Millars Creek

This data report provides a summary of the nutrients at the Millars Creek sampling site in 2019 as well as historical data from 2005–19. This report was produced as part of Healthy Estuaries WA. Millars Creek discharges into the Collie River.

About the catchment

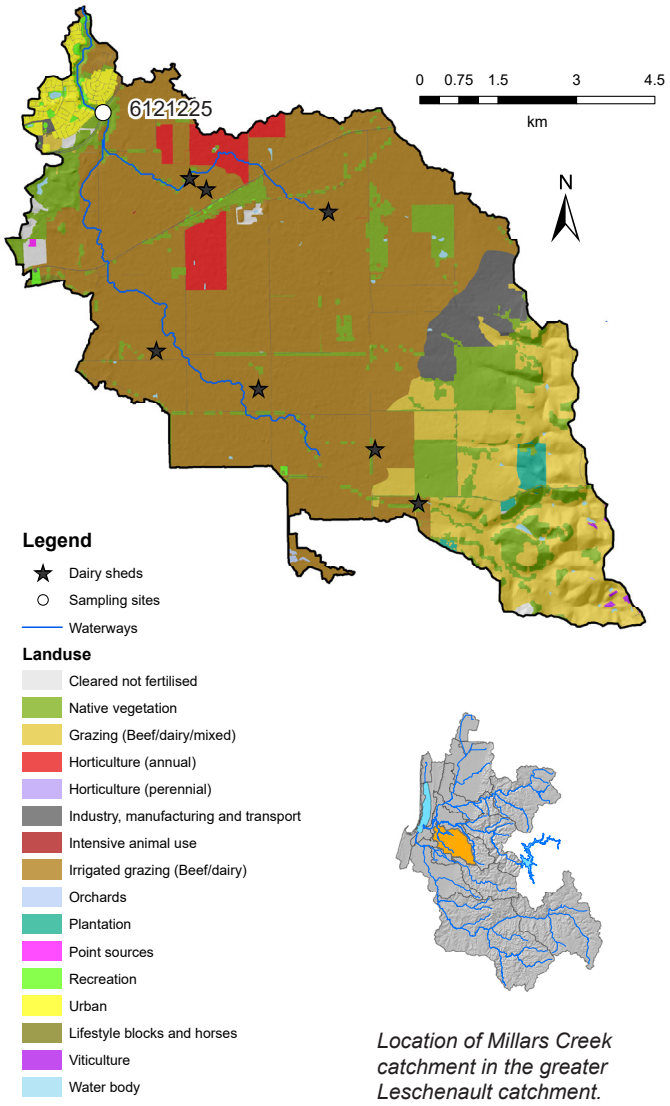
Millars Creek has a catchment area of about 70 km^2, with cattle grazing being the major land use, covering nearly three-quarters of the catchment. Native vegetation is the next largest land use. Millars Creek discharges into the Collie River in Millbridge, a suburb of Bunbury. The Collie River Irrigation District extends into the catchment and provides water for the irrigated grazing. There are a number of dairy sheds present in the catchment.

The fringing vegetation along Millars Creek has been mostly lost or is in poor condition and the irrigation channels lack fringing vegetation. Soils in the northern portion of the catchment mostly bind phosphorus poorly, whereas soils in the southern portion generally bind phosphorus well. When soils don't bind well, any phosphorus applied to them tends to move to waterways.

Water quality is measured at site 6121225, Millars, where Millars Creek passes under Forrest Highway in Dardanup. Downstream of the site, Millars Creek flows through the suburb of Millbridge before discharging to the Collie River.

Results summary

Nutrient concentrations (total nitrogen and total phosphorus) at the Millars Creek sampling site were classified as high. The proportion of nitrogen present in a bioavailable type was large. The poor water quality at this site can be attributed to the highly modified nature of the waterways, intensive agricultural land use and low coverage of remnant vegetation.



Location of Millars Creek catchment in the greater Leschenault catchment.

