Department of Water and Environmental Regulation
Department of Biodiversity, Conservation and Attractions
GOVERNMENT OF WESTERN AUSTRALIA

Bannister Creek

Bannister Creek was once a natural system that has been highly modified to become a deeply incised, permanently flowing drainage network. It discharges into the Canning Estuary downstream of Kent Street Weir.

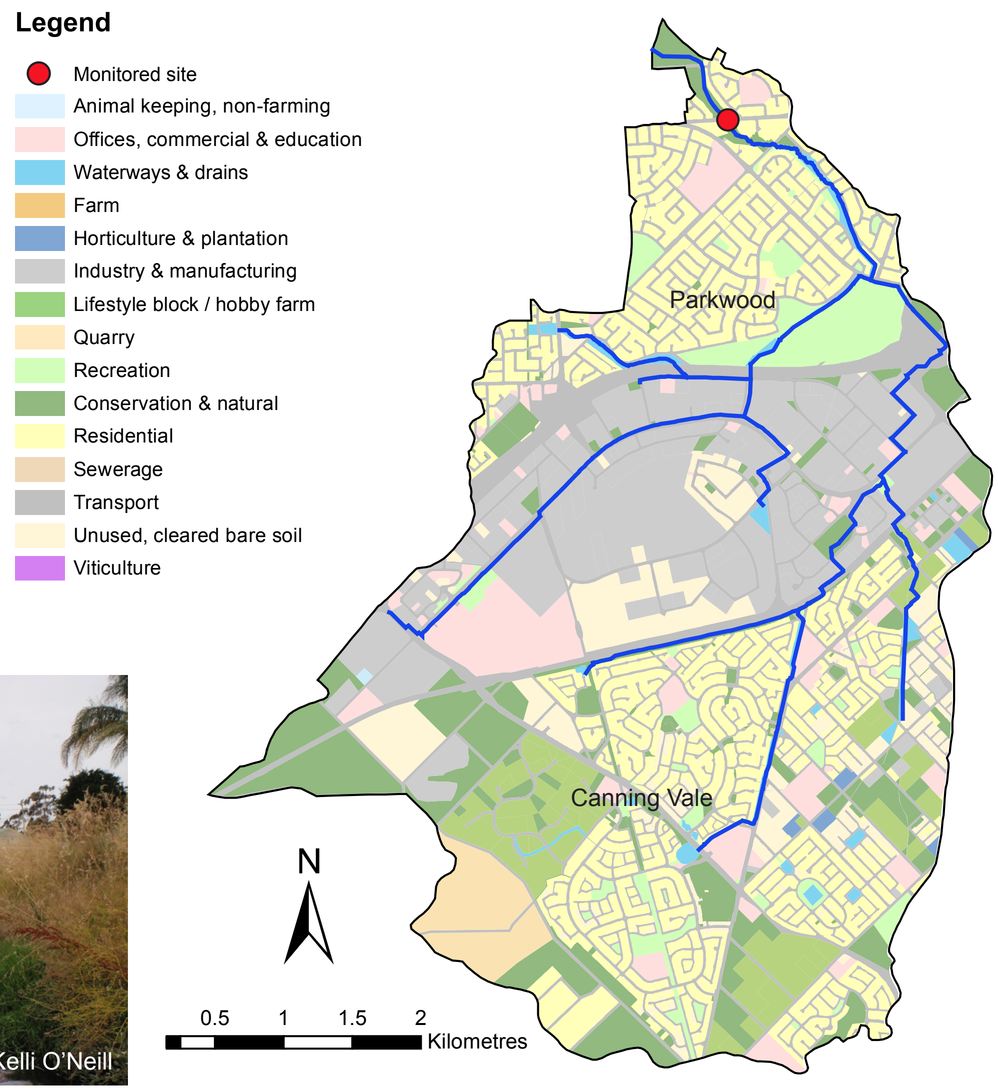
Most of the catchment has been cleared for industrial and residential uses. This has altered the flows entering the creek because hard surfaces, such as roads and roofs, don't retain water and it runs quickly into nearby compensating basins and waterways. Weeds including blackberry and hydrocotyle are an environmental concern in Bannister Creek.

The dominant soil types in the catchment are leached Bassendean and Southern River sands. During the dry summer months, groundwater is the principal water source into the drainage network. A part of the catchment's southern end lies over the Jandakot Underground Water Pollution Control Area.

