Murray valley annual surface water quality report: 2022–2023

Key Points

- Flow during July 2022 to June 2023 was characterised by heavy rain falling across much of the catchment. This rain resulted in several large flow events throughout the catchment.
- Flooding was the main driver of water quality in the Murray catchment. The water quality index indicated that of the 13 sites, one site was rated as good, 5 as moderate and 7 as poor. As a result of flooding, 9 sites returned a lower water quality index score in 2022–2023, compared to 2021–2022.
- All sites were below the Basin Plan agriculture and irrigation salinity target of 833 µS/cm (microSiemens per centimetre) and the End-of-Valley salinity target at the South Australian border of 412 µS/cm (for the 80th percentile) during 2022–2023.
- Most red alert warnings for blue-green algae in the Murray catchment occurred around Hume Dam from August 2022 until June 2023. A few red alerts were also issued in the Murray River at Fort Courage and the Wakool River during 2022–2023.

The water quality data used in this report is collected on a monthly frequency at 13 sites in the Murray valley for the State Water Quality Assessment and Monitoring Program and the River Murray water quality monitoring program on behalf of the Murray Darling Basin Authority. These programs are responsible for collecting, analysing and reporting the ambient water quality condition of rivers in NSW. This annual report summarises the surface water quality data collected in the Murray Valley from July 2022 to June 2023. The location of monitoring sites is shown in Figure 1.

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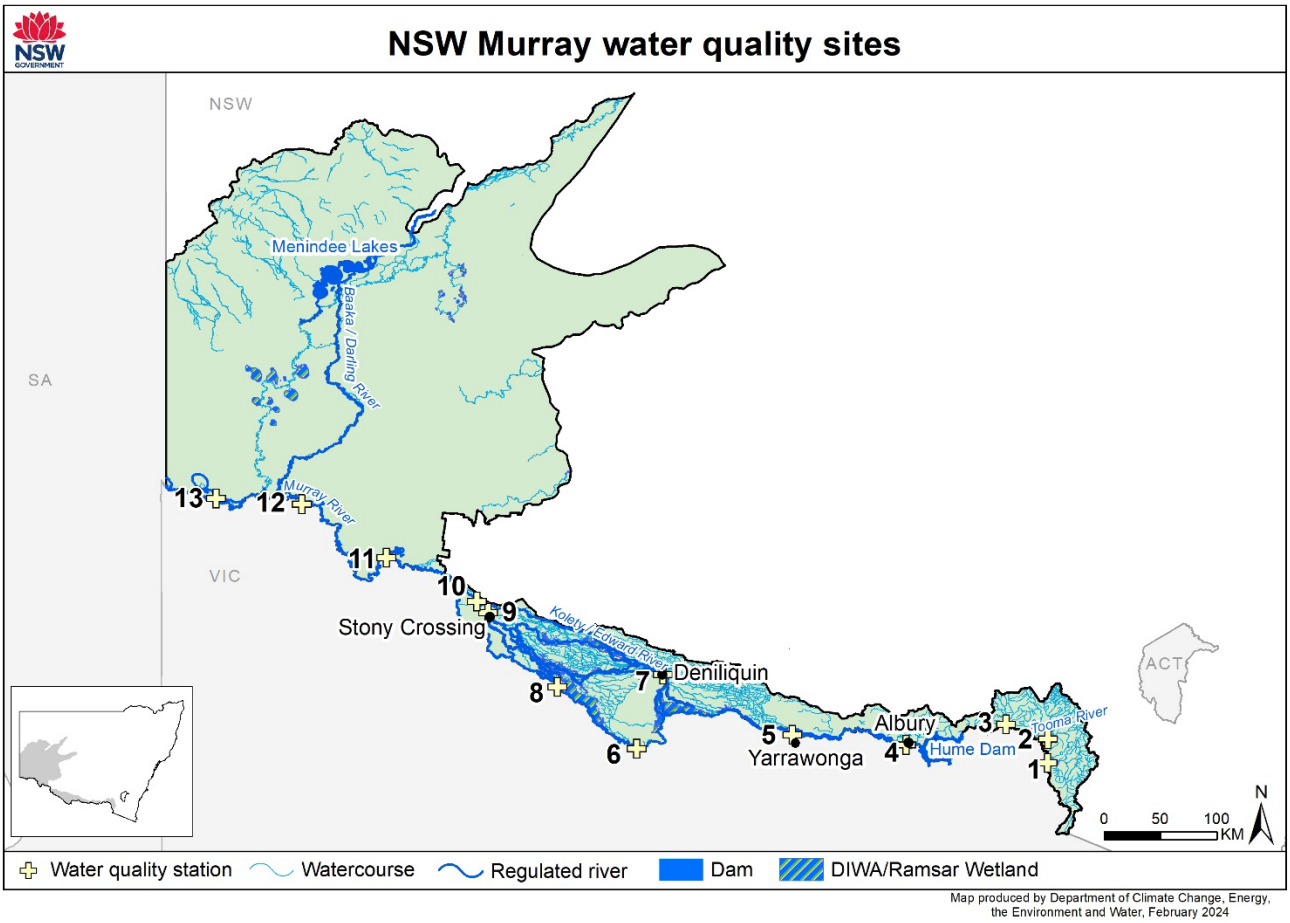

Figure 1: Location of routine water quality monitoring sites in the Murray valley

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

Site number	Site name	Water Quality Zone	Station number
1	Murray River at Indi Bridge	Murray unregulated uplands	401556
2	Tooma River at Warbrook	Murray unregulated uplands	401003
3	Murray River at Jingellic	Murray unregulated uplands	401201
4	Murray River at Albury	Murray (upper middle)	409001
5	Murray River downstream Yarrawonga Weir	Murray (upper middle)	409025
6	Murray River at Moama	Murray (upper middle)	40910087
7	Kolety/Edward River at Deniliquin	Kolety/Edward, Wakool	409003
8	Murray River at Barham	Murray (upper middle)	409005
9	Wakool River at Stoney Crossing	Kolety/Edward, Wakool	409013
10	Wakool River at Kyalite	Kolety/Edward, Wakool	409034
11	Murray River at Euston Weir	Murray (lower)	414209
12	Murray River at Merbein	Murray (lower)	414206
13	Murray River at Lock 8	Murray River (lower) lowlands	42610001

Catchment description

The Murray region is bordered by the Great Dividing Range to the east, the Victorian border in the south and the Murrumbidgee region in the north. It covers an area of over 97,800 km^2. The Murray River rises in the Alps at 1,430 m above sea level. The catchment above Hume Dam is the major source of water for the Murray River. The total length of the Murray River is 2,530 km, of which 1,880 km of its length creates the border between NSW and Victoria, before flowing to the river mouth in South Australia.

