

Upper Scott

This data report provides a summary of the nutrients at the Upper Scott 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 stream discharges to the Scott River and subsequently the Hardy Inlet.

About the catchment

The Upper Scott catchment has an area of about 162 km², a little more than three-quarters of which is covered by native vegetation. There are also areas of bluegum plantations, dryland grazing and irrigated dairy. These are all downstream of the sampling site, or along different streams than the one the sampling site is on. The fringing vegetation is in good condition in the portions of the catchment which are still covered in native vegetation. However, it is absent or in poor condition along the streams that flow through plantations or agricultural areas.

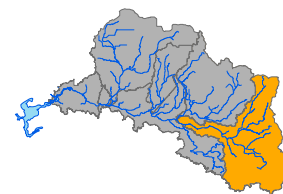
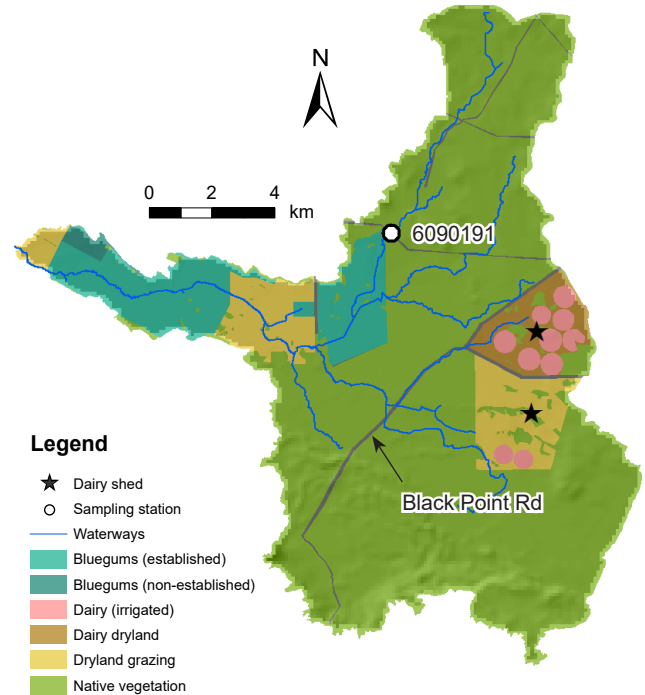
Most of the soils in the catchment have a low capacity to bind phosphorus. This is often so poor that any phosphorus applied to them can be quickly washed into drains and other waterways.

A large portion of the catchment, especially south-east of Black Point Road, will rarely flow as most rainfall will infiltrate into the deep sands in this region.

Water quality is measured at site 6090191, Four Acres Road, where the stream passes under Four Acres Road. This site was established to quantify how much nutrients are being exported from native vegetation; upstream of the sampling site is mostly uncleared native vegetation.

Results summary

Nutrient concentrations (total nitrogen and total phosphorus) at the Four Acres Road sampling site in the Upper Scott catchment were classified as low and were lower than any other site in the Scott River catchment. This is because the catchment is almost entirely uncleared upstream of the sampling site. Almost all of the nutrients present at this site are from natural sources.



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

Facts and figures

Sampling site code	6090191 (Four Acres Road)
Catchment area	162 km ²
Per cent cleared area (2009)	23 per cent
River flow	Ephemeral
Main land use (2009)	Native vegetation, bluegum plantations and dryland grazing

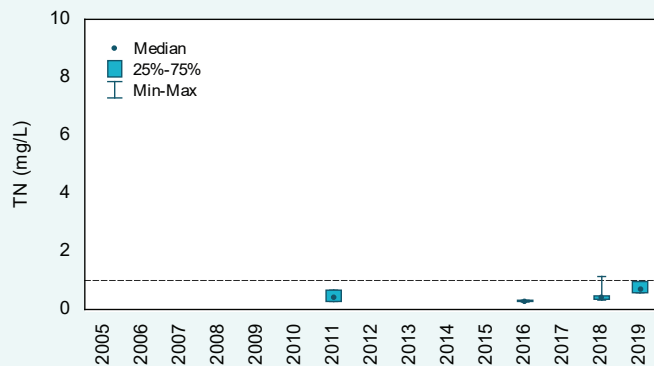


Nitrogen over time (2005–19)

Concentrations

TN concentrations at Four Acres Road were low, with all years classified as low using the State Wide River Water Quality Assessment (SWRWQA) methodology. Further, all the available data were below the Water Quality Improvement Plan (WQIP) target with the exception of one sample collected in 2018. The 2019 median TN concentration at Four Acres Road was the second lowest of the sites sampled in the Scott River catchment (0.76 mg/L, Brennans Ford had the lowest median of 0.54 mg/L).

