Barwon–Darling valley annual surface water quality report: 2023-2024

Key Points

- Rain in the Northern Basin maintained flow in the Barwon and Darling Rivers from July 2023 to June 2024. Discharge from Menindee Lakes was carefully managed to reduce the risk of fish deaths whilst preserving the water resources stored in the lakes.
- The water quality index indicated that of the 8 monitoring sites in the catchment, 3 were rated as poor, 3 were moderate and 2 were good. Compared to 2022–2023 results, the water quality index scores for 5 of the 8 sites were lower in 2023–2024.
- All sites from Brewarrina to Menindee Lakes had electrical conductivity above the Basin Plan agriculture and irrigation salinity target of 957 µS/cm. Except for the Darling River at Wentworth, all sites downstream of Menindee Lakes had electrical conductivity above the Basin Plan irrigation target of 833 µS/cm. The median and 80th percentile at Wilcannia were above the End-of Valley targets.
- Electrical conductivity in the Darling River at Burtundy exceeded the Basin Plan target for managing water flows (830 µS/cm) from July 2023 to January 2024.
- Blue-green algal blooms were not a major problem in the Barwon-Darling River system upstream of Menindee Lakes due to continued flow. However, red alert warnings for blue-green algal blooms were issued in the Menindee Lakes, lower Darling River and towards the southern end of the Great Darling Anabranch.

The water quality data is collected monthly at 8 sites in the Barwon–Darling valley for the State Water Quality Assessment and Monitoring Program. The program is responsible for collecting, analysing, and reporting the ambient water quality of rivers in NSW. This annual report summarises the surface water quality data collected in the Barwon–Darling Valley from July 2023 to June 2024. The location of monitoring sites is shown in Figure 1.

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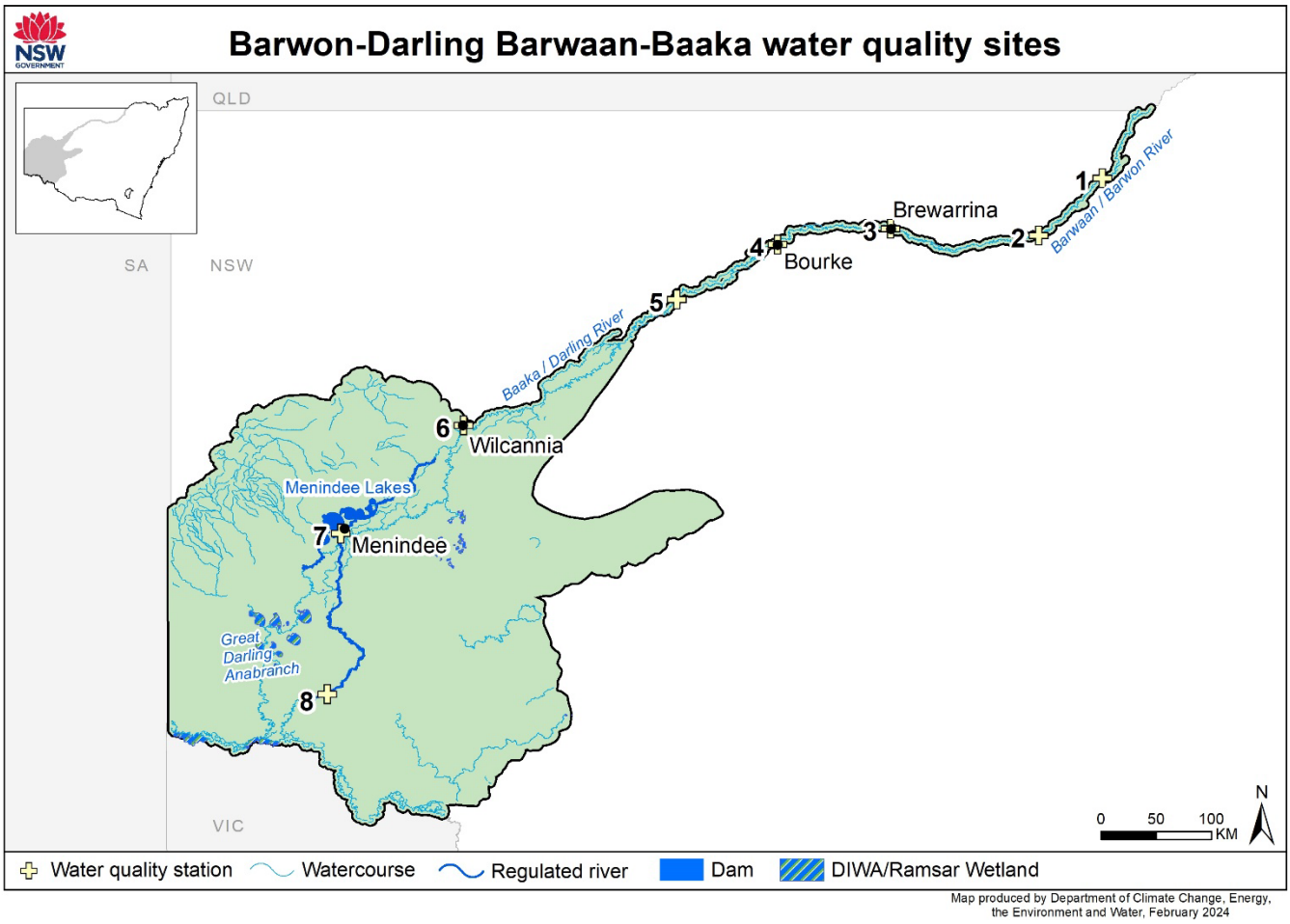

Figure 1: Location of routine water quality monitoring sites in the Barwon–Darling valley

Table 1: Site information for each monitoring site in the Barwon–Darling River catchment. Refer to Figure 1 and the site numbers for the location of each site

Site number	Site name	Water Quality Zone	Station number
1	Barwon River at Collarenebri	Barwon	422003
2	Barwon River at Dangar Bridge (Walgett)	Barwon	422001
3	Barwon River at Brewarrina	Barwon	422002
4	Darling River at Bourke	Upper Darling	425003
5	Darling River at Louth	Upper Darling	425004
6	Darling River at Wilcannia	Upper Darling	425008
7	Darling River at Weir 32	Lower Darling	425012
8	Darling River at Burtundy	Lower Darling	425007

Catchment description

The Barwon-Darling valley covers a large area of western NSW. The region is characterised by extremely low relief, low rainfall and climatic variability.

