

St Leonards Creek

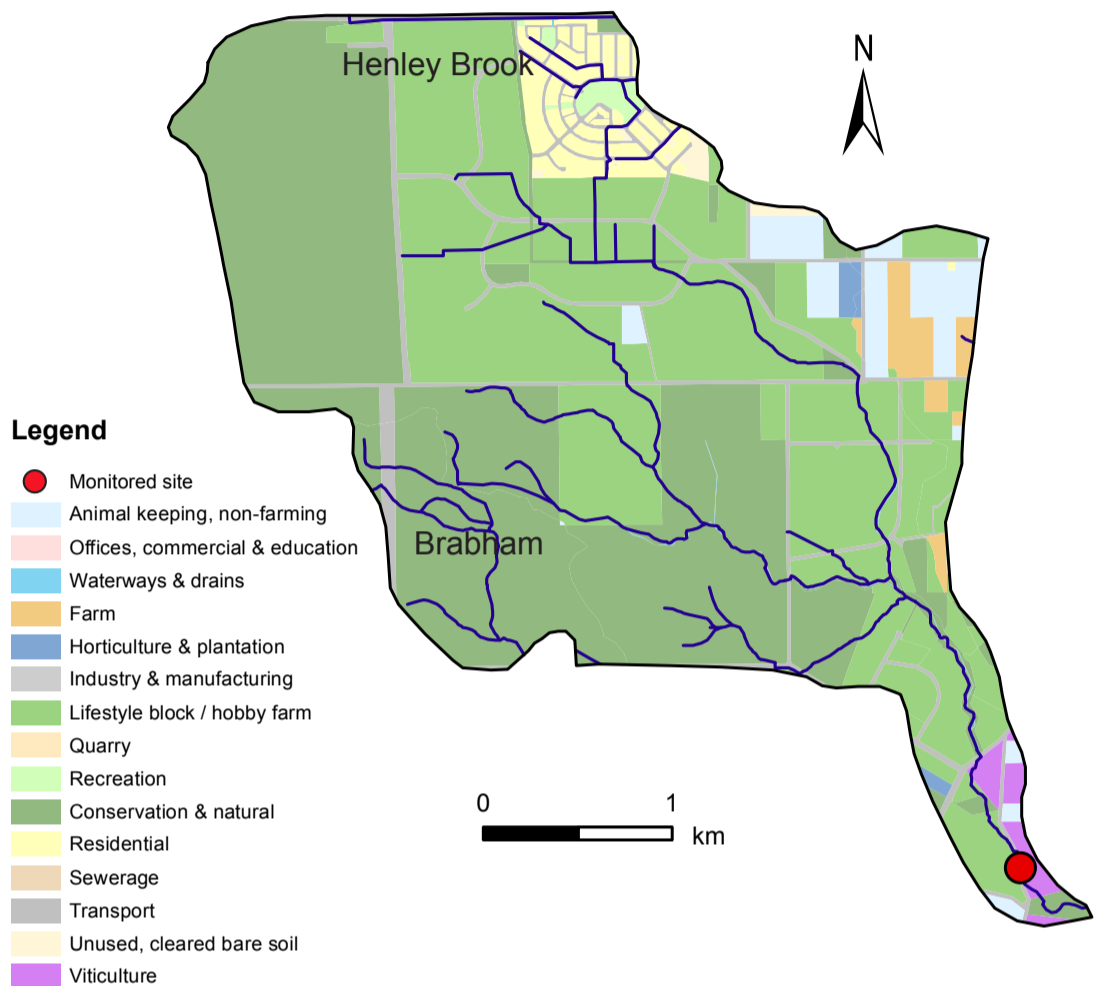
St Leonards Creek is a largely natural waterway which runs through bushland, lifestyle blocks and urban areas before discharging to the Upper Swan Estuary in West Swan. The creek is ephemeral, only flowing for a few months each year. Damming of the creek and the installation of water retention features such as sumps along the creek may have reduced the amount of water discharging from this catchment into the Upper Swan Estuary.

Prior to European colonisation, the abundance of water would have meant that the area was an important food resource. There are a number of identified Aboriginal sites of significance in the catchment and surrounding area.

Early settlers in the region typically ran several types of agriculture such as wheat crops, fruit and vegetables as well as livestock such as sheep and cattle. The catchment is now predominantly rural lifestyle blocks, with a small area of viticulture near the Upper Swan Estuary. It is located in the Swan urban growth corridor and rapid urban development is expected in the future.

