South Coast 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. The widespread rainfall led to several large flow events occurring simultaneously across the Clyde, Tuross and Towamba Rivers.
- The heavy rains kept water storage levels high throughout the year.
- Flooding was the main driver of water quality in the South Coast catchments. The water quality index indicated that of the 7 sites in the catchment, one was rated as good, 4 as moderate and 2 as poor. Compared to the 2021–2022 results, the water quality index score improved at 3 sites, and declined at 4 sites.
- Electrical conductivity was low across the South Coast catchments and did not pose a threat to agricultural use or aquatic ecosystems.
- There were no red alert warnings issued for blue-green algae in Brogo Reservoir or the Brogo River downstream of the dam during 2022 to 2023.

The water quality data used in this report is collected on a monthly frequency at 7 sites in the South Coast valley for the State Water Quality Assessment and Monitoring Program. The program is 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 South Coast Valley from July 2022 to June 2023. The location of monitoring sites is shown in Figure 1.

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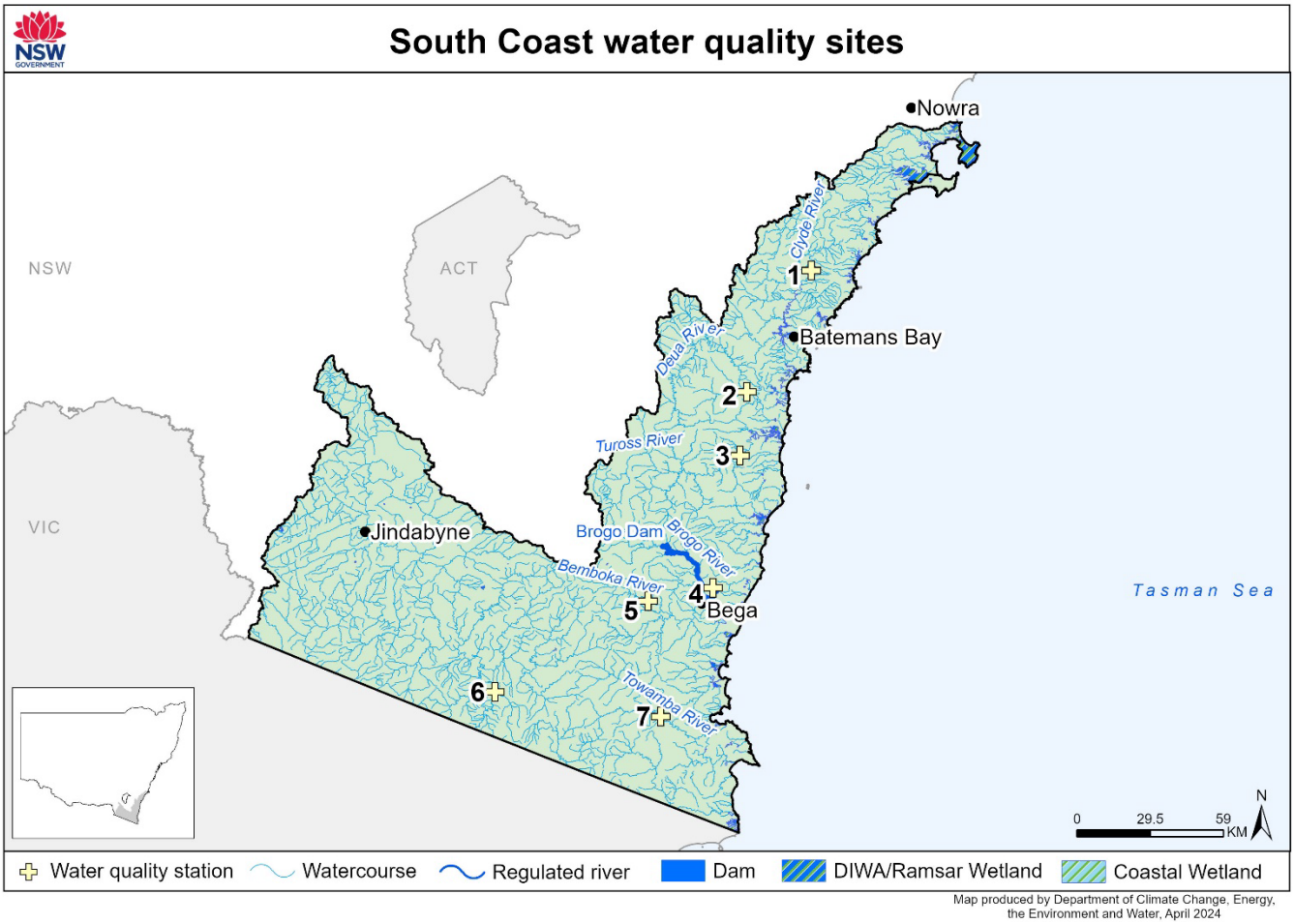

