

Murray-Darling Basin – water quality and dissolved oxygen results

Multiple agencies are undertaking water quality monitoring to review dissolved oxygen conditions across NSW and identify potential risks to ecological communities. This update provides an assessment of information collected up to 20 December 2022.

Low rainfall figures for December have provided an opportunity for saturated catchments to start drying out and flooding to subside in many inland catchments. The Bureau of Meteorology has major flood warnings remaining for the Lachlan River at Euabalong and Hillston, Murrumbidgee River at Balranald, Murray River at Wentworth and Darling River at Louth, Tilpa and Wilcannia. As floodwaters continue downstream into South Australia, flood emergency warnings have been issued for Renmark, Walker Flat and Kingston.

Falling river levels will allow water that has been sitting out on the floodplain to drain back into the main river channels. While this water has been sitting on the floodplain, bacteria have been breaking down organic material such as sticks, leaves, bark, grass and crop residue that has been inundated by the floodwater. The breakdown of this organic material uses up the oxygen in the water and releases tannins which can turn the water black in colour. When this low oxygen water returns back into the main river channel it can impact on fish health. These are often referred to as hypoxic (low oxygen) blackwater events. As high flows recede, fish may also be stranded in disconnecting waterbodies and may suffer from exposure to declines in water quality and dissolved oxygen, higher temperatures and predators as water depth decreases.

The Murray, Wakool and Kolety/Edward rivers are continuing to experience low dissolved oxygen. In addition to these critical areas, dissolved oxygen levels in the Darling River at Wilcannia, the lower Murrumbidgee River and Merran, Barbers and Thule creeks could be detrimental to fish health.

There have been reports of fish deaths, fish struggling at the surface or edges, and Murray Crayfish and shrimp exiting the water in the Murray-Darling Basin over recent months, including the Murray, Kolety/Edward and Wakool Rivers, lower Gwydir River and Merran and Yanco-Billabong Creek systems.

To report dead fish, fish struggling or gasping at the water surface, or crayfish exiting the water, please call the New South Wales 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

Where are the main areas of concern?

There are four main areas of concern where dissolved oxygen is at levels that could be detrimental to fish health. These are:

- Murray River from Tocumwal downstream to the NSW/South Australian border
- Wakool River, including tributaries such as Merran, Little Merran, Thule and Barbers Creeks
- Koley/Edward River
- Darling River at Wilcannia

The Bureau of Meteorology has forecast air temperatures will increase in these critical areas until a cold front brings showers and cooler temperatures on Thursday and Friday this week. As air temperature increases, so does the water temperature. The process of bacteria breaking down organic material speeds up as water temperature increases, which uses up the oxygen in the water even faster. The cooler temperatures later in the week will provide another opportunity for dissolved oxygen levels to recover again before warmer weather returns over the weekend.

Dissolved oxygen levels – Murray River catchment

Flood warnings for the Murray River at Barham, the Murray-Wakool River Junction, Boundary Bend (Murray-Murrumbidgee River junction) Euston and Mildura have eased to the moderate level. Major flooding is continuing at Wentworth and the prolonged flood peak could persist through until January 2023. Flood emergency warnings have been issued for Renmark, Walker Flat and Kingston in South Australia.

In the Murray River at Tocumwal, dissolved oxygen is at levels that are safe for fish health. Further downstream at Barham, Pental Island and Boundary Bend (Murray-Murrumbidgee River junction) dissolved oxygen levels have been less than 2 mg/L for some time but have improved above this level in response to the cooler temperatures (Figure 1). Fish may still be seen gasping at the water surface when dissolved oxygen falls to this low level. Fish and other aquatic animals have difficulty surviving under low oxygen conditions. The critical minimum level for dissolved oxygen varies between fish species, their size and physical condition. The larger the fish the more oxygen they require. 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.

Downstream of Robinvale, the monitoring site on the Murray River at Wemen is showing oxygen levels have increased above 4 mg/L. Oxygen levels have also improved further downstream at Wentworth.