Almost the entire catchment lies over highly permeable, leached Bassendean Sands. These soils have poor nutrient-retention capabilities so nutrients applied as fertiliser rapidly enter the underlying groundwater after the application of water.

Water quality is monitored fortnightly at a site located near the catchment's lower end, shortly before the creek flows into the Upper Swan Estuary in West Swan. This site is positioned to indicate what nutrients are leaving the catchment and flowing into the Upper Swan Estuary, so the data may not represent nutrient concentrations in upstream areas.



St Leonards Creek – facts and figures

Average rainfall (2012–16)	~ 680 mm per year (Perth metro)
Catchment area	11.6 km ²
Per cent cleared area (2005)	57%
River flow	Ephemeral creek, only flows for a few months each year
Major land uses (2005)	Lifestyle blocks/hobby farms and unused, cleared areas covered in grass



Ornamental lake in Henley Brook, February 2016.

Nutrient Summary: concentrations, rainfall and targets

Year	Site	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Annual rainfall (mm)	009225	466.8	703.0	807.8	607.2	503.8	860.8	608.2	782.4	674.4	617.8	715.8
TN median (mg/L)	SCCIN3		2.70			1.50	3.65	3.05	3.45	3.40	3.10	3.30
TP median (mg/L)	SCCIN3		0.115			0.096	0.160	0.120	0.165	0.170	0.130	0.140

TN short term target = 2.0 mg/L

TN long term target = 1.0 mg/L

TP short term target = 0.2 mg/L

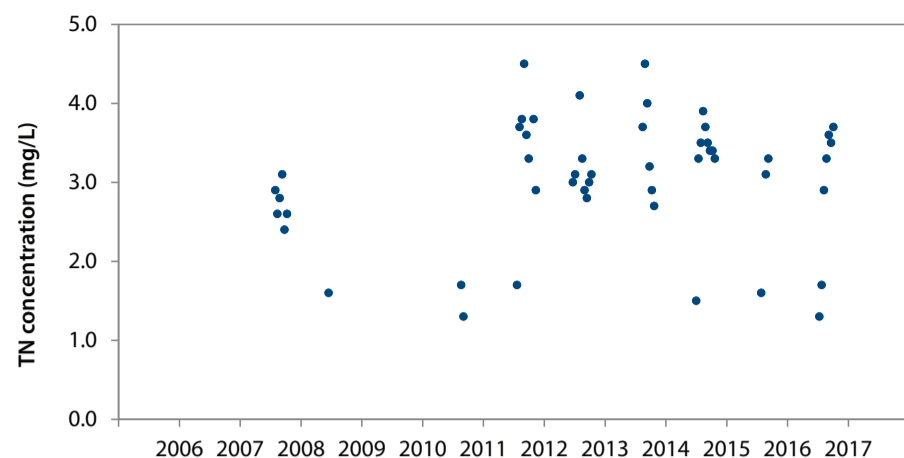
TP long term target = 0.1 mg/L

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 St Leonards Creek

Total nitrogen concentrations over the 2006 to 2016 monitoring period



Trend

Total nitrogen (TN) concentrations were relatively stable over the 2011 to 2016 reporting period. 2010 was a very dry year so the creek was only flowing on two sampling occasions. Statistical analysis did not detect a trend.

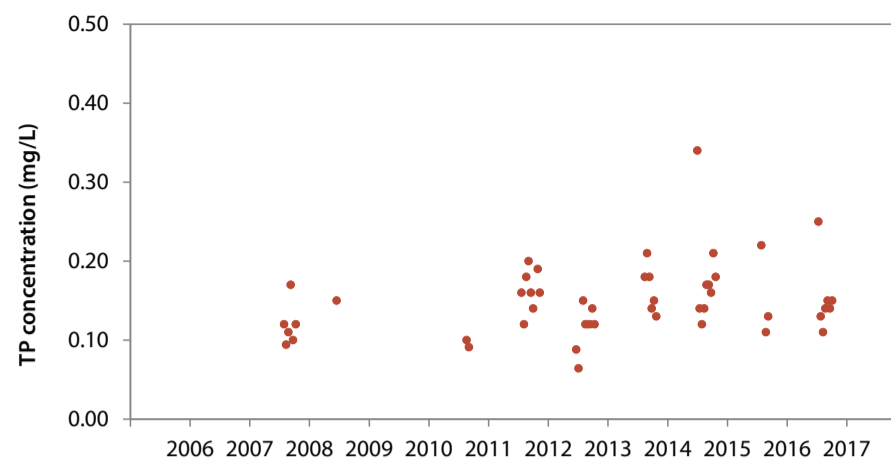
Target

St Leonards Creek has been failing the short- and long-term TN targets since monitoring commenced.



