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 7 December 2022.

Rainfall over the past months caused prolonged flooding in many rivers across the Murray-Darling Basin. Flooding in the upper parts of most catchments is slowly starting to subside. Towns that were encountering major flooding such as Forbes and Condobolin on the Lachlan River, Deniliquin on the Kolety/Edward River and Echuca on the Murray River have had flood warnings reduced to the minor or moderate flooding level. Flood waters are progressing downstream of these towns with major flood warnings continuing for parts of the Lachlan, Murrumbidgee, Murray and Darling rivers.

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 and is a natural occurrence in Australian River systems.

There have been reports of fish deaths, fish struggling or dying and Murray Crayfish and shrimp exiting the water in a number of areas in the southern Murray-Darling Basin over recent weeks, including the Murray, Kolety/Edward and Wakool Rivers and Merran and Yanco-Billabong Creek systems.

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.

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 Phoneline 1800 043 536 or fill in a fish kill protocol report form Part A at: www.dpi.nsw.gov.au/fishing/habitat/threats/fish-kills-2019-2020/info-sheet

Where are the main areas of concern?

There are three main areas of concern where dissolved oxygen is at critical levels for fish health. These are:

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- Murray River from Tocumwal downstream to the NSW-South Australian border
- Wakool River
- Kolety/Edward River

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

The Bureau of Meteorology has forecast air temperatures will increase on 10 and 11 December before declining again next 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. Forecast warmer temperatures will increase the risk of further reductions in dissolved oxygen in some areas and the potential for further fish death events.

Dissolved oxygen levels – Murray River catchment

The Bureau of Meteorology is reporting river levels at Barham are expected to remain around the major flood level through until 11 December. Major flooding is occurring at the Murray-Wakool River Junction, Boundary Bend and at Wentworth. Major flooding at Wentworth could persist through until early January 2023.

Figure 1 is a satellite-derived Sentinel colour infrared image of the Murray River from 4 December. The darker coloured areas are floodwater and can indicate water with low dissolved oxygen. The image highlights where floodwaters from the Wakool and Murrumbidgee Rivers are trying to push into the high flows in the Murray River upstream of Robinvale which is causing water slow down and to spread out onto the floodplain and into billabongs and anabranches along the Murray River. As the floodwater slows down in this section of the river, it is not being oxygenated from the air by water turbulence, causing dissolved oxygen levels to remain low.

Flooding has continued from NSW into South Australia with flood emergency warnings issued for Renmark.

The extent of flooding being experienced 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.

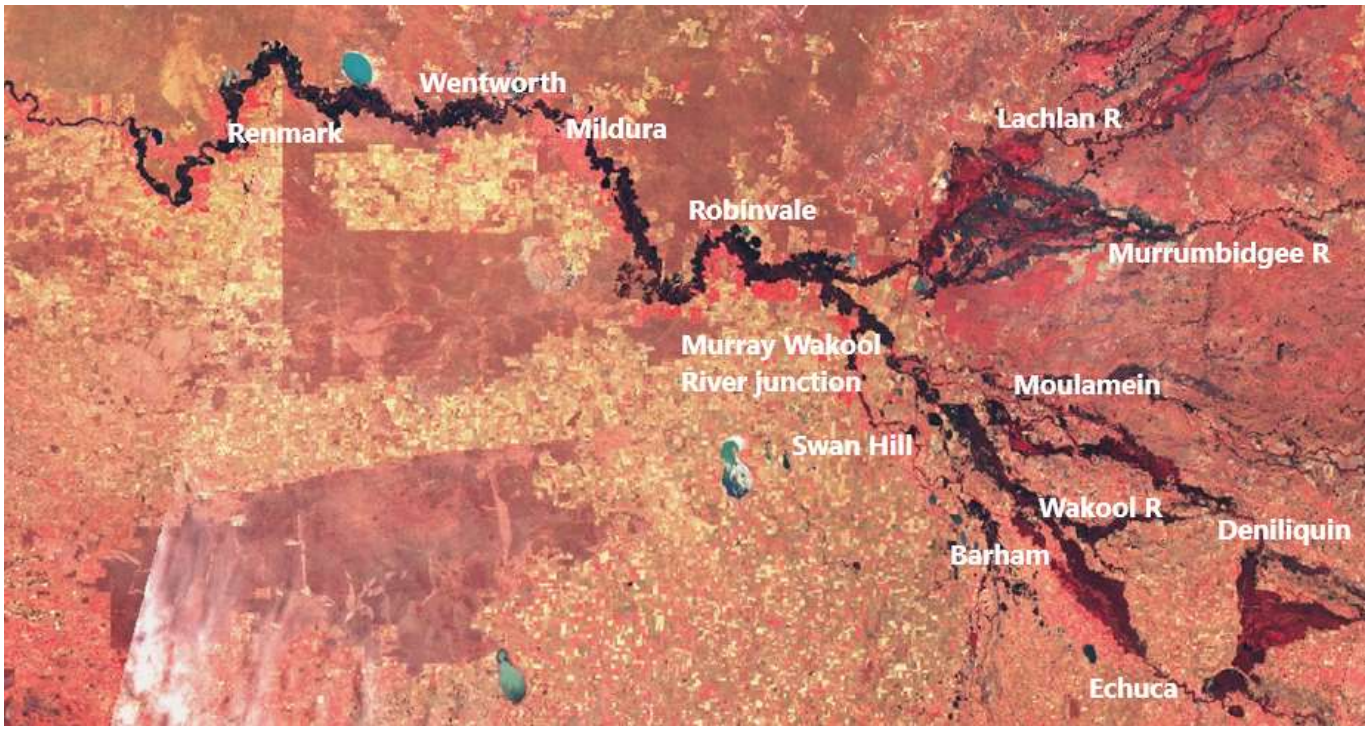

Figure 1: A satellite-derived Sentinel colour infrared image of the Murray River - 4 December 2022

Dissolved oxygen levels – Wakool River

The dissolved oxygen levels in the Wakool River have dropped to critical levels for fish health following warm air temperatures over recent weeks. Dissolved oxygen levels remain less than 2 mg/L. 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 are slightly better than the Wakool River and are fluctuating between 2 and 4 mg/L.

