NSW Murray-Darling Basin dissolved oxygen

Water Quality update No. 6 I 16 February 2022

Multiple agencies are undertaking water quality monitoring to assess dissolved oxygen conditions across NSW and identify potential risks to ecological communities. This update provides an assessment of information collected up to 16 February 2022 along the Barwon-Darling River and in Menindee Lakes, as well as the management actions to minimise the risks to fish health.

Blackwater and the Menindee Lakes

High flows are continuing down the Darling River and have started to enter the upper lakes of the Menindee Lakes system (Lakes Wetherell, Tandure and Pamamaroo). These flood flows have mobilised large amounts of organic material from the floodplains. The breakdown of this material has caused dissolved oxygen levels to drop to critical levels for fish health. This is a naturally occurring process in Australian rivers. It has happened in the past and can result in fish deaths if they cannot move away to areas of aerated water.

The three main risks are from:

- The low dissolved water being captured within Lake Wetherell as the deoxygenated floodwater arrives.
- The low dissolved oxygen water being released from Menindee Lakes.
- The return of low dissolved oxygen water from the lower Darling floodplains back into the main channel.

Agencies and scientific experts are working together to continually monitor the dissolved oxygen levels throughout the river system and advise the best operational measures to mitigate the risk to aquatic life as much as possible. This involves:

- transferring the water between the lakes to mix the inflows of low dissolved oxygen water with better quality water
- adjusting the timing, size and location of releases from the Lakes into the Lower Darling to mix the water quality in the main river
- providing refuge areas of better quality water.

Dissolved oxygen levels - Barwon and Darling rivers

Floodwater from heavy rain in the Northern Murray-Darling Basin during November 2021 has peaked at over 36 gigalitres (GL)/day at Wilcannia and is continuing to make its way down the Darling River. Higher flows have started to reach Lake Wetherell, with the peak flow expected to arrive in the third week of February.

Monitoring of the Barwon and upper Darling rivers shows dissolved oxygen levels at Bourke and Brewarrina have been slowly improving in recent weeks as the high flows pass (Figure 1). Oxygen

levels at Louth are currently below the critical threshold for fish health of 2 milligrams per litre (mg/L), but it is expected this will improve over the coming weeks as flows subside.

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 at levels below 4 to 5 mg/L. Despite the very low results, no major fish deaths have been reported in this area.

If you see dead fish or fish starting to gasp at the water surface, please call the **NSW DPI Fisheries Hotline – 1800 043 536.**