Facts and figures

Sampling site code	6121225 (Millars)
Catchment area	70 km^2
Per cent cleared area (2018)	85 %
River flow	Permanent
Main land use (2018)	Cattle grazing and native vegetation

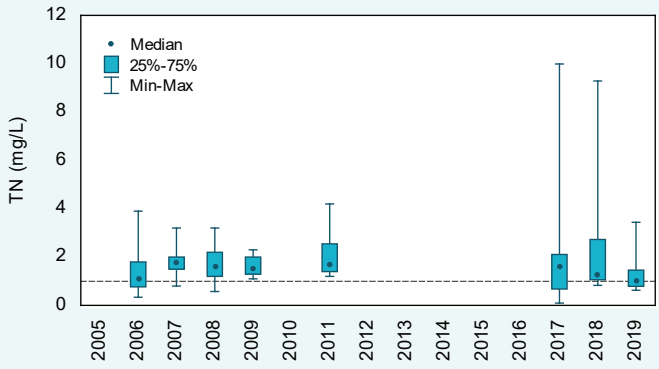
Millars Creek

Nitrogen over time (2005–19)

Concentrations

Annual total nitrogen (TN) concentrations at the Millars Creek sampling site were classified as high using the State Wide River Water Quality Assessment (SWRWQA) methodology. All annual medians were above the Leschenault Water Quality Improvement Plan (WQIP) TN target for lowland rivers. The high TN concentrations at this site can be attributed to the agricultural land use in the catchment and the highly modified nature of the waterways which flow through it.

Millars Creek



Total nitrogen concentrations, 2005–19 at site 6121225. The dashed line is the Leschenault WQIP target for lowland rivers.

The Millars Creek sampling site, November 2011. Note the poor quality fringing vegetation, the erosion on the far bank as well as the sand deposited in the creek on the right.

Nitrogen (2019)

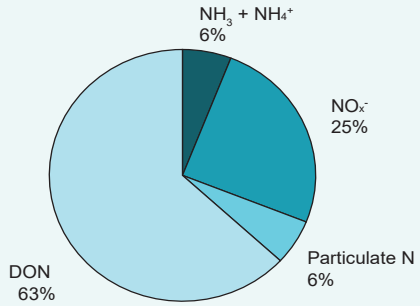
Types of nitrogen

Total N is made up of different types of N. The proportion of N present as highly bioavailable dissolved inorganic N (DIN – consisting of nitrate, NO_x^-, and total ammonia, NH_3 + NH_4^+) was large. DIN is usually sourced from fertilisers and animal wastes. High proportions of DIN are commonly seen in agricultural catchments. Most of the remainder of the N was present as dissolved organic N (DON). DON consists mainly of plant and animal matter but may include other types. DON varies in its bioavailability. Plant and animal matter usually needs to be further broken down before it becomes available whereas other types of DON are readily bioavailable.

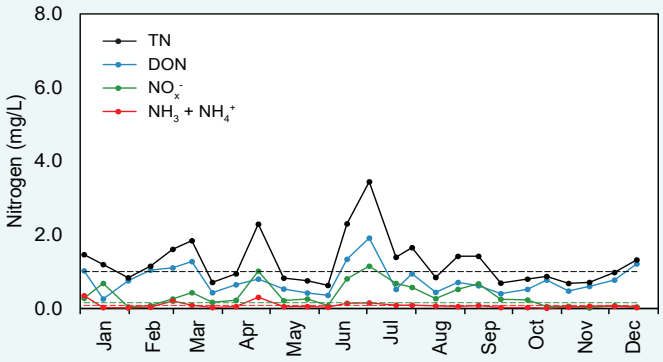
Concentrations

A seasonal pattern was present in TN, DON and nitrate, which all increased in June, when rainfall and flow increased. At this time, N was mobilised from the catchment following heavy rainfall. Much of this N was probably the result of mineralisation of organic N in soils and drains over the summer period, and runoff from agricultural land where fertilisers and animal wastes build up over the summer period, as well as organic N washing from soils and remnant wetlands. There was also a peak in TN, nitrate and total ammonia in April (as there was in 2018). The reason for this peak is unclear, though it may have been the result of rainfall a few days before the sampling event washing nutrients into the waterway.

Millars Creek



2019 average nitrogen fractions at site 6121225.



2019 nitrogen concentrations at 6121225. The black dashed line is the WQIP target for lowland rivers, the red and green are the ANZECC trigger values for total ammonia and nitrate.

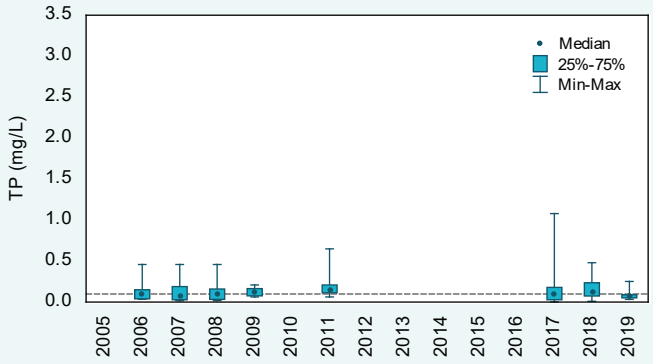
The Collie River, near the Millars Creek discharge point, January 2009. The bank on the right has slumped and there are plants growing on the large sand deposit in the centre of the river.

