Turnwood Creek

This data report provides a summary of the nutrients at the Turnwood Creek 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 creek discharges to the Hardy Inlet.

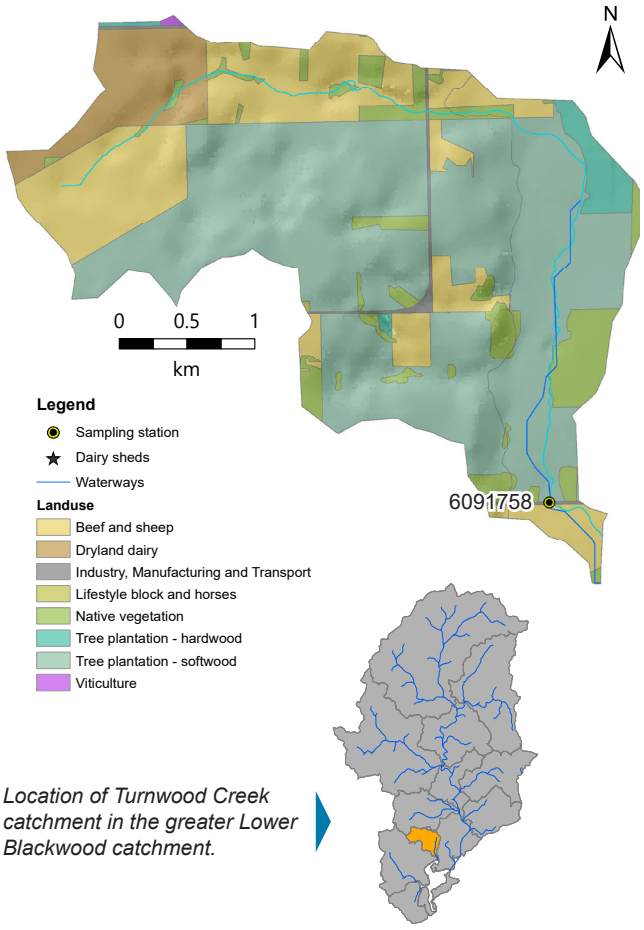
About the catchment

Turnwood Creek has a catchment area of about 10 km^2. The dominant land use is softwood tree plantations (bluegums) which cover nearly 60 per cent of the catchment; the other major land use is beef and sheep grazing. More than half of the creek has had its fringing vegetation cleared or severely modified.

The soils in the catchment have a high phosphorus-binding capacity and so bind most of the phosphorus applied to them, reducing the amount that enters streams.

Turnwood Creek discharges to the North Bay of the Hardy Inlet, in Kudardup.

Water quality is measured at site 6091758, SCCAT7, where Turnwood Creek passes under Fisher Road in Kudardup. This site is just downstream of a large area of bluegum plantation and less than 5km from the discharge point to the Hardy Inlet.



Location of Turnwood Creek catchment in the greater Lower Blackwood catchment.

Results summary

Nutrient concentrations (total nitrogen and total phosphorus) were classified as low at the Turnwood Creek sampling site. The proportion of nitrogen present as bioavailable nitrate in 2019 was large, suggesting fertiliser for animal waste from upstream landuse was possibly entering the creek.

Facts and figures

Sampling site code	6091758 (SCCAT7)
Catchment area	10 km^2
Per cent cleared area (2001)	90 per cent
River flow	Ephemeral
Main land use (2001)	Softwood tree plantations and beef and sheep grazing

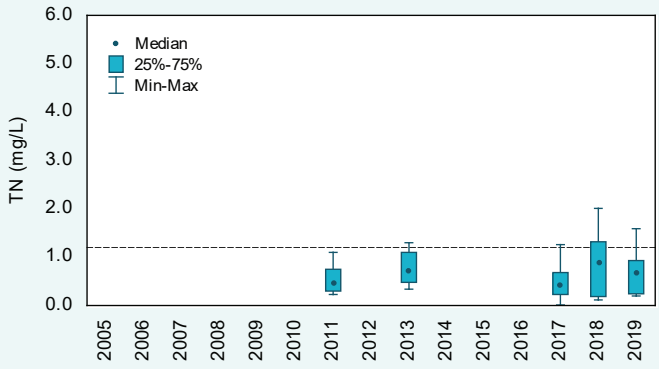
Turnwood Creek

Nitrogen over time (2005–19)

Concentrations

Using the State Wide River Water Quality Assessment (SWRWQA) methodology, all years with sufficient data to graph were classified as having low total nitrogen (TN) concentrations. TN concentrations fluctuated over the reporting period and though it appeared they were worse in 2018, this is not as evident in 2019. Ongoing monitoring will help determine if TN concentrations are changing at this site.

