Lower Scott

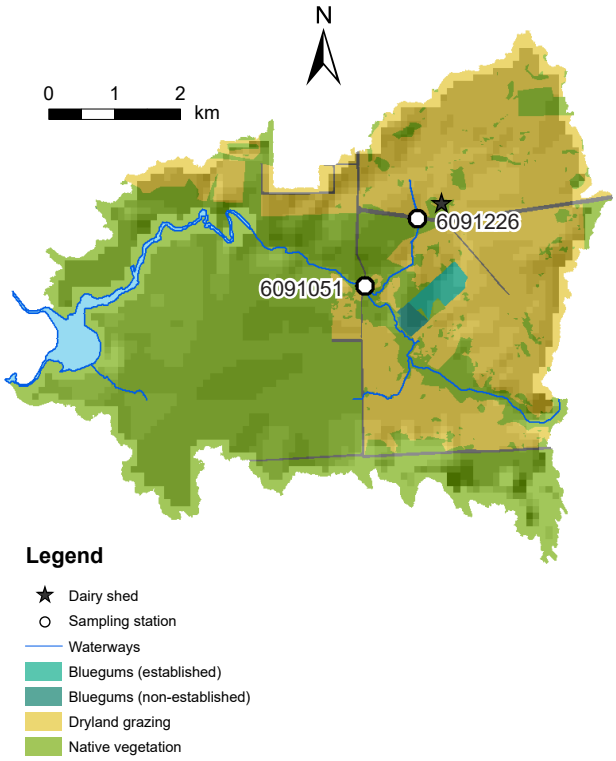
This data report provides a summary of the nutrients at the two Lower Scott sampling sites, one on the Scott River and one on a tributary, in 2019 as well as historical data from 2005–19. This report was produced as part of Healthy Estuaries WA. Downstream of the site on the Scott River, the river flows into the Hardy Inlet.

About the catchment

The Lower Scott catchment has an area of about 38 km^2 and starts just downstream of the gauging station at Brennans Ford. Nearly half the catchment is covered in native vegetation, mostly in the southern side. Other major land uses are dryland dairy and dryland grazing. The Scott River has reasonably intact fringing vegetation; however, the tributary that enters from the north has lost much of its fringing vegetation along its upper half.

Most of the soils in the cleared portion of the catchment have a low capacity to bind phosphorus. This is often so poor that any phosphorus applied to them can be quickly washed into drains and other waterways.

Water quality is measured at two sites. Site 6091051, Brennans Bridge, is on the Scott River, about 5 km downstream of the gauging station at Brennans Ford. This site takes the entire catchment's flow and represents what is leaving the catchment and entering the Hardy Inlet. The second site, 6091226, Woodhouse, is on the northern tributary, downstream of where it flows under Governor Broome Road. Land use upstream of this site is mostly dryland dairy, with a dairy shed also present.



Location of Lower Scott catchment in the greater Scott River catchment.

Results summary

Nutrient concentrations (total nitrogen and total phosphorus) at the two sites in the Lower Scott catchment were generally high. Nitrogen was classified as high at Woodhouse, except for 2019 when it was very high, and moderate at Brennans Bridge. Phosphorous was classified as high at both sites. Concentrations were worse at Woodhouse (on a tributary to the Scott River) than Brennans Bridge (on the Scott River itself). The higher nutrient concentrations at Woodhouse are because of the highly modified agricultural catchment.

Facts and figures

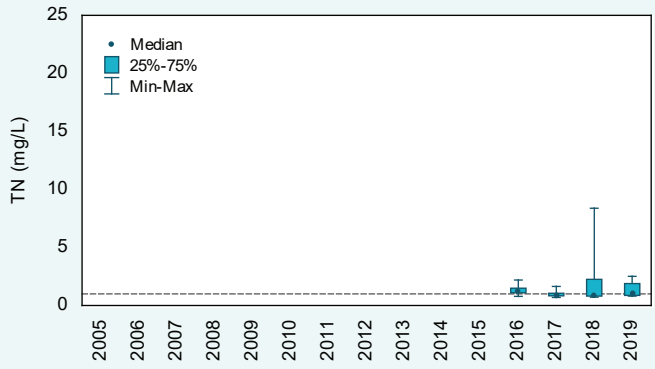
Sampling site code	6091051 (Brennans Bridge) 6091226 (Woodhouse)
Catchment area	38 km^2
Per cent cleared area (2009)	50 per cent
River flow	Ephemeral
Main land use (2009)	Native vegetation, dryland grazing, dryland dairy