The Barwon–Darling connects the river systems of the northern Murray–Darling Basin with those of the south. It is considered unregulated from Mungindi on the NSW-Queensland border to Menindee Lakes in south-west NSW, despite there being 15 weirs between Mungindi and Wilcannia (NSW Office of Water 2012) and approximately 100 in-stream structures. The weirs provide important storage pools for local town water supplies and to meet irrigation needs. They also create major barriers to fish movement (NSW DPI 2015) and can be associated with algal blooms (Mitrovic et al. 2003).

Upstream of Bourke, inflows are received from all of the major river valleys in the northern Murray-Darling Basin, including from the Intersecting Streams, Border Rivers, Gwydir, Namoi, Wambuul/ Macquarie, Castlereagh and Bogan rivers. Downstream of Bourke and further west, the Paroo and Warrego are the only major tributaries that contribute intermittent flows but can provide significant volumes during flood events.

Flows in the lower Darling are regulated by releases from Menindee Lakes. There are 2 major river systems in the lower Darling, the Darling River and the Great Darling Anabranch. The Darling Anabranch Lakes are listed in the Directory of Important Wetlands.

Grazing is the dominant land use along the Barwon and Darling Rivers. Cropping (dryland and irrigated) is largely concentrated between Mungindi and Brewarrina, with some areas of irrigated cotton around Bourke and irrigation of horticulture crops near Wentworth.

Catchment conditions during 2023-2024

Flow from July to October 2023 was characterised by low rainfall across the catchment area, followed by higher totals from November 2023 to June 2024 (Figure 2A). Releases from Menindee Lakes to maintain flows in the lower Darling River to reduce the risk of further fish deaths saw their capacity reduce from around 80% in July down to 50% at the end of April (Figure 2B). Rainfall and inflows from the Northern Basin maintained flows into Menindee Lakes throughout 2023–2024.

Heavy rainfall from ex-tropical cyclone Megan resulted in a flow peaking at over 15,000 ML/day at Collarenebri (Figure 2C). Basin jurisdictions worked quickly to fast track the commencement of a trial to protect environmental water from the northern Basin to the southern Basin to maintain connectivity. A portion of the flow was shepherded through Menindee Lakes and down the remaining length of the Murray-Darling system. This enabled environmental flows to be protected from Queensland all the way to the Coorong (South Australia), and out into the Southern Ocean via the Murray's mouth for the first time.

Releases from Lake Cawndilla maintained flows down the length of the Great Darling Anabranch in 2023–2024.

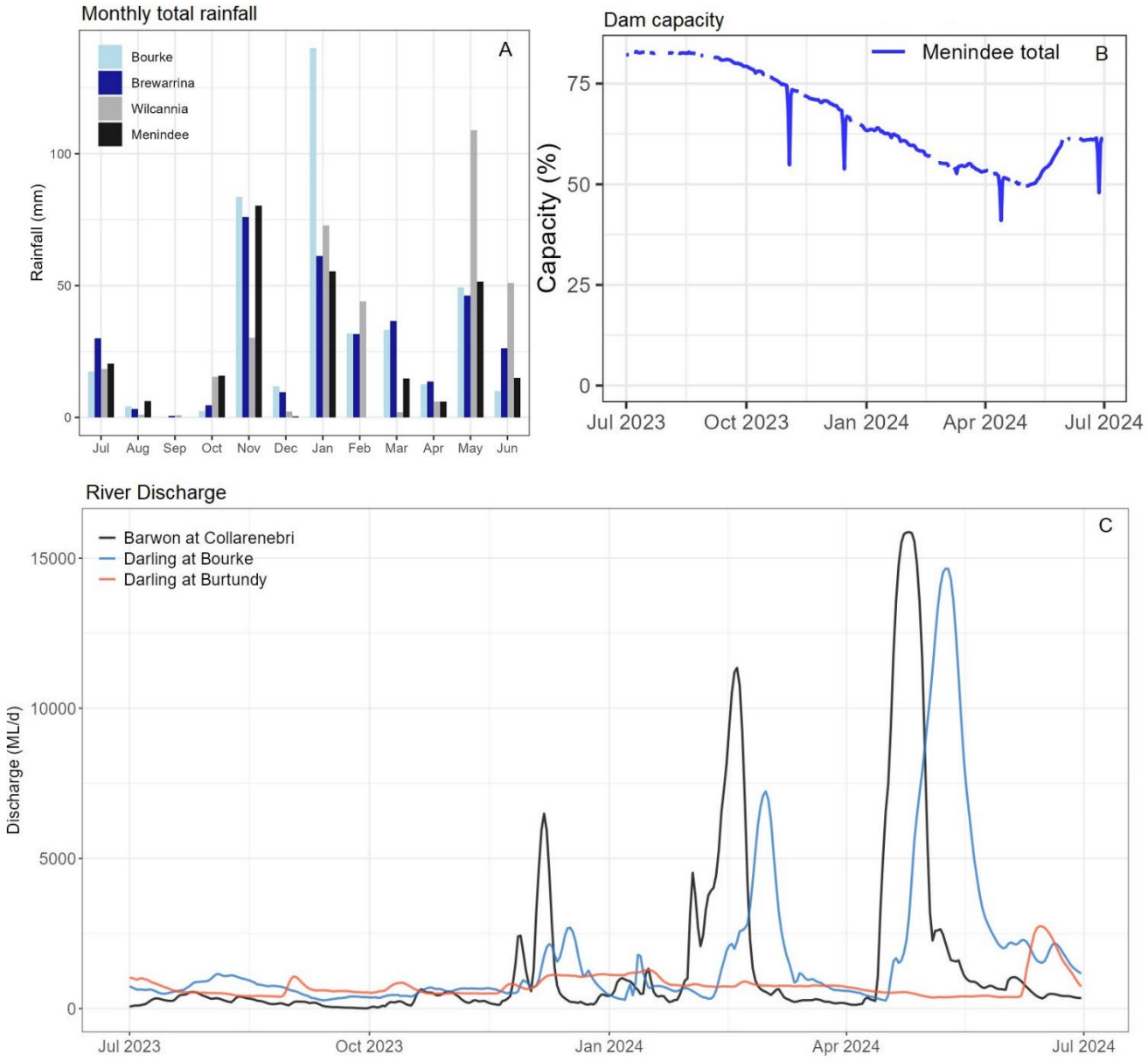

Figure 2: Catchment conditions for selected stations in the Barwon–Darling catchment from July 2023 to June 2024 for A: Monthly total rainfall (mm) B: Dam capacity (%) and C: River discharge (ML/day).

