks (25 March, 29 March and 1, 5, 11 and 13 April). Figure 2 compares these sets

of results and shows that over time, dissolved oxygen levels have been improving in response to the operational measures in place.

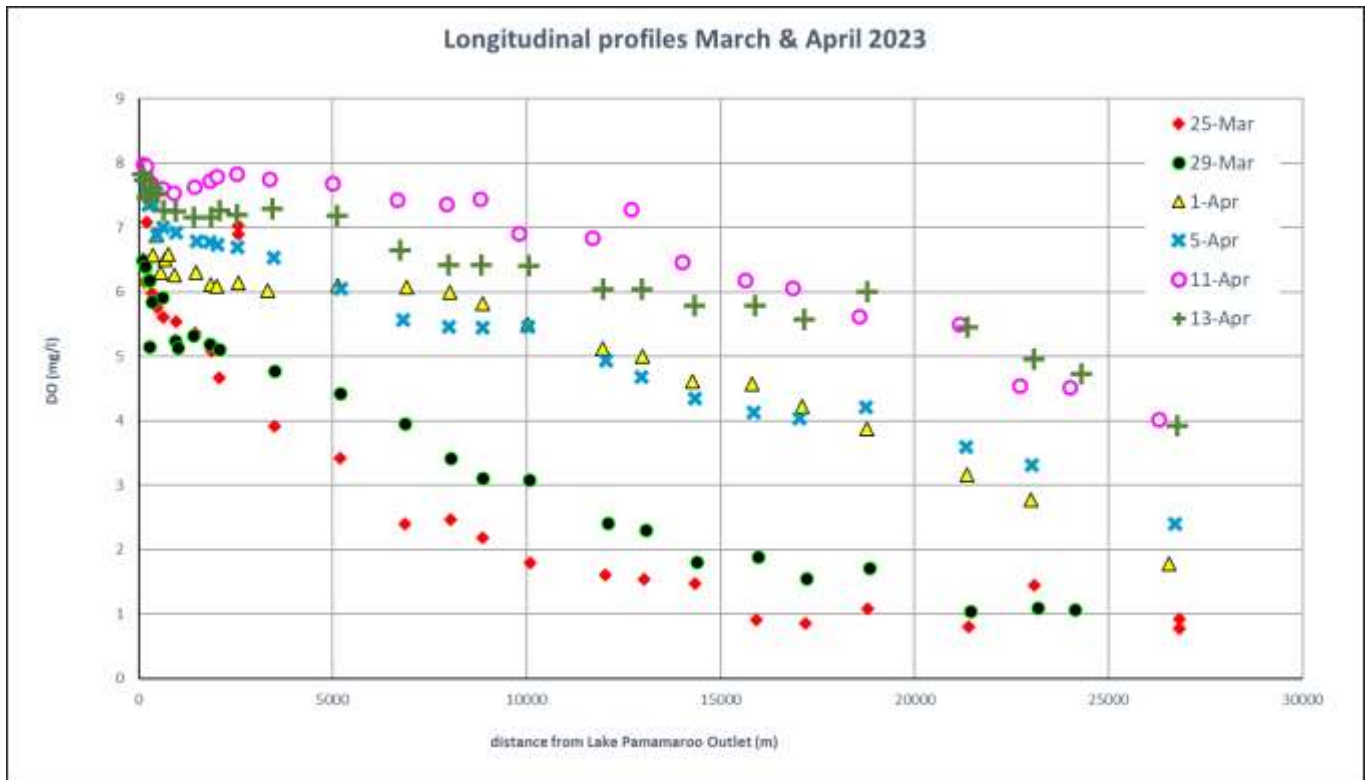


Figure 2: Comparison of dissolved oxygen results (mg/L) from the Lake Pamamaroo outlet to Menindee town

Data from WaterNSW dissolved oxygen sensors at the Menindee pump station, Menindee Town and further downstream at Weir 32, are shown in Figure 3. These sensors are set at various depths so may not always reflect the readings taken at the water surface. They indicate daily fluctuations in dissolved oxygen, with replenishment during the day, but decreasing overnight (mainly due to algal respiration). Dissolved oxygen levels at Weir 32 are above the critical thresholds for fish health, highlighting that the release of oxygenated water from lakes Menindee and Pamamaroo is mixing with and replenishing oxygen levels in the water progressing down the Darling River from Menindee.

NSW and Commonwealth agencies will continue to work together and monitor dissolved oxygen levels in this area and advise the best operational measures to mitigate risks to aquatic life as much as possible. This can involve adjusting the timing, size and location of releases from the Lakes into the lower Darling River to maintain the quality of the water in the river.

