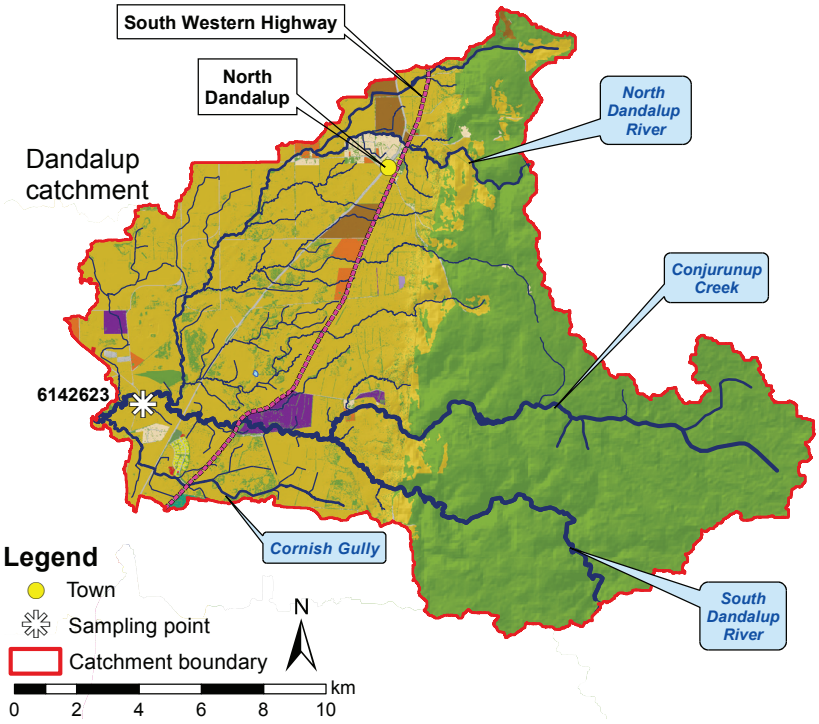
South Dandalup River

The Dandalup catchment contains the North and South Dandalup rivers below their dams, along with Conjurunup Creek and Cornish Gully. The South Dandalup River flows into the Murray River.

Water quality is monitored on the South Dandalup River at Patterson Road (6142623), downstream of the confluence with the North Dandalup River. There is no flow-gauging station located in the catchment.

Half the catchment lies on the Darling Plateau where the soils are mostly ironstone gravel with hard acidic red or yellow soils, although to the west sandy acidic yellow mottled soils dominate. Less than 5% of the catchment is subject to seasonal inundation, reflected in a small section of sandy and clayey swamps and leached sands. About a quarter of the catchment (west of the South Western Highway) has a high or very high risk of phosphorus leaching to waterways.

To the Darling Scarp's east the catchment remains relatively undisturbed. West of the scarp the land has been cleared, mostly for agriculture such as stock grazing.



Upstream view of the South Dandalup River at Patterson Road – February 2008

Land use classification (2006)	Area (km²)	Area (%)
Animal keeping – non-farming (horses)	1.7	0.68
Cattle for beef (predominantly)	100	41
Cattle for dairy	3.0	1.2
Conservation and natural	129	53
Horticulture	0.06	0.03
Industry, manufacturing and transport	3.2	1.3
Lifestyle block	1.9	0.78
Mixed grazing	2.5	1.0
Offices, commercial and education	0.09	0.04
Plantation	0.20	0.08
Recreation	0.15	0.06
Residential	0.39	0.16
Total	**243**	**100**

In 2009 the South Dandalup River had one of the lowest median TN concentrations of the 13 routine monitoring sites in the Peel-Harvey catchment.