Water quality for water dependent ecosystems

NSW uses a Water Quality Index (WaQI) to communicate complex and technical water quality data simply and consistently. The WaQI score was calculated for each monitoring site using total nitrogen, total phosphorus, turbidity, pH, dissolved oxygen and electrical conductivity. The index compares the monthly water quality results against predetermined water quality targets to calculate a score between one and 100. A score of 100 represents a site in pristine condition, while a score of one is a highly degraded site. This value can then be categorised to rate the general water quality at a monitoring site. The results from the WaQI are summarised in Figure 3. Sites with a

change of less than 5 points in WaQI score have been identified with horizontal arrows. Arrows pointing up or down indicate the score has increased/decreased by more than 5 points.

The water quality index category ratings in the Barwon and Darling rivers improved in 2023–2024 for one of the 8 sites compared to 2022–2023, while the rest of the sites either declined or remained the same.

- The Darling River at Burtundy improved from moderate to good.
- The Barwon River at Collarenebri declined from moderate to poor.
- The Barwon River at Brewarrina and Dangar Bridge (Walgett) remained poor.
- The Darling River at Wilcannia remained moderate.
- The Darling River at Bourke and Louth declined from good to moderate.
- The Darling River at Menindee remained good.

The poor index scores in the Barwon River from Collarenebri to Brewarrina is attributed to high turbidity, nutrient concentrations and electrical conductivity, and dissolved oxygen results outside the desired range for this area. These pollutants also impacted the downstream sites on the Darling River from Bourke to Wilcannia.

Releases from Menindee Lakes were managed to maintain dissolved oxygen levels through the Menindee weir pool. This also resulted in lower turbidity and electrical conductivity in the lower Darling River than the upstream sites.

Compared to 2022–2023, the water quality index score for 2 sites increased, 5 decreased, and one site showed minimal change in 2023–2024. The 5 sites with a lower score in 2023–2024 were all upstream of Menindee Lakes.

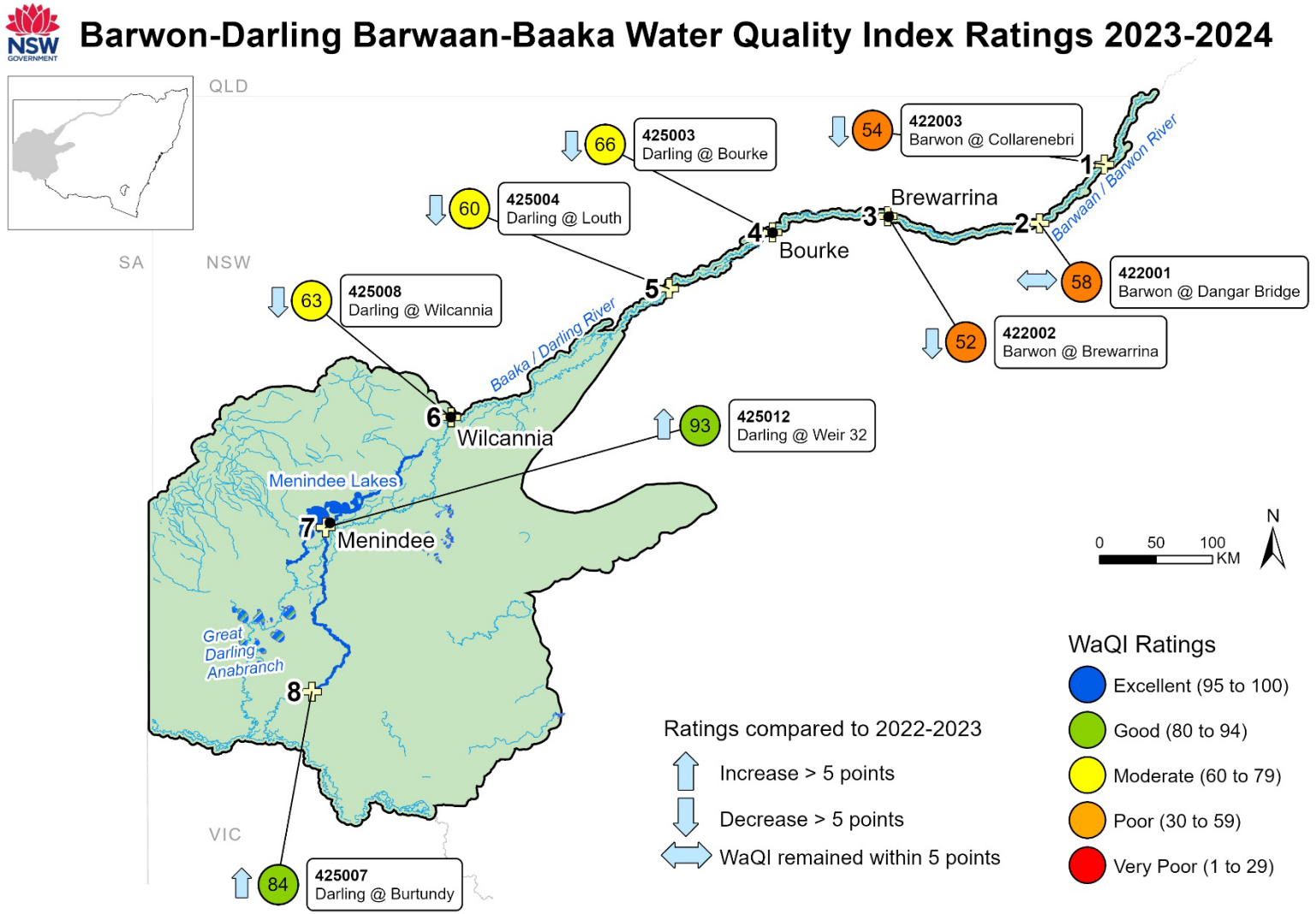

Figure 3: Water quality index scores and ratings for the Barwon–Darling valley

Down the Barwon-Darling system, pH increased with distance. The highest results were in the lower Darling River, which may have been in response to higher algal numbers.

