East Tributary

This data report provides a summary of the nutrients at the East Tributary 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, East Tributary discharges into the Blackwood River and, subsequently, the Hardy Inlet.

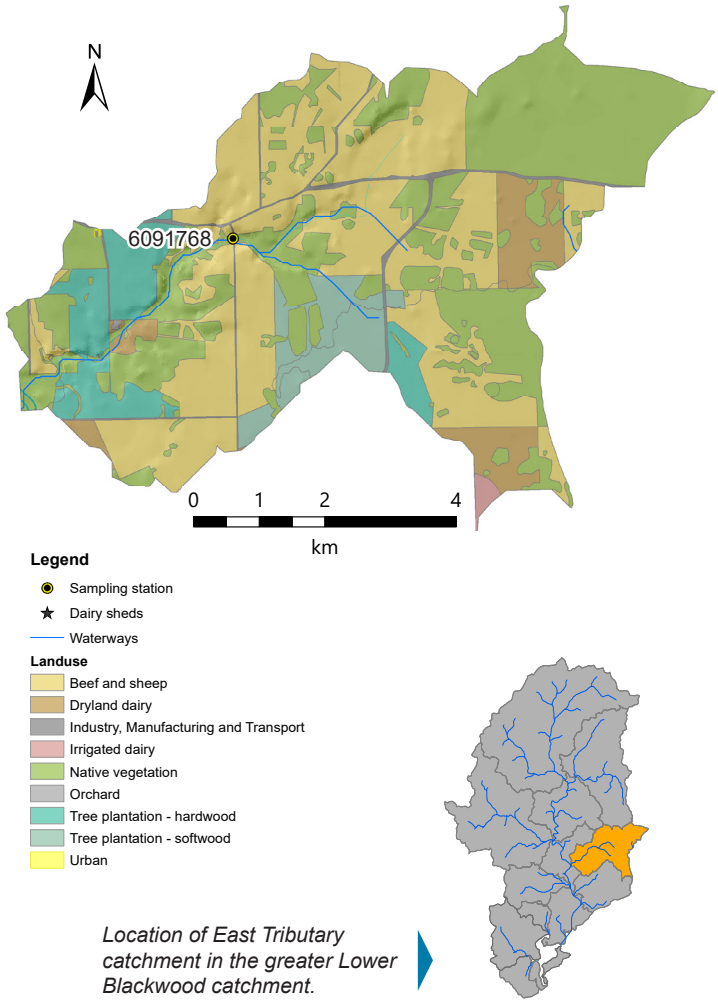
About the catchment

East Tributary has a catchment area of about 41 km^2. The two dominant land uses are beef and sheep grazing and native vegetation, which cover about 40 per cent of the catchment each. This includes a portion of the South Blackwood State Forest in the north-east corner of the catchment. Some sections of the streams still have fringing vegetation along them but much of it has been lost, especially where they pass through agricultural land.

Most of the soils in the catchment have a high phosphorus-binding capacity, with the exception of a small area in the south-east portion. Soils with a high phosphorus-binding capacity tend to bind most of the phosphorus applied to them, reducing the amount that enters the streams.

The East Tributary flows through the Scott National Park before discharging to the Blackwood River in Courtenay.

Water quality is measured at site 6091768, Courtney Road, which is close to the Brockman Highway, in Courtenay. This site is a few kilometres upstream of the confluence with the Blackwood River.



Location of East Tributary catchment in the greater Lower Blackwood catchment.

Results summary

Nutrient concentrations in the East Tributary catchment were classified as high for nitrogen to 2013 and more recently (2018–19) they are moderate. Phosphorus concentrations were classified as high. Phosphate (the bioavailable type of phosphorus) concentrations were high during the wetter months when runoff from surrounding farmland was contributing most of the nutrients present in the stream.

