

Upper Blackwood River

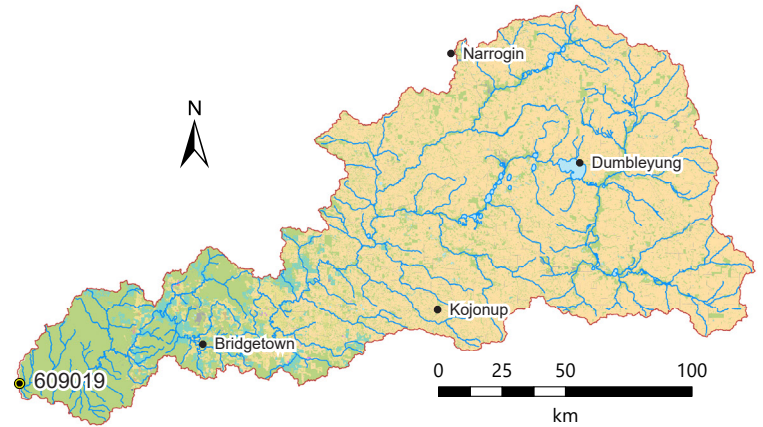
This data report provides a summary of the nutrients at the sampling site at the bottom of the Upper Blackwood River in 2019 as well as historical data from 2005–19. This report was produced as part of Healthy Estuaries WA. Downstream, the river continues through the Lower Blackwood River and discharges into the Hardy Inlet.

About the catchment

The Upper Blackwood River has a very large catchment area, about 21,148 km² which extends east, out into the wheatbelt. The dominant land use is cropping which covers about three-quarters of the catchment area. Close to the sampling site, however, the dominant land use is native vegetation. Fringing vegetation is in excellent condition near the bottom of the catchment.

There are a number of towns on the Blackwood River, including Nannup and Bridgetown.

Water quality and flow is measured at site 609019, Hut Pool, where the Blackwood River passes under Great North Road in Nillup.



Legend

- Sampling station
- ★ Dairy sheds
- Waterways
- Landuse**
- Annual horticulture
- Aquaculture
- Beef and sheep
- Cropping
- Dryland dairy
- Industry, Manufacturing and Transport
- Intensive animal use
- Lifestyle block and horses
- Native vegetation
- Orchard
- Tree plantation - hardwood
- Tree plantation - rehabilitation
- Urban
- Viticulture
- Water body

Results summary

Nutrient concentrations (total nitrogen and total phosphorus) at the Hut Pool sampling site were classified as low, though there were some total nitrogen samples which were high compared with the other sites in the Blackwood River catchment. Hut Pool was by far the saltiest of the Blackwood River sampling sites. Much of this salt was sourced from the upper catchment where clearing of deep-rooted native vegetation for agriculture has raised groundwater levels, mobilising salts stored in the soils and bringing them to the surface.



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

Facts and figures

Sampling site code	609019 (Hut Pool)
Catchment area	21,148 km ²
Per cent cleared area (2001)	81 per cent
River flow	Permanent
Main land use (2001)	Cropping

Estimated loads and flow at Hut Pool

609019	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Flow (GL)	843	165	360	429	651	71	390	121	441	366	128	675	419	455	161
TN load (t)	1004	134	377	497	835			79	495				507	521	126
TP load (t)	17.9	1.97	5.82	8.89	14.9			1.17	8.52				9.32	9.13	1.92

Upper Blackwood River

Nitrogen over time (2005–19)

Concentrations

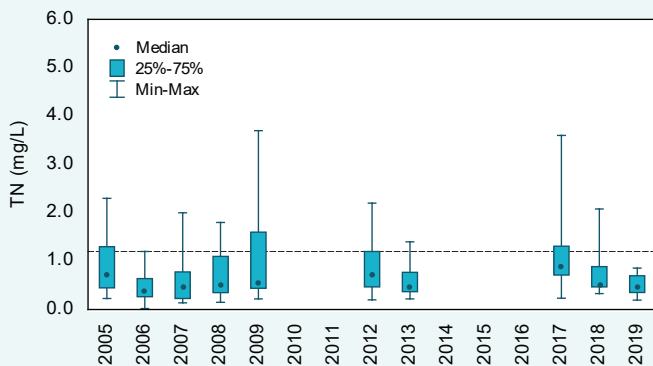
Total nitrogen (TN) concentrations fluctuated over the reporting period at Hut Pool. While the annual median concentrations were consistently below the Australian and New Zealand Environment and Conservation Council (ANZECC) trigger value, each year (with the exception of 2006 and 2019) had some samples over the trigger value. Using the State Wide River Water Quality Assessment (SWRWQA) methodology, all years with sufficient data were classified as having a low TN concentration.