Water quality is monitored fortnightly at a site near the catchment's lower end close to Hybanthus Road, shortly before Bannister Creek flows into the Canning Estuary. Flows were recorded at this site between 1988 and 1993, however since then only water quality has been monitored. The site is positioned to indicate what nutrients are leaving the catchment and entering the estuary. In 2007 a Department of Water and Environmental Regulation gauging station was constructed at Acacia Place in Lynwood.

Bannister Creek – facts and figures

Average rainfall (2012–16)	~ 680 mm per year (Perth metro)
Catchment area	23 km^2
Per cent cleared area (2005)	86%
River flow	Permanent No major water supply dams in catchment
Average annual flow	~ 5.2 GL per year (2012–16 average)
Main land uses (2005)	Residential, transport (roads), industry and manufacturing



Lliving stream site on Bannister Creek, four years after restoration works, October 2016.

Bannister Creek is a drain along much of its length, like this section here. November 2012.

Nutrient Summary: concentrations, estimated loads and targets

Year	Site	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Annual flow (GL)	616134			6.5*	5.8*	3.5*	5.6*	5.3*	6.7*	5.0*	3.4*	5.6*
TN median (mg/L)	SWS2	1.35	1.20	1.30	1.30	1.40	1.15	1.10	1.30	1.50	1.20	1.30
TP median (mg/L)	SWS2	0.080	0.076	0.071	0.080	0.092	0.094	0.084	0.100	0.105#	0.099	0.091
TN load (t/yr)	SWS2			8.70*	7.70*	4.62*	7.41*	6.64*	8.70*	6.30*	4.28*	6.98*
TP load (t/yr)	SWS2			0.44*	0.39*	0.26*	0.39*	0.40*	0.52*	0.40*	0.27*	0.45*

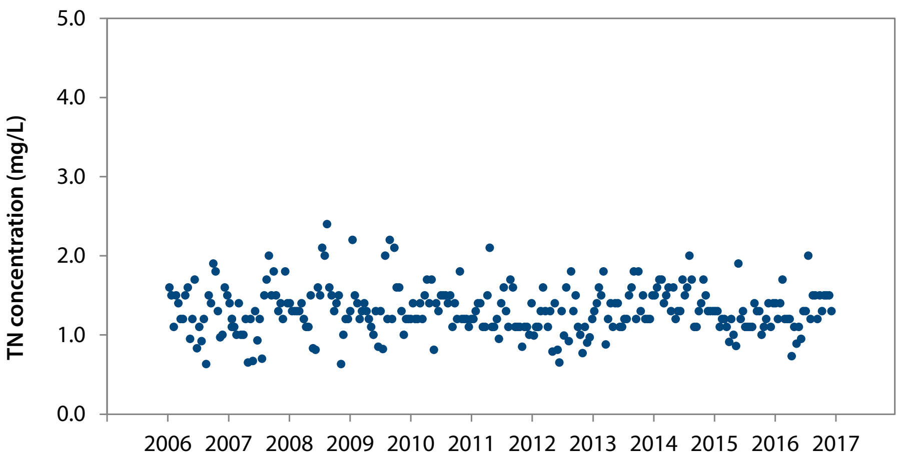
TN short term target = 2.0 mg/L   TN long term target = 1.0 mg/L   TP short term target = 0.2 mg/L   TP long term target = 0.1 mg/L

insufficient data to test target | failing both short and long-term target | passing short but failing long-term target | passing both short and long-term target

* Best estimate using available data.   # Statistical tests that account for the number of samples and large data variability are used for testing against targets on three years of winter data. Thus the annual median value can be above the target even when the site passes the target (or below the target when the site fails).

