EPA VICTORIA

Report Card 2020-21

Publication 2037

VICTORIA State Government

Summary

The annual Report Card summarises the water quality in Port Phillip Bay, Western Port and the Gippsland Lakes and their catchments (Figure 1). The Department of Environment, Land, Water & Planning (DELWP), Environment Protection Authority Victoria (EPA), and Melbourne Water monitor the water quality in these regions of Victoria. The results are described in this report.

The Report Card uses key indicators of environmental water quality to calculate an overall annual score. The score generates a rating of Very Poor, Poor, Fair, Good or Very Good. This Report Card compiles results from July 2020 to June 2021, and shows a history for each region over the last twenty years.

In 2020–21, water quality in the bays, lakes and waterways was similar to previous years. Water quality was mostly Very Good or Good for rivers in the headwaters of catchments. Water quality generally declined to Poor or Very Poor as the rivers moved through rural, agricultural and urbanised areas in the foothills and coastal plains of the lowlands. In the bays and lakes, water quality was mostly Very Good or Good for areas that are able to mix with the open ocean. Water quality was generally worse in marine waters adjacent to river entrances that transport sediments and nutrients from urban, industrial and agricultural areas.

Data from the Bureau of Meteorology shows that the climate in Victoria during 2020-21 was similar to the long-term average. A weak La Niña event brought higher than average rainfall to some areas, which differed from the relatively drier conditions during the preceding three years. The Gippsland region experienced extreme flooding in June 2021.

Due to COVID-19 travel restrictions in 2020, EPA was unable to monitor Port Phillip Bay, Western Port Bay and the Gippsland Lakes for several months. In particular, there is no data for the Gippsland Lakes from July to November. While the number of samples collected was above the minimum requirement of six across the 12-month reporting period, there is a gap in results during winter and spring in the Gippsland Lakes.

The annual Report Card has been available on EPA's website since 2019 (https://www.epa.vic.gov.au/for-community/monitoring-your-environment/monitoring-victorias-water-quality/report-card). Before that, results were published on the Yarra and Bay website.

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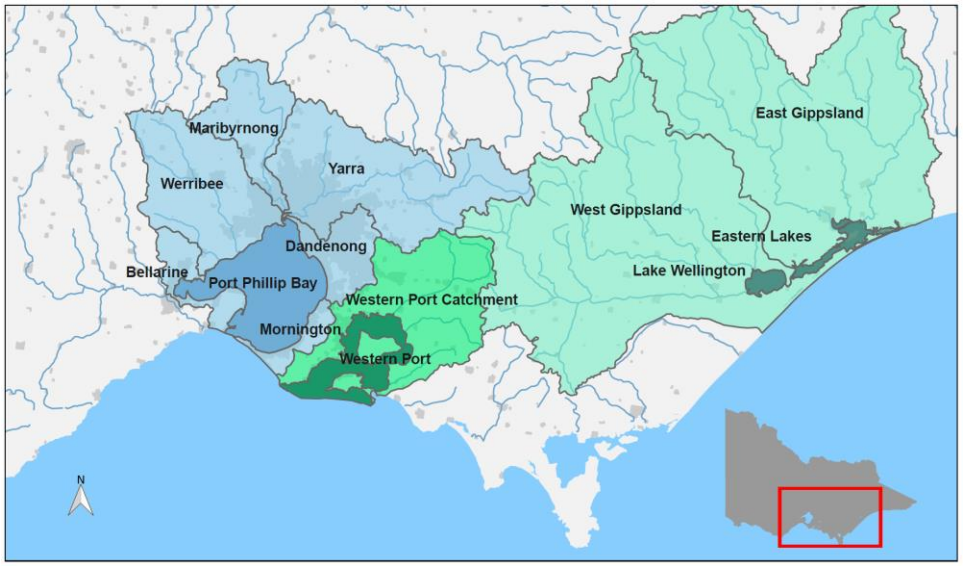

Figure 1: Location of Port Phillip Bay, Western Port, Gippsland Lakes (dark shading) and their catchments (light shading) within the state of Victoria.

About the Report Card

This Report Card provides a snapshot of environmental water quality in Port Phillip Bay, Western Port, Gippsland Lakes and the waterways in their catchments for 2020–21. These bays and lakes are the largest coastal waterbodies in Victoria. The waterways are a complex network of rivers, wetlands and estuaries. They are of immense cultural, economic and environmental value. During summer, EPA forecasts recreational water quality based on microbial indicators that are not reported here. For more information, see the Yarra Watch and Beach Report programs (https://www.epa.vic.gov.au/for-community/summer-water-quality).

How the scores are calculated

Key indicators of water quality are assessed against Victorian environmental quality objectives for relevant indicators in the Environment Reference Standard (2021). These are combined to calculate an overall water quality index score (WQI), corresponding to a rating of Very Poor to Very Good (Table 1). For this Report Card, WQI scores dating back to 2000 have been updated to include the period from July 2020 to June 2021.

Table 1: Water quality index (WQI) scoring categories for Report Card.

Water quality index score	Rating	Description
8–10	Very Good	High quality waterbodies generally not impacted by pollution
6–8	Good	Meets Victorian water quality objectives
4–6	Fair	Some evidence of stress
2–4	Poor	Under considerable stress
0–2	Very Poor	Under severe stress

The water quality indicators used for catchment waterway sites are:

- dissolved oxygen
- metals
- nutrients (total nitrogen and total phosphorous)
- pH
- salinity (not at estuarine sites)
- water clarity.

The water quality indicators used for marine bay and lake sites are:

- algae (chlorophyll-a)
- dissolved oxygen
- metals (where data is available)
- nutrients (total nitrogen in the bays, total phosphorous in the Gippsland Lakes)
- salinity (not at the estuarine Eastern Lakes)
- water clarity.

Key indicators gauge risks to aquatic ecosystems from key stressors, such as nutrient inputs, increased sediment and algal blooms. The scores are summarised at the catchment and bay scale. The scores are calculated by considering the area of the sub-catchments and marine zones that each site represents and calculating area-weighted average scores. Only sites that have a minimum of six samples that span the 12-month period are included so that the Report Card more accurately reflects the conditions throughout the year.