Estimated loads

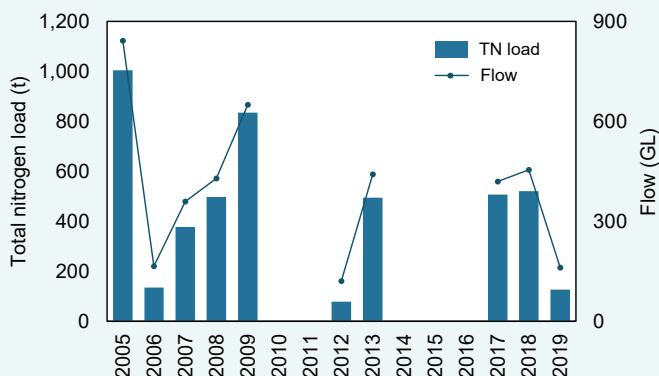
In 2019, the estimated TN load at the Hut Pool sampling site was 126 t and the load per square kilometre 6 kg/km². Hut Pool was one of only two sites in the Blackwood catchment with flow data, the other being Chapman Brook, which is a tributary of the Blackwood River. No comparisons have been made between the two sites because of the very different size and nature of their two catchments.

As the total flow volume in 2019 was small compared to other years, so to was the annual TN load. Annual TN loads were closely related to flow volumes; years with large annual flow volumes had large TN loads and vice versa.

Hut Pool



Total nitrogen concentrations, 2005–19 at site 609019. The dashed line is the ANZECC trigger value.



Total nitrogen loads and annual flow, 2005–19 at site 609019.



The road crossing at the Hut Pool sampling site, November 2018.

Upper Blackwood River

Nitrogen (2019)

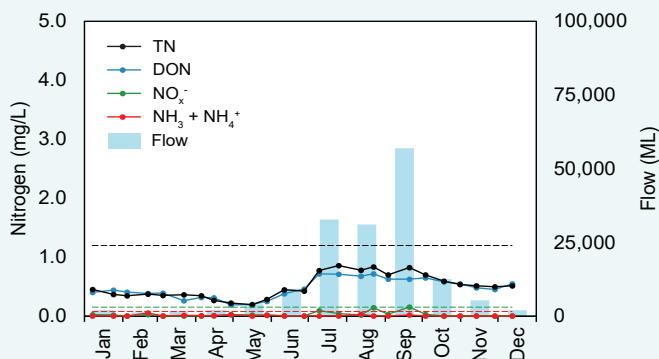
Types of nitrogen

Total N is made up of different types of N. Because a large number of samples were below the laboratory limit of reporting (LOR) a nitrogen fraction pie chart was not constructed for 2019 (10 of 25 nitrate (NO_x^-) and 17 of 25 total ammonia ($\text{NH}_3 + \text{NH}_4^+$) samples were below their respective LORs). As can be seen from the 2019 concentration graph, however, the proportion of N present as DON was large. Likely sources for this kind of N include degrading plant and animal matter which generally needs to be further broken down before becoming available to plants and algae. Some types of DON, however, are highly bioavailable to plants and algae. The proportion of N present as nitrate and total ammonia was low. These types of N tend to be highly bioavailable and are often sourced from fertilisers and animal wastes. It is possible that the heavily vegetated main channel of the Blackwood River upstream of this site was processing total ammonia via plant uptake and nitrate via plant uptake and denitrification.

Concentrations

Total N, DON and nitrate all showed a seasonal pattern, increasing from June as rainfall and flow increased. At this time, N was mobilised following heavy rainfall at the start of the winter. Much of this nitrate was probably the results of mineralisation of organic N in soils and drains over the summer period as well as runoff from the agricultural land upstream of the site. The DON was likely from organic N washing in from soils and remnant wetlands. Both nitrate and total ammonia concentrations tended to be low with many below their respective LORs and only one nitrate sample was above the ANZECC trigger value.

Hut Pool



2019 nitrogen concentrations at 609019. The dashed lines are the ANZECC trigger values for the different N species.



The road crossing at the Hut Pool sampling site during high flows, August 2018. The poles just visible in the water at the centre of the picture are the poles along the left side of the road.

