McLeod Creek

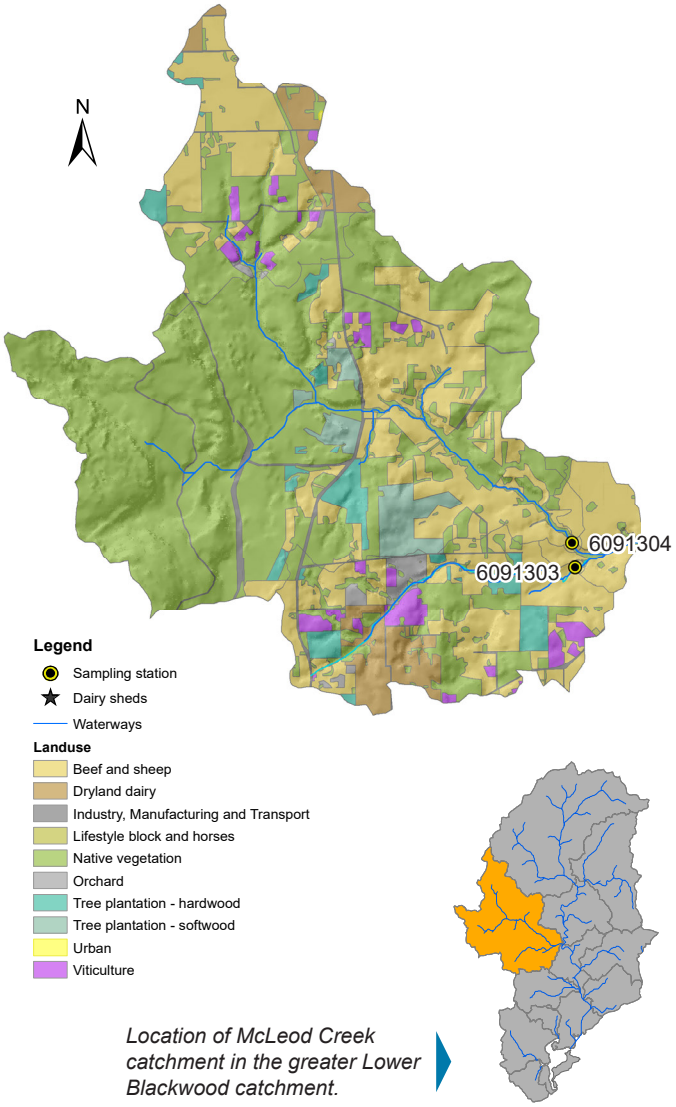
This data report provides a summary of the nutrients at the two McLeod Creek sampling sites in 2019 as well as historical data from 2005–19. This report was produced as part of Healthy Estuaries WA. Downstream of the sites, McLeod Creek discharges to the Blackwood River and subsequently the Hardy Inlet.

About the catchment

McLeod Creek has a catchment area of about 114 km^2, just over half of which is still covered in native vegetation. This is predominantly in the western portion of the catchment which is state forest. The other major land use is beef and sheep grazing. There are two major waterways: McLeod Creek which drains the northern half of the catchment; and Rushy Creek which drains the southern. McLeod Creek still has fringing vegetation along much of its length whereas it has been largely cleared from Rushy Creek. Rushy Creek also has a number of dams on it, including one just upstream of the sampling site. McLeod Creek discharges to the Blackwood River in Forest Grove, just above the Alexandra Bridge Camp Ground.

Most of the catchment has soils with a high phosphorus-binding capacity, reducing the amount that enters streams.

Water quality is measured at two sites. Rushy Creek, 6091303, which is on Rushy Creek where it passes under Millers Road, just upstream from the discharge point into McLeod Creek. And 6091304, Millers Road Crossing, which is on McLeod Creek where it passes under Millers Road. Both sites are in Forest Grove.



Location of McLeod Creek catchment in the greater Lower Blackwood catchment.

Results summary

Nutrient concentrations (total nitrogen and total phosphorus) at the two sites in the McLeod Creek catchment were slightly different. At the McLeod Creek site, both total nitrogen and total phosphorus were classified as low. At the Rushy Creek site, total nitrogen was classified as moderate and total phosphorus as low. The proportion of nitrogen present as bioavailable dissolved inorganic nitrogen was high at both sites, indicative of the agricultural land uses in this catchment.

