Chapman Brook

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

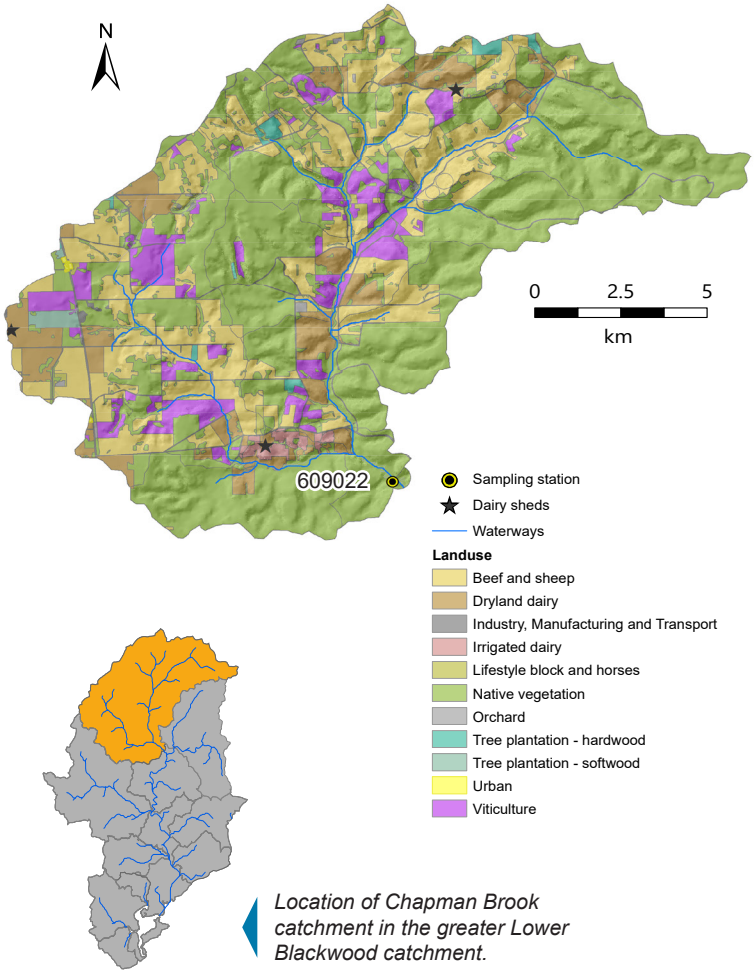
About the catchment

Chapman Brook has a catchment area of about 187 km^2, just over half of which is covered in native vegetation. The other major land use is beef and sheep grazing, which covers nearly a quarter of the catchment. There are also a number of vineyards in the catchment. There are two major watercourses: the Upper Chapman Brook which drains the northern part of the catchment; and Chapman Brook which drains the western portion of the catchment. These combine a few kilometres upstream of the sampling site. The brook enters the Blackwood River in Forest Grove, just downstream of the Warner Glen Campsite.

While fringing vegetation is still present along much of the Upper Chapman Brook, and sections of Chapman Brook, it has been cleared from many of their tributaries and a number of these tributaries also have dams on them.

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 that enters streams.

Water quality is measured at site 609022, White Elephant Bridge, close to Warner Glen Road.



Location of Chapman Brook catchment in the greater Lower Blackwood catchment.

Results summary

Nutrient concentrations (total nitrogen and total phosphorus) in the Chapman Brook catchment were classified as low. This can be attributed to the relatively large amount of native vegetation remaining in the catchment, including fringing vegetation along the banks, and the high phosphorus-binding capacity of the soils found in the catchment.