Private dam on St Leonards Creek, upstream of the sampling site, February 2016. Photo: Emma van Looij

Total phosphorus concentrations over the 2006 to 2016 monitoring period



Trend

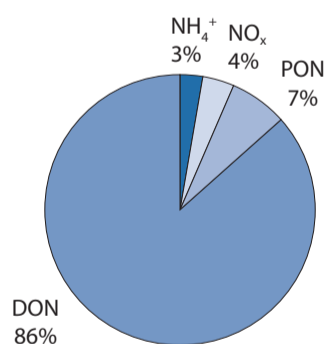
Total phosphorus (TP) concentrations were fairly stable over the reporting period. Statistical analysis did not detect any trends.

Target

St Leonards Creek has been passing the short-term but failing the long-term TP targets since monitoring commenced.

Nutrient fractions in St Leonards Creek

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



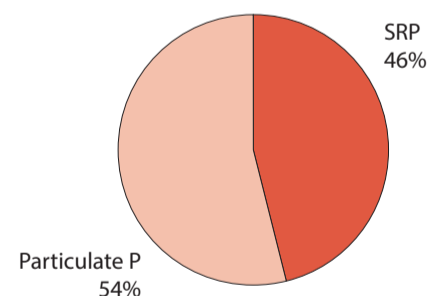
Nitrogen

Almost of all of the nitrogen (N) present in St Leonards Creek was in the form of organic N which consists of both dissolved (DON) and particulate (PON) fractions. DON largely comprises organic compounds leached from peaty soils, degrading plant and animal matter and synthetic compounds such as urea

which is used in fertilisers. This form of N is available for uptake by plants, algae and bacteria. PON is composed of plant and animal detritus and needs to be further broken down to become available to plants and algae. Dissolved inorganic N (DIN made up of ammonium – NH_4^+ and N oxides – NO_x) made up the remaining N. These forms are readily available to plants and algae. NH_4^+ and NO_x are derived from animal wastes and fertilisers used for agriculture and home gardens as well as septic tank leachate.

There were no flow data for St Leonards Creek so loads have not been calculated.

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



Phosphorus

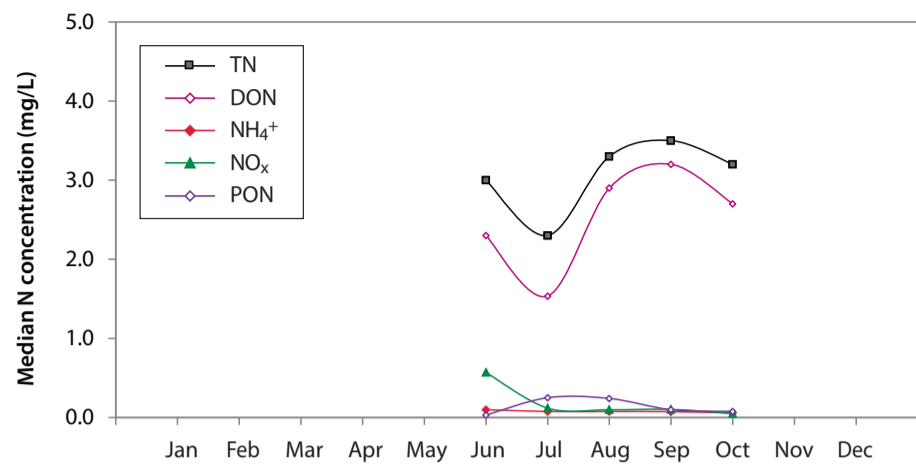
Just over half of the phosphorus (P) in St Leonards Creek was particulate P which is commonly associated with soil erosion, suspended sediments in the water column and organic material. This form of P is not readily bioavailable, but may become so as particles decompose and bound phosphate is released. The remainder of the P was present as soluble reactive phosphorus (SRP). Animal waste, fertilisers and septic tank leachate are common sources of SRP in semi-rural catchments. This form of P is readily available for plant and algal growth.

There were no flow data for St Leonards Creek so loads have not been calculated.