Climate in 2020–21

Weather fluctuations influence WQI scores. Long periods of dry weather can reduce river flows, decrease pollution run-off into waterways, increase salinity and cause more frequent or prolonged algal blooms. Conversely, wet conditions can increase the transport of pollutants (such as nutrients and sediment) via stormwater from the catchment into waterways and bays.

In 2020–21, Victoria's rainfall was similar to the long-term average. There were some exceptions, such as Gippsland, that had higher than average rainfall (Figure 2). This pattern is in contrast to relatively dry conditions experienced during the preceding three years. A weak La Niña event was announced by the Bureau of Meteorology in September 2020, which typically brings above average rainfall. These wetter conditions in some areas resulted in above average streamflows. In June 2021, extreme rainfall caused significant flooding across the Gippsland region after more than 200 mm of rain fell in 24 hours.

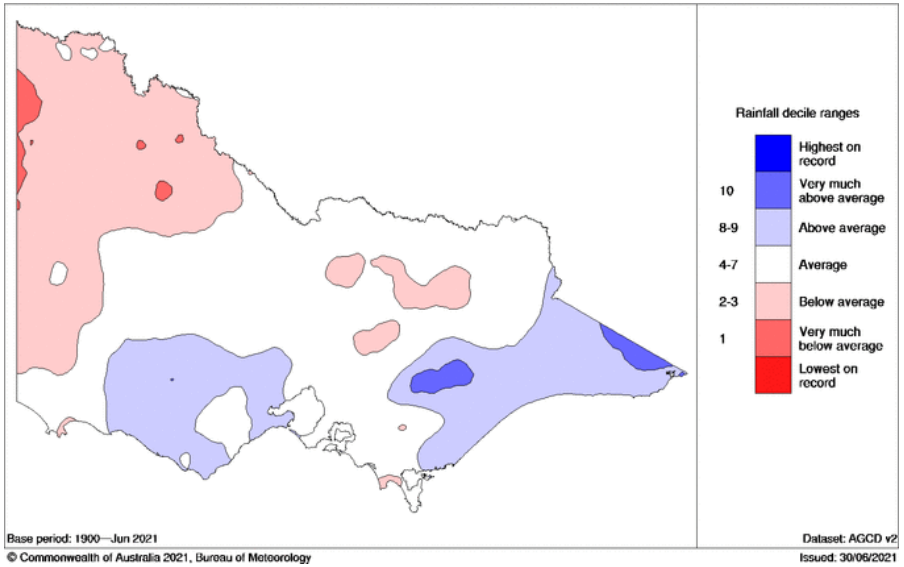

Figure 2: Victorian rainfall decile ranges from 1 July 2020 to 30 June 2021.
(Source: © Commonwealth of Australia 2020, Bureau of Meteorology.)

Port Phillip Bay and its catchment

Port Phillip Bay is a large, shallow embayment. It is surrounded by catchments that are mostly rural, but has large urban areas around its shoreline, including Victoria's two largest cities: Melbourne and Geelong. The Yarra, Maribyrnong and Werribee Rivers are major river systems that originate in forested hills and mountains, which then flow through rural properties, townships and urban areas to the bay. The bay is connected to Bass Strait by a narrow entrance. Waters in the south of the bay mix well with ocean waters, while riverine inputs highly influence the waters in the north and west. The Report Card for Port Phillip Bay and catchment is calculated using data from EPA and Melbourne Water.

Catchment Report Card

Melbourne Water routinely collects water samples across waterways of the Port Phillip Bay catchments: Yarra, Werribee, Maribyrnong, Dandenong, Mornington. In 2020-21, monitoring data from 89 sites across five Port Phillip Bay catchments were used to calculate the WQI score. Water quality varied from mostly Very Good or Good in upper reaches of the catchment to Very Poor in highly urbanised waterways (Figure 3).

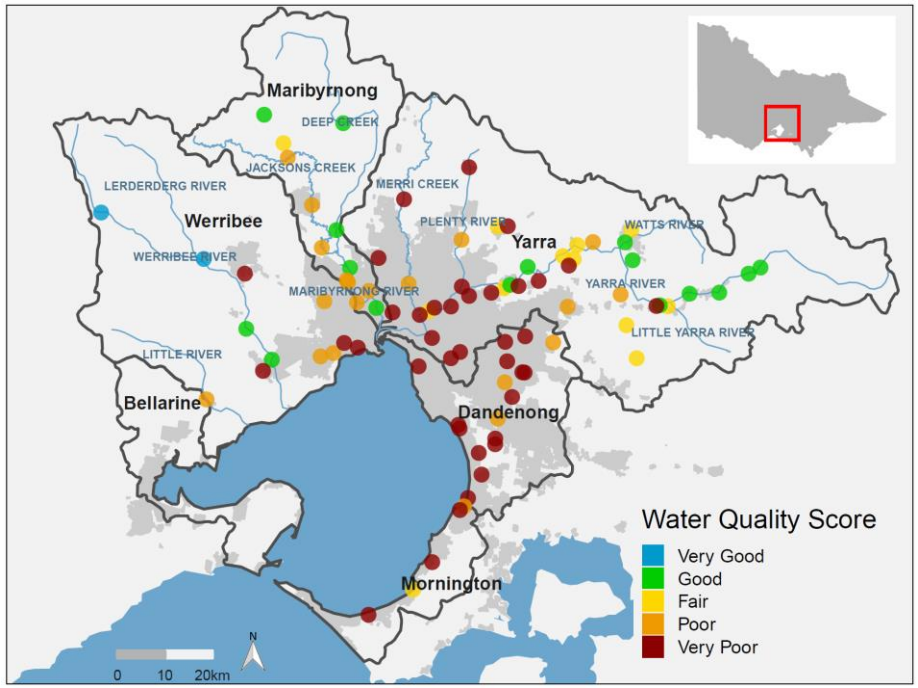

Figure 3: WQI scores of Melbourne Water's monitoring sites in the Port Phillip catchments. Colour indicates WQI score for each site in 2020–21. Grey shading indicates urban areas of greater Melbourne and Geelong.

