South Dandalup River

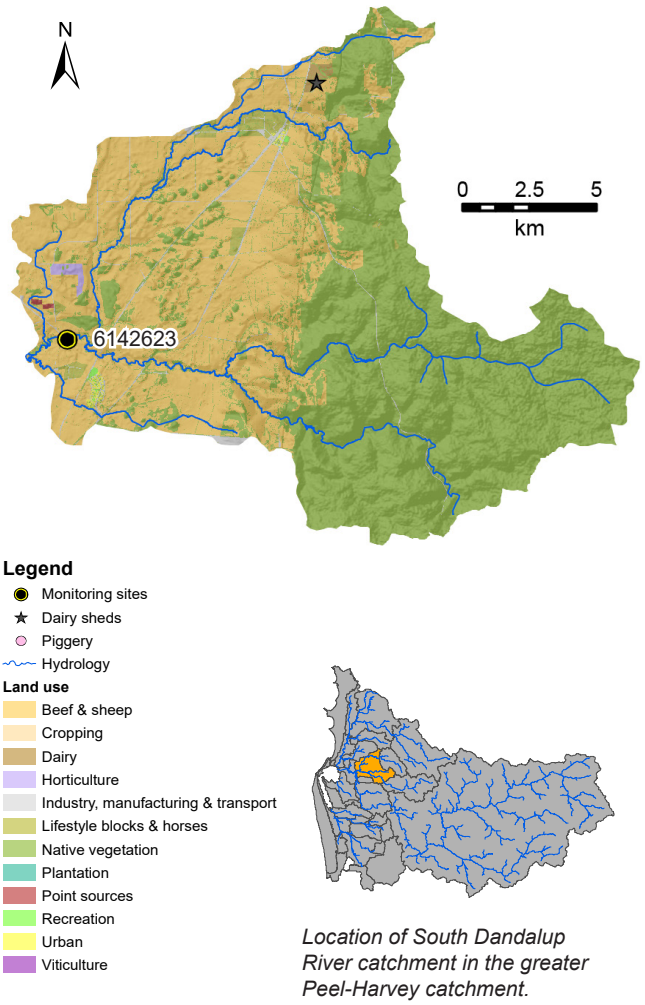
This data report provides a summary of the nutrients at the South Dandalup River sampling site in 2018 as well as historical data from 2004–18. This report was produced as part of the Regional Estuaries Initiative. Downstream of the site, the river flows into the Murray River and then the Harvey Estuary. 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 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 and 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 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 moderate to low. 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

South Dandalup River

Nitrogen over time (2004–18)

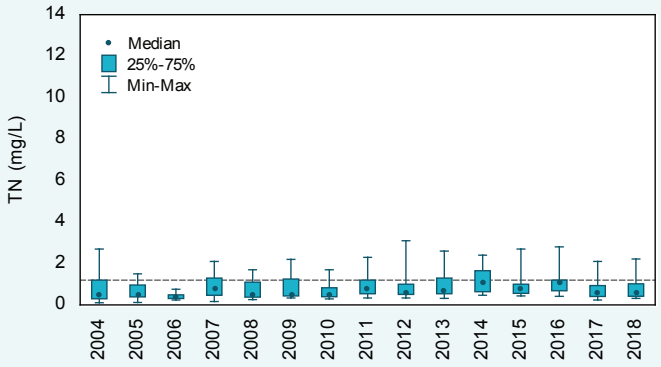
Concentrations

Total nitrogen (TN) concentrations were moderate to low at the South Dandalup River sampling site, with all annual medians below the Australian and New Zealand and Environment Conservation Council (ANZECC) trigger value. With the exception of 2006, all years had some samples over the trigger value.

Trends

There was a short-term (2014–18) decreasing trend in TN concentrations of 0.1 mg/L/yr. This may be because of natural fluctuations at this site or an actual decrease in TN concentrations. Ongoing monitoring will help determine if the water quality is improving at this site. There was no long-term (2004–18) trend present.

South Dandalup River



Total nitrogen concentrations, 2004–18 at site 6142623. The dashed line is the ANZECC trigger value for lowland rivers.

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

South Dandalup River

Nitrogen (2018)

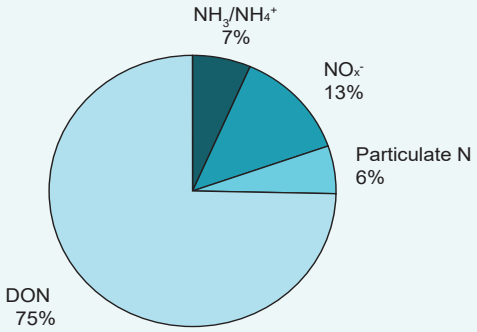
Types of nitrogen

Total N is made up of many different types of N. At the South Dandalup River sampling site, 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 forms. Most forms of N need to be further broken down to become available to plants and algae, though some forms are readily bioavailable. A fifth of the N was present as highly bioavailable dissolved inorganic N (DIN—which consists of oxides of N, NO_x^- and ammonia N, 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).

