West Bay Creek

This data report provides a summary of the nutrients at the West Bay Creek sampling site in 2019 as well as historical data from 2005–19. This report was produced as part of Healthy Estuaries WA. Downstream of the site, the creek discharges into West Bay of the Hardy Inlet.

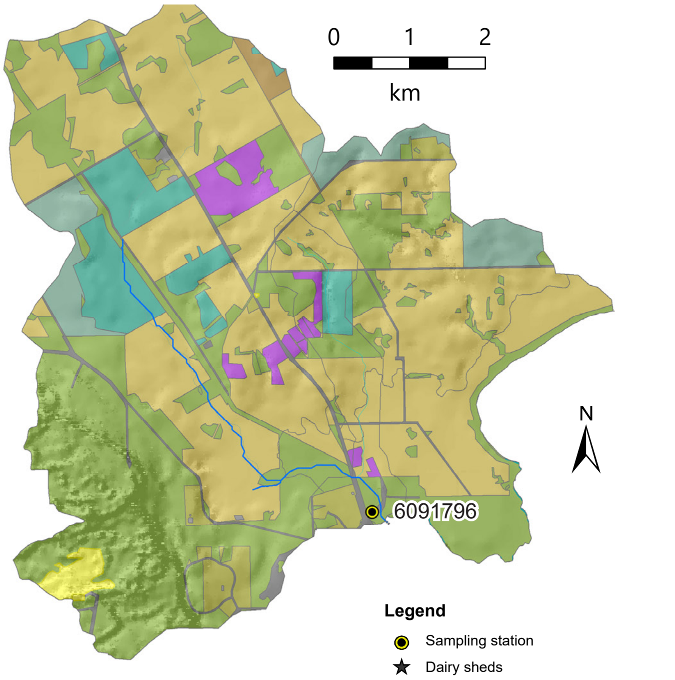
About the catchment

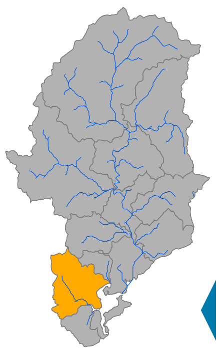
West Bay Creek has a catchment area of about 42 km^2. The dominant land uses are beef and sheep grazing and native vegetation. There are a number of streams which discharge to the Hardy Inlet from this catchment; however only one, West Bay Creek which drains the western part of the catchment, is sampled. The creek has virtually no fringing vegetation remaining.

Most of the soils in the catchment have a high phosphorus-binding capacity and so bind most of the phosphorus applied to them, reducing the amount entering the streams.

West Bay Creek discharges into West Bay, in the Hardy Inlet in Augusta.

Water quality is measured at site 6091796, West Bay Creek, where the creek passes under West Bay Creek Road, a few hundred meters upstream of where it discharges into the Hardy Inlet.





Location of West Bay Creek catchment in the greater Lower Blackwood catchment.

Results summary

Nutrient concentrations at the West Bay Creek sampling site were classified as low (total nitrogen) and moderate (total phosphorus).

Facts and figures

Sampling site code	6091796 (West Bay Creek)
Catchment area	42 km^2
Per cent cleared area (2001)	61 per cent
River flow	Permanent
Main land use (2001)	Beef and sheep grazing and native vegetation

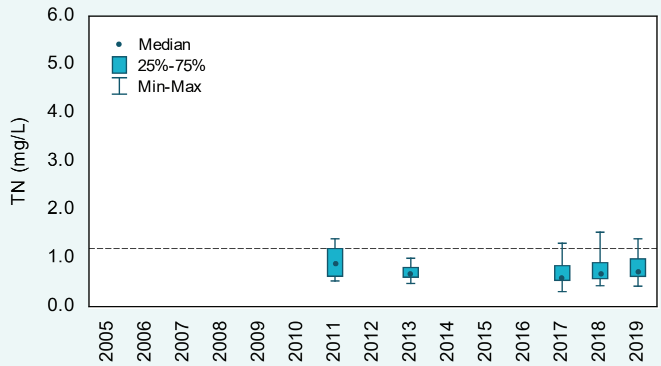
West Bay Creek

Nitrogen over time (2005–19)

