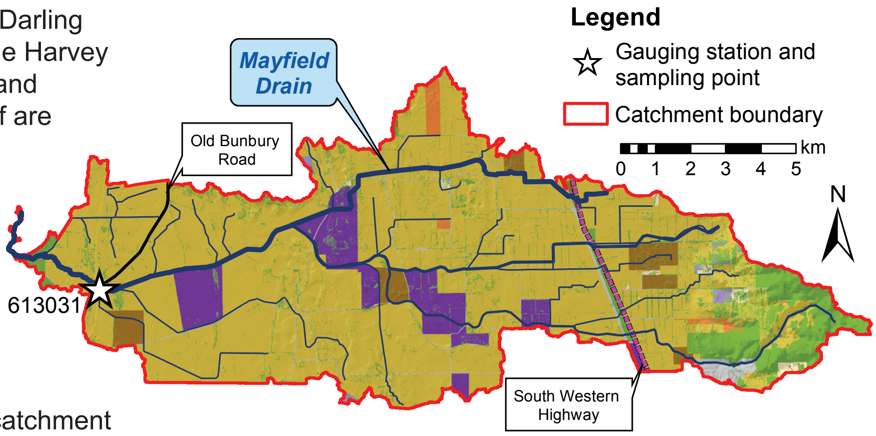
Mayfield Drain

Mayfield Drain catchment drains west from the Darling Plateau, discharging into the southern end of the Harvey Estuary. The catchment has 237 km of natural and modified waterways of which approximately half are gazetted under the Waroona Drainage District and managed by the Water Corporation.

The catchment's soils are mostly poorly drained flats and sandy soils containing either ironstone gravel or calcareous mounds. It has the smallest area of leached sands (5.3 km², 4.5%) of all the Peel-Harvey catchments. Nearly a third of the catchment has a high to very high risk of phosphorus loss to waterways (30%).



Mayfield Drain - July 2010

Most of the catchment is used for agriculture (e.g. cattle and mixed grazing) with the largest percentage area dedicated to a single land use ('cattle for beef') of all the Peel-Harvey catchments. The Mayfield Drain catchment also had the smallest area and percentage of remnant vegetation of the Peel-Harvey catchments.

Land use classification (2006)[1]		Area (km²)	Area (%)
Animal keeping – non-farming (horses)		1.0	0.80
Cattle for beef (predominantly)		87	73
Cattle for dairy		3.7	3.1
Conservation and natural		16	13
Cropping		0.03	0.02
Horticulture		0.44	0.37
Industry, manufacturing and transport		2.8	2.3
Lifestyle block		0.58	0.48
Mixed grazing		8.3	7.0
Residential		<0.01	<0.01
Total		**119**	**100**

Water quality was monitored at the gauging station close to the Old Bunbury Road (613031), near the outlet of the catchment.

Flow data was also recorded at the gauging station between 7 March 1991 and 5 March 2002, then from 11 May 2005 to 31 October 2007 and from 1 June 2010. Mayfield Drain appeared to flow year-round, as this was the case during the periods monitored which included the low rainfall years of 2001, 2006 and 2010.

In 2014 Mayfield Drain had the second-lowest median TN and TP concentrations of the 13 sites sampled in the Peel-Harvey catchment.

Nutrient summary: median concentrations, loads and status classification at 613031

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Annual flow (GL)	3.7	-	-	-	26*	3.4	25*	-	-	3.9*	13	11	26	15
TN median (mg/L)	0.40	0.42	0.47	0.37	0.62	0.52	1.30	0.80	0.49	0.41	1.2	0.62	1.3	0.73
TP median (mg/L)	0.03	0.03	0.03	0.03	0.05	0.06	0.17	0.05	0.03	0.02	0.05	0.03	0.13	0.03
TN load (t/yr)	5.4	-	-	-	45*	5.5	48*	-	-	5.8*	23	20	43	28
TP load (t/yr)	0.64	-	-	-	6.4*	0.74	6.6*	-	-	0.68*	3.1	2.5	6.3	3.5