Facts and figures

Sampling site code	6091768 (Courtney Road)
Catchment area	41 km^2
Per cent cleared area (2001)	61 per cent
River flow	Permanent
Main land use (2001)	Beef and sheep grazing and native vegetation

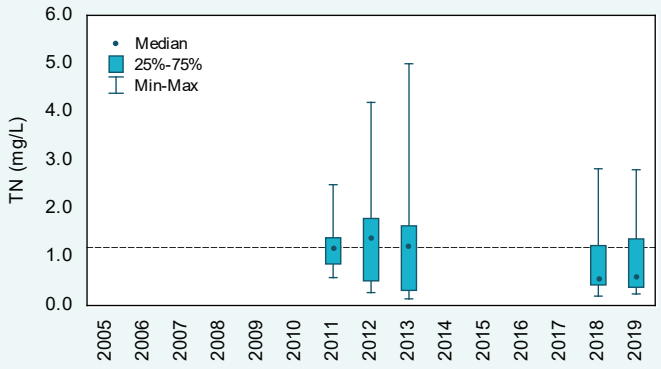
East Tributary

Nitrogen over time (2005–19)

Concentrations

Using the State Wide River Water Quality Assessment (SWRWQA) methodology, annual total nitrogen (TN) concentrations were classified as high before the break in monitoring and moderate since then. Ongoing monitoring will help determine if TN concentrations have actually decreased or if the observed change is part of the natural fluctuations at this site. While the annual medians have been below the Australia and New Zealand Environment and Conservation Council (ANZECC) trigger value since the break in monitoring, the annual range in TN concentrations is still quite large.

Courtney Road



Total nitrogen concentrations, 2005–19 at site 6091768. The dashed line is the ANZECC trigger value.

Cattle with unrestricted access to streams damage banks, causing erosion as well as contributing nutrients through their waste, March 2019.

Nitrogen (2019)

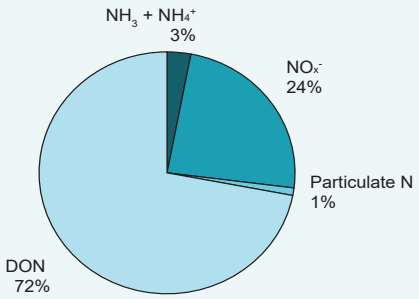
Types of nitrogen

Total N is made up of different types of N. At Courtney Road, nearly a quarter of the N was present as nitrate (NO_x^-). This type of N is readily available for plants and algae to use to fuel rapid growth. Likely sources of nitrate include fertilisers and animal waste from upstream land use. Nearly three-quarters of the N was present as dissolved organic N (DON) which consists mainly of degrading plant and animal matter but may also include other types. The bioavailability of DON varies depending on its type. Some 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.

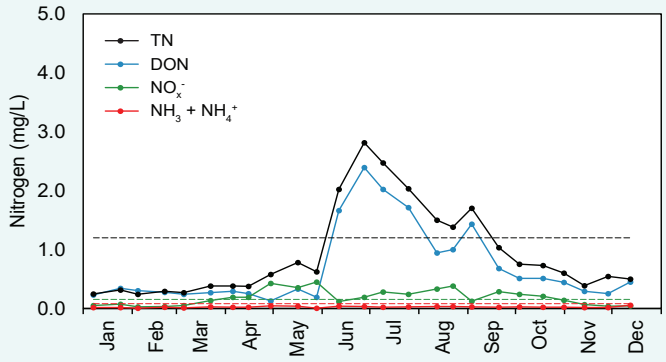
Concentrations

Total N, DON and, to a lesser extent, nitrate showed a seasonal response, increasing and peaking in June. This is typical of a first flush effect where N was mobilised following heavy rainfall (about 120–130 mm had fallen in the six days before the early June sampling event). Much of this N was probably the result of organic N washing from soils and remnant wetlands where it had built up over the summer months. Total ammonia (NH_3 + NH_4^+) was low all year and showed little seasonal variation. Nitrate concentrations were high, above the ANZECC trigger value for 13 of the 25 sampling occasions in 2019.

Courtney Road



2019 average nitrogen fractions at site 6091768.



2019 nitrogen concentrations at 6091768. The dashed lines are the ANZECC trigger values for the different N species.

Grazing is one of the dominant land uses in the East Tributary catchment, May 2019.