The natural flow regime is characterised by high winter/spring flows and low summer/autumn flows resulting from run-off derived from its alpine headwaters and associated tributaries. The five longest tributaries are the Mitta Mitta River, Kiewa River, Tooma River, Black Dog Creek and Swampy Plain River. The significant inter-valley diversions of both the Snowy-Tumut and Snowy-Murray Developments of the Snowy Mountains Hydroelectric Scheme impact on the Upper Murray River Water Source. This is a direct result of the operation of Murray 1 and Murray 2 Power Stations and their final storage dam, Khancoban Pondage. Flows in the Murray River system are modified by a highly regulated weir system, water extraction and structures. Yarrawonga Weir is the point of the greatest diversion of water from the Murray River. The two main irrigation channels from Lake Mulwala are the Mulwala Canal, on the NSW side, and the Yarrawonga Main Channel, on the Victorian side. The Mulwala Canal has a discharge capacity of about 10,000 ML/day and provides flows to the Edward and Wakool rivers and numerous distributary streams and canals. Torrumbarry Weir diverts flows into Deniboota Canal in NSW and National Channel in Victoria. Euston Weir regulates water for the Robinvale Irrigation District. The Murrumbidgee River flows into the Murray River upstream of Euston Weir. There are two sites in the Murray Water Resource Plan area listed as wetlands of international importance under the Ramsar Convention. The NSW Central Murray State Forests consist of three discrete but interrelated forest areas the Millewa, Koondrook-Perricoota and Werai forests. Blue Lake in Kosciuszko National Park was listed under the Ramsar Convention in 1996. The Living Murray icon sites within NSW include the Millewa Forest, Koondrook-Perricoota Forest, the eastern section of the Chowilla floodplain and the River Murray Channel. The mountainous areas in the upper Murray catchment are predominantly native vegetation and grazing. Dryland cropping increases downstream of Hume Dam with irrigation areas receiving water through the regulation of flows from the Murray River (DoIW 2018).

Catchment conditions during 2022–2023

Flow during 2022–2023 was characterised by heavy rain falling across much of the catchment, the majority falling in 2022 (Figure 2A). Discharge in the Murray River downstream of Yarrawonga Weir

peaked at almost 179,000 megalitres per day (ML/day) on 16 November 2022 (Figure 2C). These large flows resulted in high discharge (above 25,000 ML/day) downstream at Barham from September until December 2022 when flows reduced below 10,000 ML/day until June 2023 (Figure 2C).

Hume Dam began the year at 94% capacity (Figure 2B). During November, the dam had been operated in controlled release mode to create airspace and reduce the impact of the floods on downstream communities. In November, the release volume was increased to 95,000 ML/day before being reduced to 65,000 ML/day as rainfall moved in and streamflow responses were observed upstream and downstream of the dam (MDBA, 2022).