The highest median turbidity was in the Barwon River at Collarenebri. The median was lower at other sites in the Barwon-Darling, though there were high results recorded when sampling coincided with high flows. The regulation of water from Menindee Lakes maintained lower turbidity in the Darling River at Weir 32 and Burtundy.

Total nitrogen and total phosphorus increased with distance down the Barwon and Darling rivers as nutrients flushed into the river system by previous flooding were gradually transported downstream. Similar to turbidity, the release of water from Menindee Lakes maintained lower nutrient concentrations at the Weir 32 monitoring site.

Consistent flows upstream of Menindee Lakes maintained the median dissolved oxygen levels in the Barwon and Darling rivers above the critical threshold for fish health. Dissolved oxygen is expected to be lower in these western lowland rivers as higher water temperature reduces the solubility of oxygen in the water column. Releases from Menindee Lakes were carefully managed in 2023-2024 to maintain higher dissolved oxygen levels in the Menindee weir pool and reduce the risk of fish deaths.

The recharge of shallow saline groundwater by the previous wet years resulted in a reconnection of surface and groundwater, resulting in some high electrical conductivity results in the Barwon and Darling rivers. Electrical conductivity was more stable in the lower Darling River due to releases from Menindee Lakes.

Summary statistics for the key water quality parameters at each monitoring site in the Barwon Darling system have been displayed as box plots (Figure 4). The box plots show the annual 25th, 50th and 75th percentile values, with error bars indicating the 10th and 90th percentile values for each site.

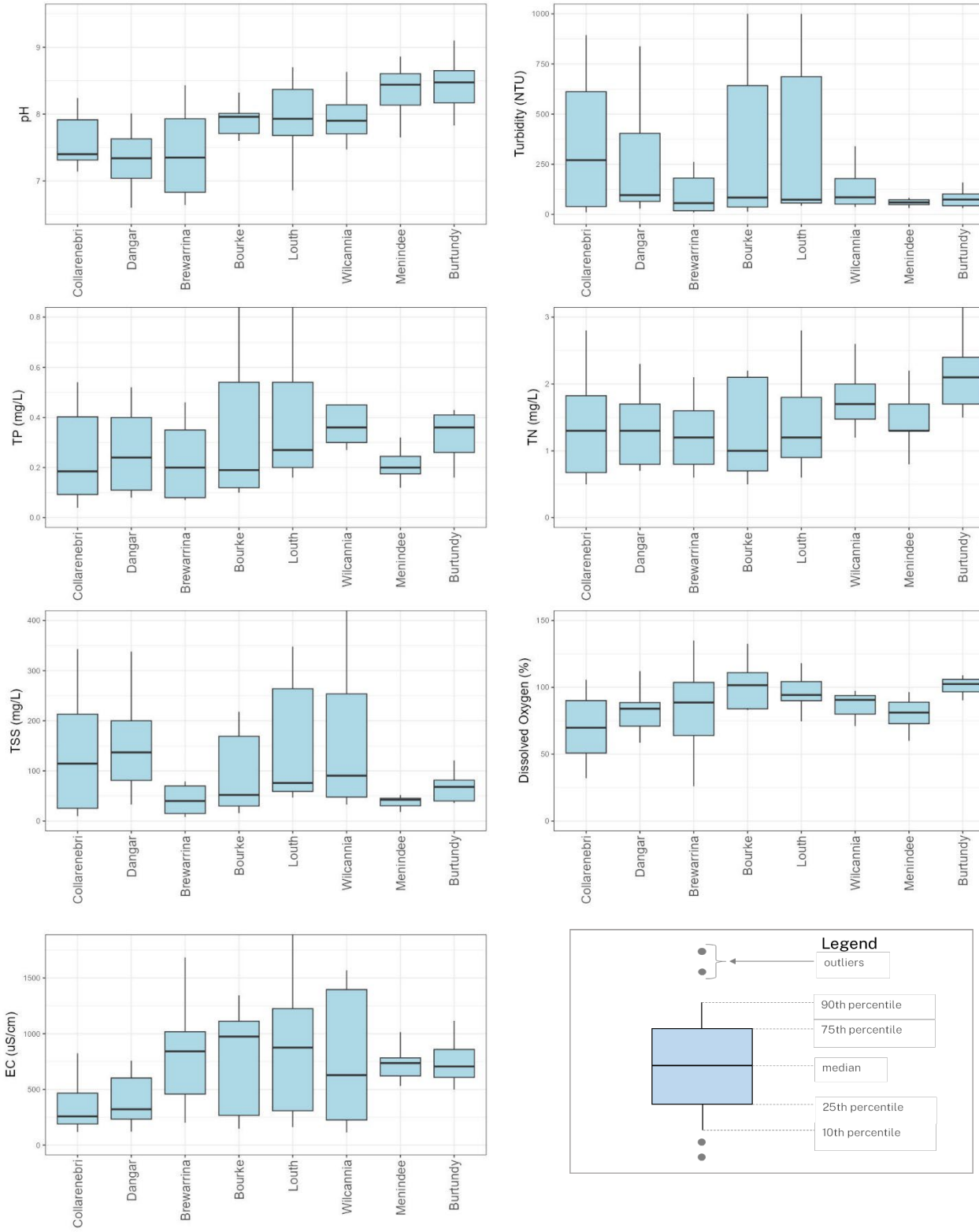

Figure 4: Water quality data by site, moving upstream to downstream from left to right. The water quality parameters shown are pH, Turbidity, Total phosphorus (TP), Total nitrogen (TN), Total suspended solids (TSS), Dissolved oxygen, and electrical conductivity (EC). *Note: extreme results were not plotted to maintain emphasis on the core data*

Irrigation and salinity

There are 17 continuous electrical conductivity monitoring sites in the Barwon–Darling valley extending from Mungindi to Burtundy and down the Great Darling Anabranch. There is also a cluster of electrical conductivity monitoring sites located between Bourke and Louth for the Upper Darling salt interception scheme. There is one irrigation infrastructure operator in the lower Darling River at Pomona (Wentworth).