Nitrogen over time (2005–19)

Concentrations

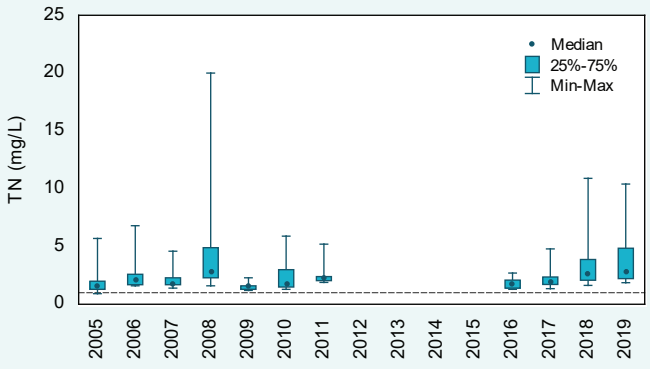
Annual total nitrogen (TN) concentrations were classified as moderate at Brennans Bridge using the State Wide River Water Quality Assessment (SWRWQA) methodology. At Woodhouse, they were classified as high for all years except 2019, when they were classified as very high. All samples collected between 2016–19 were above the Water Quality Improvement Plan (WQIP) target for TN concentrations at Woodhouse whereas at Brennans Bridge there were some samples below the target each year. TN concentrations fluctuated at Woodhouse over the reporting period. It appears that TN concentrations have been increasing at this site since 2016.

Brennans Bridge



Total nitrogen concentrations, 2005–19 at site 6091051. The dashed line is the Scott River WQIP target for median TN concentrations.

Woodhouse



Total nitrogen concentrations, 2005–19 at site 6091226. The dashed line is the Scott River WQIP target for median TN concentrations.

The Woodhouse sampling site in August.

Nitrogen (2019)

Types of nitrogen

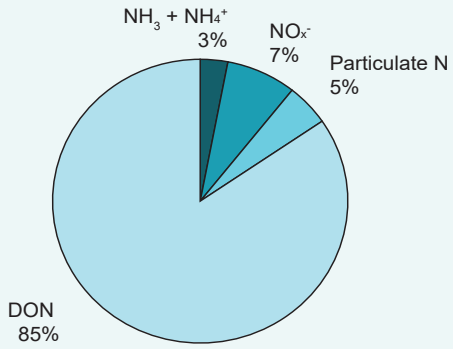
Total N is made up of different types of N. Woodhouse, which drains mainly agricultural land, had one of the larger proportions of N present as dissolved inorganic N (nitrate, NO_x^-, and total ammonia, $NH_3 + NH_4^+$) of the sites in the Scott catchment. This was likely because of the land uses upstream of this site which contributed runoff rich in dissolved N. Brennans Bridge represents what is leaving the Scott catchment and entering the Hardy Inlet. It is possible the heavily vegetated main channel of the Scott River upstream of this site was acting like a large linear wetland, processing total ammonia via plant uptake and nitrate via plant uptake and denitrification.

Concentrations

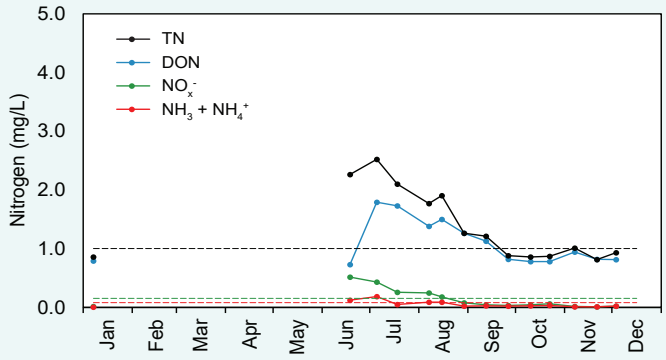
Concentrations of all types of N were higher at Woodhouse than Brennans Bridge because of the very different size and nature of their catchments (note the differences in the scale of the vertical axes in the graphs below). The concentrations at Brennans Bridge show what is leaving the Scott catchment and entering the Hardy Inlet. Both sites showed a first flush effect 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 upstream agricultural areas which build up with fertiliser and animal waste over summer.