Turnwood Creek



Total nitrogen concentrations, 2005–19 at site 6091758. The dashed line is the ANZECC trigger value.

The Turnwood Creek sampling site which is dry, January 2018.

Turnwood Creek

Nitrogen (2019)

Types of nitrogen

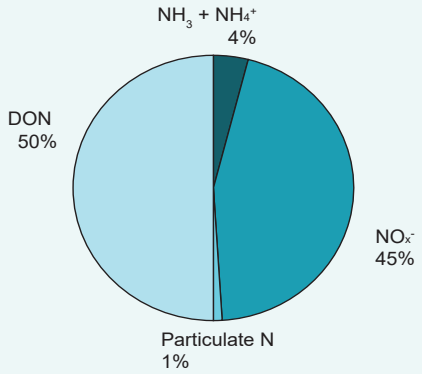
Total N is made up of different types of N. In 2019, Turnwood Creek had one of the largest average percentage of N present as nitrate (NO_x^-) of the nine sites sampled in the Blackwood River catchment. Nitrate is readily bioavailable to plants and algae to use to fuel rapid growth. The main source of nitrate was likely fertilisers. Most of the rest of the N was present as dissolved organic N (DON). This type of N consists mainly of degrading plant and animal matter, though it may also include other types. Most types of DON are not very bioavailable, though some are readily used by plants and algae to fuel growth. The large proportion of N present as nitrate is typical of an agricultural catchment where most of the N is coming from non-natural sources.

Concentrations

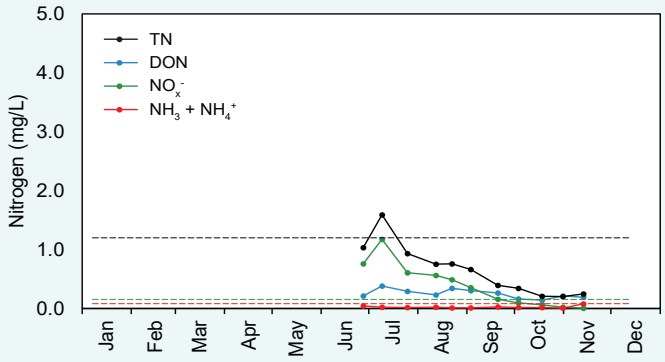
All types of N, except for total ammonia (NH_3 + NH_4^+), showed a first flush effect where N was mobilised following heavy rainfall near the start of the flow year. Much of this N was probably the result of mineralisation of organic N in soils and streams over the summer period, and runoff of high-concentration waters from upstream landuse, which build up with fertiliser and animal waste over the summer. After this, concentrations fell during the rest of the year.

Where there are no data shown on the graph, the creek was not flowing.

Turnwood Creek



2019 average nitrogen fractions at site 6091758.



2019 nitrogen concentrations at 6091758. The dashed lines are the ANZECC trigger values for the different N species.

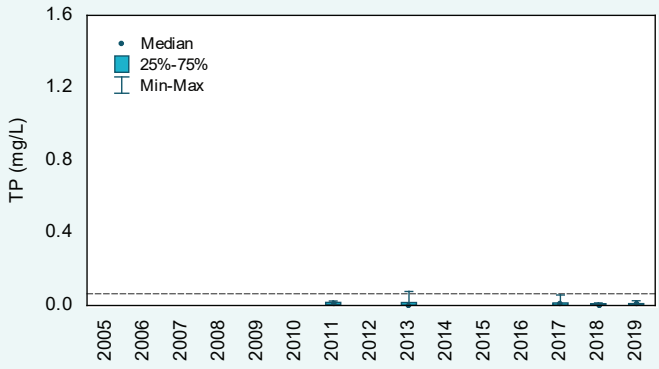
Looking downstream from Fisher Road along Turnwood Creek, July 2018.

