Wellesley River

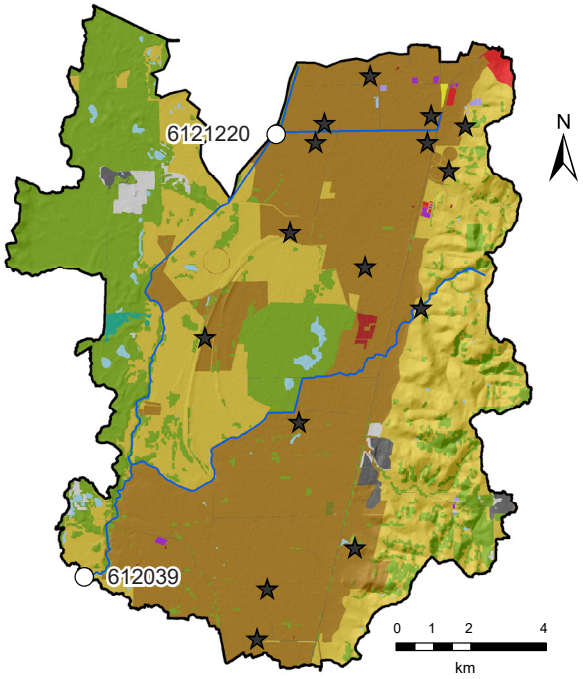
This data report provides a summary of the nutrients at the two sampling sites in the Wellesley River catchment in 2019 as well as historical data from 2005–19. This report was produced as part of Healthy Estuaries WA. The northern section of the Wellesley River has been converted into a drain, the Wellesley Diversion Drain, to remove water from agricultural land. Mangosteen Drain enters the Wellesley Diversion Drain from the north, downstream of the Hope Avenue sampling site. The Wellesley River discharges into the Brunswick River.

About the catchment

The Wellesley River has a catchment area of about 163 km^2, nearly three-quarters of which has been cleared for agriculture. Cattle grazing is the dominant land use and there are a number of dairy sheds present. The Harvey Irrigation district supplies the northern half of the catchment with irrigation water and the Collie River Irrigation District supplies the south. The Myalup State Forest lies along the west of the catchment and Benger Swamp Nature Reserve is in the centre of the catchment.

The phosphorus-binding capacity of soils in the catchment varies. Where soils bind phosphorus poorly, it can quickly move to waterways after it is applied. The lower section of the Wellesley River still retains fringing vegetation. However, further upstream the river has been de-snagged and straightened to improve drainage and there is little or no fringing vegetation left along this section or the other waterways in the catchment.

Water quality is measured at two sites: 612039 (Juegenup), on the Wellesley River where it passes under Devlin Road in Wellesley; and 6121220 (Hope Ave), on the Wellesley River Diversion Drain where it passes under Hope Avenue in Wokalup.

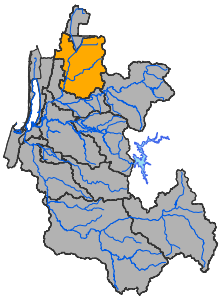


Legend

- Dairy sheds
- Sampling sites
- Waterways

Landuse

- Cleared not fertilised
- Native vegetation
- Grazing (Beef/dairy/mixed)
- Horticulture (annual)
- Horticulture (perennial)
- Industry, manufacturing and transport
- Intensive animal use
- Irrigated grazing (Beef/dairy)
- Orchards
- Plantation
- Point sources
- Urban
- Lifestyle blocks and horses
- Viticulture
- Water body



Location of Wellesley catchment in the greater Leschenault catchment.

Results summary

Nutrient concentrations (total nitrogen and total phosphorus) were classified as high at both the Wellesley River and the Wellesley Diversion Drain sampling sites. They were, however, higher at the Wellesley Diversion Drain site. The poor water quality at both sites can be attributed to the intensive agricultural land use in the catchment and the small amount of remnant vegetation.

