Upper Preston River

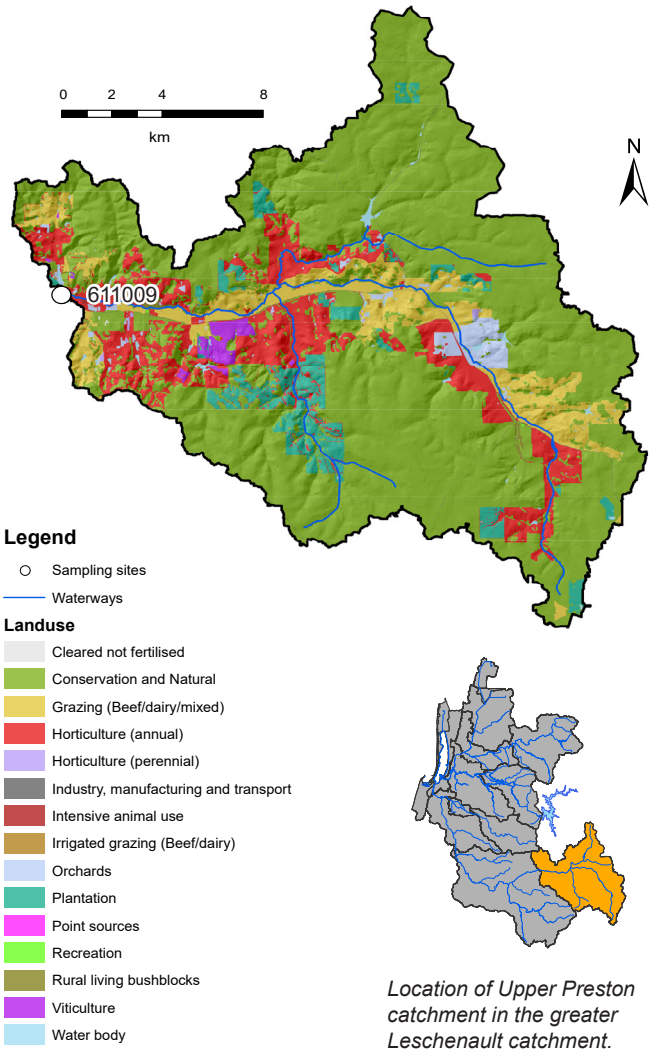
This data report provides a summary of the nutrients at the Upper Preston River sampling site in 2019 as well as historical data from 2005–19. This report was produced as part of Healthy Estuaries WA. Downstream of this site, the Preston River flows through the middle and then lower Preston River catchments before discharging to the Leschenault Estuary.

About the catchment

The Upper Preston River has a catchment area of about 324 km^2, about two-thirds of which is covered by native vegetation. The other major land use is annual horticulture and cattle grazing. There are some plantations and a few areas of viticulture present. Water for agriculture is provided by the Preston Valley Irrigation Cooperative which sources water from the Glen Mervyn Dam (on Lyalls Mill Stream, the northern tributary to the Preston River).

Most of the agricultural land use is centred around the Preston River and, consequently, much of the fringing vegetation is in poor condition. The entire catchment is on the Darling Plateau and therefore has soils with a high capacity to bind phosphorus. These soils bind phosphorus applied to them, helping to reduce the amount entering waterways.

Water quality is measured at site 611009, Lowden Road Bridge, where the Preston River passes under Lowden Road in Lowden.



Location of Upper Preston catchment in the greater Leschenault catchment.

Results summary

Nutrient concentrations (total nitrogen and total phosphorus) were classified as low. The proportion of nitrogen present in a bioavailable type was large because of the agricultural land use in the catchment. The low total phosphorus concentrations can be attributed to the catchment's soils which tend to bind phosphorus well, despite the intensive agricultural land use present. The presence of large areas of native vegetation also contributed to the relatively low nutrient concentrations found at this site. Nutrient loads were small compared with the other Leschenault catchment sampling sites.

