South Dandalup River

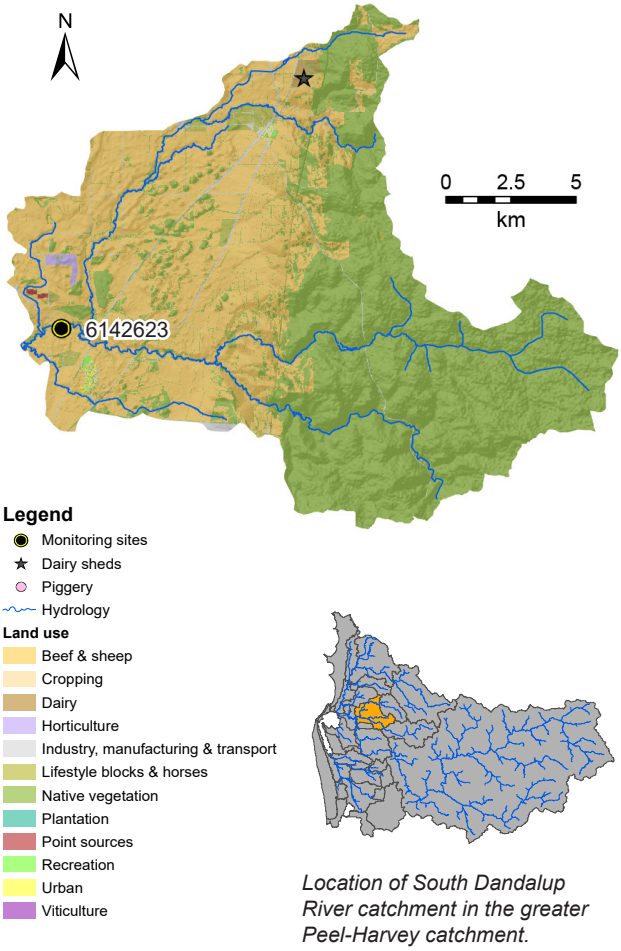
This data report provides a summary of the nutrients at the South Dandalup River sampling site in 2019 as well as historical data from 2005–19. This report was produced as part of Healthy Estuaries WA. Downstream of the site, the river flows into the Murray River and then the Harvey Estuary.

About the catchment

The South Dandalup River has a catchment area of about 241 km^2, just under half of which has been cleared for agriculture, mostly beef and sheep grazing. The eastern portion of the catchment, on the Darling Scarp, remains largely uncleared. While the river mostly retains its natural form, much of the fringing vegetation is in poor condition. The South Dandalup Dam is on the river, upstream of the South Dandalup River catchment.

The Swan Coastal Plain portion of the catchment has soils with a low phosphorus-binding capacity. This is often so poor that any phosphorus applied to them can be quickly washed or leached into drains and other waterways. In the Darling Scarp, the soils tend to bind phosphorus better, reducing the amount entering drains and other waterways.

Water quality is monitored at site 6142623, Patterson Road, where the South Dandalup River passes under Patterson Road in Ravenswood.



Location of South Dandalup River catchment in the greater Peel-Harvey catchment.

Results summary

Nutrient concentrations (total nitrogen and total phosphorus) at the South Dandalup River sampling site were low (nitrogen) and high (phosphorus). The river mostly retains its natural form; however, the fringing vegetation is generally in poor condition.

Facts and figures

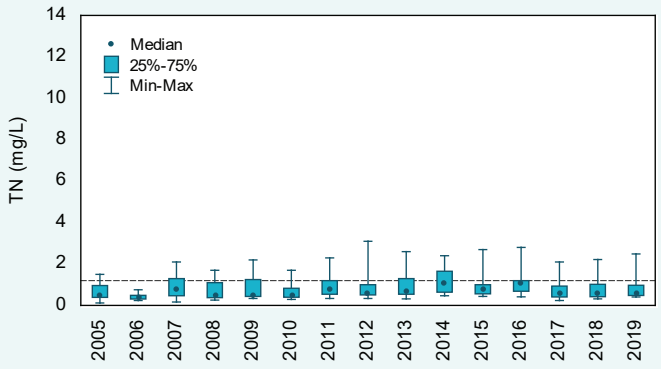
Sampling site code	6142623
Catchment area	241 km^2
Per cent cleared area (2015)	44 per cent
River flow	Permanent
Main land use (2015)	Native vegetation and beef and sheep grazing

