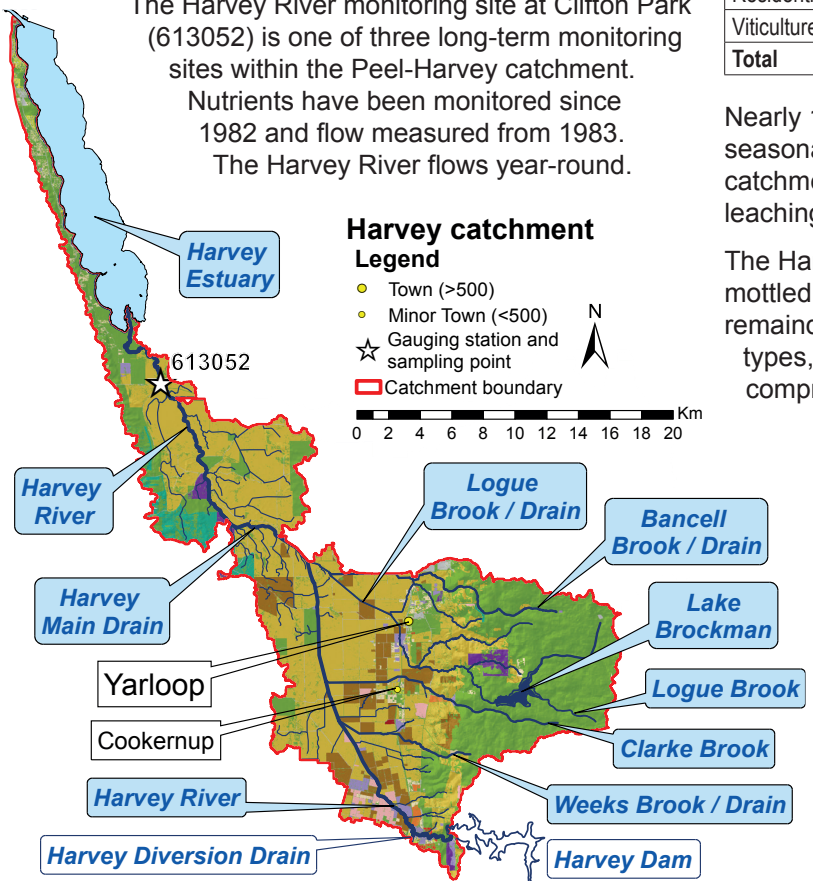
Harvey River

The Harvey River flows north-easterly from the Harvey Reservoir to its discharge point at the southern end of the Harvey Estuary. Many of the waterways within the catchment have been modified and these portions of the rivers and brooks have been re-named as drains. Just downstream of the Harvey Reservoir the Harvey Diversion Drain carries water directly to the ocean.

The headwaters of Logue Brook are located on the Darling Plateau in the Dwellingup State Forest. The brook flows into Lake Brockman, the reservoir formed by the Logue Brook Dam, before continuing across the coastal plain to its confluence with Harvey Main Drain. Bancell Brook flows into Logue Brook while both Clarke Brook and Weeks Brook discharge into Harvey Main Drain, upstream of Logue Brook.

The Harvey River monitoring site at Clifton Park (613052) is one of three long-term monitoring sites within the Peel-Harvey catchment. Nutrients have been monitored since 1982 and flow measured from 1983. The Harvey River flows year-round.



Land use classification (2006)[1]	Area (km²)	Area (%)
Animal keeping – non-farming (horses)	1.1	0.26
Cattle for beef (predominantly)	169	41
Cattle for dairy	27	6.5
Conservation and natural	172	42
Cropping	<0.01	<0.01
Horticulture	5.3	1.3
Industry, manufacturing and transport	8.1	2.0
Intensive animal use	0.15	0.04
Lifestyle block	5.6	1.4
Mixed grazing	4.9	1.2
Offices, commercial and education	0.54	0.13
Plantation	9.5	2.3
Recreation	0.10	0.02
Residential	1.3	0.31
Viticulture	4.3	1.1
Total	**408**	**100**

Nearly 10% of the Harvey catchment is subject to seasonal inundation and more than a quarter of the catchment has a high or very high risk of phosphorus leaching to waterways (27%).

The Harvey River flows through sandy acidic yellow mottled soils, some containing ironstone gravel. The remainder of the catchment consists of a variety of soil types, including leached sands and poorly drained flats comprising of black and grey cracking clays.

To the east of the Darling Scarp the catchment remains relatively undisturbed. West of the scarp, the land has been cleared, mostly for agriculture such as stock grazing, as well as more intensive land uses such as piggeries and turf farms.

