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, and implement mitigating measures. This update provides a summary of information collected up to 2 March 2023.

The focus of monitoring activities is on Menindee Lakes and the lower Darling River. Dissolved oxygen in these areas is at levels that could be detrimental to fish health. There have been fish deaths in the Darling River in Lake Wetherell, downstream of Lake Wetherell (between Menindee Main Weir and Weir 32) and in stretches between Menindee and Pooncarie. In each case predominantly Common Carp and Bony Herring have been affected, along with some Murray Cod, Golden Perch and yabbies.

River levels in the lower Darling River are continuing to recede. As the river level drops, the last of the floodwaters upstream of Pooncarie are draining off the floodplain and back into the main river channel. This can bring low oxygen and nutrient-rich return water into the Darling River which contributes to the depletion of dissolved oxygen. This is exacerbated overnight when, in the absence of sunlight, water plants and algae cease producing dissolved oxygen via photosynthesis.

The Bureau of Meteorology has forecast maximum air temperatures at Menindee will increase towards 40°C again this weekend, before returning to cooler temperatures again next week. As air temperature increases, so does the water temperature. The amount of dissolved oxygen water can hold decreases with increasing water temperature, further contributing to oxygen stress for organisms that need dissolved oxygen to survive, including fish.

NSW and Commonwealth agencies will continue to assess the risks in this area as low oxygen water makes its way down the lower Darling River and to monitor dissolved oxygen levels while air temperatures remain high. Ongoing monitoring will inform the best operational flow measures to mitigate risks to aquatic life as much as possible.

As flows recede, fish can become stranded in disconnected waterbodies on the floodplain where they may suffer from exposure to declining water quality and dissolved oxygen, higher air and water temperatures and predators as water depth decreases and these waterbodies eventually dry out. Some fish deaths have been reported in the lower Darling, as a result of this process occurring. Given the size of recession flows, there is little management action that can be taken to prevent this from happening.

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

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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

Dissolved oxygen levels – Menindee Lakes

WaterNSW are transitioning to normal operations at Menindee Lakes as inflows from the Darling River decline. To guide flow management decisions and to assess the impact low dissolved oxygen floodwater is having on Menindee Lakes and the Darling River, water quality monitoring is continuing.

Figure 1 is a satellite-derived Sentinel colour infrared image of Lakes Wetherell, Tandure and Pamamaroo at Menindee on 25 February. It highlights the darker coloured, low oxygen floodwater from Lake Wetherell was pushing into lakes Tandure and Pamamaroo. This approach has been used during previous flooding events. As well as the mixing of 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.

It was identified that the poorer quality water entering Lake Pamamroo was being drawn through the Pamamaroo outlet and being discharged into the Darling River. To address this issue, the inlet structure between Lake Wetherell and Pamamaroo was closed.

