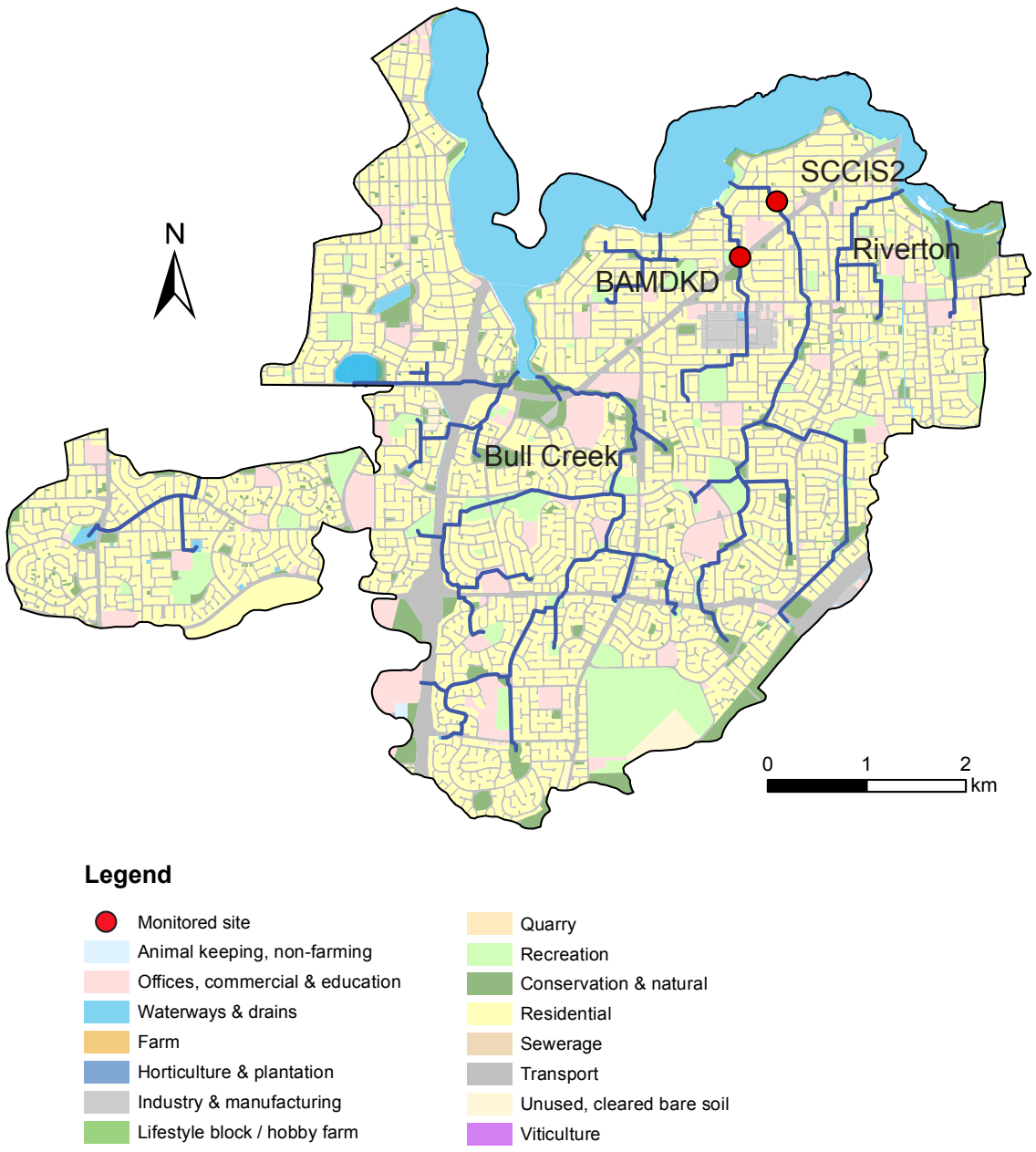
Bull Creek

The Bull Creek catchment is highly modified and consists of a series of drains which discharge into the Canning River. There are small areas of remnant vegetation present in Bull Creek Reserve and around some of the wetlands such as Booragoon Lake.

The Creek was named after an early settler, Lieutenant Henry Bull of the Royal Navy, who explored the Canning River and to whom a grant of land was made in 1830. Prior to European settlement, the Wadjuk Beeliar people used the Bull Creek Wetlands as a source of food and fresh water in summer.