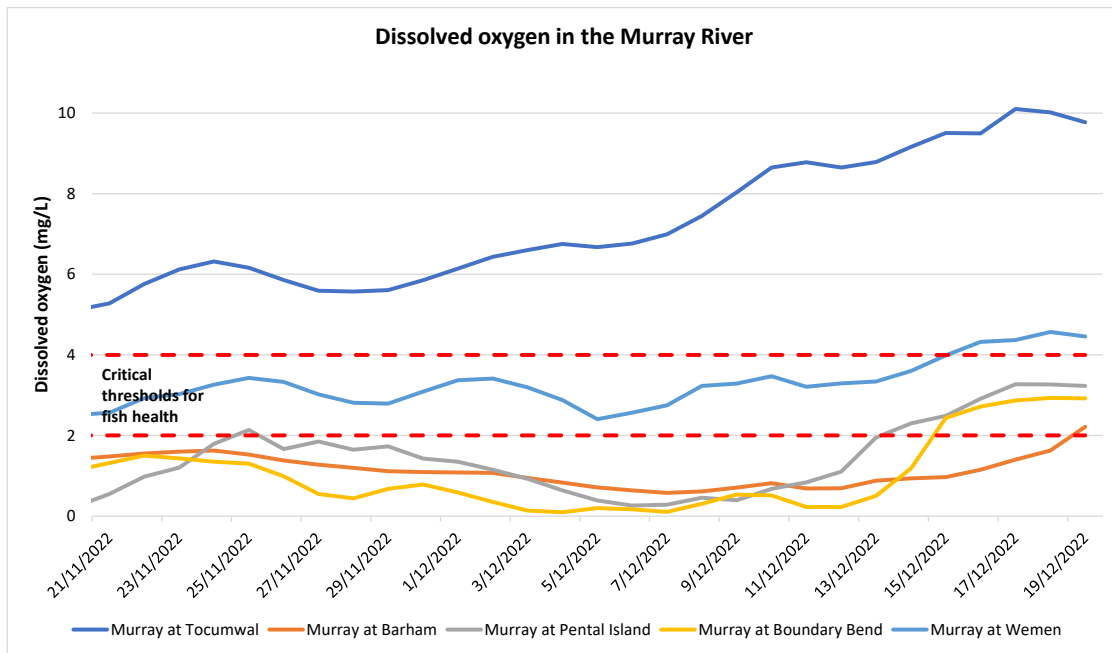


Figure 1: Mean daily dissolved oxygen (mg/L) in the Murray River at Tocumwal, Barham, Pental Island, Boundary Bend and Wemen from 21 November to 19 December 2022

Dissolved oxygen levels – Wakool River

The dissolved oxygen levels in the Wakool River are remaining at critical levels for fish health but have been improving in response to the cooler weather over previous weeks (Figure 2). Dissolved oxygen levels at both monitoring sites remain between 2 and 4 mg/L but have decreased slightly over the last two days. Waterways that feed into the Wakool River such as Merran, Little Merran, Thule and Barbers Creeks also have low dissolved oxygen. Dissolved oxygen levels in the Niemur River remain more oxygenated than the sites in the Wakool River.

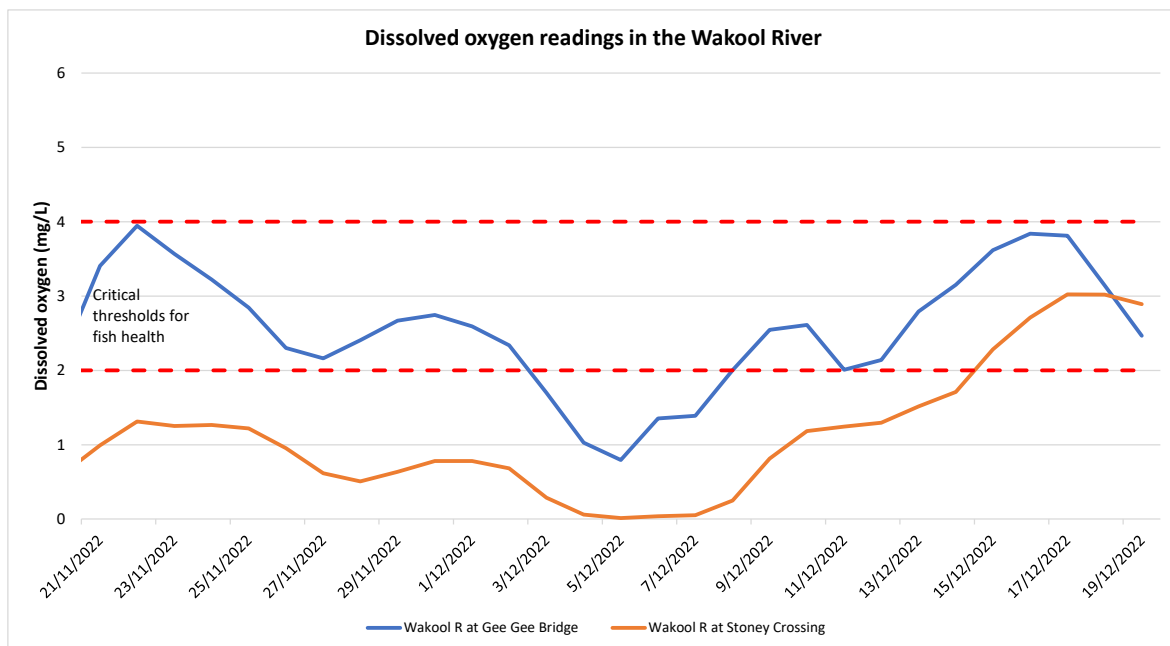


Figure 2: Mean daily dissolved oxygen (mg/L) in the Wakool River at Gee Gee Bridge and Stoney Crossing from 21 November to 19 December 2022

