Upper Preston River

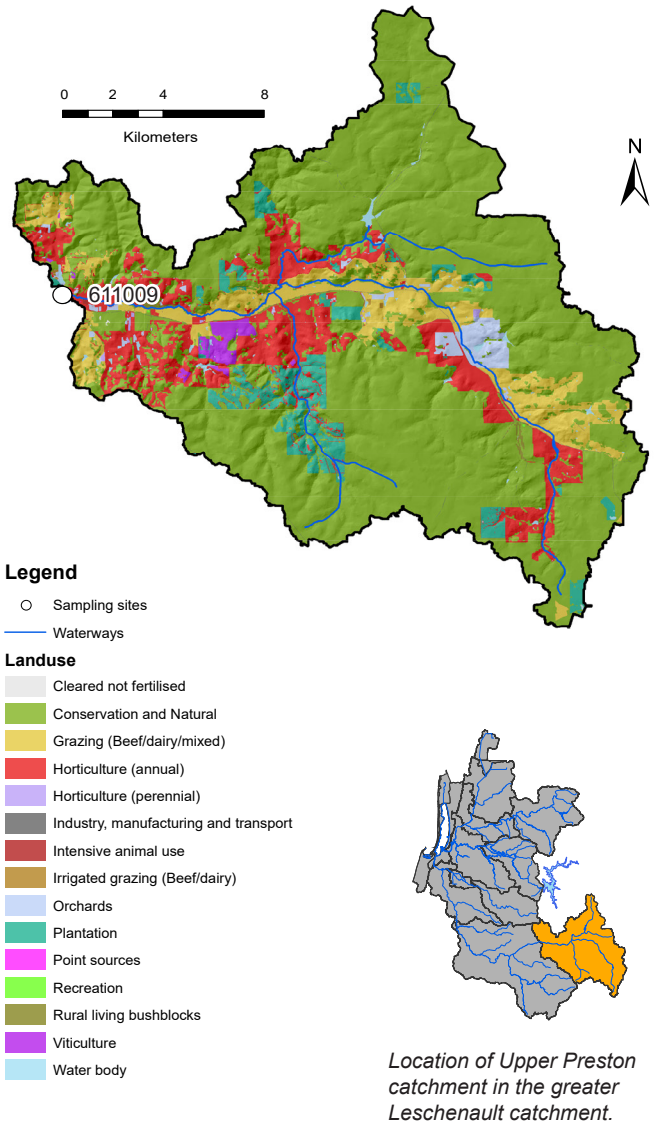
This data report provides a summary of the nutrients at the Upper Preston River sampling site in 2018 as well as historical data from 2004–18. This report was produced as part of the Regional Estuaries Initiative. Downstream of this site, the Preston River flows through the middle and then lower Preston River catchments before discharging to the Leschenault Estuary. 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 water and harm fish and other species. Total suspended solids, pH and salinity data are also presented as they help us better understand the processes occurring in the catchment.

About the catchment

The Upper Preston River has a catchment area of about 324 km^2, around 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 ranged from low (total phosphorus) to moderate (total nitrogen). The proportion of nitrogen present in a bioavailable form was large, because of the agricultural land use in the catchment. The low total phosphorus concentrations can be attributed to the catchments 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
Catchment area	324 km^2
Per cent cleared area (2018)	30%
River flow	Permanent
Annual flow (2018)	22 GL
Main land use (2018)	Native vegetation and annual horticulture

Upper Preston River

Nitrogen over time (2004–18)

Concentrations

Total nitrogen (TN) concentrations were low to moderate compared with the other sites sampled in the Leschenault catchment. 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 in 2017 and 2018 were below the target. The 2018 annual median (0.40 mg/L) was the second lowest of the 10 sites in the Leschenault catchment. Only the site in the Middle Preston catchment had a lower median (0.20 mg/L).