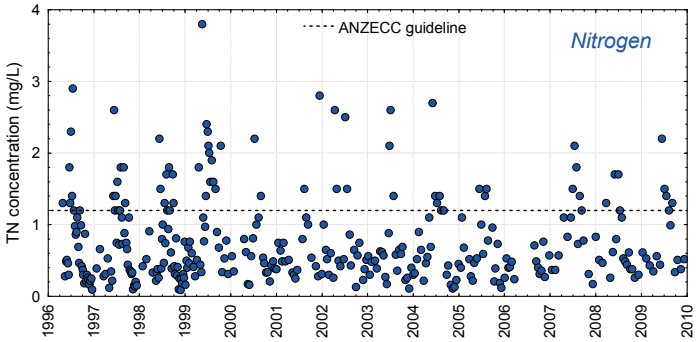
Nutrient summary: median concentrations, loads and status classification at 6142623

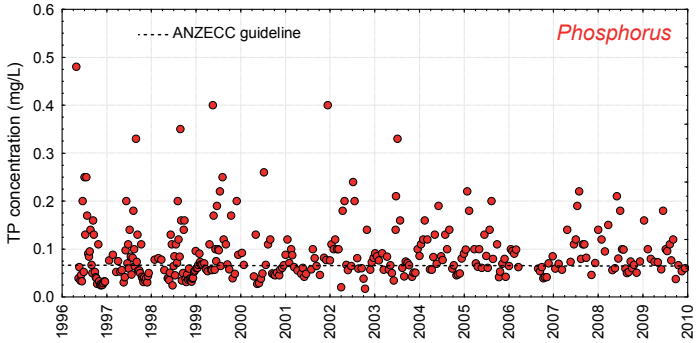
Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Annual flow (GL)														
TN median (mg/L)	0.49	0.66	0.45	0.77	0.52	0.54	0.57	0.57	0.54	0.53	0.40	0.81	0.61	0.55
TP median (mg/L)	0.05	0.06	0.06	0.07	0.05	0.08	0.08	0.07	0.08	0.09	0.06	0.08	0.08	0.08
TN load (t/year)														
TP load (t/year)														

Status classification — Low — Moderate — High — Very high

Status reported for three-year period end (i.e. 1996–98 reported in 1998)
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 0% (2006) and 36% (1999).

Between 1996 and 2004, 19% of samples exceeded the guideline. This value decreased to 16% for the period between 2005 and 2009, however minimum concentrations increased by an average of 0.093 mg/L.

TN trend:

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

No trend was detected.

North Dandalup River

TP concentration:

The annual percentage of samples that exceeded the ANZECC[1] guideline for lowland rivers (0.065 mg/L) ranged between 38% (2006) and 81% (2007).

Between 1996 and 2004, 53% of samples exceeded the guideline. This value increased to 67% for the period between 2005 and 2009.

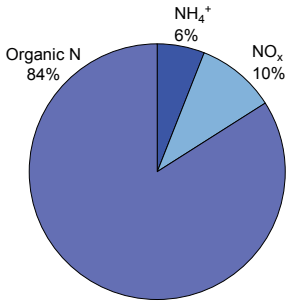
An increase in minimum TP concentrations was also observed between the two time periods, with an average increase of 0.011 mg/L.

TP trend:

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

Once the data were adjusted for seasonality, an emerging decreasing trend (0.007 mg/L/year) 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.

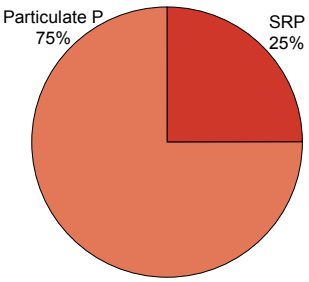
Of the seven catchments that drain into the Peel Inlet, the sample site on the South Dandalup River had the highest percentage of NH_4^+ (6%).

Downstream view at Patterson Road – February 2008

Phosphorus:

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

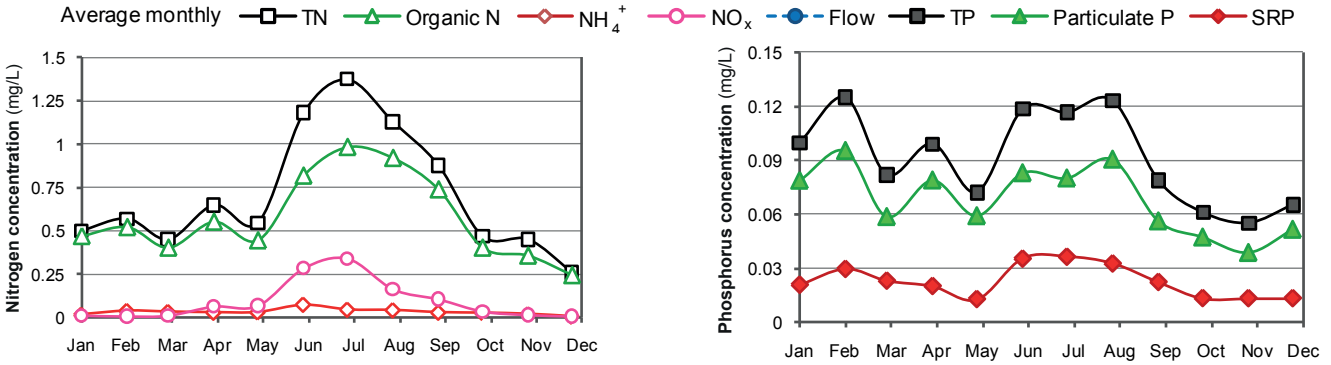
Particulate P is not readily available for uptake by plants and algae, but may become available over time as organic matter decomposes or soil particles release bound phosphorus.



