Glenarty Creek

This data report provides a summary of the nutrients at the Glenarty 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 to the Blackwood River, and subsequently, the Hardy Inlet.

About the catchment

Glenarty Creek has a catchment area of about 32 km^2 with grazing (beef, sheep and dryland dairy) covering just over half of the catchment. The other dominant land use is native vegetation which covers about a quarter of the catchment, as well as vineyards and plantations. Two dairy sheds are present in the upper catchment. There are two main watercourses in the catchment: Glenarty Creek which drains the southern portion of the catchment; and an unnamed stream which drains the northern portion of the catchment. The unnamed stream joins Glenarty Creek below the sampling site, just over a kilometre from where it discharges into the Blackwood River.

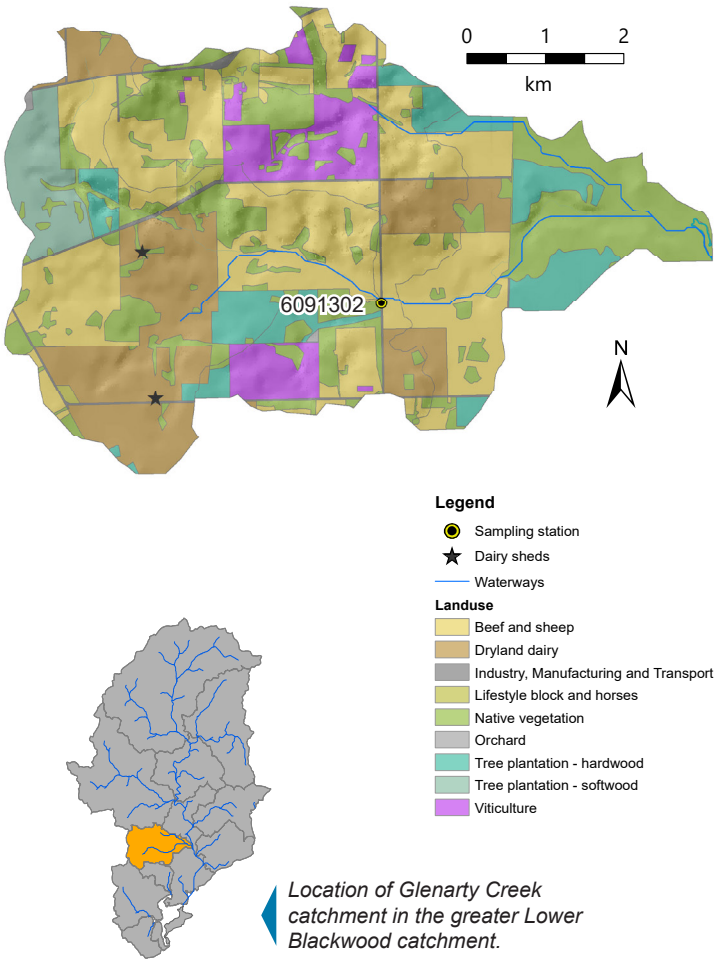
Much of the fringing vegetation has been cleared along the creek and its tributaries, with the exception of a few small sections in the upper catchment and the lower portion of the creek, just before it enters the Blackwood River in Karridale.

The majority 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 that enters streams.

Water quality is measured at site 6091302, Glenarty Road Crossing, which is where Glenarty Creek passes under Glenarty Road in Kudardup.

Results summary

Nutrient concentrations (total nitrogen and total phosphorus) were classified as moderate at the Glenarty Creek sampling site. The concentration of total ammonia was high compared with the other sites in the Blackwood catchment and this was probably sourced from upstream agricultural land-uses.



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

Facts and figures

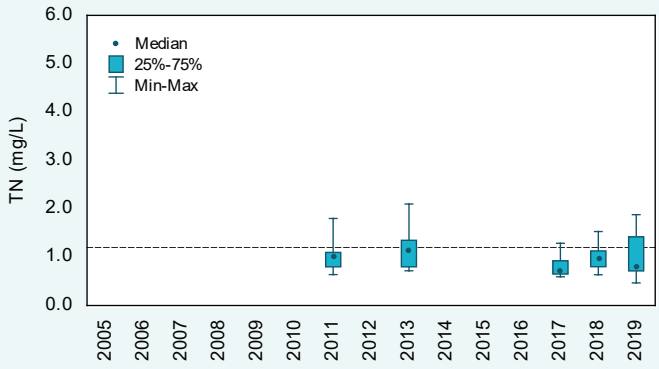
Sampling site code	6091302 (Glenarty Road Crossing)
Catchment area	32 km^2
Per cent cleared area (2001)	74 per cent
River flow	Ephemeral
Main land use (2001)	Beef and sheep grazing, native vegetation and dryland dairy