The soils in the catchment are predominantly Bassendean Sands in the east and Spearwood Sands with areas of Forrestfield and Guildford Soils in the west. They tend to have poor nutrient retention capacity so any nutrients applied to the surface have the potential to quickly mobilise into the waterways.

Water quality samples are collected fortnightly from two sites located in different subcatchments within the Bull Creek catchment. Each site is located near the discharge point of the drain into the Canning River. These sites give an indication of the nutrient concentrations leaving these two subcatchments and entering the Canning River. They do not represent nutrient concentrations in upstream areas, nor do they give an indication of the water quality in the other subcatchments.



The SCCIS2 sampling site, August 2017.

Bull Creek – facts and figures

Average rainfall (2012–16)	~ 680 mm per year (Perth metro)
Catchment area	42 km^2
Per cent cleared area (2005)	92% (total catchment)
River flow	Dries over summer though not every year No major water supply dams in catchment
Main land uses (2005)	Residential and transport (roads) (total catchment)

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)	SCCIS2		0.80			0.81	0.83	0.78	0.79	0.87	0.76	0.81
TP median (mg/L)	SCCIS2		0.065			0.072	0.062	0.067	0066	0.070	0.062	0.066
TN median (mg/L)	BAMDKD							0.89	0.82	0.93#	0.85#	0.99#
TP median (mg/L)	BAMDKD							0.091	0.087	0.115#	0.076	0.062

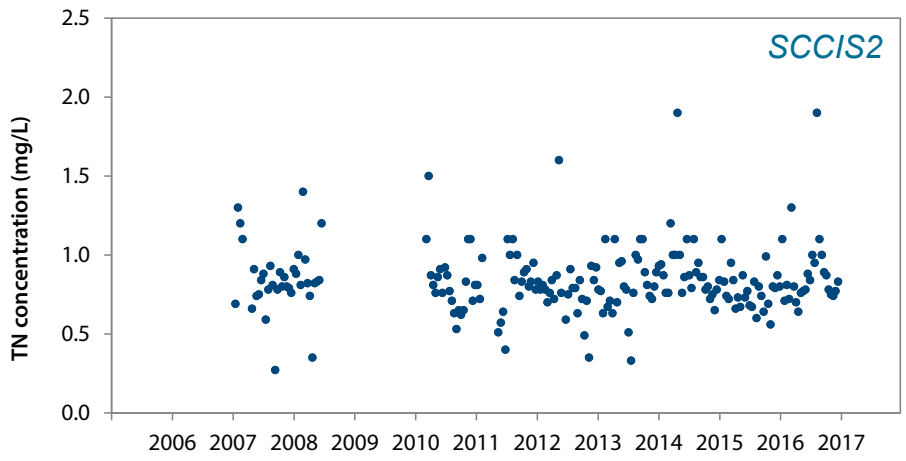
TN short term target = 2.0 mg/L TN long term target = 1.0 mg/L TP short term target = 0.2 mg/L TP long term target = 0.1 mg/L

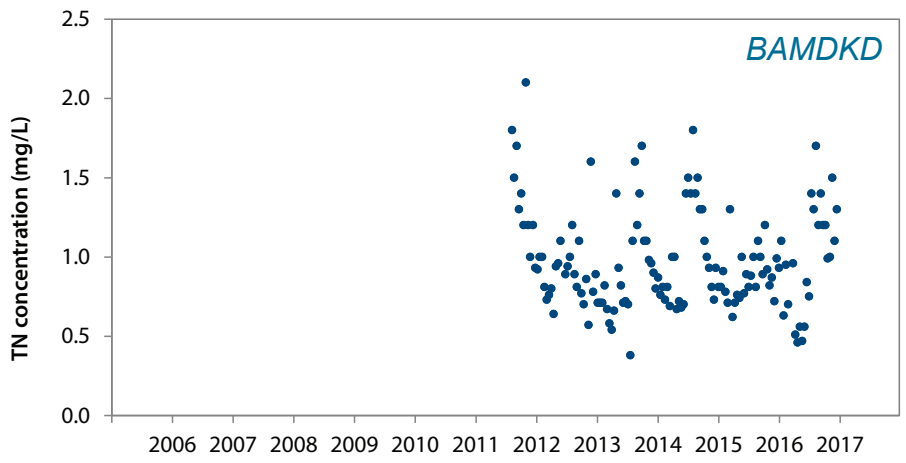
insufficient data to test target failing both short and long-term target passing short but failing long-term target passing both short and long-term target

* 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).