Phosphorus over time (2005–19)

Concentrations

Total phosphorus (TP) concentrations were low in Turnwood Creek with only one sample, collected in 2013, over the Australian and New Zealand Environment and Conservation Council (ANZECC) trigger value. Using the SWRWQA methodology, all years with sufficient data to graph were classified as having low TP concentrations. The high P-binding capacity of the soils present in the catchment contributed to the low P concentrations recorded.

Turnwood Creek



Total phosphorus concentrations, 2005–19 at site 6091758. The dashed line is the ANZECC trigger value.

A shallow drain which runs between Fisher Road and the bluegum plantation and contributes flow to Turnwood Creek, September 2018.

Phosphorus (2019)

Types of phosphorus

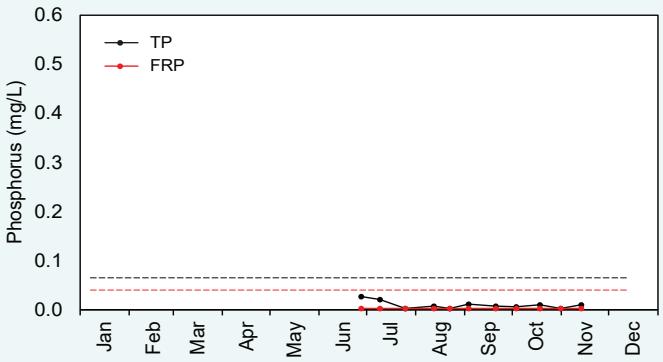
Total P is made up of different types of P. Because a large number of samples were below the laboratory limit of reporting (LOR) in 2019, a phosphorus fraction pie chart was not generated for the Turnwood Creek site. At this site, three of the 11 TP samples and all of the phosphate samples were below their laboratory limits of reporting (0.005 mg/L in each case). Phosphate is measured as filterable reactive phosphorus (FRP) which in surface waters is mainly present as phosphate (PO_4^{3-}) species and is readily bioavailable.

Concentrations

Both TP and phosphate concentrations were low year-round in Turnwood Creek. While concentrations fluctuated over the year there was no clear evidence of a seasonal pattern and all samples were well below their respective ANZECC trigger values. The high P-binding capacity of the soils present in the catchment contributed to the low P concentrations recorded.

Where there are no data shown on the graph, the creek was not flowing.

Turnwood Creek



2019 phosphorus concentrations at 6091758. The dashed lines are the ANZECC trigger values for the different P species.

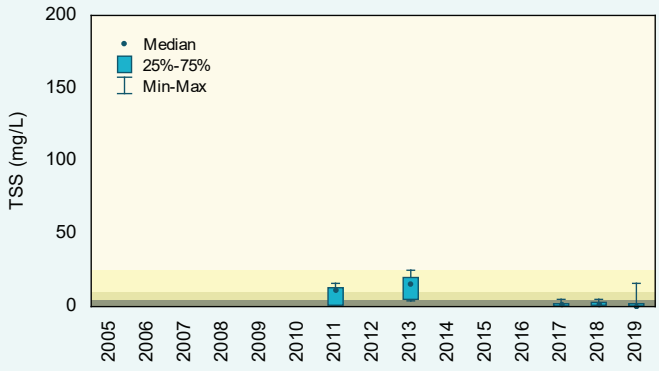
Collecting a water quality sample from Turnwood Creek, June 2019.

Total suspended solids over time (2005–19)

Concentrations

Using the SWRWQA methodology, total suspended solids (TSS) concentrations in Turnwood Creek were classified as moderate in 2011 and 2013, and low in 2017–19. Ongoing monitoring will help determine if the apparent decrease is because of an actual improvement in TSS concentrations or just part of the natural variation at this site.

Turnwood Creek



Total suspended solids concentrations, 2005–19 at site 6091758. The shading refers to the SWRWQA classification bands.

low moderate high very high

The culverts through which Turnwood Creek passes under Fisher Road, October 2019.