Nitrogen over time (2005–19)

Concentrations

Annual total nitrogen (TN) concentrations in Glenarty Creek were classified as moderate using the State Wide River Water Quality Assessment (SWRWQA) methodology. The median TN concentration was below the Australian and New Zealand Environment and Conservation Council (ANZECC) trigger value in the five years in which there were enough data to graph; however, each year had some samples over the trigger value. In 2019, Glenarty Creek had one of the highest median TN concentrations of the Blackwood River catchment sites (0.82 mg/L; behind Payne Road with 1.4 mg/L), though it was still below the ANZECC trigger value.

Glenarty Creek



Total nitrogen concentrations, 2005–19 at site 6091302. The dashed line is the ANZECC trigger value.

Collecting a water quality sample at Glenarty Creek, June 2019.

Nitrogen (2019)

Types of nitrogen

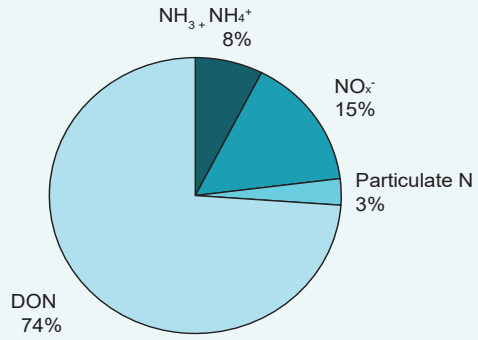
Total N is made up of different types of N. In Glenarty Creek, the dominant type of N was dissolved organic N (DON). This type of N consists mainly of degrading plant and animal matter but may also include other types. The bioavailability of DON varies depending on its type. Some types are highly bioavailable whereas others, like degrading plant and animal matter, often need to be further broken down before they can be used by plants and algae. The percentage of N present as nitrate (NO_x^-) was low compared with the other sites in the Blackwood River catchment but still consistent with an agricultural catchment. Glenarty Creek had the second highest average proportion of total ammonia (NH_3 + NH_4^+); only Rushy Creek had a higher percentage at 22 per cent. Both nitrate and total ammonia are readily bioavailable for plants and algae to fuel rapid growth and are likely sourced from fertilisers and animal wastes.

Concentrations

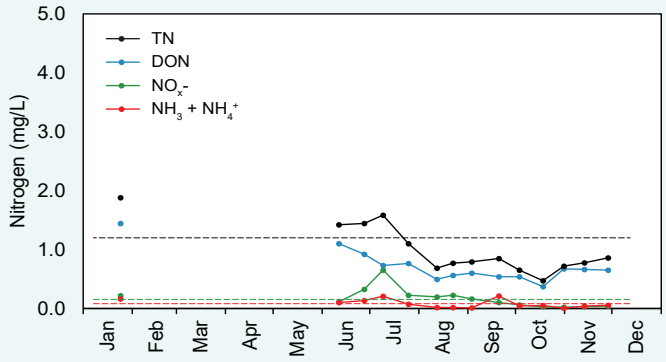
Total N and nitrate showed a seasonal pattern, being highest at the beginning of the period when the creek was flowing before reducing during the remainder of the year. The early peak in nitrate was because of a first flush response where N was mobilised early in the flow year following heavy rainfall. 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 fertilisers and animal waste over the summer. Nitrate was above the ANZECC trigger value on half of the sampling occasions. The high TN and DON concentrations recorded in January were when the creek was flowing following about 25–50 mm of rain in the previous 48 hours. The water was turbid on this sampling occasion.

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

Glenarty Creek



2019 average nitrogen fractions at site 6091302.



2019 nitrogen concentrations at 6091302. The dashed lines are the ANZECC trigger values for the different N species.