Four Acres Road



Total nitrogen concentrations, 2005–19 at site 6090191. The dashed line is the Scott River WQIP target for median TN concentrations.



The Four Acres Road sampling site in September, shortly before the site dried for the year. The culvert where the stream passes under the road is on the right of the photograph. Note the tannin-stained water.

Nitrogen (2019)

Types of nitrogen

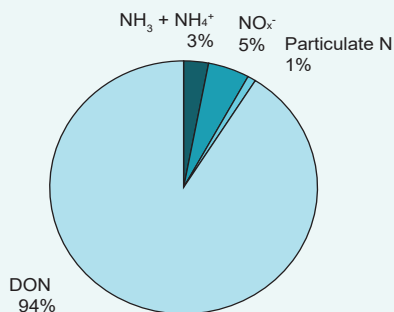
Total N is made up of different types of N. At Four Acres Road, most of the N was present as dissolved organic N (DON), which consists mainly of degrading plant and animal matter. Only a small proportion of N was present as dissolved inorganic N (nitrate; NO_3^- and total ammonia; $\text{NH}_3 + \text{NH}_4^+$); one of the smallest of the sites sampled in the Scott River catchment. The proportions of N at this site were typical of a largely undisturbed, forested catchment where most of the N is being sourced from nitrogen fixation by native vegetation. This accounts for the high proportion of N present as DON.

Concentrations

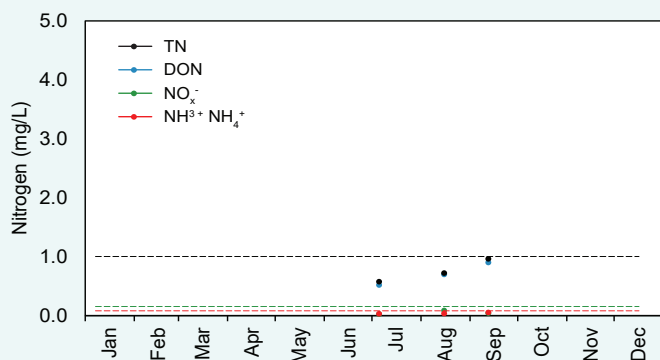
N concentrations were low at Four Acres Road, with all samples collected below their respective WQIP target or Australian and New Zealand Environment and Conservation Council (ANZECC) trigger value. As 2019 was a low-rainfall year, the site was only flowing on three sampling occasions. Given the relatively undisturbed state of the catchment, most of the N came from nitrogen fixation carried out by native vegetation and decaying plant material, which breaks down to become DON. The N concentrations seen at this site are typical for streams with an undisturbed catchment covered in native vegetation.

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

Four Acres Road



2019 average nitrogen fractions at site 6090191.



2019 nitrogen concentrations at 6090191. The black dashed line is the Scott River WQIP target for TN, the red and green lines are the ANZECC trigger values total ammonia and nitrate.



The Four Acres Road sampling site in June 2018. Rain has created a muddy puddle but the site did not start flowing until August.