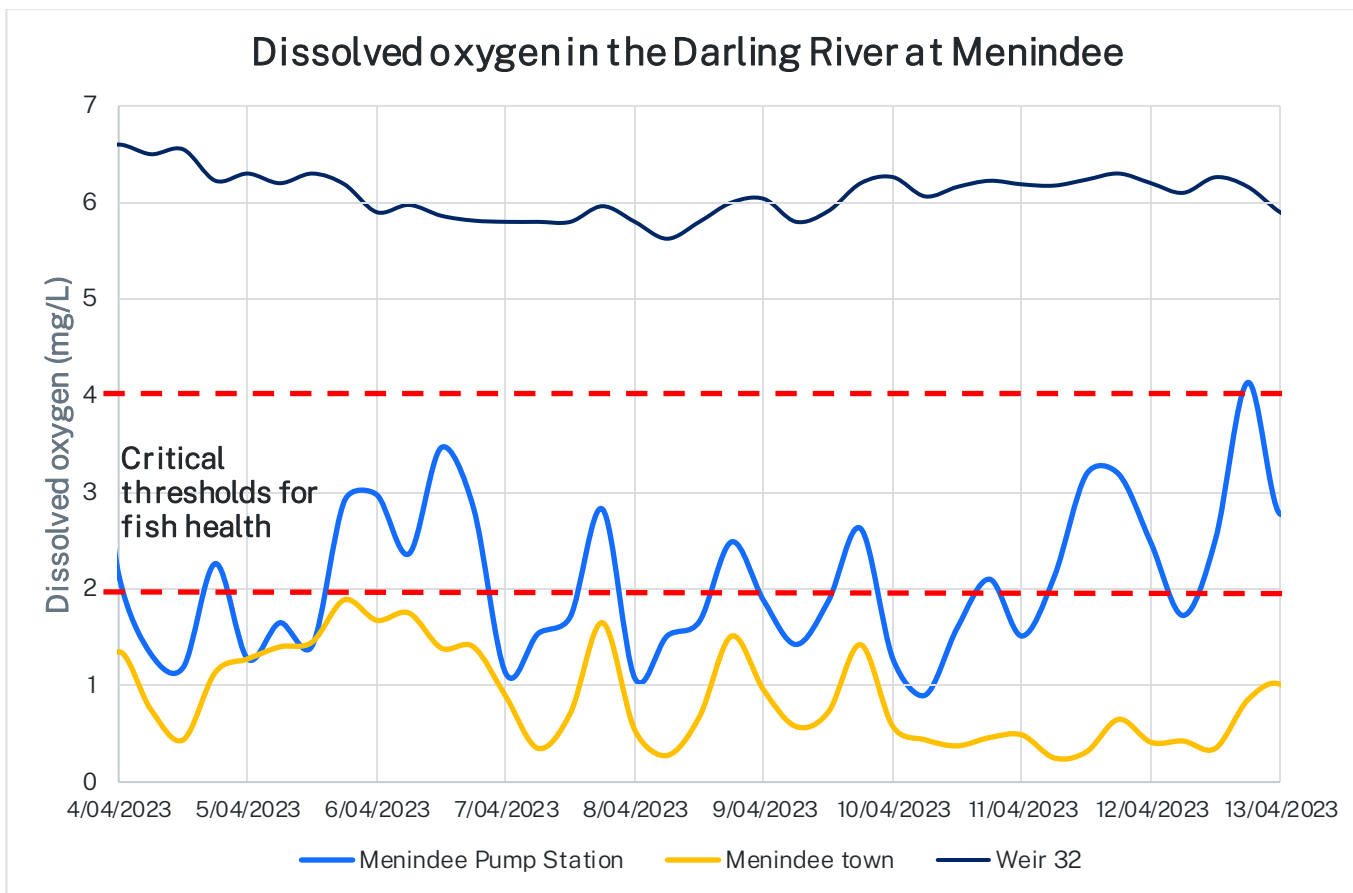


Figure 3: Dissolved oxygen (mg/L) in the Darling River at Menindee: Menindee pump station, Menindee town and Weir 32 – 4 April to 13 April 2023

Dissolved oxygen levels – lower Darling River

Downstream of the Menindee Lakes, dissolved oxygen levels in the Darling River have also been low for several weeks following the recession of floodwaters. Poor quality water from the Menindee town weir pool at the time of the mass fish deaths (mid-March) is progressing downstream, further reducing oxygen levels. The progression of this front of poor quality water resulted in additional deaths of fish along the Darling River downstream of the Menindee Lakes, including thousands of Bony Herring and hundreds of large-bodied native fish, including Golden Perch, Silver Perch and Murray Cod. This front reached Pooncarie on 26 March with reports of fish struggling and dying near town and at the Pooncarie Weir. This front of low dissolved oxygen water has progressed downstream past Burtundy Weir. Further fish deaths are possible in the Darling River from Pooncarie through to Wentworth in coming weeks.