Facts and figures

Sampling site code	609022 (White Elephant Bridge)
Catchment area	187 km^2
Per cent cleared area (2001)	44 per cent
River flow	Ephemeral, dries over summer
Main land use (2001)	Native vegetation and beef and sheep grazing

Estimated loads and flow at Chapman Brook

609022	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Flow (GL)	41	14	31	38	57	16	27	23	60	34	15	44	29	43	26
TN load (t)								12	42				18	29	15
TP load (t)								0.17	0.66				0.29	0.42	0.22

Chapman Brook

Nitrogen over time (2005–19)

Concentrations

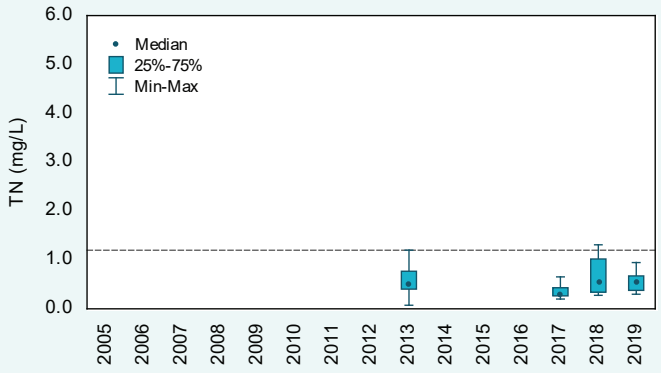
Annual total nitrogen (TN) concentrations were classified as low using the State Wide River Water Quality Assessment (SWRWQA) methodology. The annual median TN concentrations were below the Australian and New Zealand Environment and Conservation Council (ANZECC) trigger value in all four years in which there were sufficient data to graph. Over this same time period, there was only one sample (collected in 2018) that was greater than the ANZECC trigger value.

Estimated loads

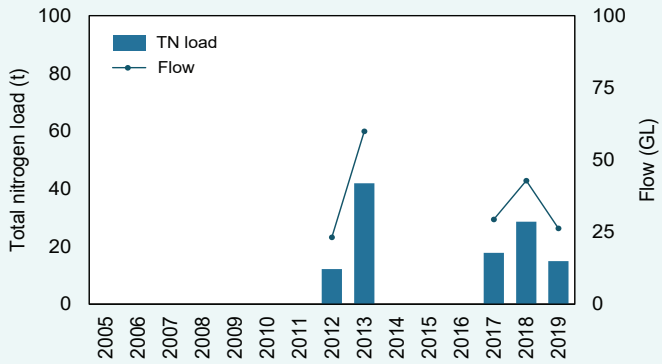
In 2019, the estimated TN load at the Chapman Brook sampling site was 15 t, and the load per square kilometre was 80 kg/km^2. Chapman Brook was one of only two sites in the Lower Blackwood catchment with flow data, the other being at Hut Pool, which is on the Blackwood River itself. No comparisons have been made between the two sites because of the very different size and nature of their two catchments.

Annual TN loads were closely related to flow volumes; years with large annual flow volumes had large TN loads and vice versa.

Chapman Brook



Total nitrogen concentrations, 2005–19 at site 609022. The dashed line is the ANZECC trigger value.



Total nitrogen loads and annual flow, 2005–19 at site 609022.

Chapman Brook near the sampling site. Note the natural fringing vegetation along the banks, February 2019.

Chapman Brook

Nitrogen (2019)

Types of nitrogen

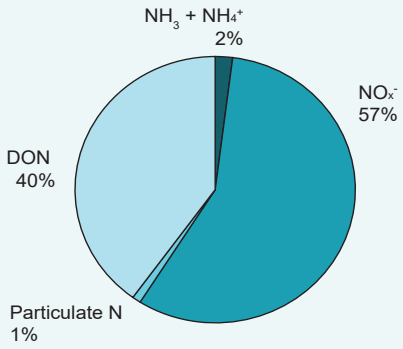
Total N is made up of different types of N. In Chapman Brook, nearly two-thirds of the N was present as nitrate (NO_x^-) which is sourced mainly from animal wastes and fertilisers. This type of N is readily bioavailable for plants and algae to use to fuel rapid growth. High proportions of nitrate are commonly seen in agricultural catchments. The other type of N that was present in a high percentage was dissolved organic N (DON). This type of N 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 becoming available whereas other types of DON are readily bioavailable.