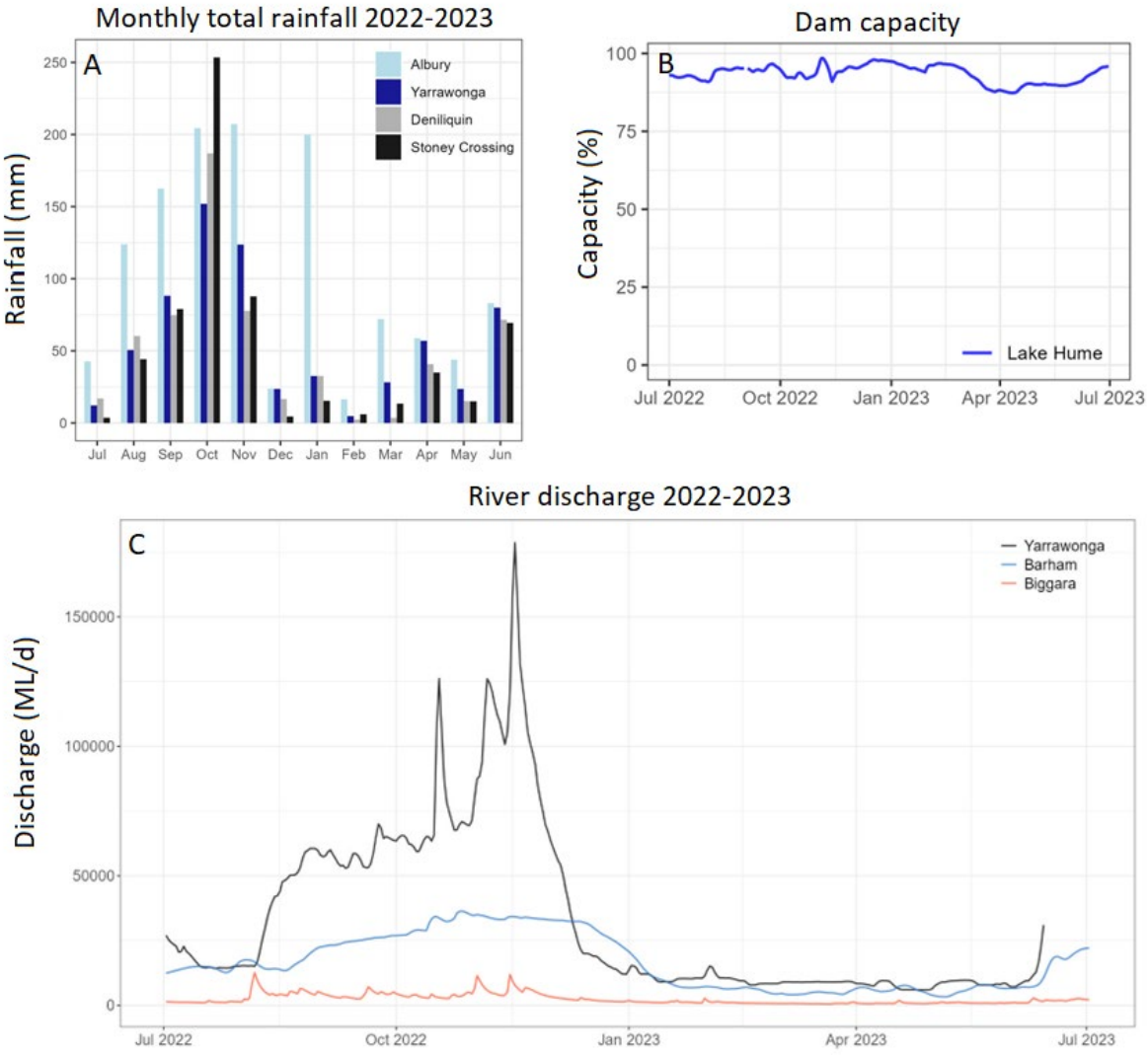

Figure 2: Catchment conditions for selected stations in the Murray catchment from July 2022 to June 2023 for A: Monthly total rainfall (mm) B: Dam capacity (%) and C: River discharge (ML/day)

Water quality for water dependent ecosystems

NSW uses a Water Quality Index (WaQI) as a tool to communicate complex and technical water quality data in a simple and consistent way. 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 a set of predetermined water quality targets to calculate a score between 1 and 100. A score of 100 represents a site in pristine condition, while a score of one is a very 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 5. Sites where there has been 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 Murray Valley declined in 2022–2023 for 3 of the 13 sites compared to 2021–2022. There was no change in the ratings for the remaining sites.

- The Murray River at Albury and Merbein declined from good to moderate.
- The Murray River at Euston Weir declined from good to poor.
- The Murray River at Indi Bridge remained good.
- The Murray River at Jingellic, the Murray River downstream Yarrawonga Weir, and the Kolety/Edward River at Deniliquin remained moderate.
- The Murray River at Moama, Barham and Lock 8, the Wakool River at Stoney Crossing and Kyalite, and the Tooma River at Warbrook remained poor.

The Tooma River at Warbrook has historically had poor water quality with high turbidity, nutrient concentrations and electrical conductivity.

Two sites in the mid Murray River at Moama and Barmah had high turbidity, total phosphorus, electrical conductivity and low dissolved oxygen. The 2 sites on the Wakool River both had high nutrients, electrical conductivity and low dissolved oxygen due to blackwater events.

The high inflows from the Darling River into the Murray River at Wentworth increased the turbidity and nutrient concentrations at Lock 8 resulting in a poor rating.

Compared 2021–2022, the water quality index score for one site (the Tooma River at Warbrook), improved but its rating remained poor. Nine sites returned a lower index score than in 2021–2022 and 3 sites showed minimal change.