Maribyrnong catchment

The Maribyrnong River is a major tributary of the Yarra River, flowing from its headwaters in the Macedon Ranges through the urban areas of north-western Melbourne. It has two main branches: Deep Creek and Jacksons Creek. The Maribyrnong meets the Yarra River just four kilometres upstream of Port Phillip Bay.

Overall, water quality in the Maribyrnong catchment was Fair in 2020-21, which was slightly worse than previous years but better than water quality in the Yarra catchment (Figure 4). Water quality was Good in the upper reaches of the Maribyrnong, but declined to Poor as it flowed into the urban areas of Melbourne.

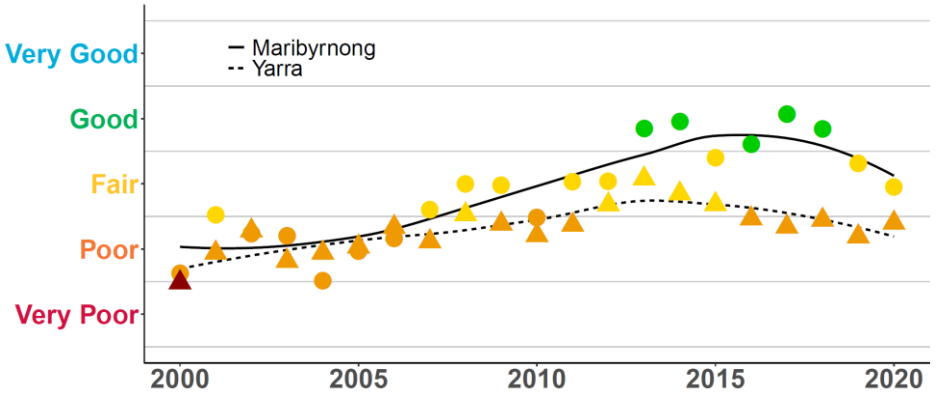

Figure 4: Historical WQI scores for the Maribyrnong (circles) and Yarra (triangles) catchments from 2000-01 to 2020-21. Colour indicates WQI score in each year. Line indicates general trend using a loess smoothing function.

Yarra, Werribee, Dandenong and Mornington catchments

Over the reporting year water quality was Very Good in the upper catchment of the Werribee River, and Good in the forested areas of the upper Yarra catchment, but declined to Very Poor in urban areas. The highly urbanised areas of the Dandenong and Mornington catchments had Very Poor water quality (Figure 3). These results follow a clear pattern throughout the Port Phillip Bay catchments reflecting impacts of land use on water quality, which is similar to previous years.

Bellarine catchment

The Bellarine catchment covers much of Geelong, Victoria's second largest city. It also includes waterways such as Cowies Creek and Hovells Creek, both of which flow into Corio Bay. There are several monitoring sites in the citizen science Waterwatch (http://www.vic.waterwatch.org.au/) program within the Bellarine catchment. However, this data is not currently used in the calculation of WQI scores in this Report Card.

Bay Report Card

Overall, water quality in Port Phillip Bay was Good in 2020-21. Most water quality indicators were above water quality objectives, except for water clarity which was rated Very Poor (Figure 6). Riverine inputs into Port Phillip Bay carry sediment and nutrients that can reduce water clarity, particularly in the northern part of the bay. Algal blooms are also common, particularly during the warmer, summer months. In January 2020, EPA monitoring detected a short-term bloom of a potentially harmful species in Hobsons Bay. The presence of the algal bloom was communicated to the public through EPA's Beach Report (https://www.epa.vic.gov.au/for-community/summer-water-quality/beach-report) program until conditions returned to normal.

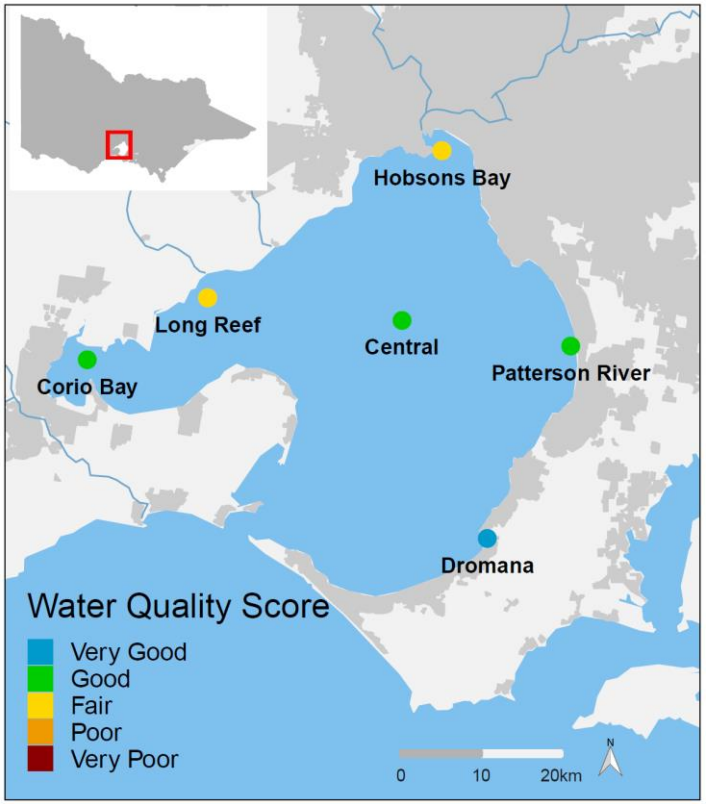

Figure 5: Locations and WQI scores of EPA long-term marine monitoring sites in Port Phillip Bay.

EPA has six monitoring locations in Port Phllip Bay (Figure 5). Conditions in Port Phillip Bay have remained relatively consistent over the last twenty years, with overall water quality fluctuating between Good to Very Good (Figure 7). Regular mixing with oceanic waters from Bass Strait and the natural recycling of nutrients in the seafloor sediments help to maintain good water quality in the bay overall.