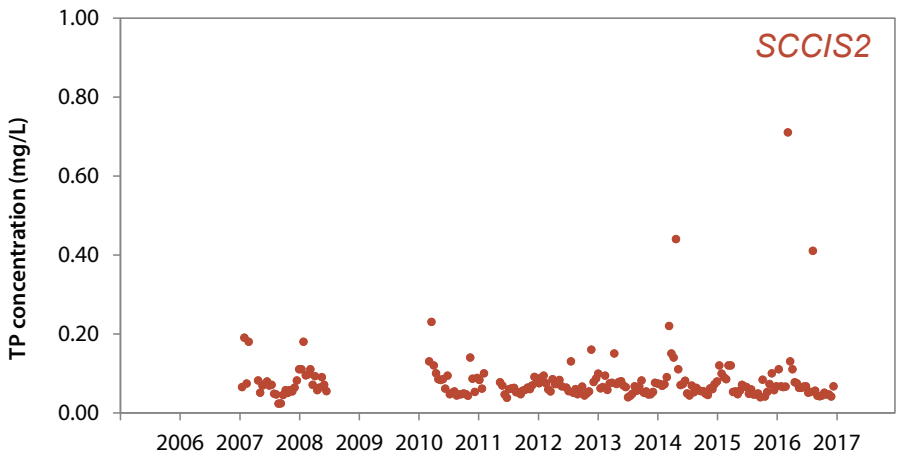
Changes in nutrient concentrations over time in Bull Creek

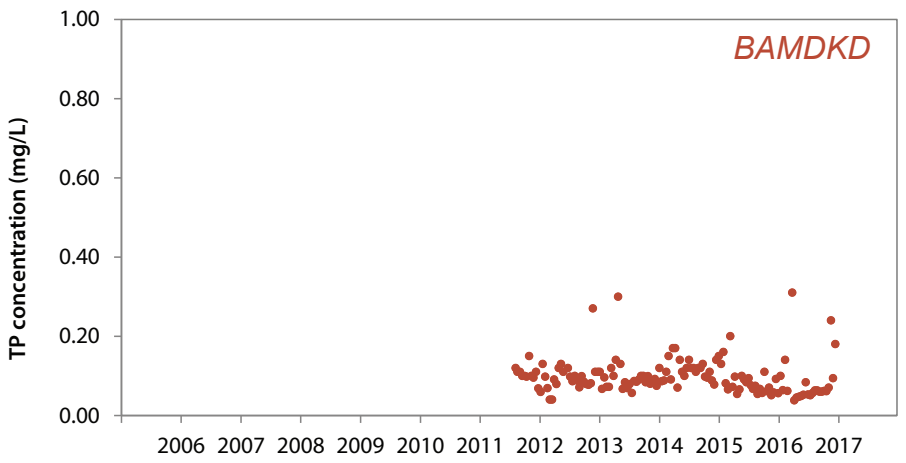
Total nitrogen concentrations over the 2006 to 2016 monitoring period





Total phosphorus concentrations over the 2006 to 2016 monitoring period





Trend

Total nitrogen (TN) concentrations appear stable at both sites. The concentration range was higher at BAMDKD, the site with a smaller catchment. No trends were detected in TN concentrations at either SCCIS2 or BAMDKD.

Target

SCCIS2 was passing the short- and long-term TN targets. BAMDKD was passing the short-term but failing the long-term TN targets.

Trend

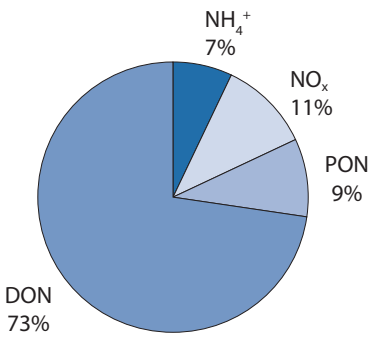
Total phosphorus (TP) concentrations appear stable at SCCIS2. At BAMDKD, TP concentrations have fluctuated, increasing between 2013 to mid 2014 before decreasing again. No trends were detected.