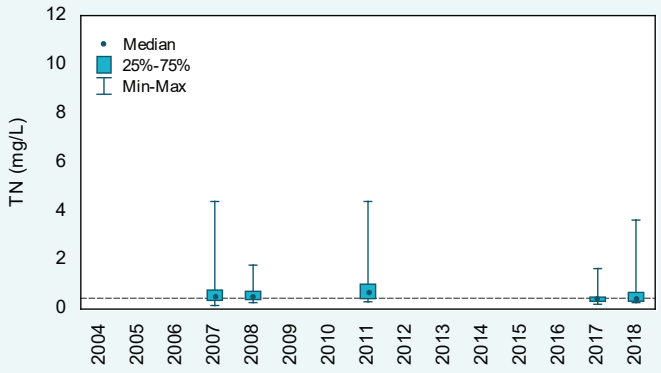
Trends

As the Upper Preston River site was not sampled between 2012–16 it was not possible to test for trends at this site. A minimum of five consecutive years of data are required to test for trends.

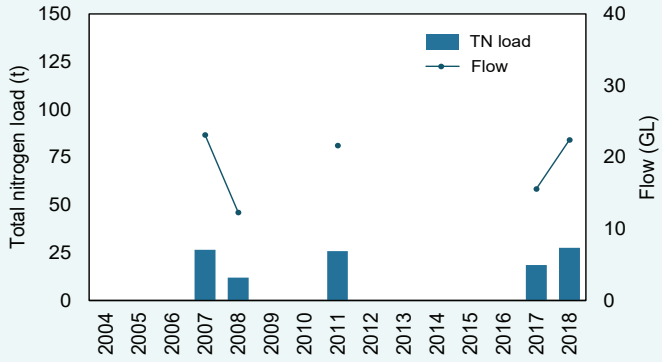
Estimated loads

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 2018, the estimated TN load (28 t) was similar to the load at the Ferguson River site (33 t) and the Middle Collie River site (27 t). The Middle Preston site had a much larger TN load at 82 t. 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, 2004–18 at site 611009, The dashed line is the Leschenault WQIP target for upland rivers.



Total nitrogen loads and annual flow, 2004–18 at site 611009.

The Upper Preston River sampling site, November 2018.

Upper Preston River

Nitrogen (2018)

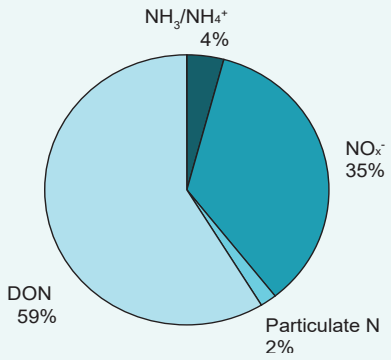
Types of nitrogen

Total N is made up of many different forms of N. About a third of the N was present as oxides of N (NO_x^-), with this form of N present in a higher proportion at only one other Leschenault site (the Middle Preston River). NO_x^- is readily bioavailable and is likely from fertilisers used in horticulture and grazing, and animal wastes. High proportions of NO_x^- 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 forms. DON varies in its bioavailability. Plant and animal matter usually needs to be further broken down before becoming available, whereas other forms of DON are readily bioavailable.

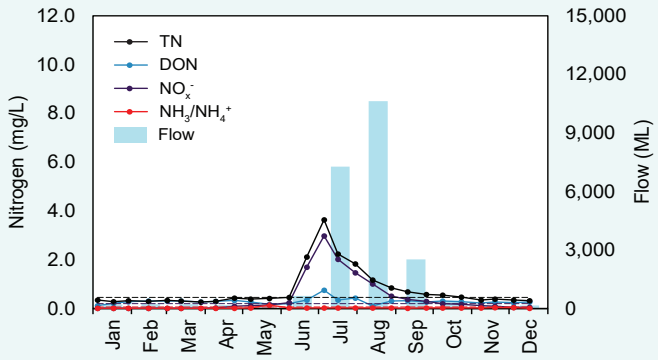
Concentrations

Total N, DON and NO_x^- all showed a seasonal pattern in 2018 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 rapidly (especially TN and NO_x^-), 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. 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



2018 average nitrogen fractions at site 611009.



2018 nitrogen concentrations and monthly flow at 611009. The black dashed line is the Leschenault WQIP target for upland rivers, the red and purple are the ANZECC trigger values for upland rivers.