Where there are no data in the graphs below, the site was not flowing.

Brennans Bridge

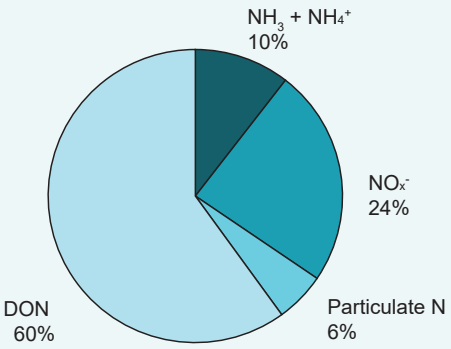


2019 average nitrogen fractions at site 6091051.

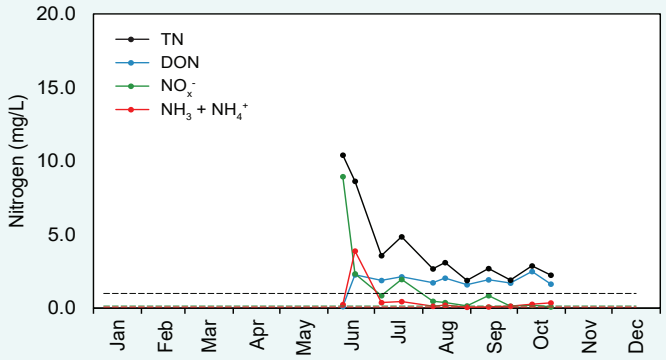


2019 nitrogen concentrations at 6091051. The black dashed line is the Scott River WQIP target for TN, the red and green lines are the ANZECC trigger values tor total ammonia and nitrate.

Woodhouse



2019 average nitrogen fractions at site 6091226.



2019 nitrogen concentrations at 6091226. The black dashed line is the Scott River WQIP target for TN the red and green lines are the ANZECC trigger values for total ammonia and nitrate.

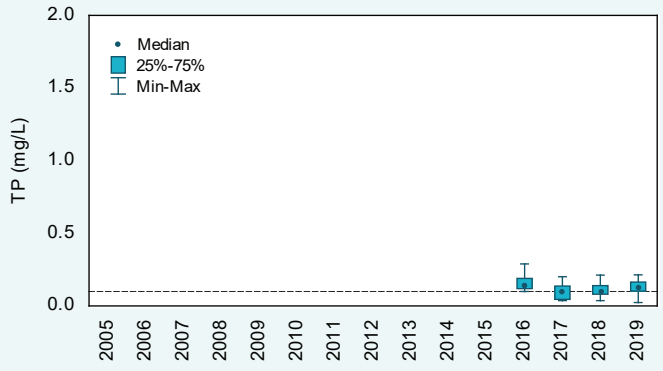
Phosphorus over time (2005–19)

Concentrations

Using the SWRWQA methodology, all annual total phosphorus (TP) concentrations were classified as high at both sites. 2008 appears to be an outlier at Woodhouse, with much higher TP concentrations than surrounding years; the reason for this is unknown. Interestingly 2008 was also an outlier at the Governor Broome Road sampling site. TP concentrations have steadily increased from 2016.

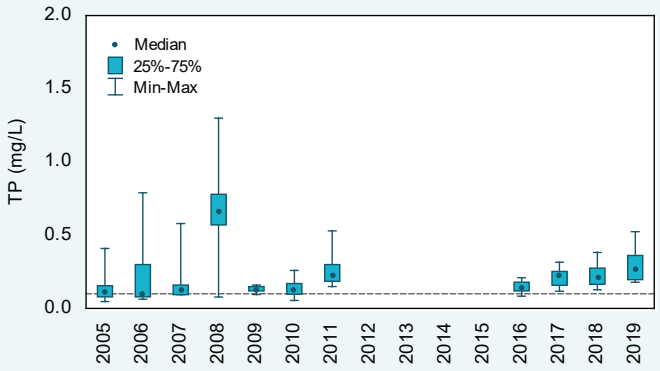
Recent total phosphorus (TP) concentrations were higher at Woodhouse than at Brennans Bridge because of the very different size and nature of the land use upstream of the sampling sites. The concentrations at Brennans Bridge show what is leaving the Scott catchment and entering the Hardy Inlet.