Status classification[2]: Low | Moderate | High | Very high

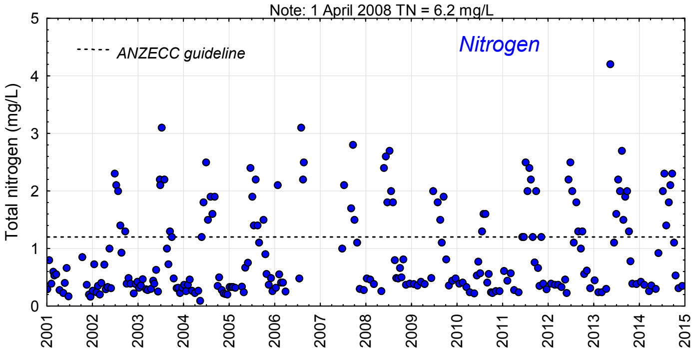
Status reported for three-year period end (i.e. 2012–14 reported in 2014)

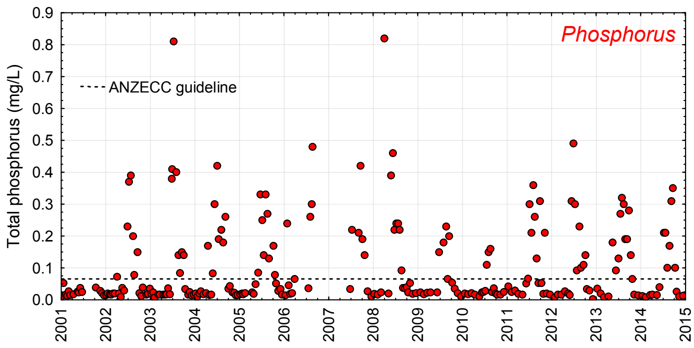
TN = total nitrogen TP = total phosphorus

* Best estimate using available data

(- not applicable)

Total nitrogen (TN) and total phosphorus (TP) concentrations (2001–14) at 613031





TN concentration:

The annual percentage of TN samples that exceeded the ANZECC[3] guideline for lowland rivers (1.2 mg/L) ranged from 0% in 2001 to 53% in 2013.

Between 2001 and 2014, 29% of samples exceeded the guideline. The percentage of samples exceeding the guideline was similar between 2005 and 2009 (35%) and between 2010 and 2014 (34%).

TN trend:

Trend analysis[2] used data from 2010 to 2014 inclusive.

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

TP concentration:

The annual percentage of TP samples that exceeded the ANZECC[3] guideline for lowland rivers (0.065 mg/L) ranged from 0% in 2001 to 63% in 2007.

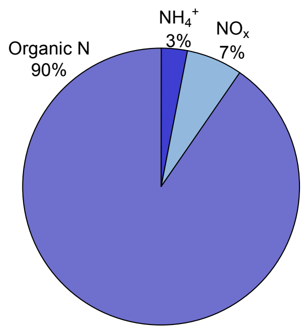
Between 2001 and 2014, 38% of samples exceeded the guideline. The percentage of samples exceeding the guideline decreased slightly from 44% between 2005 and 2009 to 42% between 2010 and 2014.

TP trend:

Trend analysis[2] used data from 2010 to 2014 inclusive.

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

Nutrient fractions (2010–14) at 613031



Nitrogen:

Most of the nitrogen (N) present was organic in nature. Organic N consists of both dissolved organic and particulate N. 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.

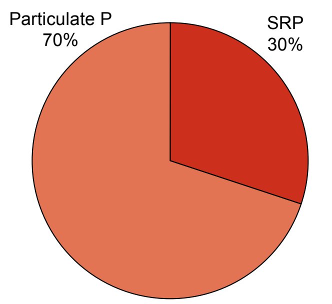
Mayfield Drain had the third-lowest percentage of DIN of the catchments draining to the Harvey Estuary (10%). It was one of six sites within the Peel-Harvey catchment where 90% or more of the N present was organic.

