

# 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 29 November 2022.

Heavy rainfall on the saturated catchment areas of inland New South Wales has eased over the past few weeks, but major flooding continues in parts of the Lachlan, Murrumbidgee, Murray and Barwon-Darling River systems. The extent of the flooding means that some floodplain areas in these catchments are being inundated for the first time in decades. Figure 1 highlights how much bigger these floods in the Murrumbidgee, Kolety/Edward, Wakool and Murray Rivers are than any experienced since 2000. The flooding of large areas is washing organic material such as sticks, leaves, bark, grass and crop residue into the river system. The breakdown of this organic material by bacteria uses up the oxygen in the water and can release tannins, turning the water black in colour. This is often called a hypoxic (low oxygen) blackwater event.

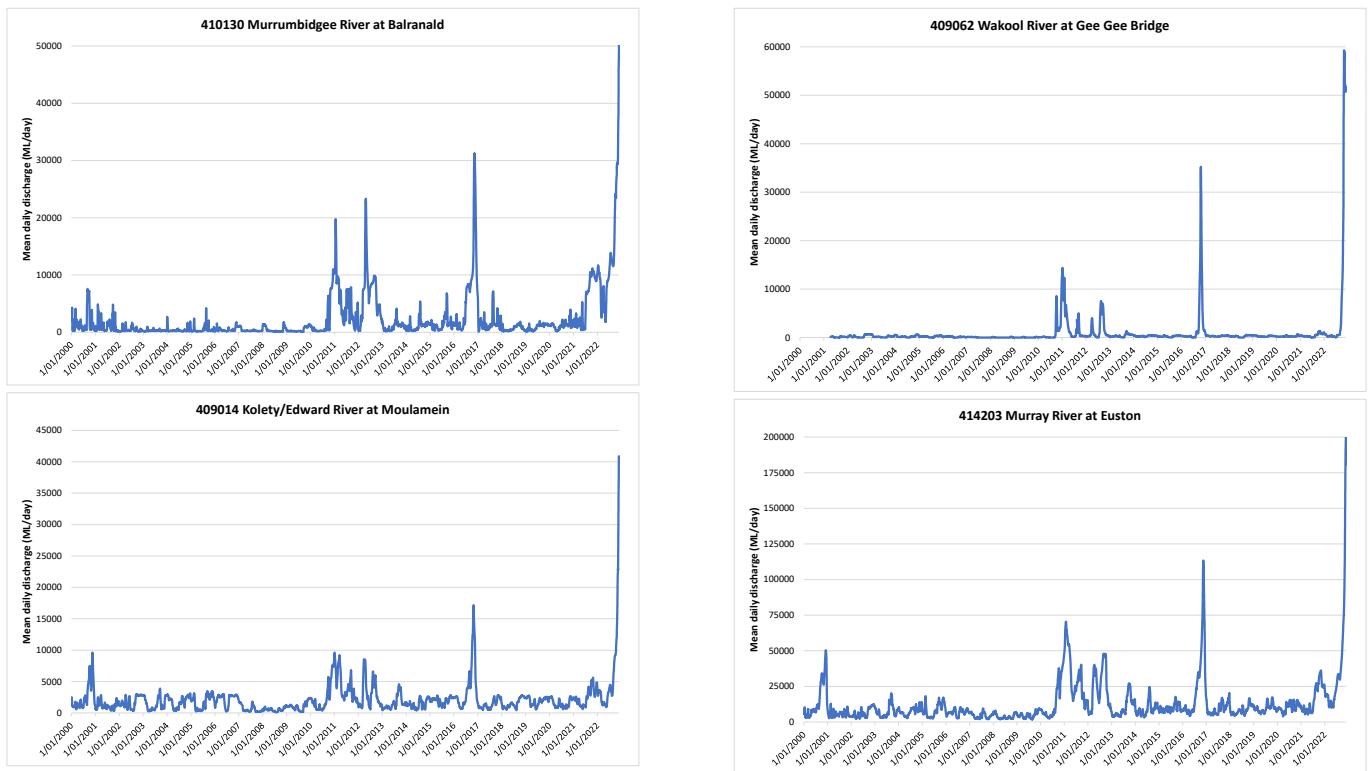


Figure 1: Mean daily discharge (ML/day) at selected flow gauging stations in the Murrumbidgee, Kolety/Edward, Wakool and Murray Rivers from 2000 to 2022