Dromana

Dromana had Very Good water quality. The southern area of Port Phillip Bay is well flushed with water from Bass Strait due to regular tidal exchange, and minimal impacts from rivers and urban run-off.

Central, Corio Bay and Patterson River

Monitoring sites in central areas of the bay, including Central, Corio Bay and Patterson River, maintained Good water quality. This was similar to 2019-20 when water quality at these sites was also Good.

Hobsons Bay and Long Reef

Water quality at Hobsons Bay and Long Reef were Fair, a decrease from last year when they were both Good. These sites in the north of the bay are influenced by flows from large rivers such as the Yarra, Maribyrnong and Werribee Rivers that carry pollutants, such as nutrients and sediment.

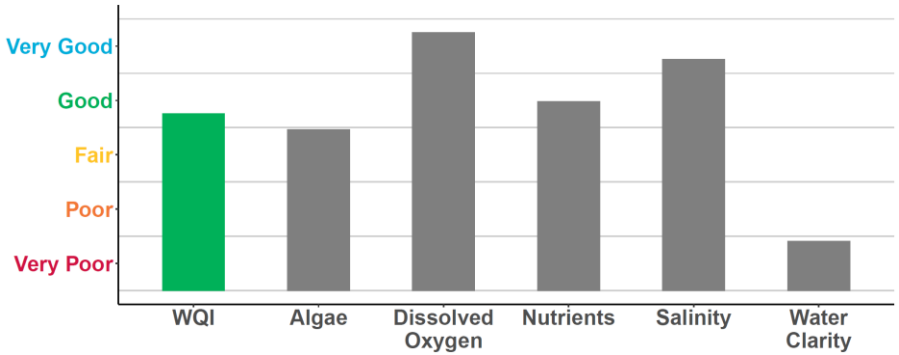

Figure 6: WQI scores for Port Phillip Bay in 2020-21. Coloured bar indicates the overall WQI score. Grey bars are the individual indicators used to calculate the overall WQI score.

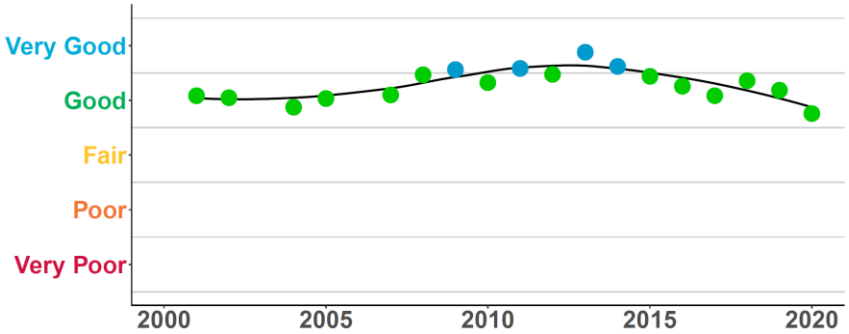

Figure 7: Historical WQI scores for Port Phillip Bay from 2000-01 to 2020-21. Line indicates general trend using a loess smoothing function.

Western Port and its catchment

Western Port is a semi-enclosed bay with two large islands (Phillip Island and French Island) that constrain water flow. The catchment is largely rural, with state reserves in the upper catchment, and a fast-growing urban growth corridor. Waterways in the catchment flow through areas that have been highly modified to support urban and rural land use. The Report Card for Western Port and its catchment is calculated using data from EPA and Melbourne Water.

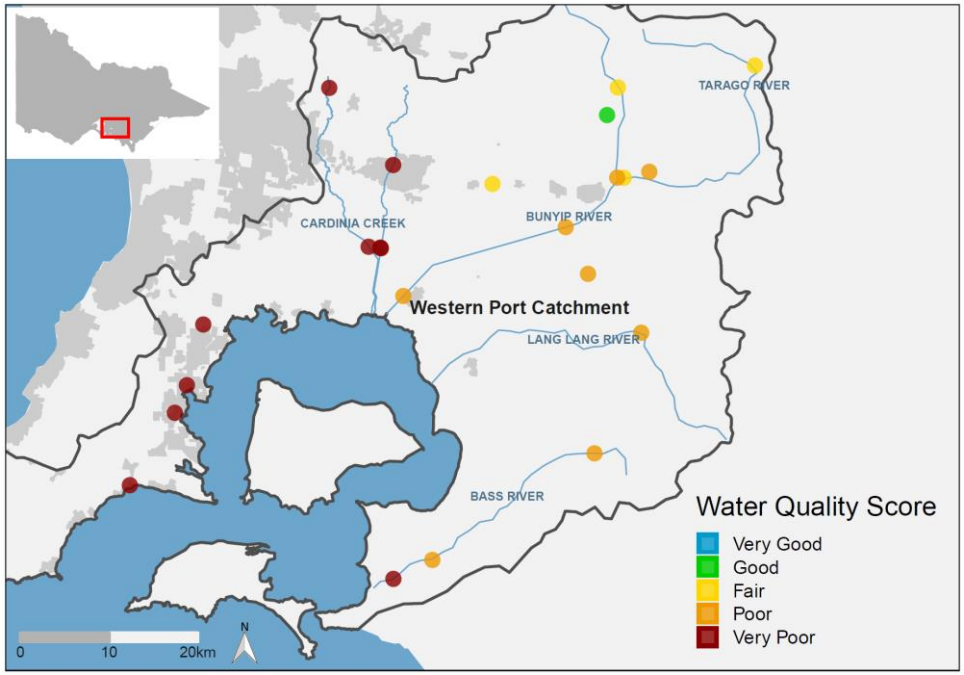

Figure 8: WQI scores of Melbourne Water's monitoring sites in the Western Port catchment.

Catchment Report Card

Overall, the water quality in Western Port catchment was Poor for 2020-21. Water quality varied from Good to Fair in areas of the upper catchment, to Very Poor in highly urbanised or intensive agricultural areas. Scores for the Western Port catchment have remained relatively consistent over time and have mostly shown Poor water quality (Figure 10).