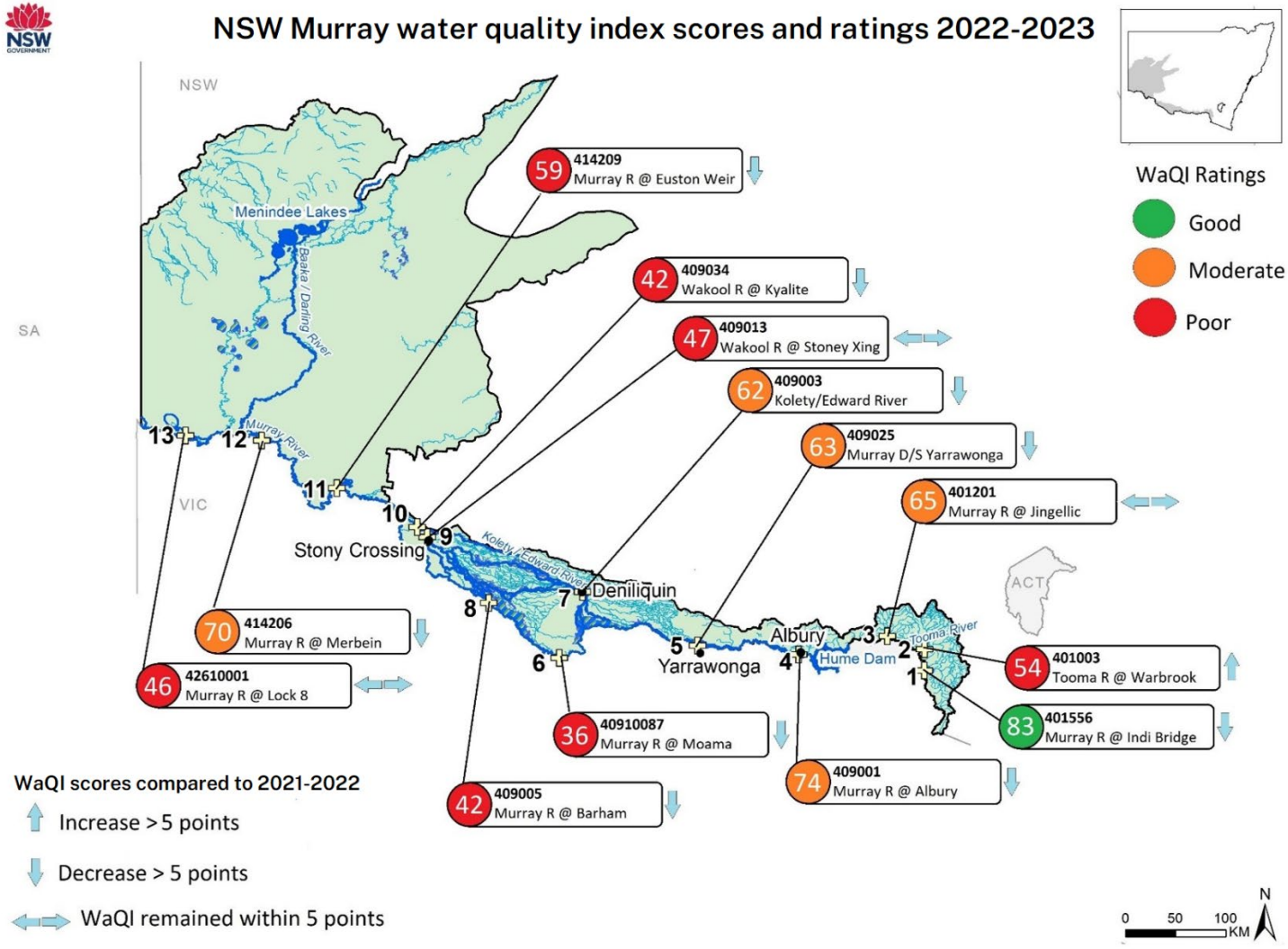

Figure 3: Water quality index scores and ratings for the Murray valley

The pH largely ranged between 7 and 8 at all sites in the Murray valley and would not impact on the health of aquatic ecosystems or agricultural enterprises.

There was a general pattern of increased turbidity with distance down the catchment, reflecting the impact of the cumulative effects of land use, soil disturbance and human activity on water quality. Turbidity decreased in the lower Murray River at Euston Weir and Merbein but increased again at Lock 8 with the inflow of highly turbid floodwaters from the Darling River and Great Darling Anabranch at Wentworth. Total nitrogen and total phosphorus concentrations followed the same pattern as turbidity, with increasing concentrations with distance downstream until the lower valley, and then increased markedly downstream of the Darling River inflows.

Dissolved oxygen levels fluctuated between sites in response to local drivers. The site medians were between 75 and 100% saturation. Major flooding resulted in the flushing of organic matter from the lowland floodplain forests and into waterways. The rapid breakdown of this material by bacteria caused dissolved oxygen levels in parts of the Kolety/Edward-Wakool River system to decline to critical levels for fish health.

Electrical conductivity in the Murray River is generally low. The release of water from Hume Dam provides dilution flows. The electrical conductivity of surface water in the Wakool River and Murray River lowlands did increase but still suitable for irrigation purposes. Again, floodwater from the Darling River increased electrical conductivity in the Murray River at Lock 8.

Summary statistics for the key water quality parameters at each monitoring site in the Murray valley 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.