Figure 1: Location of routine water quality monitoring sites in the South Coast valley

Table 1: Site information for each monitoring site in the South Coast catchments. Refer to Figure 1 and site numbers for location of each site.

Site number	Site name	Water Quality Zone	Station number
1	Clyde River	South Coast Unregulated Lowlands	216002
2	Deua River	South Coast Unregulated Lowlands	217007
3	Tuross River	South Coast Unregulated Lowlands	21810018
4	Brogo River	South Coast Regulated	219025
5	Bemboka River	South Coast Unregulated Lowlands	21910054
6	Little Plains River	South Coast Montane	222004
7	Towamba River	South Coast Unregulated Lowlands	22010241

Catchment description

The South Coast region of NSW covers an area of 14,440 km^2 and extends from the Victorian border to the Greater Metropolitan region in the north and to the Murray and Murrumbidgee catchments in the west. Most of the rivers in the South Coast rise in the foothills or mountainous regions in the west and flow east onto floodplains before entering the sea, except the Snowy River which flows south into Victoria. Upstream areas are generally undeveloped with in-tact forested areas, whereas some lowland areas have been cleared for agriculture. Several significant national parks are within the South Coast region including Jervis Bay National Park.

The South Coast region contains several river basins including the Clyde River in the upper-south coast, the Tuross, Deua and Moruya Rivers in the mid-south coast and the Bega, Brogo, Snowy, Murrah and Towamba Rivers in the far-south coast.

Population centres within the South Coast region include Bega, Narooma, Ulladulla, Batemans Bay and Moruya. Tourism is a major industry throughout the region. Beef grazing and dairy farming are the main agricultural activities, with oyster farming also an important industry throughout the region. Most of the major storages are within the upper catchment of the Snowy River (Eucumbene, Guthega, Island Bend and Jindabyne dams), Brogo River is also regulated by Brogo Dam, several smaller weirs and off-stream storages are also present throughout the South Coast.

Catchment conditions during 2022–2023

Flow during 2022–2023 was characterised by heavy rain falling across much of the catchment from July 2022 through to April 2023 (Figure 2A). The widespread rainfall led to several large flow events occurring simultaneously across the Clyde, Tuross and Towamba Rivers, the largest of which resulted in a flow event greater than 70,000 ML/day on the Towamba River on 25 October 2022 (Figure 2C). The storage capacity of Brogo Dam remained above 101% (9 GL) for the entire year, reaching 135% capacity near the end of October 2022 (Figure 2B).

