Dirk Brook – Punrak Drain

Dirk Brook begins on the Darling Plateau before flowing onto the Swan Coastal Plain where it is joined by Myara Brook. To the north, Karnet Brook also flows from the plateau, becoming Karnet Drain before its confluence with Dirk Brook. It is at this point the modified drainage system is re-named Punrak Drain.

Punrak Drain flows into Lake Amarillo, one of the Serpentine Lakes. It is responsible for contributing large amounts of nutrients, especially nitrogen, to the Serpentine River and lakes and depositing sediment at the drain’s outflow – widening the delta.

Since July 2006, water quality has been monitored near the bottom of the catchment at the gauging station at Yangedi Swamp (614094). Before this, samples were collected approximately 600 m upstream near the Punrak Road Bridge. No samples were collected between April and June 2006.

Flow has been measured at the gauging station since 1995. Initially this was done by the Water Corporation, but in 2005 the Department of Water assumed responsibility. There was a period of approximately two years when flow was not measured (April 2004 to March 2006).

Punrak Drain flows year-round during wet years but stops flowing from around December to May in dry years. Much of the Punrak Drain catchment is subject to seasonal inundation (52%).

To the east of the Darling Scarp the catchment remains relatively undisturbed. To the west, the land has been cleared, mostly for agriculture (e.g. stock grazing), as well as more intensive land uses (e.g. piggeries and turf farms). The soils in the greater catchment vary, however the Punrak Drain catchment consists entirely of sandy and clayey swamps and leached sands and has a high or very high risk of phosphorus leaching to waterways.

Nutrient summary: median concentrations, loads and status classification at 614094

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</thead>
<tbody>
<tr>
<td>Annual flow (GL)</td>
<td>4.3</td>
<td>15</td>
<td>42</td>
<td>-</td>
<td>-</td>
<td>4.1*</td>
<td>15</td>
<td>15</td>
<td>18</td>
<td>6.8</td>
<td>12</td>
<td>5.5</td>
<td>11</td>
<td>9.6</td>
</tr>
<tr>
<td>TN median (mg/L)</td>
<td>5.1</td>
<td>2.2</td>
<td>1.3</td>
<td>1.6</td>
<td>2.4</td>
<td>2.1*</td>
<td>1.7</td>
<td>2.0</td>
<td>2.8</td>
<td>2.4</td>
<td>2.8</td>
<td>3.0</td>
<td>2.6</td>
<td>1.9</td>
</tr>
<tr>
<td>TP median (mg/L)</td>
<td>0.73</td>
<td>0.17</td>
<td>0.14</td>
<td>0.16</td>
<td>0.24</td>
<td>0.26*</td>
<td>0.17</td>
<td>0.23</td>
<td>0.32</td>
<td>0.30</td>
<td>0.26</td>
<td>0.30</td>
<td>0.25</td>
<td>0.21</td>
</tr>
<tr>
<td>TN load (t/yr)</td>
<td>7.2</td>
<td>29</td>
<td>95</td>
<td>-</td>
<td>-</td>
<td>8.3*</td>
<td>31</td>
<td>31</td>
<td>38</td>
<td>12</td>
<td>24</td>
<td>10</td>
<td>21</td>
<td>18</td>
</tr>
<tr>
<td>TP load (t/yr)</td>
<td>0.77</td>
<td>3.3</td>
<td>11</td>
<td>-</td>
<td>-</td>
<td>0.97*</td>
<td>3.8</td>
<td>3.6</td>
<td>4.3</td>
<td>1.3</td>
<td>2.7</td>
<td>1.1</td>
<td>2.4</td>
<td>2.0</td>
</tr>
</tbody>
</table>

Status classification:
- Low
- Moderate
- High
- Very high

Values are different to those previously reported as only routine grab sample data collected by Department of Water staff is included. In previous nutrient reports for Dirk Brook extra data collected by the Peel-Harvey Catchment Council for a targeted study was included (May to October 2000–05).
**DIN** is also derived from animal wastes and fertilisers but is readily available to plants and algae.

Of the five catchments that drain into the Serpentine River, Dirk Brook – Punrak Drain had the highest proportion of DIN (15%).

**TP** is also derived from animal wastes and fertilisers and is readily available for uptake by plants and algae.

The remaining P was present as particulate P which consists of sediment-bound forms of P and organic waste materials.

Dirk Brook – Punrak Drain was one of four sites within the Peel-Harvey catchment that had more than half of the P present as SRP. Of the four, two others flow to the Serpentine River (Gull Road and Nambeelup Brook) while Meredith Drain flows to the Harvey River at the south of the Peel-Harvey catchment.
Plant growth

Punrak Drain can become choked with grass and weeds despite ongoing efforts to remove them.

Catchment remediation

Many nutrient reduction measures have been made in the Dirk Brook catchment. In 2001 an artificial wetland was constructed and riffles and meanders were also installed in several waterways. Revegetation and stock exclusion occurred during subsequent years. The aim was to reduce nutrient concentrations and sediment loads, while enhancing the system’s ecological values by slowing the flows, increasing oxygen concentrations and providing habitat.

The effect of individual interventions on nutrient concentrations could not be assessed due to insufficient data. Similarly, ecological monitoring was not undertaken after these activities so their effectiveness in improving stream health could not be determined.

No improvement was observed in nutrient concentrations at the bottom of the catchment. This is not surprising given the extent of the remediation works relative to the size of the catchment, as well as land use intensification.

Phosphorus:

TP concentrations were highest between January and April when flow was at its lowest, possibly due to nutrient-rich groundwater seepage or from evapo-concentration.

Average monthly SRP concentrations were greater than particulate P concentrations except in November.

All average monthly TP and SRP concentrations exceeded ANZECC$^4$ guideline values.

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**Plant growth**

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**Nitrogen:**

TN and organic N concentrations were highest during low flows. The high concentrations during the summer were possibly caused by algal blooms, decaying plant matter, nutrient-rich groundwater seepage or from evapo-concentration.

Winter flows diluted the organic N but average monthly NO$_x$ concentrations increased, possibly due to excess fertilisers and animal wastes being flushed into the system.

Average monthly concentrations of TN exceeded ANZECC$^4$ guidelines throughout the year (except in October).

ANZECC$^4$ guideline concentrations were also exceeded in summer and autumn by average monthly NH$_4^+$ concentrations and in winter by average NO$_x$ concentrations.

**Seasonal variations in nutrient concentrations and riverine flow (2010–14) at 614094**

<table>
<thead>
<tr>
<th>Months exceeded</th>
<th>ANZECC 2000$^4$</th>
<th>TN 1.2 mg/L</th>
<th>All$^*$</th>
<th>NH$_4^+$ 0.08 mg/L</th>
<th>Jan–Jun</th>
<th>NO$_x$ 0.15 mg/L</th>
<th>Jun–Sept</th>
<th>TP 0.065 mg/L</th>
<th>All</th>
<th>SRP 0.04 mg/L</th>
<th>All</th>
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</table>

* Except October

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References