Facts and figures

Sampling site code	611009 (Lowden Road Bridge)
Catchment area	324 km^2
Per cent cleared area (2018)	30%
River flow	Permanent
Main land use (2018)	Native vegetation and annual horticulture

Estimated loads and flow at Upper Preston River

611009	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Flow (GL)	27	9.0	23	12	29	2.2	22	7.6	24	24	4.0	24	17	22	6.3
TN load (t)			27	12			26						19	28	5.7
TP load (t)			0.42	0.20			0.40						0.29	0.42	0.10

Upper Preston River

Nitrogen over time (2005–19)

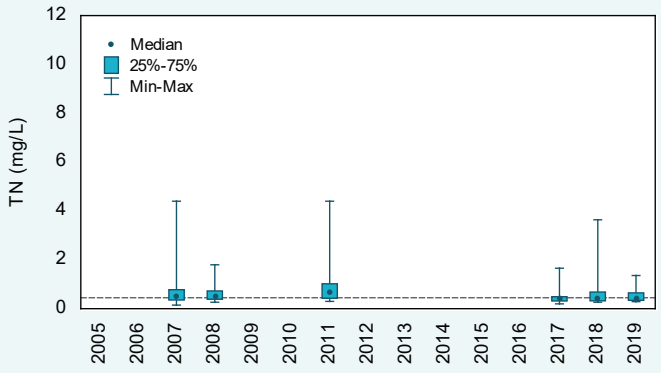
Concentrations

Annual total nitrogen (TN) concentrations were classified as low using the State Wide River Water Quality Assessment (SWRWQA) methodology. The 2007, 2008 and 2011 annual medians were all above the Leschenault Water Quality Improvement Plan (WQIP) TN target for upland rivers. Since the break in monitoring, the annual medians have been below the target.

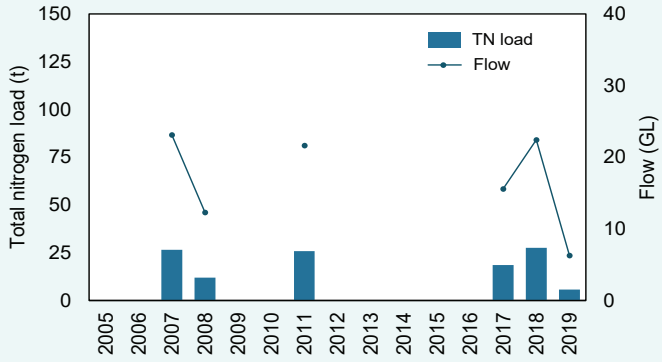
Estimated loads

The estimated TN loads at the Upper Preston River sampling site were generally small compared with the other three sites with flow data in the Leschenault catchment. In 2019, the estimated TN load (5.7 t) was the smallest of the Leschenault catchment sites. It also had the smallest load per square kilometre of 18 kg/km^2, similar to the Middle Preston site of 21 kg/km^2. Annual TN loads were closely related to flow volumes; years with large annual flow volumes had large TN loads and vice versa.

Upper Preston River



Total nitrogen concentrations, 2005–19 at site 611009. The dashed line is the Leschenault WQIP target for upland rivers.



Total nitrogen loads and annual flow, 2005–19 at site 611009.

The Upper Preston River sampling site, November 2018.

Upper Preston River

Nitrogen (2019)

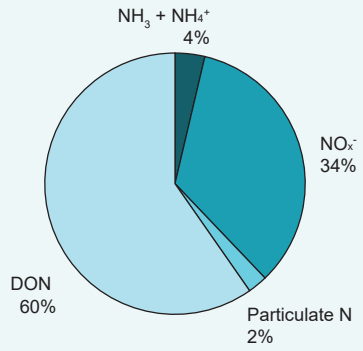
Types of nitrogen

Total N is made up of different types of N. About a third of the N was present as nitrate (NO_x^-), the equal highest proportion (with the Middle Preston River) of the 10 sites sampled in the Leschenault catchment. Nitrate is readily bioavailable and is likely from fertilisers used in horticulture and grazing, and animal wastes. High proportions of nitrate are often found in agricultural catchments. Dissolved organic N (DON) made up the largest percentage of N. 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 becoming available, whereas other types of DON are readily bioavailable.