Nitrogen over time (2005–19)

Concentrations

Total nitrogen (TN) concentrations fluctuated over the reporting period. Using the State Wide River Water Quality Assessment (SWRWQA) methodology, all annual TN concentrations were classified as low except for 2016–18 which were classified as moderate. All annual medians were below the Bindjareb Djilba (Peel-Harvey estuary) Protection Plan water quality target for TN concentrations.

South Dandalup River



Total nitrogen concentrations, 2005–19 at site 6142623. The dashed line is the protection plan TN target.

Collecting a water quality sample at the South Dandalup River sampling site, September 2018.

South Dandalup River

Nitrogen (2019)

Types of nitrogen

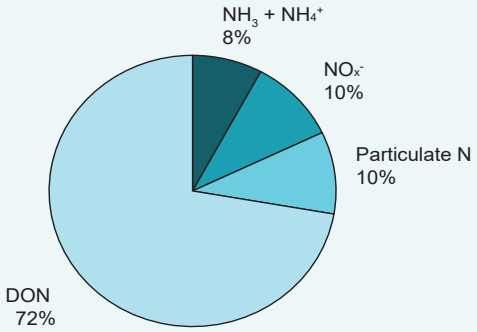
Total N is made up of different types of N. At the South Dandalup River sampling site, nearly three-quarters of the N was present as dissolved organic N (DON) which consists mainly of degrading plant and animal matter but may also include other types. Most types of DON need to be further broken down to become available to plants and algae, though some are readily bioavailable. The remainder of the N was present as highly bioavailable dissolved inorganic N (DIN – which consists of nitrate, NO_x^- and total ammonia, $NH_3 + NH_4^+$). Likely sources of these kinds of N include fertilisers and animal wastes as well as natural sources (though these are probably contributing less).

Concentrations

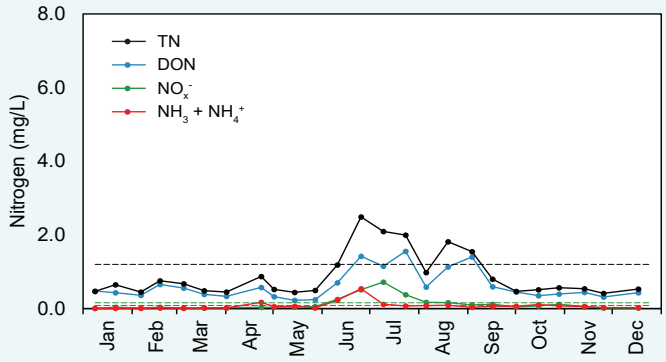
All types of N showed a seasonal pattern at the South Dandalup River sampling site with the highest concentrations recorded from June to August, coinciding with highest rainfall and flows. This suggests that at this time of the year most of the N was entering the stream via surface flows. These are washing nitrate from surrounding land use as well as mobilising N that has been mineralised from organic N in soils and streams over summer. DON is being washed in from soils and remnant wetlands where it also built up over the summer period. It is likely entering the stream via groundwater year-round as well as surface water during the wetter months. In-stream sources were contributing N year-round.

The dip in TN and DON in August was probably the result of a dry spell which caused parts of the catchment to dry out, therefore no longer contributing nutrients. This dip was present at many of the Peel-Harvey catchment sites in both N and phosphorus concentrations.

South Dandalup River



2019 average nitrogen fractions at site 6142623.



2019 nitrogen concentrations at 6142623. The black dashed line is the protection plan TN target, the red and green lines are the ANZECC trigger values for total ammonia and nitrate.