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

Upper Preston River

Phosphorus over time (2004–18)

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. All annual medians were below the Leschenault WQIP target for upland rivers, with only a small number of samples above the target each year. The 2018 annual median (0.011 mg/L) was the second lowest of the Leschenault catchment sites. Only the site in the Middle Collie River had a lower median (0.009 mg/L). The low TP concentrations at this site are likely because of the large phosphorus-binding capacity of the soils found in the catchment.

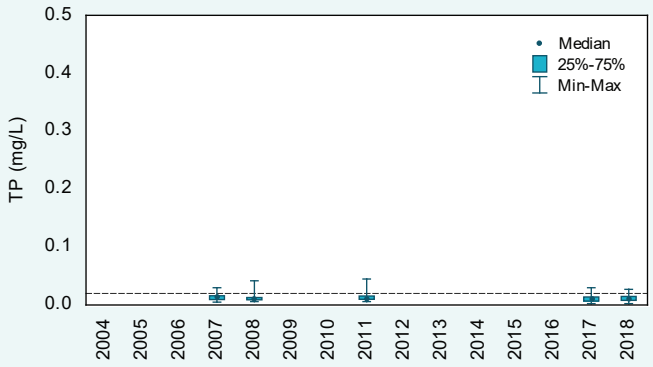
Trends

As the Upper Preston River site was not sampled between 2012–16 it was not possible to test for trends at this site. A minimum of five consecutive years of data are required to test for trends.

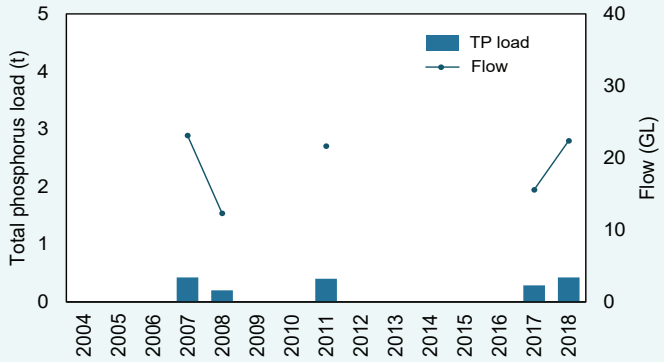
Estimated loads

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 2018, the site had the smallest estimated TP load (0.42 t) the Middle Collie River had the next largest load of 0.57 t. 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, 2004–18 at site 611009. The dashed line is the Leschenault WQIP target for upland rivers.



Total phosphorus loads and annual flow, 2004–18 at site 611009.

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

Upper Preston River

Phosphorus (2018)

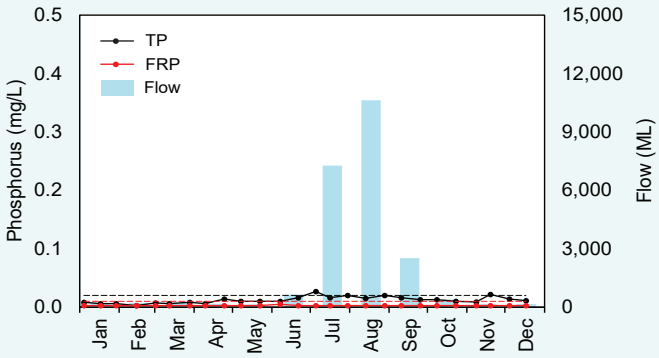
Types of phosphorus

Total P is made up of different forms of P. Filterable reactive phosphorus (FRP) is a form of P which is readily used by plants and algae to fuel growth and it typically derived from fertilisers, animal wastes and natural sources. Because a large number of samples were below the laboratory limit of reporting in 2018, phosphorus fraction pie charts were not generated for the Upper Preston River site. At this site, one of the 26 TP samples and 25 of the 26 filterable reactive phosphorus (FRP) samples were below their limit of reporting (LOR) (0.005 mg/L in each case).

