

Water quality snapshot: Leschenault Estuary 2023

Through Healthy Estuaries WA, the Department of Water and Environmental Regulation monitors water quality fortnightly in the estuary and the surrounding catchment.

This snapshot provides some insights from our water quality monitoring from June 2022 to May 2023.

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



The Leschenault Estuary tends to have healthy nutrient concentrations, mostly because of the tidal exchange between marine waters via the permanent connection with the ocean ('the Cut'). However, the rivers that flow into the estuary have excessive nutrient concentrations and poor water quality. This is especially the case in Parkfield Drain, as well as the estuarine parts of the Collie, Preston and Brunswick rivers, which are the brackish areas closest to the estuary that can extend as far as 13 km upstream.

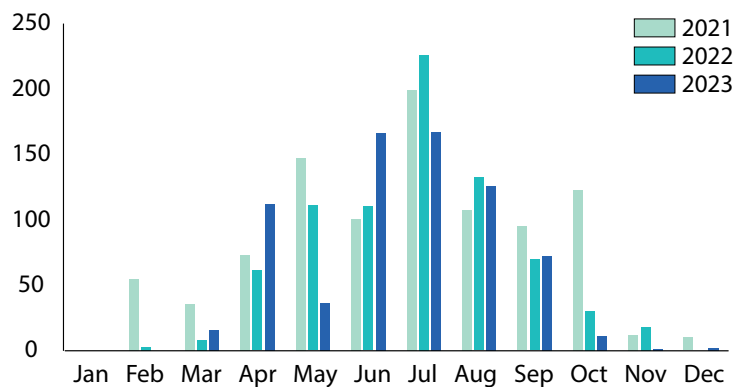
Rainfall washes nutrients (nitrogen and phosphorus) and organic matter from the surrounding area (catchment) into the rivers, and then to the estuary. Nutrients applied in the catchment, for example as fertiliser or livestock waste, wash into the waterways

when it rains. Oversupply of nutrients in waterways can cause excessive algal growth, especially during summer when conditions are sunny and warm and stream flows are reduced.

During the 2022–23 sampling period, two fish kill events occurred in the Collie River in April and May 2023. High densities of microalgae from the genus *Karlodinium* were recorded during both events. Since some species of *Karlodinium* can produce toxins, further studies are currently underway to identify the specific species present. The fish kills were likely a combination of low oxygen events and *Karlodinium* following heavy rain. There were no fish kills or algal blooms in the estuary itself.

Rainfall

Rainfall recorded in the Leschenault catchment between June 2022 to May 2023 (754 mm) was slightly higher than the annual average for the region (705 mm).¹ However, about 45 per cent of the total rainfall recorded during this period occurred in July 2022 or during a storm event in April 2023. This meant that persistent dry conditions were observed throughout most of the 2022–23 water quality monitoring cycle.



Rainfall (mm) in the Leschenault catchment, Bureau of Meteorology station 9965

Nutrients

We monitor nutrient concentrations because nitrogen and phosphorus drive algal growth, with their dissolved inorganic forms (like phosphate) capable of fuelling rapid and prolific algal growth.² While algae are a natural part of aquatic ecosystems, excessive algal growth can make waterways unsightly, smelly and can harm or kill aquatic life such as fish.

Consistent with previous years, the average total nitrogen and phosphate concentrations from 2022 to 2023 in the four estuary monitoring sites were healthy.³ Overall, total nitrogen and phosphate concentrations in the estuary were higher during wet months (June to October) compared with dry months (November to May). The rivers that flow into the

estuary have higher nutrient concentrations (i.e. poorer water quality) than the estuary itself, especially during the wet months of the year. These rivers receive high inputs of nutrients from the catchment and its land uses when it rains, and take time to flow to the estuary where they are diluted by ocean water entering from the Cut.

¹ Data from Bureau of Meteorology Bunbury station (9965). Average annual rainfall is for the past 30 years from 2003 to 2023.

² Nutrient concentrations are compared with ANZECC and ARM CANZ (2000) water quality guidelines for estuaries in south-west Australia. Available from www.waterquality.gov.au/anz-guidelines/resources/previous-guidelines/anzecc-armcanz-2000.

³ For more information, see the [Condition of the Estuary: Leschenault Estuary 2016-19](#) report.