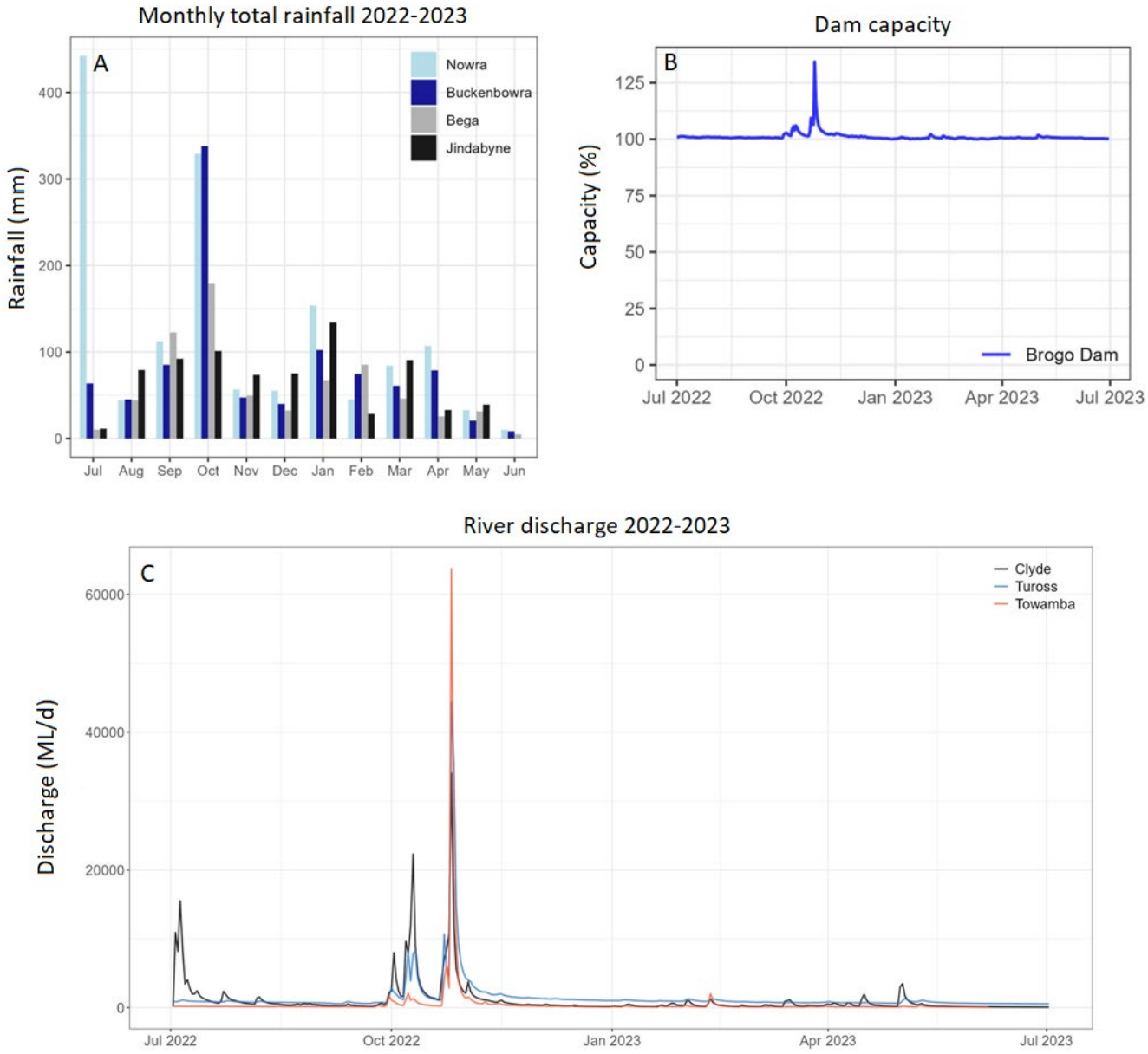

Figure 2: Catchment conditions for selected stations in the South Coast catchments from July 2022 to June 2023 for A: Monthly total rainfall (mm) B: Dam capacity (%) and C: River discharge (ML/day).

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 3. 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 South Coast Valley improved in 2022–2023 for 2 of the 7 sites compared to 2021–2022. The rating for two sites declined and there was no change for 3 sites from the previous year.

- The Brogo River improved from moderate to good.
- The Towamba River improved from poor to moderate.
- The Deua River declined from good to moderate.
- Little Plains River declined from moderate to poor.
- The Clyde River and Tuross River remained moderate.
- The Bemboka River remained poor.

The Brogo River was the only monitoring site on the South Coast to be rated by the water quality index as having good water quality in 2022–2023 due to lower turbidity and nutrient levels. The Bemboka and Little Plains rivers were rated as having poor water quality, due mainly to higher concentrations of nitrogen and phosphorus, which may have been a consequence of increased runoff during 2022–2023.

Compared to the 2021–2022 results, the water quality index scores improved for 3 sites and declined for 4 sites. The lower index score for these 4 sites was due to increased nutrient and sediment loads.