Dissolved oxygen levels – Kolety/Edward River

River levels in the Kolety/Edward River have fallen to the moderate flood warning level at Stevens Weir and Moulamein. Moderate flooding at Moulamein could persist until the end of December.

Dissolved oxygen measured at the three automated gauged monitoring sites in the Kolety/Edward River have improved above 2 mg/L. As hypoxic blackwater events and fish deaths have occurred in this river system in the past, agencies will continue to monitor the situation. Floodwater from Billabong Creek is continuing to contribute low dissolved oxygen water to the Kolety/Edward River at Moulamein.

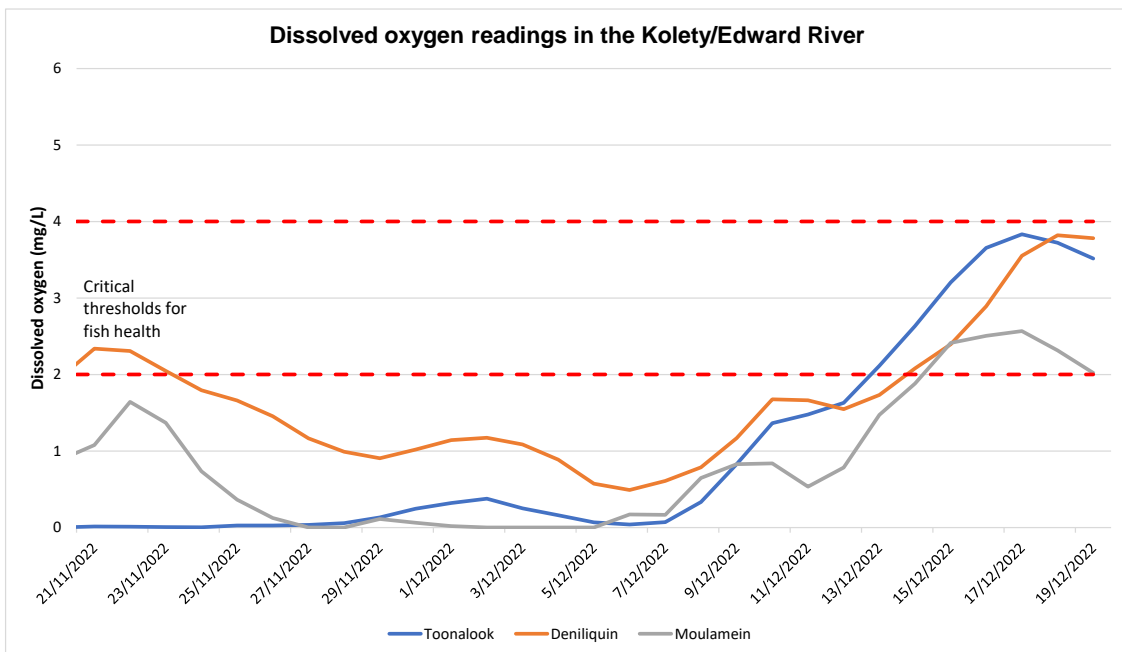


Figure 3: Mean daily dissolved oxygen (mg/L) in the Kolety/Edward River at Toonalook, Deniliquin and Moulamein from 21 November to 19 December 2022

Dissolved oxygen levels – Darling River

Major flooding in the Darling River continues at Louth, Tilpa and Wilcannia. The Bureau of Meteorology have predicted river levels at Wilcannia will peak from 22 to 27 December and remain at the major flood level into 2023. Figure 4 is a satellite-derived Sentinel colour infrared image showing the progression of the turbid flood water (blue colour) from Tilpa towards Wilcannia.