Concentrations

Using the State Wide River Water Quality Assessment (SWRWQA) methodology, all years with sufficient data were classified as having low total nitrogen (TN) concentrations. Further, all annual median TN concentrations were below the Australian and New Zealand Environment and Conservation Council (ANZECC) trigger value. TN fluctuated over the reporting period, with all years having some samples over the ANZECC trigger value with the exception of 2013.

West Bay Creek



Total nitrogen concentrations, 2005–19 at site 6091796. The dashed line is the ANZECC trigger value.

West Bay Creek sampling site during high flows, August 2018.

West Bay Creek

Nitrogen (2019)

Types of nitrogen

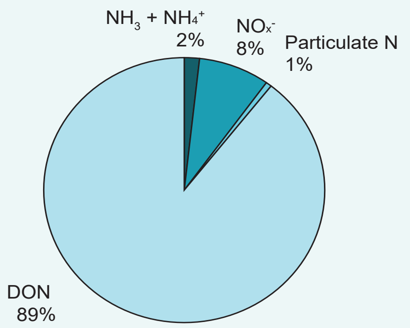
Total N is made up of different types of N. Dissolved organic N (DON) contributed the largest proportion of the N present at West Bay Creek. DON is mostly sourced from degrading plant and animal matter which generally needs to be further broken down to become available to plants and algae but may also be present in other types, which are bioavailable. Generally, agricultural catchments have a larger portion of N present as dissolved inorganic N (DIN), consisting of nitrate (NO_x^-) and total ammonia (NH_3 + NH_4^+), than observed at West Bay Creek. Both nitrate and total ammonia generally come from fertilisers and animal wastes and are readily bioavailable to plants and algae.

Concentrations

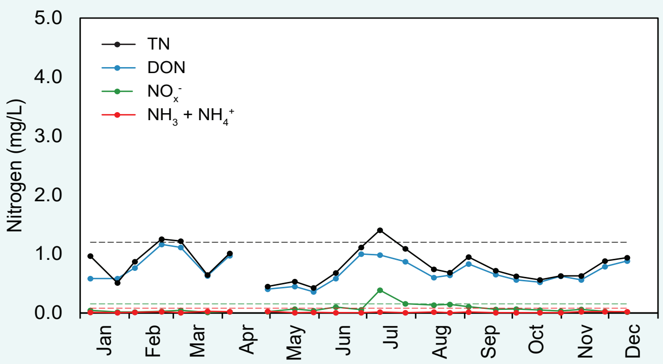
Total N, nitrate and DON all showed a seasonal response, increasing in June when rainfall increased and then decreasing again later in the year. The peak in June is likely because of a first flush effect where N was mobilised following the onset of winter rains. Much of this N was probably the result of mineralisation of organic N in soils and streams over the summer period, and runoff of high concentration waters from agricultural land which builds up with fertiliser and animal waste over summer. The reason for the peak in February is unknown, though it did follow about 25–50 mm of rain falling in the first few days of February so may be related to runoff associated with this rainfall.

Where there are no data presented, the creek was likely experiencing backflow from the Blackwood River.

West Bay Creek



2019 average nitrogen fractions at site 6091796.



2019 nitrogen concentrations at 6091796. The dashed lines are the ANZECC trigger values for the different N species.