Melbourne Water routinely collects water samples across waterways of the Western Port catchment to assess how water quality is changing over time. Not all monitored sites have a WQI score each year due to insufficient or unsuitable data. In this Report Card, 23 sites in the Western Port catchment were used to calculate the WQI score (Figure 8).

Water quality was Good or Fair in the forested upper catchment of the Bunyip River and Tarago River in the northeast where headwaters flow from the Bunyip State Park and Tarago State Forest. Waterways in the mid and lower catchment were generally Poor or Very Poor where the land use changes into rural, agricultural and urbanised areas.

The results from monitoring sites on the western side of the catchment are notably worse than the eastern catchment. Eight monitoring sites in this region were Very Poor, which was similar to the previous year. The Very Poor water quality along the western shoreline is due to proximity to Melbourne's urban fringe and reflects the impacts of land use on water quality, as seen in other catchments.

High nutrient levels, salinity and reduced water clarity contributed to the Poor water quality rating for the Western Port catchment (Figure 9). The progressive growth of urban areas in the region and intensive agricultural land use are significant challenges for maintaining water quality in these rivers and streams.

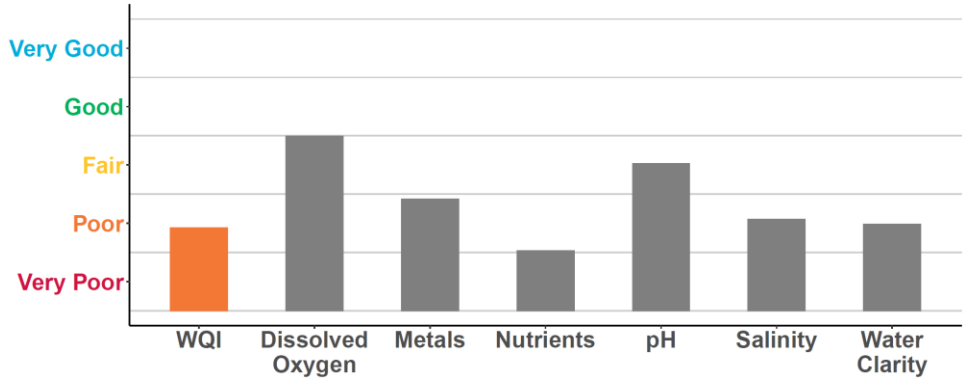

Figure 9: WQI scores for Western Port catchment in 2020-21.

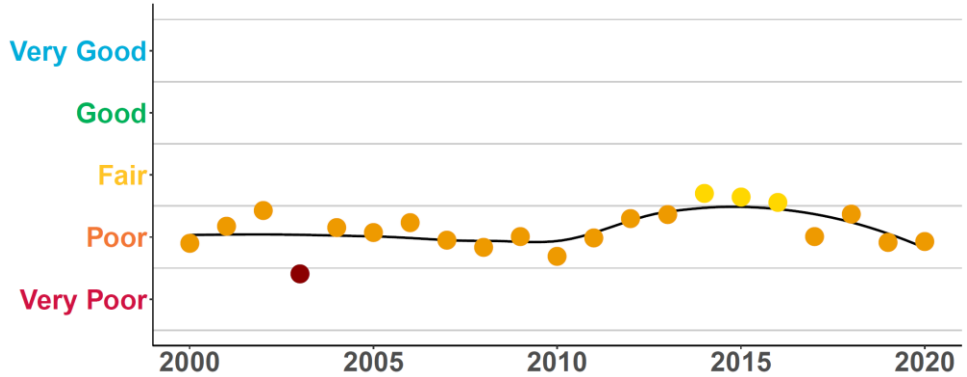

Figure 10: Historical WQI scores for the overall Western Port catchment from 2000-01 to 2020-21. Line indicates general trend using a loess smoothing function.

Western Port Bay Report Card

Overall, water quality was Good in Western Port Bay for 2020-21. Reduced water clarity resulted in a Poor rating for this parameter (Figure 12). The northern and eastern areas of the bay are mostly intertidal mudflats dominated by inflows from Cardinia Creek, Bunyip River and Lang Lang River. These rivers are a source of pollutants (such as nutrients and sediment) from the catchment to the bay.

Conditions in Western Port have generally remained consistent since 2000 (Figure 13). Regular exchange with Bass Strait waters helps to maintain good water quality. In comparison to Port Phillip Bay, which has a narrower entrance to Bass Strait, Western Port is typically well-mixed with oceanic waters.

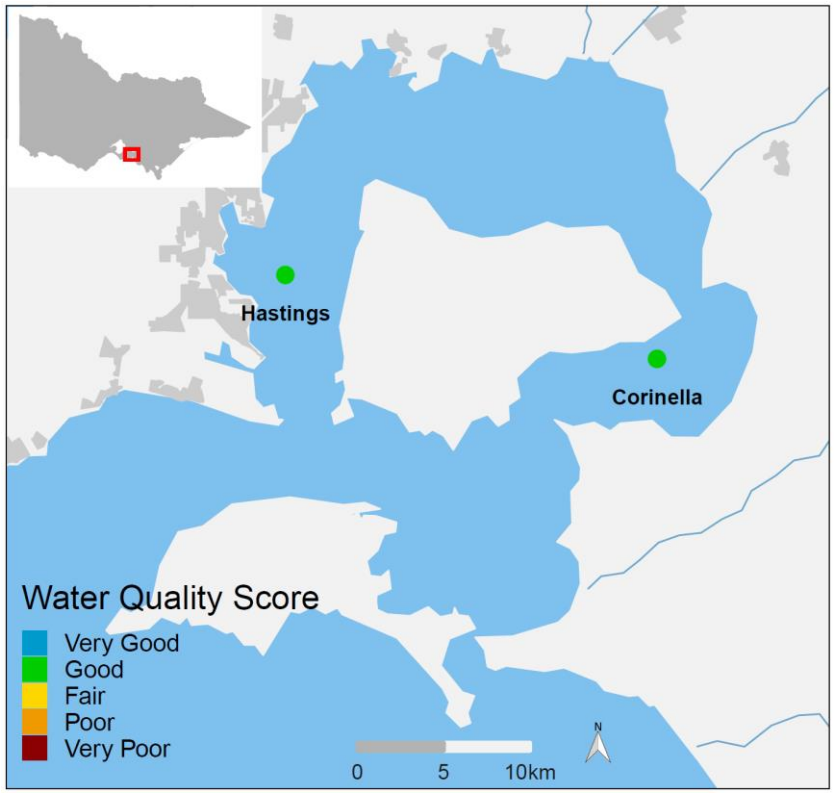

Figure 11: WQI scores of long-term EPA marine monitoring sites in Western Port.