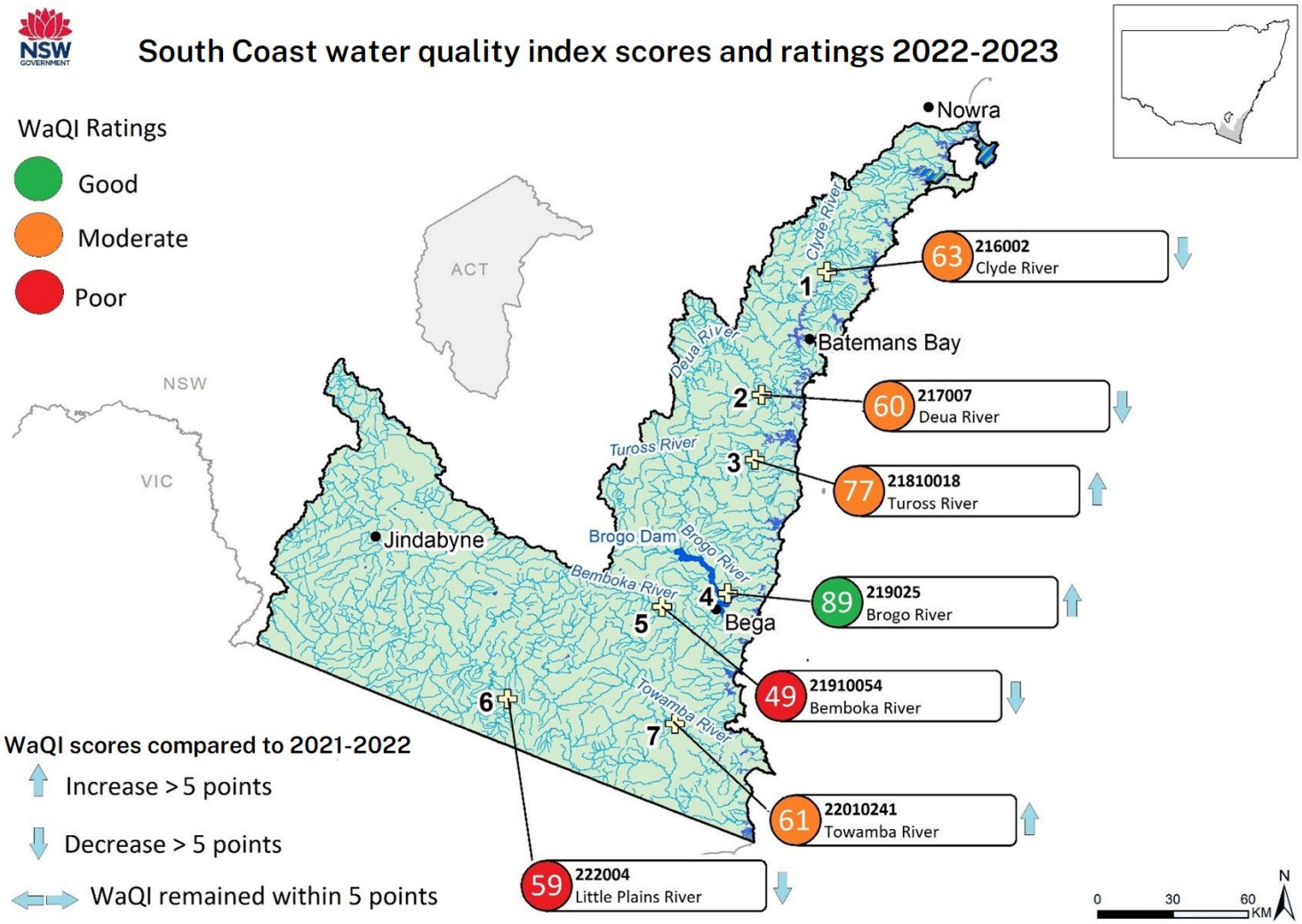

Figure 3: Water quality index scores and ratings for the South Coast valley

All the monitoring sites on the South Coast (except for Little Plains River), are located at the bottom of the main river systems where the quality of the water is impacted by the cumulative effects of land use, soil and vegetation disturbance and human activity occurring in the catchment. The Little Plains River is located in the Snowy Mountains and drains into Victoria.

There was some variability in pH results between the South Coast valleys. The median results for all sites except for the Clyde River were between 7 and 8, which is safe for water-dependent ecosystems. The lower pH results in the Clyde River are consistent with the historical data for this site.

The median turbidity, nitrogen and phosphorus results are generally low. This is due to the soils of the catchment areas being largely dominated by lower fertility sandy soil types, and large areas of the steeper upper catchments that are protected from disturbance by National Parks and forested areas. However, there are some higher results, such as for turbidity in Little Plains River, when sample collection coincided with high flows.

A high proportion of nitrogen and phosphorus are transported in rivers attached to soil particles. The high nutrient results in Little Plains River coincide with high turbidity readings. As this site is in the Snowy Mountains, the high velocity of the water in this steeper river system is able to carry a larger load of sediment and attached nutrients. Some of this material is likely to drop out of suspension as the rivers slow down when they reach lowland areas.