Changes in nutrient concentrations over time in Bannister Creek

Total nitrogen concentrations over the 2006 to 2016 monitoring period



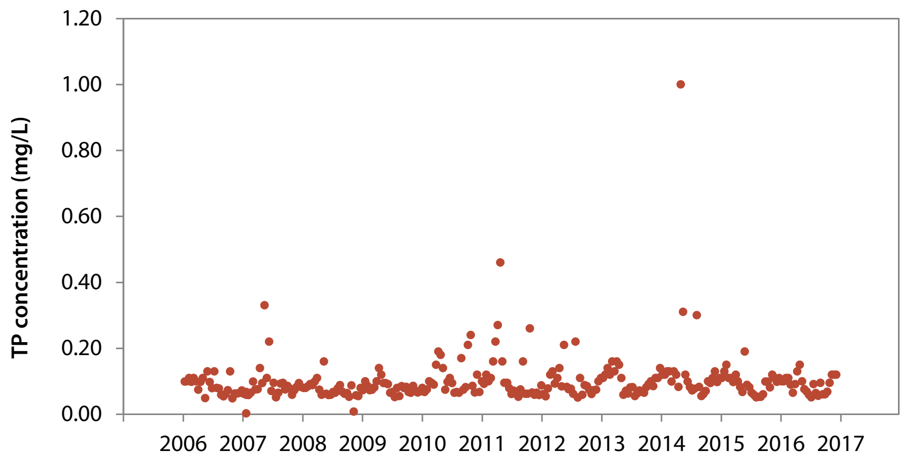
Trend

Visually, total nitrogen (TN) concentrations have remained stable over the reporting period. There was no short- or long-term trends detected (2012–16 and 2007–16 respectively).

Target

Bannister Creek has been passing the short-term but failing the long-term TN target for the reporting period.

Total phosphorus concentrations over the 2006 to 2016 monitoring period



Trend

Visually, total phosphorus concentrations (TP) have remained relatively stable over the reporting period. There was greater variability in TP concentrations around 2011, with a number of higher than normal concentrations recorded. The reason for these readings is unknown. No trends were detected in TP concentrations.

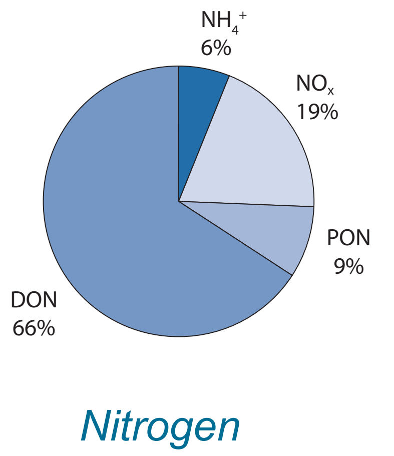
Tom Bateman Wetland October 2014. Photo: Water Science Branch.

Target

Bannister Creek has been passing the short- and long-term TP targets for the reporting period.

Nutrient fractions and estimated loads in Bannister Creek

Average composition of nitrogen (N) in Bannister Creek over the 2012 to 2016 monitoring period

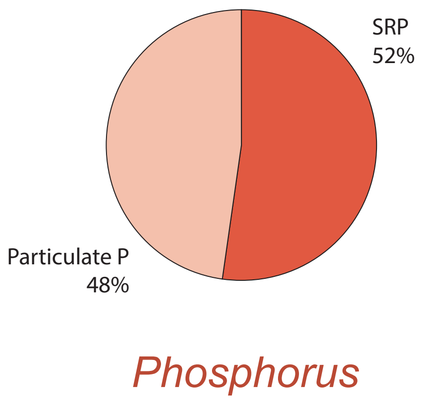


Three-quarters of the nitrogen (N) was present in the form of organic N which consists of dissolved (DON) and particulate (PON) fractions. DON is largely organic compounds leached from peaty sub-soils and wetlands, as well as degrading plant and animal matter and is available for uptake by plants, algae and bacteria. PON is mostly plant and animal debris and needs to be further broken down to become available. Dissolved inorganic N (DIN, consisting of ammonium – NH_4^+ and N oxides – NO_x) made up the remainder of the N and is mostly from animal wastes and fertilisers and is readily available for plant and algal uptake.

The average TN load (2012–16) is not particularly large compared to other catchments however the load per unit area (0.28 t/km²/yr) is the third-largest of the nine subcatchments with consistent flow data.

Average composition of phosphorus (P) in Bannister Creek over the 2012 to 2016 monitoring period