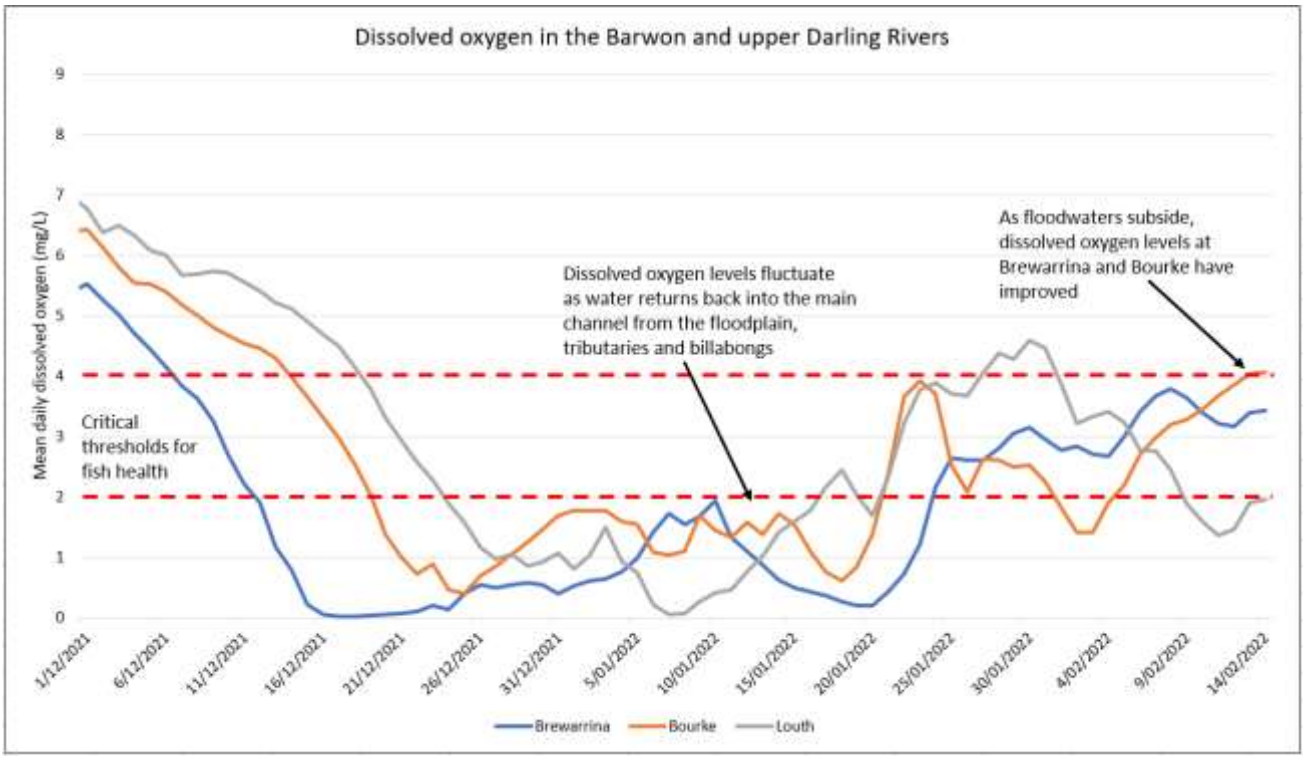

Figure 1. Mean daily dissolved oxygen (mg/L) in the Barwon and upper Darling rivers

Dissolved oxygen levels - Menindee Lakes and lower Darling Baaka

Dissolved oxygen at Wilcannia has improved toward the critical threshold of 2 mg/L. A new monitoring site installed at the inflow to Lake Wetherell shows dissolved oxygen dropped rapidly to critical levels last week as the hypoxic blackwater flowed into the Menindee Lakes system. Dissolved oxygen levels have recovered back above the critical threshold (Figure 2).

Dissolved oxygen levels at a second new monitoring site installed downstream of Menindee at Weir 32, as well as the existing site further downstream at Burtundy, are remaining above 4 mg/L.

Recent high air temperatures did not cause dissolved oxygen levels in the lower Darling River to fall (Figure 2). It is expected that cooler air temperatures as autumn approaches will help oxygen levels to improve.