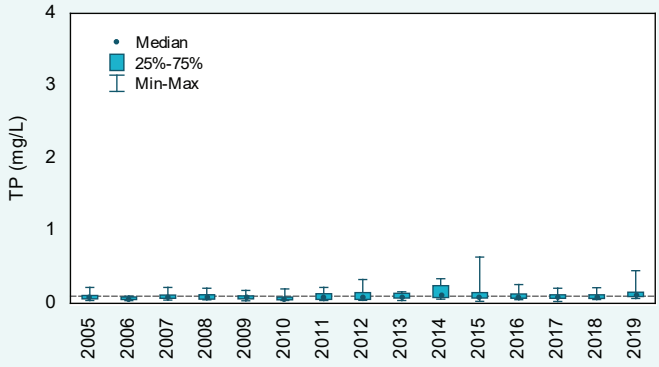
Cattle grazing is one of the dominant land uses in the South Dandalup River catchment, September 2018.

Phosphorus over time (2005–19)

Concentrations

Total phosphorus (TP) concentrations fluctuated over the reporting period. While the annual range in TP concentrations was small, annual medians were often only just below the protection plan water quality target for TP (except for 2014 and 2019, when they were just above the water quality target). Using the SWRWQA methodology, TP concentrations were classified as moderate to 2013 and high since then.

South Dandalup River



Total phosphorus concentrations, 2005–19 at site 6142623. The dashed line is the protection plan TP target.

Looking upstream from the sampling site. The river runs through paddocks which house cattle that damage banks and deposit nutrients into the river, November 2003.

Phosphorus (2019)

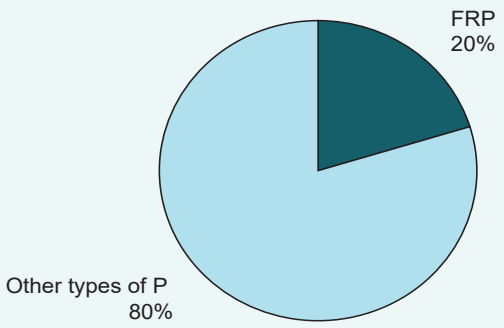
Types of phosphorus

Total P is made up of different types of P. Compared with the other sites sampled in the Peel-Harvey catchment, only a small proportion of P was present as highly bioavailable phosphate (the second smallest proportion of phosphate of the Peel-Harvey catchments, only Drakesbrook–Waroona Drain had a smaller proportion). Phosphate is measured as filterable reactive phosphorus (FRP) which in surface waters is mainly present as phosphate (PO_4^{3-}) species. Phosphate is readily bioavailable and is 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 chart below). Particulate P generally needs to be broken down before becoming bioavailable. The bioavailability of DOP varies and is poorly understood.

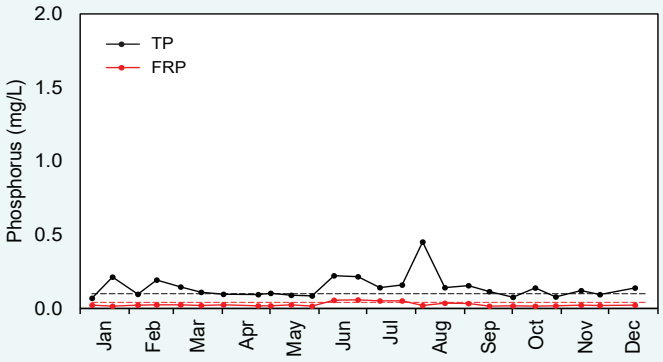
Concentrations

Total P and phosphate concentrations generally showed a similar pattern to TN and nitrate. P entered the stream from June to August via surface flows from surrounding land use as well as coming from groundwater and in-stream sources. Phosphate samples were over the Australian and New Zealand Environment and Conservation Council (ANZECC) trigger value in June and July.

South Dandalup River



2019 average phosphorus fractions at site 6142623.



2019 phosphorus concentrations at 6142623. The dashed black line is the protection plan TP target, the red is the ANZECC trigger value for phosphate.

Using an in-situ probe to measure pH and salinity at the South Dandalup River sampling site, September 2018.