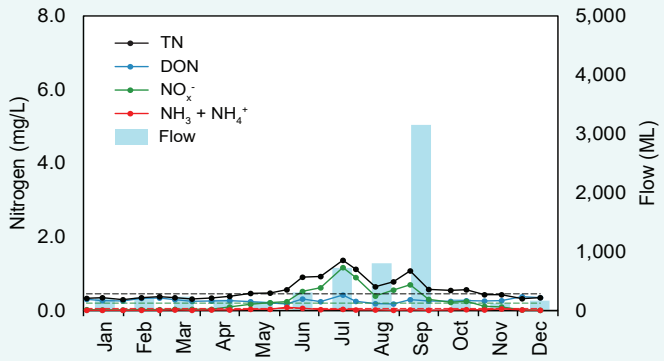
Concentrations

Total N, DON and nitrate all showed a seasonal pattern in 2019 at the Upper Preston River sampling site. Concentrations were very low in the early part of the year when there was little rainfall or flow. In June, as rainfall and flow started to increase, concentrations increased (especially TN and nitrate), before peaking in July and falling again. The increase in June was likely because of a first-flush response where N was mobilised 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 of high-concentration waters from agricultural land, where fertiliser and animal waste builds up over summer. There was a second peak in early September, most likely because this sample was collected shortly after the highest flows of the year. Given the pattern in N concentrations seen at this site it is likely that most of the N is entering the river via surface flows, with in-stream sources and groundwater contributing proportionally less.

Upper Preston River



2019 average nitrogen fractions at site 611009.



2019 nitrogen concentrations and monthly flow at 611009. The black dashed line is the WQIP target for upland rivers, the red and green are the ANZECC trigger values for total ammonia and nitrate.

Recording information related to a river health assessment, October 2009.

Upper Preston River

Phosphorus over time (2005–19)

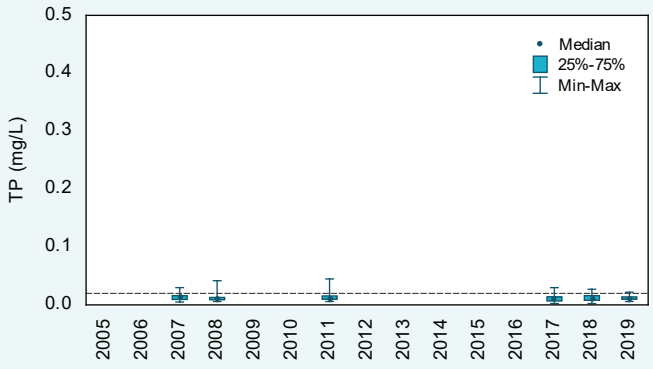
Concentrations

Total phosphorus (TP) concentrations at the Upper Preston River sampling site were generally low compared with the other 10 sites sampled in the Leschenault catchment. Using the SWRWQA methodology, all years with sufficient data were classified as having a low TP concentration. The 2019 median TP concentration (0.012 mg/L) was the second lowest of the 10 sites sampled in the Leschenault catchment with only the Middle Collie River site having a lower (though almost identical) median of 0.011 mg/L. The low TP concentrations at this site are likely because of the good phosphorus-binding capacity of the soils found in the catchment.

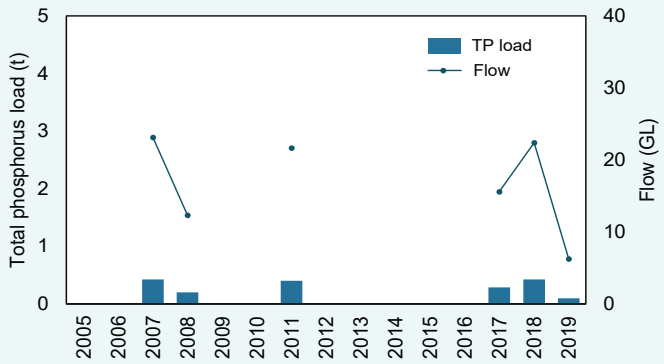
Estimated loads

The estimated TP loads at the Upper Preston River sampling site were small compared with the other three sites with flow data in the Leschenault catchment. In 2019, the site had the smallest estimated TP load (0.10 t); the Middle Collie River had the next largest load of 0.26 t. The Upper Preston River also had the smallest load per square kilometre of 0.3 kg/km^2. Annual TP loads were closely related to flow volumes; years with large annual flow volumes had large TP loads and vice versa.