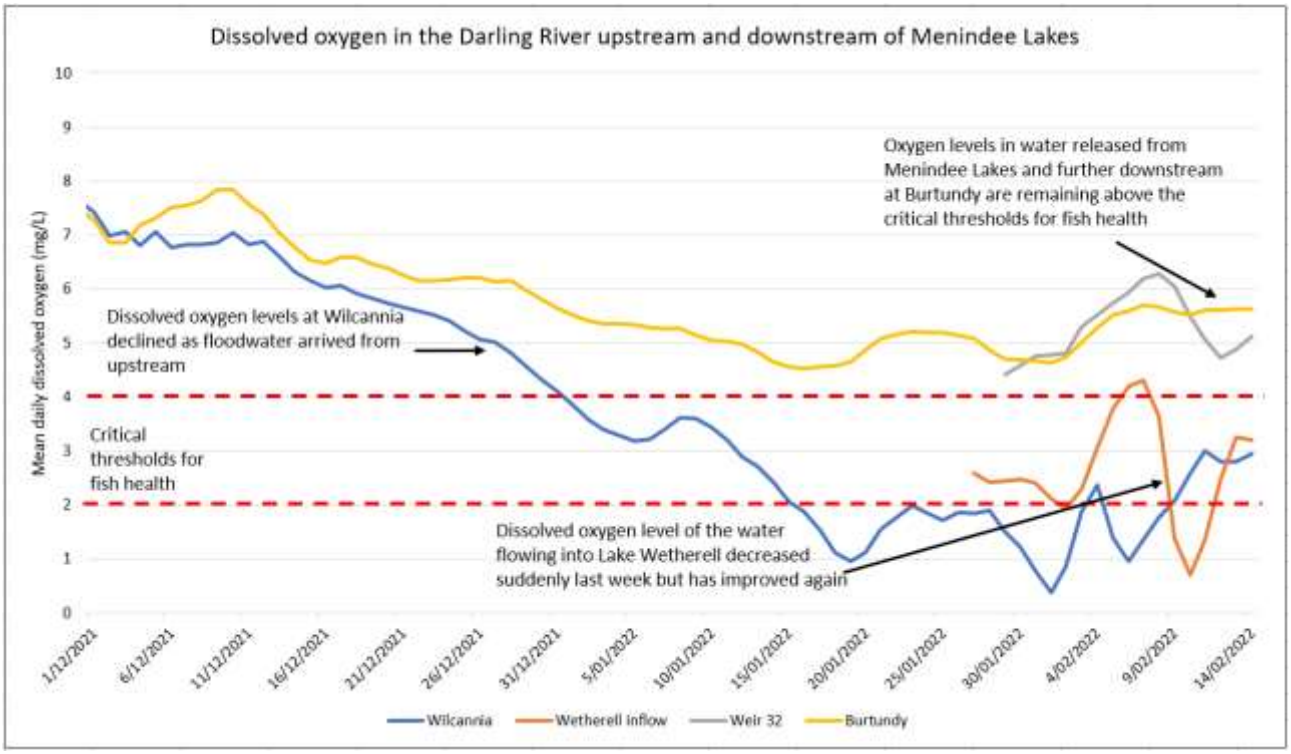

Figure 2. Mean daily dissolved oxygen (mg/L) in the Darling River upstream and downstream of Menindee Lakes

A satellite derived Sentinel image from 15 February highlights the blackwater from Lake Wetherell pushing into Lakes Tandure and Pamamaroo (Figure 3). Monitoring is showing that despite the blackwater inflows, dissolved oxygen levels in both Tandure and Pamamaroo are remaining at safe levels and are providing a refuge area for native fish. Monitoring of oxygen levels in the lakes will continue as more floodwater arrives from upstream.