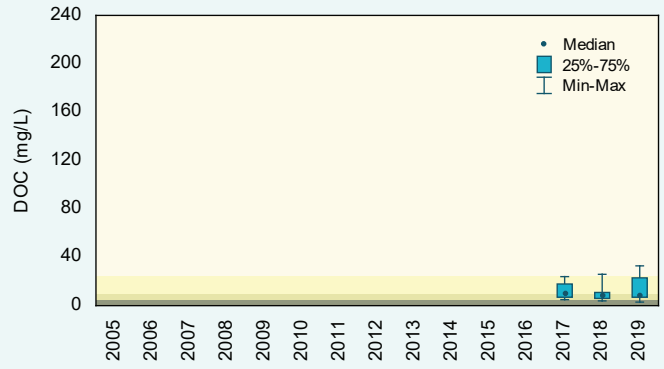
South Dandalup River

Dissolved organic carbon over time (2005–19)

Concentrations

There were only three years with sufficient dissolved organic carbon (DOC) data to graph at the South Dandalup River sampling site. Using the SWRWQA methodology, DOC concentrations were classified as moderate. However, the annual range in DOC concentrations at this site was small and concentrations were low compared with the other Peel-Harvey catchment sites. The South Dandalup River site had the equal second-lowest median DOC concentration in 2019 (9 mg/L, the same as Drakesbrook–Waroona Drain and only slightly higher than Mayfield Drain and the Middle Murray River which had medians of 7 mg/L).

South Dandalup River



Dissolved organic carbon concentrations, 2005–19 at site 6142623. The shading refers to the SWRWQA classification bands.

low moderate high very high

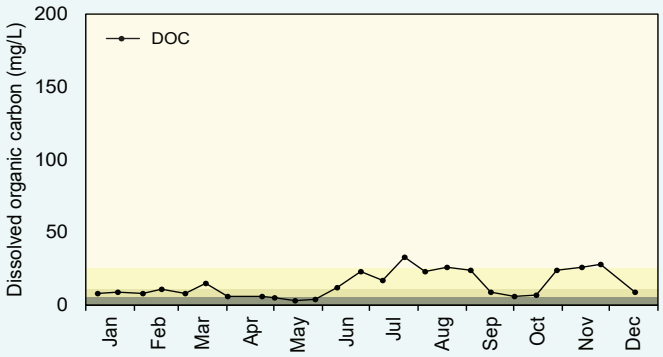
The South Dandalup River passing under the Patterson Road Bridge at the sampling site, September 2018.

Dissolved organic carbon (2019)

Concentrations

DOC concentrations showed a seasonal pattern at the South Dandalup River sampling site, being high from June to September, when rainfall and flow were high. The reason for the second peak from October to November is unknown. DOC was entering the South Dandalup River via surface and groundwater flows as well as coming from in-stream sources. DOC is sourced mainly from degrading plant and animal matter, including from agricultural land and natural organic matter in soils and wetlands. It varies widely in its bioavailability.

South Dandalup River



2019 dissolved organic carbon concentrations at 6142623. The shading refers to the SWRWQA classification bands.

low moderate high very high

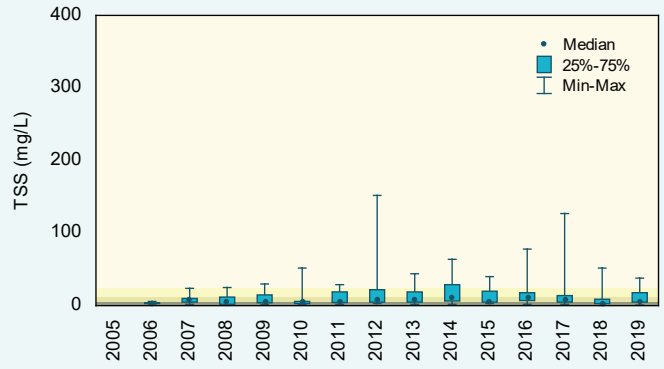
The North Dandalup River. This river flows into the South Dandalup River, September 2020.

Total suspended solids over time (2005–19)

Concentrations

Total suspended solids (TSS) concentrations fluctuated over the reporting period at the South Dandalup River sampling site. Using the SWRWQA methodology, all TSS concentrations were classified as moderate though most years had at least some samples that fell into the very high band.

