Coolup South Main Drain

The Coolup (Harvey) catchment drains to the Harvey Estuary. There are two main waterways, Coolup South Main Drain which drains the southern portion of the catchment and an unnamed watercourse which drains the north. Several lakes and wetlands are located within the catchment, including the Lake Mealup and Lake McLarty which lie within the Ramsar listed Peel-Yalgorup system.

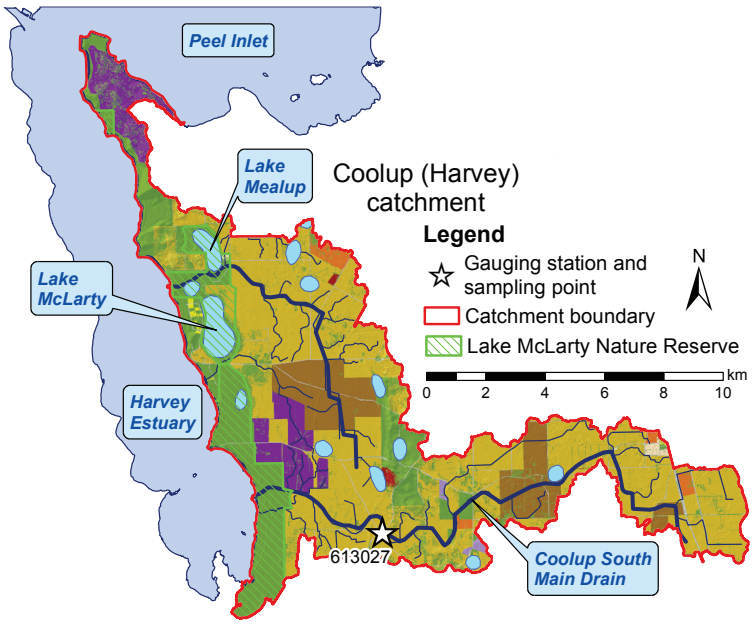
Water quality is monitored at the gauging station on Coolup South Main Drain at Yakaboon on the Old Bunbury Road (613027). No water quality samples were collected between July 2001 and June 2005.

Flow has been measured at the gauging station since 1990, with the exception of an approximately six year period from March 1999 to June 2005. The drain generally ceases to flow from around November to June, however in 1993 and 1997 it flowed year-round.

The soils in the catchment are mostly sandy, including areas of leached sands and limestone gravel. While only a small area of the catchment is subject to inundation (10%) over half has a high or very high risk of phosphorus leaching to waterways (56%).

Most of the catchment has been cleared, predominantly for agriculture such as stock grazing. A narrow strip of undisturbed vegetation remains to the east of the Harvey Estuary (Lake McLarty Nature Reserve). Two piggeries are also located within the catchment.

Land use classification (2006)		Area (km²)	Area (%)
Animal keeping – non-farming (horses)		1.3	1.2
Cattle for beef (predominantly)		57	50
Cattle for dairy		11	9.4
Conservation and natural		34	30
Horticulture		0.34	0.30
Industry, manufacturing and transport		2.0	1.8
Intensive animal use		0.33	0.29
Lifestyle block		0.33	0.29
Mixed grazing		7.6	6.7
Residential		0.20	0.18
Total		**113**	**100**



Coolup South Main Drain 613027 – May 2005

Nutrient summary: median concentrations, loads and status classification at 613027

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Annual flow (GL)	7.5	4.0	2.7							5.4*	0.27	2.9	4.4	2.7
TN median (mg/L)	1.7	1.8	1.5	1.7	1.6	1.6				1.8	1.7	2.6	2.2	1.8
TP median (mg/L)	0.42	0.41	0.36	0.36	0.30	0.24				0.29	0.25	0.50	0.31	0.23
TN load (t/year)	18	9.0	5.9							13*	0.54	7.8	10	6.1
TP load (t/year)	3.3	1.6	1.1							2.2*	0.07	1.2	1.9	0.93

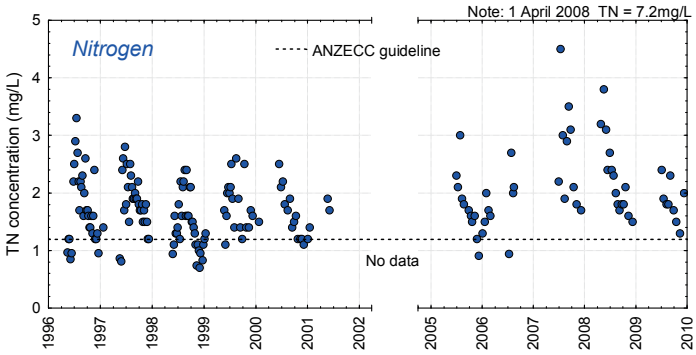
Status classification — Low — Moderate — High — Very high