Facts and figures

Sampling site code	612039 (Juegenup) and 6121220 (Hope Ave)
Catchment area	163 km^2
Per cent cleared area (2018)	73%
River flow	612039 flows year round whereas 6121220 ceases to flow over summer
Main land use (2018)	Cattle grazing and native vegetation

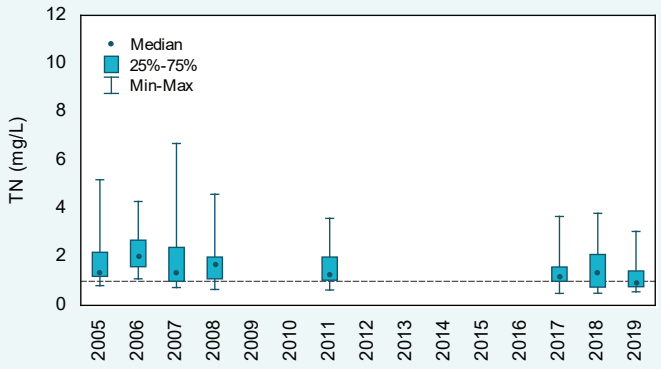
Wellesley River

Nitrogen over time (2005–19)

Concentrations

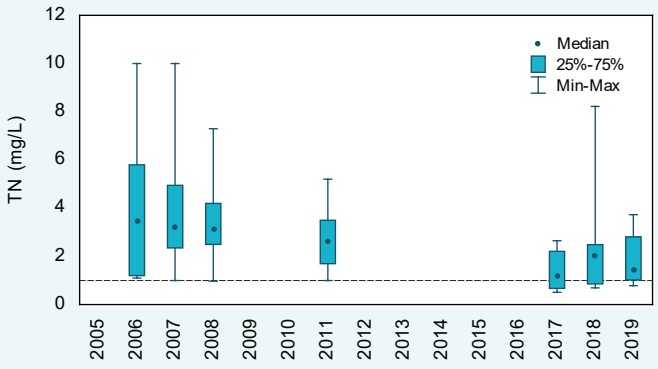
Using the State Wide River Water Quality Assessment (SWRWQA) methodology, all years with sufficient data were classified as having high total nitrogen (TN) concentrations at the Wellesley River site. At the Wellesley Diversion Drain, TN was classified as very high before the break in monitoring and high since. Concentrations fluctuated over the reporting period; however, all annual medians at both sites were above the Leschenault Water Quality Improvement Plan (WQIP) TN target for lowland rivers, with the exception of 2019 at the Wellesley River site. The annual ranges in TN samples were greater at the site on the Wellesley Diversion Drain and the annual medians at this site were also higher. This is likely driven by the land use in the catchment (there is very little native vegetation upstream of the Wellesley Diversion Drain site), and the fact that virtually all the waterways are drains.

Wellesley River



Total nitrogen concentrations, 2005–19 at site 612039. The dashed line is the Leschenault WQIP target for lowland rivers.

Wellesley Diversion Drain



Total nitrogen concentrations, 2005–19 at site 6121220. The dashed line is the Leschenault WQIP target for lowland rivers.

The Wellesley Diversion Drain sampling site with low water levels, November 2018.

Nitrogen (2019)

Types of nitrogen

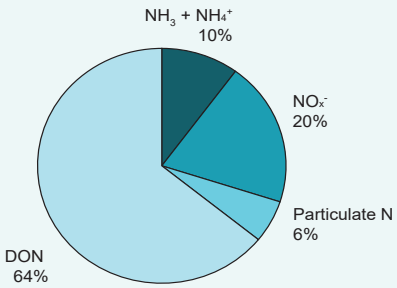
Total N is made up of different types of N. The proportion of N present as dissolved inorganic N (DIN – consisting of nitrate, NO_x^-, and total ammonia, NH_3 + NH_4^+) was higher at the Wellesley River site. DIN is highly bioavailable and is likely sourced from animal wastes and fertilisers. Dissolved organic N (DON) made up the largest proportion of N at both sites. DON consists mainly of degrading plant and animal matter but may include other types. DON varies in its bioavailability. Plant and animal matter usually needs to be further broken down before becoming available, whereas other types of DON are readily bioavailable.