South Dandalup River



Total suspended solids concentrations, 2005–19 at site 6142623. The shading refers to the SWRWQA classification bands.

low moderate high very high

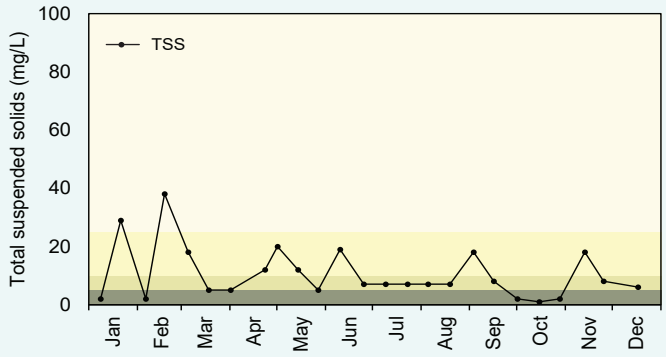
Sheep grazing is one of the main land uses in the South Dandalup catchment, September 2020.

Total suspended solids (2019)

Concentrations

In 2019, TSS concentrations fluctuated at the South Dandalup River sampling site. There were a number of peaks in TSS concentrations during the year, the reason for each being unclear. It is possible that stock was accessing the river for water or there was some other form of disturbance to the river upstream of the sampling site.

South Dandalup River



2019 total suspended solids concentrations at 6142623. The shading refers to the SWRWQA classification bands.

low moderate high very high

Conjurnup Creek, September 2020. This creek flows into the South Dandalup River upstream of the sampling site.

South Dandalup River

pH over time (2005–19)

pH levels

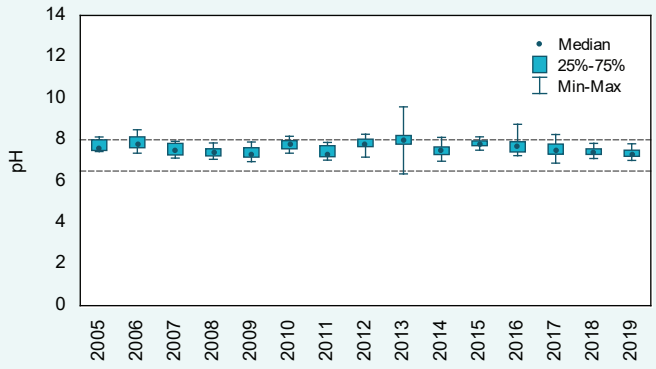
pH at the South Dandalup River sampling site fluctuated over the reporting period. All annual medians fell within the upper and lower ANZECC trigger values, though a number of years had some samples that were above the upper trigger value.

pH (2019)

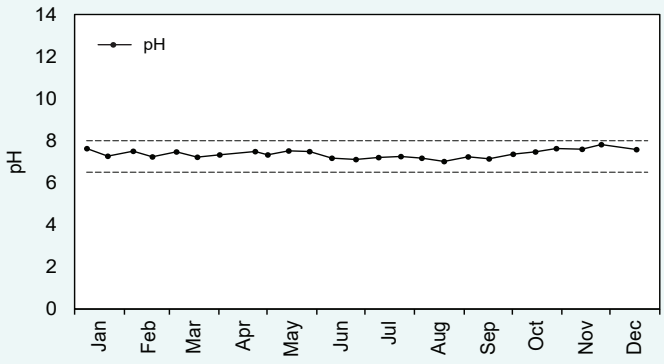
pH levels

There was no evidence of a seasonal pattern in pH at the South Dandalup River sampling site, with levels fluctuating throughout the year. All samples collected in 2019 fell within the upper and lower ANZECC trigger values.

South Dandalup River



pH levels, 2005–19 at site 6142623. The dashed lines are the upper and lower ANZECC trigger values.



2019 pH levels at 6142623. The dashed lines are the upper and lower ANZECC trigger values.