Dissolved oxygen levels were relatively stable across all 7 sites, with median levels close to 100% saturation. 100% saturation is ideal for aquatic ecosystems.

Electrical conductivity was low across all the South Coast catchments and does not pose a threat to agricultural use or aquatic ecosystems.

Summary statistics for the key water quality parameters at each monitoring site in the South Coast 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.

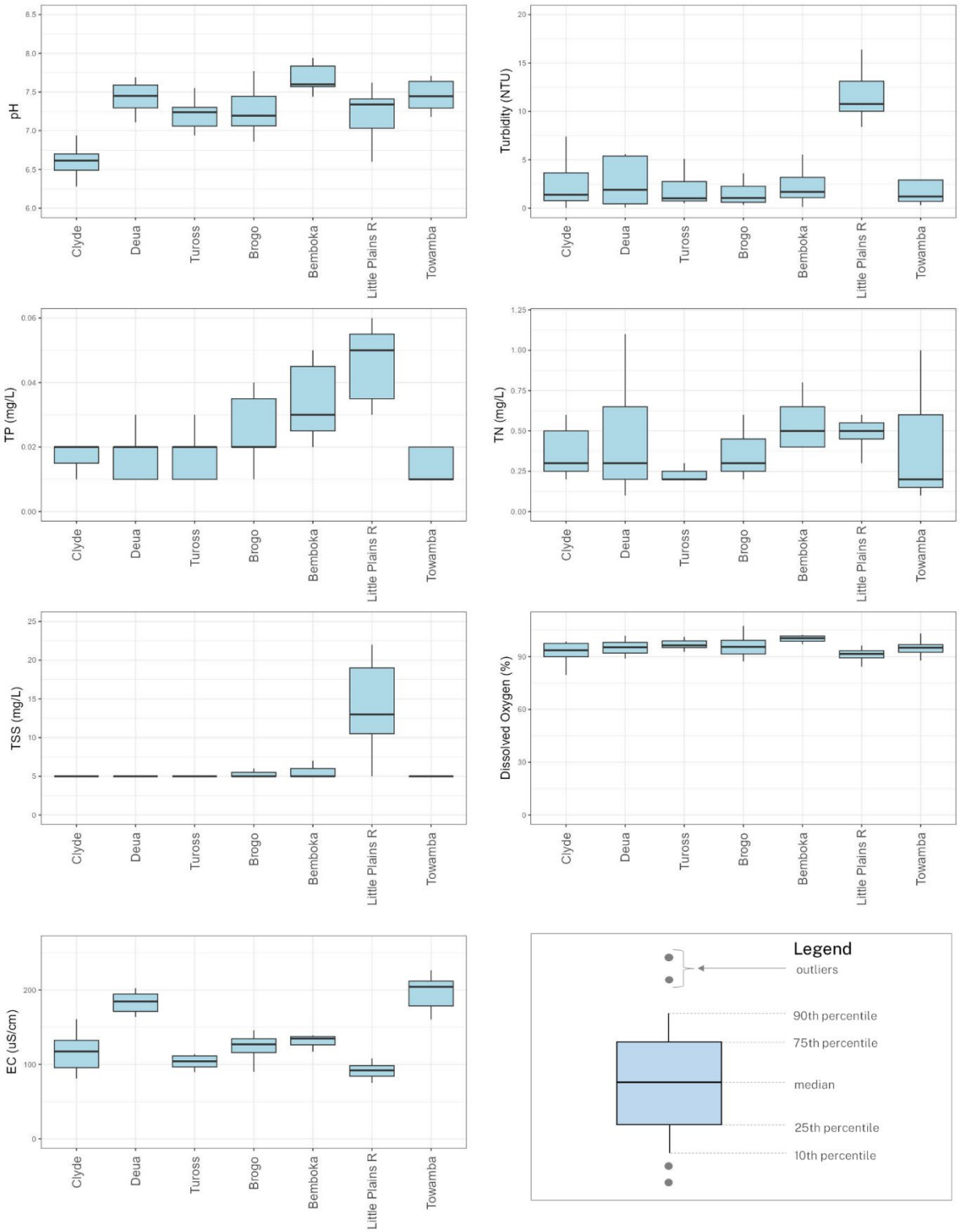

Figure 4: Water quality data by site, moving upstream to downstream from left to right. The water quality parameters shown are pH, Turbidity, Total phosphorus (TP), Total nitrogen (TN), Total suspended solids (TSS), Dissolved oxygen, and electrical conductivity (EC).

