

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 22 November 2022.

Ongoing flooding has led to dissolved oxygen levels decreasing to critical levels for fish health in many rivers across New South Wales. 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.

There have been reports of fish deaths, fish struggling or dying and crustaceans, such as Murray Crayfish, exiting the water in a number of areas in the southern Murray-Darling Basin, including in the Murray, Edward-Wakool Murrumbidgee and Yanco-Billabong Creek systems. Reports are being investigated by DPI Fisheries where possible. Confirmed fish death incidents are listed in this fact sheet. These fish deaths are likely the result of hypoxic (low oxygen) blackwater associated with the current widespread flooding. There may be other fish death incidents that have not yet been reported directly to DPI Fisheries.

To report dead fish, struggling fish or fish that are starting to gasp at the water surface, or crayfish climbing out of the water, please call the NSW DPI 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.

NSW and Commonwealth agencies are continuing to assess the risks of poor water quality and to monitor dissolved oxygen levels to identify areas that may require further action. There have been some small improvements in dissolved oxygen levels following the cooler air temperatures last week.

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 and Merran, Barbers and Thule creeks, which could impact fish health.

Dissolved oxygen levels – mid Murray River catchment

The Murray is a controlled river. The regulation of flows via dams, weirs and locks reduces the frequency of flooding 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. In addition to this, successive droughts since the 2000s has meant that regular flooding of the Murray Valley had been further reduced.

The reduced flooding allows organic material such as leaves, bark, sticks and grass to build up on the floodplain. The extent of flooding being experienced this spring 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 this hypoxic (low oxygen) blackwater event.

Figure 1 is a false colour Landsat satellite image of the mid Murray River catchment taken on 18 November. The dark coloured areas are rivers that are in flood. The image highlights the area being inundated by the Wakool and Niemur rivers and the lower Murrumbidgee floodplain to the north. It also highlights where floodwaters from the Wakool and Murrumbidgee rivers are trying to push into the high flows in the Murray River. Fish deaths have been confirmed in the Swan Hill, Moulamein and Murray-Wakool River junction areas.