Target

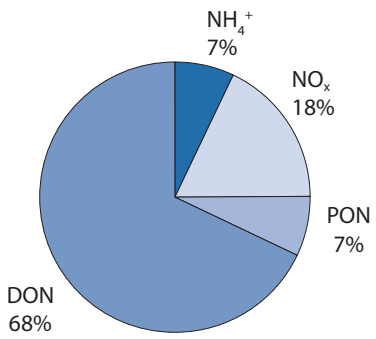
Both sites in the Bull Creek catchment were passing the short- and long-term TP targets.

Nutrient fractions in Bull Creek

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



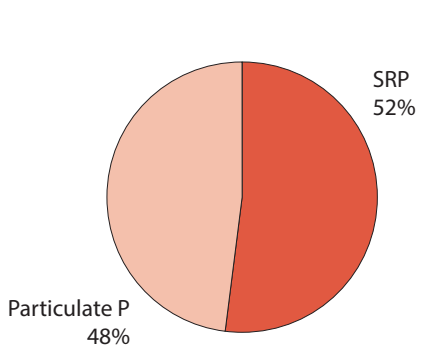
SCCIS2



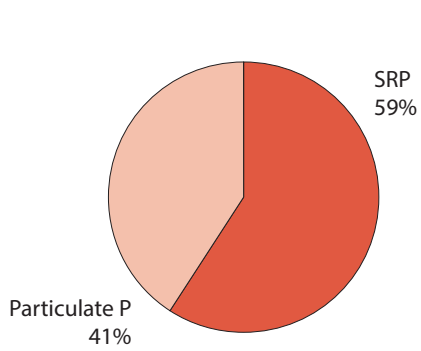
BAMDKD

Nitrogen (N) composition was similar at both sites with most of the N present in the form of dissolved organic N (DON). This largely comprises organic compounds leached from peaty sub-soils and degrading plant and animal matter and is available for uptake by plants, algae and bacteria. Particulate organic N (PON) is composed of plant and animal debris and needs to be further broken down to become available to plants and algae. The remaining N was present as dissolved inorganic N (DIN, consisting of ammonium – NH_4^+ and N oxides – NO_x) which is mostly derived from animal waste and fertilisers and is readily available for plant and algal uptake.

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



SCCIS2



BAMDKD

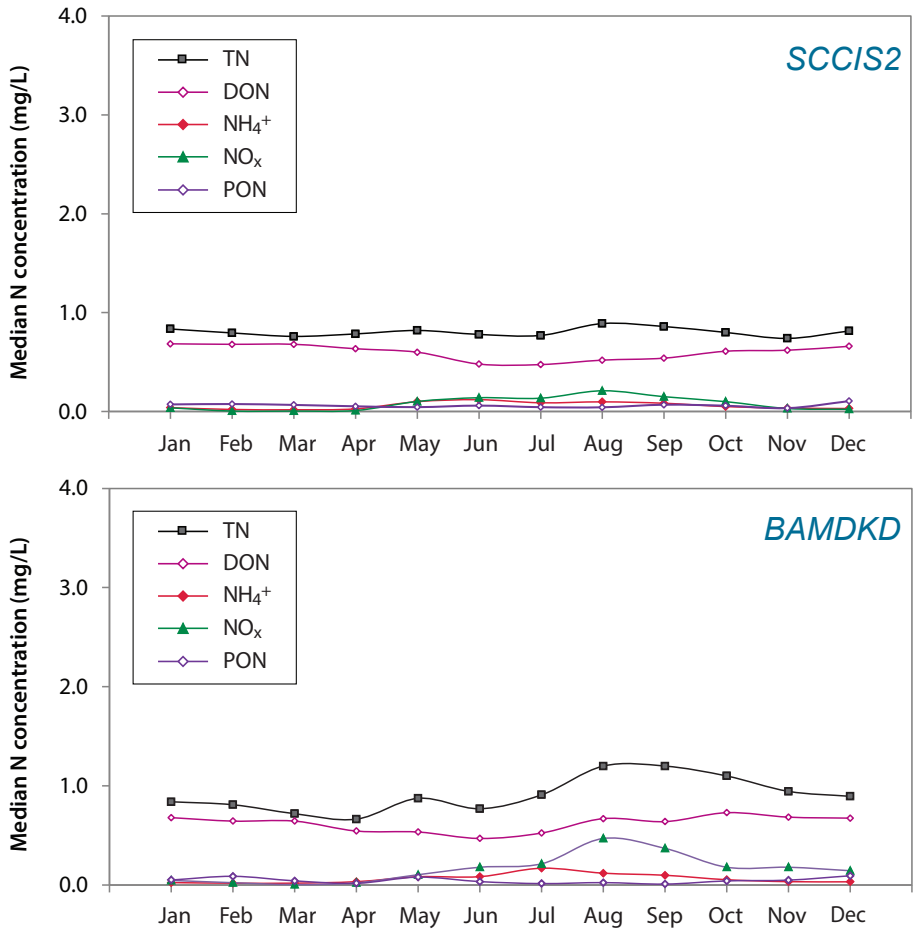
Phosphorus (P) composition was also similar at both sites with just under half present as particulate P which consists of sediment-bound forms of P and organic material. Particulate P is not readily available for plant and algal uptake, but may become available over time as particles decompose or release bound phosphate.