Facts and figures

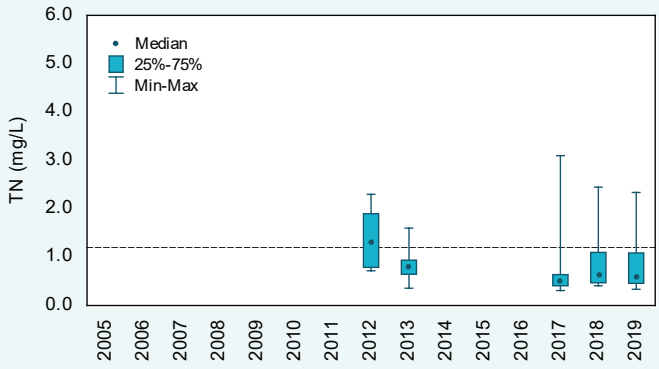
Sampling site code	6091303 (Millers Road Crossing (Rushy Creek)) and 6091304 (Millers Road Crossing (McLeod Creek))
Catchment area	114 km^2
Per cent cleared area (2001)	45 per cent
River flow	McLeod Creek (6091304) flows year-round whereas Rushy Creek (6091303) dries over summer
Main land use (2001)	Native vegetation and beef and sheep grazing

Nitrogen over time (2005–19)

Concentrations

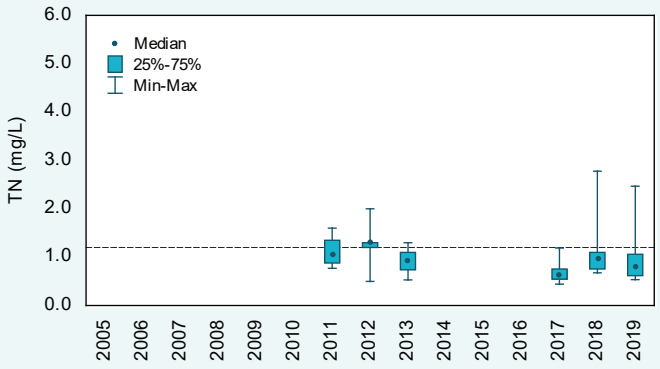
Median total nitrogen (TN) concentrations were generally slightly higher in Rushy Creek than McLeod Creek, though the annual range in concentrations was slightly greater in McLeod Creek. TN fluctuated over the reporting period, with a similar pattern observed at both sites. Using the State Wide River Water Quality Assessment (SWRWQA) methodology, annual TN concentrations were classified as low at McLeod Creek and moderate at Rushy Creek.

McLeod Creek

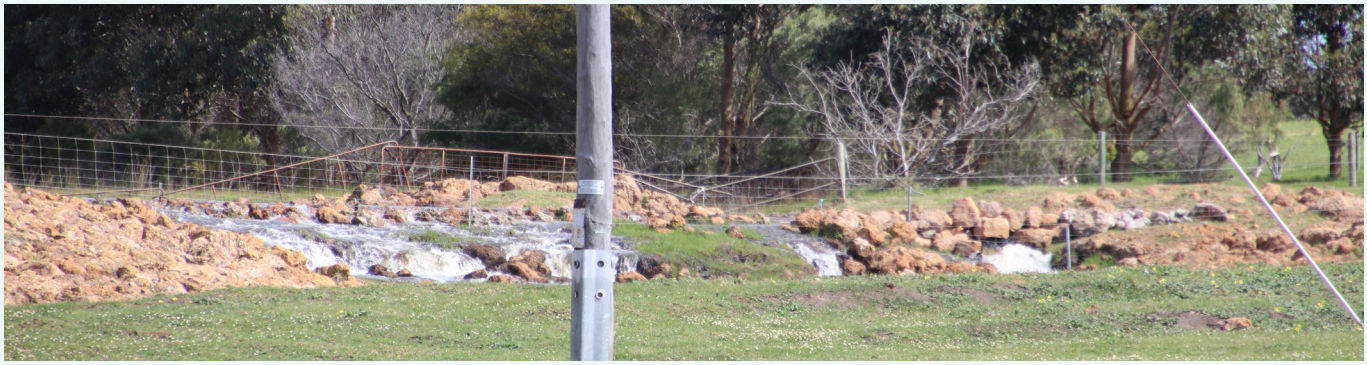


Total nitrogen concentrations, 2005–19 at site 6091304. The dashed line is the ANZECC trigger value.