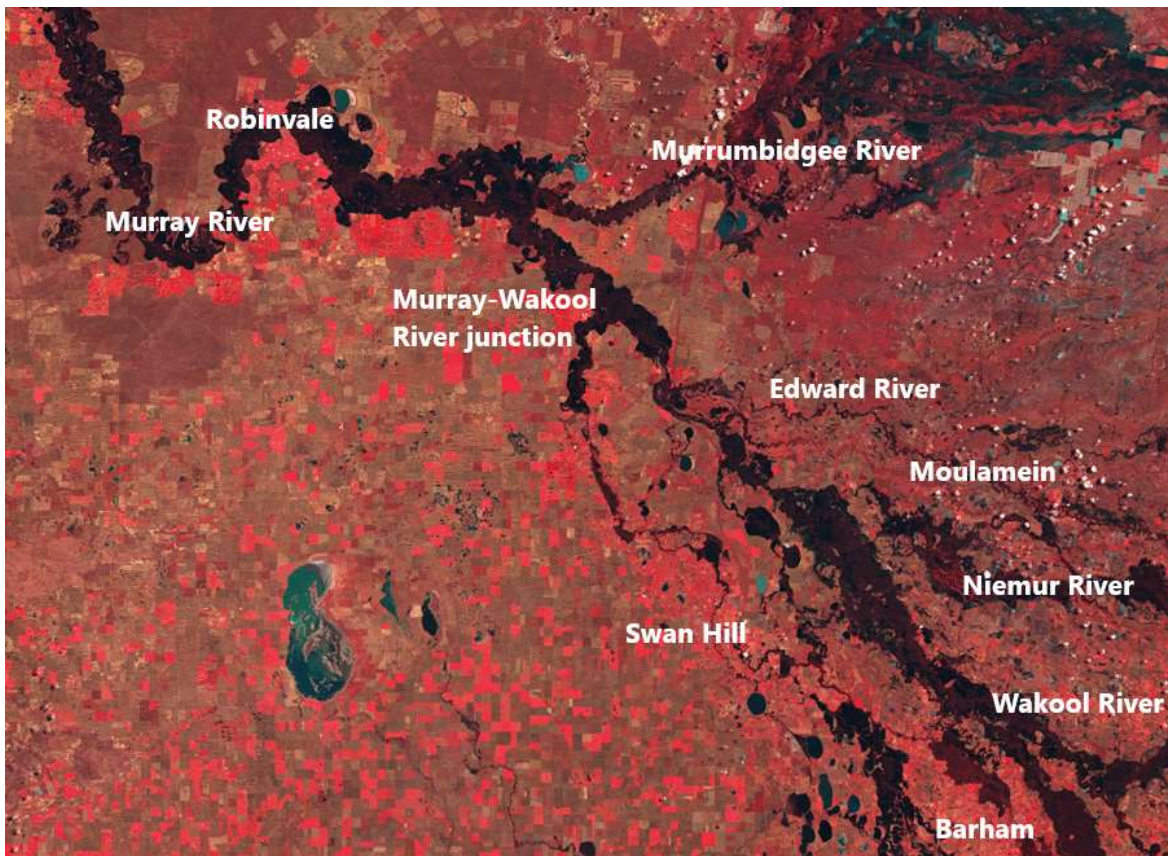


Figure 1: False colour Landsat satellite image of the mid Murray River valley – 18 November 2022

Water with low dissolved oxygen is currently flowing down the Merran, Little Merran, Thule and Barber creeks and Edward River. These rivers all feed into the Wakool River. The dissolved oxygen levels in all these waterways have declined below safe levels for fish health.

Dissolved oxygen levels in the Niemur River are faring much better than the Edward River and are currently remaining in the safe range for fish health. The good dissolved oxygen readings suggests that water from the Edward River is being re-oxygenated in the Werai Forest, before it flows into the Niemur/Colligen River system.

As the floodwater from all these systems makes its way downstream, the impact on dissolved oxygen is evident in the Murray River. Dissolved oxygen levels at Barham, Boundary Bend (Murray-Murrumbidgee River junction) and at Wentworth were all less than 2 mg/L. Fish may be seen gasping at the water surface when dissolved oxygen falls to this low level.

Dissolved oxygen levels – Kolety/Edward River

Dissolved oxygen in the Kolety/Edward River at Deniliquin and Moulmein fell below the critical threshold of 2 mg/L and continued to drop down to 0.5 mg/L (Figure 2). The arrival of cooler air temperatures has allowed the dissolved oxygen levels at Deniliquin to improve back above 2 mg/L and a slight improvement at Moulmein. As hypoxic blackwater events and fish deaths have occurred in this river system in the past, agencies will continue to monitor the situation in the Kolety/Edward River.

