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 Zone in the east and Spearwood Zone 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 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.

**Bull Creek – facts and figures**

<table>
<thead>
<tr>
<th>Average rainfall (2010–14)</th>
<th>~ 686 mm per year (Perth metro)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catchment area</td>
<td>42.3 km² (total catchment)</td>
</tr>
<tr>
<td>Per cent cleared area</td>
<td>92% (total catchment)</td>
</tr>
<tr>
<td>(2005)</td>
<td></td>
</tr>
<tr>
<td>River flow</td>
<td>Dries over summer though not every year</td>
</tr>
<tr>
<td></td>
<td>No major water supply dams in catchment</td>
</tr>
<tr>
<td>Main land uses (2005)</td>
<td>Residential and transport (roads) (total catchment)</td>
</tr>
</tbody>
</table>

**Nutrient Summary: concentrations, rainfall and targets**

<table>
<thead>
<tr>
<th>Year</th>
<th>Site</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual rainfall (mm)</td>
<td>009225</td>
<td>703.0</td>
<td>807.8</td>
<td>607.2</td>
<td>503.8</td>
<td>860.8</td>
<td>608.2</td>
<td>782.4</td>
<td>674.4</td>
</tr>
<tr>
<td>TN median (mg/L)</td>
<td>SCCIS2</td>
<td>0.80</td>
<td></td>
<td></td>
<td>0.81</td>
<td>0.83</td>
<td>0.78</td>
<td>0.79</td>
<td>0.87</td>
</tr>
<tr>
<td>TP median (mg/L)</td>
<td>SCCIS2</td>
<td>0.065</td>
<td></td>
<td></td>
<td>0.072</td>
<td>0.062</td>
<td>0.067</td>
<td>0.066</td>
<td>0.070</td>
</tr>
<tr>
<td>TN median (mg/L)</td>
<td>BAMDKD</td>
<td></td>
<td></td>
<td></td>
<td>0.89</td>
<td>0.82</td>
<td>0.93*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TP median (mg/L)</td>
<td>BAMDKD</td>
<td></td>
<td></td>
<td></td>
<td>0.091</td>
<td>0.087</td>
<td>0.115*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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).
Nutrient fractions in Bull Creek

Average composition of nitrogen (N) in Bull Creek over the 2010 to 2014 (SCCIS2) and 2012 to 2014 (BAMDKD) monitoring period

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 is present as dissolved inorganic N (DIN, consisting of ammonium – $\text{NH}_4^+$ and N oxides – $\text{NO}_x$) 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 2010 to 2014 (SCCIS2) and 2012 to 2014 (BAMDKD) monitoring period

Phosphorus (P) composition was also similar at both sites with around half of the P 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 makes up the remaining P.
Seasonal variation in nutrient levels in Bull Creek

Nitrogen seasonal variation over the 2010 to 2014 (SCCIS2) and 2012 to 2014 (BAMDKD) monitoring period

N concentrations behaved slightly differently at both sites. NO\textsubscript{x} and, to a lesser extent, NH\textsubscript{4}\textsuperscript{+} showed a seasonal response at both sites, 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 decreases as rainfall and flow increase.

Phosphorus seasonal variation over the 2010 to 2014 (SCCIS2) and 2012 to 2014 (BAMDKD) monitoring period

P concentrations behaved similarly at both sites with SRP and, to a lesser extent, particulate P concentrations increasing shortly after 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 are fairly steady indicating that it is entering the drain via both groundwater and surface runoff.

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 Parks and Wildlife, 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). It has a particular 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,
  - the design of an oil pollutant trap on Leach Highway to protect the Bull Creek foreshore area from potential spills.
- City of Melville Stormwater Environment Management Plan drafted to investigate and recommended stormwater management treatment measures.
- City of Canning drain redesigns. Retrofitting existing drainage at Wadup Point and a site opposite 235 Riverton Drive to improve 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.
- Riverbank has 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 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 a ‘catchment to coast’ approach and by engaging in partnerships that focus 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 Swan River in the south sub-region led by SERCUL and funded by the Department of Parks and Wildlife.
- The Phosphorus Awareness Project 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 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

<table>
<thead>
<tr>
<th></th>
<th>Max. acceptable load (t/yr)</th>
<th>Concentration target (mg/L)</th>
<th>% reduction required</th>
</tr>
</thead>
<tbody>
<tr>
<td>TN</td>
<td>4.9</td>
<td>0.5</td>
<td>56%</td>
</tr>
<tr>
<td>TP</td>
<td>1.01</td>
<td>0.05</td>
<td>16%</td>
</tr>
</tbody>
</table>

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

Summary: Bull Creek

- Site SCCIS1 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 percent reduction in TN to enable it to pass the SCWQIP target, this is the fourth largest reduction required of the 12 catchments in this series of nutrient reports.
- SCCIS2 had the third lowest median TN concentration of the 12 catchments in this series of nutrient reports.
- Of the 12 catchments in this series of nutrient reports, SCCIS2 had the third lowest proportion of N present as bioavailable DIN.
- BAMDKD had the third highest proportion of P present as bioavailable SRP of the 12 catchments in this series of nutrient reports.