Upper Blackwood River

Phosphorus over time (2005–19)

Concentrations

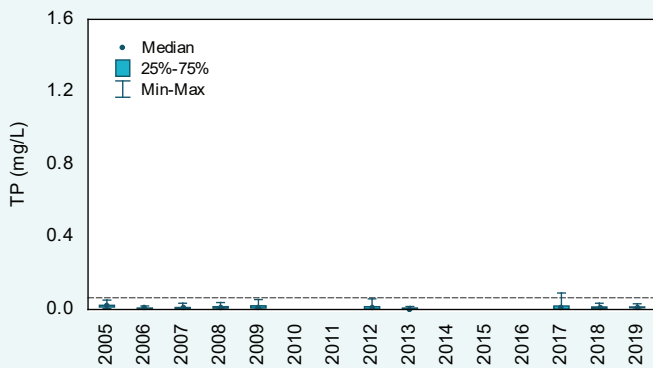
Annual total phosphorus (TP) concentrations were classified as low at Hut Pool using the SWRWQA methodology. The annual median TP concentration was below the ANZECC trigger value in all years where there were sufficient data to graph. The only year which had any samples over the trigger value was 2017.

Estimated loads

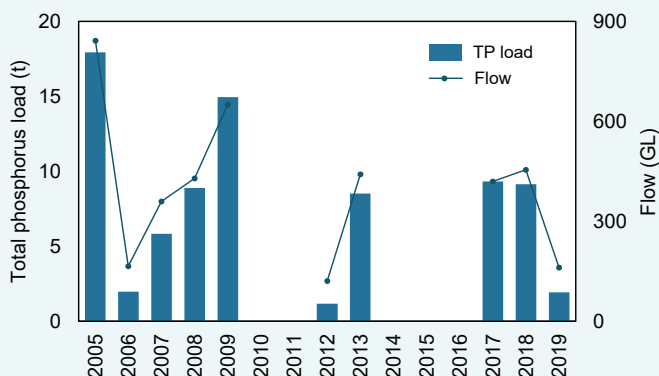
In 2019, the estimated TP load at Hut Pool was 1.92 t and the load per square kilometre was 0.1 kg/km². Hut Pool was one of only two sites in the Blackwood catchment with flow data, the other being Chapman Brook, which is a tributary of the Blackwood River. No comparisons have been made between the two sites because of the very different size and nature of the two catchments.

As the total flow volume in 2019 was small compared with other years, so to was the annual TP load. Annual TP loads were closely related to flow volumes; years with large annual flow volumes had large TP loads and vice versa.

Hut Pool



Total phosphorus concentrations, 2005–19 at site 609019. The dashed line is the ANZECC trigger value.



Total phosphorus loads and annual flow, 2005–19 at site 609019.



Collecting a water quality sample at the Hut Pool sampling site, May 2019.

Upper Blackwood River

Phosphorus (2019)

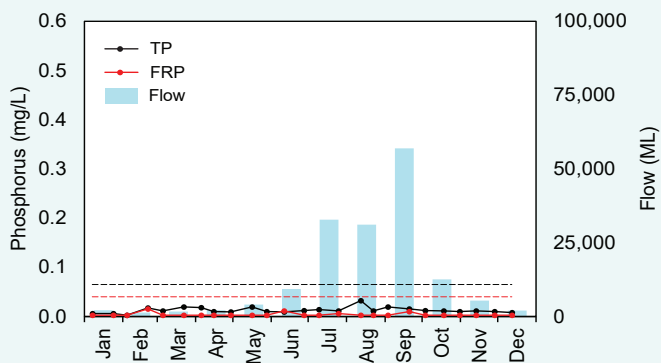
Types of phosphorus

Total P is made up of different types of P. Because a large number of samples were below the LORs in 2019, a phosphorus fraction pie chart was not generated for the Hut Pool site. At this site, one of the 25 TP samples and 21 of the 25 phosphate samples were below their LORs (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

Total P concentrations did not show a clear seasonal response in 2019 with concentrations fluctuating during the year. It is likely that P is entering the river via both surface runoff as well as groundwater and in-stream sources. All samples collected in 2019 were well below their respective ANZECC trigger values.

Hut Pool



2019 phosphorus concentrations at 609019. The dashed lines are the ANZECC trigger values for the different P species.



Filtering a water quality sample before sending it to the laboratory for analysis, May 2019.