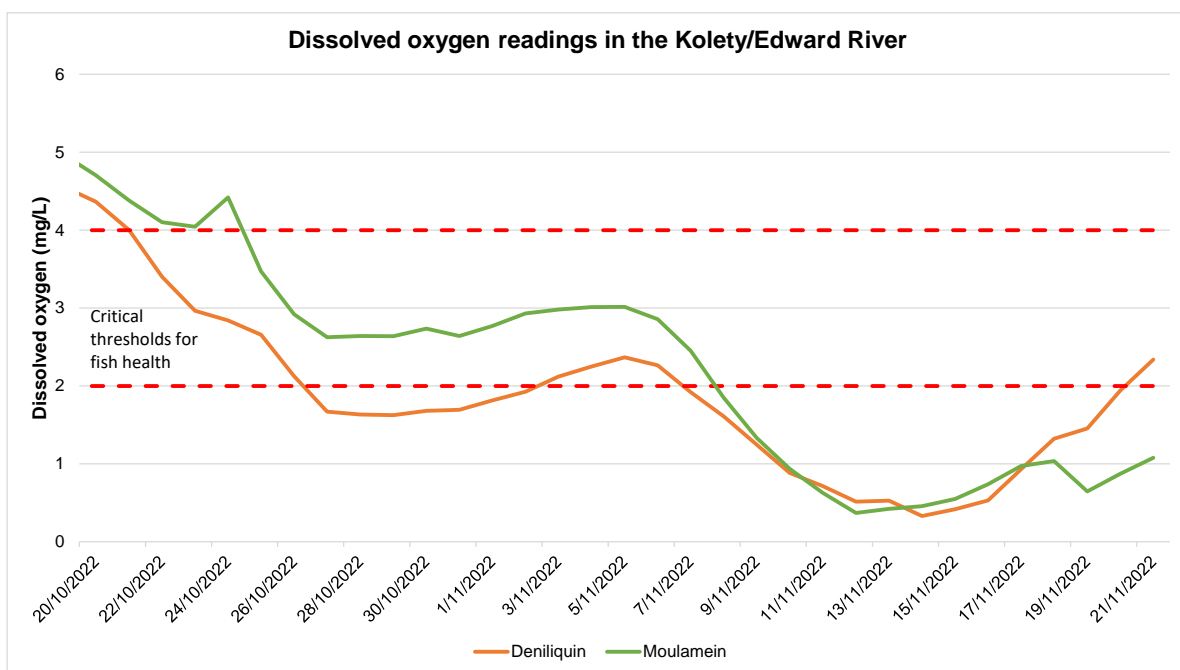


Figure 2: Dissolved oxygen (mg/L) in the Kolety/Edward River at Deniliquin and Moulmein

Dissolved oxygen levels – Barwon River

The inflow of floodwater from the Northern Murray-Darling Basin catchments into the Barwon River caused 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 are currently above 4 mg/L. A satellite-derived Sentinel colour infrared image shows the inundation of large areas in the Barwon and Darling River catchments (Figure 3). The darker areas (Macquarie River, Bogan River and Barwon River at Brewarrina) are clearer water, which can indicate the presence of low oxygen conditions. At this stage the low oxygen water does not extend down the Darling River beyond Bourke.

It is expected that these flood flows will impact dissolved oxygen levels further downstream at Wilcannia and Menindee Lakes as air temperatures increase over the coming months.



Figure 3: Satellite-derived Sentinel colour infrared image of the Barwon and Darling Rivers - 18 November 2022

Hypoxic blackwater fish death summary

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, Murrumbidgee and Yanco-Billabong Creek systems.

Below is a list of confirmed fish deaths in the last two weeks (as of 22 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):

- Murray River at Pental Island, upstream Swan Hill (8 November 2022). Approximately 50 dead adult Murray Cod. Limited extent.
- Murray River, Murray Downs Marina area near Swan Hill (12 November 2022). 50 to 100 adult Murray Cod. Limited extent.
- Edward River upstream Deniliquin (12 November 2022). Approximately 20 dead Murray Cod, approximately 60 to 80 cm. Limited extent.
- Murray River (Murray / Edward-Wakool floodplain) near Goodnight, upstream of Wakool Junction (13 November 2022). Many dead Murray Cod, possibly hundreds of fish and possibly also Golden Perch and Silver Perch. Locally widespread.
- Billabong Creek (upstream from Moulamein) (13 November 2022). 12 Murray cod. Limited extent.

- Merran Creek (east of Swan Hill) (13 November 2022). 100's of Murray cod observed across to locations on Merran Creek (road crossings). Limited extent.
- Murray River at Mildura Marina (15 to 16 November 2022). Two dead Murray cod, one dead Golden perch and one dead Bony bream. Limited extent.

What is being done?

The Bureau of Meteorology has forecast air temperatures at Echuca and Mildura will increase during the week before a cool change brings temperatures back down again over the weekend. Lower air temperatures are predicted for early next week and will slow down the breakdown of organic material by bacteria, which may provide opportunity for oxygen levels to continue to recover.

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 in the Murray catchment. These works are vital and provide an environment where fish populations can bounce back from hypoxic blackwater events such as these.

Hypoxic blackwater events on this scale have occurred in the past and will continue to occur in the future. It is distressing that these events occur, resulting in the loss of fish and other aquatic life. The impacts of these events on the environment are harmful, but are usually short-term, as the river water re-oxygenates again as the flooding subsides. Naturally occurring events such as these underpin the broad health of rivers. They provide nutrients to drive the overall production of our river and wetland systems. In the longer term, native fish, water birds and other organisms will benefit from the increased production in the river, boosting food supplies and supporting breeding cycles.

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 - DCCEE](#)

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@dpie.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 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 DPIE 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 MDBA 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 EPA's Web page at: www.epa.nsw.gov.au/news/news/2022/nsw-storm-and-flood-updates-2022