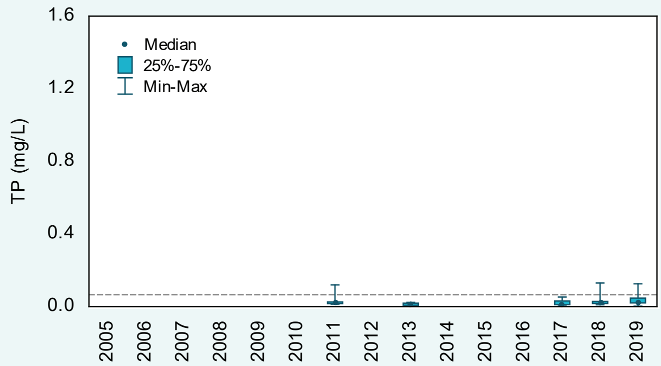
West Bay Creek sampling site during low flows, December 2018.

Phosphorus over time (2005–19)

Concentrations

Using the SWRWQA methodology, all years with sufficient data were classified as having moderate TP concentrations. Annual medians were all below the ANZECC trigger value, however, and overall TP concentrations were still relatively low.

West Bay Creek



Total phosphorus concentrations, 2005–19 at site 6091796. The dashed line is the ANZECC trigger value.

Triglochin growing in West Bay Creek at the sampling site, October 2018.

West Bay Creek

Phosphorus (2019)

Types of phosphorus

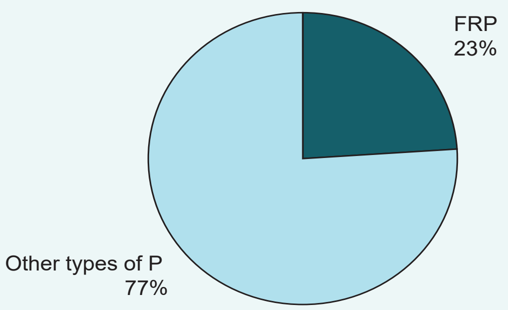
Total P is made up of different types of P. In West Bay Creek, just under a quarter of the P was present as phosphate; measured as filterable reactive phosphorus (FRP) which in surface waters is mainly present as phosphate (PO_4^{3-}) species and is readily bioavailable. Likely sources of phosphate in an agricultural catchment like this one include fertilisers and animal wastes as well as natural sources. The remaining P was present as either particulate P or dissolved organic P (DOP) or both. Particulate P generally needs to be broken down before becoming bioavailable. The bioavailability of DOP varies and is poorly understood.

Concentrations

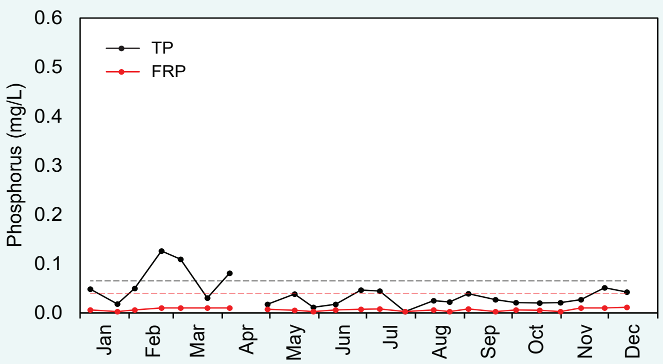
In 2018, TP concentrations showed a seasonal pattern, being highest during the wetter months. This pattern was not evident in 2019, with the highest concentrations recorded in February and concentrations fluctuating during the rest of the year. The reason for the peak in February is unclear though it may be a result of the 25–50 mm of rain that fell in the first days of February washing P into the creek from surrounding land use.

Where there are no data presented, the creek was likely experiencing backflow from the Blackwood River.

West Bay Creek



2019 average phosphorus fractions at site 6091796.



2019 phosphorus concentrations at 6091796. The dashed lines are the ANZECC trigger values for the different P species.

Looking downstream along West Bay Creek from underneath the West Bay Creek Road bridge, June 2019.