Irrigation and salinity

There are 10 continuous electrical conductivity monitoring sites in the South Coast valley. Selected sites plotted in Figure 5 shows electrical conductivity is low across the South Coast catchments and does not pose a threat to agricultural use or aquatic ecosystems.

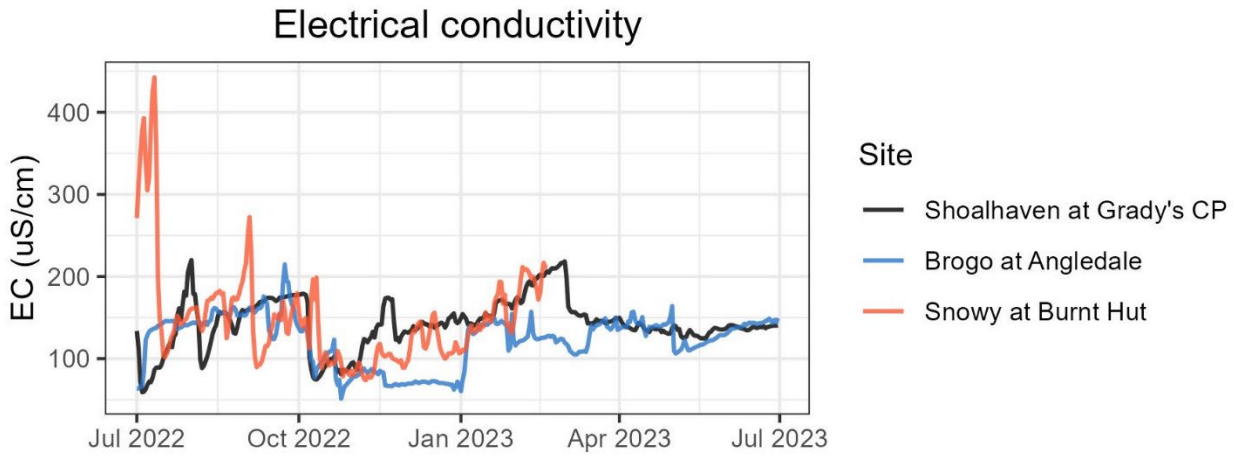

Figure 5: Electrical conductivity in the South Coast valley

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).

Blue-green algae have historically not been a major issue in South Coast rivers. There were no red alert warnings issued for blue-green algae in Brogo Reservoir or the Brogo River downstream of the dam during 2022 to 2023.

Table 2: Distribution of algal alert levels in South Coast Valley July 2022 to June 2023

	Jul					Aug					Sep					Oct					Nov					Dec					Jan					Feb					Mar					Apr					May					Jun				
Brogo Dam	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Brogo River downstream Brogo Dam	*	*	*	*	*	*	*	1	1	1	1	1	1	1	1	1	1	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

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 (Figure 6 - BoM, 2023 and Figure 7). For the east coast of New South Wales, several days of very heavy rain in July resulted in major flooding of the Hawkesbury–Nepean River and extended along the New South Wales coast. A natural disaster was declared for New South Wales following the flooding from heavy rainfall.

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, or low oxygen events and a high risk of significant fish deaths. Despite widespread flooding, no fish kills were reported in the South Coast Valley for 2022–2023. Fish kills in NSW are listed on Department of Primary Industries website.