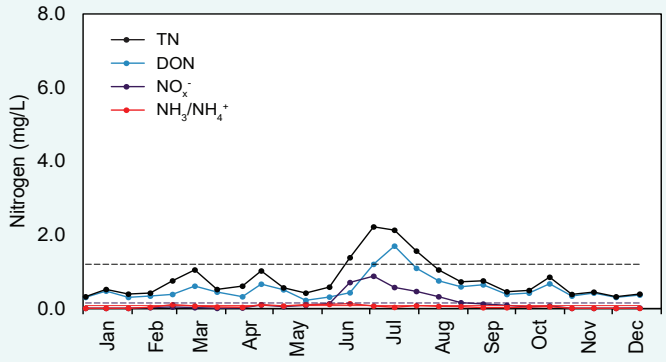
Concentrations

Total N, DON and NO_x^- concentrations all 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 NO_x^- and DON are entering the stream via surface flows. These are washing NO_x^- off from surrounding land use as well as mobilising N that had been mineralised from organic N in soils and streams over summer. DON is being washed from soils and remnant wetlands where it also built up over the summer period. DON is higher than NO_x^- for the rest of the year. It is likely entering the stream via groundwater during these times. In-stream sources were also contributing N year round.

South Dandalup River



2018 average nitrogen fractions at site 6142623.



2018 nitrogen concentrations at 6142623. The dashed lines are the ANZECC trigger values for lowland rivers for the different N species.

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

South Dandalup River

Phosphorus over time (2004–18)

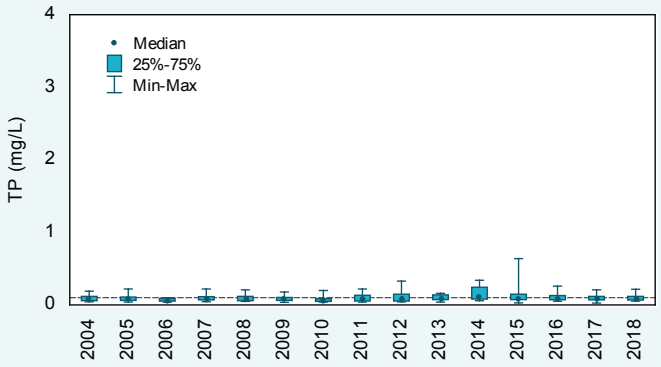
Concentrations

Total phosphorus (TP) concentrations were low to moderate at the South Dandalup River sampling site. Concentrations fluctuated over the reporting period; however, all annual medians were below the Peel-Harvey Water Quality Improvement Plan (WQIP) target, with the exception of 2014 where the median was just above the target. The annual range in TP concentrations was generally very small (with the exception of 2015).

Trends

There was a short-term (2014–18) decreasing trend in TP concentrations of 0.008 mg/L/yr. This may be because of natural fluctuations at this site or an actual decrease in TP concentrations. Ongoing monitoring will help determine if the water quality is getting better at this site. There was no long-term (2004–18) trend present.

South Dandalup River



Total phosphorus concentrations, 2004–18 at site 6142623. The dashed line is the Peel-Harvey WQIP target for winter median TP concentrations.

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 (2018)

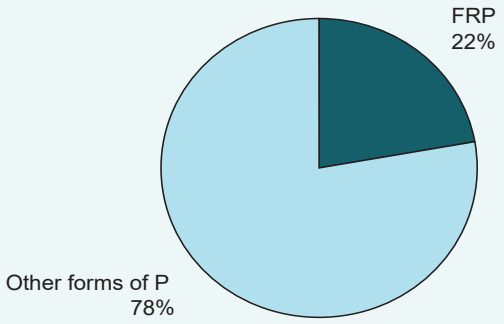
Types of phosphorus

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 filterable reactive P (FRP) (the equal smallest proportion, along with the site in the Drakes Brook–Waroona Drain catchment). This form of P is readily used by plants and algae to fuel growth 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. Particulate P generally needs to be broken down before becoming bioavailable to algae. The bioavailability of DOP varies and is poorly understood.