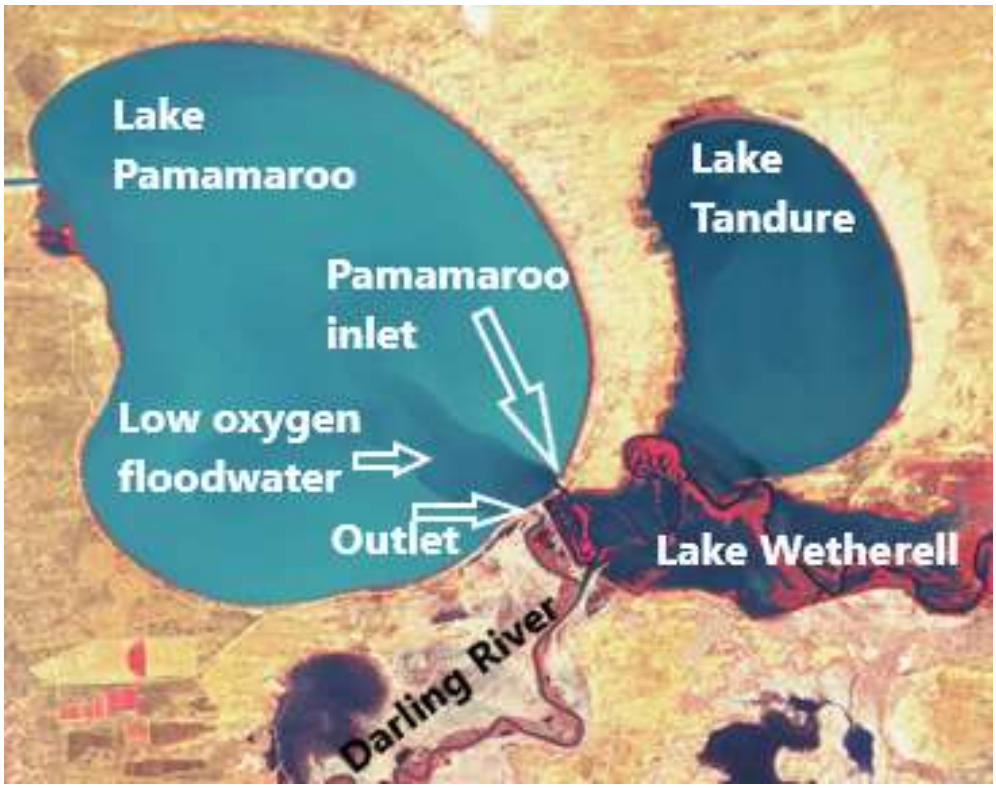

Figure 1: Satellite derived Sentinel colour infrared image of Lakes Wetherell, Tandure and Pamamaroo, 25 February 2023

Figure 2 is a Sentinel colour infrared image from the 27 February. This image highlights the darker-coloured low oxygen flood water from the upper Darling River is being held in Lake Wetherell. Once the Pamamaroo inlet structure was closed, the darker, lower oxygen water is no longer flowing into the more turbid water (blue colour) in lakes Pamamaroo and Menindee. Monitoring is showing the

water in Lake Pamamaroo is of better quality than in Lake Wetherell, making it the preferred option of the two higher lakes for releasing water into the lower Darling River. Water is also being released from Lake Menindee.

Figure 2 also shows dissolved oxygen results (in mg/L) collected 1 March. The samples were taken close to the water surface during the day with all four dissolved oxygen results from the Darling River less than 2 mg/L. 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.

Lower dissolved oxygen results are being recorded overnight and early in the morning in some areas. Dissolved oxygen levels drop overnight when respiration (microbes and animals breathing oxygen) outpaces oxygen replenishment (photosynthesis from aquatic plants and algae) that occurs during the day.