There are 2 Basin Plan agriculture and irrigation salinity targets for the Barwon–Darling valley:

- 957 µS/cm for sites upstream of Menindee Lakes and
- 833 µS/cm downstream of Menindee Lakes.

In addition, there is a Basin Plan target for managing water flows in the Darling River at Burtundy of 830 µS/cm.

As flows receded in 2023 and shallow saline groundwater started draining back into the main river channel, electrical conductivity increased. All sites from Brewarrina to Menindee Lakes had a 95th percentile electrical conductivity above the Basin Plan agriculture and irrigation salinity target of 957 µS/cm.

All sites downstream of Menindee Lakes, apart from the Darling River at Wentworth, had a 95th percentile electrical conductivity above the Basin Plan irrigation target of 833 µS/cm.

Electrical conductivity in the Darling River at Burtundy exceeded the Basin Plan target for managing water flows (830 µS/cm) from July 2023 to January 2024, peaking at 1,784 µS/cm in late December 2023. The protection of environmental water from the Northern Basin provided a flushing flow to the lower Darling River in March, reducing electrical conductivity below the flow management target.

Figure 5 shows electrical conductivity at selected sites in the Barwon–Darling valley. Inflows from the Northern Basin maintained low electrical conductivity in the Barwon River at Dangar Bridge near Walgett. The recharge of shallow saline groundwater by the previous wet years resulted in a reconnection between surface and groundwater. This caused high electrical conductivity in the Darling River at Bourke. The release of lower salinity water from Menindee Lakes maintained lower electrical conductivity at Weir 32, but similar to upstream at Bourke, the reconnection of surface and groundwater in the lower Darling River resulted in high electrical conductivity at Burtundy during low flows.

The Basin Salinity Management Strategy End-of-Valley salinity targets for the Darling River at Wilcannia are:

- the median electrical conductivity does not exceed 389 µS/cm
- the 80th percentile electrical conductivity does not exceed 453 µS/cm and
- the annual salt load does not exceed 576,400 t/year.

The 2023–2024 median (859 µS/cm) and 80th percentile (1,320 µS/cm) at Wilcannia exceed both of the End-of-Valley targets. Despite the high electrical conductivity, the annual salt load of 199,993 t/year was less than the target due to lower flows.

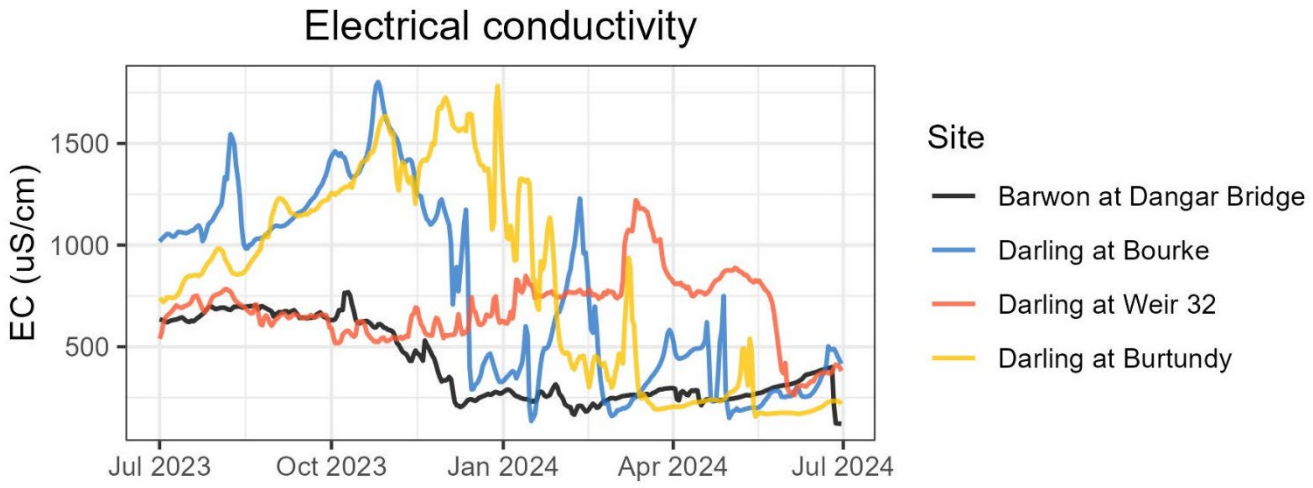

Figure 5: Electrical conductivity (µS/cm) at selected sites in the Barwon–Darling valley

Recreation

Exposure to blue-green algae (cyanobacteria) through ingestion, inhalation or contact during recreational water use can impact human health. A colour alert scale is used with a green alert warning indicating low numbers of blue-green algae but requiring monitoring, an amber alert warning being a heightened level of alert with increased sampling and surveillance, and a red alert warning being a state of action where waters are unsuitable for recreational use. For more information about blue-green algae and algal alerts, see the WaterNSW algae web page (Algae - WaterNSW).

Table 2 shows the sites where a red alert warning for recreational use was issued during 2023–2024. Consistent inflows from the Northern Basin maintained algal numbers in the Barwon-Darling River upstream of Menindee Lakes below the red alert warning level throughout 2023–2024.

Stable conditions resulted in a red alert warning being issued for Lake Wetherell in February, followed by all other lakes in March. The algal blooms persisted in some of the lakes until the end of June 2024.

A return to lower flow conditions in the lower Darling River following the significant flooding in early 2023 resulted in increased algal growth. A red alert warning was issued for the Tolarno monitoring site in July. This bloom slowly impacted all sites down the lower Darling River and into the Wentworth weir pool. The red alert in the weir pool was lifted in December 2023. Algal blooms began to re-establish in the lower Darling in February. A trial to protect environmental water from the Barwon-Darling system through Menindee Lakes and into the lower Darling River allowed a large volume of higher-quality water to be released from Menindee Lakes in late May 2024. This flush dispersed the high numbers of blue-green algae from the lower Darling and the Wentworth weir pools, with warnings removed in June 2024.