Concentrations

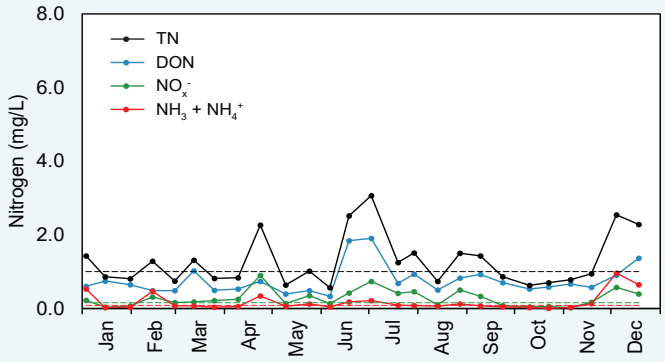
Nitrogen concentrations showed a seasonal response at both sites, being high in the middle of the year when rainfall and flow were at their highest. Both sites also had a number of peaks in N concentrations at other times of the year, not related to seasonal rainfall and flow. The reasons for these peaks are unclear but they may be related to discharge events upstream of the sampling sites, or irrigation returns.

Where there are no data shown in the Wellesley Diversion Drain graph, the site was not flowing.

Wellesley River

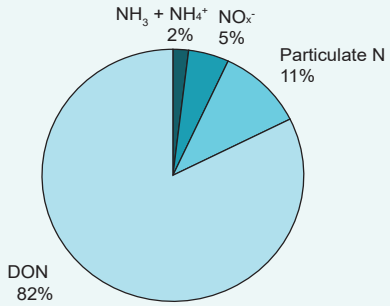


2019 average nitrogen fractions at site 612039.

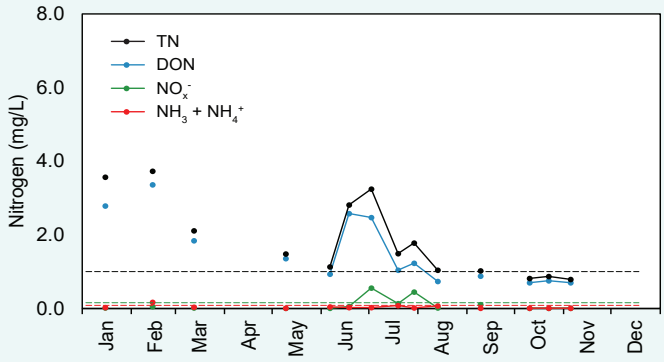


2019 nitrogen concentrations at 612039. The black dashed line is the WQIP target for lowland rivers, the red and green are the ANZECC trigger values total ammonia and nitrate.

Wellesley Diversion Drain



2019 average nitrogen fractions at site 6121220.



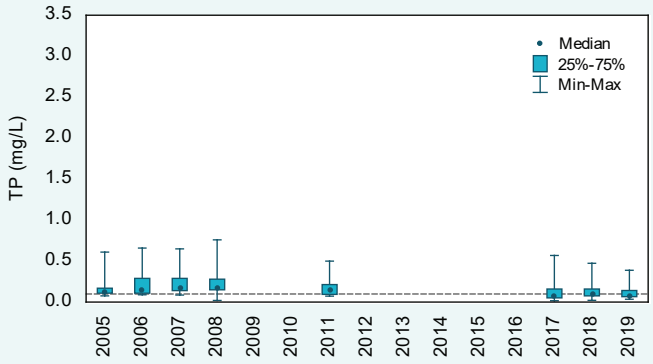
2019 nitrogen concentrations at 6121220. The black dashed line is the WQIP target for lowland rivers, the red and green are the ANZECC trigger values for total ammonia and nitrate.

Phosphorus over time (2005–19)

Concentrations

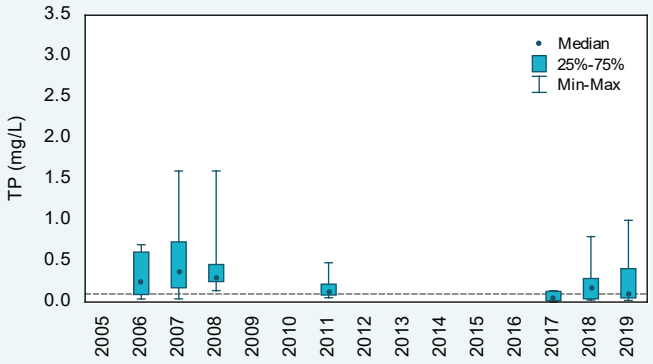
Total phosphorus (TP) concentrations were generally higher at the Wellesley Diversion Drain site than the Wellesley River sampling site. Using the SWRWQA methodology, all years with sufficient data were classified as having high TP concentrations at the Wellesley River site. At the Wellesley Diversion Drain, TP was classified as very high before the break in monitoring and high since. With the exception of 2017 at both sampling sites, and 2019 at the Wellesley River site, all annual medians were above the Leschenault WQIP target for lowland rivers. The higher proportion of agricultural land use upstream of the Wellesley Diversion Drain site compared with the Wellesley River site is the likely cause of the higher TP concentrations.