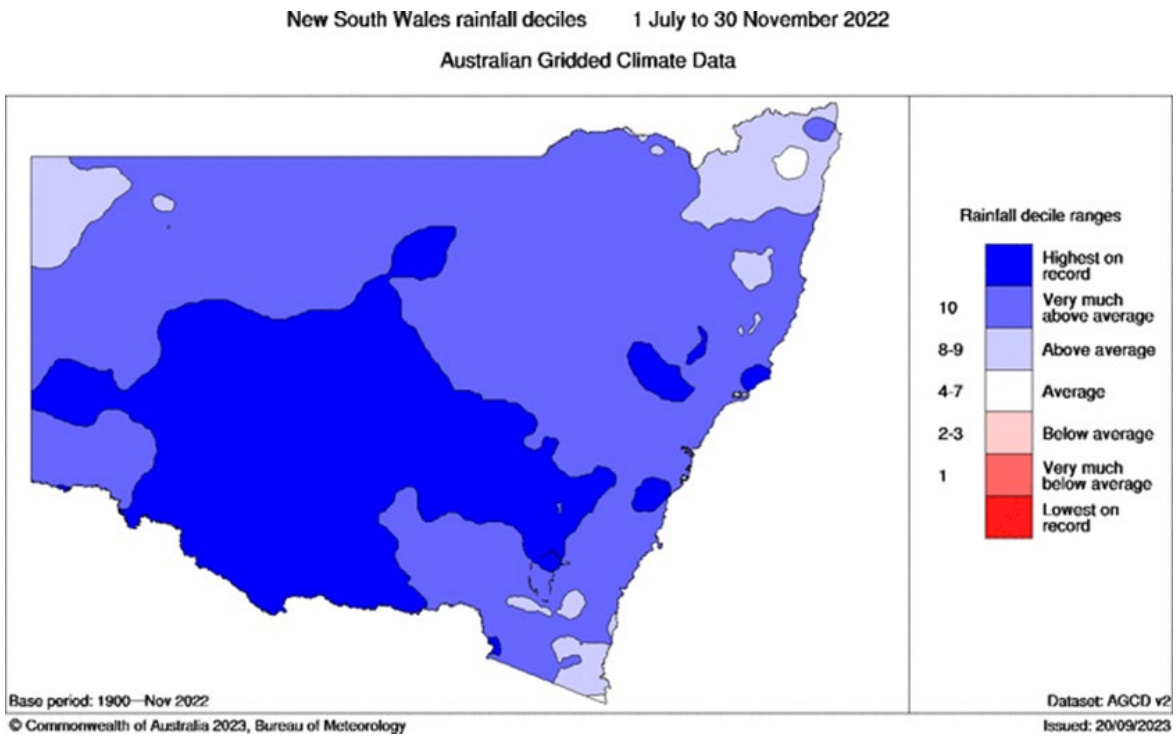

Figure 6: NSW rainfall deciles from July to November 2022. (Source: BoM)

Figure 7: Bega River near Bega after heavy rainfall, 7 November 2022. (Source: Planet Explorer)

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 South Coast rivers, turbidity, nitrogen and phosphorus results are generally low due to the soils of the catchment areas being largely dominated by lower fertility sandy soil types. In 2022 to 2023, flooding led to elevated turbidity and nutrient concentrations in the Bemboka and Little Plains rivers resulting in a low water quality index score and poor rating. Most sites had a moderate water quality index rating.

Long-term water quality trends

Analysis of WaQI scores from 2012–2013 to 2022–2023 shows all sites except for Bemboka River have a long term median WaQI rating of moderate or good (Figure 8). The highest score was in the Deua River. Bemboka River had a rating of poor. Some sites had years with a high or low scores. These outlier results may have been in response to events such as floods, drought and bushfires occurring in the catchment.