Rushy Creek



Total nitrogen concentrations, 2005–19 at site 6091303. The dashed line is the ANZECC trigger value.



The dam upstream of the Rushy Creek sampling site overflowing, September 2019.

Nitrogen (2019)

Types of nitrogen

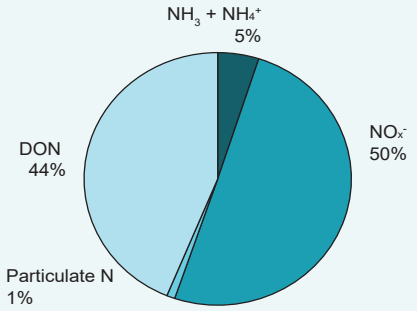
Total N is made up of different types of N. In 2019, a large portion of the N was present as dissolved inorganic nitrogen (DIN, consisting of nitrate – NO_x^- and total ammonia – NH_3 + NH_4^+) at both sites. DIN is readily utilised by plants and algae to fuel rapid growth and typically makes up a large percentage of the N in agricultural catchments where it is usually sourced from fertilisers and animal wastes. Dissolved organic N (DON) is generally less bioavailable than DIN (though some types are readily available) and is sourced from degrading plant and animal matter as well as fertilisers and animal wastes. More natural catchments tend to have a higher proportion of N present as DON than these two sites.

Concentrations

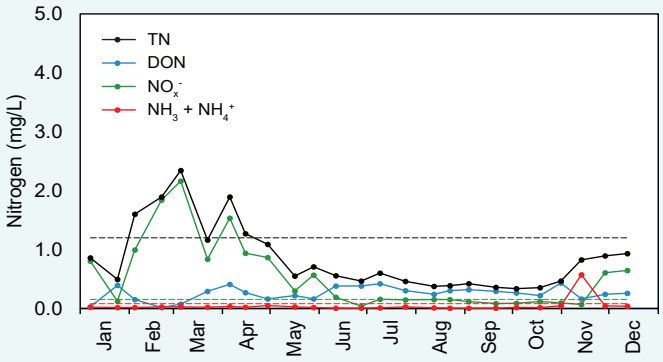
Nitrogen concentrations varied differently at the two sites in the McLeod Creek catchment. At McLeod Creek there was a large peak in TN and nitrate early in the year; this was also evident in 2018. The reason for this is unknown, though it does suggest some kind of discharge to the creek. At Rushy Creek there was a large peak in total ammonia late in the year. This was probably because of runoff from an upstream land-use. Other than these peaks, TN, nitrate and DON all showed a seasonal pattern, being higher during the wetter months when there was more flow.

Where there are no data shown in the Rushy Creek graph, the creek was not flowing.

McLeod Creek

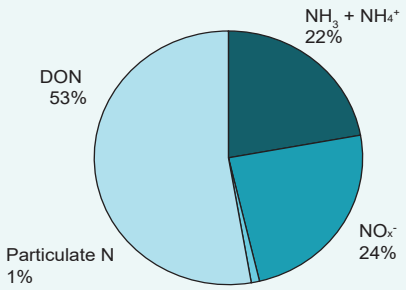


2019 average nitrogen fractions at site 6091304.

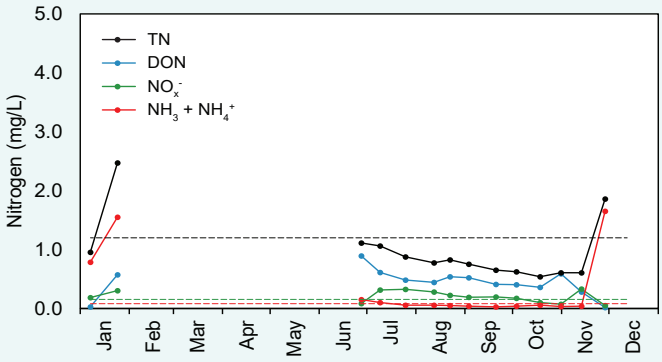


2019 nitrogen concentrations at 6091304. The dashed lines are the ANZECC trigger values for the different N species.