Concentrations

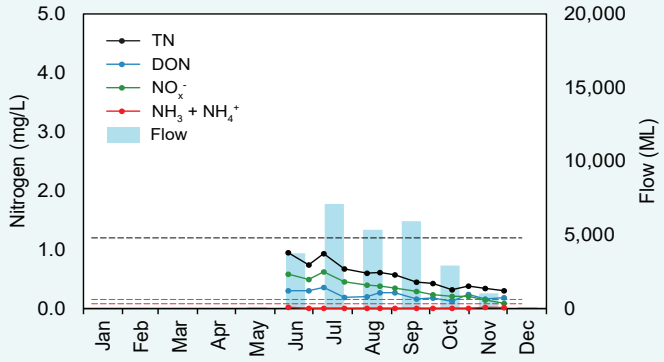
Total N, nitrate and, to a lesser extent, DON all showed a first flush response where N was mobilised following heavy rainfall at the start of the flow year. Much of this N was probably the results of mineralisation of organic N in soils and streams over the summer period, and runoff of high-concentration water from agricultural land, which builds up with fertilisers and animal waste (in grazing areas) over the summer. While TN concentrations were generally low, nitrate concentrations were high. Only two of the 13 samples had a nitrate value below the ANZECC trigger value, both collected near the end of the year.

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

Chapman Brook



2019 average nitrogen fractions at site 609022.



2019 nitrogen concentrations and monthly flow at 609022. The dashed lines are the ANZECC trigger values for the different N species.

Fishing for marron is a popular recreational activity near the Chapman Brook sampling site, January 2018.

Chapman Brook

Phosphorus over time (2005–19)

Concentrations

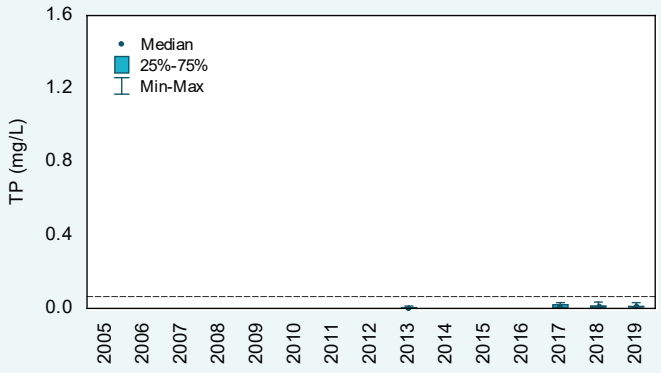
Annual total phosphorus (TP) concentrations in Chapman Brook were classified as low using the SWRWQA methodology. All samples collected were below the ANZECC trigger value. The site had one of the lowest 2019 median TP concentration of the nine sites monitored in the Blackwood River catchment. The high P-binding capacity of the soils in the catchment contributed to the lower P concentrations as they tend to bind P, reducing the amount that enters the waterways.

Estimated loads

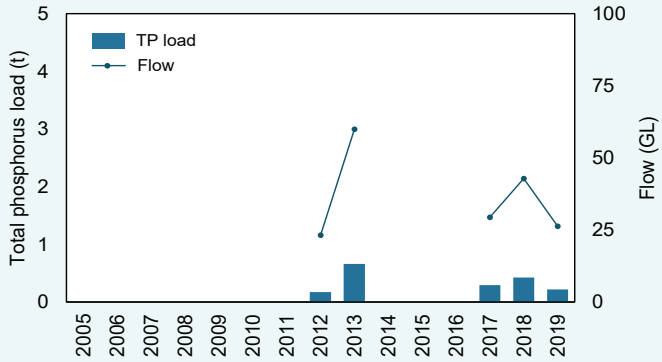
In 2019, the estimated TP load at the Chapman Brook sampling site was 0.22 t and the load per square kilometre was 1.2 kg/km^2. Chapman Brook was one of only two sites in the Lower Blackwood catchment with flow data, the other being at Hut Pool, which is on the Blackwood River itself. No comparisons have been made between the two sites because of the very different size and nature of their two catchments.

Annual TP loads were closely related to flow volumes; years with large annual flow volumes had large TP loads and vice versa.

Chapman Brook



Total phosphorus concentrations, 2005–19 at site 609022. The dashed line is the ANZECC trigger value.



Total phosphorus loads and annual flow, 2005–19 at site 609022.