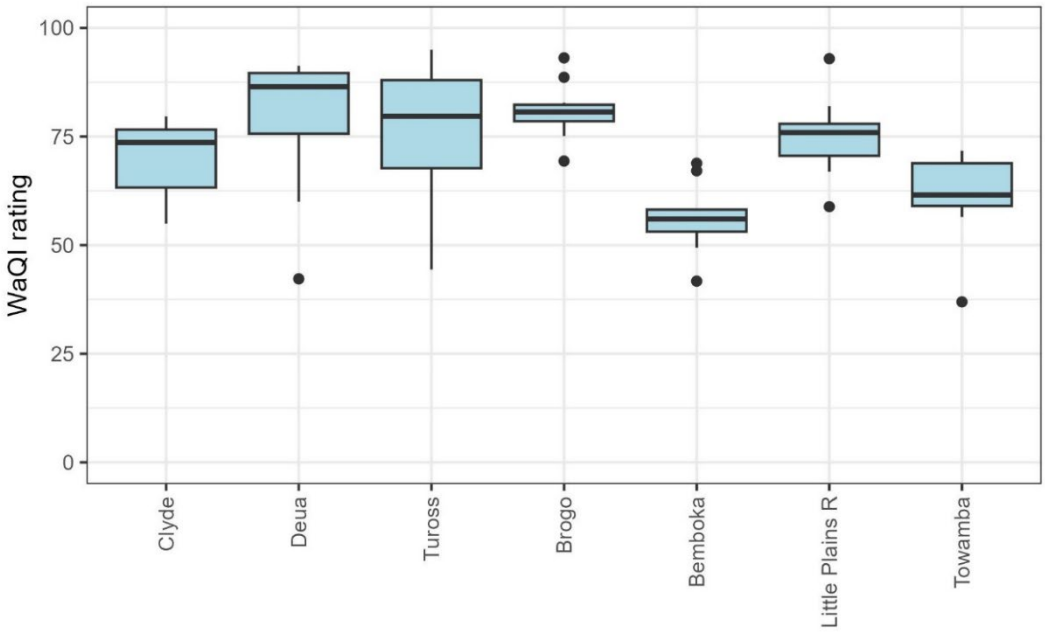

Figure 8: Boxplots showing long-term (2012–2013 to 2022–2023) WaQI scores for every site in the South Coast valley

The number of sites with good, moderate and poor ratings fluctuated from year to year in response to events occurring in the catchments (Figure 9). During the Black Summer bushfires in 2019–2020 the number of poor sites peaked at 5, with zero sites rated as good.

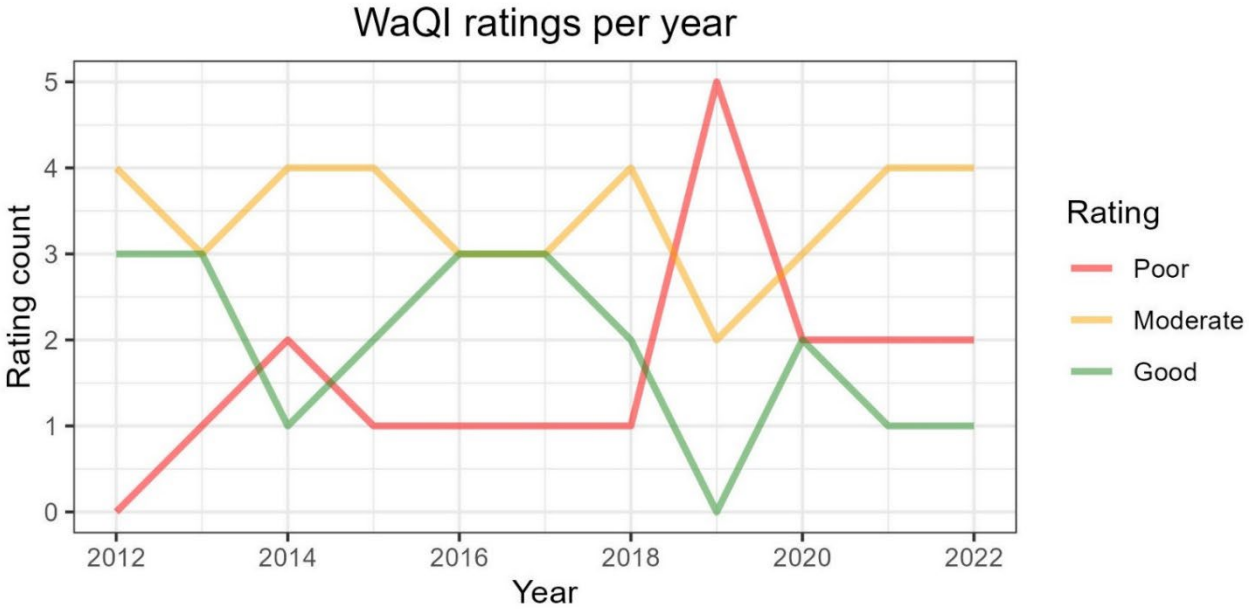

Figure 9: Graph summarising long-term water quality index ratings (2012–2013 to 2022–2023) for every site in the South Coast Valley by year

References and further information

Bureau of Meteorology, (BoM). 2023. Financial year Australian climate and water statement 2023. Financial year climate and water report 2023. http://www.bom.gov.au/climate/current/financial-year/aus/summary.shtml#tabs=Water

Bureau of Meteorology, (BoM). Recent and historical rainfall maps: http://www.bom.gov.au/climate/maps/rainfall/?variable=rainfall&map=totals&period=daily&region=nat&year=2023&month=10&day=13

Fish kills in NSW: https://www.dpi.nsw.gov.au/fishing/habitat/threats/fish-kills