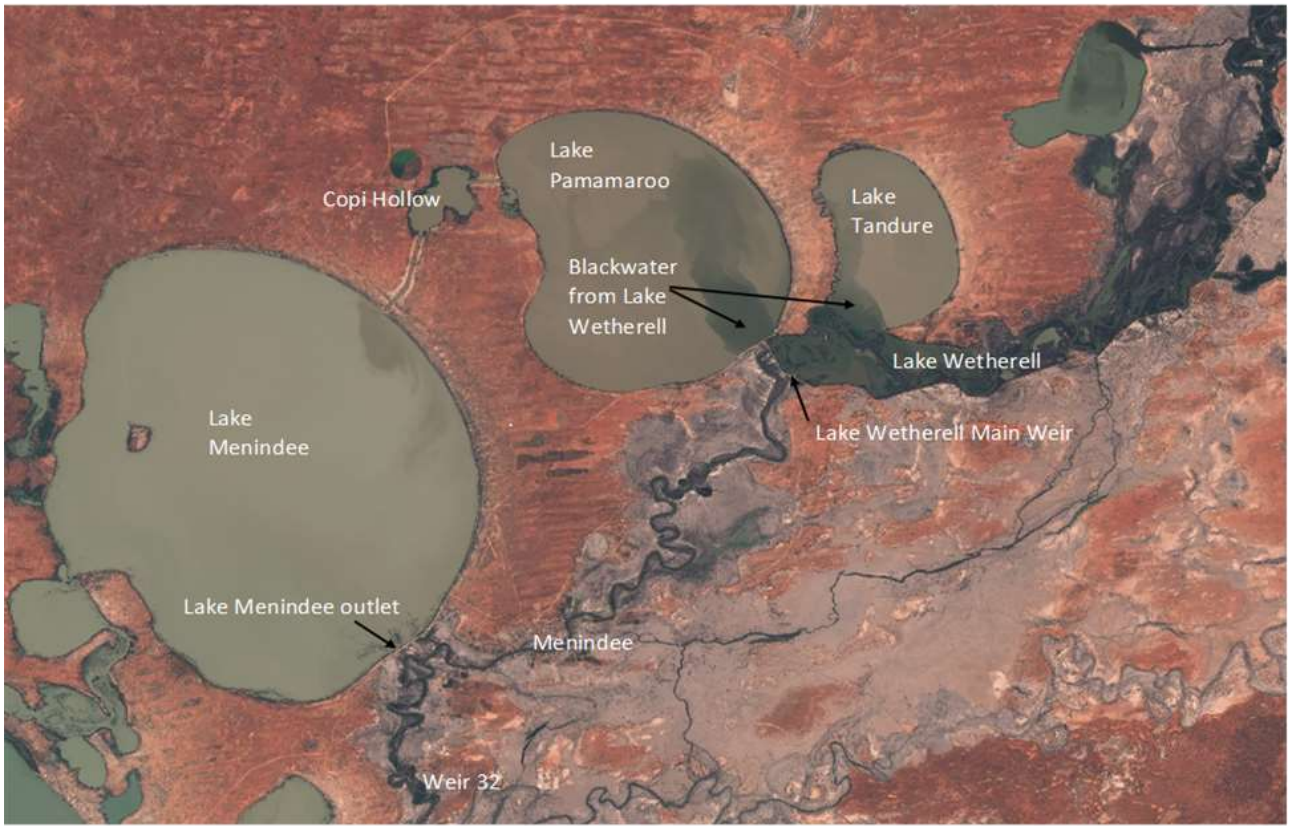

Figure 3. Satellite image from 15 February 2022 showing the blackwater entering Lakes Tandure and Pamamaroo

What is being done?

The biggest obstacle to minimising the impacts of this hypoxic blackwater event on aquatic ecosystems, is the extent of the hypoxic blackwater. Dissolved oxygen levels have started to improve in the Barwon River upstream, but are remaining at critical levels in the Darling River from Bourke, all the way to Menindee Lakes (Figure 4).

The river distance from Bourke to Menindee is about 1,000 km. The large volume of water spread over such a large distance, and water slowly draining back into the main channel from anabranches and billabongs, means the hypoxic blackwater will continue flowing into Lake Wetherell for weeks to come.

Figure 4 highlights the water yet to drain back into the main channel around Tilpa. There are no options available to water managers to limit the inflow of this deoxygenated water into Menindee Lakes.

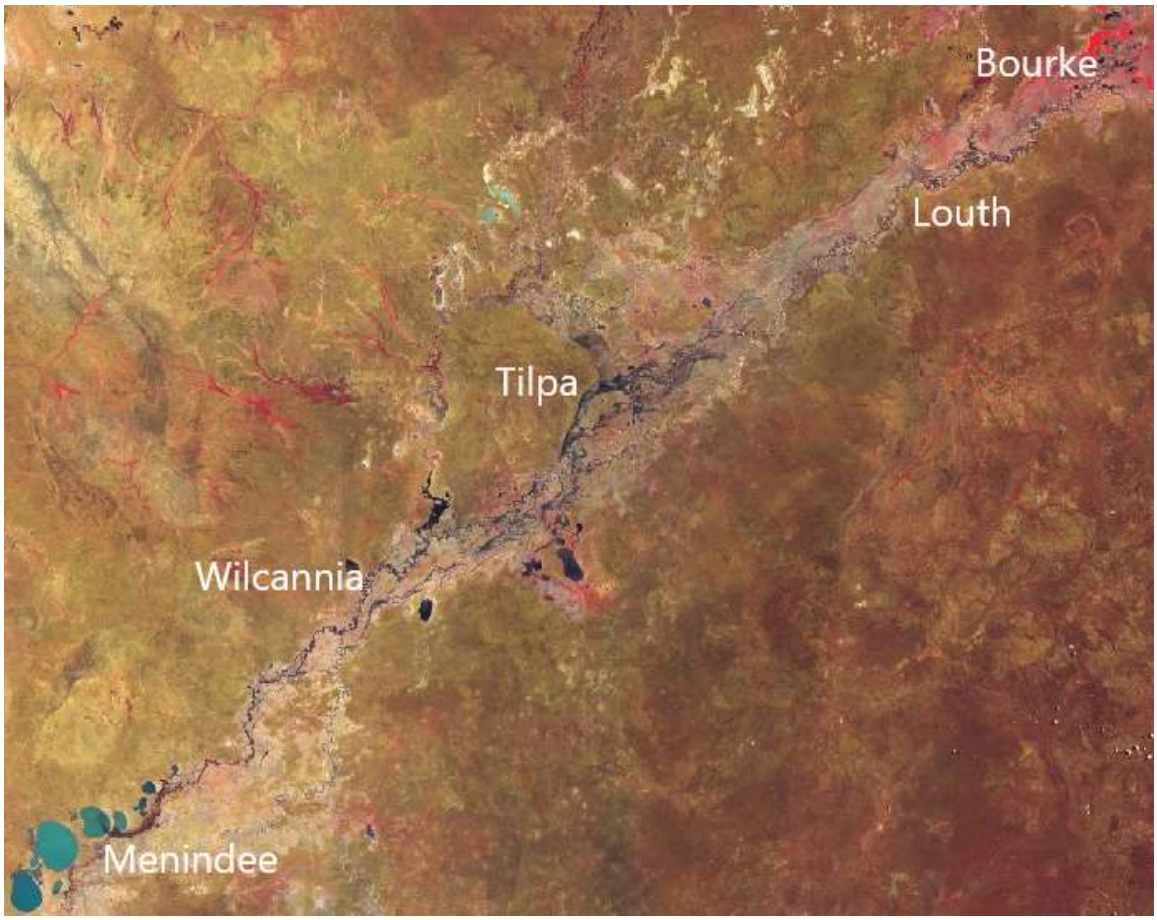

Figure 4. Satellite Image from 12 February 2022 showing the extent of the hypoxic blackwater in the Darling River from Bourke to Menindee