Rushy Creek



2019 average nitrogen fractions at site 6091303.



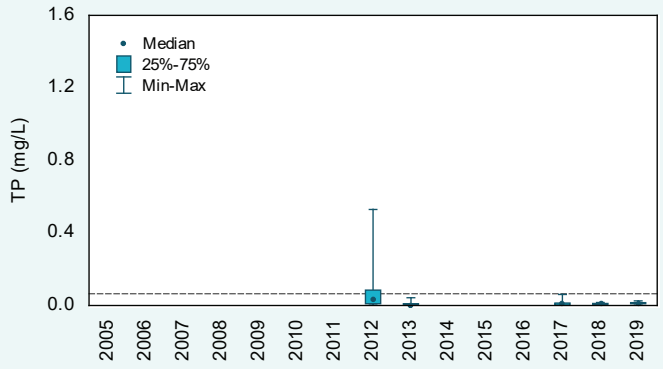
2019 nitrogen concentrations at 6091303. The dashed lines are the ANZECC trigger values for the different N species.

Phosphorus over time (2005–19)

Concentrations

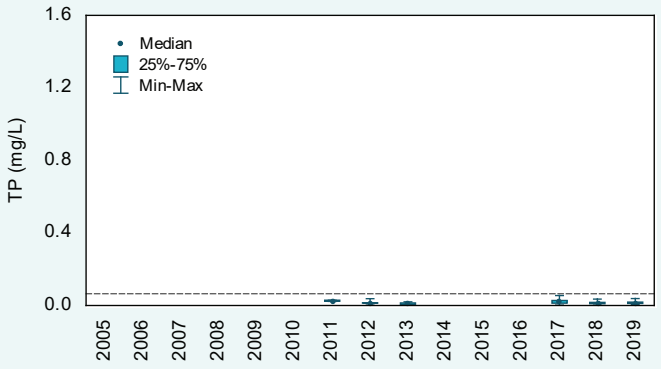
With the exception of 2012 at McLeod Creek, where total phosphorus concentrations (TP) were unusually high, all TP samples were below the Australian and New Zealand Environment and Conservation Council (ANZECC) trigger value at both sites. Why there were some unusually high TP concentrations in 2012 at McLeod Creek is unknown, though the very high reading at this site coincided with a high TSS reading, suggesting there may have been some disturbance near the site which contributed P-rich particulate matter to the creek. Using the SWRWQA methodology, both sites had all years where there were sufficient data to graph classified as having low TP concentrations. It is likely that the presence of soils with a high phosphorus-binding capacity contributed to the low TP concentrations observed at these sites.

McLeod Creek



Total phosphorus concentrations, 2005–19 at site 6091304. The dashed line is the ANZECC trigger value.

Rushy Creek



Total phosphorus concentrations, 2005–19 at site 6091303. The dashed line is the ANZECC trigger value.

The McLeod Creek sampling site, June 2019.

Phosphorus (2019)

Types of phosphorus

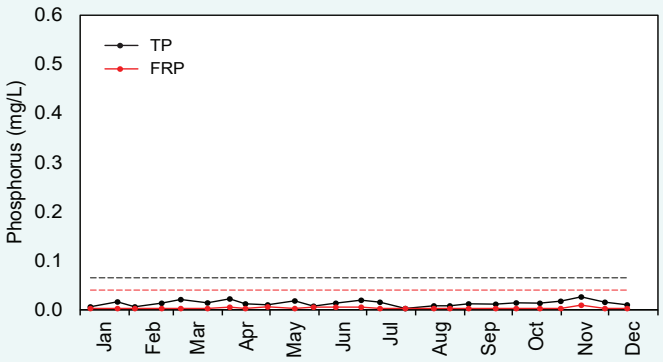
Total P is made up of different types of P. Because a large number of samples were below the laboratory limit of reporting (LOR) in 2019, phosphorus fraction pie charts were not generated for either the McLeod or Rushy creek sites. At the McLeod Creek site, one of the 25 TP samples and 19 of the 25 phosphate samples were below their limits of reporting (0.005 mg/L in each case). At the Rushy Creek site, 13 of the 14 phosphate samples were below their limit of reporting. Phosphate is measured as filterable reactive phosphorus (FRP) which in surface waters is mainly present as phosphate (PO_4^{3-}) species and is readily bioavailable.