Upper Blackwood River

Total suspended solids over time (2005–19)

Concentrations

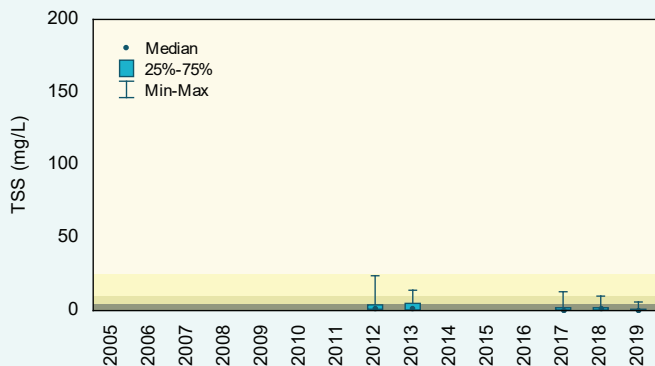
Using the SWRWQA methodology, all years with adequate data to graph were classified as having low total suspended solids (TSS) concentrations.

Estimated loads

In 2019, the estimated TSS load at Hut Pool was 363 t and the load per square kilometre was 17 kg/km². Hut Pool was one of only two sites in the Blackwood catchment with flow data, the other being Chapman Brook, which is a tributary of the Blackwood River. No comparisons have been made between the two sites because of the very different size and nature of the two catchments.

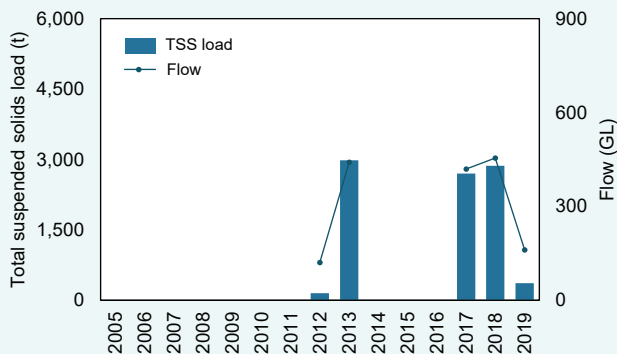
Annual TSS loads were closely related to flow volumes; years with large annual flow volumes had large TSS loads and vice versa.

Hut Pool



Total suspended solids concentrations, 2005–19 at site 609019. The shading refers to the SWRWQA classification bands.

low moderate high very high



Total suspended solids loads and annual flow, 2005–19 at site 609019.



Foam on the surface of the water at the Hut Pool sampling site, September 2019. This is a naturally occurring phenomenon.

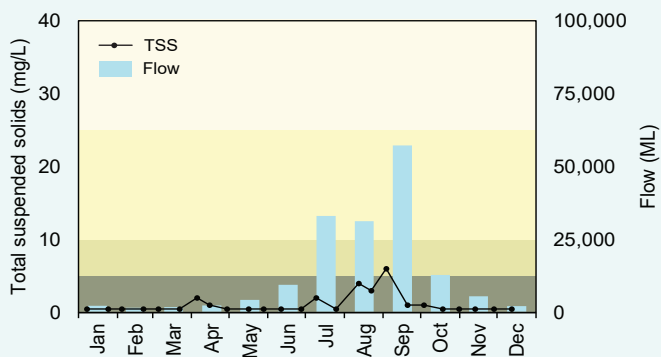
Upper Blackwood River

Total suspended solids (2019)

Concentrations

In 2019, most of the samples collected fell into the low band of the SWRWQA. There was a seasonal pattern in TSS concentrations, with concentrations increasing during the wetter months before decreasing again as rainfall and flow eased. This suggests most of the particulate matter, which is detected as TSS by the laboratory, was entering the stream via surface flows and in-stream erosion.

Hut Pool



2019 total suspended solids concentrations at 609019. The shading refers to the SWRWQA classification bands.

low moderate high very high



Looking downstream from the Hut Pool sampling site, May 2019. Note the dense fringing vegetation growing along the bank.

Upper Blackwood River

pH over time (2005–19)

pH values

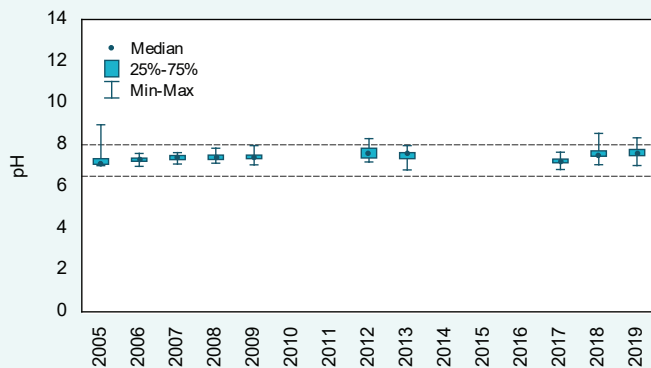
pH at Hut Pool fluctuated over the reporting period, though the median pH fell within the upper and lower ANZECC trigger values each year. There have been a few years (2005, 2012 and 2018–19) where there were some samples over the upper ANZECC trigger value.