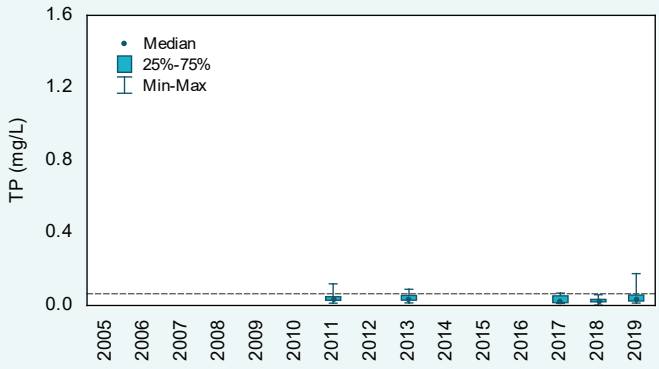
The Glenarty Road Bridge on Glenarty Creek, August 2019.

Phosphorus over time (2005–19)

Concentrations

The median total phosphorus (TP) concentrations were below the ANZECC trigger value in each of the five years where there were sufficient data to graph. Using the SWRWQA methodology, all years were classified as having moderate TP concentrations. In 2019, Glenarty Creek had the third highest median TP concentration of the Blackwood River catchment sites (0.031 mg/L, behind Payne Road at 0.045 mg/L and Courtney Road at 0.092 mg/L).

Glenarty Creek



Total phosphorus concentrations, 2005–19 at site 6091302. The dashed line is the ANZECC trigger value.

Glenarty Creek, January 2018. At this time there were only a few small puddles of water present.

Phosphorus (2019)

Types of phosphorus

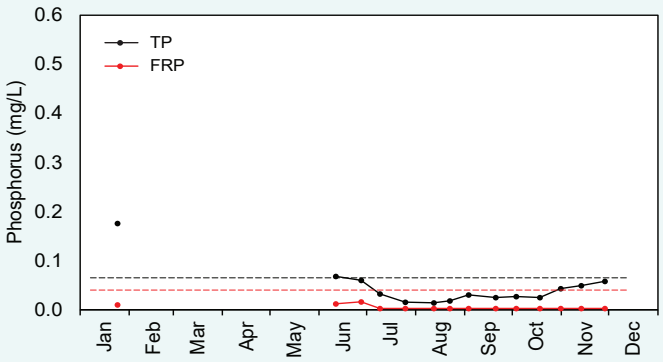
Total P is made up of different types of P. Because a large number of samples were below the laboratory limit of reporting (LOR) in 2019, phosphorus fraction pie charts were not generated for the Glenarty Creek site. At this site, 11 of the 14 phosphate samples were below the LOR (0.005 mg/L). Phosphate is measured as filterable reactive phosphorus (FRP) which in surface waters is mainly present as phosphate (PO_4^{3-}) and is readily bioavailable.

Concentrations

Total P concentrations showed a reverse seasonal response in 2019, being highest at the beginning and end of the flow year. There was evidence of a first flush effect with TP concentrations high in June, just after the creek started flowing. At this time, heavy rainfall would have washed P from upstream agricultural land use into the creek as well as mobilising any that was in the dry creek bed. TP concentrations increased again near the end of the year. The sample collected in January was after 25–50 mm of rain fell in the preceding 48 hours, causing the creek to flow when it would normally be dry. The high P-binding capacity of the soils present in this catchment will be contributing to the mostly low P concentrations.

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

Glenarty Creek



2019 phosphorus concentrations at 6091302. The dashed lines are the ANZECC trigger values for the different P species.

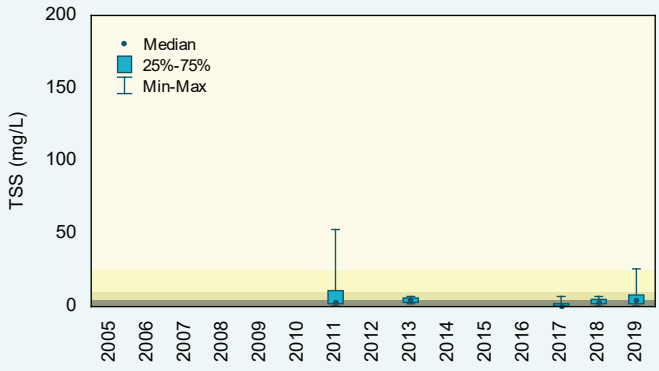
Collecting a water quality sample at the Glenarty Creek sampling site, September 2018.