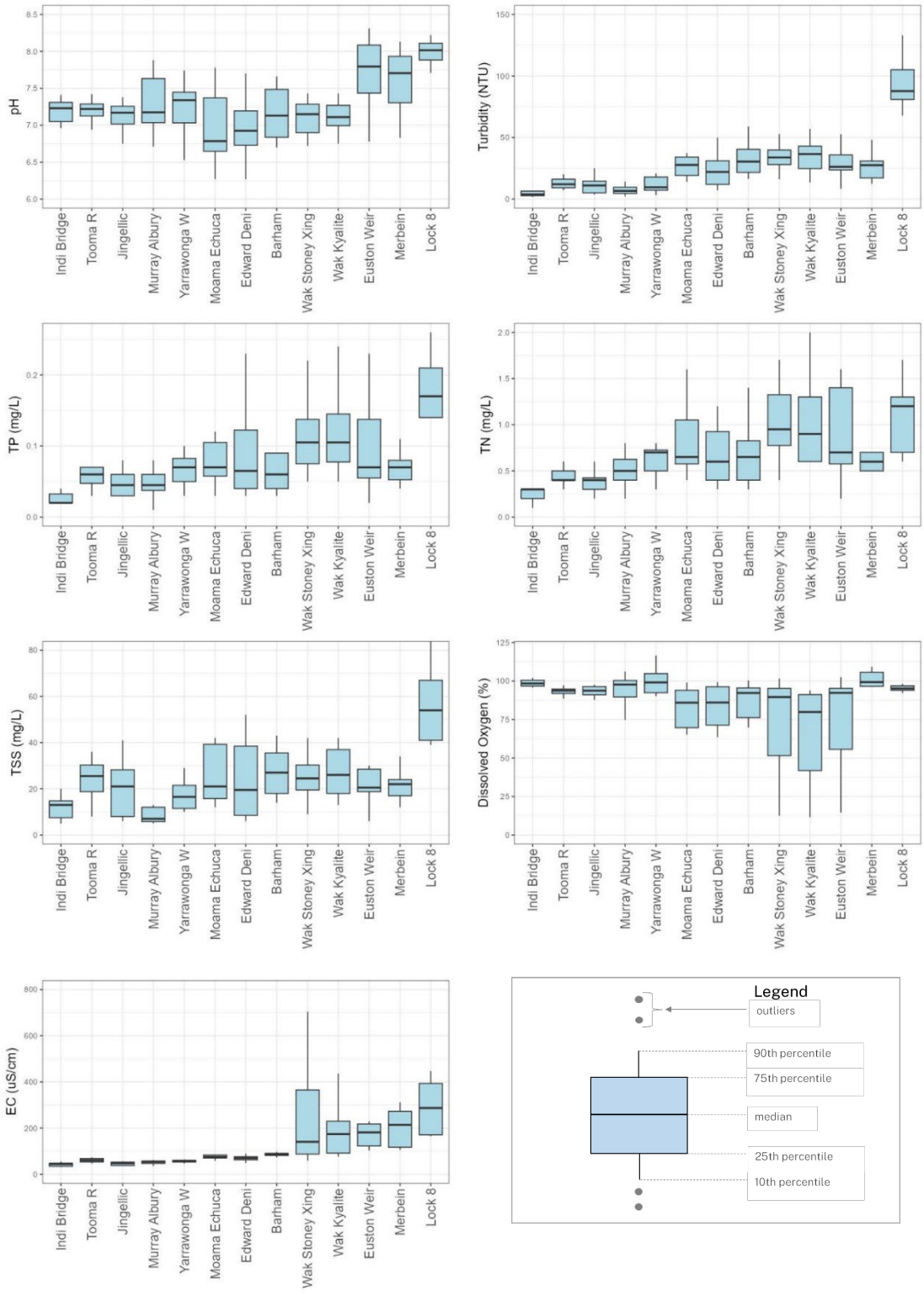

Figure 4: Water quality data by site, moving upstream to downstream from left to right. The water quality parameters shown are pH, Turbidity, Total phosphorus (TP), Total nitrogen (TN), Total suspended solids (TSS), Dissolved oxygen, and electrical conductivity (EC).

Irrigation and salinity

There are 37 continuous electrical conductivity monitoring sites in the Murray valley managed by NSW agencies with more sites managed by Victoria agencies. Salinity in the lower Murray (Mallee region) can approach levels where it will impact agricultural productivity. The numerous monitoring sites assist in the operation of various salt interception schemes in the lower Murray by both NSW and Victorian agencies to reduce salt inputs to the Murray River from saline groundwater.

Electrical conductivity levels are generally low in the upper Murray River with regular inflows diluting salt and keeping electrical conductivity low. The mean daily electrical conductivity in the Murray River fluctuates throughout the year (Figure 5), though results do not exceed the agriculture and irrigation salinity target of 833 µS/cm, keeping the risk of impacts on soil and crop health low.

The Basin Salinity Management Strategy End-of-Valley salinity targets for the Murray River at the NSW/South Australian border is that the 80th percentile electrical conductivity does not exceed 412 µS/cm. The 80th percentile for the Murray River downstream of Rufus River (upstream of the border) from 2022 to 2023 was 397 µS/cm, which is less than the End-of-Valley target value.

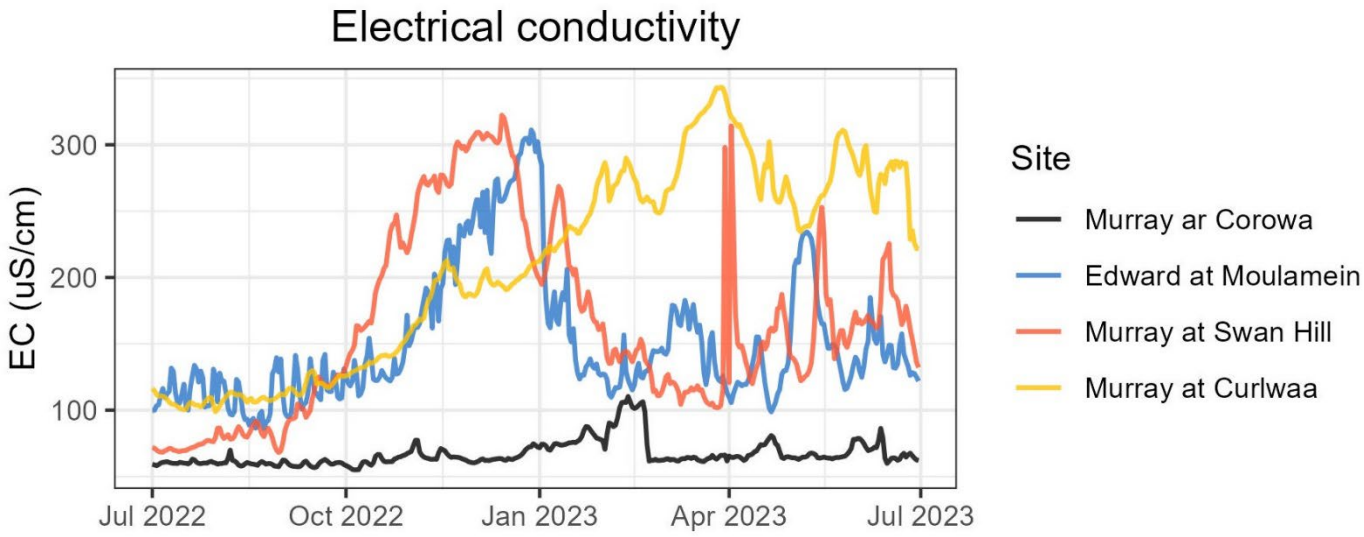

Figure 5: Electrical conductivity (µS/cm) in the Murray valley

Recreation

Exposure to blue-green algae (cyanobacteria) through ingestion, inhalation or contact during recreational use of water can impact on 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 indicates the distribution of algal alerts during 2022 to 2023 for selected sites along the Murray River Valley. The majority of red alerts for recreational use were issued in Hume Dam from August 2022 until June 2023. Hume Dam is known to have regular algal blooms, especially in summer. Inflow from the heavy rainfall events would also have flushed nutrients such as nitrogen and phosphorus into the dam which has encouraged algal growth. In November 2022, releases from Hume Dam were increased from 85,000 ML/day to 95,000 ML/day to create airspace and minimise flood impacts. The releases did not impact red alerts at the sites downstream of the dam. The red alert warning for recreational use in the Murray River at Fort Courage was due to algal rich water flowing into the Murray River from the Great Darling Anabranch.