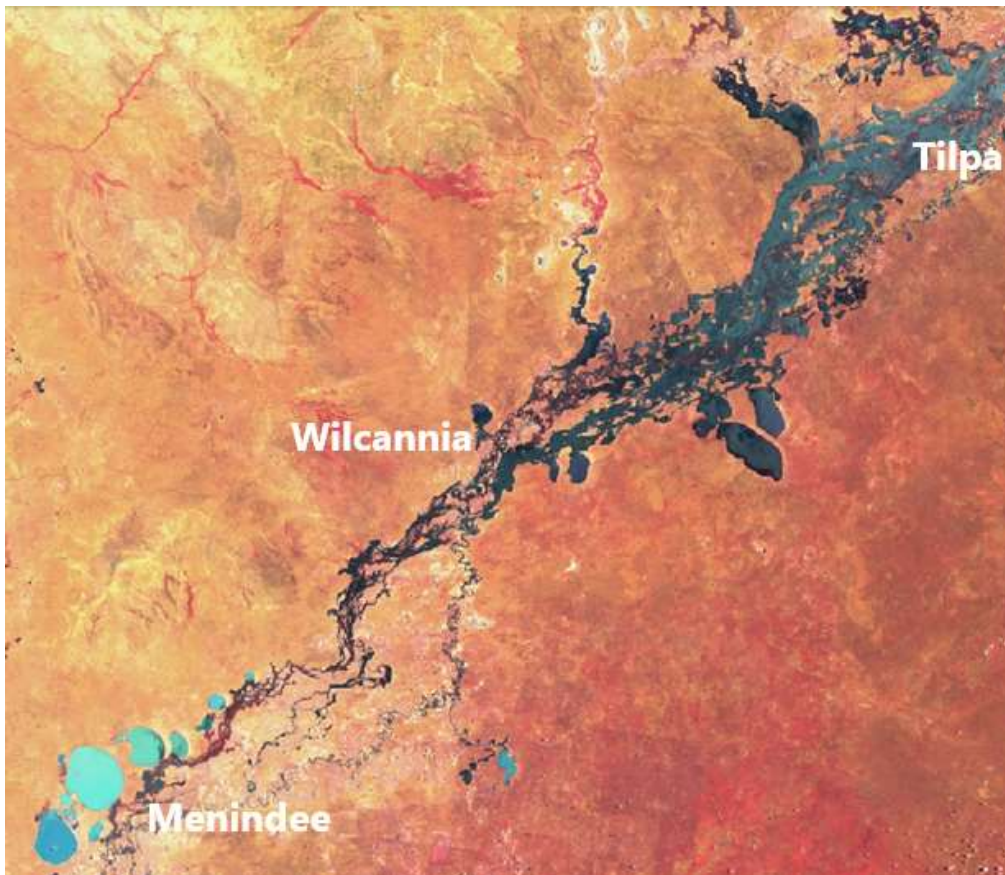


Figure 4: Satellite-derived Sentinel colour infrared image of the Darling River – 16 December 2022

Dissolved oxygen in the Darling River at Wilcannia had been improving toward 4 mg/L in response to cooler air and water temperatures but has decreased slightly again. Oxygen levels in the upper reaches of Lake Wetherell and the Darling River downstream of Menindee Lakes are remaining in the safe range for fish health.

Figure 5 highlights the darker coloured flood water from Lake Wetherell is pushing into Lakes Tandure and Pamamaroo where it is mixing with the turbid water held in the lakes. As well as the mixing of low oxygen floodwater with the more oxygenated water in the lakes, these large shallow lakes allow the water to be more quickly aerated and provide refuge areas for smaller fish and crustaceans to move into if dissolved oxygen conditions deteriorate in Lake Wetherell.

NSW and Commonwealth agencies will continue to assess the risks as floodwaters make their way past Wilcannia and into Menindee Lakes and to monitor dissolved oxygen levels as air temperatures increase over summer.

