

# Water quality snapshot: Nullaki (Wilson Inlet) 2023

Through Healthy Estuaries WA, the Department of Water and Environmental Regulation monitors water quality in Nullaki (Wilson Inlet) and its surrounding catchment. This snapshot provides insights from our monitoring during 2022 and 2023 with comparison to previous years.

The water quality of Wilson Inlet is generally good. Higher concentrations of the nutrients nitrogen and phosphorus occur in periods with high rainfall, caused mainly by inflows from the surrounding area (catchment). A small portion of the nutrients in the inlet is released from the sediment, mostly when the sandbar is open.

Rainfall washes nutrients (nitrogen and phosphorus) and organic matter from the catchment into the rivers and drains, and then to the inlet. Nutrients applied in the catchment, such as fertiliser or livestock waste, wash into the waterways when it rains. Excessive nutrients in estuaries can cause algal blooms.

Understanding estuary condition and monitoring for change helps to guide how we manage our estuaries

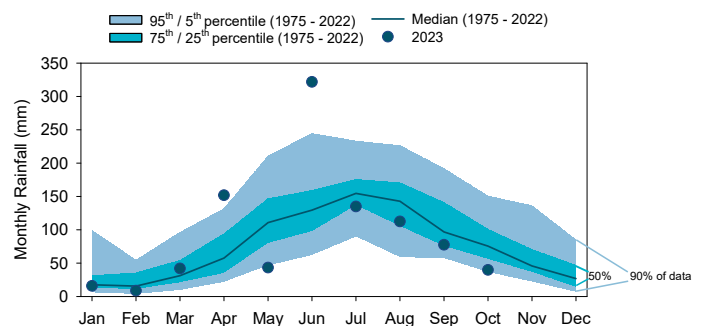
## Sandbar and rainfall conditions 2023

When the sandbar is 'open', a channel through the sandbar allows an exchange of water between the estuary and the ocean. The sandbar is usually opened in winter to prevent flooding of low-lying areas. It then closes naturally during summer. After the opening in 2021, the sandbar remained open for a record 563 days and closed in January 2023.<sup>1</sup>

In 2023 we observed an unusual pattern of rainfall timing and quantity. There was above average rainfall in April followed by very little rainfall in May, and record-high rainfall in June. This meant that there was a very sudden increase in river discharge during June instead of the typical gradual increase through autumn to mid-winter. As a consequence, the water levels in the inlet increased by 1.3 m over 24 days – the fastest rate we have ever recorded.

This high rainfall in June and rapid increase in inlet water level caused significant flooding. As a result, on

Thursday 29 June 2023 the sandbar was opened. The inlet water level was approximately 1.27 mAHD at the time of opening. By Friday 30 June, the outgoing flow had scoured the bar to a width of about 100 m. About 27 GL of water (approximately 11 times the volume of an olympic-sized pool) was discharged into the ocean in the first 24 hours after opening.



Wilson Inlet Catchment monthly rainfall in 2023 compared with historical averages, Bureau of Meteorology site 9531

## Oxygen and salinity

When the sandbar is open and the rivers are flowing, river and seawater meet but do not easily mix. This leads to stratification: a process of layering where fresh water sits on top of denser salty water. This is a natural characteristic of estuaries, but it prevents the mixing of oxygen. The resulting low dissolved oxygen concentrations in the deeper parts of the water column can kill aquatic animals and cause the release of nutrients from the sediment.

In Wilson Inlet, salinity stratification occurs during times where the sandbar is open, allowing ocean

water to enter the inlet, and the rivers also bring fresh water to the inlet. In 2023 the inlet was well mixed until the sandbar was opened in June. Strong stratification then persisted in the inlet until about September 2023, when the river flows decreased. This is consistent with other years with similar rainfall. During the stratified period, there were instances where oxygen concentrations were lower in the bottom waters close to the sediment compared with the water close to the surface.

<sup>1</sup> A combination of factors caused a long-lasting channel. These included high water level at the time of the sandbar breach in 2021, high rainfall and river flows in winter 2021, and high ocean levels and tides because of the La Niña weather event in 2021–22. For more detail including reasons the sandbar stayed open for so long, see the [Nullaki Water Quality Snapshot 2021–22](#) on [wa.gov.au](#).