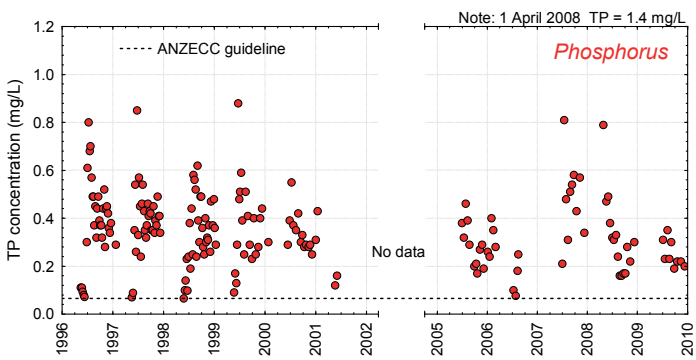
Status reported for three-year period end (i.e. 1996 98 reported in 1998)

* best estimate using available data

TN = total nitrogen TP = total phosphorus

Total nitrogen (TN) and total phosphorus (TP) concentrations (1996–2009)





TN concentration:

The annual percentage of TN samples that exceeded the ANZECC[1] guideline for lowland rivers (1.2 mg/L) ranged between 65% (1998) and 100% (2007, 2008 and 2009).

Between 1996 and 2001, 77% of samples exceeded the guideline. This value increased to 95% for the period between 2005 and 2009. In addition, after 2005 three samples (5%) also exceeded 3.6 mg/L, three times the guideline.

It is unclear why TN concentrations increased after 2006 and were notably higher during 2007 and 2008.

TN trend:

Trend analysis was undertaken using data from 2005 to 2009 inclusive.

Once the data was adjusted for flow no trend was detected.

TP concentration:

Between 1996 and 2009, all but one sample (1998) exceeded the ANZECC[1] guideline for lowland rivers (0.065 mg/L).

Eight samples (4.3%) also exceeded 0.65 mg/L, 10 times the ANZECC[1] guideline; five between 1996 and 1999 and three between 2007 and 2008.

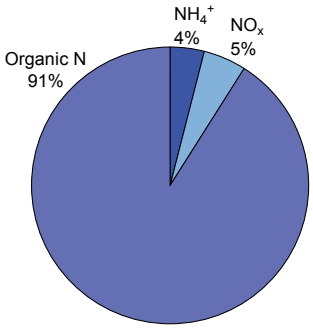
TP concentrations in 2007 and 2008 appeared to be similar to those before 2000.

TP trend:

Trend analysis was undertaken using data from 2005 to 2009 inclusive.

Once the data was adjusted for flow no trend was detected.

Nutrient fractions (2005–09)



Nitrogen:

Most of the nitrogen (N) was organic in nature. Organic N consists of both dissolved organic and particulate nitrogen. It is derived from degrading plant and animal matter and fertilisers. It often needs to be further broken down before it can be used by plants and algae.

The remaining N was dissolved inorganic N (DIN) such as ammonium (NH_4^+) and N oxides (NO_x).

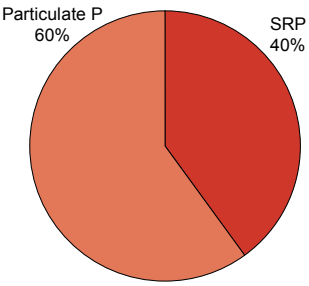
DIN is also derived from animal wastes and fertilisers but is readily available to plants and algae.

South Coolup Main Drain had the equal highest percentage of organic N of the catchments that drain towards the Harvey Estuary, along with Meredith Main Drain to the south.

Phosphorus:

More than half of the phosphorus (P) was present as particulate P, which consists of sediment-bound forms of P and organic waste materials.

Particulate P is not readily available for uptake by plants and algae, but may become available over time as organic matter decomposes or soil particles release bound phosphorus.