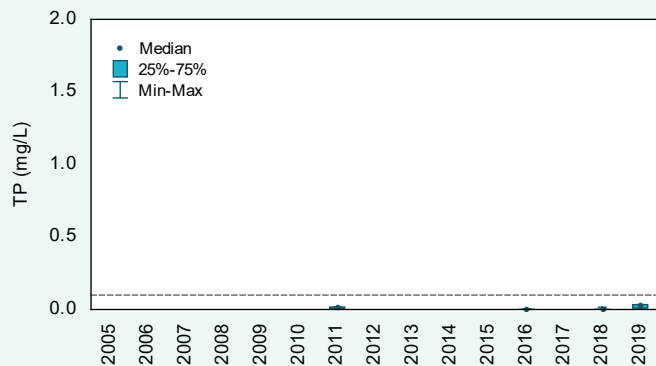
Phosphorus over time (2005–19)

Concentrations

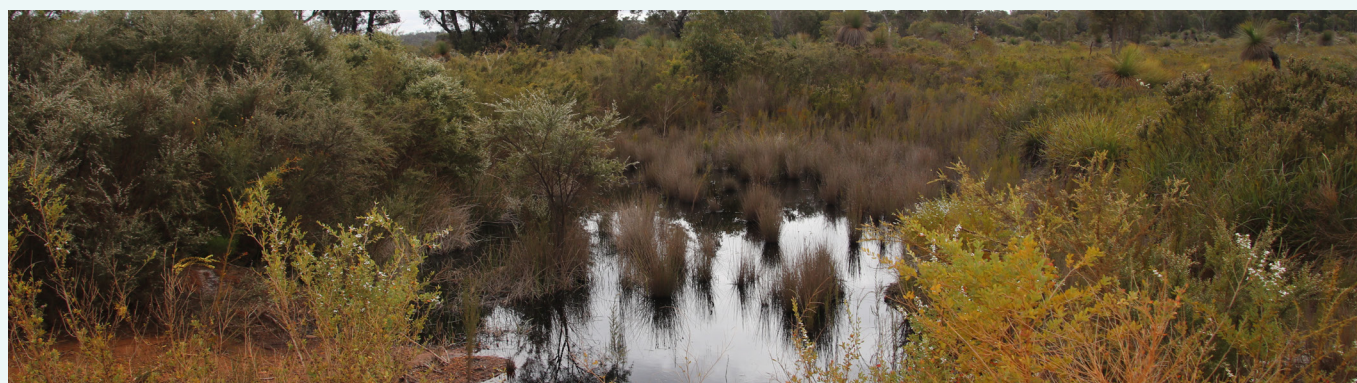
Total phosphorus (TP) concentrations were very low at the Four Acres Road site. All samples collected were well below the WQIP target, and all years were classified as low using the SWRWQA methodology. The 2019 median was the lowest of the sites sampled in the Scott River catchment (0.023 mg/L, the next lowest was at Brennans Ford with a median of 0.066 mg/L).

The P concentrations seen at this site are typical for streams with an undisturbed catchment covered in native vegetation.

Four Acres Road



Total phosphorus concentrations, 2005–19 at site 6090191. The dashed line is the Scott River WQIP target for median TP concentrations.



Four Acres Road in September, note the dense fringing vegetation at this largely natural site.

Phosphorus (2019)

Types of phosphorus

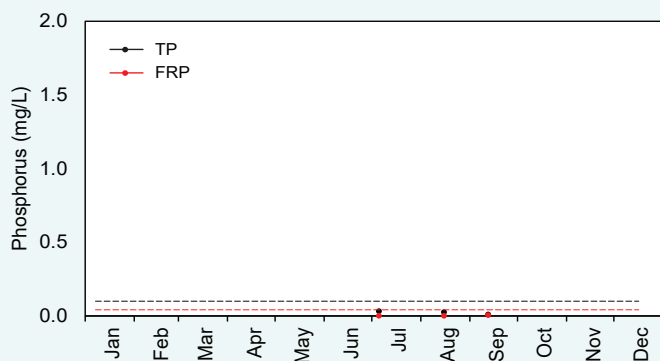
As two of the three samples collected in 2019 were below the laboratory limit of reporting (LOR) for phosphate, it was not possible to construct pie charts showing the relative proportion of the different types of P. Phosphate is measured as filterable reactive phosphorus (FRP) which in surface waters is mainly present as phosphate (PO_4^{3-}) species.

Concentrations

In 2019, phosphorus concentrations were very low at Four Acres Road with no evidence of a seasonal pattern. All TP samples were below the WQIP target and all phosphate samples below the ANZECC trigger value. In fact, concentrations were so low that of the three samples collected in 2019, two were below the LOR for phosphate. This is indicative of the heavily vegetated catchment present upstream of this site.