Phosphorus over time (2005–19)

Concentrations

Annual total phosphorus (TP) concentrations were classified as high at the Millars Creek sampling site using the SWRWQA methodology. Only three of the eight years which had sufficient data to graph had an annual median below the WQIP TP target for lowland rivers, though each year had some samples below the target.

Millars Creek



Total phosphorus concentrations, 2005–19 at site 6121225. The dashed line is the Leschenault WQIP target for lowland rivers.

A fyke net set in the Collie River, near the Millars Creek discharge point. This net captures fish and crayfish which are recorded before being returned to the water alive, March 2017.

Phosphorus (2019)

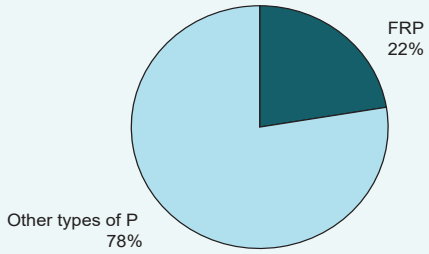
Types of phosphorus

Total P is made up of different types of P. At the Millars Creek sampling site, nearly a quarter of the P was present as highly bioavailable phosphate; measured as filterable reactive P (FRP), in surface waters this is mainly present as phosphate (PO_4^{3-}) species. This type of P was likely sourced from fertilisers and animal waste as well as natural sources. The remaining P was present as either particulate P or dissolved organic P (DOP) or both (shown as 'other types of P' in the pie chart below). Particulate P generally needs to be broken down before becoming bioavailable. The bioavailability of DOP varies and is poorly understood.

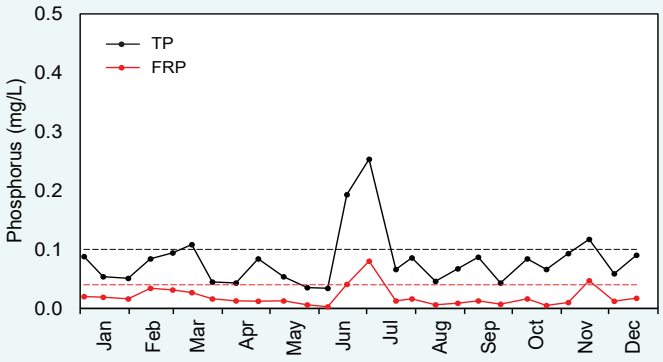
Concentrations

Total P and phosphate showed a similar pattern to TN in 2019. There was evidence of a seasonal pattern, with concentrations of both TP and phosphate highest in June and July when rainfall washed P into the creek. The peak in April may have been caused by rainfall a few days before the sampling event washing nutrients into the waterway. The reason for the other peaks is unclear but it is possible that they are because of some form of discharge upstream of the sampling site, especially on those occasions where both TP and phosphate peak. During the year, it is likely that P is entering the creek via a number of pathways, including surface and groundwater flows as well as in-stream sources. The large phosphorus-binding capacity of the soils in the catchment upstream of the sampling site are likely having a positive impact on the P concentrations seen at this site.

Millars Creek



2019 average phosphorus fractions at site 6121225.



2019 phosphorus concentrations at 6121225. The black dashed line is the WQIP target for lowland rivers, the red is the ANZECC trigger values for lowland rivers for phosphate.

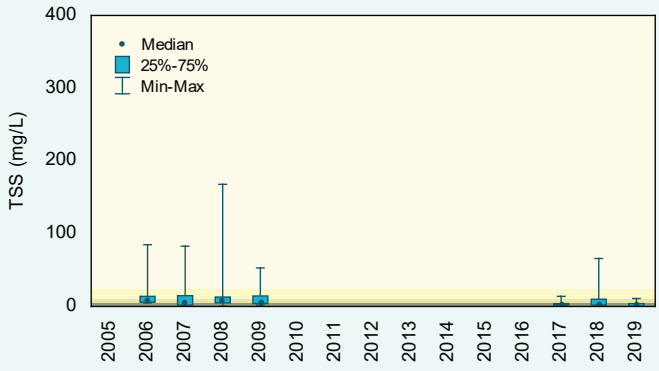
A south-western goby, Afurcagobius suppositus, caught in the Collie River, near the Millars Creek discharge point, as part of a river health assessment, February 2018.