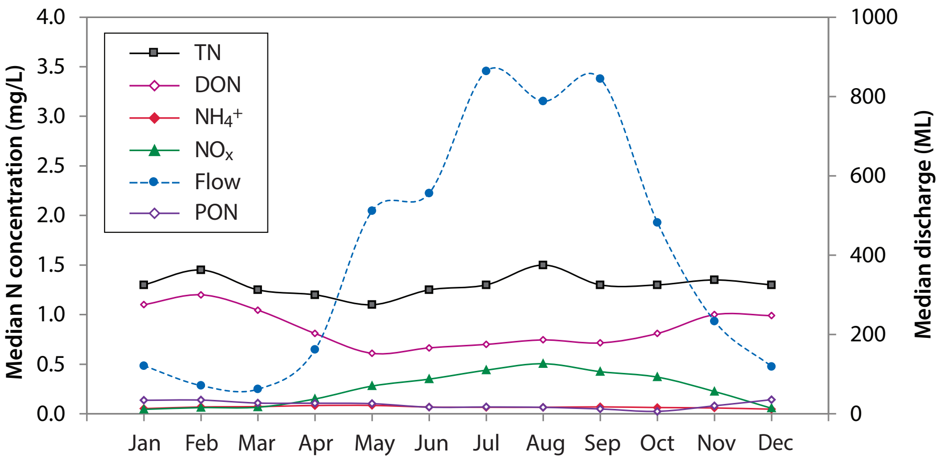
Marginally more phosphorus (P) was present as soluble reactive phosphorus (SRP) than particulate P. SRP is readily available for plant and algal uptake and is derived from animal waste, fertilisers and possibly industrial runoff. Old liquid waste disposal sites are another potential source of SRP. The particulate P is sourced from organic waste materials and sediment-bound forms of P. Particulate P is not readily available for plant and algal uptake, but may become available over time as particles decompose or bound phosphate is released.



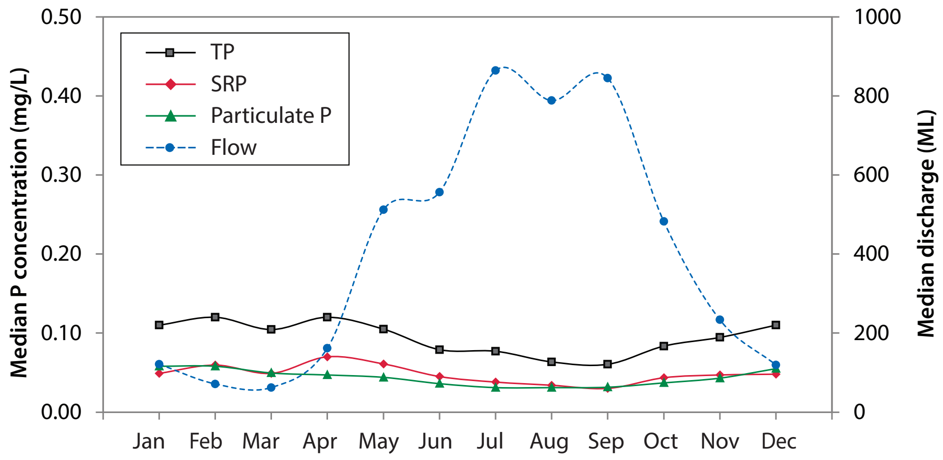
The average TP load (2012–16) in Bannister Creek is not particularly large compared to the other catchments however, the load per unit area (0.018 t/km²/yr) was the largest of the nine subcatchments with consistent flow data.

Seasonal variation in nutrient concentrations in Bannister Creek

Nitrogen seasonal variation over the 2012 to 2016 monitoring period



Phosphorus seasonal variation over the 2012 to 2016 monitoring period



Nitrogen

NO_x showed a seasonal response; increasing over the winter months in response to rainfall and flow. DON (and TN) decreased when winter flows started – suggesting that DON is entering the creek via groundwater and being diluted by surface runoff. As the groundwater table drops near the end of summer, DON concentrations reduced. Then, as winter rainfall recharges the groundwater, DON concentrations began to increase again. The catchment is situated on permeable Bassendean and Southern River sands that have a poor ability to retain nutrients. Water infiltrates readily into these soils, bringing with it nutrients leached from parks, gardens and golf courses. Most of the N is probably entering the creek year-round via groundwater or as discharge from industry and other pollution sources.

Phosphorus

P concentrations remained fairly steady throughout the year, indicating they were not generally influenced by season (or rainfall). The small peak in April was probably due to a first-flush effect whereby nutrients are washed into the creek via surface runoff following the first winter rains. Soils in the catchment have a very low capacity to retain phosphate leached from fertilisers. The dominant transport pathway for P is probably groundwater, discharge from industry and other sources, and recycling from sediments under favourable conditions.