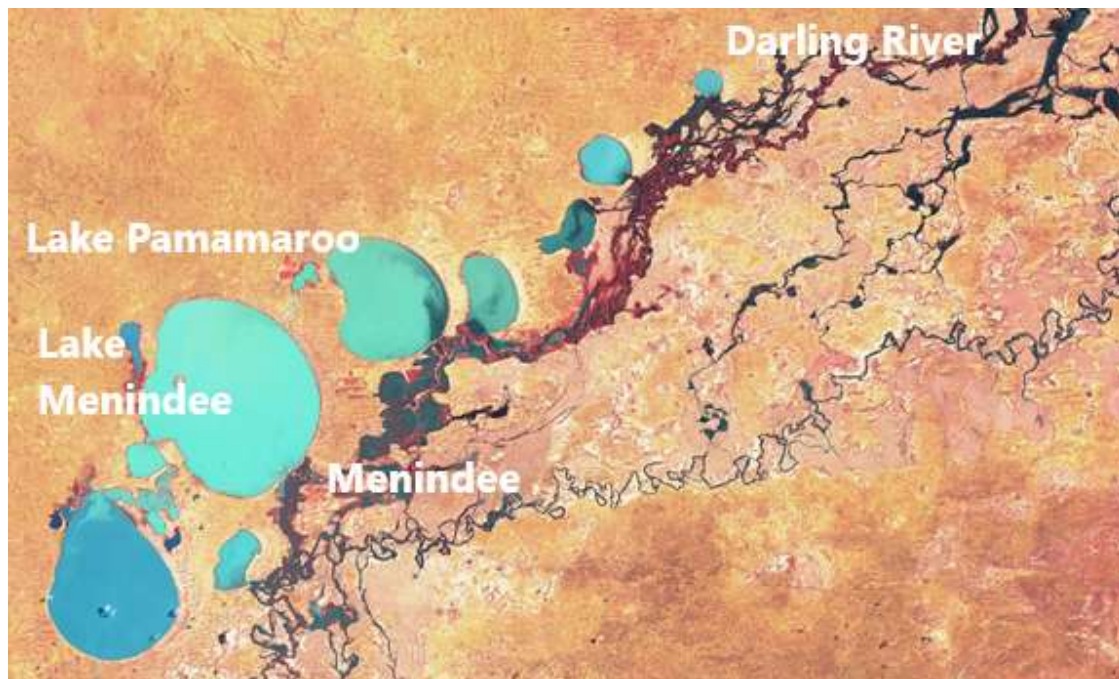


Figure 5: Satellite-derived Sentinel colour infrared image of Menindee Lakes – 16 December 2022

Hypoxic blackwater fish death summary

In recent months NSW DPI Fisheries has received reports of fish deaths, fish struggling and crustaceans leaving the water across a broad area in the Murray-Darling Basin, including in the Murray, Kolety/Edward, Wakool, Murrumbidgee and Gwydir rivers and Yanco-Billabong Creek system. Warmer temperatures over summer will increase the risk of further reductions in dissolved oxygen in some areas and the potential for further fish death events.

There have been two new confirmed fish death events related to hypoxic blackwater reported in the last week up to 20 December. On 19 December 2022 in the Bogan River downstream of Nyngan Dam weir, the introduced species Carp, Goldfish, and Mosquito Fish (*Gambusia*) have been affected, likely by poor water quality, with up to a thousand or more fish killed. Yabbies were also observed leaving the water. Also on 19 December, at the Barwon-Darling floodplain near Bourke, up to a thousand or more Spangled Perch and Carp have died. NSW agencies are working together to investigate and determine if any other native fish have been affected.

There may be other fish death incidents that have not yet been reported directly to NSW Department of Primary Industries Fisheries.

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 hypoxic blackwater events.

What is being done?

The Bureau of Meteorology has forecast air temperatures will increase before a cold front brings showers and cooler temperatures to NSW later in the week. The cooler temperatures will provide another opportunity for dissolved oxygen levels to recover slightly before warmer weather returns

on the weekend. The forecast is that rainfall figures for January through to March will be similar to historic averages. There is always the possibility of isolated summer thunderstorms, but a lower chance of above average rainfall reduces the risk of further major flooding.

The Commonwealth Environmental Water Office (CEWO), in collaboration with the NSW DPE Environment and Heritage Group, Murray Irrigation, and the CEWOs community reference group, are continuing to divert small volumes of environmental water to the Wakool, Kolety/Edward and Niemur rivers and Thule, Murrain-Yarrein and Cockrans and Jimaringle creeks, to provide a refuge from declining water quality. Monitoring of water quality and fish responses to refuge flows from the Edward River Escape and Niemur Escape is being undertaken by scientists from Charles Sturt University. You can find out more about the Commonwealth's current environmental water releases in the mid-Murray at: [Latest water use - Mid-Murray - DCCEEW](#)

With the sheer volume of floodwater that has flowed across floodplains in all catchments in the Murray Darling Basin, complete mitigation of hypoxic blackwater by intervention measures is not possible. The use of aerators to try and increase oxygen levels in critical areas is not feasible due to the volume of water in the rivers. Over time, as the organic material is broken down, dissolved oxygen will return back to normal levels.

Hypoxic (low oxygen) blackwater events are a natural occurrence in Australian River systems. The risk and severity of these events is increased in regulated systems where the frequency of overbank flows has been reduced. NSW and Commonwealth agencies will continue to assess the risks of poor water quality and to monitor dissolved oxygen levels to identify areas that may require further action. Updates are being provided to the media and posted on agency web pages to ensure the community is informed of high-risk areas.

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 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