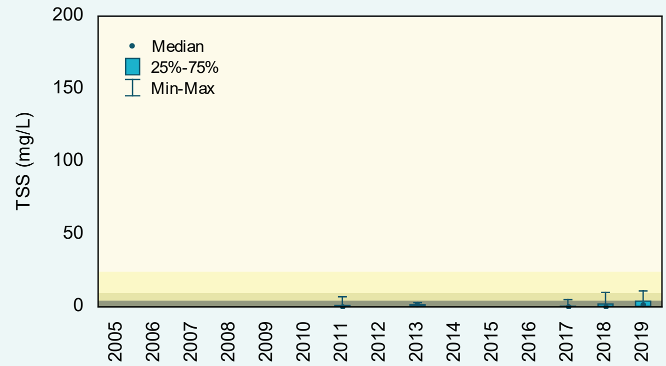
West Bay Creek

Total suspended solids over time (2005–19)

Concentrations

Using the SWRWQA methodology, all years with sufficient data were classified as having low total suspended solids (TSS) concentration. TSS concentrations fluctuated over the reporting period, though they were consistently low.

West Bay Creek



Total suspended solids concentrations, 2005–19 at site 6091796. The shading refers to the SWRWQA classification bands.

low moderate high very high

White-faced heron at West Bay Creek sampling site, May 2019.

West Bay Creek

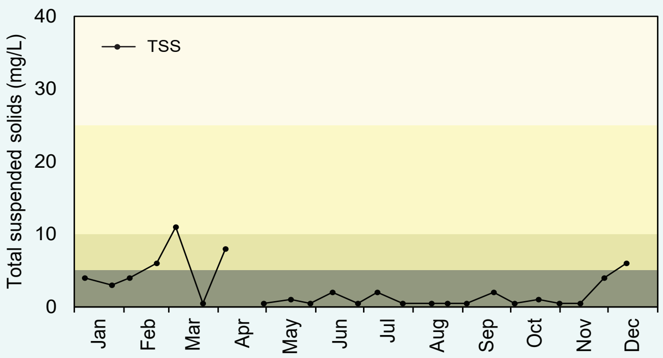
Total suspended solids (2019)

Concentrations

In 2019, most of the TSS samples collected fell into the low band of the SWRWQA. There was a peak in TSS near the beginning and end of the year. The peak at the beginning of the year may have been a result of the 25 – 50 mm of rain that fell in the first few days of February. It is unclear what caused the peak in December.

Where there are no data presented, the creek was likely experiencing backflow from the Blackwood River.

West Bay Creek



2019 total suspended solids concentrations at 6091796. The shading refers to the SWRWQA classification bands.

low | moderate | high | very high

Collecting a water quality sample at West Bay Creek, September 2019.

West Bay Creek

pH over time (2005–19)

pH values

pH at West Bay Creek fluctuated slightly over the years for which there were sufficient data to graph. All samples (and therefore medians) were within the upper and lower ANZECC trigger values.

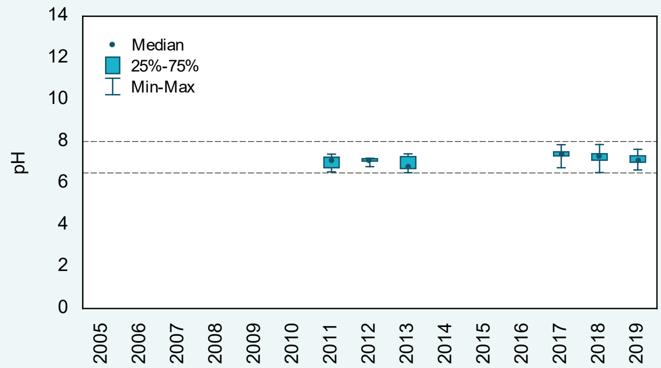
pH (2019)