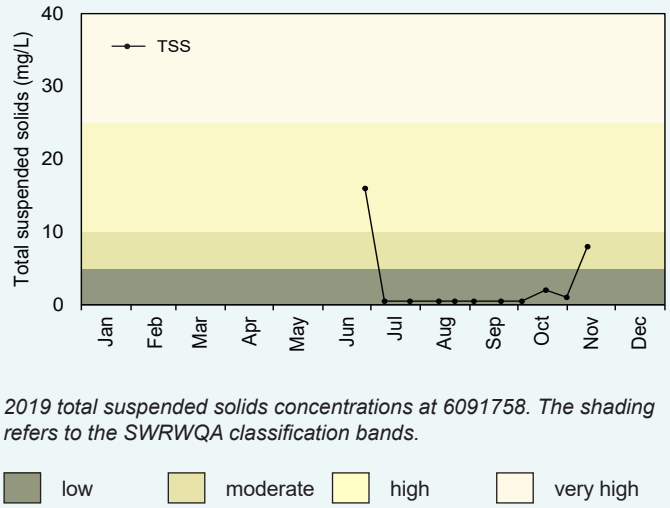
Total suspended solids (2019)

Concentrations

TSS concentrations fluctuated in 2019 with evidence of a first flush effect in June, shortly after the creek started flowing. At this time, rainfall washed particulate matter into the creek from surrounding land use as well as mobilising any particulate matter present in the creek itself. The peak in November coincided with very low water levels as the creek was drying up. This peak may be the result of evapoconcentration because the creek was drying, or possibly some disturbance which increased the amount of particulate matter in the water.

Where there are no data shown on the graph, the creek was not flowing.

Turnwood Creek



2019 total suspended solids concentrations at 6091758. The shading refers to the SWRWQA classification bands.

The Turnwood Creek sampling site, October 2019. As the creek starts to dry up, the water becomes more cloudy.

Turnwood Creek

pH over time (2005–19)

pH values

The median pH was within the upper and lower ANZECC trigger values in each of the years for which there were sufficient data to graph. Each year had a proportion of samples below the lower ANZECC trigger value, though in 2019 this was only one sample.

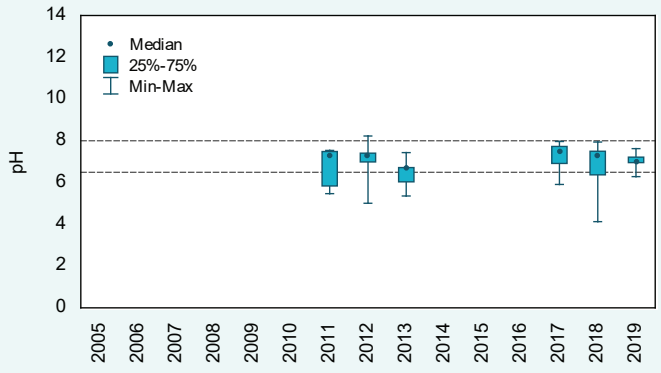
pH (2019)

pH values

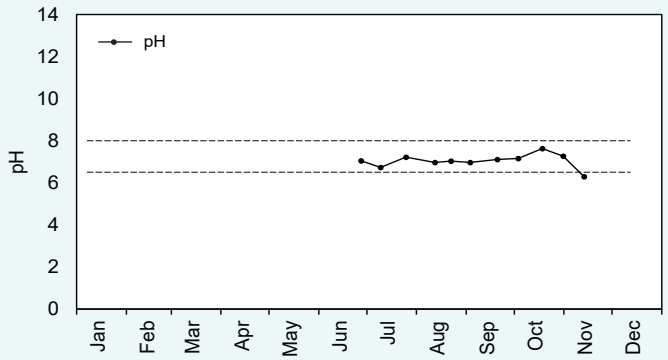
In 2019 pH values fluctuated at Turnwood Creek. pH was relatively stable for the first part of the flow year, before reducing from October. At this time, the relative proportion of groundwater in the stream would be increasing as rainfall and surface flows decrease. This suggests the pH of the groundwater is possibly more acidic than the surface water at this site.

Where there are no data shown on the graph, the creek was not flowing.

Turnwood Creek



pH levels, 2005–19 at site 6091758. The dashed lines are the upper and lower ANZECC trigger values.



2019 pH levels at 6091758. The dashed lines are the upper and lower ANZECC trigger values.

Fast flows in Turnwood Creek looking downstream from Fisher Road, August 2018.