Total suspended solids over time (2005–19)

Concentrations

Using the SWRWQA methodology, annual total suspended solids (TSS) concentrations were classified as moderate before the break in monitoring and low afterwards. Annual concentrations fluctuated during the reporting period.

Millars Creek



Total suspended solids concentrations, 2005–19 at site 6121225. The shading refers to the SWRWQA classification bands.

low moderate high very high

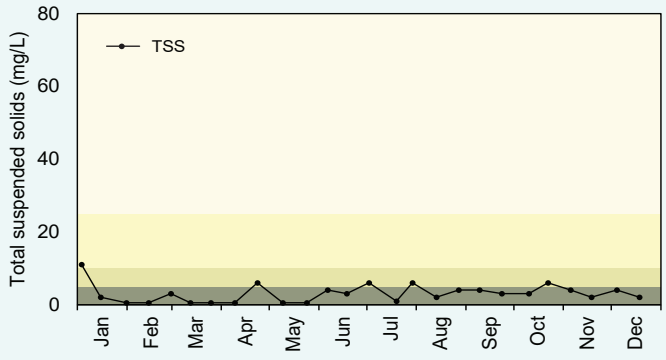
In the Millars Creek catchment, there is little fringing vegetation. A thin band of trees separates the Collie River from surrounding farmland near the Millars Creek discharge point, January 2009.

Total suspended solids (2019)

Concentrations

In 2019, TSS concentrations fluctuated at the Millars Creek sampling site with no noticeable pattern. It is likely that particulate matter is entering the creek via surface runoff as well as being dislodged from within the creek via erosion and livestock access to the creek.

Millars Creek



2019 total suspended solids concentrations at 6121225. The shading refers to the SWRWQA classification bands.

low moderate high very high

A degraded section of the Collie River, near the Millars Creek discharge point. The fringing vegetation is poor and the bank in the foreground has been trampled by cattle, February 2018.

Millars Creek

pH over time (2005–19)

pH values

pH at the Millars Creek sampling site fluctuated in the years for which there were data. All annual medians and most of the samples were between the upper and lower Australian and New Zealand Environment and Conservation Council (ANZECC) trigger values.

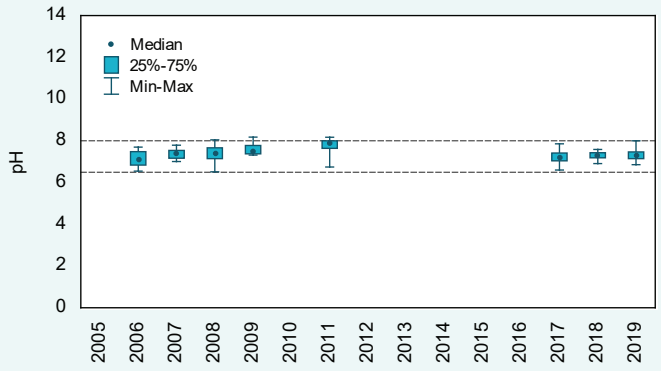
pH (2019)

pH values

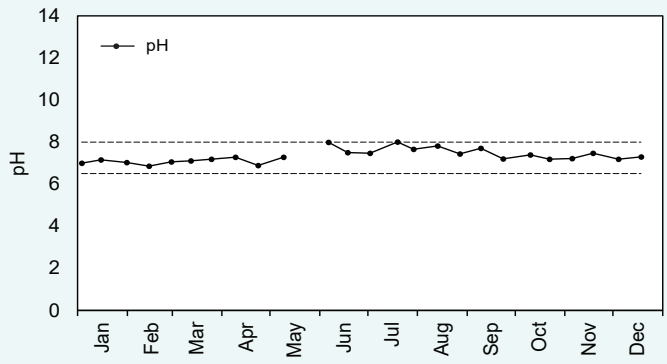
In 2019, pH values fluctuated slightly during the year. All samples fell within the upper and lower ANZECC trigger values.

The missing data point in May was because the probe malfunctioned.

Millars Creek



pH levels, 2005–19 at site 6121225. The dashed lines are the upper and lower ANZECC trigger values.



2019 pH levels at 6121225. The dashed lines are the upper and lower ANZECC trigger values.

Millars Creek at the sampling site where it passes under Forrest Highway, November 2018.