Table 2: Distribution of red alert warnings for blue green algae in the Barwon–Darling valley from July 2023 to June 2024

MURRAY RIVER SYSTEM / BILLBONG CREEK, EDWARD & WAKOOL RIVERS / MENINDEE LAKE SYSTEM & LOWER DARLING RIVER	Jul				Aug				Sep				Oct				Nov				Dec				Jan				Feb				Mar				Apr				May				Jun			
425100002 - Menindee Lakes at Lake Wetherell Site 2	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	3	3	3	3	3	3	*	*	*	*	*	*	*
Menindees Lake at Lake Wetherell Station 3	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	3	3	3	3	3	3	*	*	*	*	*	*	*
425100004 - Menindee Lakes at Lake Wetherell Site 4	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	3	3	3	3	3	3	3	3	3	3	3	3	*	*	*	*	*	*	*
425100008 - Menindee Lakes at Tandure Lake Site 8	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	3	3	3	3	*	*	*	*	*	*	*	*	*	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
425100013 Centre Pamamaroo (Site 13)	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	3	3	3	3	3	3	3	3	3	3	3
425100010 Pamamaroo Outlet / Regulator (Site 10)	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	3	3	3	3	3	*	*	*	3	3	3	3	3	*	*	*
425100037 - Menindee Lakes at Copi Hollow	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	3	3	3	*	*	*	3	3	3	3	3	*	*	*	*	*	*	*
425100019 - Lake Menindee Site 19	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Darling River BHWB Pumping Station @ Menindee	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	3	3	3	3	3	3	3	3	3	3	3	3	*	*	*
425012 - Darling River at Menindee Weir 32	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	3	3	3	3	3	3	3	3	3	3	3	*	*	*	*
Talyawalka @ Menindee-Pooncarie Road	3	3	3	3	3	3	3	3	3	3	3	3	3	*	*	*	3	3	*	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
425026 - Darling River at Tolarno	*	*	3	3	3	3	3	3	3	3	3	3	3	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	3	3	3	3	3	3	3	3	3	3	*	*	*
425005 - Darling River at Pooncarie	*	*	*	*	*	*	3	3	3	3	3	3	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	3	3	3	3	3	3	3	3	3	3	*	*	*
425007 - Darling River at Burtundy	*	*	*	*	*	3	3	3	3	3	3	3	3	3	3	3	3	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	3	3	3	3	3	3	3	3	*	*	*
425100049 - Darling River at Ellerslie	*	*	*	*	*	*	*	3	3	3	3	3	3	3	3	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	3	3	3	3	3	3	3	3	3	3	3	3	3	*	*	*
425100050 - Darling River at Tapio	*	*	*	*	*	*	*	3	3	3	3	3	3	3	3	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	3	3	3	3	3	3	3	3	3	3	*	*	*
US Pomona (13KM)	*	*	*	*	*	*	*	*	*	*	*	*	*	3	3	3	3	3	3	3	3	*	*	*	*	*	*	*	*	*	*	*	*	*	*	3	3	3	3	3	3	3	3	3	3	*	*	*
Pomona (@ Boat Ramp)	*	*	*	*	*	*	*	*	*	*	*	*	*	3	3	3	3	*	3	3	3	*	*	*	*	*	*	*	*	*	*	*	*	*	*	3	3	3	*	3	3	3	3	3	3	*	*	*
425100032 - Lake Cawndilla Site 32	*	*	*	*	*	*	*	*	*	*	*	*	3	3	3	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Lake Wetherell adjacent to Lake Pamamaroo Inlet	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	3	3	3	3	3	3	3	3	3	3	3	3	3
Darling River DS of Menindee main weir	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	3	3	3	3	3	3	3	3	3	3	3	3	3
Darling River downstream of train bridge	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	3	3	3	3	3	3	3	3	3	3	3	3	3
GREAT DARLING ANABRANCH	Jul				Aug				Sep				Oct				Nov				Dec				Jan				Feb				Mar				Apr				May				Jun			
Silver City Hwy	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	3	3	3	3	3	3	3	3	3	3	3	3	*	*	*	3	3	3	3	3	3	3	3	3	3	*	*	*	*	*	*	*

Key: * = no red alert 3 = red alert

Extreme water quality events

Above average rainfall during the 2023–2024 summer maintained flow in rivers across the Barwon-Darling catchment (Figure 6). Following the mass fish deaths in March 2023, releases from Menindee Lakes were actively managed throughout 2023–2024 to reduce the risk of further fish deaths while trying to preserve the water resource stored in the lakes.