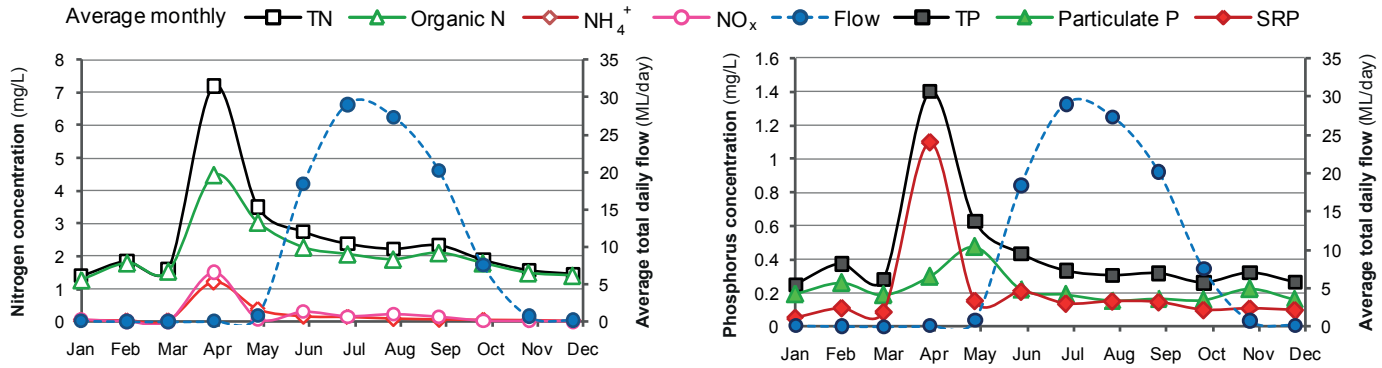


The remaining P was present as soluble reactive phosphorus (SRP). SRP is derived from fertilisers and animal wastes and is readily available for uptake by plants and algae.

South Coolup Main Drain had the second-highest percentage of SRP of the catchments that drain towards the Harvey Estuary. Meredith Main Drain to the south had the highest (58%).

Weir - June 2005

Seasonal variation in nutrient concentrations and riverine flow (2005–09)



Nitrogen:

Average monthly nitrogen concentrations were dominated by organic N throughout the year. All average monthly concentrations were greatest during the first-flush in April.

Average monthly concentrations of TN exceeded the ANZECC[1] guidelines\ throughout the year. Both average monthly NH_4^+ and NO_x concentrations exceeded guidelines from the first-flush in April to August.

	ANZECC 2000	Months exceeded
TN	1.2 mg/L	All*
NH_4^+	0.08 mg/L	Apr* – Aug
NO_x	0.15 mg/L	Apr*, Jun* – Aug
TP	0.065 mg/L	All*
SRP	0.04 mg/L	All*
*Jan – Jun (< 3 samples / month)		

Phosphorus:

Average monthly particulate P concentrations were greater than SRP during most of the year with the exception of the first-flush, and two months in winter.

All average monthly TP and SRP concentrations exceeded ANZECC[1] guideline values.

21 July 2009

Changes in flow at Coolup South Main Drain

First-flush receding - 2 May 2005

17 August 2005

10 May 2005

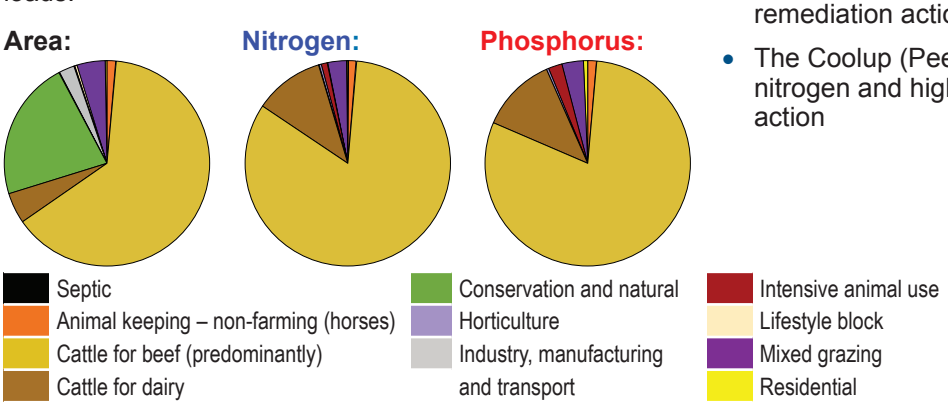
Summer pool – 16 February 2010

Modelled results (1997–2007)[2]

This page reports results from the Streamflow Quality Affecting Rivers and Estuaries (SQUARE) model. It estimated flow, nitrogen and phosphorus loads at the outlets of the 13 subcatchments of the Peel-Harvey estuary. While annual nitrogen and phosphorus exports were calculated for the Coolup (Harvey) and Coolup (Peel) subcatchments, nutrient sources were modelled for both subcatchments combined due to similarities in land use.