Table 2: Distribution of algal alert levels along the Murray River Valley July 2022 to June 2023

MURRAY RIVER SYSTEM	Jul					Aug				Sep					Oct				Nov				Dec					Jan				Feb				Mar				Apr				May				Jun			
Hume Dam	2	2	2	2	2	2	3	3	3	2	2	2	2	2	2	2	3	3	3	3	2	3	2	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	3	3	3	2
Murray River at Union Bridge (Albury)	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	*	*	*	*	*	*	*	*	*	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Murray River at Corowa	1	1	2	2	2	2	1	1	1	1	1	2	2	2	2	2	2	2	2	2	1	1	1	1	*	*	*	*	*	*	*	*	*	*	*	*	*	*	2	2	2	2	1	1	1	1	2	2	2	2
Murray River downstream Yarrawonga Weir	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	2	2	2	2	2	1	1	1	1	1	1	1	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	1	1	1
Murray River at Tocumwal	1	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	*	*	*	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	2	2	2	2	*	*
Murray River at Moama	2	2	*	*	*	*	1	1	1	1	1	1	*	*	*	*	*	*	*	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	2	2	2	2	1	1	1
Murray River at Barham	2	2	1	1	1	1	1	1	1	1	1	1	*	*	*	2	2	2	2	2	1	1	1	1	1	1	1	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	1	1	1
Murray River at Murray Downs	2	2	1	1	1	1	2	2	2	2	2	2	*	*	*	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Lake Benanee at recreation area	*	*	1	1	1	1	1	1	1	1	1	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	1	1	1	1	1	1	*	*	*	*	2	2	2	2	2	2	2	2	2	2	2	2
Murray River upstream Euston Weir	2	2	1	1	1	1	1	1	1	1	1	1	1	1	*	*	*	*	*	*	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	1	1	1	1	2	2	2	2	1	1	1	1	1	2	2	2
Murray River at Mt Dispersion	2	2	1	1	1	1	1	1	1	1	1	*	*	*	*	2	2	2	2	2	1	1	1	1	*	*	*	*	*	*	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Murray River at Buronga	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	2	2
Murray River at Curlwaa	2	2	2	2	2	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	*	*	*	*	*	*	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Murray River at Fort Courage	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	3	3	3	3	3	3	3	2	2	2	2
Murray River at Lock 8	1	1	*	*	*	*	*	*	*	*	*	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2
BILLBONG CREEK, EDWARD & WAKOOL RIVERS	Jul					Aug				Sep					Oct				Nov				Dec					Jan				Feb				Mar				Apr				May				Jun			
Billabong Creek at Walbundrie	1	1	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	*	*	*	*	*	*
Gulpa Creek at Mathoura	2	2	*	*	*	*	1	1	1	1	1	1	*	*	*	*	*	*	*	*	2	2	2	2	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	2	2	2	2	2	1	1
Edward River at Deniliquin	2	2	*	*	*	*	1	1	1	1	1	1	*	*	*	*	*	*	*	*	2	2	2	2	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	2	2	2	2	2	1	1
Edward River at Moulamein	2	2	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	2	2	2	2	2	*	*
Wakool River at Wakool	2	2	2	2	2	2	*	*	*	*	*	*	*	*	*	*	*	*	*	*	1	1	1	1	1	1	1	1	1	2	2	2	2	2	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Wakool River at Stoney Crossing	2	2	1	1	1	1	*	*	*	*	*	1	1	1	*	*	*	*	*	*	1	1	1	1	1	*	*	*	*	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	2	2	2	2
Wakool River at Kyalite	2	1	*	*	*	*	1	1	1	1	1	1	1	1	1	*	*	*	*	*	1	1	1	1	1	1	1	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2

Key : * = Nil/Low alert 1 = green alert 2 = amber alert 3 = red alert

Extreme water quality events

Spring 2022 was the wettest spring on record (since 1900) for New South Wales. In October, heavy rainfall led to widespread flooding in the Murray–Darling Basin, impacting many towns in inland New South Wales (Figure 6 - BoM, 2023 and Figure 7). The heavy rains led to substantial increases in water storage levels, with many storages spilling. With flooding on this scale came an increased risk of hypoxic blackwater events.

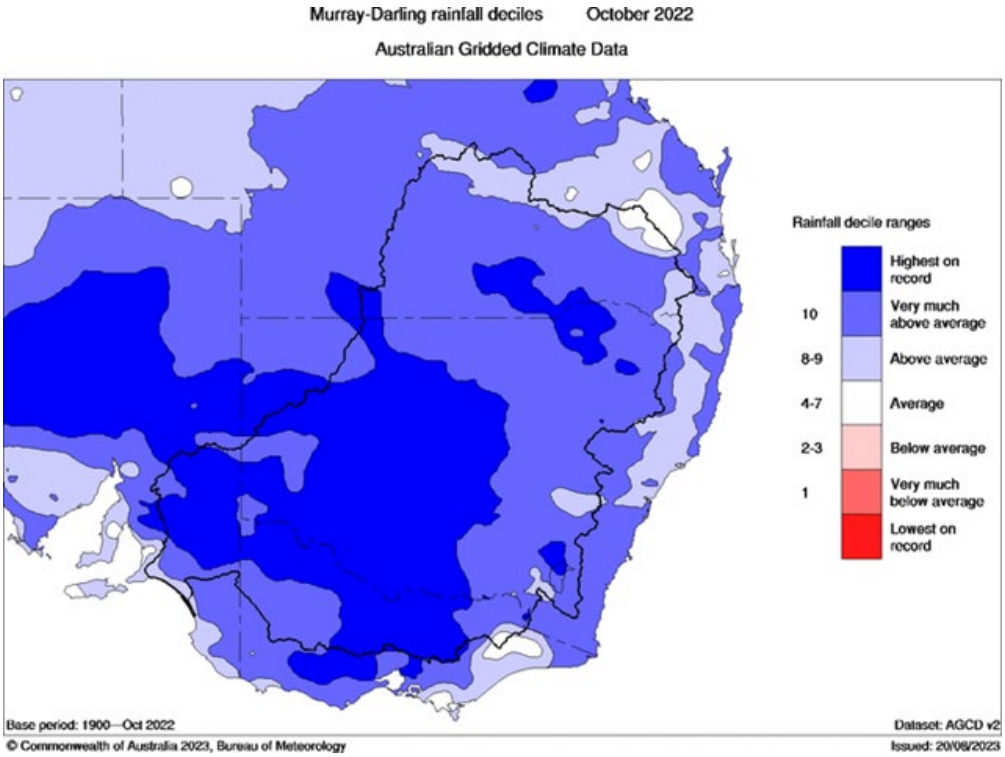

Figure 6: Murray Darling rainfall deciles for October 2022. (Source: BoM)