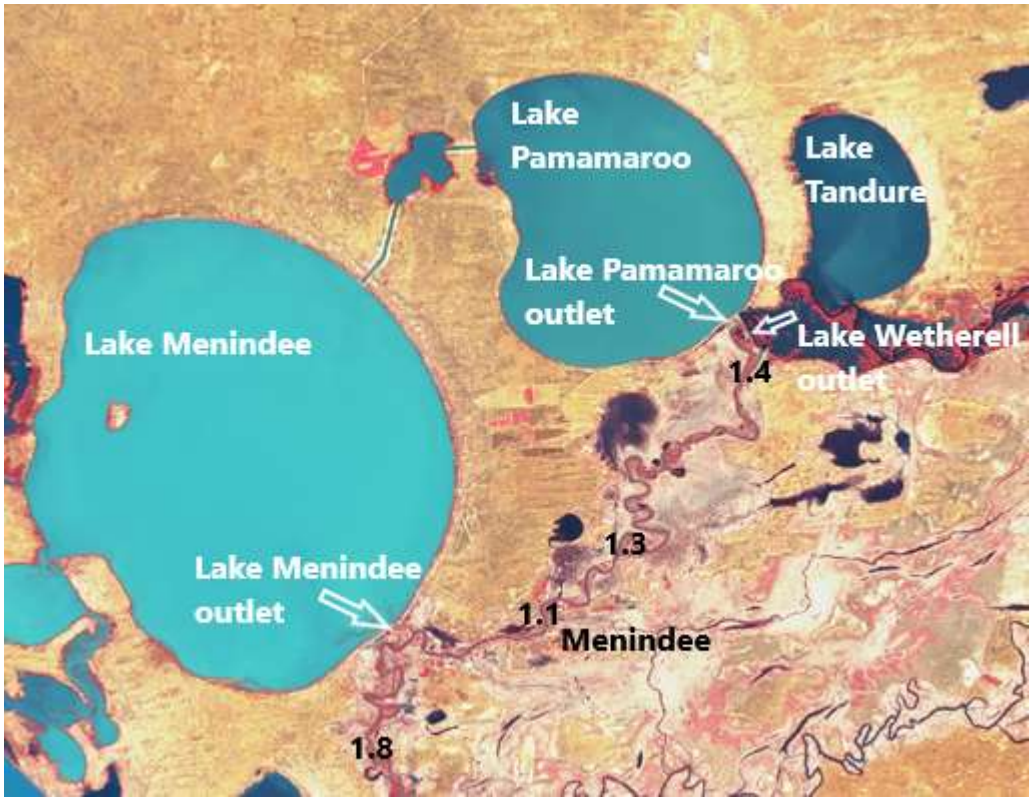

Figure 2: Satellite derived Sentinel colour infrared image of the Darling River and Menindee Lakes, 27 February 2023. Dissolved oxygen results collected 1 March are in mg/L

Dissolved oxygen levels in the Darling River at Wilcannia have been steadily improving as river levels fall (Figure 3). This indicates that oxygenated water is making its way toward Lake Wetherell. Dissolved oxygen levels in the upper reaches of Lake Wetherell at Nelia Gaari have been dropping to less than 1 mg/L overnight but increasing to safe levels during the day. Dissolved oxygen in the Darling River downstream of Menindee at Weir 32 had also been low, but has improved above 2 mg/L over the last two days in response to the operational measures implemented.

High concentrations of nutrients such as nitrogen and phosphorus have been flushed into the rivers during flooding. These nutrient-rich inflows combined with warm, still water provide ideal conditions

for the growth of potentially toxic blue-green algae and increases the risk that dissolved oxygen levels could deteriorate in this area.

NSW and Commonwealth agencies will continue to work together to assess the risks as floodwaters make their way through Menindee Lakes and into the lower Darling River. The agencies will monitor dissolved oxygen levels throughout the river system 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.