Wellesley River



Total phosphorus concentrations, 2005–19 at site 612039. The dashed line is the Leschenault WQIP target for lowland rivers.

Wellesley Diversion Drain



Total phosphorus concentrations, 2005–19 at site 6121220. The dashed line is the Leschenault WQIP target for lowland rivers.

The Wellesley River sampling site, November 2018.

Phosphorus (2019)

Types of phosphorus

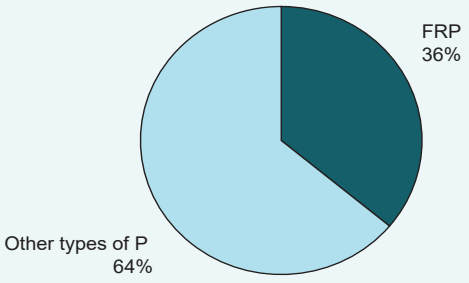
Total P is made up of different types of P. Phosphate, measured as filterable reactive phosphorus (FRP), in surface waters this is mainly present as phosphate (PO_4^{3-}) species, is readily bioavailable and is typically derived from fertilisers, animal waste and natural sources. The proportion of P present as phosphate was higher at the Wellesley River site than the Wellesley Diversion Drain site. The remainder of the P was present as either particulate P, dissolved organic P (DOP) or both (shown as 'Other types of P' in the charts below). Particulate P generally needs to be broken down before becoming bioavailable. The bioavailability of DOP varies and is poorly understood.

Concentrations

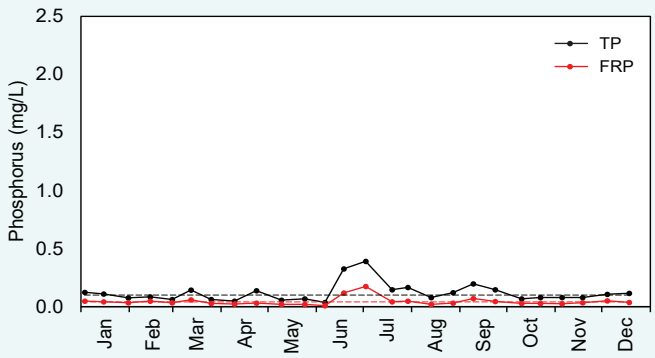
Both the Wellesley River and the Wellesley Diversion Drain sampling sites showed a seasonal pattern in P concentrations. TP and phosphate peaked in June to July at both sites when rainfall and flow increased, indicating that P was being washed into the waterways from upstream agricultural land use via surface flows. TP and phosphate concentrations were also high in January and February at the Wellesley Diversion Drain site, possibly because of irrigation returns or discharge upstream of the sampling site. It is likely that much of the P at both these sites is coming from fertiliser and animal waste from agricultural land use in the catchment and that most of it is entering the streams via surface flows and irrigation runoff/returns.

Where there are no data shown in the Wellesley Diversion Drain graph, the site was not flowing.

Wellesley River

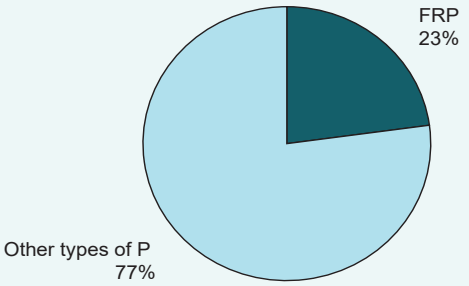


2019 average phosphorus fractions at site 612039.