Concentrations

Neither the McLeod Creek or the Rushy Creek site showed a seasonal pattern in TP or phosphate concentrations. TP fluctuated at both sites during the year with some minor peaks present. All samples collected were well below their ANZECC trigger values for both TP and phosphate. The high P-binding capacity of the soils present in this catchment will be contributing to the low P concentrations observed.

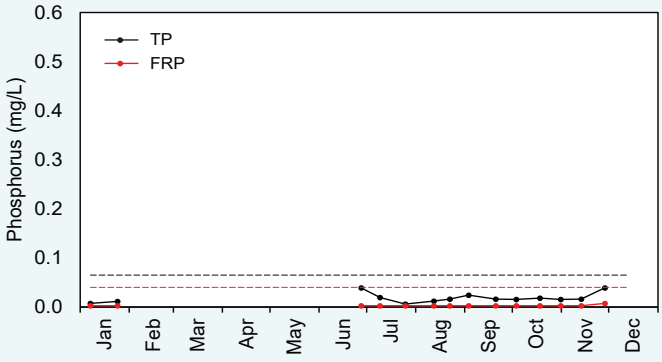
Where there are no data shown in the Rushy Creek graph, the creek was not flowing.

McLeod Creek



2019 phosphorus concentrations at 6091304. The dashed lines are the ANZECC trigger values for the different P species.

Rushy Creek



2019 phosphorus concentrations at 6091303. The dashed lines are the ANZECC trigger values for the different P species.

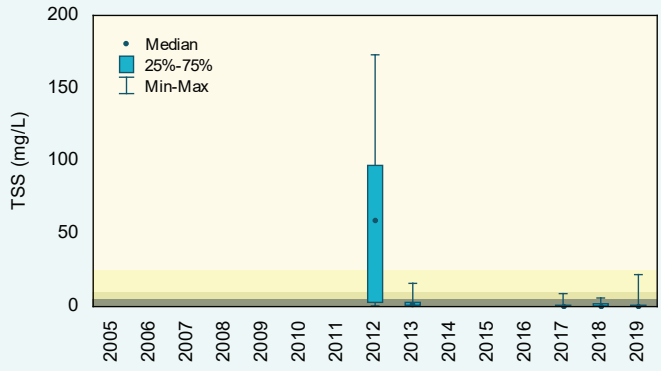
The Rushy Creek sampling site, September 2019.

Total suspended solids over time (2005–19)

Concentrations

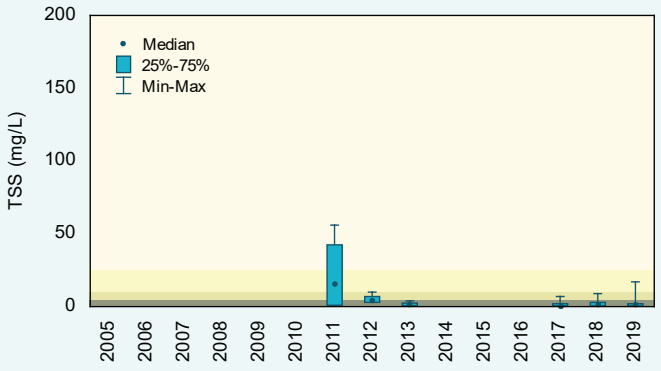
Total suspended solids (TSS) concentrations were classified as very high (McLeod Creek) and high (Rushy Creek) in 2012 using the SWRWQA methodology. Since then, TSS has been classified as low at both sites. Why TSS concentrations were so much higher in 2012 is unknown, though it did coincide with high TP concentrations in the same year.

McLeod Creek



Total suspended solids concentrations, 2005–19 at site 6091304. The shading refers to the SWRWQA classification bands.

Rushy Creek



Total suspended solids concentrations, 2005–19 at site 6091303. The shading refers to the SWRWQA classification bands.

low moderate high very high

Western minnows in McLeod Creek, March 2019.