Nutrient sources

The main sources of nutrients within the Coolup (Harvey and Peel) catchments were 'Cattle for beef" followed by 'Cattle for dairy'. The two land uses accounted for 70% of the area and over 90% of the nitrogen and phosphorus loads.



Annual exports to Harvey Estuary

The Coolup (Harvey) catchment is 11% of the area that drains to the Harvey Estuary. On average it contributed to the Harvey Estuary:

- 8% of the flow (16 GL/year)
- 8% of the nitrogen load (26 tonnes/year)
- 21% of the phosphorus load (14 tonnes/year).

Values may differ to those on the front page due to different analysis techniques.

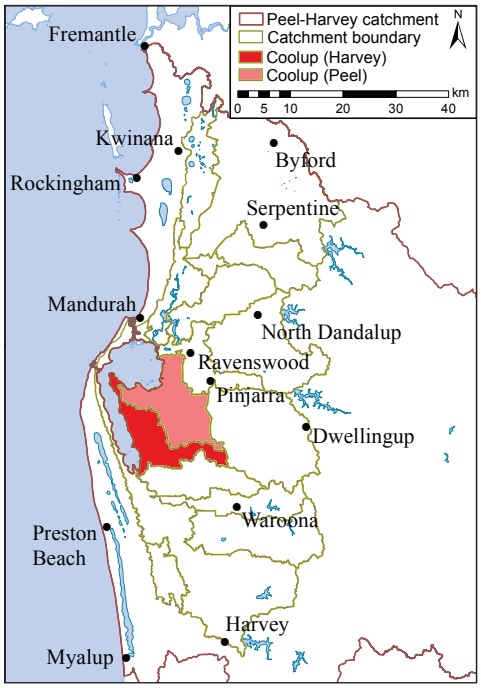
Remediation priority

The SQUARE-modelled data indicated that based on nutrient loads per cleared area (kg/ha/year):

- The Coolup (Harvey) catchment requires medium-priority nitrogen and high-priority phosphorus remediation action
- The Coolup (Peel) catchment requires medium-priority nitrogen and high-priority phosphorus remediation action

The Coolup (Harvey) catchment had the second-highest phosphorus load per cleared area of all the Peel-Harvey catchments.

How Coolup (Harvey) fits within the Peel-Harvey catchment: location and statistics



Catchment draining to estuary	Area (km^2)	Flow (GL)	TN load (tonnes/ year)	TN load per cleared area (kg/ha)	TP load (tonnes/ year)	TP load per cleared area (kg/ha)
Peel Main Drain	120	11	26	3.0	4.5	0.52
Upper Serpentine	502	55	106	3.8	21	0.75
Dirk Brook – Punrak Drain	134	18	51	7.5	5.6	0.82
Nambeelup	143	19	44	3.6	10.5	0.86
Lower Serpentine	94	6.2	9.7	1.6	2.9	0.49
Mandurah	24	3.0	7.9	5.0	1.3	0.84
Upper Murray	6 752	286	204	0.51	4.9	0.01
Lower Murray, mid Murray and Dandalup	638	74	198	6.4	4.9	0.16
Coolup (Peel)	151	23	42	3.2	15	1.2
Subtotal Peel Inlet	**8 558**	**496**	**701**	**1.4**	**73**	**0.14**
Coolup (Harvey)	**113**	**16**	**26**	**3.3**	**14**	**1.8**
Mayfield Drain	119	19	33	3.1	7.1	0.67
Harvey	710	142	259	6.9	39	1.0
Meredith Drain	56	11	16	4.3	8.3	2.2
Subtotal Harvey Estuary	**998**	**188**	**334**	**5.6**	**69**	**1.2**
Total Peel-Harvey Estuary	**9 556**	**684**	**1 035**	**1.8**	**142**	**0.25**

References

[1] ANZECC & ARMCANZ 2000, *Australian guidelines for water quality monitoring and reporting,* National Water Quality Management Strategy, Paper no. 7, Australian and New Zealand Environment and Conservation Council & Agriculture and Resource Management Council of Australia and New Zealand, Canberra.

[2] Kelsey, P, Hall, J, Kretschmer, P, Quinton, B & Shakya D 2010, *Hydrological and nutrient modelling of the Peel-Harvey catchment*, Water Science Technical Series, Report no. 33, Department of Water, Western Australia.

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