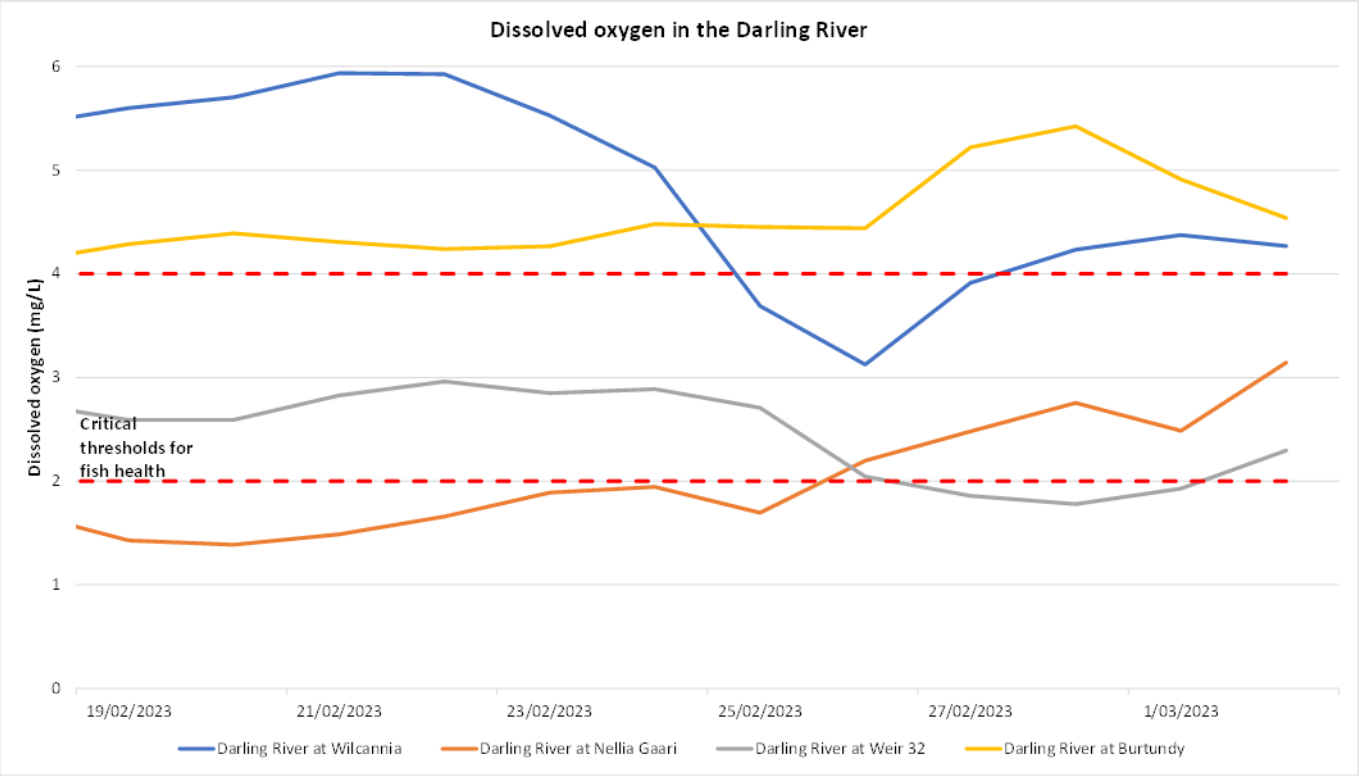

Figure 3: Mean daily dissolved oxygen (mg/L) in the Darling River at Wilcannia, Nelia Gaari, Weir 32 and Burtundy – 17 to 28 February 2023

Dissolved oxygen levels – lower Darling River

Flooding in the lower Darling River has decreased to the minor flood warning level at Burtundy. The flooding of higher areas of the lower Darling River floodplain that have not been inundated since 2012 will flush organic material such as sticks, leaves, bark and grass into the river system. The breakdown of this organic material by bacteria uses up the oxygen in the water which can impact fish health.

Figure 4 is a series of satellite derived Sentinel colour infrared images. The image on the left was taken on 8 January during major flooding at Menindee. The centre image (11 February) shows, as river levels drop, floodwater is returning back into the main channel. By 27 February (right) the last of the floodwaters are returning to the channel. The most recent fish deaths (mostly Carp and Bony Herring) in this area downstream of Menindee have been attributed to the last of the return water coming back into the channel.

Despite this floodwater water returning off the floodplain, dissolved oxygen in the Darling River downstream of Pooncarie at Burtundy is remaining above 4 mg/L (Figure 3).