pH values

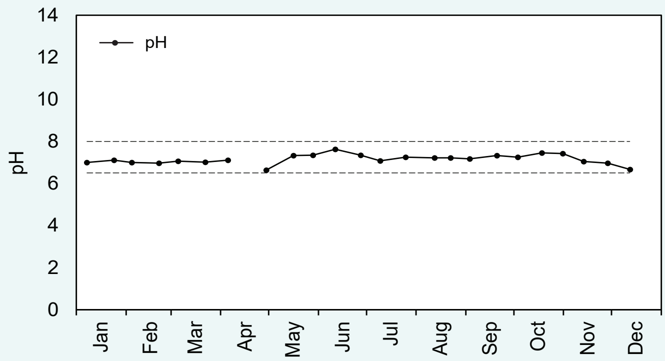
There was no evidence of a seasonal pattern in pH at West Bay Creek, with values fluctuating throughout the year. All samples collected in 2019 fell within the upper and lower ANZECC trigger values.

Where there are no data presented, the creek was possibly experiencing backflow from the Blackwood River.

West Bay Creek



pH levels, 2005–19 at site 6091796. The dashed lines are the upper and lower ANZECC trigger values.



2019 pH levels at 6091796 The dashed lines are the upper and lower ANZECC trigger values.

West Bay Creek Road, September 2018. The vegetation is starting to regenerate following the January 2018 fire.

West Bay Creek

Salinity over time (2005–19)

Concentrations

Salinity fluctuated over the years that had sufficient data to graph. Using the Water Resources Inventory 2014 salinity ranges, those years with adequate data prior to the break in monitoring were classified as fresh and after the break in monitoring were classified as marginal (note, the 2018 nutrient report used the SWRWQA classification bands). Ongoing monitoring will help determine if salinity at this site is getting worse or whether it is part of the natural fluctuations at this site.

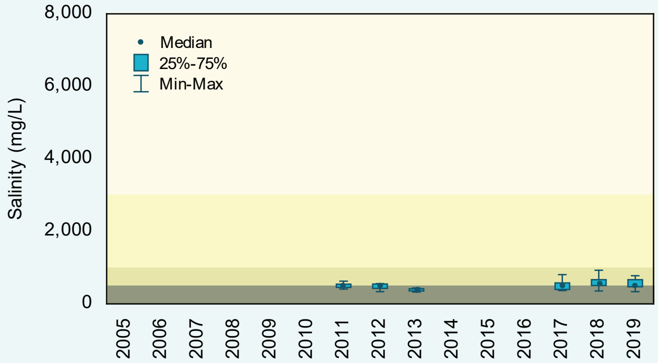
Salinity (2019)

Concentrations

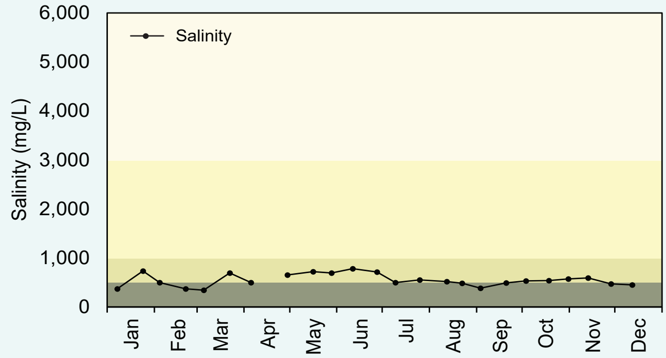
Salinity was slightly higher at the start of the year, falling into the marginal band on most sampling occasions until July when it fell into the fresh band. Later in the year, in October, it increased again and fell into the marginal band once more. This suggests salts are entering the creek year-round via surface flow as well as from groundwater. The higher salinity present in the drier months may be because of evapoconcentration, where salts are left behind as the creek water dries up, or because the groundwater in the area is more saline than the surface water, or both.

Where there are no data presented, the creek was likely experiencing backflow from the Blackwood River.

West Bay Creek



Salinity concentrations, 2005–19 at site 6091796. The shading refers to the Water Resources Inventory 2014 salinity ranges.



2019 salinity concentrations at 6091796. The shading refers to the Water Resources Inventory 2014 salinity ranges.

fresh | marginal | brackish | saline

Low water levels in West Bay Creek where it flows under West Bay Creek Road, July 2019.