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

Four Acres Road



2019 phosphorus concentrations at 6090191. The black dashed line is the Scott River WQIP target for TP, the red is the ANZECC trigger values for phosphate.



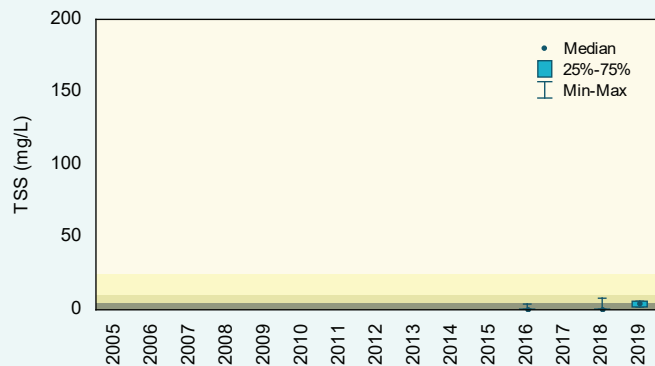
A dry creek bed in December in the Upper Scott catchment. The streams in this catchment dry over the summer months, only starting to flow again following the onset of winter rain.

Total suspended solids over time (2005–19)

Concentrations

Using the SWRWQA methodology, all years at Four Acres Road were classified as having low total suspended solids (TSS) concentrations.

Four Acres Road



Total suspended solids concentrations, 2005–19 at site 6090191. The shading refers to the SWRWQA classification bands.

low moderate high very high



Natural vegetation along a stream in the Upper Scott catchment. There are large areas of undisturbed vegetation in this catchment.

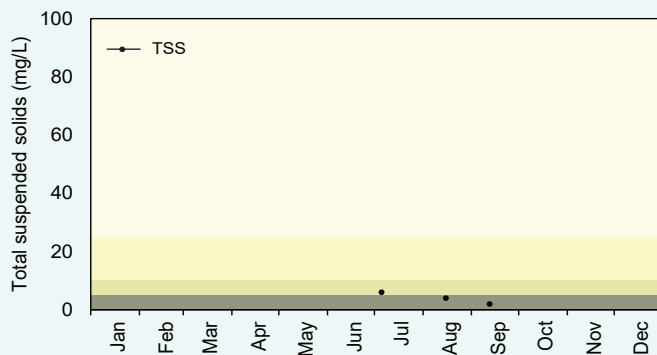
Total suspended solids (2019)

Concentrations

In 2019, all of the samples except one fell into the low SWRWQA classification band. The sample collected in July fell into the moderate band.

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

Four Acres Road



2019 total suspended solids concentrations at 6090191. The shading refers to the SWRWQA classification bands.

low moderate high very high



Native bushland in the Upper Scott catchment, February 2020.

Upper Scott

pH over time (2005–19)

pH values

pH fluctuated at Four Acres Road over the reporting period. Except for 2019, the annual median pH was between the upper and lower ANZECC trigger values for all years for which there were data. Why pH values were so much lower in 2019 is unclear. Ongoing monitoring will help determine if this was some form of outlier or if it reflects an actual decrease in pH at this site.

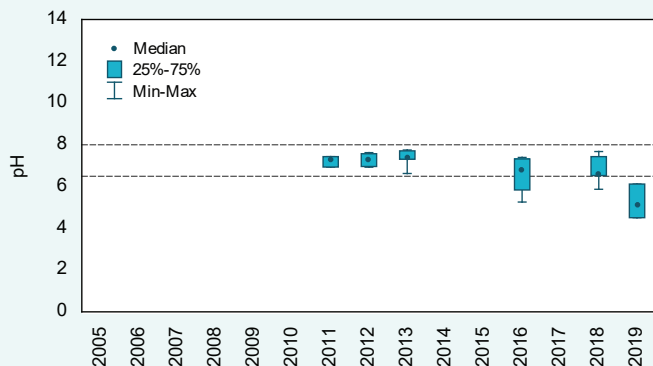
pH (2019)