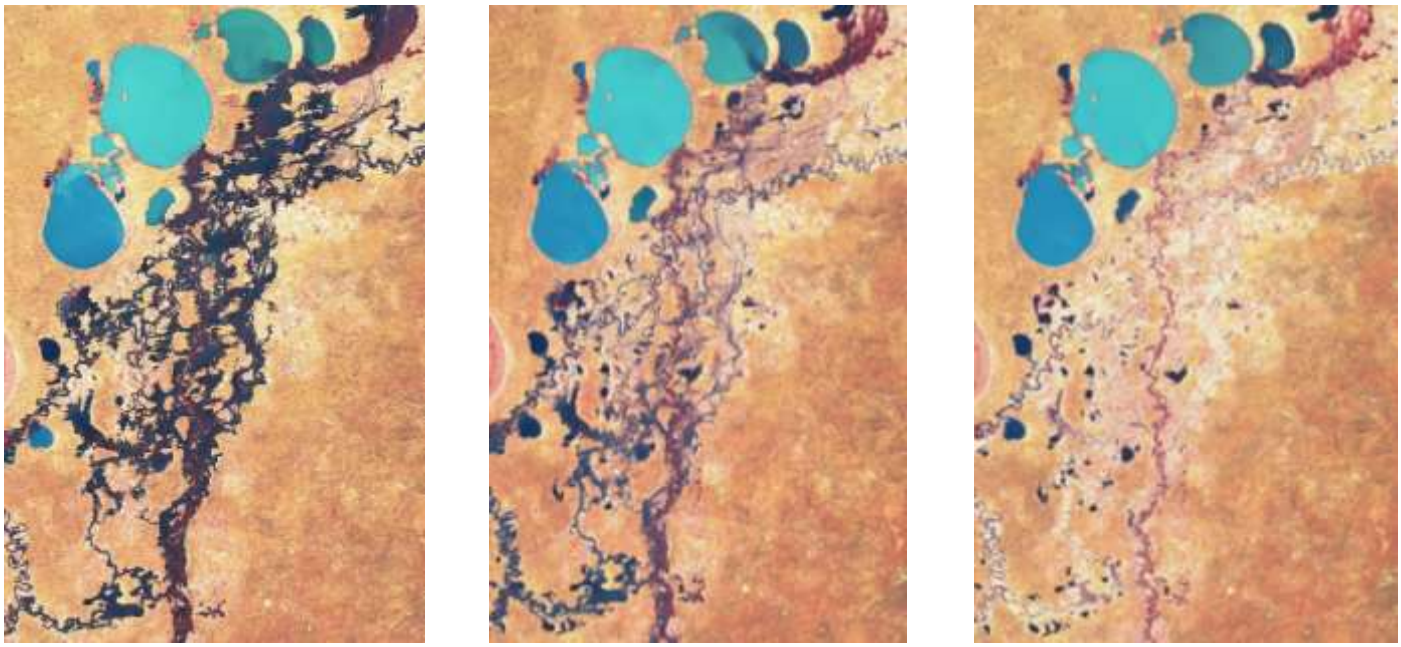

Figure 4: Series of satellite derived Sentinel colour infrared image of the Darling River between Menindee and Pooncarie. 8 January (left), 11 February (middle) and 27 February (right)

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, Lachlan, Gwydir, Darling, Barwon, Namoi and Macquarie rivers and Yanco-Billabong Creek system. High air temperatures increase the risk of further reductions in dissolved oxygen in some areas and the potential for further fish death events.

There have been confirmed fish death events in the Darling River near Menindee related to poor water quality: in Lake Wetherell, the Darling River downstream of Lake Wetherell to Weir 32 and in stretches of the Darling River between Menindee and Pooncarie. In each case predominantly Common Carp and Bony Herring are affected, along with Murray Cod, Golden Perch and yabbies.

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 low oxygen events.

What is being done?

Releases into the lower Darling River can be made from Lake Wetherell, Lake Pamamaroo and Lake Menindee. Monitoring is showing the quality of the water in Lake Pamamaroo is better than in Lake Wetherell. To maintain an oxygenated flow in the Darling River through Menindee township and

reduce the risk of further fish deaths, releases from the Lake Wetherell outlet have been reduced, while releases from the Pamamaroo outlet have been increased. Releases from Lake Menindee have also been reduced (currently at 3 GL/day) to assist in the flow of water from Lake Pamamaroo, past Menindee town and through to the lower Darling River. Discharge from Pamamaroo will be maintained at higher levels over the next few days, utilising the lower Darling water quality allowance to provide a flushing flow of oxygenated water to the Darling River through Menindee town. The discharge will also maintain sufficient flow velocity that research has shown provides conditions that are less favourable for harmful algal blooms. Ongoing monitoring will identify if the operations are achieving the desired results. Water recessions are expected commence on Monday 6 March at a slower rate than normal operational requirements.

Weather outlook

The Bureau of Meteorology has forecast median maximum air temperatures will remain close to average to slightly higher for March with a higher chance of exceeding the median maximum temperature for March to May across most of New South Wales. The forecast is that rainfall figures for March through to May will be slightly lower than historic averages for the majority of New South Wales. 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 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.