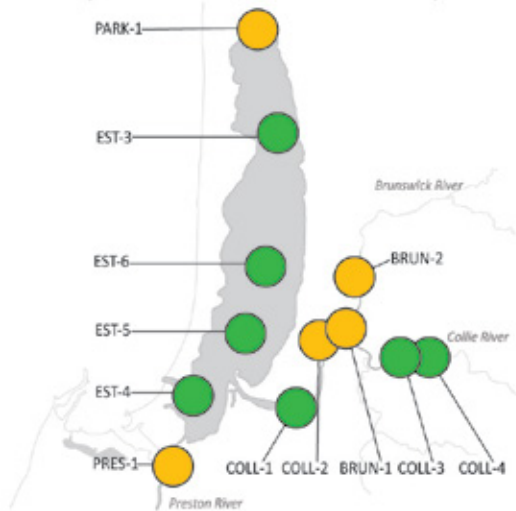
Parkfield Drain



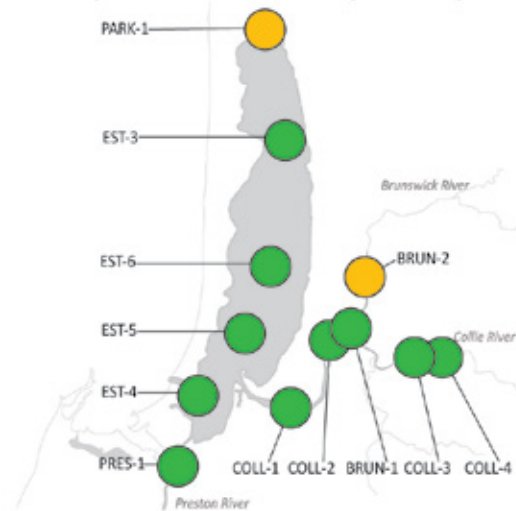
The Cut, viewed from Leschenault Estuary

Total nitrogen (TN)

Wet months
(Jun 2022 to Oct 2022)

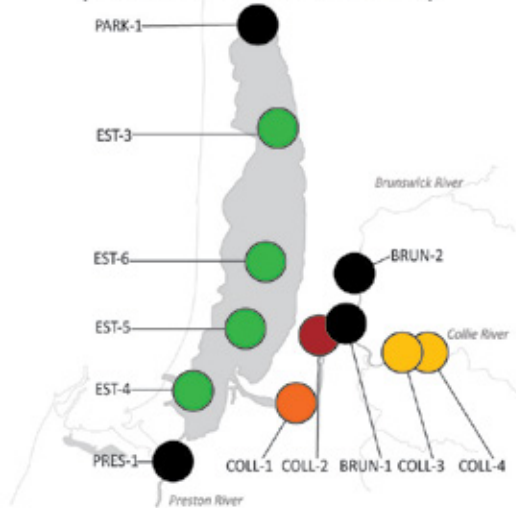


Dry months
(Nov 2022 to May 2023)

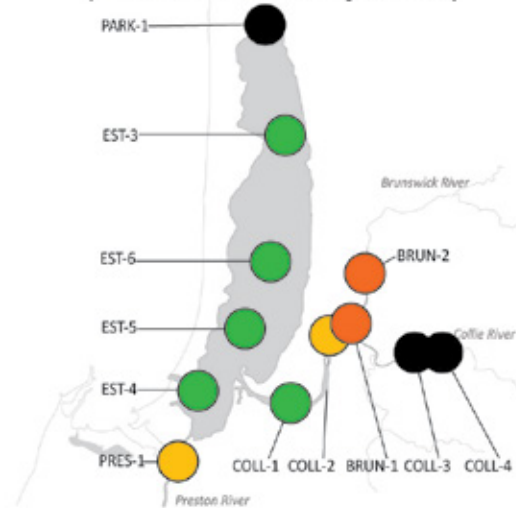


Phosphate (FRP)

Wet months
(Jun 2022 to Oct 2022)



Dry months
(Nov 2022 to May 2023)



Nutrient concentration categories

Low	● ≤ guideline*
Moderate	● > guideline to 2X guideline
High	● > 2X guideline to 3X guideline
Very high	● > 3X guideline to 4X guideline
Extreme	● > 4X guideline