Millars Creek

Salinity over time (2005–19)

Concentrations

The Millars Creek sampling site was one of the most saline of the sites in the Leschenault catchment (along with the sites on the Middle Brunswick and Wellesley Rivers). Using the Water Resources Inventory 2014 salinity ranges, all years with sufficient data were classified as brackish.

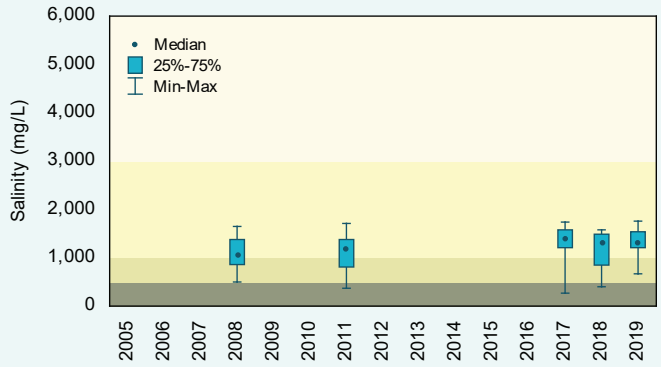
Salinity (2019)

Concentrations

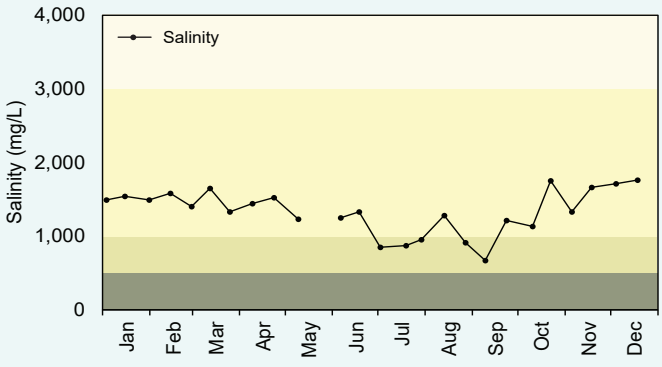
Salinity concentrations were higher in the earlier and later part of the year when rainfall and flow were at their lowest. At this time, much of the water present at the sampling sites would have been from groundwater and irrigation returns. In June, when rainfall and flow increased, salinity reduced. This suggests that the surface water runoff at this site is fresher than the groundwater and possibly the irrigation returns.

The missing data point in May was because the probe malfunctioned.

Millars Creek



Salinity concentrations, 2005–19 at site 6121225. The shading refers to the Water Resources Inventory 2014 salinity ranges.



2019 salinity concentrations at site 6121225. The shading refers to the Water Resources Inventory 2014 salinity ranges.

fresh marginal brackish saline

Cattle grazing is one of the major land uses in the Millars Creek catchment, January 2009.

Millars 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 on 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 the Leschenault Estuary at estuaries.dwer.wa.gov.au/estuary/leschenault-estuary

Healthy Estuaries WA partners with the Leschenault Catchment Council 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 Leschenault Catchment Council go to leschenaultcc.org.au
- To find out more about the health of the rivers in the Leschenault Catchment go to rivers.dwer.wa.gov.au/assessments/results

Methods

Variables were compared with the Leschenault Estuary water quality improvement plan concentration targets or ANZECC trigger values where available, or the SWRWQA bands or the 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.

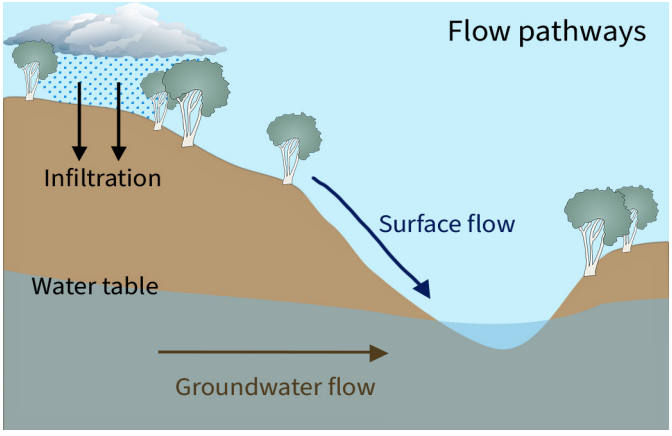
Laboratory limit of reporting: (LOR) this is the lowest concentration of an analyte that can be reported by a laboratory.

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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