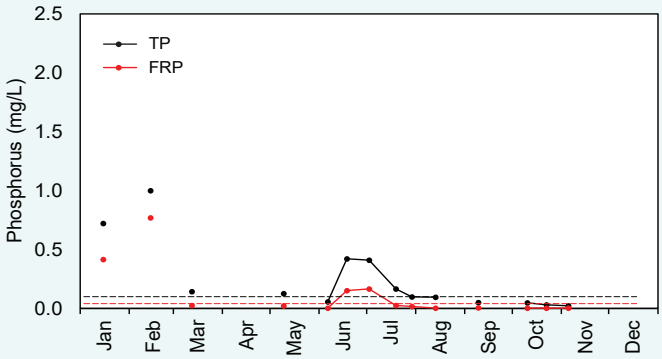


2019 phosphorus concentrations at 612039. The black dashed line is the WQIP target for lowland rivers, the red is the ANZECC trigger value for lowland rivers for phosphate.

Wellesley Diversion Drain



2019 average phosphorus fractions at site 6121220.



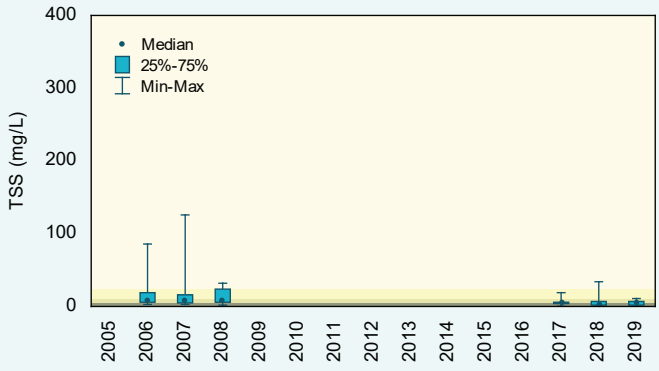
2019 phosphorus concentrations at 6121220. The black dashed line is the WQIP target for lowland rivers, the red is the ANZECC trigger value for lowland rivers for phosphate.

Total suspended solids over time (2005–19)

Concentrations

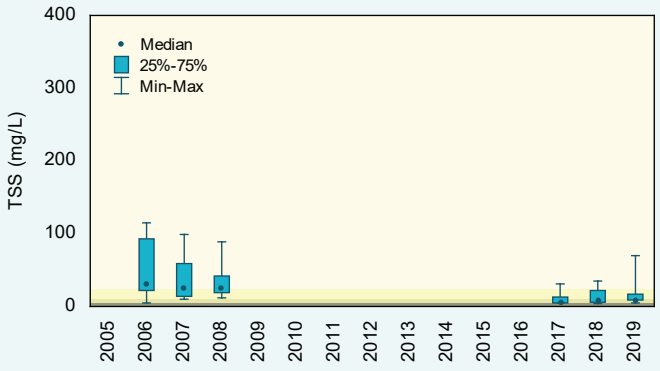
Total suspended solids (TSS) concentrations were higher at the Wellesley Diversion Drain site than the Wellesley River site. At both sites, concentrations were higher before the break in monitoring. Using the SWRWQA methodology, TSS was classified as moderate for all years with sufficient data at the Wellesley River site. At the Wellesley Diversion Drain site, TSS was classified as high before the break in monitoring and moderate since. The more intensive land use, higher proportion of drains and lack of fringing vegetation upstream of the Wellesley Diversion Drain site is the likely cause for the observed differences in TSS concentrations.

Wellesley River



Total suspended solids concentrations, 2005–19 at site 612039. The shading refers to the SWRWQA classification bands.

Wellesley Diversion Drain



Total suspended solids concentrations, 2005–19 at site 6121220. The shading refers to the SWRWQA classification bands.

fresh marginal brackish saline

Cattle grazing is one of the major land uses in the Wellesley catchment, January 2009.

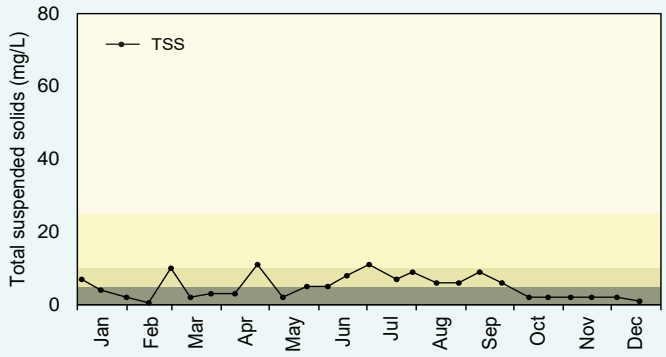
Total suspended solids (2019)

Concentrations

The Wellesley River sampling site showed a slight seasonal pattern in TSS concentrations in 2019. Concentrations increased in early June, coinciding with increased rainfall and flow before dropping again later in the year. There were also a couple of peaks in March and April. At the Wellesley Diversion Drain site, TSS did not show a clear seasonal pattern, being highest in early August. It is likely that this is being driven by irrigation runoff/returns which make up a larger portion of the flow at this site compared with the Wellesley River site.