Concentrations

Total P showed a slight seasonal pattern at the Upper Preston River sampling site, increasing marginally in June as rainfall and flow increased, before falling again in September. There was also a small peak in TP concentrations in April and November, the reasons for which are unknown. Patterns in FRP could not be assessed because of the concentrations being below the LOR for most of the year. 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



2018 phosphorus concentrations and monthly flow at 611009. The black dashed line is the Leschenault WQIP target for upland rivers, the red is the ANZECC trigger value for upland rivers.

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.

Upper Preston River

Total suspended solids over time (2004–18)

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. All annual medians were classified as low using the Statewide River Water Quality Assessment (SWRWQA) classification bands and many samples were below the LOR for TSS (1 mg/L).

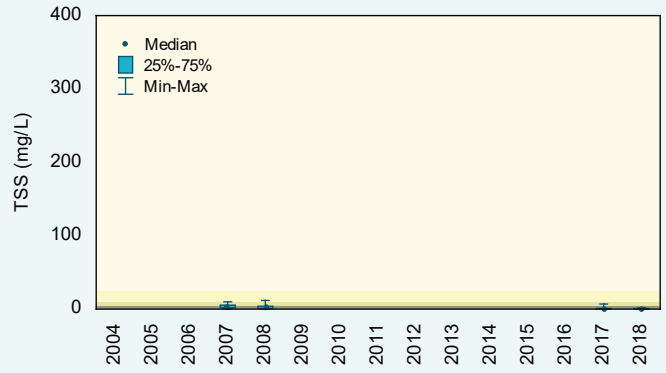
Trends

As the Upper Preston River site was not sampled between 2009–16 it was not possible to test for trends at this site. A minimum of five consecutive years of data are required to test for trends.

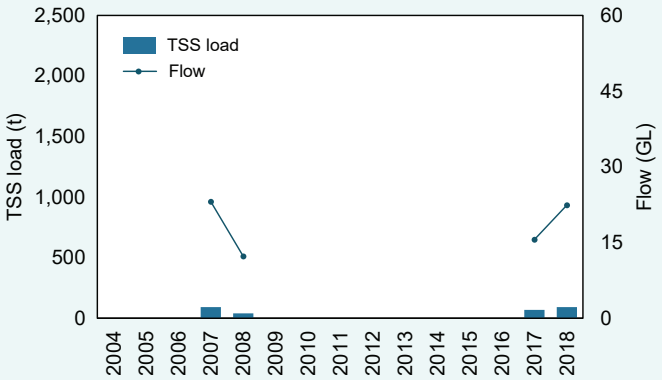
Estimated loads

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 2018, the site had the smallest estimated TSS load (91 t; the Middle Collie River had the next largest load of 144 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, 2004–18 at site 611009. The shading refers to the SWRWQA classification bands.



Total suspended solids loads and annual flow, 2004–18 at site 611009.

very high high moderate low

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

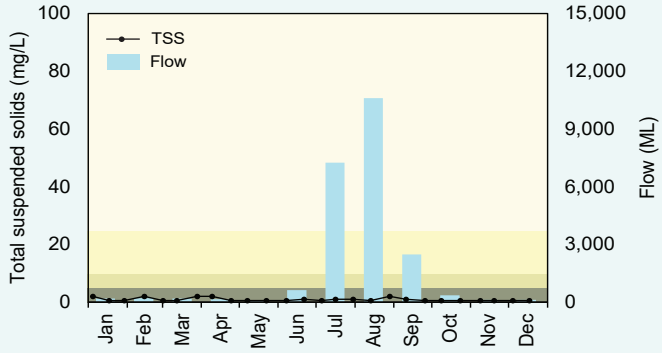
Total suspended solids (2018)

Concentrations

In 2018, all but one TSS sample were classified as low using the SWRWQA bands. Seventeen of the 26 samples collected were below the LOR.

The missing data point in March was because of a road closure making the site inaccesible at the time. The site was flowing.

Upper Preston River



2018 total suspended solids concentrations and monthly flow at 611009. The shading refers to the SWRWQA classification bands.

very high high moderate low

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 (2004–18)

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.