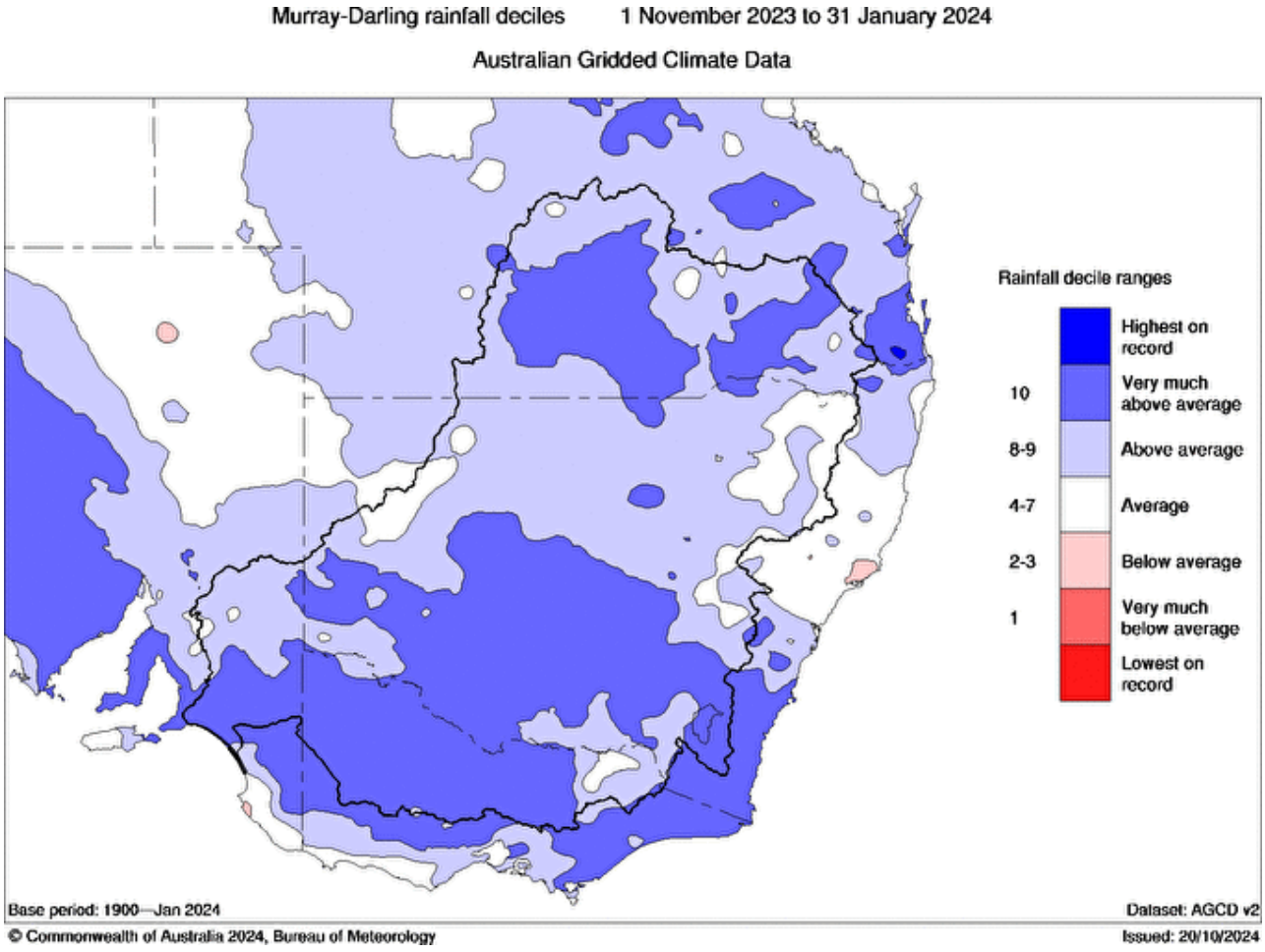

Figure 6: Murray Darling rainfall deciles from November 2023 to January 2024. (Source: BoM)

NSW Fisheries investigated numerous fish death reports for 1 July 2023 - 30 June 2024. These reports are available on the Department of Primary Industries and Regional Development website.

The fish death reports listed for the Barwon-Darling for 2023-2024 were:

- Darling River downstream of the Pamamaroo outlet (25 July) - Report of 10 Murray cod and one golden perch.
- Darling River at Menindee (15 – 19 October) – Small numbers of dead Murray cod and golden perch.
- Darling River at Menindee (3 November) – Small numbers (less than 5) of dead Murray cod and golden perch in the Menindee town weir pool
- Darling River near Menindee (12 November) – Small numbers (less than 20) of dead Murray cod and golden perch
- Barwon River downstream of Walgett (13 December) – Reports of dead carp in a lagoon
- Darling River at Menindee (10 February) – A fish death event impacting golden perch in Weir 32 at Menindee. It was estimated that more than 1,000 fish died. Small numbers of Murray cod, boney herring and carp were also affected. Water quality monitoring data showed that dissolved oxygen levels in the Darling River at the time were above the critical levels

required for fish health through the entire weir pool at Menindee. All deceased fish showed evidence of the external parasite *Lernaea* species, often referred to as anchor worm. This parasite is common throughout the Basin and is often found on fish that are suffering impacts from other environmental factors. Despite detailed investigations and sample analysis, no single factor was identified as the cause of the fish deaths or explained the infestation of external parasites.

Long-term water quality trends

Long-term analysis of WaQI scores in the Barwon-Darling River (Figure 7) shows all sites except Brewarrina have a long-term median rating of moderate to good. The Darling River at Bourke, Menindee and Burtundy had the highest long-term WaQI scores. There are outlier scores at some sites coinciding with droughts and floods across the 2013–2014 to 2023–2024 period.

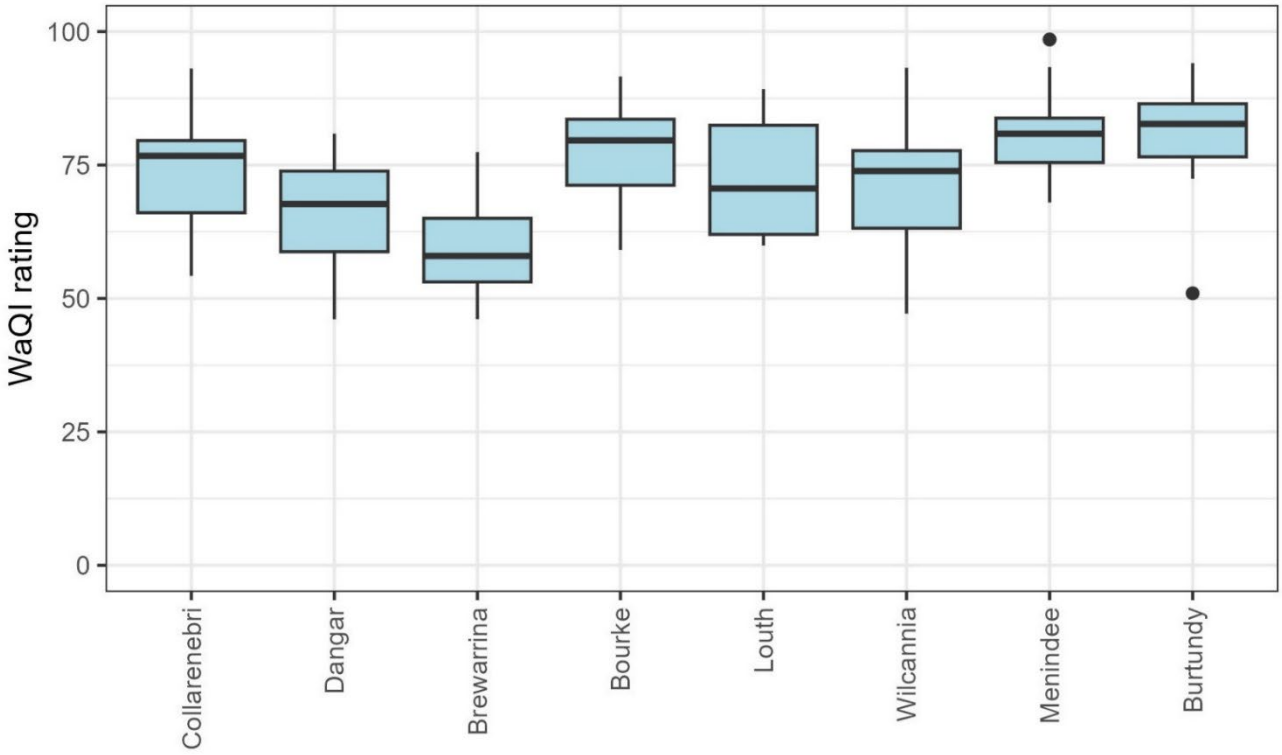

Figure 7: Boxplots showing long-term analysis (2013–2014 to 2023–2024) of WaQI ratings at all sites on the Barwon-Darling River