EPA has two monitoring locations in Western Port: Hastings and Corinella. Both sites had Good water quality in 2020-21 (Figure 11).

Hastings

Hastings generally maintains Good water quality. This area of the bay is regularly flushed and mixed with oceanic waters from Bass Strait.

Corinella

Water quality at Corinella was Good this year, but in the past it has only been Fair. This area of the bay typically has high levels of suspended sediment and reduced water clarity. The high levels of sediment are caused by a combination of coastal erosion in the north-east of the bay, inputs from the catchment, and the re-suspension of sediment within Western Port.

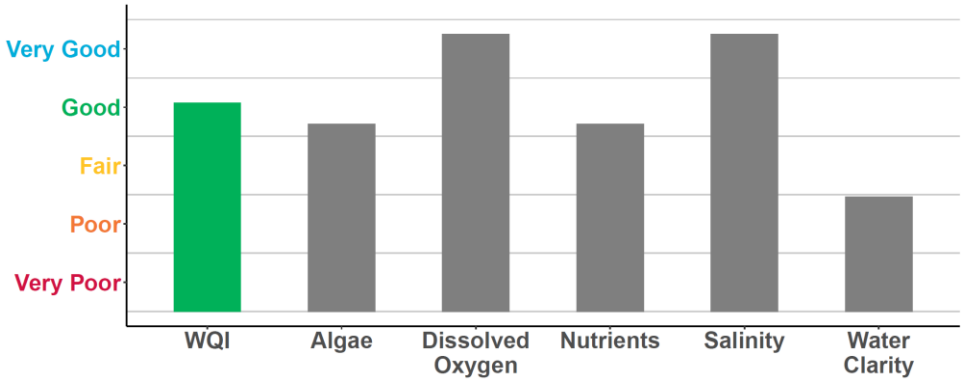

Figure 12: WQI scores for Western Port Bay in 2020-21.

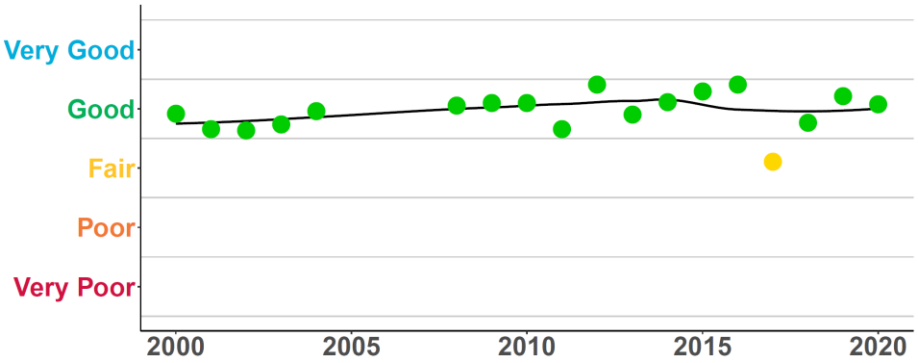

Figure 13: Historical WQI scores for Western Port Bay from 2000-01 to 2020-21. Due to limited monitoring, no scores were calculated for the period 2005-2008. Line indicates general trend using a loess smoothing function.

Gippsland Lakes and its catchment

The Gippsland Lakes are a 70 km-long series of large, shallow coastal lagoons. A narrow, artificially maintained channel at Lakes Entrance connects the lakes to Bass Strait. The catchment consists of mostly state reserves, forests and national parks and rural land. Five major river systems drain directly into the lakes: the Mitchell, Nicholson and Tambo Rivers flow into Lake King, while the Latrobe and Avon Rivers flow into Lake Wellington. The Report Card for the Gippsland Lakes and catchment is calculated using data from DELWP and EPA.

Catchment Report Card

DELWP routinely collect water samples from waterways across the Gippsland region. For the Report Card only rivers and streams that flow into the Gippsland Lakes are included. This year monitoring data from 25 sites was used to calculate the WQI score. In 2020-21 water quality was mostly Very Good or Good in the catchment (Figure 14).