The Bureau of Meteorology has forecast air temperatures at Deniliquin and Echuca will increase up to 35°C on Sunday 4 December and 37°C in Mildura. 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. With warmer air and water temperatures, the possibility of hypoxic blackwater events increases and, unfortunately, so too the risk that fish deaths, like those experienced during the 2011 and 2016 floods, could occur.

Since late October there have been reports of fish deaths, fish struggling or dying, and Murray Crayfish exiting the water in a number of areas in the southern Murray-Darling Basin, including in the Murray and Kolety/Edward rivers, and Merran and Yanco-Billabong Creek systems. In the past week there has been one new confirmed report of a fish death event at the junction of the Darling and the Murray rivers at Wentworth. Two Murray Cod and two Carp were observed on the Darling side of the junction however these may have drifted from the Murray where dissolved oxygen was lower than in the Darling. The fish appeared to have been dead for several days prior to being observed.

Forecast warmer temperatures for the coming week will increase the risk of further reductions in dissolved oxygen in some areas and the potential for further fish death events.

To report dead fish, fish struggling or starting to gasp at the water surface, or crayfish exiting the water please call the New South Wales Department of Primary Industries Fisheries, Fishers Watch 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](http://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 critical levels for fish health. These are:

- Murray River from Tocumwal downstream to the NSW-South Australian border
- Wakool River
- Kolety/Edward River
- Barwon River between Walgett and Brewarrina.

In addition to these critical areas, there is low dissolved oxygen in the lower Murrumbidgee River and Billabong, Merran, Barbers and Thule creeks which could impact fish health.

## Dissolved oxygen levels – Murray River catchment

Flooding in the Murray River continues with major flood warnings for Barham, Wakool Junction, Boundary Bend and Wentworth. Figure 2 is a false colour Landsat satellite image of the Murray River from 25 November. The dark coloured areas are floodwater. The image highlights where floodwaters from the Wakool and Murrumbidgee Rivers are trying to push into the high flows in the Murray River. Fish deaths have previously been confirmed in the Swan Hill, Moulamein and Murray-Wakool River junction areas.

Floodwaters are also spreading out onto the floodplain and into billabongs and anabranches along the Murray River.

The regulation of flows in the Murray River via dams, weirs and locks reduces the frequency of flooding in the lower Murray catchment in return for better security for town water supply and the diversion of water for agriculture. The retention of peak winter/spring flows and low to medium floods in Lake Hume for later water delivery reduces the frequency of floodwater breaking the banks and flowing onto the floodplain.

Reduced flooding allows organic material such as leaves, bark, sticks and grass to build up on the floodplain. The extent of flooding being experienced now has not been seen in the Murray catchment for decades. The inundation of both forested and agricultural floodplains is mobilising large stores of organic material, resulting in low dissolved oxygen in the Murray River. Dissolved oxygen levels at Barham, Boundary Bend (Murray-Murrumbidgee River junction) and at Wentworth are all less than 2 mg/L. Fish may 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.