Upper Preston River



Total phosphorus concentrations, 2005–19 at site 611009. The dashed line is the Leschenault WQIP target for upland rivers.



Total phosphorus loads and annual flow, 2005–19 at site 611009.

The Preston River near the sampling site. Note the dominance of exotic grasses in the fringing vegetation, October 2009.

Phosphorus (2019)

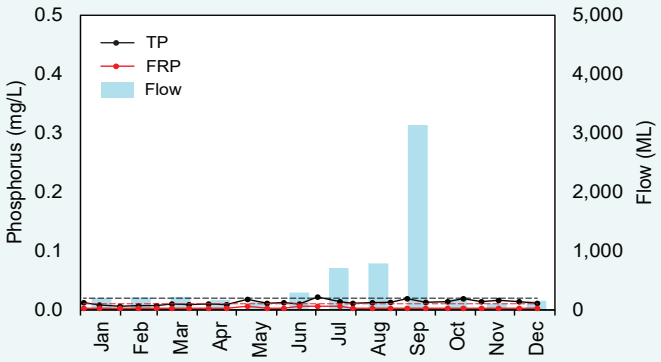
Types of phosphorus

Total P is made up of different types of P. Phosphate, measured as filterable reactive phosphorus (FRP), is mainly present as phosphate (PO_4^{3-}) species in surface waters and is readily bioavailable. Phosphate is typically derived from fertilisers, animal wastes and natural sources. 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 Upper Preston River site. At this site 22 of the 26 phosphate samples were below their LOR (0.005 mg/L).

Concentrations

Total P concentrations did not show a clear seasonal pattern, fluctuating during the year. Except for a single sample collected in July, which was just above the Leschenault WQIP TP target, all samples were below the target. The low P concentrations at this site are likely because of the high phosphorus-binding capacity of the soils found in the catchment. Most of the P at this site would have been entering the river via surface flows, with in-stream sources and groundwater contributing proportionally less.

Upper Preston River



2019 phosphorus concentrations and monthly flow at 611009. The black dashed line is the WQIP target for upland rivers, the red is the ANZECC trigger value for upland rivers for phosphate.

A fyke net set in the Upper Preston River to capture fish and crayfish for a river health assessment. After being recorded, they are returned to the river alive, October 2009.

Total suspended solids over time (2005–19)

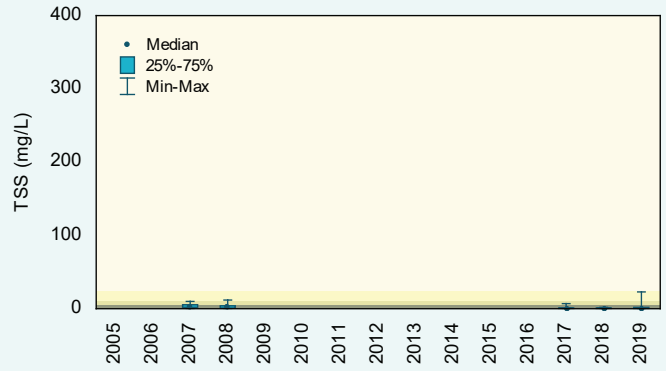
Concentrations

Compared with the other sites sampled in the Leschenault catchment, total suspended solids (TSS) concentrations at the Upper Preston River sampling site were low. Using the SWRWQA methodology, all years with sufficient data were classified as having a low TSS concentration. Many samples were below the LOR for TSS (1 mg/L).

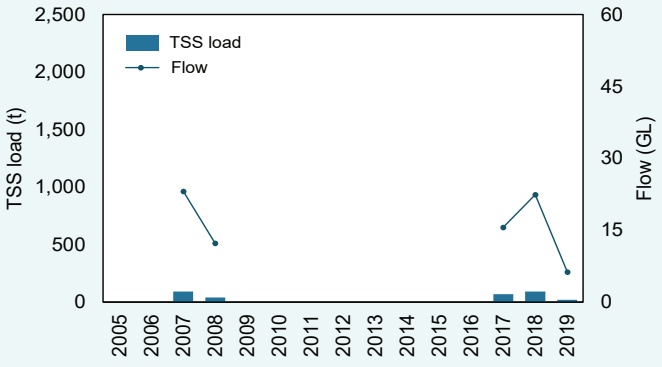
Estimated loads

The estimated TSS loads at the Upper Preston River sampling site were small compared with the other three sites with flow data in the Leschenault catchment. In 2019, the site had the smallest estimated TSS load (20 t; the Middle Collie River site had the next largest load of 55 t). Annual TSS loads were closely related to flow volumes; years with large annual flow volumes had large TSS loads and vice versa.