Figure 7: Floodwaters in the Murray Valley near Albury, 18 November 2022. (Source: Sentinel Hub)

Hypoxic, or low oxygen blackwater occurs when organic material, such as sticks, leaves, bark and grass is broken down in the floodwater or washed off the floodplain into the river. The breakdown of this material by bacteria can rapidly use up all the oxygen in the water. The dark appearance of the water is due to the release of tannins as the organic matter decays. Whilst this breaking down and recycling of organic material is an essential natural process of rivers, a sudden drop or prolonged exposure to low oxygen levels can have adverse impacts. Fish and other aquatic animals have difficulty surviving under low oxygen conditions. 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.

In the Upper Murray, releases from Hume Dam were increased in November 2022 to create airspace and minimise impacts of flood to communities downstream. Dissolved oxygen remained above 4.0 mg/L at Heywood's Bridge, downstream of the Hume Dam for 2022–2023.

There were concerns the Hume Dam air-space releases might cause dissolved oxygen issues around the Barmah-Millewa Forest.

The Kolety / Edward-Wakool system is a large anabranch of the Murray River. In 2022, the floodwaters from Victoria's Goulburn River flowed into the Murray River at the same time as floodwater arrived in the mid-Murray from the upper Murray and tributaries. This caused water to back up in the Murray River near Barmah, forcing water to flow north through the Millewa Forest and adjacent farmland into the Kolety / Edward-Wakool river system (CEWH, 2023).

High flows flooding low-lying areas of the forests, combined with increasing water temperatures and high loads of leaf litter on the forest floor saw declining dissolved oxygen in the Kolety/Edward -Wakool area in September 2022. Agencies and scientific experts worked together to continually monitor the dissolved oxygen levels throughout the river system. Environmental water was delivered through Murray Irrigation escapes providing an oxygenated refuge for fish to move into. Oxygenated water was delivered to the Kolety / Edward River upstream of Deniliquin via the Mulwala canal. Deliveries began on 17 September 2022 at the Thule escape at 50 ML/day. On 26 September 2022 due to a continued drop in oxygenated water in the Wakool and Niemur rivers, deliveries of water for the environment through other escapes commenced. Despite these releases, NSW Fisheries investigated several fish death reports for 1 July 2022 - 30 June 2023. These reports are listed on the Department of Primary Industries website.

The likely cause for most reports was due to widespread flooding in the Murray Valley and associated organic material entering waterways resulting in the deoxygenation of the water and

subsequent fish deaths. Ongoing investigations are still being conducted for some reports to determine the likely causes.

The reports listed for the Murray for 2022–2023 were:

- Rufus River near Wentworth, (30 October) - Report of 1 to 5 dead Murray Cod.
- Frenchmans Creek upstream Scaddings Bridge, near Wentworth (2 November) - Report of 1 to 10 dead Murray Cod.
- Billabong Creek near Moulamein (6 November) - Report of 3 dead Murray Cod.
- Murray River at Pental Island, upstream Swan Hill (8 November) - Report of approximately 50 dead fish. Species affected included Murray Cod.
- Murray River, Murray Downs Marina area near Swan Hill, (12 November) - Report of approximately 50 to 100 dead fish. Species affected were Murray Cod.
- Edward River upstream of Deniliquin (12 November) - Report of approximately 20 dead Murray Cod.
- Murray River (Murray/ Edward-Wakool floodplain) near Goodnight, upstream of Wakool Junction (13 November) - Report of hundreds of dead fish. Species affected included Murray Cod, Golden Perch and Silver Perch.
- Billabong Creek upstream from Moulamein (14 November) - Report of 10 to 20 dead fish. Species affected included Murray Cod.
- Mildura Marina, Murray River (15-16 November) - Report of 1 to 5 dead fish. Species affected included Murray Cod, Golden Perch and Bony Bream.
- Murray River, junction with Darling River, near Wentworth (22 November) - Report of two dead Murray Cod and two Carp.
- Billabong Creek backwater area, upstream from Moulamein (30 November) - Report of up to one hundred dead Murray Cod.
- Lake Hume, near Albury (4 February and ongoing sporadic reports until 1 March) - Report of tens of dead fish over a series of events, with Redfin Perch the only species affected.

Summary

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

In 2022 to 2023, flooding was the key driver of water quality. Increased runoff carries high volumes of sediment and attached nutrients into waterways resulting in 12 of the 13 water quality monitoring sites being rated as moderate or poor. In contrast, the high flows maintained electrical conductivity below the irrigation targets. As a result of the flooding, 9 sites returned a lower water quality index score in 2022–2023 compared to 2021–2022.

The management of inflows into the rivers, and their release, 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.

Although hypoxic blackwater events may result in the loss of fish and other aquatic life, the impacts of these events on the environment 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 benefit from the increased production in the river, boosting food supplies and supporting breeding cycles.

The flushing of nutrients into Hume Dam by floodwaters may have contributed to the high potentially harmful blue-green algal numbers from August 2022 to June 2023 and occasional alert warnings for recreational use in the Murray, Kolety/Edward and Wakool rivers.

For more detailed information about water quality issues in the Murray catchment see the Murray surface water quality technical report (https://www.industry.nsw.gov.au/__data/assets/pdf_file/0009/305757/Water-quality-technical-report-for-the-Murray-Lower-Darling-surface-water-resource-plan-area-SW8.pdf).