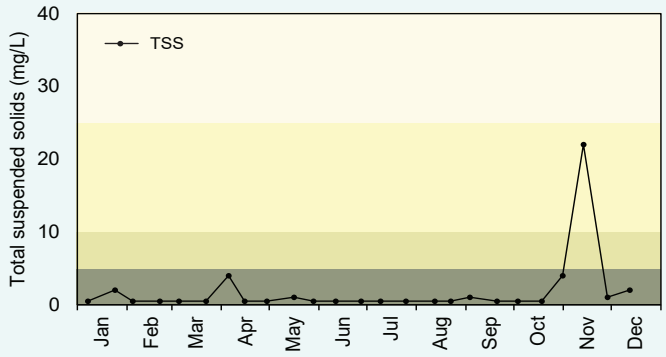
Total suspended solids (2019)

Concentrations

In 2019, most of the samples collected fell into the low band of the SWRWQA at both sites. There was one sample at both Rushy and McLeod creeks, both collected in November, which fell into the high band. These coincided with high total ammonia concentrations. It is unclear why TSS was higher at this time; possibly it was because of runoff from an upstream land use. TSS did not exhibit a seasonal pattern at either site, instead fluctuating throughout the year. Particulate matter was probably entering the creeks via surface flows as well as from in-stream sources such as erosion.

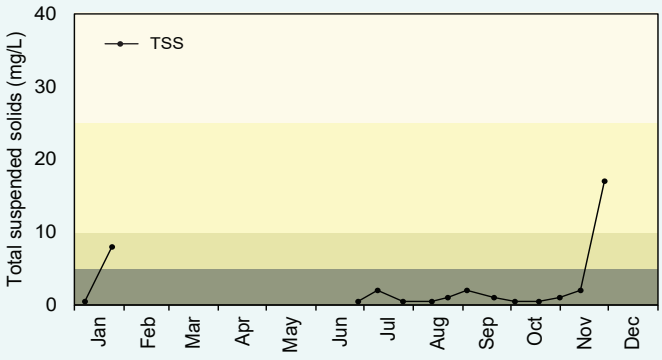
Where there are no data shown on the Rushy Creek graph, the creek was not flowing.

McLeod Creek



2019 total suspended solids concentrations at 6091304. The shading refers to the SWRWQA classification bands.

Rushy Creek



2019 total suspended solids concentrations at 6091303. The shading refers to the SWRWQA classification bands.

low moderate high very high

An irrigation pipe being buried at the McLeod Creek sampling site, November 2018. This pipe provides irrigation water from the dam upstream of the Rushy Creek sampling site.

McLeod Creek

pH over time (2005–19)

pH values

The two sites in the McLeod Creek catchment had similar pH values. Most of the samples collected fell within the upper and lower ANZECC trigger values, though there were a few samples outside the trigger values in most years. Since the break in monitoring, pH appears to be decreasing at both sites. Ongoing monitoring will help determine if this is a real change in pH or part of the natural fluctuations at these sites.

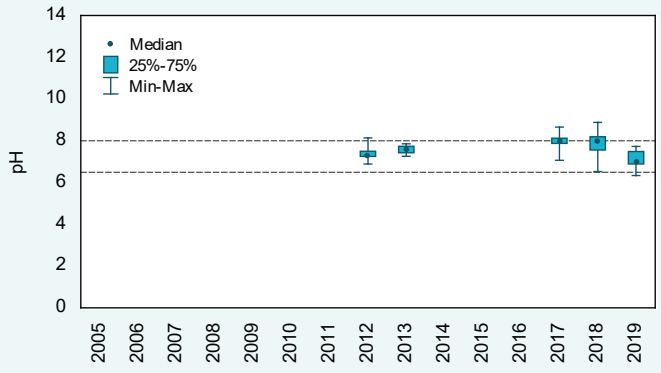
pH (2019)

pH values

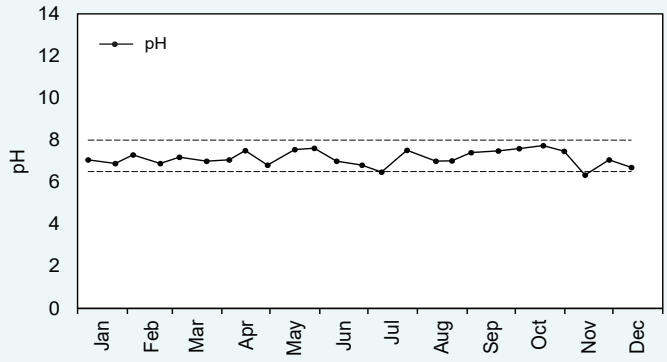
In 2019, there was no evidence of a seasonal pattern in pH at either McLeod Creek or Rushy Creek, with values fluctuating during the year. The majority of samples collected were within the ANZECC trigger values.