Brennans Bridge



Total phosphorus concentrations, 2005–19 at site 6091051. The dashed line is the Scott River WQIP target for median TP concentrations.

Woodhouse



Total phosphorus concentrations, 2005–19 at site 6091226. The dashed line is the Scott River WQIP target for median TP concentrations.

The Brennans Bridge sampling site during high flows in September.

Phosphorus (2019)

Types of phosphorus

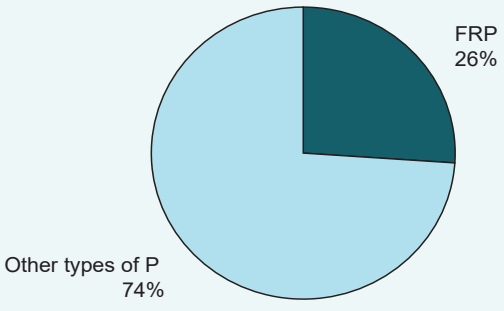
Total P is made up of different types of P. The two sites have very different catchments both in terms of their size and nature. The processes determining the types and concentrations of P present at the two sites will be very different. The proportion of P present as bioavailable phosphate in 2019 was similar at both sites, about 25 per cent. Phosphate is measured as filterable reactive phosphorus (FRP), in surface waters this is mainly present as phosphate (PO_4^{3-}) species. The remainder of the P was present as either particulate P or dissolved organic P (DOP) or both (shown as 'Other types of P' in the pie charts below). Particulate P generally needs to be broken down before becoming bioavailable. The bioavailability of DOP varies and is poorly understood. The proportion of P present as phosphate reflects that both these sites have disturbed catchments upstream.

Concentrations

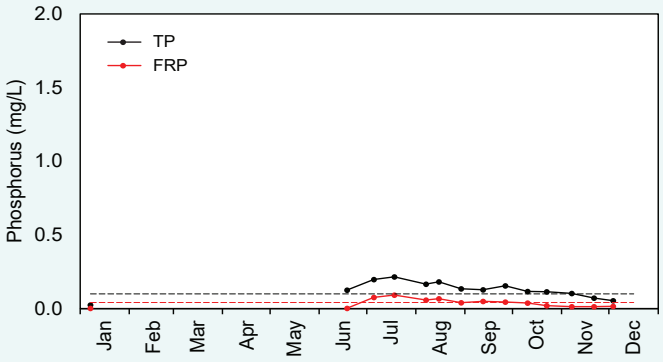
Both sites showed similar patterns in TP and phosphate concentrations over the year. Both had a peak in July before concentrations decreased again. The reason for this early peak is unclear. At Woodhouse, there was a second peak in TP concentrations later in August. This second peak may be because of fertiliser being applied as the waterlogging of the catchment eased. It is also possible that suspended sediment or detritus which had been caught up on aquatic plants growing at the site was disturbed while sampling beause there is a corresponding peak in total suspended solids concentrations. The concentrations present at Brennans Bridge represent what is leaving the Scott catchment and entering the Hardy Inlet.

Where there are no data in the graphs below, the site was not flowing.

Brennans Bridge

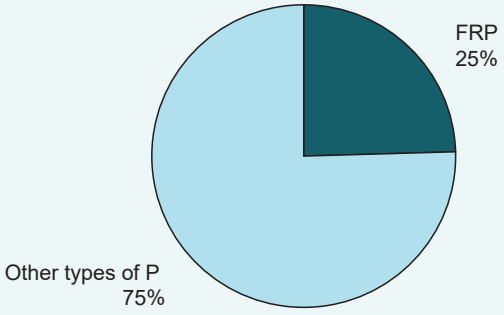


2019 average phosphorus fractions at site 6091051.