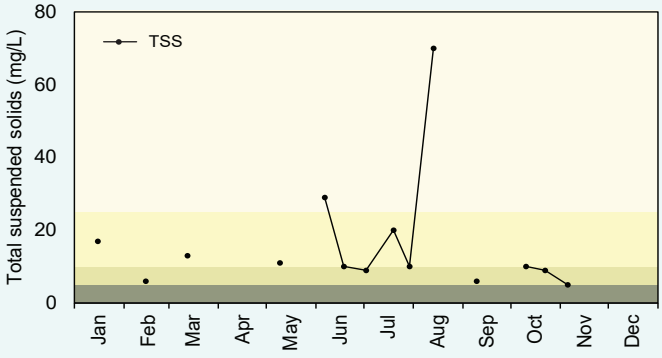
Where there are no data shown in the Wellesley Diversion Drain graph, the site was not flowing.

Wellesley River



2019 total suspended solids concentrations at 612039. The shading refers to the SWRWQA classification bands.

Wellesley Diversion Drain



2019 total suspended solids concentrations at 6121220. The shading refers to the SWRWQA classification bands.

fresh marginal brackish saline

Bank erosion is causing these trees to slowly tip over into the river. Fringing vegetation, including trees, help to stabilise the banks because when the fringing vegetation is lost, erosion occurs more quickly, contributing particulate matter to the river, January 2009.

Wellesley River

pH over time (2005–19)

pH values

The two sites in the Wellesley River catchment had similar pH values. pH fluctuated over the reporting period, with all annual medians (at both sites) falling within the upper and lower ANZECC trigger values.

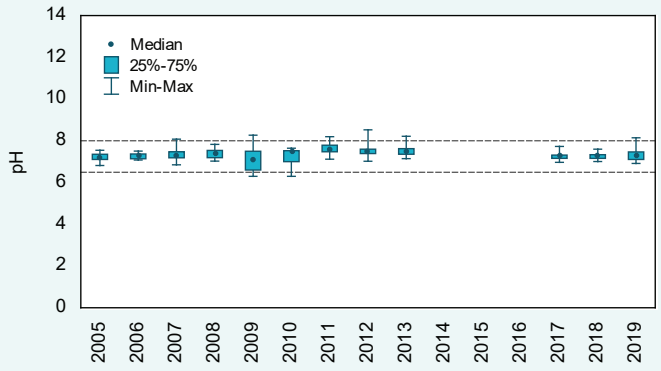
pH (2019)

pH values

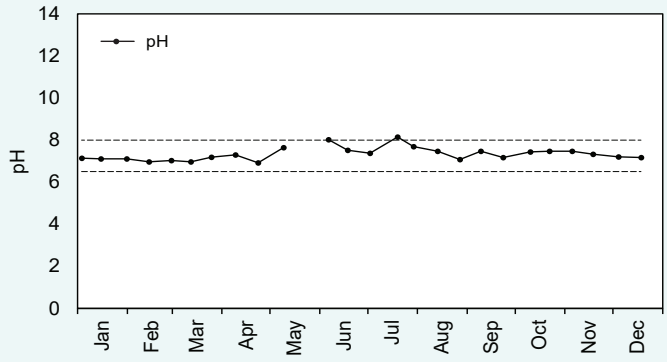
In 2019, there was some evidence of a seasonal pattern in pH values at the Wellesley River site (this was not evident in 2018). At the Wellesley Diversion Drain site, pH fluctuated during they year. Both sites had a small number of samples that fell above the upper ANZECC trigger value in 2019.

Where there are no data shown in the Wellesley Diversion Drain graph, the site was not flowing.