Turnwood Creek

Salinity over time (2005–19)

Concentrations

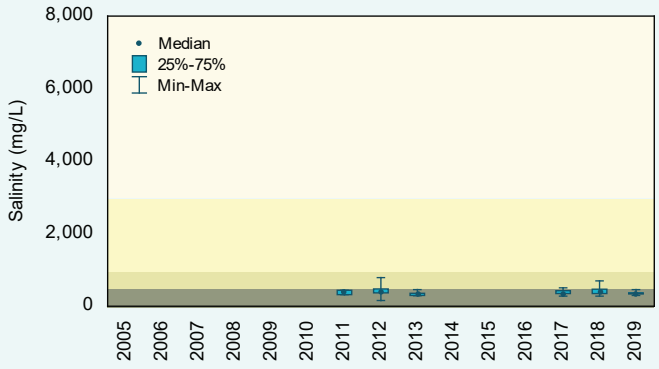
Using the Water Resources Inventory 2014 salinity ranges, all years with sufficient data to graph were classified as fresh. Salinity was consistently low at this site with very few samples falling above the fresh band.

Salinity (2019)

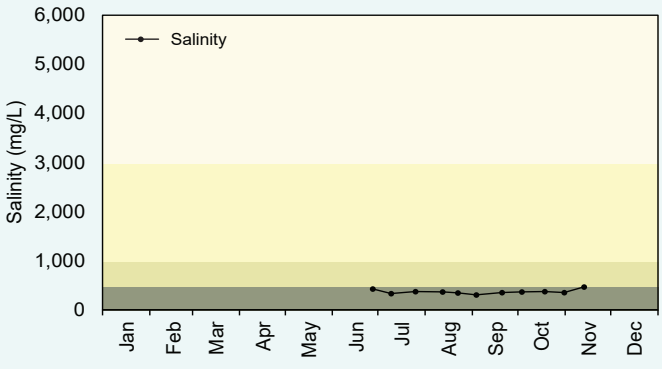
Concentrations

Salinity showed a very slight inverse seasonal relationship. That is, salinity was slightly higher at the start and end of the flow year. The slightly higher salinity recorded in June is likely because of a first flush effect where the onset of winter rains flushed salt from surrounding land use into the creek as well as mobilising salts that had been left behind after the creek dried the previous summer. Salinity levels then dropped slightly as flow increased before increasing again in November. It is possible that the groundwater at this site is more saline than the surface water; as the surface water dries up, the proportion of water in the creek coming from groundwater increases, leading to increased salinity. Evapoconcentration may also be causing the increased salinity seen at this time.

Turnwood Creek



Salinity concentrations, 2005–19 at site 6091758. The shading refers to the Water Resources Inventory 2014 salinity ranges.



2019 salinity concentrations at 6091758. The shading refers to the Water Resources Inventory 2014 salinity ranges.

fresh marginal brackish saline

Turnwood Creek sampling site, January 2018. The site was dry at this time.

Turnwood Creek

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. 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 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 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 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.

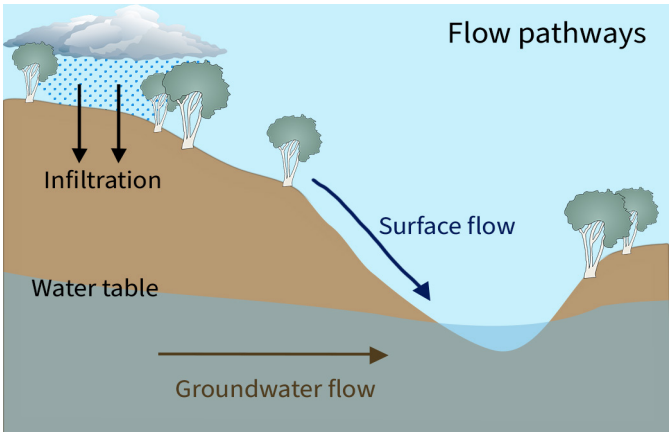
Laboratory limit of reporting: (LOR) this is the lowest concentration of an analyte that can be reported by a laboratory.

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.



Turnwood Creek Issue 2
Publication date: August 2023
ISSN: 2209–6779 (online only)