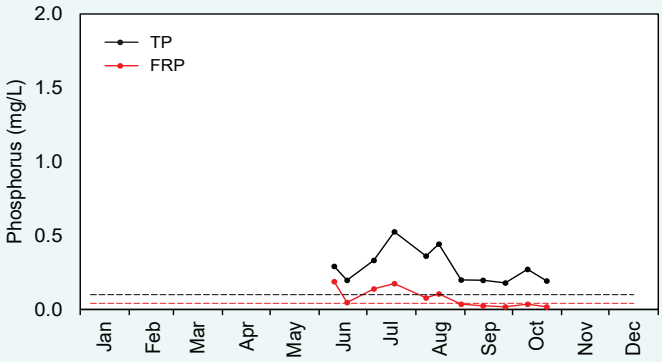


2019 phosphorus concentrations at 6091051. The black dashed line is the Scott River WQIP target for TP, the red is the ANZECC trigger value for phosphate.

Woodhouse



2019 average phosphorus fractions at site 6091226.



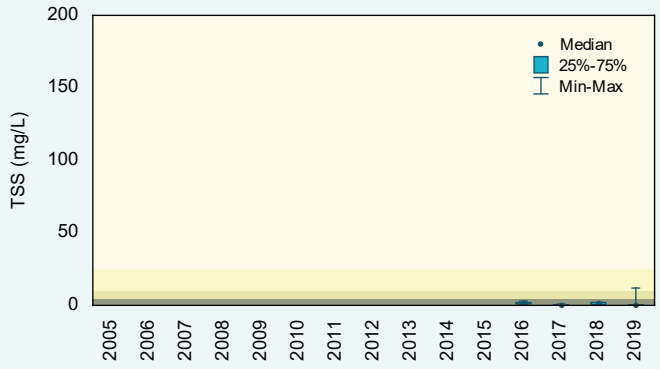
2019 phosphorus concentrations at 6091226. The black dashed line is the Scott River WQIP target for TP, the red is the ANZECC trigger value for phosphate.

Total suspended solids over time (2005–19)

Concentrations

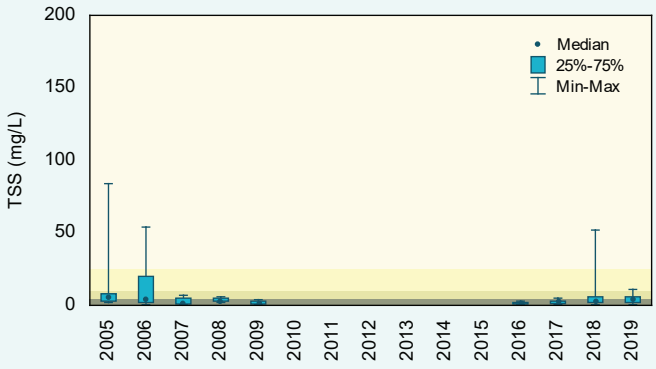
Annual total suspended solids (TSS) concentrations at both sites in the Lower Scott catchment were classified as low using the SWRWQA methodology. Concentrations were slightly higher at Woodhouse.

Brennans Bridge



Total suspended solids concentrations, 2005–19 at site 6091051. The shading refers to the SWRWQA classification bands.

Woodhouse



Total suspended solids concentrations, 2005–19 at site 6091226. The shading refers to the SWRWQA classification bands.

low moderate high very high

Cattle grazing is one of the major land uses in the Lower Scott catchment.

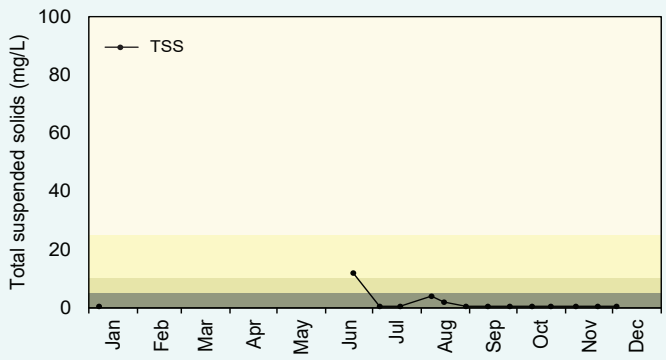
Total suspended solids (2019)