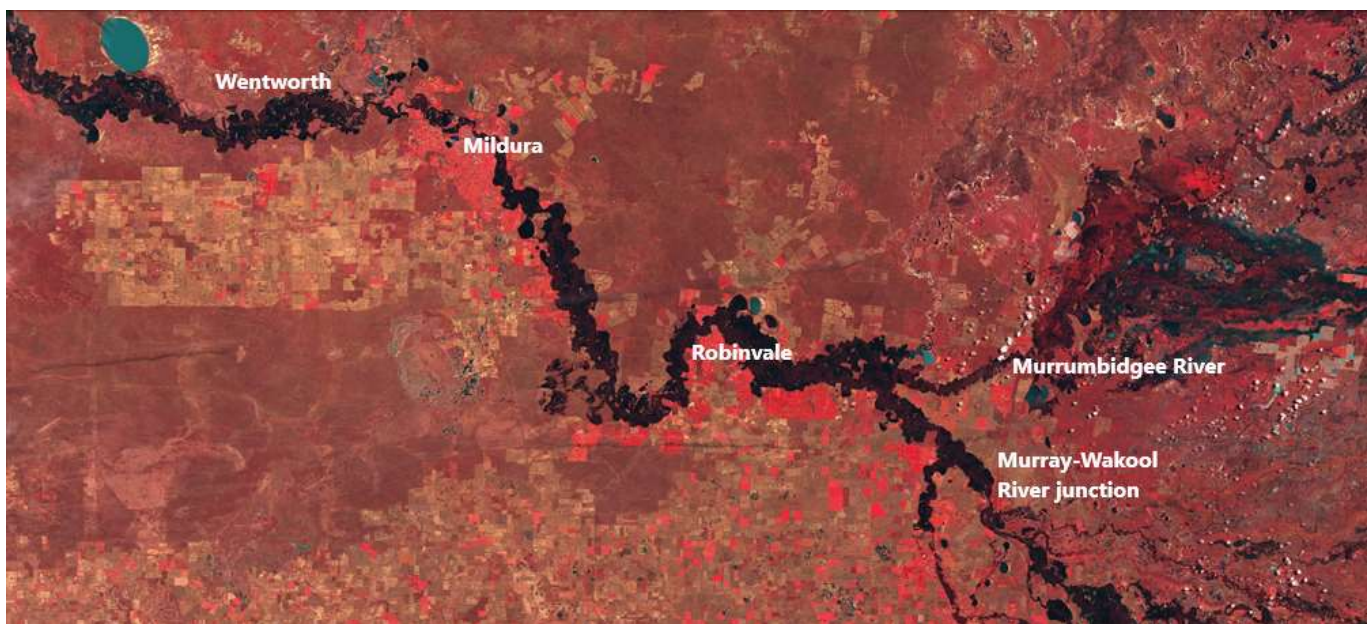


Figure 2: False colour Landsat satellite image of the lower Murray River valley – 25 November 2022

## Dissolved oxygen levels – Wakool River

The dissolved oxygen levels in the Wakool River had dropped to critical levels for fish health during a week of warm weather in early November (Figure 3). This was followed by cooler air temperatures which allowed oxygen levels to improve. There has been a small improvement in the Wakool River at Stoney Crossing but dissolved oxygen levels remain less than 2 mg/L. Dissolved oxygen levels in the Niemur River are faring much better than the Wakool River and are in the safe range for fish health.