Wellesley River

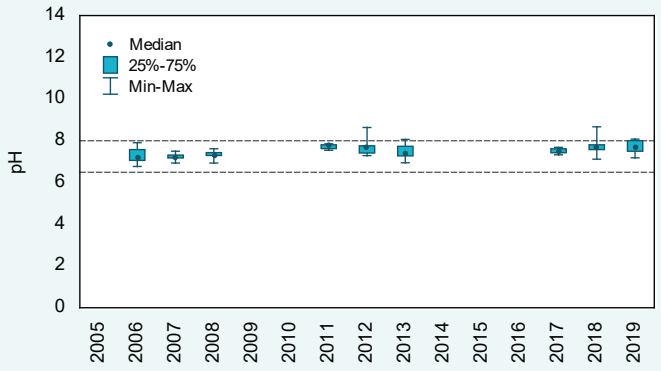


pH levels, 2005–19 at site 612039. The dashed lines are the upper and lower ANZECC trigger values.

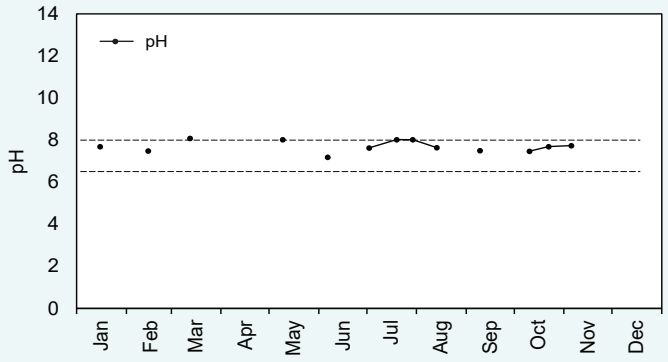


2019 pH levels at 612039. The dashed lines are the upper and lower ANZECC trigger values.

Wellesley Diversion Drain



pH levels, 2005–19 at site 6121220. The dashed lines are the upper and lower ANZECC trigger values.



2019 pH levels at 6121220. The dashed lines are the upper and lower ANZECC trigger values.

Wellesley River

Salinity over time (2005–19)

Concentrations

The Wellesley River sampling site was more saline than the Wellesley Diversion Drain site. Using the Water Resources Inventor 2014 salinity ranges, all years with sufficient data were classified as being brackish at the Wellesley River site. At the Wellesley Diversion Drain site, salinity was fresh salinity the break in monitoring and marginal since. (Note, in 2018, the SWRWQA bands were used).

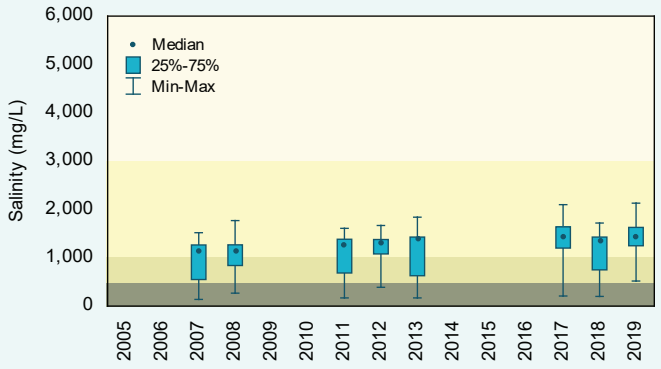
Salinity (2019)

Concentrations

Salinity at the Wellesley River site was generally higher at the beginning and end of the year and lower during the wetter months (though there were two peaks in salinity during this time). This suggests that the groundwater is more saline than the surface water at this site. This pattern was not evident at the Wellesley Diversion Drain site, which flowed only intermittently during the drier months. The reason for the peak in salinity in November at this site is unknown; it may be related to a discharge of more saline water into the drain somewhere upstream of the sampling site.

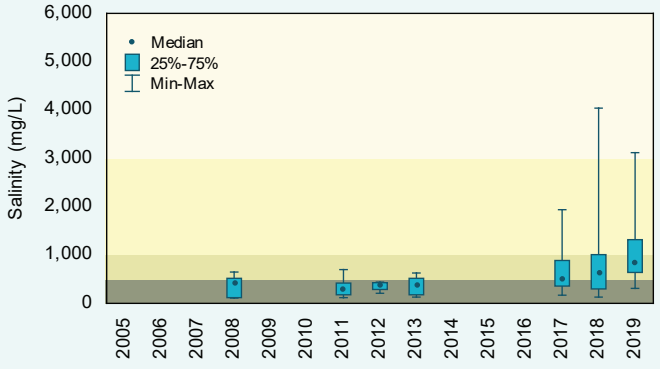
Where there are no data shown in the Wellesley Diversion Drain graph, the site was not flowing.