Concentrations

In 2019, TSS concentrations fluctuated at both sites with no evidence of a seasonal pattern. The peak at Brennans Bridge in June was likely because of a first flush effect where rainfall washed particulate matter into the river as well as mobilising any particulate matter left in the dry river bed. The peak in TSS in August at Woodhouse may be a result of rainfall that fell the day before sampling, washing particulate matter into the waterway or mobilising particulate matter already in the waterway. The peak in October coincided with the waterway nearly drying out.

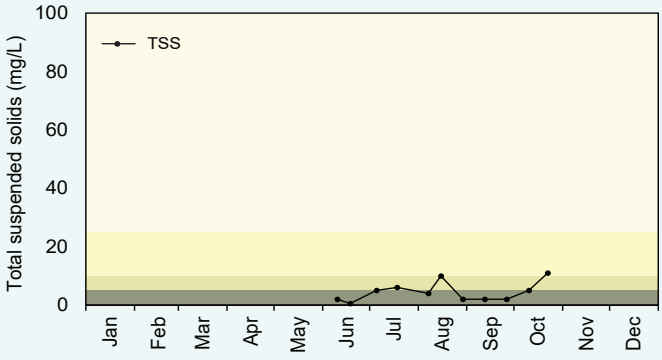
Where there are no data in the graphs below, the sites were not flowing.

Brennans Bridge



2019 total suspended solids concentrations at 6091051. The shading refers to the SWRWQA classification bands.

Woodhouse



2019 total suspended solids concentrations at 6091226. The shading refers to the SWRWQA classification bands.

low moderate high very high

The Scott River near the Brennans Bridge sampling site. Fringing vegetation is present along much of the Scott River.

Lower Scott

pH over time (2005–19)

pH values

At both sites pH fluctuated over the reporting period. All annual medians at both sites were between the upper and lower Australian and New Zealand Environment and Conservation Council (ANZECC) trigger values.

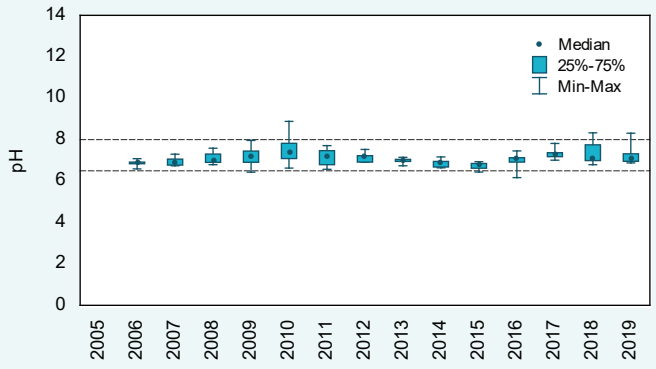
pH (2019)

pH values

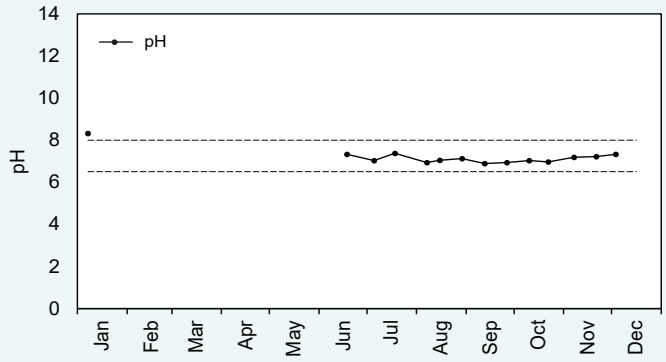
pH varied similarly at the two sites in the Lower Scott catchment, fluctuating through the year with no evidence of a seasonal pattern. At Brennans Bridge, all samples were between the upper and lower ANZECC trigger values whereas at Woodhouse there was one sample, collected in June, which was below the lower ANZECC trigger value.

Where there are no data in the graphs below, the sites were not flowing.