The number of sites with ratings of good, moderate or poor on the Barwon-Darling River has changed considerably from 2012–2013 to 2023–2024 (Figure 8). The number of sites with a good rating declined from a peak of 6 sites in 2013–2014 to zero sites with a good rating in 2016–2017 and 2021–2022. In 2012–2013, there were 3 sites with a moderate rating, this increased to 7 by 2016 and then gradually decreased until returning to 3 sites in 2022–2023. The number of sites with a poor rating remained between one and zero from 2012–2013 until 2018–2019 before increasing to 4 sites in 2021–2022. The increase in sites with a poor rating coincides with drought followed by repeated flood and hypoxic blackwater events.

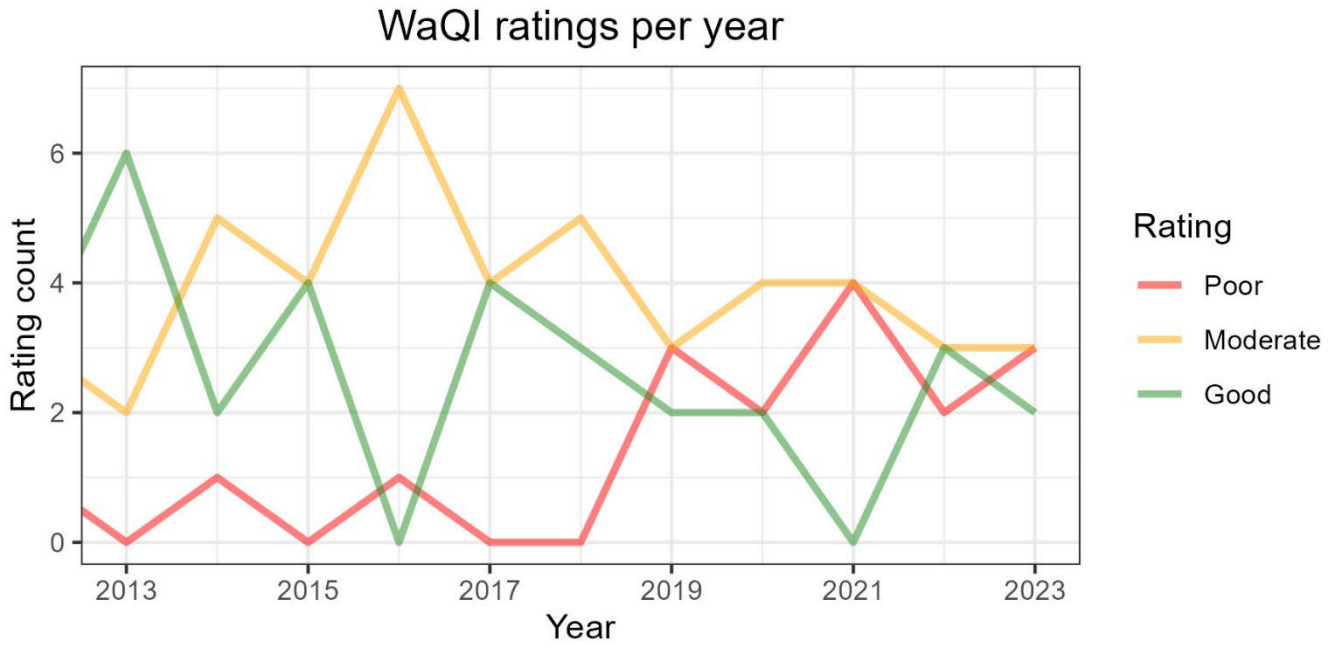

Figure 8: Number of sites with ratings of good, moderate or poor in the Barwon-Darling River from 2012–2013 until 2023–2024

Summary

The quality of the water in a river or stream reflects the underlying climate and geology and the multiple activities and land uses occurring in a catchment area. Numerous factors contribute to the observed results.

In 2023–2024, rainfall in the northern Basin maintained flows in the Barwon and Darling Rivers upstream of Menindee Lakes, resulting in higher turbidity and nutrient concentrations. Five sites returned a lower water quality index score in 2023–2024 than in 2022–2023.

The recharge of shallow saline groundwater by the previous wet years resulted in a reconnection between surface and groundwater. This resulted in elevated electrical conductivity results above the Basin Plan irrigation and flow management targets.

The management of flows to the lower Darling River was a careful balancing act, which was continually monitored and adjusted as needed. Agencies and scientific experts worked together to monitor the dissolved oxygen levels throughout the river system and advise the best operational measures to minimise the risk to aquatic life in the Menindee weir pool. Despite maintaining dissolved oxygen levels above critical thresholds for fish health, more than 1,000 golden perch died in the Menindee weir pool in February and March 2024. Detailed investigations and sample analysis have not identified a clear factor as the cause of the fish deaths.

The trial to protect environmental water from the northern Basin to the southern Basin enabled environmental flows to be protected from Queensland all the way to the Coorong in South Australia for the first time. This flush also dispersed the high numbers of blue-green algae and high salt load from the lower Darling and the Wentworth weir pools.

For more detailed information about water quality issues in the Barwon–Darling catchment see the Barwon–Darling surface water quality technical report (https://water.dpie.nsw.gov.au/__data/assets/pdf_file/0004/456925/Water-quality-technical-report-for-the-Barwon-Darling-surface-water-resource-plan-area-SW12.pdf).

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