Table 1 shows recent dissolved oxygen data in the lower Darling River from Moorara (upstream of Pooncarie) down to Tapio in the Wentworth weir pool. Critical readings below 2 mg/L have been highlighted in red. Figure 4 shows dissolved oxygen results for the Darling River at Burtundy over the last 8 days. Dissolved oxygen levels have been slowly increasing at this site.

Table 1: Dissolved oxygen (mg/L) readings in the lower Darling River

Monitoring site	27/3/23	28/3/23	29/3/23	30/3/23	31/3/23	1/4/23	2/4/23	3/4/23	4/4/23	6/4/23	13/04/23
Darling River at Moorara	0.54	0.99			1.33	1.38	1.71				
Darling River at Pooncarie	0.76	0.76	1.03	1.66	1.75	1.77	2.18	2.56		2.72	3.93
Darling River at Lethero	1.36			1.82	2.07	1.95	2.14	2.53			
Darling River at Ellerslie	3.63		3.37	2.75	3.08	3.15	3.42		5.44		
Darling River at Tapio			3.88	4.04	3.48	3.70	4.27		5.51		

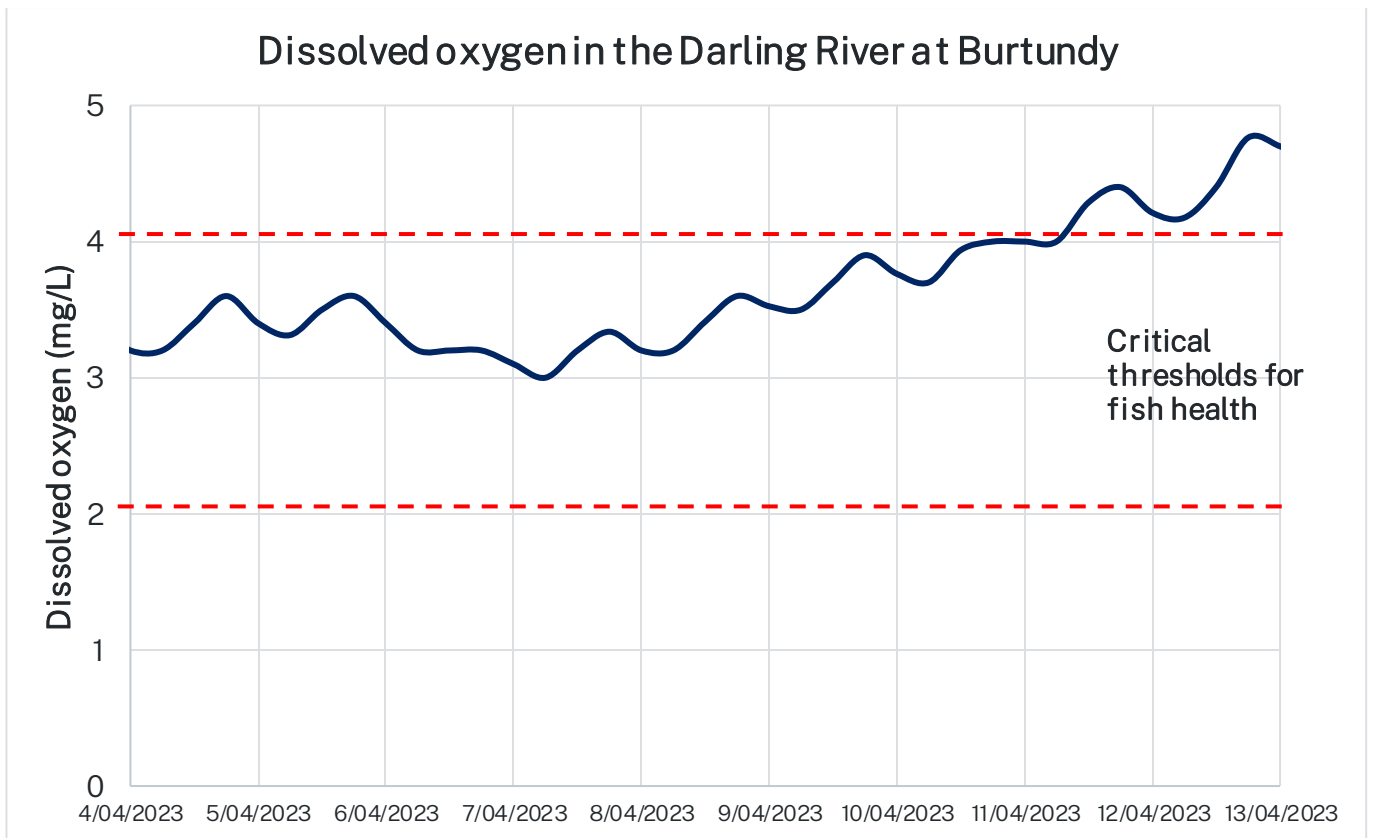


Figure 4: Dissolved oxygen (mg/L) in the Darling River at Burtundy – 4 April to 13 April 2023