Once Lake Wetherell is full, water will spill out into the associated floodplains and lakes, including Lake Tandure. Initial modelling has indicated that the floodplain and smaller lakes, being shallower, should allow the water to be more quickly aerated and provide refuge areas for smaller fish and crustaceans.

Lake Tandure is likely to provide a refuge area that fish can move into if/when conditions become hypoxic in Lake Wetherell. Recent water quality readings in Lake Tandure are indicating that dissolved oxygen levels are of reasonable quality, despite the blackwater moving into this lake.

Some of the poorer quality water in Lake Wetherell is being passed into Lake Pamamaroo, where it can mix with the existing better quality water.

Releases from Weir 32 have been slowly and progressively reduced from 10 February. Scientific advice and assessment of carbon levels suggests that this recession will enable the water from the Lower Darling floodplains to return to the river and mix with the better quality water currently in-channel.

The low dissolved oxygen floodplain return water can then be diluted and move downstream before any low dissolved oxygen water from the front moving down Lake Wetherell is released.

In addition, monitoring is showing that turbulence from releasing water through the Main Weir is providing good oxygenation of the water. Releases from the Wetherell and Pamamaroo outlets have been reduced to ensure most water is released through the Main Weir.

Releases will be maintained from the upper lakes until they are reduced to 5,000 megalitres (ML)/day (expected around 10 March). At that time, releases may then be made from Lake Menindee, where it is expected that the blackwater and the better quality water in the Lakes will have had time to mix and should be of reasonable quality.

The management of inflows into the Lakes, and their release, is a careful balancing act, which will be continually monitored and adjusted as needed. If further rainfall occurs upstream or water temperatures stay cool, then the risks are reduced.

However, if water temperatures rise significantly, dissolved oxygen levels will quickly reduce. Under these latter circumstances, in particular, fish deaths may occur.

Blue-green algae

As the hypoxic blackwater makes its way down the system, flow conditions in the Barwon and Darling Rivers will return to normal. However, as well as mobilising large volumes of organic material, the flooding in the Northern Basin has also flushed high concentrations of nutrients, such as nitrogen and phosphorus, off the landscape and into the river. Low flow, combined with high nutrients and warm, still weather conditions, provide ideal conditions for the growth of potentially toxic blue-green algae.

Monitoring by WaterNSW is showing that algal numbers are increasing at some sites in the Barwon and Darling Rivers.

For definitions of algal alerts and further information visit the WaterNSW website at: www.waternsw.com.au/water-quality/algae

Weather forecast

The Bureau of Meteorology eight-day total rainfall forecast for 16 to 23 February (Figure 6) indicates higher falls of up to 50 mm are expected along most of the NSW coast, with totals decreasing toward western NSW.

The predicted totals are unlikely to result in major flooding, however; isolated thunderstorms may result in localised flooding events.

The long-term rainfall outlook for March is shown in Figure 7. There is a slight chance of exceeding median rainfall across most of NSW.

Bureau of Meteorology rainfall maps are available at: www.bom.gov.au/jsp/watl/rainfall/pme.jsp