*ANZECC guideline values

Total nitrogen (TN)	0.750 mg/L
Phosphate (FRP)	0.005 mg/L

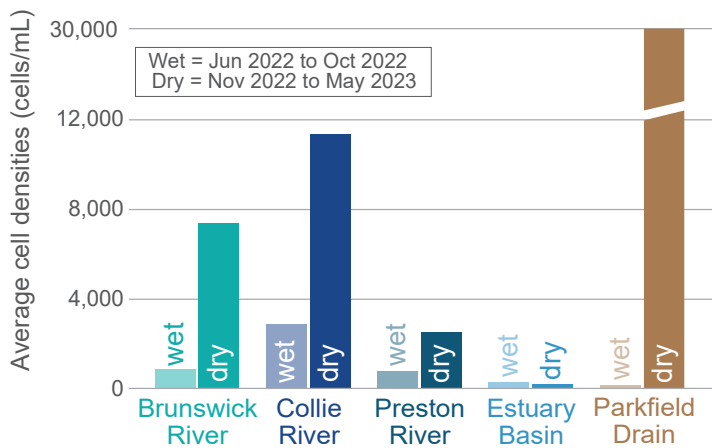
Key takeaways

- Nutrient concentrations in the Leschenault Estuary were at healthy levels in both wet and dry months.
- During the wet months, the average nitrogen concentrations in Parkfield Drain, Brunswick River, Collie River and Preston River exceeded the water quality guideline value at five of the eight sampling sites, indicating poor water quality. Comparatively, average nitrogen concentrations were lower during dry months, with averages exceeding the water quality guideline at only two sites (Parkfield Drain and the uppermost Brunswick River site).
- The average phosphate concentrations in Parkfield Drain, Brunswick River, Collie River, and Preston River exceeded the guideline value at all sampling sites during wet months, with phosphate concentrations in Parkfield drain, Brunswick River, and Preston River considered extremely high. Phosphate concentrations decreased during dry months, except for the upstream Collie River sites (COLL-3 and COLL-4) which had average phosphate concentrations more than eight times higher than the guideline value.

Microalgal productivity

Average chlorophyll concentrations, an indicator of algal productivity, were above guideline values in the Collie and Brunswick rivers and Parkfield Drain, indicating excessive algal growth. Average chlorophyll concentrations were 12 µg/L for the Brunswick and Collie Rivers, 11 µg/L for Parkfield Drain and 5 µg/L for the Preston River, compared with the ANZECC water quality guideline of 3 µg/L. Average chlorophyll concentrations within the estuary were healthy (average of 1 µg/L).

Microalgal densities were higher in the dry, hot and sunny months of 2022–23 (November to May). Although there is less flow and associated nutrient inputs in these months, nutrients can be released from the sediments and fuel excessive microalgal growth.



Algal cell densities were highest in the locations that had consistently high phosphate concentrations throughout 2022–23 (Parkfield Drain, Collie River and Brunswick River).

These areas often also had stratified conditions in the dry months. Stratification is 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. Low oxygen conditions near the sediment can cause release of further nutrients that become available to fuel algal growth.

Microalgal densities at Parkfield Drain were more than double those observed in Collie River and Brunswick River. Parkfield drain has nutrient-rich sediments and is poorly flushed. This creates conditions suitable for excessive algal growth. Dissolved oxygen can be low in the drain (e.g. in February 2023), releasing more nutrients from the sediment.

Key takeaways

- Algal productivity tended to be higher in the dry months of the year compared with the wetter months.
- Algal productivity was lower in the estuary itself compared with the waterways that flow into the estuary.
- Parkfield Drain had the highest algal cell densities of all the waterways that flow into the estuary.

Summary

Water quality in the estuary basin remains good. The Collie, Preston and Brunswick Rivers and Parkfield Drain have high to extreme nutrient concentrations, particularly of phosphate which can easily fuel excessive algal growth. The estuarine parts of the rivers and Parkfield Drain have higher algal productivity compared with the estuary, with Parkfield Drain having the highest algal cell densities. Additionally, most of the estuarine stretch of the Collie River had high densities of the dinoflagellate *Karlodinium* in the months prior to and during two fish kill events.

The very high nutrient inputs in the Brunswick, Collie and Preston Rivers and Parkfield Drain could lead to deteriorating water quality in the estuary basin over time. Managing land use appropriately and reducing nutrient inputs remain essential to protect the Leschenault Estuary and the waterways that flow into the estuary.

Healthy Estuaries WA is supporting work in the catchment to reduce nutrient inputs to the Leschenault Estuary. For example, the program works with farmers on best practice fertiliser and nutrient management, and keeping livestock out of waterways.



More information

estuaries.dwer.wa.gov.au/estuary/leschenault-estuary