Upper Preston River



Total suspended solids concentrations, 2005–19 at site 611009. The shading refers to the SWRWQA classification bands.



Total suspended solids loads and annual flow, 2005–19 at site 611009.

low moderate high very high

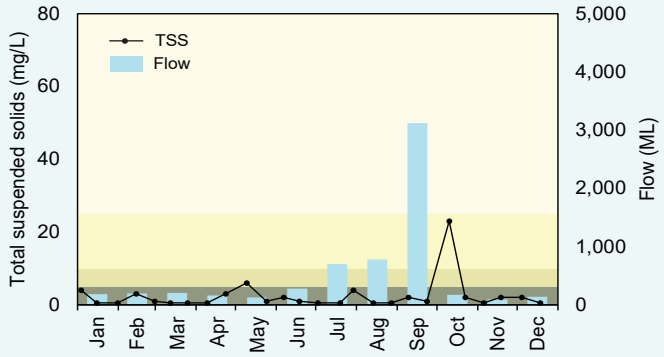
Cattle grazing is one of the major land uses in the Upper Preston River catchment, October 2009.

Total suspended solids (2019)

Concentrations

In 2019, all but two of the TSS samples fell into the low band of the SWRWQA. Eleven of the 26 samples collected were below the LOR. The reason for the two peaks observed in May and October are unclear, though the peak in May coincides with a peak in salinity on the same date.

Upper Preston River



2019 total suspended solids concentrations and monthly flow at 611009. The shading refers to the SWRWQA classification bands.

low moderate high very high

Bank erosion near the Upper Preston River sampling site. Erosion like this can add particulate matter to the river during high flows, October 2009.

Upper Preston River

pH over time (2005–19)

pH values

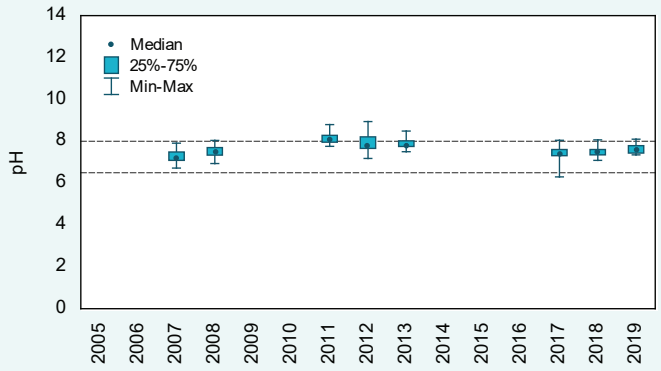
In the Upper Preston River, pH values fluctuated over the reporting period. All annual medians fell between the upper and lower ANZECC trigger values except for 2011, which was slightly above.

pH (2019)

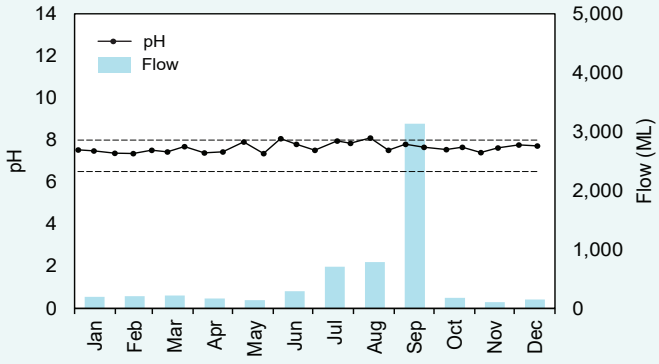
pH values

There was no clear evidence of a seasonal pattern in pH values at the Upper Preston River sampling site in 2019. There were two samples, collected in June and August, that were just above the upper ANZECC trigger value. Other than these, all samples fell within the upper and lower ANZECC trigger values.