Dense fringing vegetation at the Chapman Brook sampling site, December 2018.

Phosphorus (2019)

Types of phosphorus

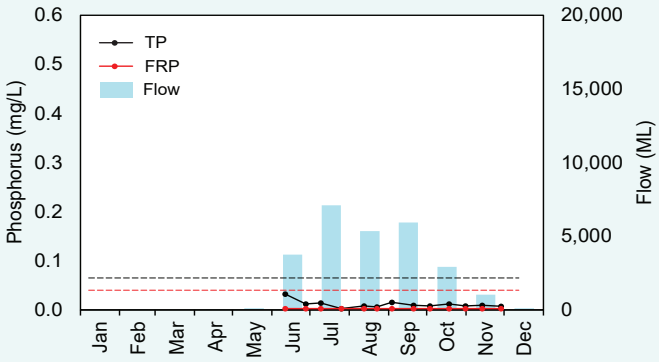
Total P is made up of different types of P. Because all the phosphate samples were below the laboratory limit of reporting (LOR) of 0.005 mg/L in 2019, phosphorus fraction pie charts were not generated for the Chapman Brook site. Phosphate is measured as filterable reactive phosphorus (FRP) which in surface waters is mainly present as phosphate (PO_4^{3-}) species and is readily bioavailable. The high P-binding capacity of the soils present in this catchment contributed to the low P concentrations.

Concentrations

Phosphorus concentrations were low in Chapman brook with all TP and phosphate concentrations below their respective ANZECC trigger values. Total P showed a first flush response in 2019 (this was not as evident in 2018) with concentrations highest in June, when the brook first started flowing. At this time, rainfall would have washed P into the stream from surrounding land use. Overall, it is likely that most of the P was entering Chapman Brook from surface flows as well as in-stream sources such as erosion, with groundwater contributing proportionally less P.

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

Chapman Brook



2019 phosphorus concentrations and monthly flow at 609022. The dashed lines are the ANZECC trigger values for the different P species.

Collecting a water quality sample at the Chapman Brook sampling site, September 2018.

Chapman Brook

Total suspended solids over time (2005–19)

Concentrations

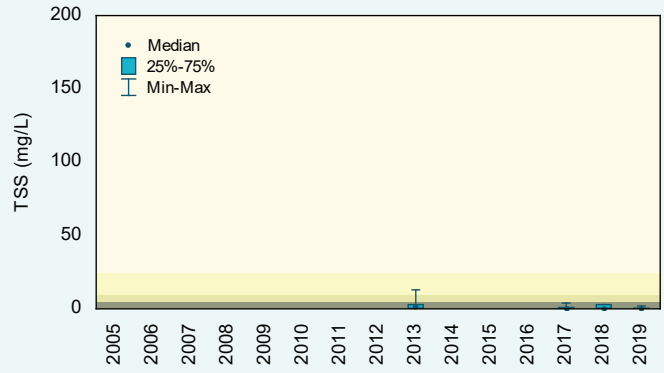
Using the SWRWQA methodology, annual total suspended solids (TSS) concentrations were classified as low. In 2019, the median of 0.5 mg/L was equal lowest with Hut Pool, McLeod and Turnwood creeks, and was below the LOR (1 mg/L).

Estimated loads

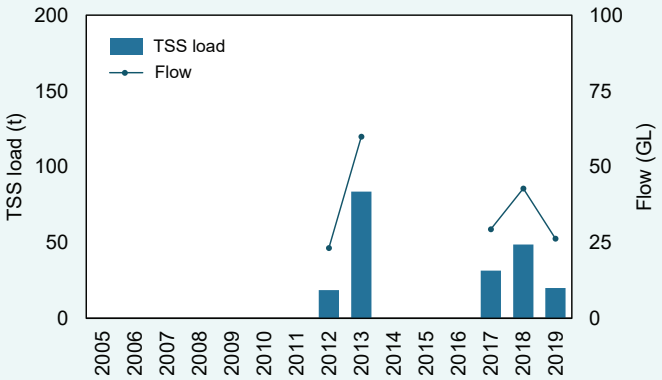
In 2019, the estimated TSS loads at the Chapman Brook sampling site was 20 t and the load per square kilometre was 107 kg/km^2. Chapman Brook was one of only two sites in the Lower Blackwood catchment with flow data, the other being at Hut Pool, which is on the Blackwood River itself. No comparisons have been made between the two sites because of the very different size and nature of their two catchments.