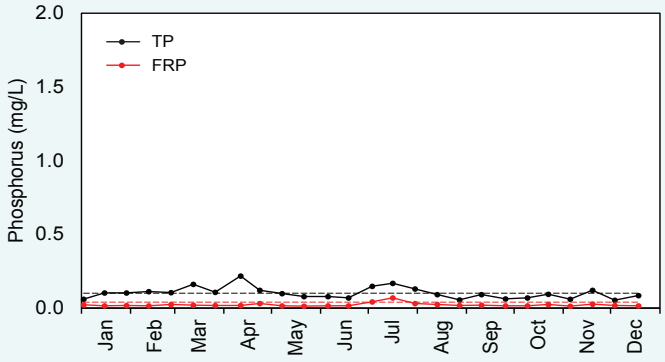
Concentrations

Total P and FRP concentrations showed a similar pattern to TN and NO_x^-. P entered the stream over June to August via surface flows from surrounding land use as well as coming from groundwater and in-stream sources. The only FRP samples over the ANZECC trigger values were the two collected in July.

South Dandalup River



2018 average phosphorus fractions at site 6142623.



2018 phosphorus concentrations at 6142623. The dashed black line is the Peel-Harvey WQIP target, the red line is the ANZECC trigger value for lowland rivers.

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

Dissolved organic carbon over time (2004–18)

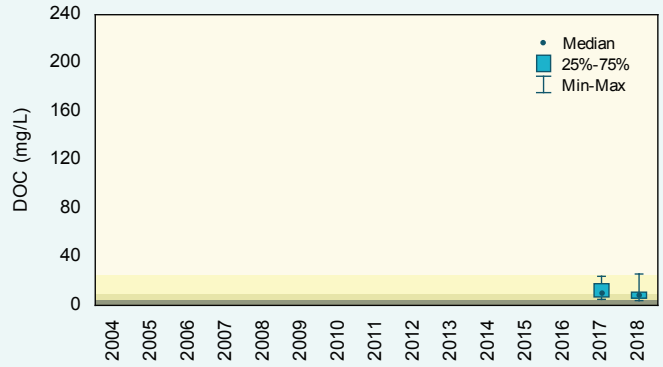
Concentrations

There were only two years with sufficient dissolved organic carbon (DOC) data to graph at the South Dandalup River sampling site. Both annual medians were classified as high using the Statewide River Water Quality Assessment (SWRWQA) classification bands. 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 third lowest median DOC concentration in 2018 (8 mg/L, very similar to the Middle Murray River which had a median of 9 mg/L).

Trends

It was not possible to calculate trends in DOC concentrations at the South Dandalup River sampling site as there were only two years of data present. A minimum of five years of data are required to test for trends.

South Dandalup River



Dissolved organic carbon concentrations, 2004–18 at site 6142623. The shading refers to the SWRWQA classification bands.

very high high moderate low

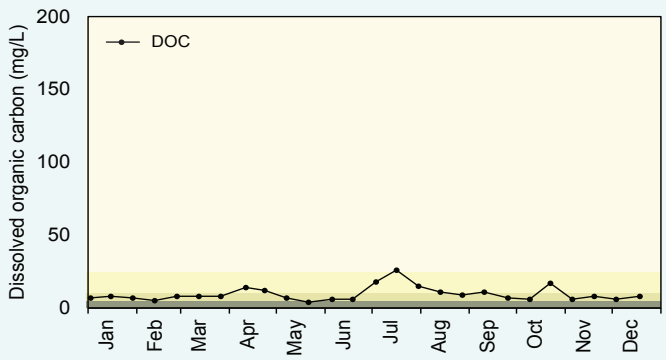
The South Dandalup River passing under the Patterson Road Bridge at the sampling site, September 2018.

Dissolved organic carbon (2018)

Concentrations

Dissolved organic carbon concentrations varied throughout the year at the South Dandalup River sampling site. There was a small peak in DOC concentrations in July, driven by the increase in rainfall and flow which flushed DOC into the river from surrounding land use at this time. The reason for the peak in April and October 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 natural organic matter in soils and wetlands, with many wetlands on deep sands typically generating high DOC concentrations. It varies widely in its bioavailability.