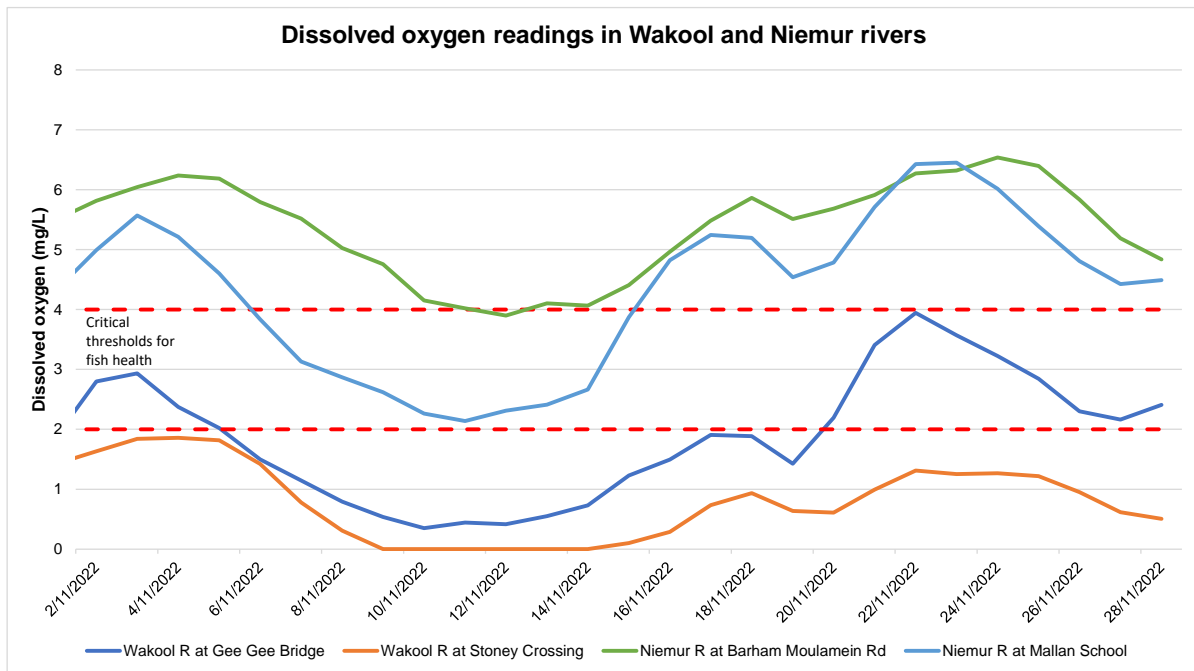


Figure 3: Dissolved oxygen (mg/L) in the Wakool and Niemur Rivers

### Dissolved oxygen levels – Kolety/Edward River

Dissolved oxygen in the Kolety/Edward River at Deniliquin is remaining less than 1 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 contributing to low dissolved oxygen in the Kolety/Edward River at Moulamein.

### Dissolved oxygen levels – Barwon River

Flooding in the Darling River at Bourke reached a peaked of almost 205,000 ML/day on 23 November. Major flooding continues at Brewarrina, Bourke, Louth and Tilpa with river levels predicted to reach the major flood level in Wilcannia this week. A satellite-derived Sentinel colour infrared image shows the inundation of large areas in the Barwon and Darling River floodplain (Figure 4). It also highlights the floodwaters approaching Wilcannia.

Flooding in the Northern Murray Darling Basin catchments resulted in dissolved oxygen levels from Walgett to Brewarrina to drop to critical levels for fish health. There have not been any reports of fish deaths or of fish gasping at the water surface in the Barwon River.

Oxygen levels downstream in the Darling River at Bourke and Wilcannia have declined but not to the same extent as the upstream sites. NSW and Commonwealth agencies will continue to assess the risks of poor water quality and to monitor dissolved oxygen levels as air temperatures increase over the coming months.