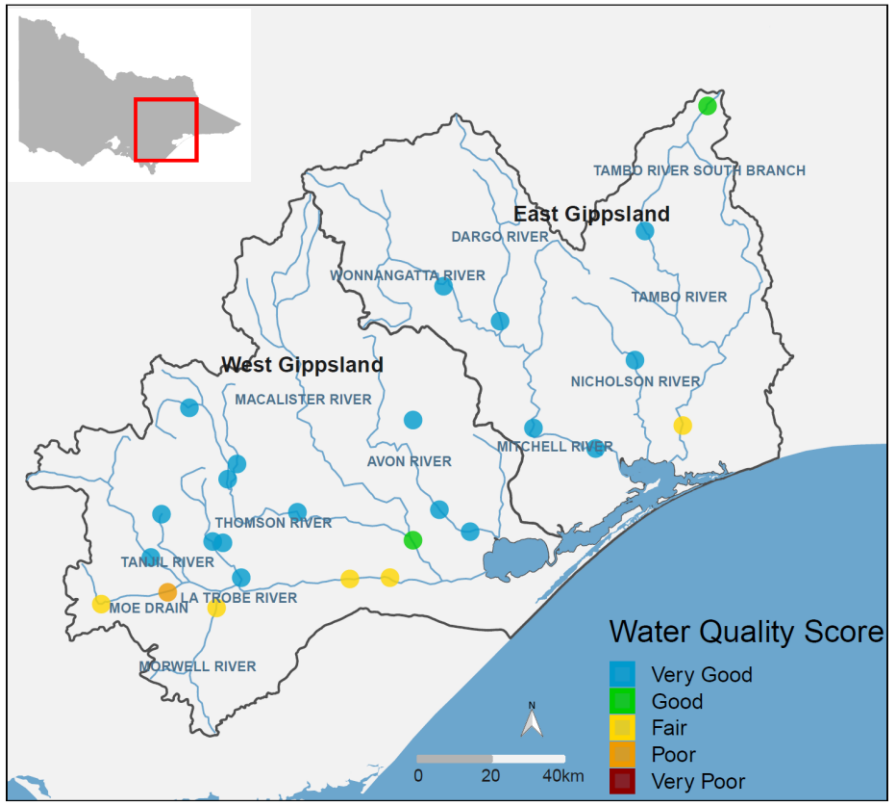

Figure 14: WQI scores of DELWP's monitoring sites in the Gippsland Lakes catchment.

In West Gippsland, water quality was Good, similar to previous years (Figure 16). The forested areas on the slopes of the Great Dividing Range maintained Very Good water quality. Water quality declined to Fair or Poor along the mid and lower reaches of the Latrobe River, where cleared land and urbanisation have impacted water quality.

In East Gippsland, water quality was Very Good, an improvement from the previous year when it was Good (Figure 16). The forested areas in the catchment had Very Good water quality. Historic clearing of vegetation for agriculture and mining has impacted water quality in some localised areas, such as two sites on the upper and lower Tambo River that were Good and Fair, respectively.

Reductions in water quality associated with drought and severe bushfires in 2019-20 and flooding in June 2021 appear to have been short-lived and did not impact the annual WQI score for 2020-21. The decline in some water quality parameters observed last year, was not reflected in scores for this year (Figure 15).

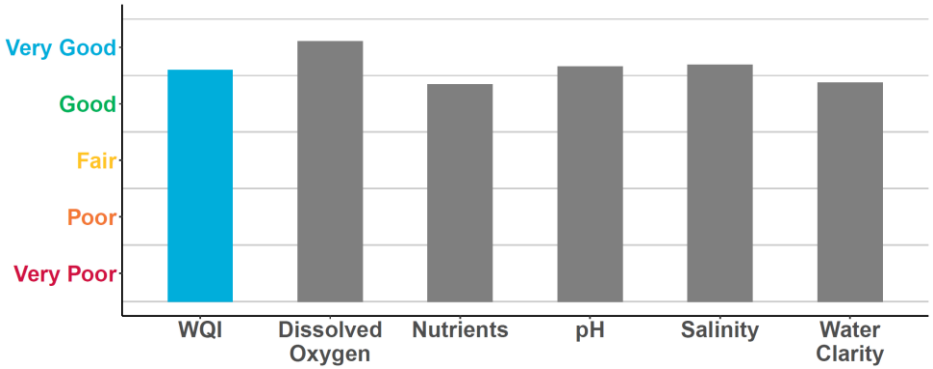

Figure 15: WQI scores for East Gippsland catchment in 2020-21

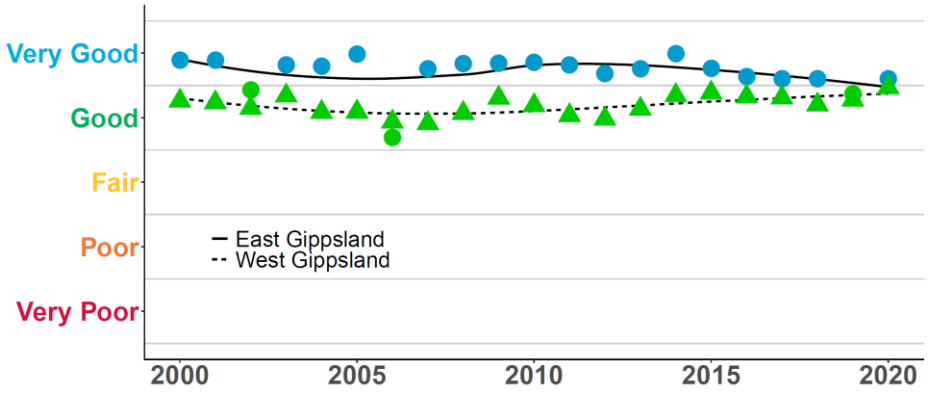

Figure 16: Historical WQI scores for East (circles) and West Gippsland (triangles) catchments from 2000-01 to 2020-21. Line indicates general trend using a loess smoothing function..

Gippsland Lakes Report Card

EPA has five monitoring locations in the Gippsland Lakes (Figure 17). Monitoring locations closer to the entrance to Bass Strait (Shaving Point, Lake King) had better water quality due to greater tidal exchange. The inland monitoring locations (Lake Wellington and Lake Victoria) are influenced significantly by river inputs to the lakes system.

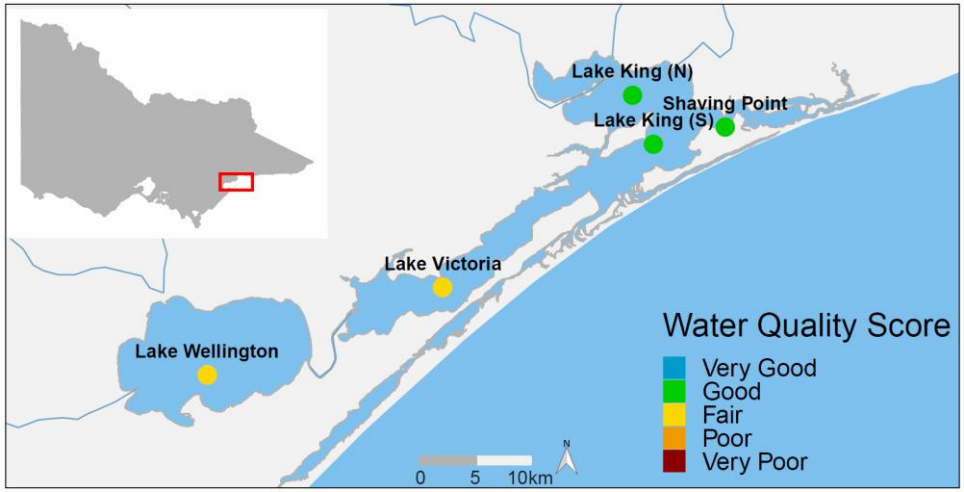

Figure 17: WQI scores of EPA monitoring sites in the Gippsland Lakes.