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

The South Dandalup River had the lowest percentage of SRP of all the sites sampled in the Peel-Harvey catchment (25%).

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



Nitrogen:

Average monthly nitrogen concentrations were greatest in winter.

A substantial increase in average monthly NO_x concentrations during winter was possibly due to excess fertilisers and animal wastes being mobilised and flushed into the system.

Average monthly TN concentrations only exceeded ANZECC[1] guidelines during peak flows in July, while average monthly NO_x concentrations exceeded guidelines throughout winter. Average monthly NH_4^+ concentrations were below guidelines.

	ANZECC 2000	Months exceeded
TN	1.2 mg/L	Jul
NH_4^+	0.08 mg/L	None
NO_x	0.15 mg/L	Jun – Aug
TP	0.065 mg/L	Dec – Sept
SRP	0.04 mg/L	None

Phosphorus:

Average monthly TP and organic P concentrations fluctuated throughout the year and were lowest during spring.

Average monthly SRP concentrations were also lowest during spring and the first-flush around May.

Average monthly TP concentrations exceeded ANZECC[1] guidelines for most of the year. However average monthly SRP concentrations were consistently below guidelines.

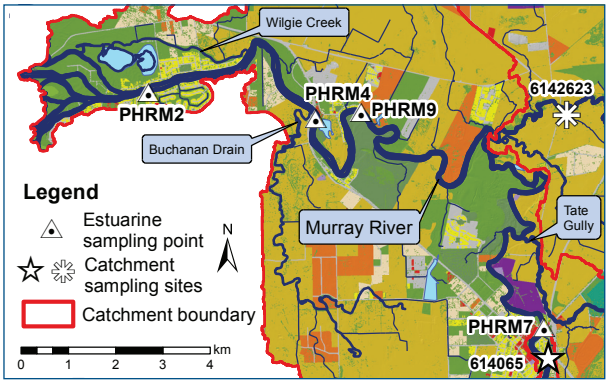
Upstream tributary – August 2005

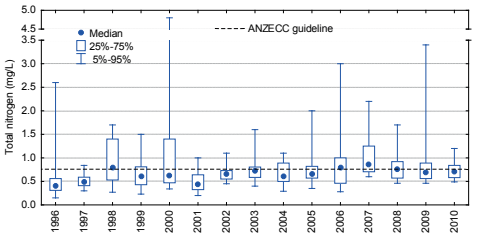
Murray River – estuarine water quality

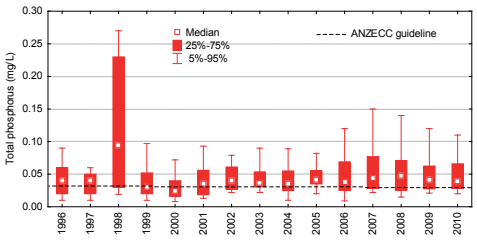
The South Dandalup River flows into the estuarine section of the Murray River where water quality monitoring occurred at four sites between 1996 and 2010.

Annual median TN concentrations rarely exceeded ANZECC[1] guideline for estuarine waters (0.75 mg/L). However, annual median TP concentrations rarely fell below the guidelines(0.03 mg/L).

Most of the nitrogen present was organic, however DIN concentrations increased substantially with winter flows. Phosphorus was present mostly as particulate P through out the year.