Upstream - April 2010

Phosphorus:

Just over two-thirds of the phosphorus (P) was present as particulate P, which consists of sediment-bound forms of P and organic waste materials.

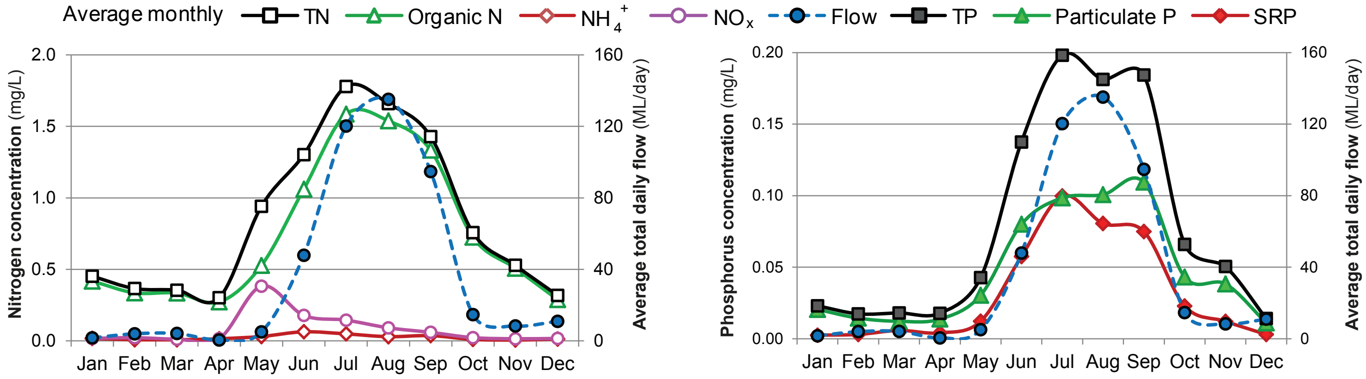
Particulate P is not readily available for uptake by plants and algae, but may become available over time as organic matter decomposes or soil particles release bound P.



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.

Mayfield Drain had the second-lowest percentage of SRP within the Peel-Harvey catchment (30%). Only the South Dandalup River (26%), which flows to the Murray River was lower.

Seasonal variations in nutrient concentrations and riverine flow (2010–14) at 613031



Nitrogen:

Average monthly nitrogen concentrations were greatest during autumn and winter, increasing with the first flush in May and ongoing winter flows.

The slight increase in monthly averages during January may have been due to evapo-concentration, algal activity or plant decay.

Average monthly NO_x concentrations exceeded ANZECC[3] guidelines during May and June after the first flush while average TN concentrations exceeded guidelines during winter.

In-stream vegetation downstream - June 2010

Phosphorus:

Average monthly phosphorus concentrations increased in May with the first flush. Phosphorus was mostly particulate P. The average monthly SRP concentration was slightly higher than the particulate P concentration in July.

Concentrations decreased as flows declined in spring. Slight increases in average monthly concentrations were also noted in January, possibly due to evapo-concentration, algal activity or plant decay.

Average monthly TP and SRP concentrations exceeded ANZECC[3] guideline values during winter.

	ANZECC 2000[3]	Months exceeded
TN	1.2 mg/L	Jun–Sept
NH_4^+	0.08 mg/L	None
NO_x	0.15 mg/L	May–Jun
TP	0.065 mg/L	Jun–Oct
SRP	0.04 mg/L	Jun–Sept

Catchment modification

The Perth to Bunbury highway was constructed immediately downstream of the Mayfield Drain gauging station. Between May 2007 and August 2009 extensive earthworks were adjacent to the sampling site. Temporary diversion of the drain resulted in a dam effect and localised back-flooding in 2007. Increases in median concentrations of both TN and TP were observed in 2007; however these were not extreme when compared with historical data.

When the highway was finished the banks were stabilised to address erosion which was undercutting banks between the highway and the gauging station (see photographs below).