Long-term water quality trends

Analysis of WaQI scores from 2012–2013 to 2022–2023 shows large variability across the Murray River catchment (Figure 8). The Tooma River, Murray River at Moama and Barham, and both sites on the Wakool River had the lowest long-term median WaQI scores and were all in the poor range. The remaining 8 sites had a rating of moderate or good. Most sites had one or two much lower WaQI scores which would have been in response to extreme events over the past 10 years, such as droughts or floods and hypoxic blackwater events impacting water quality.

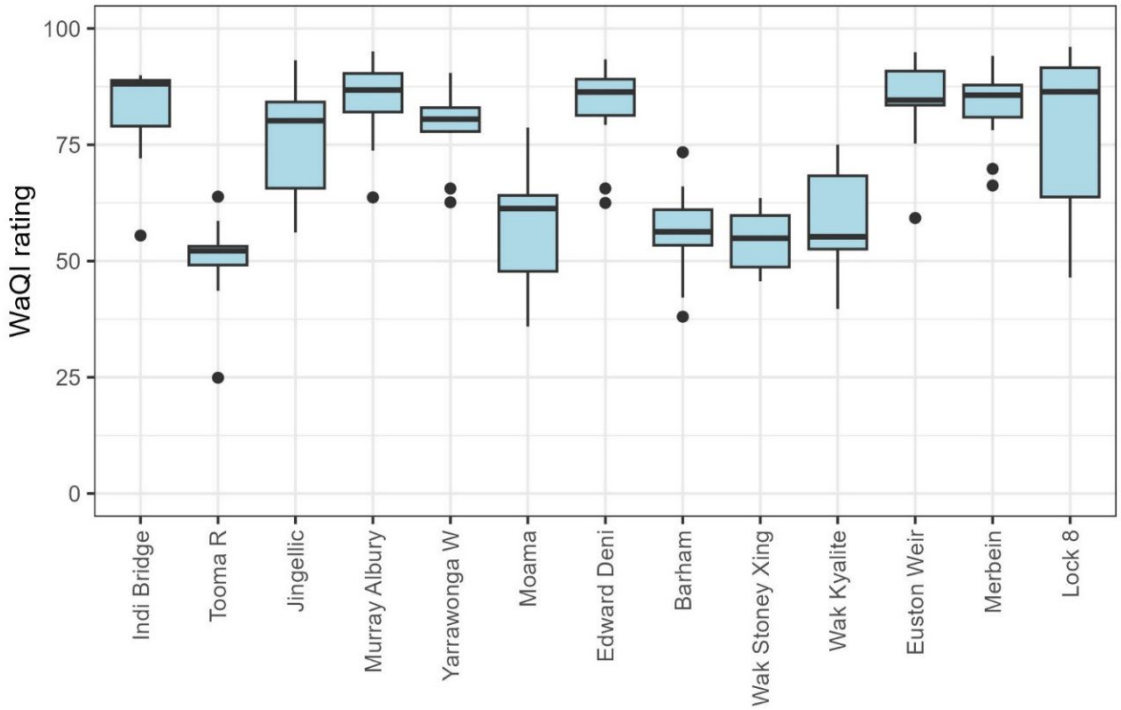

Figure 8: Boxplots showing long-term (2012–2013 to 2022–2023) WaQI ratings for every site in the Murray valley

The number of sites with ratings of good, moderate and poor followed a similar trend over time to other inland rivers, fluctuating from year to year in response to droughts and floods (Figure 9). The number of sites with a good rating declined from 8 in 2015–2016 to one in 2016–2017, coinciding with flooding and a hypoxic blackwater event in 2016. Good ratings increased back up to 8 sites 2018–2019 before again decreasing back to 1 after a series of floods. The number of sites with a poor rating followed an opposite trend, increasing in 2016–2017 and 2022–2023.

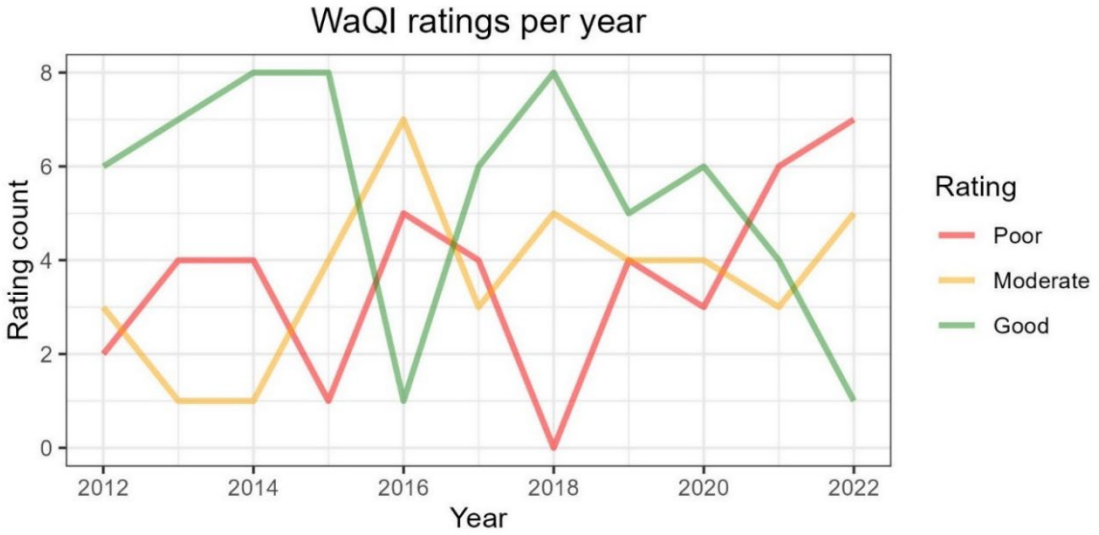

Figure 9: Graph summarising long-term water quality index ratings (2012–2013 to 2022–2023) for every site in the Murray Valley by year

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