# Nutrients

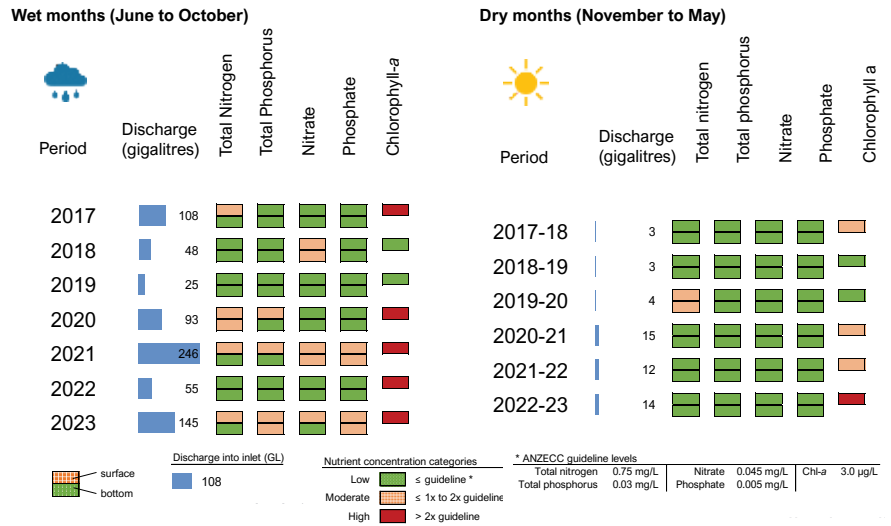
We monitor nutrient concentrations in the water because excess phosphorus and nitrogen can promote algal growth. While algae are a natural part of aquatic ecosystems, excessive algal growth can make waterways unsightly and smelly, potentially harming fish and posing risks to human health.

In the dry months of 2022–23 (November 2022 to May 2023), the average nitrogen and phosphorus concentrations in the inlet were healthy.<sup>2</sup> This is typical for the drier months of the year.

Nitrogen and phosphorus concentrations increased in the inlet after rainfall generated river flow in June 2023. The nutrient increase during the wet months of 2023 was typical for a wet year with high rainfall and river flows that carried a large amount of nutrients from the land uses in the catchment. The average nutrient concentrations for the wet months in 2023 (June to October) were moderate, consistent with other higher rainfall years such as 2021.

Average phosphate concentrations (dissolved phosphorus that is bioavailable for plant growth) in the bottom and surface waters were moderate. This suggests that phosphate was released from the sediment during periods of stratification and low oxygen conditions, in addition to the more substantial inputs from the catchment.

In comparison, the wet months of 2022 showed typical nutrient concentrations for a drier year, a result of lower nutrient input from the catchment and possibly because the sandbar was already open when the first winter river flows arrived (potentially allowing some of the nutrients to be exported to the ocean).



Average nutrient concentrations in wet and dry months between 2017 and 2024. The average is taken from the four monitoring sites in the main Wilson Inlet basin.

## Key takeaways

- In years with higher rainfall such as 2021 and 2023, there is more discharge (flow) from the rivers to the inlet than in dry years.
- Rainfall brings nutrients from the catchment's land uses into the waterways, so nutrient concentrations and algal productivity are higher in the wet months of the year than in dry months.
- Algal productivity is lowest in dry years.

<sup>2</sup> Nutrient concentrations are compared with [ANZECC and ARMCANZ \(2000\) water quality guidelines for estuaries in south-west Australia](#). Guidelines are used to assess risk of adverse effects on water quality.

## Summary

While the water quality of the inlet is generally good, the inlet remains vulnerable because high nutrient loads are discharged from the catchment land uses into the inlet during wet months. Dissolved nutrients are occasionally released from the sediment when there are low oxygen concentrations in the sediment and bottom water (close to the sediment). This highlights the importance of reducing the nutrient loads entering the inlet.

Healthy Estuaries WA is supporting work in the catchment to reduce nutrient inputs to Wilson Inlet.

## Learn more

Learn more about the Wilson Inlet sandbar: [estuaries.dwer.wa.gov.au/estuary/wilson-inlet/](https://estuaries.dwer.wa.gov.au/estuary/wilson-inlet/)

Explore the estuary's salinity and oxygen profiles over time: [estuaries.dwer.wa.gov.au/estuary/wilson-inlet/estuary/condition/physical-profiles/](https://estuaries.dwer.wa.gov.au/estuary/wilson-inlet/estuary/condition/physical-profiles/)

For example, the program works with farmers on best practice fertiliser and nutrient management, and keeping livestock out of waterways.

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