Trends

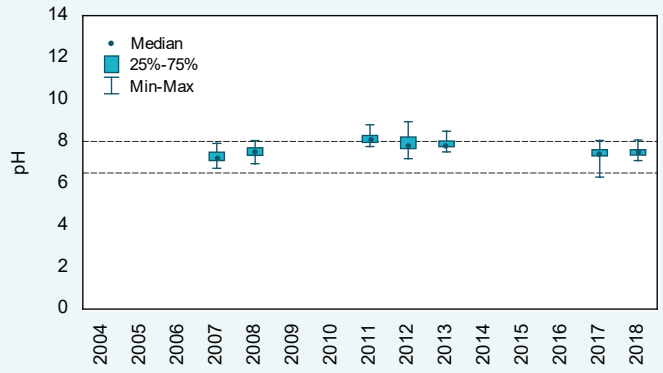
As the Upper Preston River site was not sampled between 2014–16 it was not possible to test for trends at this site. A minimum of five consecutive years of data are required to test for trends.

pH (2018)

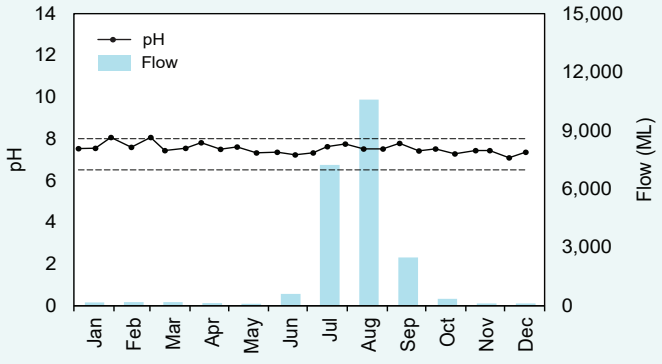
pH values

There was no clear evidence of a seasonal pattern in pH values at the Upper Preston River sampling site in 2018. There were two samples, collected in January and March, 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, 2004–18 at site 611009. The dashed lines are the upper and lower ANZECC trigger values for upland rivers.



2018 pH levels and monthly flow at 611009. The dashed lines are the upper and lower ANZECC trigger values for upland rivers.

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 (2004–18)

Concentrations

Salinity concentrations at the Upper Preston River were low compared with the other 10 sites sampled in the Leschenault catchment. All annual medians were classified as fresh using the SWRWQA bands, though there were a number of samples each year that fell into the marginal band. The 2018 annual median (430 mg/L) was one of the lowest of the Leschenault catchment sites. Only the Middle Preston River sampling site had a smaller, though very similar, median concentration (420 mg/L)

Trends

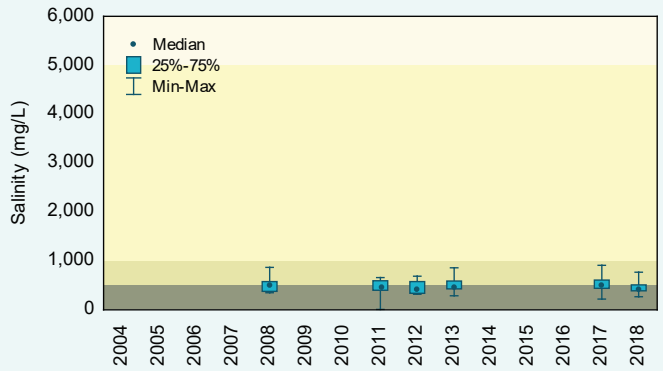
As the Upper Preston River site was not sampled between 2014–16 it was not possible to test for trends at this site. A minimum of five consecutive years of data are required to test for trends.