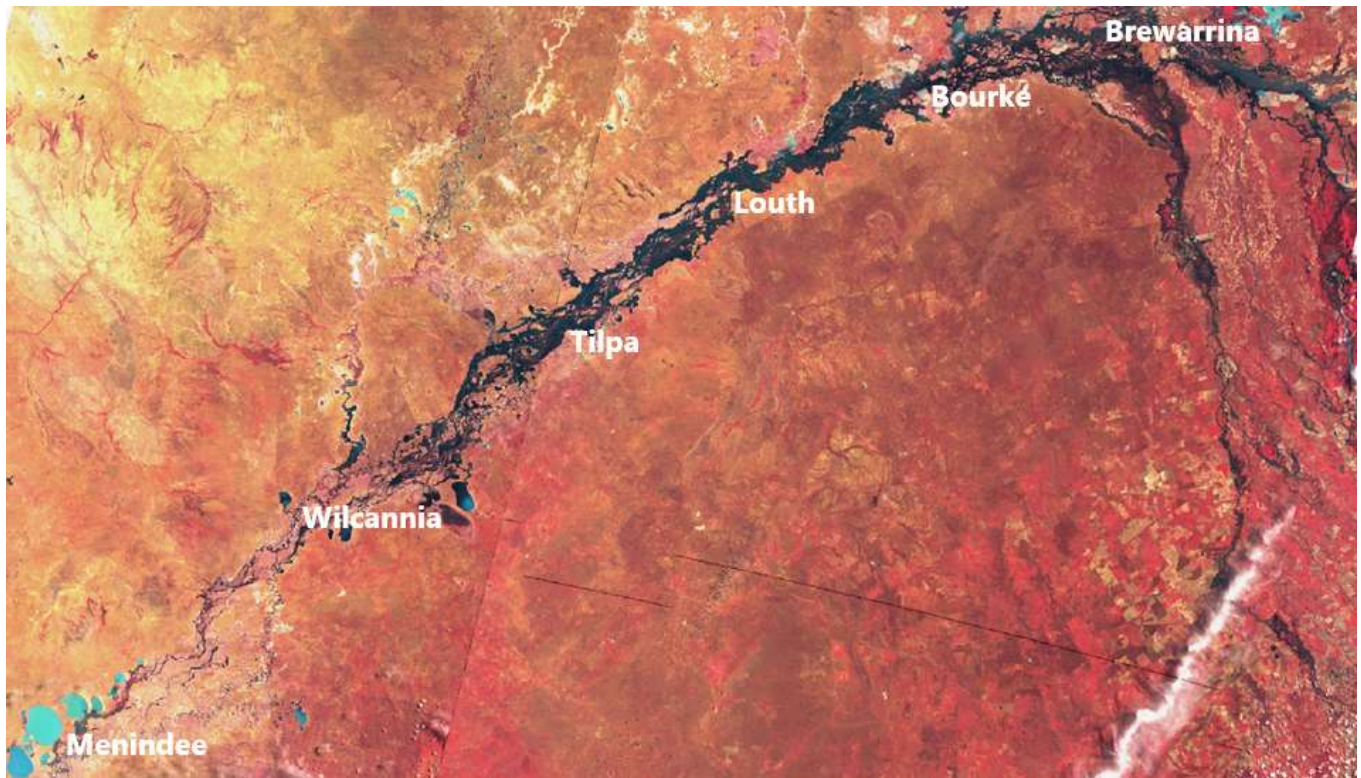


Figure 4: Satellite-derived Sentinel colour infrared image of the Barwon and Darling Rivers - 26 November 2022

## Hypoxic blackwater fish death summary

Since late October NSW DPI Fisheries has received reports of fish deaths, fish struggling and crustaceans leaving the water across a broad area in the southern Murray-Darling Basin, including in the Murray, Edward-Wakool, and Murrumbidgee rivers, and Yanco-Billabong Creek systems. Forecast warmer temperatures for the coming week will increase the risk of further reductions in dissolved oxygen in some areas and of the potential for further fish death events.

Below is a list of confirmed fish deaths in the last week (as of 29 November 2022) that were very likely the result of hypoxic blackwater associated with the current widespread flooding. There may be other fish death incidents that have not yet been reported directly to DPI Fisheries.

- Junction of the Darling and the Murray Rivers at Wentworth (22 Nov 2022). Two Murray Cod and two Carp were observed on the Darling side of the junction however these may have drifted from the Murray where dissolved oxygen was lower than in the Darling. The fish appeared to have been dead for several days prior to being observed. Limited extent.

## What is being done?

The Bureau of Meteorology has forecast air temperatures will increase during the week before the next cool change brings temperatures back down again after the weekend. With warmer air and water temperatures, the possibility hypoxic blackwater events increases and unfortunately, so to the risk that fish deaths could occur.

The magnitude of flooding means that the prevention of a hypoxic blackwater event is not possible and mitigation methods to get more oxygen back into the water are extremely limited. Small,

oxygenated refuge areas for fish can be provided by diverting environmental water to areas of poor water quality. 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 such as these.

The Commonwealth Environmental Water Office are continuing to divert small volumes of environmental water to the Wakool, Kolety/Edward and Niemur rivers and Thule, Murrain-Yarrein and Cockrans-Jimaringal creeks to provide a refuge from declining water quality. You can find out more about the Commonwealth's current environmental water releases in the mid-Murray at: [Latest water use - Mid-Murray - DCCEEW](#)

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 department of potential blackwater events email [waterqualitydata@dpi.nsw.gov.au](mailto:waterqualitydata@dpi.nsw.gov.au)

To report dead fish, fish struggling or starting to gasp at the water surface, or crayfish walking out of the water please call the NSW DPI Fisheries 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](http://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](http://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](http://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](http://www.epa.nsw.gov.au/news/news/2022/nsw-storm-and-flood-updates-2022)