Before diversion – 5 July 2007

During diversion – 10 July 2007

Before bank stabilisation – March 2009

After bank stabilisation – June 2009

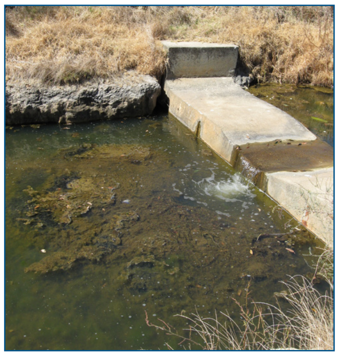
Ongoing issues

Excessive algal growth and in-stream vegetation suggests that nutrient reduction strategies are required.

Adoption of the fertiliser industry's Fertcare®[4] program could help identify fertiliser requirements and reduce nutrient losses to the waterways (Fertilizer Australia).

Efforts to fence properties to exclude stock access should also continue.

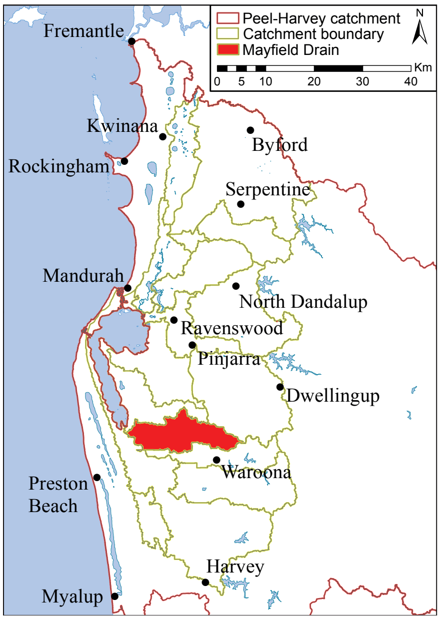
Erosion along the drain is widespread due to large fluctuations in river height (up to 2.5 m) and flow (up to 31 m^3/s) within the drain mobilising sandy soils underlying limestone.