Brennans Bridge

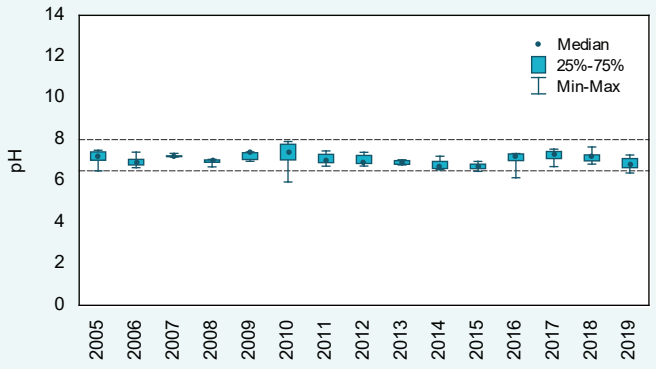


pH levels, 2005–19 at site 6091015. The dashed lines are the upper and lower ANZECC trigger values.

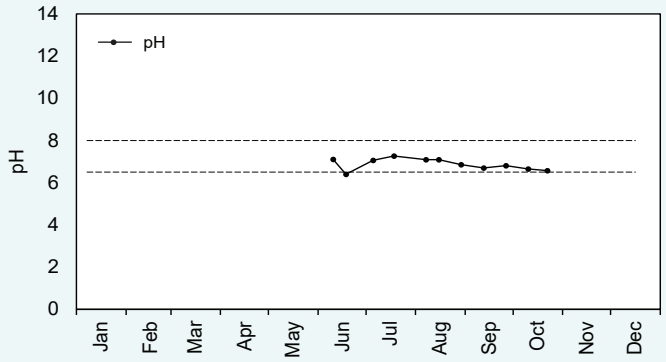


2019 pH levels at 6091051. The dashed lines are the upper and lower ANZECC trigger values.

Woodhouse



pH levels, 2005–19 at site 6091226. The dashed lines are the upper and lower ANZECC trigger values.



2019 pH levels at 6091226. The dashed lines are the upper and lower ANZECC trigger values.

Lower Scott

Salinity over time (2005–19)

Concentrations

Using the Water Resources Inventory 2014 salinity ranges, all years were classified as fresh at both sites (note, the 2018 nutrient report used the SWRWQA bands). Salinity fluctuated slightly over the reporting period at both sites.

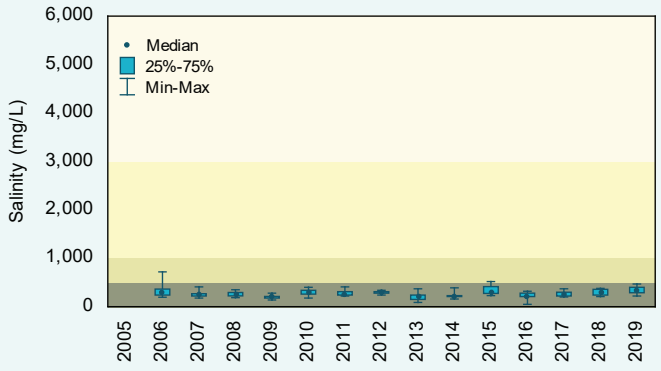
Salinity (2019)

Concentrations

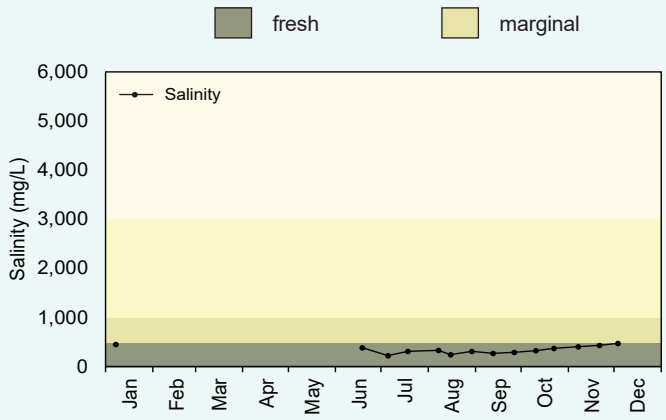
At Brennans Bridge there was no clear evidence of a seasonal pattern in salinity with all samples falling into the Water Resources Inventory 2014 fresh salinity range. At Woodhouse there was a slight reverse seasonal pattern, with salinity being higher at the beginning and end of the flow year than in the middle. All samples fell into the fresh range, with the exception of the first two and last samples collected which were marginal. At this site it is possible the slightly higher salinity at the beginning of the year was because of the first flush mobilising salts that had been left behind when the stream dried up the previous year as well as washing salts off surrounding land. The slight increase at the end of the year may be because of either evapoconcentration or an increase in the proportion of groundwater flows, or both.