Soluble reactive phosphorus (SRP) is derived from fertilisers and animal waste and is readily available for plant and algal uptake. It made up the remaining P.

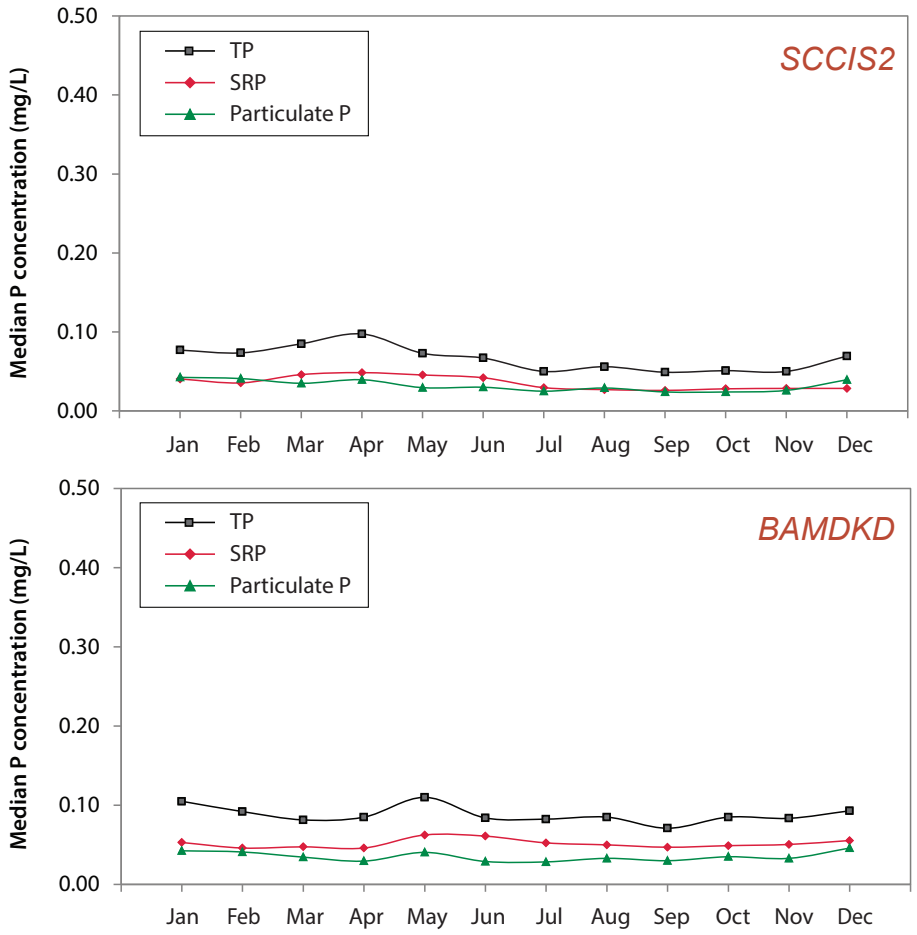
There were no flow data for Bull Creek so loads have not been calculated.

Seasonal variation in nutrient concentrations in Bull Creek

Nitrogen seasonal variation over the 2012 to 2016 monitoring period



Phosphorus seasonal variation over the 2012 to 2016 monitoring period



Nitrogen

N concentrations behaved similarly at both sites. NO_x and, to a lesser extent, NH_4^+ showed a seasonal response, suggesting that they are entering the drains via surface and subsurface flows following rainfall. DON appears to be entering the drain via groundwater as it decreased as rainfall and flow increased.