Annual TSS loads were closely related to flow volumes; years with large annual flow volumes had large TSS loads and vice versa.

Chapman Brook



Total suspended solids concentrations, 2005–19 at site 609022. The shading refers to the SWRWQA classification bands.



Total suspended solids loads and annual flow, 2005–19 at site 609022.

low moderate high very high

Canoeing on the Blackwood River, close to the Warner Glen campsite, September 2019.

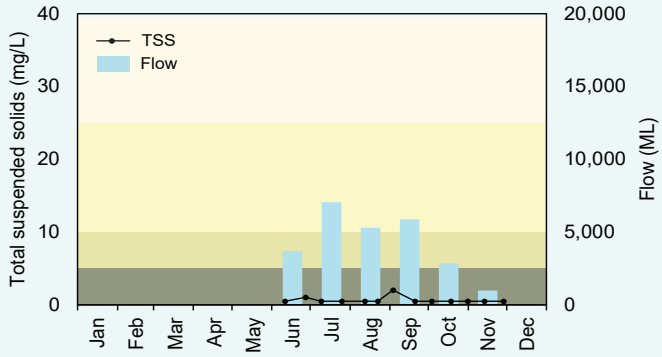
Total suspended solids (2019)

Concentrations

In 2019, TSS concentrations were very low at Chapman Brook with all samples in the low band of the SWRWQA. Eleven of the 13 samples collected were below the LOR (1 mg/L).

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

Chapman Brook



2019 total suspended solids concentrations and monthly flow at 609022. The shading refers to the SWRWQA classification bands.

low moderate high very high

Collecting water quality samples at the Chapman Brook sampling site, May 2019.

Chapman Brook

pH over time (2005–19)

pH values

In Chapman Brook, pH values were slightly alkaline, with some samples over the upper ANZECC trigger value each year for which there were sufficient data to graph. In 2019, the median pH was the highest of the nine sites sampled in the Blackwood River catchment.

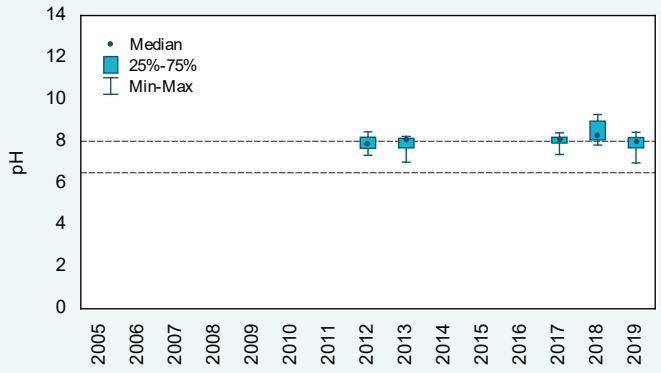
pH (2019)

pH values

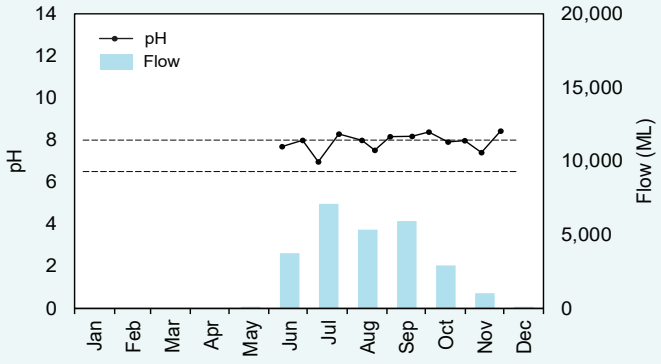
pH values fluctuated over the year in Chapman Brook with no clear seasonal pattern. pH was above the upper ANZECC trigger value on a number of sampling occasions.