Wellesley River

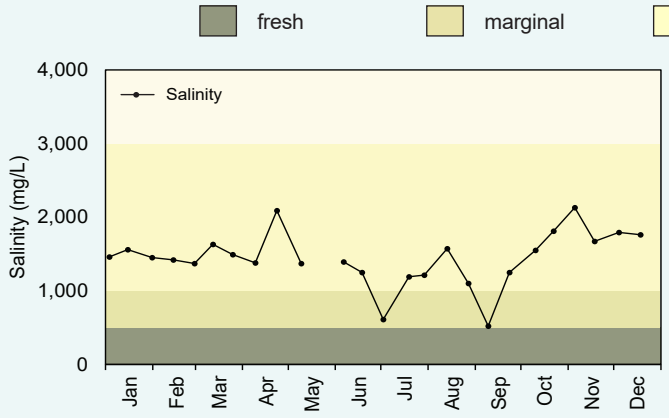


Salinity concentrations, 2005–19 at site 612039. The shading refers to the Water Resources Inventory 2014 salinity ranges.

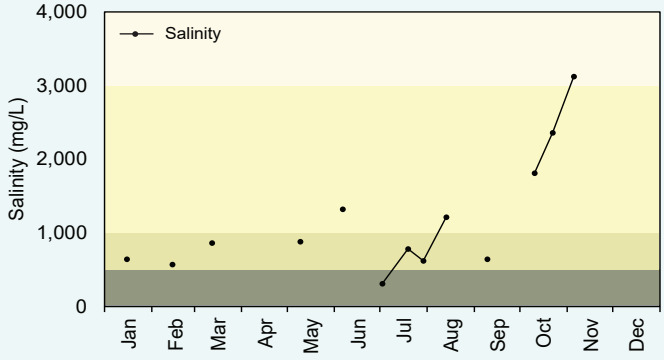
Wellesley Diversion Drain



Salinity concentrations, 2005–19 at site 6121220. The shading refers to the Water Resources Inventory 2014 salinity ranges.



2019 salinity concentrations at 612039. The shading refers to the Water Resources Inventory 2014 salinity ranges.



2019 salinity concentrations at 6121220. The shading refers to the Water Resources Inventory 2014 salinity ranges.

Wellesley 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 on 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 the Leschenault Estuary at estuaries.dwer.wa.gov.au/estuary/leschenault-estuary

Healthy Estuaries WA partners with the Leschenault Catchment Council to fund best-practice managment 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 Leschenault Catchment Council go to leschenaultcc.org.au
- To find out more about the health of the rivers in the Leschenault Catchment go to rivers.dwer.wa.gov.au/assessments/results

Methods

Variables were compared with the Leschenault Estuary water quality improvement plan concentration targets or ANZECC trigger values where available, or the SWRWQA bands or the 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.

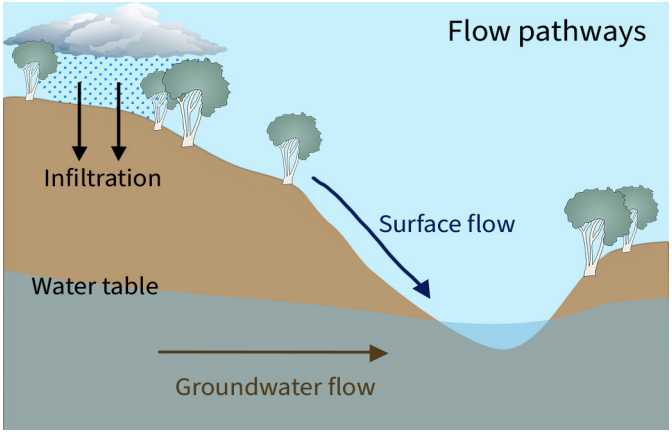
Laboratory limit of reporting: (LOR) this is the lowest concentration of an analyte that can be reported by a laboratory.

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.



Wellesley River Issue 2
Publication date: July 2023
ISSN: 2209–6779 (online only)