pH values

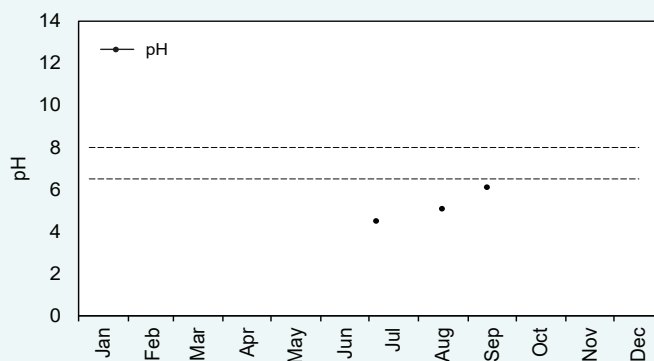
pH at this site was acidic, with all samples collected in 2019 falling below the lower ANZECC trigger value. Given the largely undisturbed state of the catchment, it is likely that the relatively low pH at this site is because of the presence of humic substances in the streams coming from the forest and soils upstream of the site.

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

Four Acres Road



pH levels, 2005–19 at site 6090191. The dashed lines are the upper and lower ANZECC trigger values.



2019 pH levels at 6090191. The dashed lines are the upper and lower ANZECC trigger values.



Four Acres Road, close to the Upper Scott sampling site. Much of the vegetation around the sampling site is undisturbed, like this, February 2020.

Salinity over time (2005–19)

Concentrations

Four Acres Road was fresh, with all years classified as fresh using the Water Resources Inventory 2014 salinity ranges (note, the 2018 nutrient report used the SWRWQA bands). While there was some slight fluctuation from year to year, salinity was stable overall.

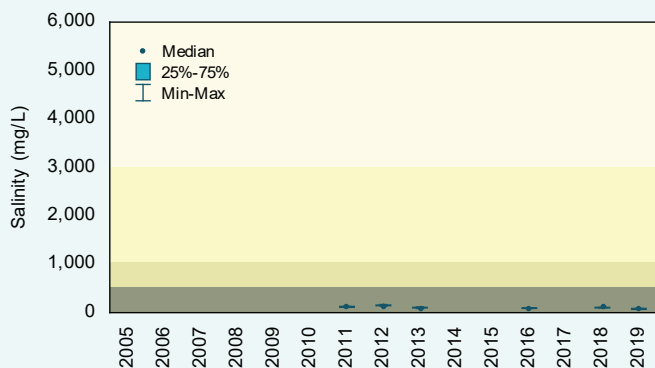
Salinity (2019)

Concentrations

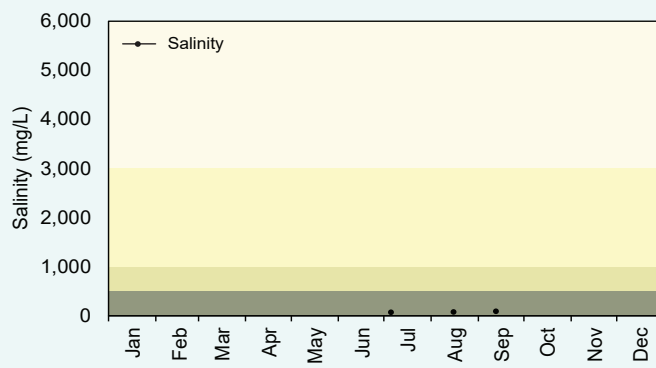
There was no evidence of a seasonal pattern in salinity at Four Acres Road. In fact, salinity was low year-round with all samples collected falling into the Water Resources Inventory 2014 fresh range. This is representative of the relatively undisturbed catchment upstream of this sampling site.

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

Four Acres Road



Salinity concentrations, 2005–19 at site 6090191. The shading refers to the Water Resources Inventory 2014 salinity ranges.



2019 salinity concentrations at 6090191. The shading refers to the Water Resources Inventory 2014 salinity ranges.

fresh
 marginal
 brackish
 saline



Natural bushland in the Upper Scott catchment, February 2020.

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 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 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.