South Dandalup River



2018 dissolved organic carbon concentrations at 6142623. The shading refers to the SWRWQA classification bands.

very high high moderate low

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

South Dandalup River

Total suspended solids over time (2004–18)

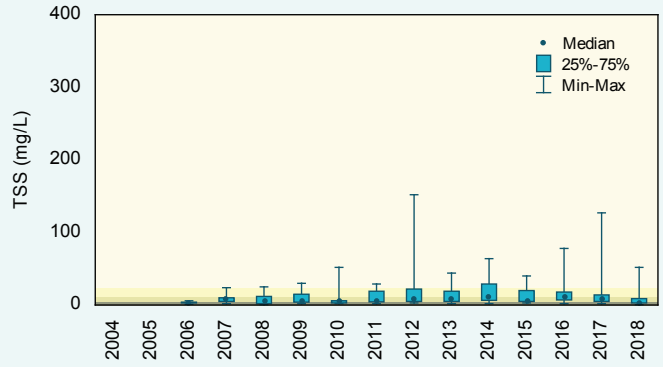
Concentrations

Total suspended solids (TSS) concentrations fluctuated over the reporting period at the South Dandalup River sampling site. Using the SWRWQA bands, most of the annual medians were classified as moderate, though 2014 and 2016 were high and 2006 and 2018 were low. Most years had at least some samples that were classified as very high.

Trends

There was a short-term (2014–18) decreasing trend in TSS concentrations of 2 mg/L/yr. This may be because of natural fluctuations at this site or an actual decrease in TSS concentrations. Ongoing monitoring will help determine if the water quality is getting better at this site. There was no long-term (2006–18) trend present.

South Dandalup River



Total suspended solids concentrations, 2004–18 at site 6142623. The shading refers to the SWRWQA classification bands.

very high high moderate low

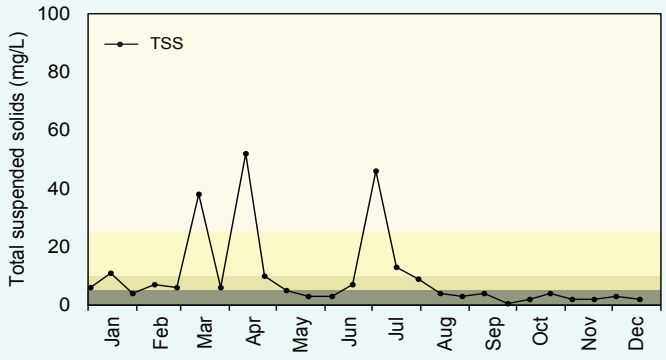
Sheep grazing is one of the main land uses in the South Dandalup catchment, September 2020.

Total suspended solids (2018)

Concentrations

In 2018, TSS concentrations varied at the South Dandalup River sampling site. The peak in early July coincided with the increase of winter rains and flow, and particulate matter was washed into the river from surrounding land use at this time. Some particulate matter was also dislodged from the riverbed and bank. The peaks in March and April coincided with small peaks in TN and TP concentrations. The reason for these peaks in unclear, though they may be because of stock accessing the river for water or some other form of disturbance to the river upstream of the sampling site.

South Dandalup River



2018 total suspended solids concentrations at 6142623. The shading refers to the SWRWQA classification bands.

very high high moderate low

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

South Dandalup River

pH over time (2004–18)

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 most years had some samples that were above the upper trigger value.

Trends

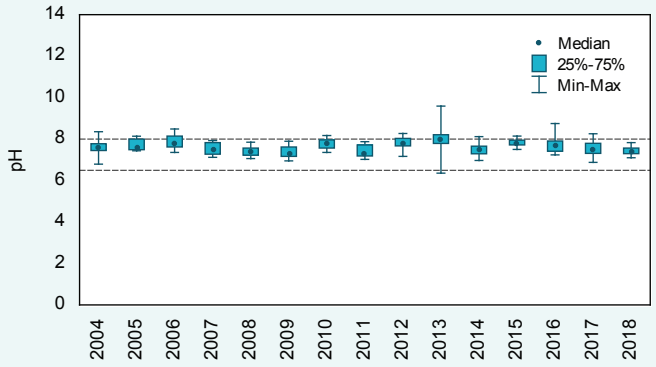
There was no trend in pH at the South Dandalup River sampling site over either the short- (2014–18) or long-term (2004–18).

pH (2018)

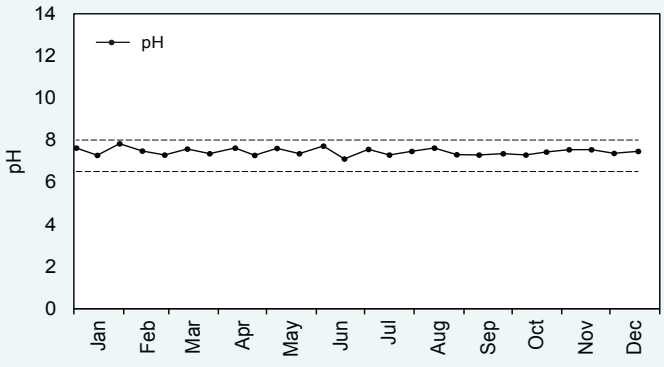
Levels

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 2018 fell within the upper and lower ANZECC trigger values.