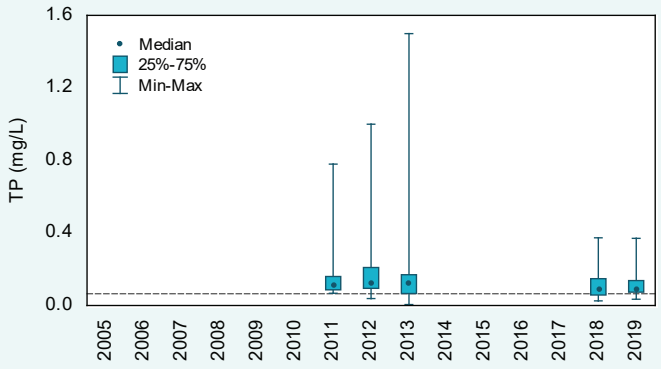
East Tributary

Phosphorus over time (2005–19)

Concentrations

Annual total phosphorus (TP) concentrations were classified as high using the SWRWQA methodology. The median was above the ANZECC trigger value in each of the five years which had sufficient data to graph. The annual range in TP concentrations were also large, with the site having the highest TP concentrations recorded in the Blackwood River catchment. The range in TP concentrations appears smaller since the break in monitoring; however, it is not possible to confirm if this is because of an actual improvement or just the natural fluctuations at the site. Ongoing monitoring will help determine this. The median was still high, however, with the 2019 median being the highest of the nine sites sampled in the Blackwood River catchment (0.092 mg/L; the next highest median was 0.045 mg/L at Payne Road).

Courtney Road



Total phosphorus concentrations, 2005–19 at site 6091768. The dashed line is ANZECC trigger value.

The culverts under Courtney Road, October 2019.

East Tributary

Phosphorus (2019)

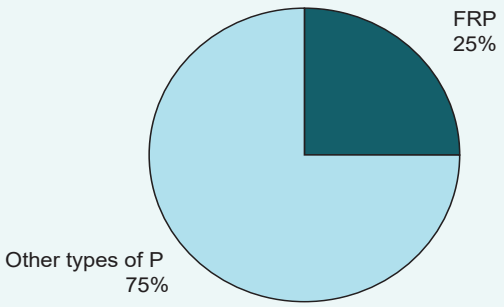
Types of phosphorus

Total P is made up of different types of P. At Courtney Road, about three-quarters of the 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. The remainder of the P was present as phosphate; measured as filterable reactive phosphorus (FRP), in surface waters this is mainly present as phosphate (PO_4^{3-}) species and is readily bioavailable. Most of the phosphate was probably derived from fertilisers and animal waste.

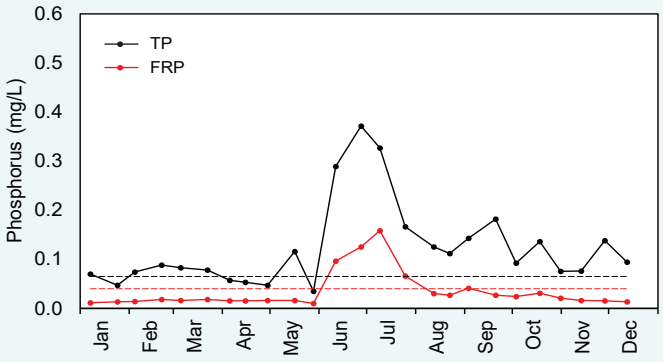
Concentrations

Both TP and phosphate showed a seasonal response, increasing rapidly in June following the onset of winter rains and increased stream flow (about 120–130 mm fell in the six days before this sampling occasion). At this time, a first flush effect was washing P into the stream from upstream agricultural land use as well as mobilising P already present in the stream. It is likely surface flows as well as in-stream sources such as erosion were the main sources of P at this site, while groundwater contributed proportionally less P. Both TP and phosphate were above their respective ANZECC trigger values for a portion of the year.

Courtney Road



2019 average phosphorus fractions at site 6091768.



2019 phosphorus concentrations at 6091768. The dashed lines are the ANZECC trigger values for the different P species.

The sampling site is situated where the stream passes under Courtney Road, where the parked car is in this photograph, April 2019.

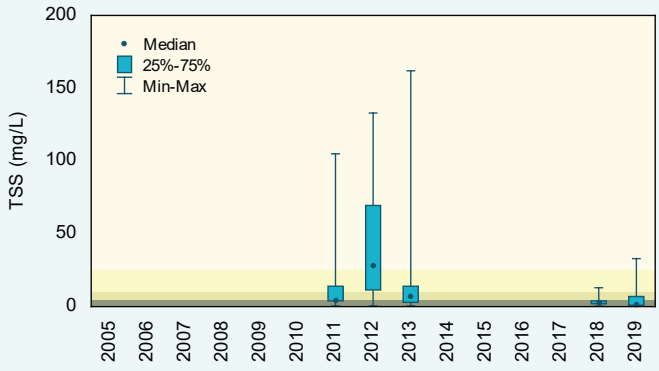
East Tributary

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. Since the break in monitoring, TSS concentrations appear to have improved, with 2018–19 having much lower TSS concentrations than previously. It is not possible to determine if the improvement observed is because of an actual change in TSS concentrations or part of the natural fluctuations at this site. Ongoing monitoring will help determine if water quality at this site is improving.