Salinity (2018)

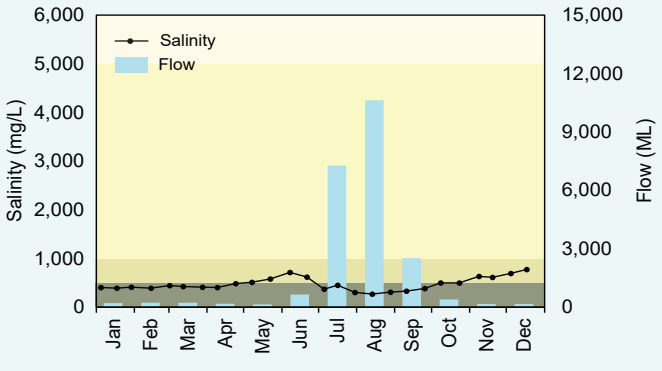
Concentrations

Salinity showed a slight seasonal pattern at the Upper Preston River sampling site. Salinity was constant during the first half of the year, before increasing slightly in June as rainfall and flow increased. It then dropped again in July and remained low before slowly increasing from about October. The increase in salinity near the end of the year may be because of evapoconcentration. It is likely that salts are entering the river via both surface water and groundwater flows at this site.

Upper Preston River



Salinity concentrations, 2004–18 at site 611009. The shading refers to the SWRWQA classification bands.



2018 salinity concentrations and monthly flow at 611009. The shading refers to the SWRWQA classification bands.

saline brackish marginal fresh

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

Upper Preston River

Background

The Regional Estuaries Initiative is a State Government program to improve the health of waterways and estuaries in the south-west of Western Australia. Healthy Estuaries WA is a Royalties for Regions program launched in 2020 and will build 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.

You can find the latest data on the condition of the Leschenault Estuary at estuaries.dwer.wa.gov.au/estuary/leschenault-estuary

The Regional Estuaries Initiative partners with the Leschenault Catchment Council to fund best-practice fertiliser, dairy effluent and watercourse management 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 www.leschenaultcc.org.au
- To find out more about the health of the rivers in the Leschenault Estuary catchment go to rivers.dwer.wa.gov.au/assessments/results

Methods

Total phosphorus and total nitrogen concentrations were compared with the Leschenault Estuary WQIP targets. These targets represent the allowable annual median winter concentrations in both lowland (TN 1.0 mg/L, TP 0.1 mg/L) and upland (TN 0.45 mg/L, TP 0.02 mg/L) catchments. Sites were compared with the appropriate target. Where possible, other parameters were compared with the ANZECC trigger values for lowland rivers in south-west Australia. These values provide a value above which there may be a risk of adverse effect. For pH there is both an upper and lower trigger value which represents the acceptable pH range. Where there were no ANZECC trigger values (for TSS and salinity), the SWRWQA classification bands were used to allow samples and sites to be classified and compared. For all parameters, the full year of data were used when comparing with targets, trigger values and classification bands.

Gaps in the data meant it was not possible to calculate trends for the Leschenault catchment sites. A minimum of five consecutive years of data are required.

Annual loads were calculated by multiplying daily flow with daily nutrient concentrations and aggregating over the year. Measured daily concentrations were not available as samples were collected fortnightly at best, so daily concentration data were calculated using the locally estimated scatterplot smoothing algorithm (LOESS).

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 in the water.

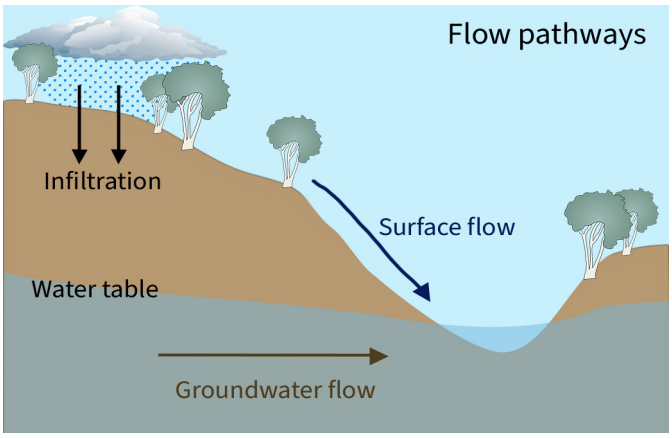
Evapoconcentration: the increase in concentration of a substance dissolved in water because of water being lost by evaporation.

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

Load: the total mass of a substance passing a certain point.

Load per unit area: the load at the sampling site divided by the entire catchment upstream of the sampling site.

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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