West Bay Creek

Background

Healthy Estuaries WA is a State Government program launched in 2020 and builds on the work of the Regional Estuaries Initiative. Collecting and reporting water quality data, such as in this report, helps build understanding of the whole system. By understanding the whole system, we can direct investment towards the most effective actions in the catchments to protect and restore the health of our waterways.

Nutrients (nitrogen and phosphorus) are compounds that are important for plants to grow. Excess nutrients entering waterways from effluent, fertilisers and other sources can fuel algal growth, decrease oxygen levels in the water and harm fish and other species. Total suspended solids, pH and salinity data are also presented as these help us better understand the processes occurring in the catchment.

You can find information on the condition of Hardy Inlet at estuaries.dwer.wa.gov.au/estuary/hardy-inlet/

Healthy Estuaries WA partners with the Lower Blackwood Land Conservation District Committee (Lower Blackwood LCDC) to fund best-practice management of fertiliser, dairy effluent and watercourses on farms.

- To find out how you can be involved visit estuaries.dwer.wa.gov.au/participate
- To find out more about the Lower Blackwood LCDC go to lowerblackwood.com.au
- To find out more about the health of the rivers in the Hardy Inlet catchment go to rivers.dwer.wa.gov.au/assessments/results

Methods

Variables were compared with ANZECC trigger values where available, or the SWRWQA bands or 2014 Water Resources Inventory ranges. They were classified using the SWRWQA methodology. Standard statistical tests were used to calculate trends and loads. For further information on the methods visit estuaries.dwer.wa.gov.au/nutrient-reports/data-analysis

Glossary

Bioavailable: bioavailable nutrients refers to those nutrients which plants and algae can take up from the water and use straight away for growth.

Concentration: the amount of a substance present per volume of water.

Evapoconcentration: the increase in concentration of a substance dissolved in water because of water being lost by evaporation.

First flush: material washed into a waterway by the first rainfall after an extended dry period. The first flush is often associated with high concentrations of nutrients and particulate matter.

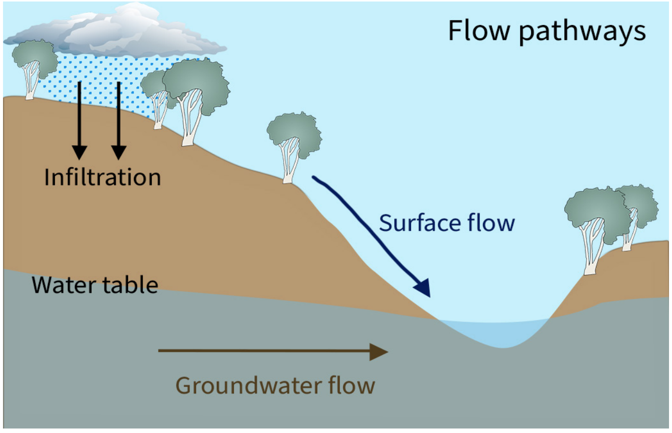
Laboratory limit of reporting: (LOR) this is the lowest concentration of an analyte that can be reported by a laboratory.

Load: the total mass of a substance passing a certain point.

Load per square kilometre: the load at the sampling site divided by the entire catchment area upstream of the sampling site.

Nitrate: The measurement for the nutrient nitrate actually measures both nitrate (NO_3^-) and nitrite (NO_2^-), which is reported as NO_x^-. We still refer to this as nitrate as in most surface waters nitrite is present in very low concentrations.

The schematic below shows the main flow pathways which may contribute nutrients, particulates and salts to the waterways. Connection between surface water and groundwater depends on the location in the catchment, geology and the time of year.



estuaries.dwer.wa.gov.au
catchmentnutrients@dwer.wa.gov.au
#WAestuaries | 6364 7000

West Bay Creek Issue 2
Publication date: August 2023
ISSN: 2209–6779 (online only)