Surface scum and fish deaths

In March 1998 surface scum was observed in the lower reaches of the Murray River, and continues to occur during the summer months. Analysis found the scum was a complex mixture of metal oxides, silica and organic secretions from bacteria and phytoplankton, along with high densities of microbes. It appeared to be worse after periods of high boating activity, suggesting that increased water column mixing may contribute to scum formation.

Between 1999 and 2010, 13 fish death incidents were reported in the Murray River's estuarine reaches. More than 200 fish died in over half of the incidents – with one involving 2000 bream (2010). Most deaths were attributed to algal blooms, scum events or low oxygen conditions following storms. On a few occasions ichthyotoxic dinoflagellates were responsible for the deaths.

Dead fish in algal scum, lower reaches of the Murray River – January 2002

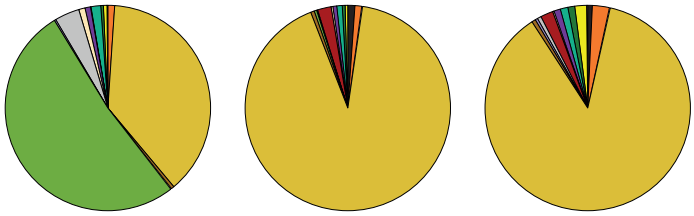
Modelled results (1997–2007)[2]

This page reports results from the Streamflow Quality Affecting Rivers and Estuaries (SQUARE) model. It estimated flow, nitrogen and phosphorus loads from the 13 subcatchments of the Peel-Harvey estuary. Outputs reported here include the lower Murray, middle Murray and Dandalup subcatchments.

Nutrient sources

'Cattle for beef' was the dominant nutrient source in the lower Murray, middle Murray and Dandalup catchment. While it only covered 38% of the catchment, it contributed 92% of the nitrogen and 87% of the phosphorus load.

Area: **Nitrogen:** **Phosphorus:**



Septic
Animal keeping – non-farming (horses)
Cattle for beef (predominantly)
Cattle for dairy
Conservation and natural
Cropping
Horticulture
Industry, manufacturing and transport
Intensive animal use
Lifestyle block
Mixed grazing
Offices, commercial and education
Plantation
Recreation
Residential
Viticulture

Annual exports to Peel Inlet

The lower Murray, middle Murray and Dandalup catchment is 7.5% of the area that drains to the Peel Inlet. On average it contributed to the Peel Inlet:

- 15% of the flow (74 GL/year)
- 23% of the nitrogen load (198 tonnes/year)
- 7% of the phosphorus load (5 tonnes/year).

Remediation priority

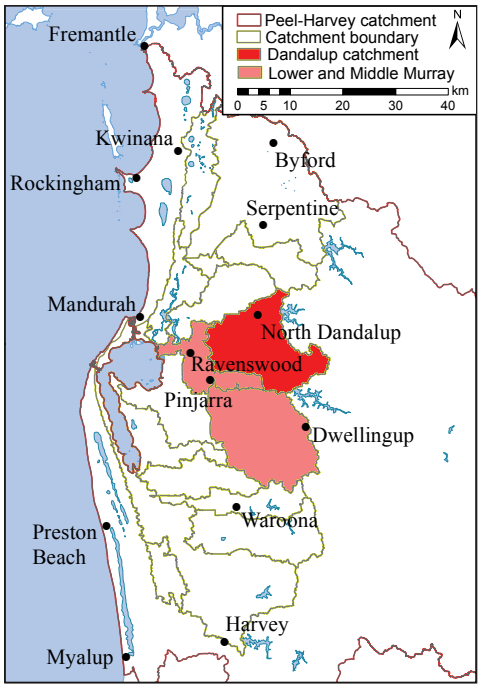
The SQUARE-modelled data indicated that based on nutrient loads per cleared area (kg/ha/year):

- the lower Murray, middle Murray and Dandalup catchment requires high-priority nitrogen and low-priority phosphorus remediation action

The lower Murray, middle Murray and Dandalup catchment had the third-highest nitrogen load per cleared area of all the Peel-Harvey catchments.

However, it had the lowest phosphorus load per cleared area.

How the lower Murray, mid Murray and Dandalup fits within the Peel-Harvey catchment: location and statistics



Catchment draining to estuary	Area (km²)	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.

For further information please contact the Water Science Branch, Department of Water
catchmentnutrients@water.wa.gov.au

ISBN 978-1-921992-75-9 (online)