Courtney Road



Total suspended solids concentrations, 2005–19 at site 6091768. The shading refers to the SWRWQA classification bands.

low moderate high very high

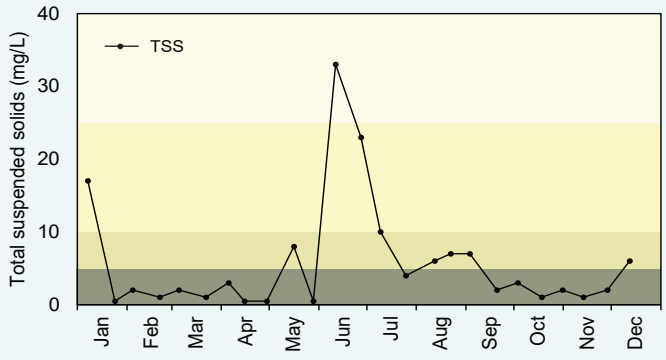
Using a probe to record water quality at Courtney Road, June 2019.

Total suspended solids (2019)

Concentrations

Unlike in 2018, when there was no obvious seasonal pattern in TSS concentrations at Courtney Road, the 2019 data did show a seasonal pattern, peaking in June. About 120–130 mm of rain had fallen over the six days before sampling so it is likely that this washed particulate matter into the stream from surrounding land use as well as mobilising any in the stream itself. The reason for the peak in early January is unknown.

Courtney Road



2019 total suspended solids concentrations at 6091768. The shading refers to the SWRWQA classification bands.

low moderate high very high

Looking downstream from the Courtney Road sampling site. Almost all the fringing vegetation here is exotic grasses, October 2019.

East Tributary

pH over time (2005–19)

pH values

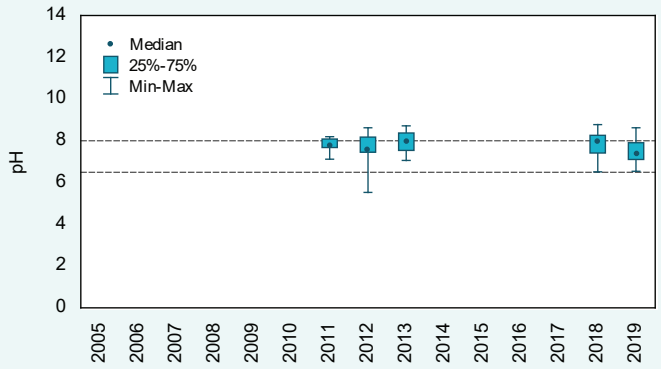
The annual median pH at Courtney Road was within the upper and lower ANZECC trigger values in each of the five years in which there were sufficient data to graph. Each year had some samples over the upper ANZECC trigger value and in 2012 there were also some samples below the lower ANZECC trigger value.

pH (2019)

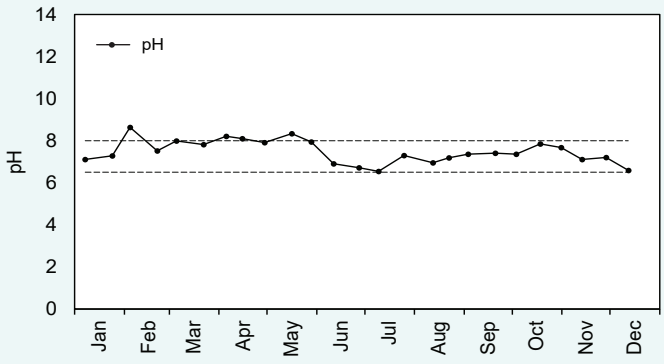
pH values

There was no strong evidence of a seasonal pattern in pH at Courtney Road, with values fluctuating throughout the year. The dip in June is likely a result of the heavy rainfall in the six days leading up to this sampling occasion (about 120–130 mm of rain fell during this period). There were a number of samples which were above the upper ANZECC trigger value in the first half of the year.