Lake Wellington

Overall, water quality was Fair in Lake Wellington during 2020-21 (Figure 18), which is a improvement from Poor during the previous three years (Figure 19). Lake Wellington is a sink for sediment and nutrients. Wind and waves within the shallow waters of the lake can re-suspend these pollutants. Algal blooms often develop because of the high availability of nutrients in the water column.

EPA was unable to monitor the Gippsland Lakes from July to November 2020 due to COVID-19 travel restrictions. Eight samples were collected within the 12-month period, which was above the minimum reporting requirement of six. However, a period of five months during winter and spring is absent. For Lake Wellington, in particular, this means that the months where turbidity and nutrients would potentially be higher are missing from the dataset, and may have influenced a change from the long-term average of Poor (Figure 19). The gap in the dataset also affected the other four monitoring sites in the Gippsland Lakes, however, water quality at these locations tends to be relatively steady due to regular tidal exchange with ocean waters from Bass Strait.

Eastern Lakes

Overall, water quality was Good in the Eastern Lakes during 2020-21 (Figure 19). While water quality in Lake King was Good, water quality in Lake Victoria was rated Fair. This may be due to increased riverine influence on water quality at sites located further from the entrance to Bass Strait.

The Eastern Lakes are estuarine, being salty from mixing with ocean waters combined with freshwater flows from the Mitchell, Nicholson and Tambo Rivers. As with many estuaries, there is stratification of the water column where more saline water sits under a freshwater layer. EPA monitors both surface and bottom waters in the Eastern Lakes, however, only the results from the surface waters are included in Report Card to allow for comparison with other marine bays.

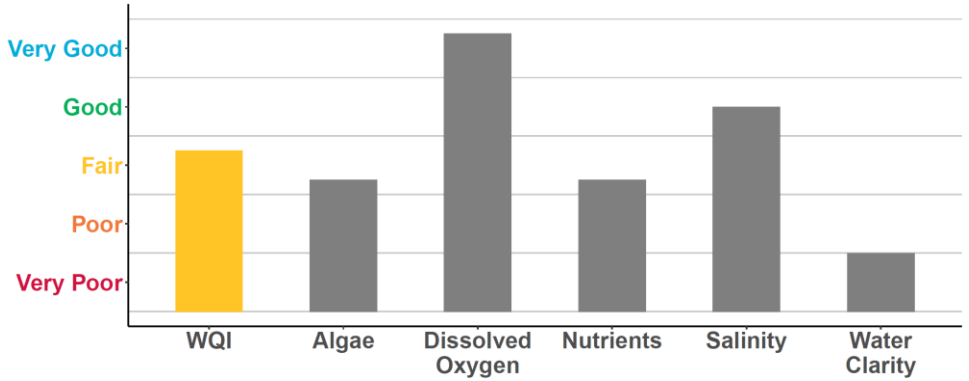

Figure 18: WQI scores for Lake Wellington overall in 2020–21.

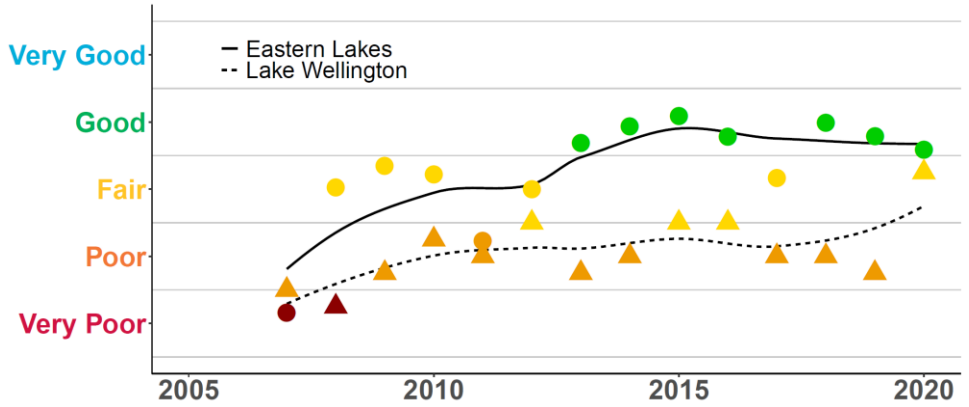

Figure 19: Historical WQI scores for Eastern Lakes (circles) and Lake Wellington (triangles) from 2007-08 to 2020-21. Due to limited monitoring, historical scores are not shown for the period 2000-2006. Line indicates general trend using a loess smoothing function.

Further information

Water Quality Data

Find data from the catchments at the Victorian government's Water Measurement Information System (https://data.water.vic.gov.au/).

Find data for the bays and lakes at the Victorian governments open data website Data Vic (https://www.data.vic.gov.au/)

Find information on how DELWP, EPA Victoria and Melbourne Water work to improve water quality across Victoria at EPA's Report Card web page (https://www.epa.vic.gov.au/for-community/monitoring-your-environment/monitoring-victorias-water-quality/report-card).

Key References

Find out more about the Environment Reference Standard (2021) for Victoria at EPA's website (https://www.epa.vic.gov.au/about-epa/laws/epa-tools-and-powers/environment-reference-standard).

EPA acknowledges Victoria's First Nations peoples as the Traditional Owners of the land and water on which we live and work. We pay our respect to their Elders past and present.