Looking at the Darling Scarp from the coastal plain in the South Dandalup River catchment, September 2020. Once on the scarp, there tends to be a lot more native vegetation.

South Dandalup River

Salinity over time (2005–19)

Concentrations

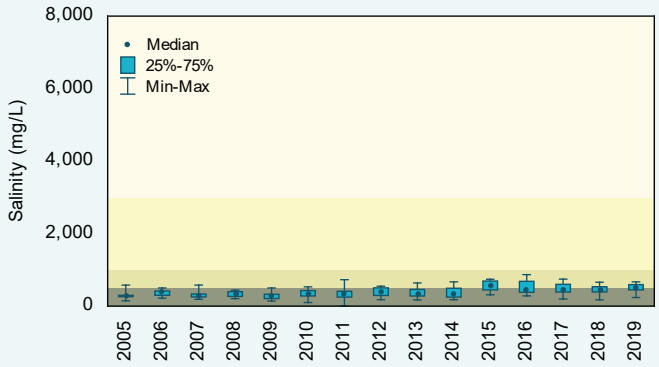
Using the Water Resources Inventory 2014 salinity ranges, all years were classified as fresh though some medians did fall into the marginal band (note, in 2018, the SWRWQA classification bands were used). The annual range in salinity concentrations was consistently small.

Salinity (2019)

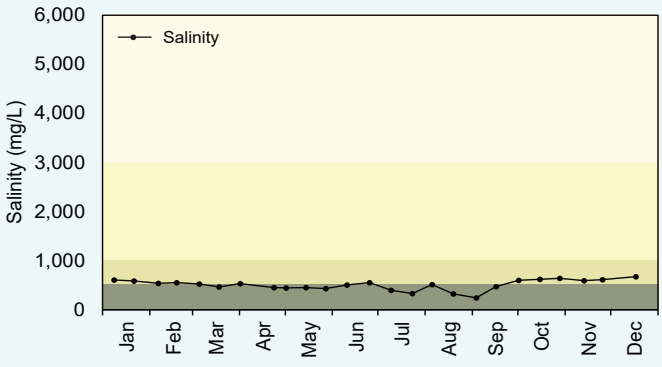
Concentrations

Salinity showed a very slight inverse relationship to flow. That is, salinity was lower from July to September, when flow would have been highest at the site. This suggests that the surface water runoff is slightly less saline than the groundwater at this site.

South Dandalup River



Salinity concentrations, 2005–19 at site 6142623. The shading refers to the Water Resources Inventory 2014 salinity ranges.



2019 salinity concentrations at 6142623. The shading refers to the Water Resources Inventory 2014 salinity ranges.

fresh marginal brackish saline

The gauging station on the North Dandalup River. This photograph shows how close the grazing land is to the river in many places in the catchment (the river is just to the left of this photograph), September 2020.

South Dandalup River

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 Peel-Harvey estuary at estuaries.dwer.wa.gov.au/estuary/peel-harvey-estuary/

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

Methods

Variables were compared with the Bindjareb Djilba (Peel-Harvey estuary) Protection 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.

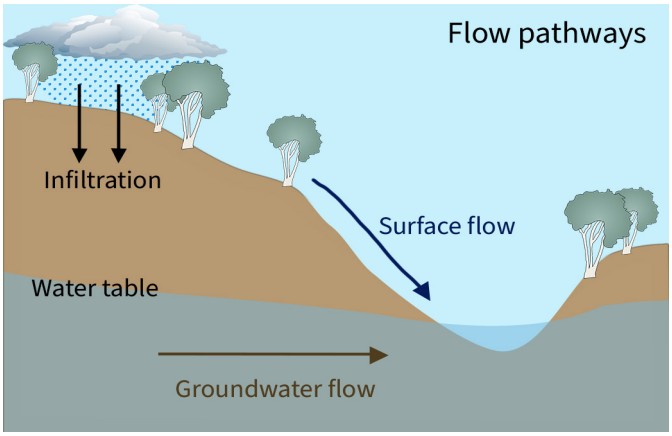
Laboratory limit of reporting: (LOR) this is the lowest concentration of an analyte that can be reported by a laboratory.

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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