Where there are no data shown on the Rushy Creek graph, the creek was not flowing.

McLeod Creek

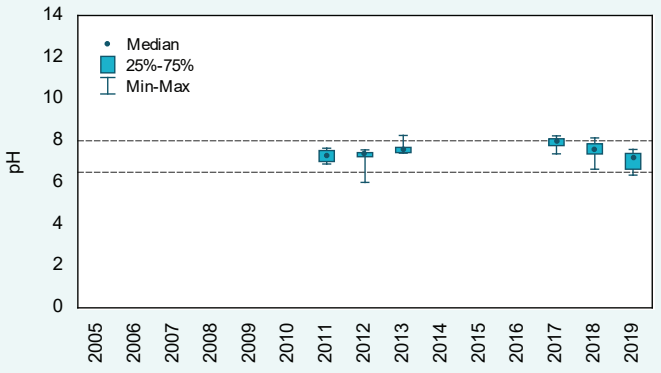


pH levels, 2005–19 at site 6091304. The dashed lines are the upper and lower ANZECC trigger values.

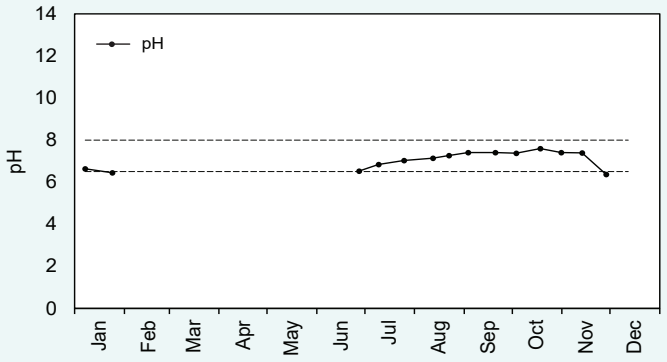


2019 pH levels at 6091304. The dashed lines are the upper and lower ANZECC trigger values.

Rushy Creek



pH levels, 2005–19 at site 6091304. The dashed lines are the upper and lower ANZECC trigger values.



2019 pH levels at 6091304. The dashed lines are the upper and lower ANZECC trigger values.

McLeod Creek

Salinity over time (2005–19)

Concentrations

Using the Water Resources Inventory 2014 salinity ranges, all years were classified as fresh (note the 2018 nutrient report used the SWRWQA bands). With the exception of a single sample at Rushy Creek which fell into the marginal band, all samples collected fell into the fresh band.

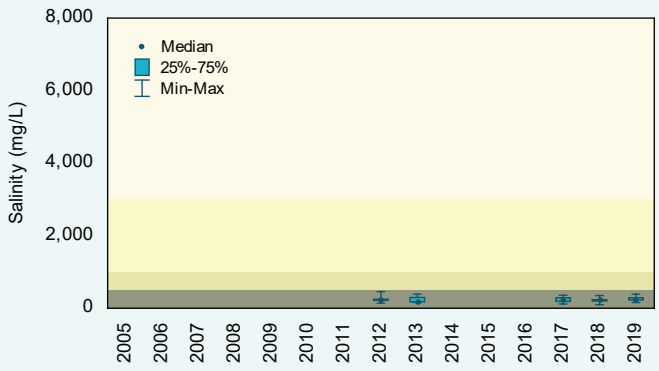
Salinity (2019)

Concentrations

There was no evidence of a seasonal pattern in salinity at either of the sites in the McLeod Creek catchment. Salinity fluctuated slightly during 2019; however, all but one sample at Rushy Creek, collected in January when the site would normally be dry, fell into the fresh band of the SWRWQA.