Dissolved oxygen levels – Kolety/Edward River

River levels in the Kolety/Edward River are slowly falling following a record major flood peak at Moulamein on 1 December. 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

Flood waters in the Darling River at Louth reached a peaked of around 150,000 ML/day on 1 December. Major flooding continues at Bourke, Louth and Tilpa. A satellite-derived Sentinel colour infrared image shows the inundation of large areas of the Darling River floodplain upstream of Wilcannia (Figure 2). River levels are predicted to reach the major flood level in Wilcannia this week and continue to rise until mid to late December.

Dissolved oxygen results in the Barwon River between Walgett and Brewarrina have been slowly improving as the flooding subsides and are now above the 4 mg/L threshold. Levels at Brewarrina have also improved toward 4 mg/L. Dissolved oxygen in the Darling River at Bourke and Wilcannia

have declined below 4 mg/L. Levels in the Darling River downstream of Menindee Lakes are remaining above the safe level for fish health.

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 the coming months.

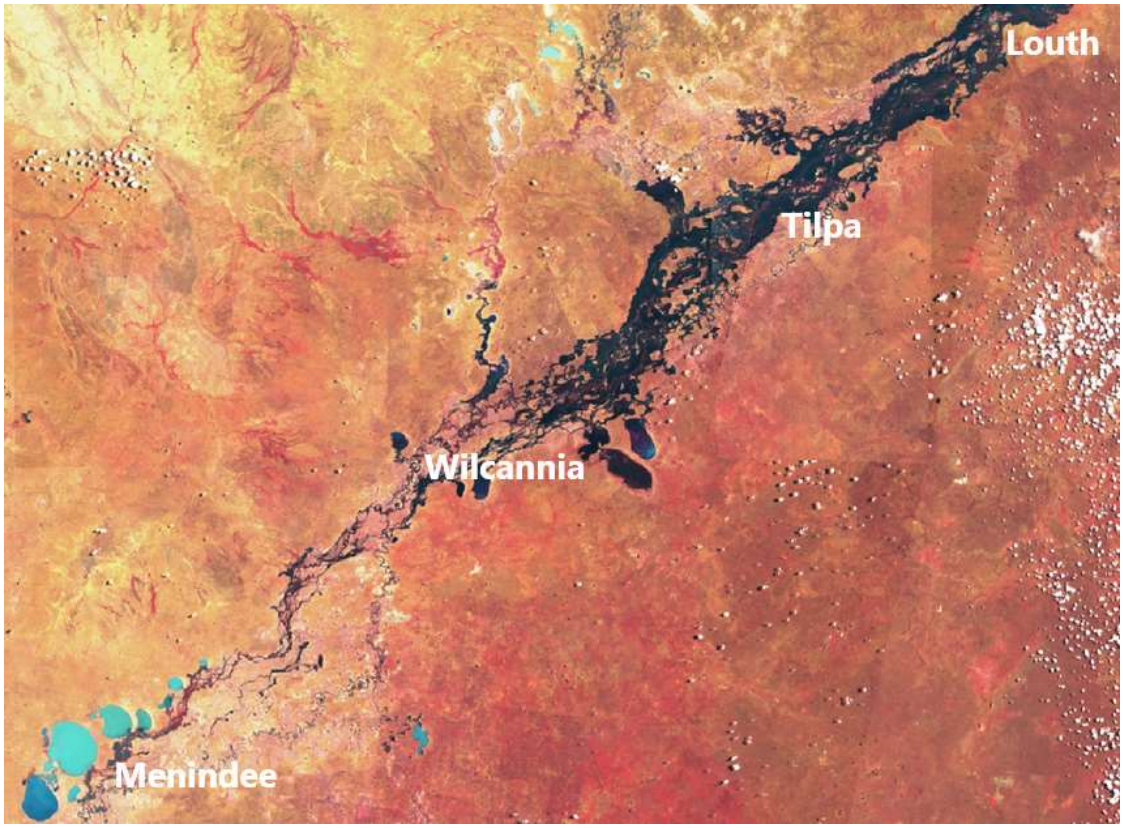

Figure 2: Satellite-derived Sentinel colour infrared image of the Darling River – 4 December 2022

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, Kolety/Edward, Wakool and Murrumbidgee rivers and Yanco-Billabong Creek system. Forecast warmer temperatures will increase the risk of further reductions in dissolved oxygen in some areas and of the potential for further fish death events.

Fish death incidents reported in the last week (as of 7 December 2022) that were very likely the result of hypoxic blackwater associated with the current widespread flooding, are summarised below. There may be other fish death incidents that have not yet been reported directly to DPI Fisheries.

- 5 December 2022. Lower Gwydir River (Big Leather area). Thousands of fish, predominantly Bony Herring with some Carp and few small Golden Perch and Spangled Perch. Limited extent. (Note the lower Gwydir is not one of the main areas of concern described in this update).

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 hypoxic blackwater event is expected to continue and unfortunately, so to the risk that fish deaths could occur. With warmer air and water temperatures, the possibility that fish deaths like those experienced during the 2011 and 2016 floods could occur.

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@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