Phosphorus

Phosphorus concentrations behaved similarly at both sites with SRP and, to a lesser extent, particulate P concentrations increasing around the time winter rains commenced. This suggests that it is entering the drain via surface flows during the first flush event. For the rest of the year P concentrations were fairly steady indicating that it is entering the drain via both groundwater and surface runoff.

Photo: Water Science Branch

Photo: Water Science Branch

Photo: Water Science Branch

Photographs of Bull Creek: (Top left) The BAMDKD sampling site, July 2015. (Bottom left) One of the numerous discharge points from the Bull Creek catchment to the Canning River, November 2005. (Right) A highly modified urban drain running behind houses in the Bull Creek catchment, November 2012.

Local nutrient reduction strategies for Bull Creek

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

- Development and implementation of the *Bull Creek Water Quality Improvement Plan* (WQIP); a partnership program between the Department of Biodiversity, Conservation and Attractions (DBCA), Cities of Melville and Canning, the South East Regional Centre for Urban Landcare (SERCUL), the Water Corporation, Main Roads, Friends of Bull Creek Catchment and the Canning River Residents Environment Protection Association (CRREPA). The WQIP has a focus on;
  - the creation of a living stream along the Brentwood Main Drain,
  - catchment water quality monitoring,
  - facilitating student research,
  - revegetation of Bull Creek,
  - redesign of priority inlet structures in major wetlands,
  - the redesign of a Main Roads compensating basin to improve water quality leaving the site and entering the Brentwood Living Stream,
  - an oil pollutant trap on Leach Highway to protect the Bull Creek foreshore area from potential spills, and
  - conversion of Frederick Baldwin Lake into a wetland with water quality improvement potential.
- Riverwise Sustainable Gardening Workshops Autumn series to be held in 2017.
- City of Melville staff participated in Water Sensitive Urban Design training supported by DBCA.
- City of Melville Stormwater Environmental Management Plan drafted to investigate and recommend stormwater management treatment measures.
- City of Canning drain redesign which involved retrofitting existing drainage at Wadjup Point and a site opposite Riverton Drive to improve the quality of the water flowing into the Canning River.
- Friends of Bull Creek Catchment Group's restoration projects along Bull Creek and its foreshore as well as Friends of Booragoon and Blue Gum Lakes restoration projects.
- CRREPA foreshore restoration and drainage interventions which have enhanced habitat around a popular waterbird roosting site at Beatrice Avenue foreshore and other points along the foreshore.
- The DBCA's Riverbank Program funded numerous projects across eight Canning River foreshore sites in the Bull Creek catchment including; construction of drain swales, stabilisation of shorelines using bioengineering, and restoration using weed control and revegetation. Examples include Shelley Beach and Prisoners Point.
- The DBCA's Healthy Catchments Program which 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.
- Ongoing sub-regional projects: Coordination and support of community led projects to reduce nutrient inputs into the Canning River in the south subregion led by SERCUL and funded by the DBCA.
- The Phosphorus Awareness Project which assists the community in reducing their nutrient outputs through education, promotion and behaviour change programs.
- The 2015–17 Light Industry Program, a project delivered by the Department of Water and Environmental Regulation in partnership with DBCA and seven local governments in the Swan Canning Catchment, including the City of Canning and City of Melville. Businesses in Willeton and Myaree light industrial areas have been audited and provided with recommendations or requirements to reduce the risk of releasing nutrient and non-nutrient contaminants into waterways and groundwater systems.

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 Bull 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 Bull Creek

	Max. acceptable load (t/yr)	Concentration target (mg/L)	% reduction required
TN	4.9	0.5	56%
TP	1.01	0.05	16%

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

Summary: Bull Creek

- Site SCCIS2 is currently passing both the short- and long-term TN and TP targets. Site BAMDKD is passing the short-term target for TN and both the short- and long-term targets for TP.
- The catchment as a whole needs a 56 per cent reduction in TN and a 16 per cent reduction in TP to enable it to pass the SCWQIP targets.
- More than 50% of the P is present as bioavailable SRP at both sites in this catchment.
- BAMDKD has the fourth highest proportion of P present as bioavailable SRP of the 33 sites sampled.
- Of the 33 sites sampled, SCCIS2 has the fourth lowest proportion of N present as bioavailable DIN.

www.dwer.wa.gov.au
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For further information please contact the
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