Harvey River – July 2004

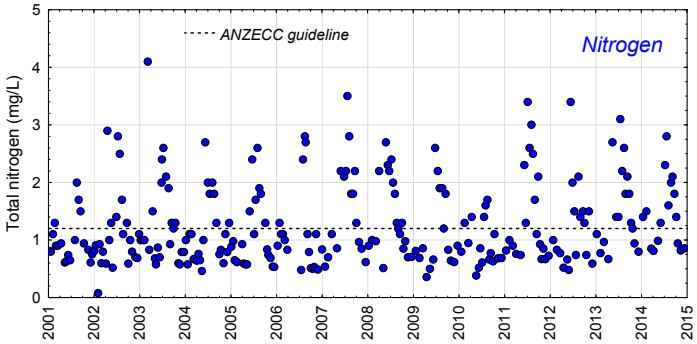
Nutrient summary: median concentrations, loads and status classification at 613052

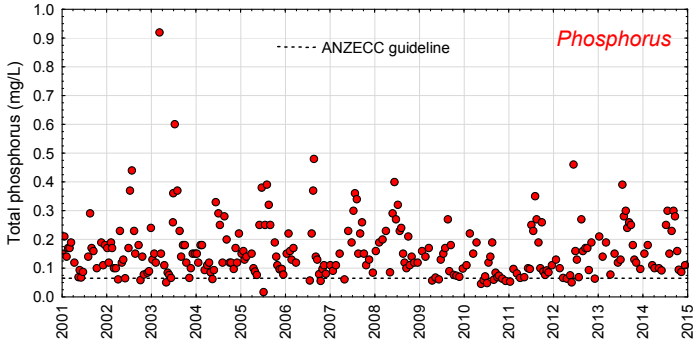
Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Annual flow (GL)	57	106	107	106	144	39	85	108	98	20	73	59	136	98
TN median (mg/L)	0.90	1.0	1.0	1.0	0.88	1.0	1.3	1.3	0.85	0.80	1.1	1.0	1.4	1.4
TP median (mg/L)	0.16	0.15	0.15	0.12	0.14	0.13	0.15	0.20	0.11	0.07	0.10	0.13	0.18	0.15
TN load (t/yr)	83	203	213	207	286	57	168	217	196	24	135	100	280	197
TP load (t/yr)	11	28	31	29	40	7.9	23	31	27	3.1	18	13	39	27

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

Total nitrogen (TN) and total phosphorus (TP) concentrations (2001–14) at 613052





TN concentration:

The annual percentage of TN samples that exceeded the ANZECC[3] guideline for lowland rivers (1.2 mg/L) ranged between 21% (2001) and 63% (2014).

Between 2001 and 2014, 39% of samples exceeded the guideline. There was a small increase in the percentage of samples exceeding the guideline between the 2005–09 period (38%) and the 2010–14 period (48%).

TN trend:

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

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

Sedimentation and in-stream plant growth at Clifton Park – June 2005

TP concentration:

Between 2001 and 2014, 92% of TP samples exceeded the ANZECC[3] guideline for lowland rivers (0.065 mg/L).

The annual percentage of samples that exceeded the guideline ranged from 65% (2010) to 100% (2001, 2008, 2013 and 2014).

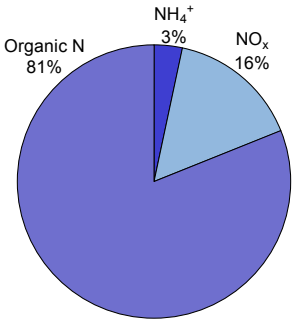
There was a slight decrease in the percentage of samples exceeding the guideline between the 2005–09 period (93%) and the 2010–14 period (88%).

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 613052



Nitrogen:

Most of the nitrogen (N) 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.

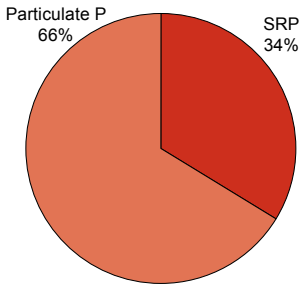
The Harvey River had the fourth-highest percentage of DIN of all the sampled sites. Two of the three sites with higher percentages were directly upstream, Waroona Drain (39%) and Samson North Drain (29%). The other was on the Murray River (22%).

Clifton Park at the Old Bunbury Road – December 2009

Phosphorus:

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

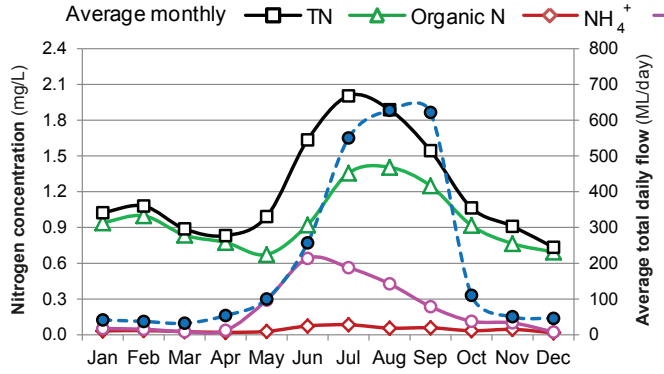
Particulate P is not readily available for uptake by plants and algae, but may become available over time as particles decompose or release bound P.