Upper Preston River



pH levels, 2005–19 at site 611009. The dashed lines are the upper and lower ANZECC trigger values.



2019 pH levels and monthly flow at 611009. The dashed lines are the upper and lower ANZECC trigger values.

The Upper Preston River near the sampling site. Agricultural land use is situated close to much of the Preston River in this catchment, October 2009.

Upper Preston River

Salinity over time (2005–19)

Concentrations

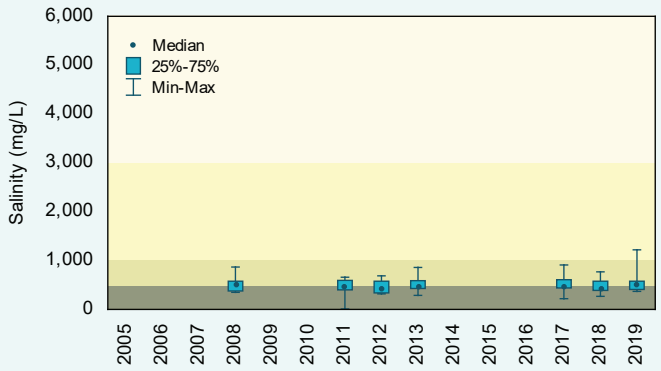
Salinity concentrations at the Upper Preston River were low compared with the other 10 sites sampled in the Leschenault catchment. Using the Water Resources Inventory 2014 salinity ranges, all years with sufficient data were classified as fresh (note, in 2018 the SWRWQA bands were used).

Salinity (2019)

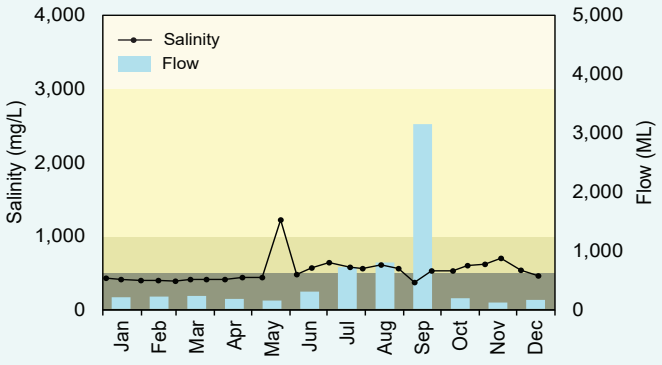
Concentrations

Salinity showed a slight seasonal pattern at the Upper Preston River sampling site. Salinity was lower in the first half of the year (with the exception of the peak in May) increasing slightly in June as rainfall and flow increased. The reason for the peak in May is unclear. It is likely that salts are entering the river via both surface water and groundwater flows at this site, with surface water slightly more saline than groundwater.

Upper Preston River



Salinity concentrations, 2005–19 at site 611009. The shading refers to the Water Resources Inventory 2014 salinity ranges.



2019 salinity concentrations and monthly flow at 611009. The shading refers to the Water Resources Inventory 2014 salinity ranges.

fresh marginal brackish saline

The Upper Preston River near the sampling site, October 2009.

Upper Preston 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 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.

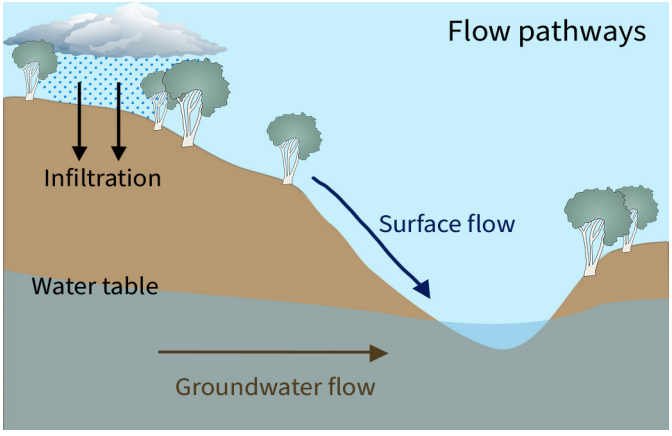
Laboratory limit of reporting: (LOR) this is the lowest concentration of an analyte that can be reported by a laboratory.

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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