Where there are no data in the graphs below, the sites were not flowing.

Brennans Bridge

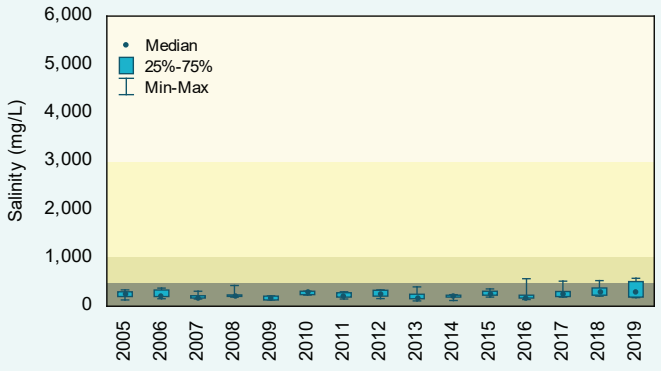


Salinity concentrations, 2005–19 at site 6091051. The shading refers to the Water Resources Inventory 2014 salinity ranges.

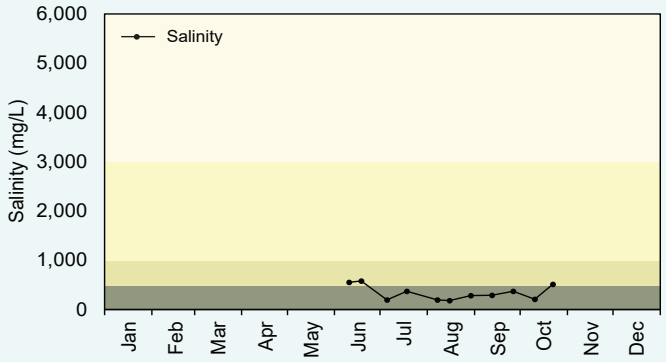


2019 salinity concentrations at 6091051. The shading refers to the Water Resources Inventory 2014 salinity ranges.

Woodhouse



Salinity concentrations, 2005–19 at site 6091226. The shading refers to the Water Resources Inventory 2014 salinity ranges.



2019 salinity concentrations at 6091226. The shading refers to the Water Resources Inventory 2014 salinity ranges.

Lower Scott

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; both the catchment and estuary. 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 more 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 fertilisers, 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 the Scott River WQIP targets or 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 in the 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.

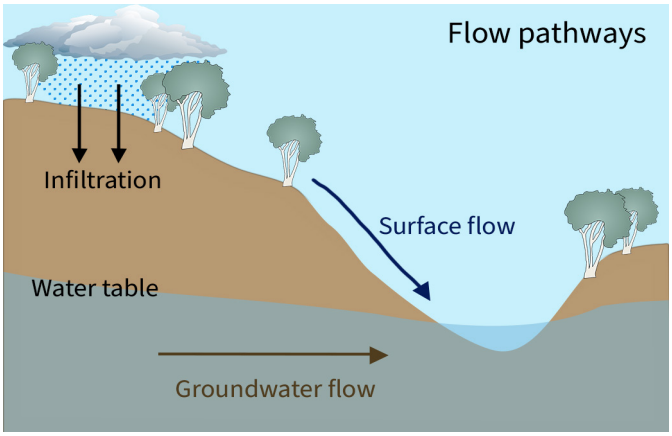
Laboratory limit of reporting: this is the lowest concentration (or amount) of an analyte that can be reported by a laboratory.

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

Load per 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.



Lower Scott Issue 2
Publication date: October 2023
ISSN: 2209–6779 (online only)