Total suspended solids over time (2005–19)

Concentrations

In Glenarty Creek, all years with sufficient data to graph were classified as having low total suspended solids (TSS) concentrations using the SWRWQA methodology. The range in TSS concentrations was larger in 2019 than the previous two years. Ongoing monitoring will help determine if TSS concentrations are increasing or if this is part of the natural fluctuations at this site.

Glenarty Creek



Total suspended solids concentrations, 2005–19 at site 6091302. The shading refers to the SWRWQA classification bands.

low moderate high very high

Glenarty Creek, November 2019.

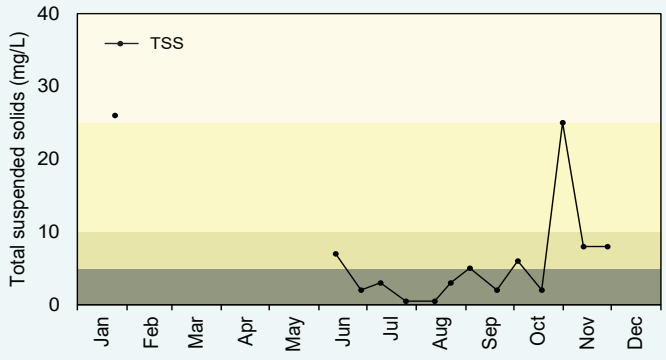
Total suspended solids (2019)

Concentrations

In 2019 there was no clear seasonal pattern in TSS concentrations in Glenarty Creek with concentrations fluctuating throughout the year. The highest concentrations were recorded in January, when the creek flowed at a time it would normally be dry following 25–50 mm of rain in the preceding 48 hours, and in late October. The reason for the peak in late October is unknown. Overall, it is likely particulate matter was being washed into the creek via surface flows as well as being mobilised in-stream by erosion year-round.

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

Glenarty Creek



2019 total suspended solids concentrations at 6091302. The shading refers to the SWRWQA classification bands.

low moderate high very high

A large gilgie (Cherax quinquecarinatus), caught as part of a river health assessment in Glenarty Creek, October 2017.

Glenarty Creek

pH over time (2005–19)

pH values

The median pH at Glenarty Creek fell between the upper and lower ANZECC trigger values for each year where there were sufficient data to graph. The apparent increase in pH after the break in monitoring noted in the 2018 nutrient report is no longer as evident, with 2019 values being more similar to those recorded before the break in monitoring. Ongoing monitoring will help determine if pH is changing or if the observed annual differences are part of the natural variation at this site.

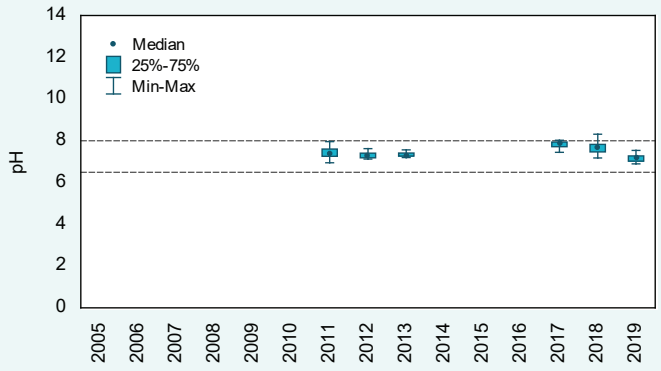
pH (2019)

pH values

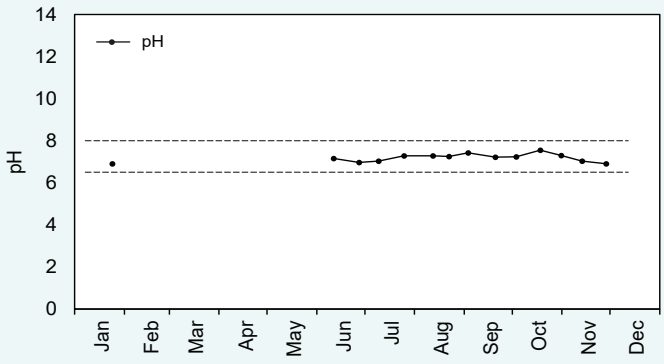
There was no evidence of a seasonal pattern in pH at Glenarty Creek in 2019, with values fluctuating throughout the year. All samples fell within the upper and lower ANZECC trigger values.

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

Glenarty Creek



pH levels, 2005–19 at site 6091302. The dashed lines are the upper and lower ANZECC trigger values.