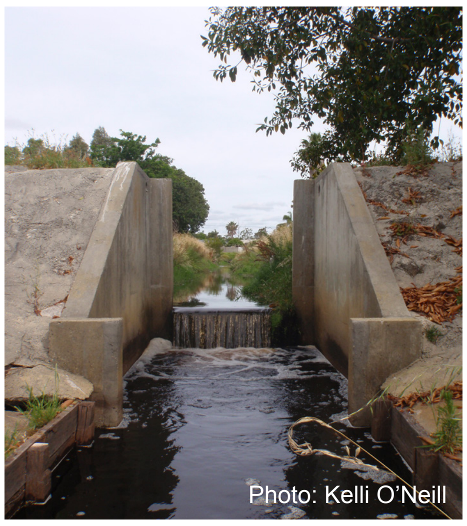


Photo: Kelli O'Neill

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Photographs of Bannister Creek: (Top left) The Bannister Creek sampling site, May 2016. (Bottom left) Riparian zone pre-restoration works, consisting almost completely of exotic species such as nasturtiums, arum lilies and blackberry, October 2010. (Right) A restored section of Bannister Creek, approximately four years post works, May 2016.

Local nutrient reduction strategies for Bannister Creek

Nutrient reduction strategies being undertaken or recently completed in the Bannister Creek catchment include but are not limited to:

- The Bannister Creek Urban Waterways Renewal Project, which aims to reduce nutrient concentrations and improve in-stream ecology by restoring the creek's lower reaches to attractive parkland and living streams while maintaining the stormwater conveyance function. The restoration includes weed control, planting of native vegetation and the installation of rock riffles.
- The 2015–17 Light Industry Program, a project delivered by the Department of Water and Environmental Regulation in partnership with the Department of Biodiversity, Conservation and Attractions (DBCA) and seven local governments in the Swan-Canning Catchment, including the City of Canning. Businesses in the Canning Vale light industrial area have been audited and provided recommendations or requirements to reduce the risk of releasing nutrient and non-nutrient contaminants into waterways and groundwater systems.
- The Hawkesbury Lakes and Vellogrove Avenue Waterways Project, through which over 90 000 seedlings have been planted since 2007 as well as several direct seeding projects. Bannister Creek Catchment Group restoration projects at Bannister Creek living stream, Tom Bateman Wetlands, Canning Vale Lake and Bannister Creek Reserve.
- Development and implementation of a *Management Plan for the Tom Bateman Wetlands* to reduce nutrient input to the wetlands.
- Review of the *Bannister Creek Reserve Management Plan*, which will provide updated information relating to the extensive restoration works that have been carried out since 1999.
- Implementation of management strategies identified in the Bannister Creek water quality improvement plan.
- Ongoing sub-regional partnership projects whereby the South East Regional Centre for Urban Landcare, DBCA, local governments and community groups are working together to deliver water quality and community-capacity building outcomes.
- The Phosphorus Awareness Project which assists the community in reducing their nutrient outputs through education, promotion and behaviour change programs.
- The DBCA's Healthy Catchments Program aims to protect the environmental health and community benefit of the Swan Canning river system by improving water quality in the catchments. This is achieved through engaging partners and focusing the effort of local governments, sub-regional groups, the community and other organisations in water quality improvement activities.

Swan Canning water quality improvement plan

The Swan Canning water quality improvement plan (SCWQIP) complements the River Protection Strategy (RPS) and presents a roadmap for reducing nutrient inputs into the Swan Canning river systems. It uses sophisticated modelling to identify nutrient sources and provides nutrient-reduction targets for each of the subcatchments.

The Bannister Creek catchment has a local WQIP that draws together activities for improving water quality in the catchment and helps to target future investment for better water quality outcomes.

SCWQIP load and concentration targets for Bannister Creek

	Max. load (t/yr)	Conc. target (mg/L)	% reduction
TN	3.9	0.50	68%
TP	0.55	0.050	33%

For further information on the RPS and the SCWQIP contact rivers.info@dbca.wa.gov.au

Photo: Water Science Branch

Summary: Bannister Creek

- Bannister Creek is currently passing both the short- and long-term TP targets.
- It is passing the short- but failing the long-term TN targets.
- Of the nine sites with flow data, Bannister Creek has the largest TP load per unit area and the second-largest TN load per unit area.
- Just over half of the P is present as bioavailable SRP.
- To enable it to meet the SCWQIP targets, Bannister Creek requires a 68% reduction in TN and a 33% reduction in TP.

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For further information please contact the
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