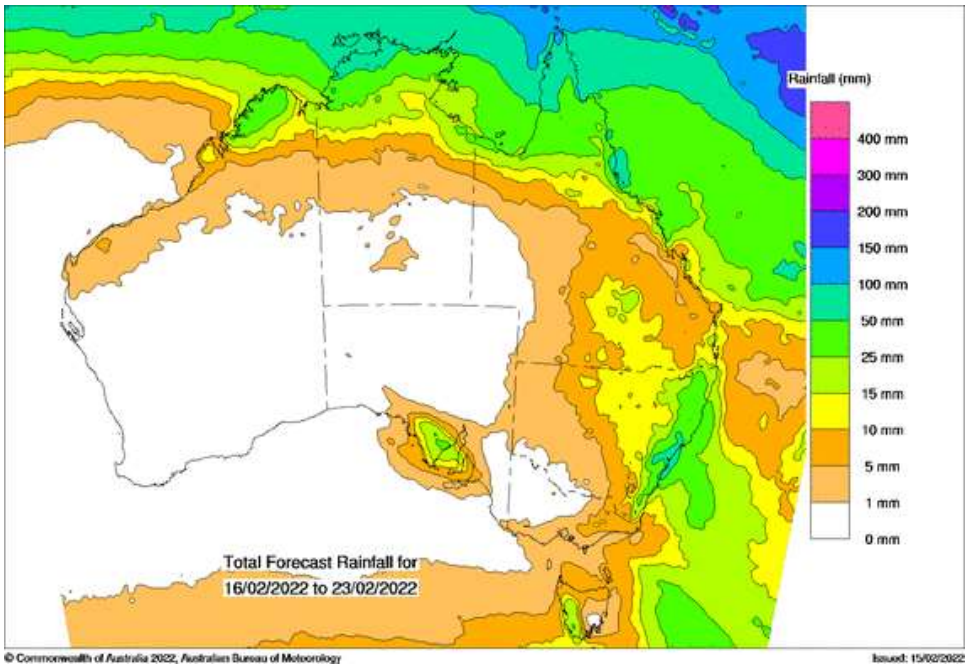

Figure 6. Eight-day total rainfall forecast for 16 February to 23 February

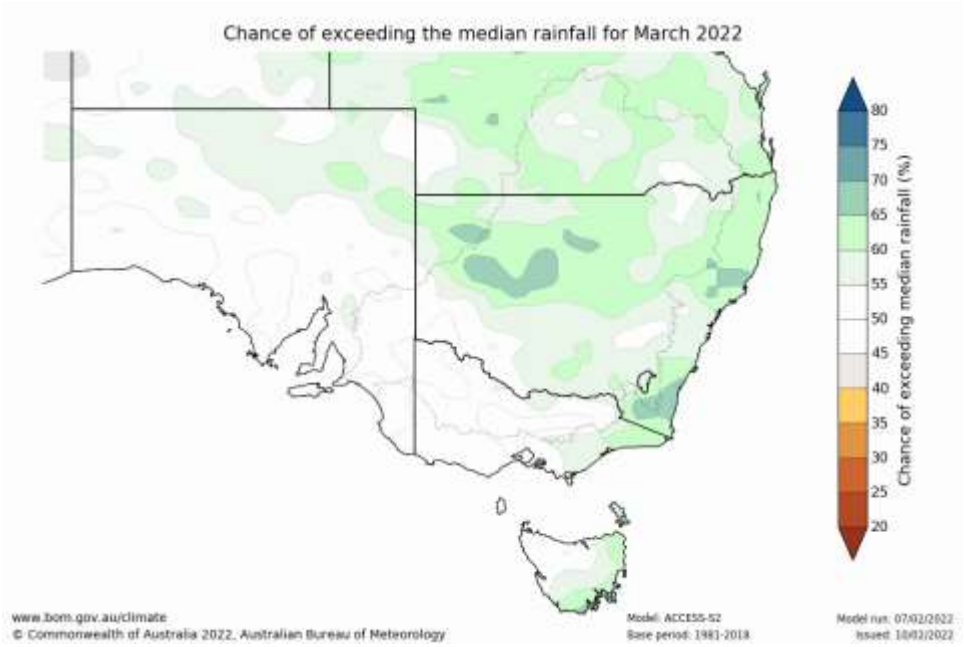

Figure 7. Chance of exceeding median rainfall for March in South-Eastern Australia

Additional information

To notify the department of potential blackwater events email: waterqualitydata@dpie.nsw.gov.au

To report dead fish or fish starting to gasp at the water surface call the NSW DPI Fisheries Hotline 1800 043 536. Information on recent fish deaths is available at: www.dpi.nsw.gov.au/fishing/habitat/threats/fish-kills

Further information on blackwater events can be found on the department's website at: www.industry.nsw.gov.au/water/allocations-availability/droughts-floods/drought-update/managing-drought-recovery/blackwater

As well as the Murray-Darling Basin Authority's website at: www.mdba.gov.au/publications/mdba-reports/water-management-101-factsheets

Operational updates for Menindee Lakes are available from WaterNSW at: waterinsights.waternsw.com.au/12104-lower-darling-regulated-river/updates