2019 pH levels at 6091302. The dashed lines are the upper and lower ANZECC trigger values.

Glenarty Creek, July 2018. Compared with the photograph on the right (taken in December 2018), water levels are higher and the water is less cloudy. There are also more grasses growing on the banks.

Glenarty Creek

Salinity over time (2005–19)

Concentrations

Using the Water Resources Inventory 2014 salinity ranges, all years where there were sufficient data to graph were classified as fresh (note, the 2018 nutrient report used the SWRWQA bands). Salinity appeared to be slightly higher in 2019 than previous years. Ongoing monitoring will help determine if salinity is increasing or this is part of the natural fluctuations at this site.

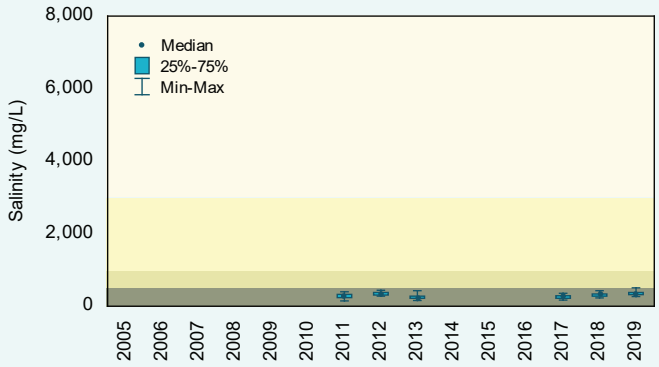
Salinity (2019)

Concentrations

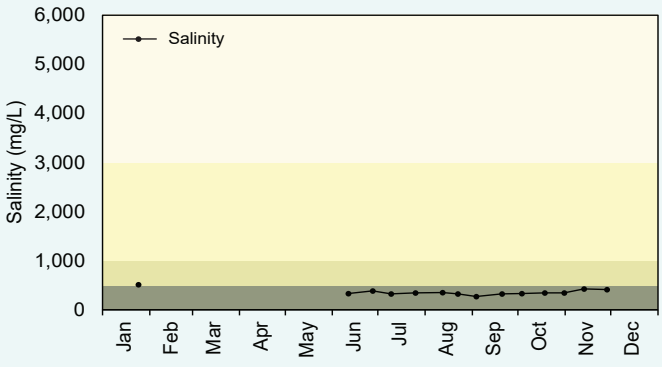
Salinity concentrations did not show a strong seasonal pattern at this site, being relatively low year-round. It is likely that salt is entering the creek via surface flows as well as from in-stream sources (such as any salts left behind in the creek bed when it dried the previous summer) and groundwater. The slight increase in salinity observed from about November may be because of evapoconcentration or the higher proportion of groundwater present at this time.

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

Glenarty Creek



Salinity concentrations, 2005–19 at site 6091302. The shading refers to the Water Resources Inventory 2014 salinity ranges.



2019 salinity concentrations at site 6091302. The shading refers to the Water Resources Inventory 2014 salinity ranges.

fresh marginal brackish saline

Glenarty Creek, December 2018. Compared with the photograph on the left (taken in July 2018), water levels are lower and the water has more suspended sediments in it. There are also less grasses growing on the banks.

Glenarty 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.

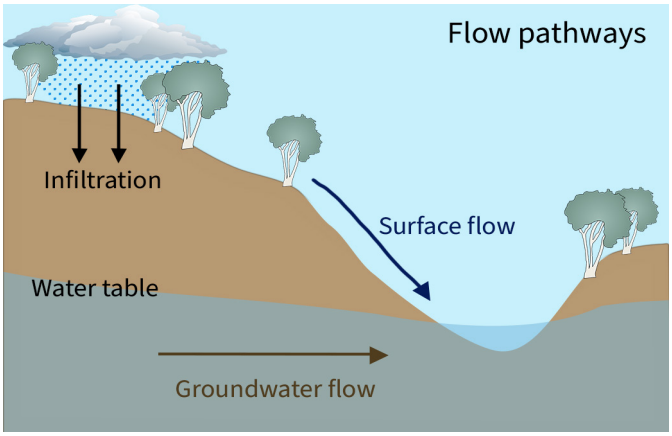
Laboratory limit of reporting: (LOR) this is the lowest concentration of an analyte that can be reported by a laboratory.

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.



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