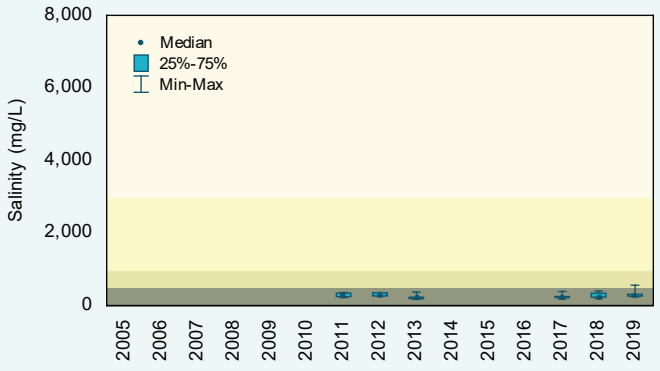
Where there are no data shown on the Rushy Creek graph, the creek was not flowing.

McLeod Creek

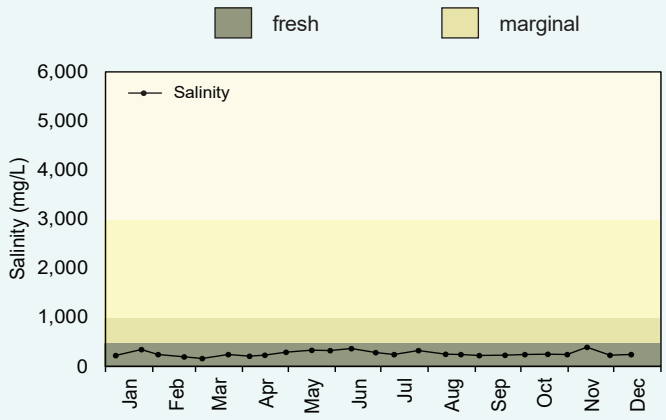


Salinity concentrations, 2005–19 at site 6091304. The shading refers to the Water Resources Inventory 2014 salinity ranges.

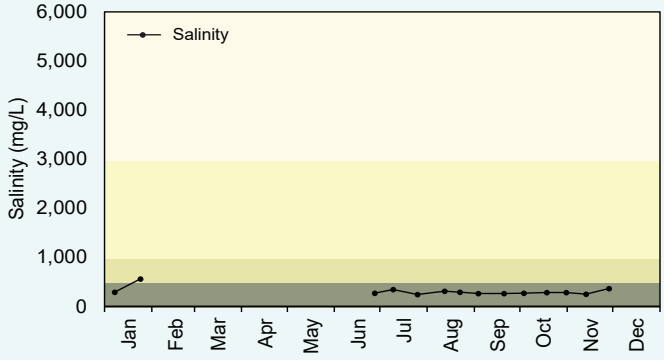
Rushy Creek



Salinity concentrations, 2005–19 at site 6091303. The shading refers to the Water Resources Inventory 2014 salinity ranges.



2019 salinity concentrations at 6091304. The shading refers to the Water Resources Inventory 2014 salinity ranges.



2019 salinity concentrations at 6091304. The shading refers to the Water Resources Inventory 2014 salinity ranges.

McLeod 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 managemetn 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.

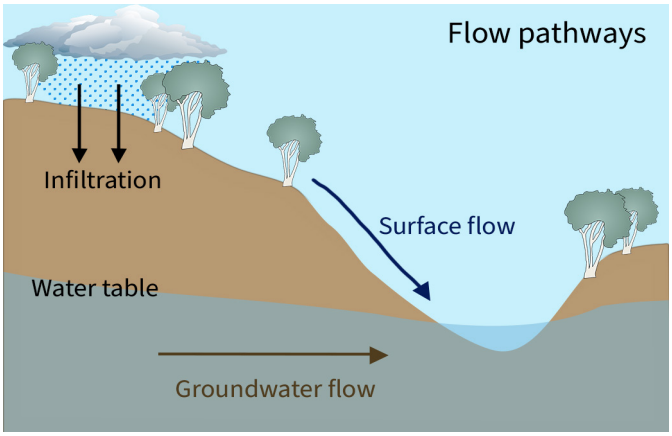
Laboratory limit of reporting: (LOR) this is the lowest concentration of an analyte that can be reported by a laboratory.

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.



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