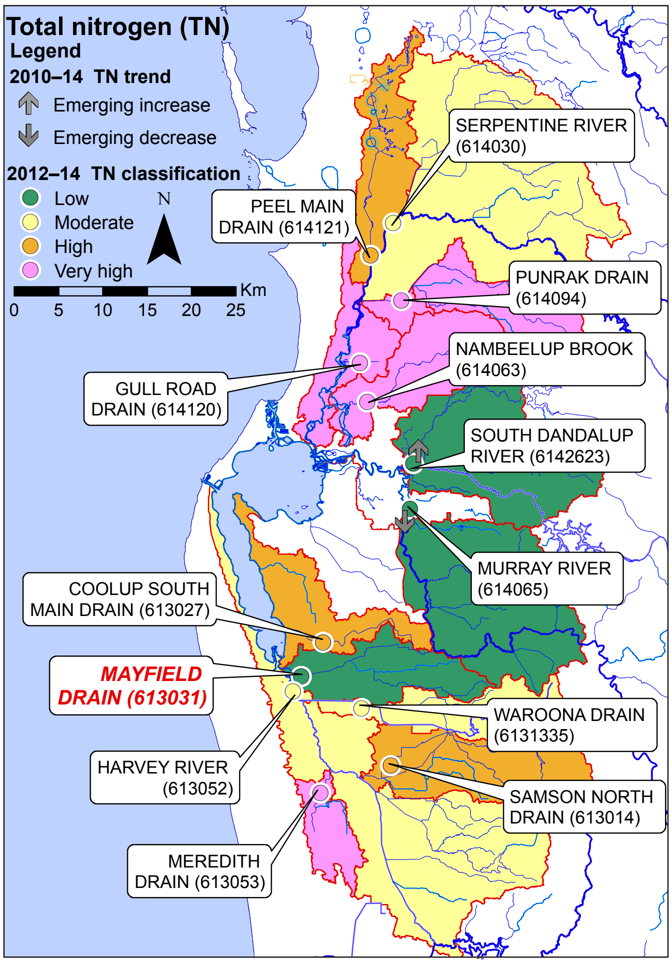
Macroalgae – March 2009

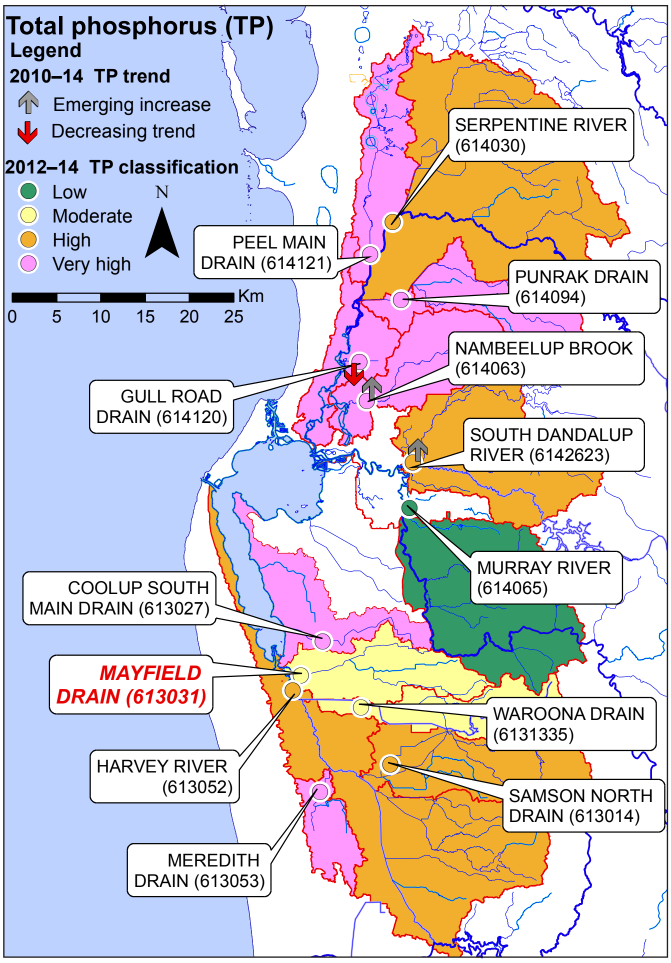
Erosion and bank undercutting – May 2009

How Mayfield Drain fits within the Peel-Harvey catchment: location and statistics



Catchment	Receiving waterbody	Sample site (AWRC)	Area (km²)	2014 Flow (GL)	2014 TN median (mg/L)	2014 TP median (mg/L)
Peel Main Drain	Serpentine River	614121	120	5.0	1.7	0.19
Upper Serpentine River	Serpentine River	614030	502	28	0.79	0.13
Dirk Brook – Punrak Drain	Serpentine River	614094	134	9.6	1.9	0.21
Nambeelup Brook	Serpentine River	614063	143	9.7	3.7	0.60
Lower Serpentine River - Gull road Drain	Peel Inlet	614120	94	-	4.4	0.93
South Dandalup River	Murray River	6142623	243	-	1.1	0.11
Mid Murray River	Murray River	614065	293	153	0.57	0.01
Coolup South Main Drain	Harvey Estuary	613027	113	2.1	2.1	0.31
Mayfield Drain	**Harvey Estuary**	**613031**	**119**	**15**	**0.73**	**0.03**
Harvey River	Harvey Estuary	613052	408	98	1.4	0.15
Drakes Brook – Waroona Drain	Harvey River	6131335	107	-	0.99	0.07
Samson North Drain	Harvey River	613014	195	-	1.5	0.18
Meredith Drain	Harvey River	613053	56	-	2.8	0.38





References

[1] 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.

[2] Department of Water 2015, *Catchment nutrient reports* (methods for the analysis of status classification, loads and trends), <http://www.water.wa.gov.au/water-topics/waterways/assessing-waterway-health/catchment-nutirent-reports>.

[3] 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.

[4] Fertiliser Australia. *Fertcare* <http://www.fertilizer.org.au/Fertcare>.

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