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

Chapman Brook



pH levels, 2005–19 at site 609022. The dashed lines are the upper and lower ANZECC trigger values.



2019 pH levels and monthly flow at 609022. The dashed lines are the upper and lower ANZECC trigger values.

Sampling at the Chapman Brook sampling site, June 2019.

Chapman Brook

Salinity over time (2005–19)

Concentrations

Salinity was low in Chapman Brook with all years classified as fresh using the Water Resources Inventory 2014 salinity ranges (note the 2018 nutrient report used the SWRWQA Bands).

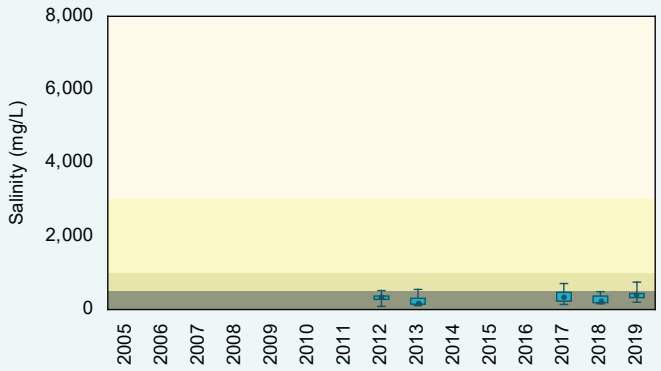
Salinity (2019)

Concentrations

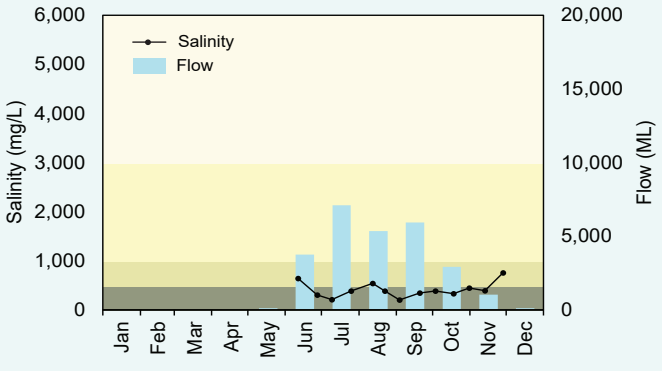
Salinity showed a slight inverse relationship with flow in Chapman Brook. Concentrations were marginally higher at the start and end of the flow year, with the exception of the peak in August. This site is influenced by the Blackwood River when water levels are low so the higher salinities may be because of this influence.

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

Chapman Brook



Salinity concentrations, 2005–19 at site 609022. The shading refers to the Water Resources Inventory 2014 salinity ranges.



2019 salinity concentrations and monthly flow at 609022. The shading refers to the Water Resources Inventory 2014 salinity ranges.

fresh marginal brackish saline

Black bream at the Chapman Brook sampling site, April 2019. At this time, the water at the site is from the Blackwood River. Chapman Brook stops flowing over summer and autumn.

Chapman Brook

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.

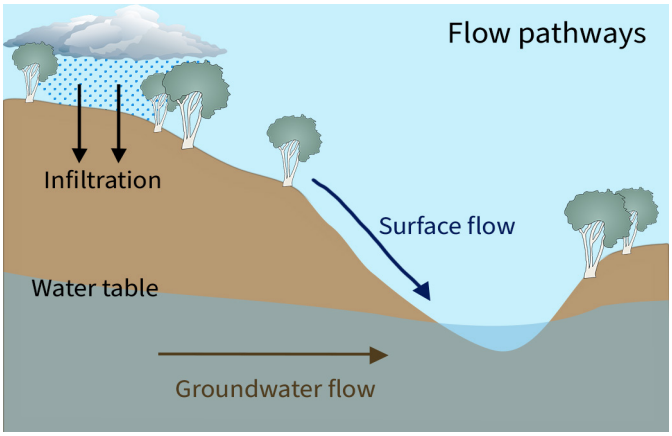
Laboratory limit of reporting: (LOR) this is the lowest concentration of an analyte that can be reported by a laboratory.

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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