South Dandalup River



pH levels, 2004–18 at site 6142623. The dashed lines are the upper and lower ANZECC trigger values for lowland rivers.



2018 pH levels at 6142623. The dashed lines are the upper and lower ANZECC trigger values for lowland rivers.

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 (2004–18)

Concentrations

Before 2015, the annual median salinity was classified as fresh using the SWRWQA bands. After this year, the annual medians have all been classified as marginal. The annual range in salinity concentrations has consistently been small, with no samples falling into the brackish or saline classification bands.

Trends

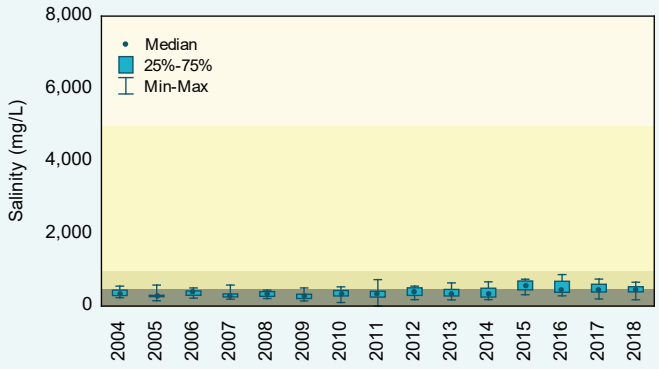
There was a long-term (2004–18) increasing trend in salinity of 10 mg/L/yr. There was no short-term (2014–18) trend present.

Salinity (2018)

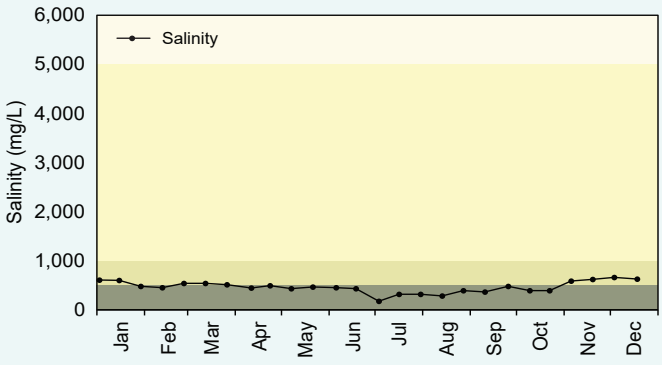
Concentrations

Salinity showed a very slight inverse relationship to flow. That is, salinity was lower from July to September, when flow would have been higher 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, 2004–18 at site 6142623. The shading refers to the SWRWQA classification bands.



2018 salinity concentrations at 6142623. The shading refers to the SWRWQA classification bands.

saline brackish marginal fresh

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

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

The Regional Estuaries Initiative partners with the Peel-Harvey Catchment Council to fund best-practice fertilisers, 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 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

Total phosphorus concentrations were compared with the Peel-Harvey WQIP target. This target represents the median winter concentration that is required for each of the subcatchments to meet their load reduction 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 represent the acceptable pH range. Where there were no ANZECC trigger values available (for DOC, TSS and salinity) the SWRWQA classification bands were used to allow samples and sites to be classified and compared.

Trend testing was carried out using either the Mann or Seasonal Kendall tests as appropriate. Where there were flow data available and there was a flow-concentration relationship, the data were flow-adjusted before trend analysis.

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.

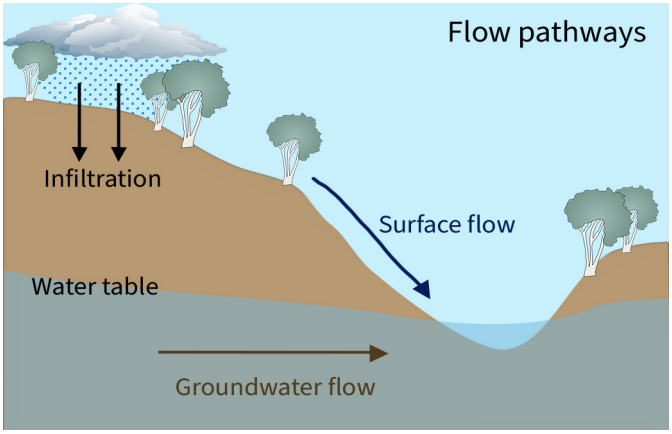
Evapoconcentration: the increase in concentration of a substance dissolved in water because of water being lost by evaporation.

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