pH (2019)

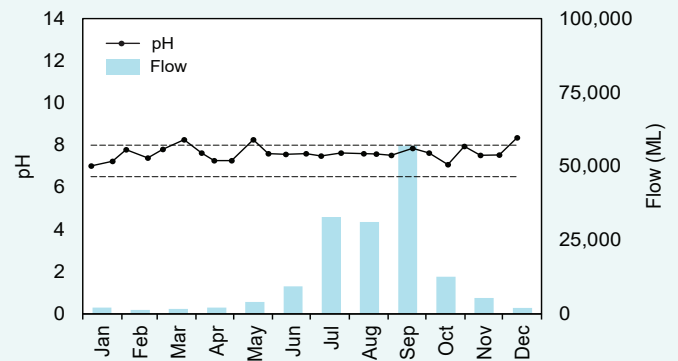
pH values

There was no evidence of a seasonal pattern in pH at Hut Pool, with values fluctuating in 2019. There were a few samples over the upper ANZECC trigger value at different times of the year.

Hut Pool



pH levels, 2005–19 at site 609019. The dashed lines are the upper and lower ANZECC trigger values.



2019 pH levels at 609019. The dashed lines are the upper and lower ANZECC trigger values.



A weir on the Balgarup River in Kojonup. This is in the south-eastern portion of the Upper Blackwood River catchment, December 2019.

Upper Blackwood River

Salinity over time (2005–19)

Concentrations

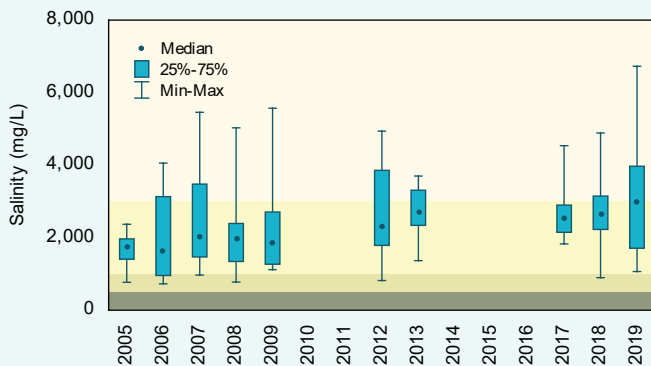
Hut Pool was by far the saltiest of the nine sites sampled in the Blackwood River catchment. Using the Water Resources Inventory 2014 salinity ranges, each year with adequate data was classified as brackish (note, the 2018 nutrient report used the SWRWQA classification bands). The raised salinity at this site is because of the large amount of clearing which has occurred in the upper catchment. Removing the original deep-rooted vegetation has caused groundwater levels to rise, bringing along salts stored in the soils with them.

Salinity (2019)

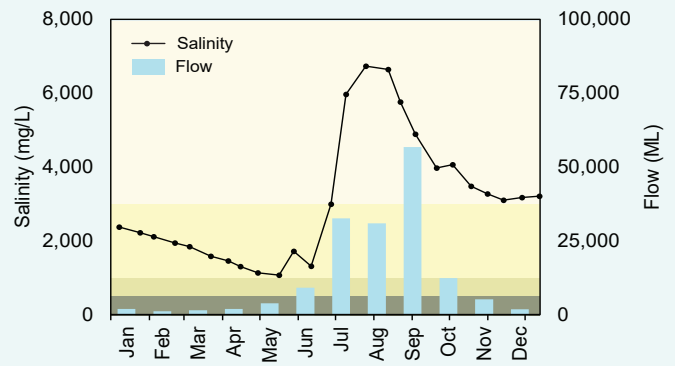
Concentrations

Salinity at Hut Pool showed a seasonal response, being highest during the wettest months, when flow was highest. The drop in salinity associated with peak flow observed in 2018 was not evident in 2019. This may be because flow volumes were much smaller in 2019 than 2018. In 2018, August had 228 GL of flow and September 82 GL; by comparison, in 2019, August had 31 GL and September 57 GL. It is likely that salt is coming from both surface water runoff and groundwater.

Hut Pool



Salinity concentrations, 2005–19 at site 609019. The shading refers to the Water Resources Inventory 2014 salinity ranges.



2019 salinity concentrations at 609019. The shading refers to the Water Resources Inventory 2014 salinity ranges.

fresh
 marginal
 brackish
 saline



The Blackwood River, just upstream of Nannup, May 2014.

Upper Blackwood River

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 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 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.