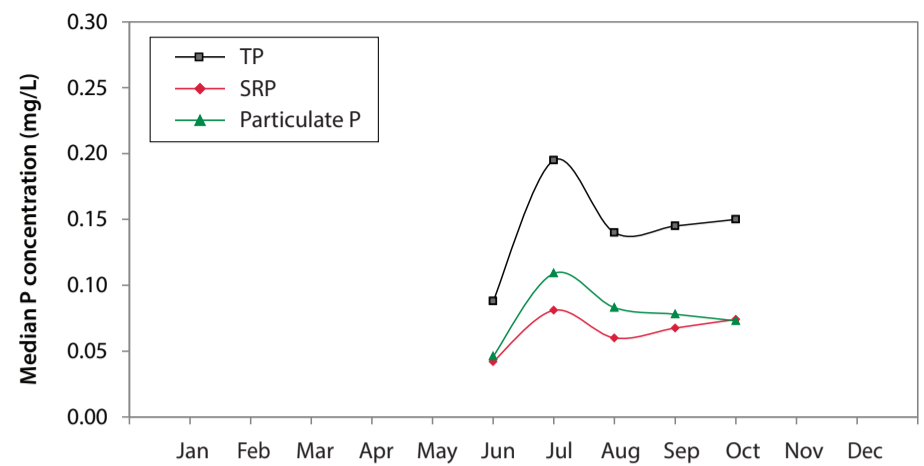


Seasonal variation in nutrient concentrations in St Leonards Creek

Nitrogen seasonal variation over the 2012 to 2016 monitoring period



Phosphorus seasonal variation over the 2012 to 2016 monitoring period



Nitrogen

Dissolved organic N and PON concentrations varied seasonally, increasing in autumn through winter and falling in spring. These increases coincide with flushing of DON and PON from surface soils and the surrounding catchment. Seasonal rises in regional groundwater levels, resulting in increased groundwater discharge (and hence DON and NO_x) into the creek also contribute to the N concentrations. The medians shown for June

and July were calculated from only a few data points collected during a time when the creek is usually dry.



Photo: Emma van Looij

Phosphorus

Soluble reactive P and particulate P concentrations varied seasonally, increasing in response to winter rains (and rising groundwater levels). SRP is transported to the creek by groundwater discharge and subsurface and surface runoff. Particulate P will be entering the creek via surface runoff as well as from instream sources such as algae and macrophytes. The medians shown for June and July were calculated from very few

datapoints collected at a time when the creek does not usually flow.



Photo: Emma van Looij



Photo: Katherine Bennett



Photo: Emma van Looij



Photo: Emma van Looij

Photographs of St Leonards Creek: (Top left) The St Leonards Creek sampling site, August 2017. (Bottom left) Urban stormwater treatment in Whiteman, February 2016. (Right) Creek in the upper catchment, where it crosses Murray Road in Brabham. There is little riparian vegetation present, February 2016.

Local nutrient reduction strategies for St Leonards Creek

Nutrient reduction strategies being conducted or recently completed in the St Leonards Creek catchment include but are not limited to:

- Development and implementation of the *Saint Leonards Creek water quality improvement plan (WQIP)* by the Department of Biodiversity, Conservation and Attractions (DBCA) in partnership with the City of Swan.
- The City of Swan ensuring widespread use of Water Sensitive Urban Design in new urban estates in the catchment.
- New requirements for residents with aerobic treatment units to submit three, six or 12 monthly reports to the City of Swan depending on the unit type.
- Foreshore assessments which have begun to enable prioritisation of revegetation activities.
- Horse industry workshops which have been run by Perth NRM to improve management practices on horse properties to reduce nutrients entering the Swan and Canning rivers.
- 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.
- Coordination and support of community led projects to reduce nutrient inputs into the Swan River in the north sub-region led by the City of Swan and funded by the DBCA.

- The Phosphorus Awareness Project which aims to assist the community in reducing their nutrient outputs through education, promotion and behaviour change programs.

Swan Canning water quality improvement plan

The *Swan Canning water quality improvement plan (SCWQIP)* complements the delivery of other major programs and presents a roadmap for reducing nutrient inputs into the river system. It uses sophisticated modelling to identify nutrient sources and provides nutrient-reduction targets for each of the subcatchments.

The St Leonards 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 St Leonards Creek

	Max. acceptable load (t/yr)	Concentration target (mg/L)	% reduction required
TN	0.5	1	64%
TP	0.1	0.1	29%

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



Vineyards are still present in the lower parts of the St Leonards Creek Catchment, February 2016. Photo: Emma van Looij

Summary: St Leonards Creek

- St Leonards Creek is currently failing both the short- and long-term TN targets and passing the short- but failing the long-term TP targets.
- Of the 33 sites sampled, St Leonards Creek has the highest median TN and one of the highest median TP concentrations.
- The percentage of N present as DIN is the equal lowest of the 33 sites sampled.
- Overall, a 64% reduction in TN and a 29% reduction in TP is required for this catchment to meet its SCWQIP targets.