Courtney Road



pH levels, 2005–19 at site 6091768. The dashed lines are the upper and lower ANZECC trigger values.



2019 pH levels at 6091768. The dashed lines are the upper and lower ANZECC trigger values.

Low water levels near the Courtney Road sampling site, January 2018. While the site was flowing on this occasion, it was too shallow to collect a water quality sample.

East Tributary

Salinity over time (2005–19)

Concentrations

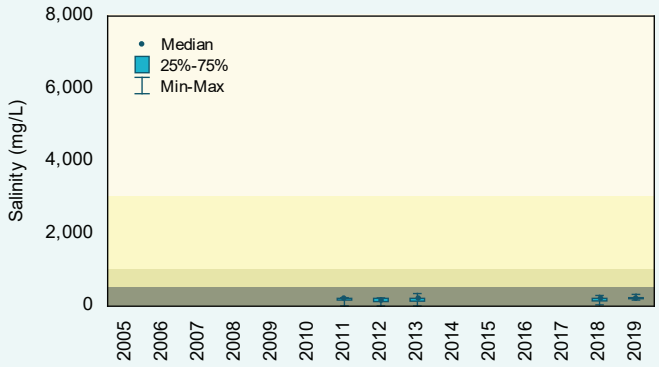
Using the Water Resources Inventory 2014 salinity ranges, salinity was classified as fresh in each year in which there were sufficient data to graph. Salinity was low compared with the other nine sites sampled in the Blackwood River catchment, with the 2019 median being the lowest recorded (220 mg/L).

Salinity (2019)

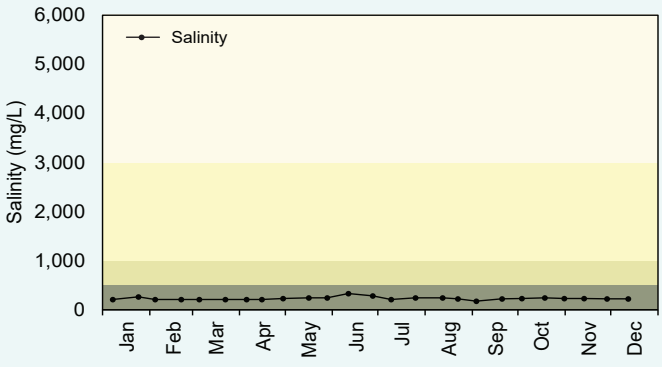
Concentrations

Salinity did not show a seasonal relationship at this site, fluctuating slightly through the year but being consistently low. This was one of the freshest sites sampled in 2019 in the Blackwood River catchment.

Courtney Road



Salinity concentrations, 2005–19 at site 6091768. The shading refers to the Water Resources Inventory 2014 salinity ranges.



2019 salinity concentrations at 6091768. The shading refers to the Water Resources Inventory 2014 salinity ranges.

fresh marginal brackish saline

High water levels at the Courtney Road sampling site, August 2018. The white flowers are Arum lilies, an introduced species from southern Africa which is a declared pest.

East Tributary

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 to 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.

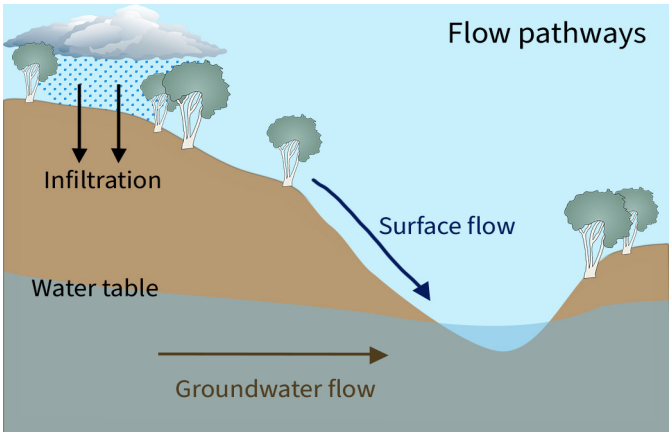
Laboratory limit of reporting: (LOR) this is the lowest concentration of an analyte that can be reported by a laboratory.

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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