Hypoxic blackwater fish death summary

On 16 and 17 March there were mass fish deaths in the reach of the Darling River between Lake Wetherell main weir and Menindee town as a result of hypoxia (low dissolved oxygen). Hot

temperatures coupled with high biomass of fish and organic matter in the water exacerbated the existing low oxygen conditions in this area. The dead species were predominantly Bony Herring, with large-bodied natives (Murray Cod and Golden Perch) also observed in this event. On 28 March additional fish deaths in the Darling River between Menindee town and Menindee Creek were reported, with tens to hundreds of dead Golden Perch and Silver Perch observed.

On 28 March there was a report of fish struggling and dying in the Darling River at Pooncarie. Dead fish were also observed floating downstream at Burtundy, with species including Bony Herring and Murray Cod. On Tuesday 4 April and subsequent days, dead fish continued to be observed floating downstream past Pooncarie and Burtundy, with species including Bony Herring and Murray Cod.

Although dissolved oxygen levels have been improving, there have been reports of tens to hundreds of Bony Herring and small numbers of Carp dying in the reach below Lake Wetherell toward the town of Menindee from Thursday 6 April and up to Wednesday 12 April. Many of the Bony Herring and Carp that boomed during the recent floods are now likely in poor condition as a result increased competition between the high numbers of fish for the food resources available in a limited area. The poor condition of Bony Herring will likely be exacerbated by cooler temperatures. There remains a significant risk of further fish deaths as temperatures cool and flow rates recede.

What is being done?

Emergency releases of well oxygenated water are being made from the Menindee Lakes to maintain flow between Pamamaroo outlet and Weir 32, with the aim of reducing the risk of further fish deaths. This water is being debited from environmental water accounts. The discharge will attempt to maintain flow velocity that research has shown provides conditions that are less favourable for harmful algal bloom formation. Ongoing monitoring will identify if the operations achieve the desired results and be used to inform future operational decisions.

There are no other operational measures available to reduce the current risk of further fish deaths in the lower Darling River downstream of the Menindee Lakes. Oxygenated water is being released from Lake Menindee, but this will take some weeks to pass along the system. Cooler ambient temperatures forecast for the area will assist in dissolved oxygen levels.

Programs to benefit native fish, such as improving fish passage and habitat restoration to provide conditions conducive to fish breeding and population growth, are ongoing. These works are vital and provide an environment where fish populations can bounce back from low oxygen events.

Blue-green algae

WaterNSW undertake routine blue green algae monitoring in Menindee Lakes and the Darling River. Alert warnings are declared where algal cell numbers exceed the triggers identified in the Guidelines for Managing Risk in Recreational Waters (NHMRC 2008). The most recent results indicate algal numbers are in the amber alert range for recreational use at numerous sites ([Algae Alerts NSW map - WaterNSW](#)).

At amber alert warning levels, blue-green algae may be multiplying in numbers. The water may have a green tinge and musty or organic odour. The water should be considered as unsuitable for potable use and alternative supplies or prior treatment of raw water for domestic purposes should be

considered. The water may also be unsuitable for stock watering. The water remains suitable for recreational use, however algal concentrations can change rapidly. Water users should use caution and avoid water where signs of blue-green algae are present.

Weather outlook

Refer to the [Bureau of Meteorology website](#) for the latest forecasts.

Additional information

To notify the NSW Department of Planning and Environment – Water of potential blackwater events email: waterqualitydata@dpie.nsw.gov.au

To report dead fish, fish struggling or gasping at the water surface, or crayfish leaving the water please call the NSW DPI Fisheries Phoneline 1800 043 536 or fill in a fish kill protocol and report form at: www.dpi.nsw.gov.au/fishing/habitat/threats/fish-kills-2019-2020/info-sheet

Information on recent fish deaths is available at: [Fish kills in NSW](#). When reporting, please include the name of the river/waterbody, location and date of your observation. If possible, please also record what species are affected and an estimate of number of each species observed.

Further information on blackwater events can be found at the DPE Water website at: www.industry.nsw.gov.au/water/allocations-availability/droughts-floods/drought-update/managing-drought-recovery/blackwater

Additional information is also available on the Murray-Darling Basin Authority website at: www.mdba.gov.au/publications/mdba-reports/water-management-101-factsheets

Operational and algae updates are available at: [WaterInsights - WaterNSW](#)

Flood updates can be found on the Environment Protection Authority web page at: www.epa.nsw.gov.au/news/news/2022/nsw-storm-and-flood-updates-2022

To report suspected algal blooms see the [WaterNSW website](#).