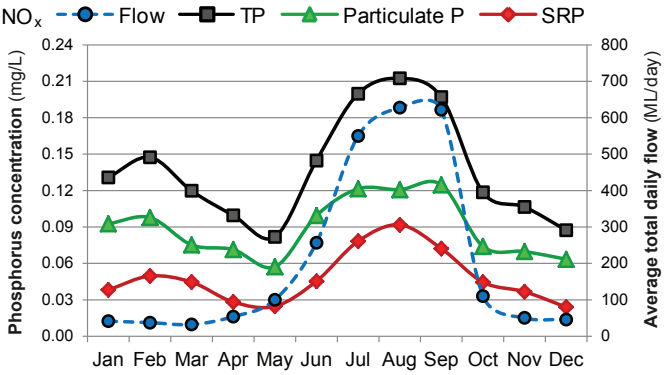


The remaining P was present as soluble reactive phosphorus (SRP). SRP is derived from fertilisers and animal wastes and is readily available for uptake by plants and algae.

The Harvey River had the fourth-lowest percentage of SRP of the sampled sites.

Seasonal variations in nutrient concentrations and riverine flow (2010–14) at 613052





Nitrogen:

Average monthly nitrogen concentrations were dominated by organic N throughout the year, while DIN was dominated by NO_x. Concentrations were related to flow with maximum average concentrations occuring in winter.

Average monthly NO_x concentrations exceeded ANZECC[3] guidelines between May and September, with average monthly TN concentrations exceeding the guideline from June to September. Average monthly NH_4^+ concentrations only exceeded guideline values in July.

	ANZECC 2000[3]	Months exceeded
TN	1.2 mg/L	Jun–Sept
NH_4^+	0.08 mg/L	Jul
NO_x	0.15 mg/L	May–Sept
TP	0.065 mg/L	All
SRP	0.04 mg/L	Feb–Mar, Jun–Oct

Phosphorus:

Average monthly phosphorus concentrations were greatest during winter however cencentrations were also elevated in February.

Average monthly particulate P concentrations were greater than SRP concentrations throughout the year.

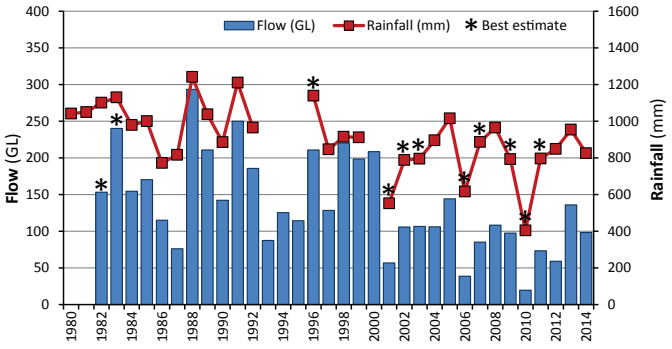
All average monthly TP concentrations exceeded the ANZECC[3] guideline. Average monthly SRP concentrations exceeded the guideline during both the dry (February and March) and wet (June to October) seasons.

Clifton Park at the Old Bunbury Road Bridge – August 2005

Long term annual flow and rainfall (1980–2014)

Flow has been measured at Clifton Park since May 1982, with a brief cessation between December 1982 and March 1983. The Harvey River flows year-round.

The Bureau of Meteorology records daily rainfall at Yarloop (9624), to the south-east of the Clifton Park gauging station. Records are available from 1947, but data from 1993 and 1994 are unavailable and intermittent thereafter.



Both total annual flow and rainfall appear to be declining. Total annual flow ranged from 20 GL (2010) to 220 GL (1988). Total annual rainfall ranged from 405 mm (2010) to 1241 mm (1988).

Logue Brook – February 2014

Ecological condition of Harvey River and Logue Brook

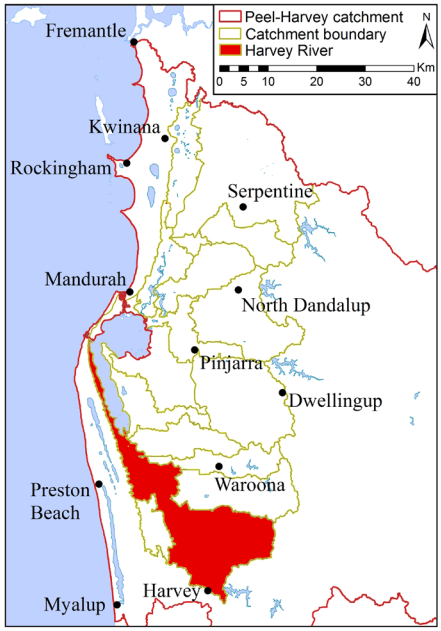
Ecological condition was assessed in the Harvey River (two reaches downstream of Harvey Dam), and Logue Brook (one reach midway between Logue Brook Dam and its confluence with Bancell Brook). The assessments were made with the South West Index of River Condition using data collected at field sites in summer 2014 and desktop data from the best available sources.

The reaches assessed on the Harvey River and Logue Brook support valuable aquatic biodiversity. Six native fish and crayfish species were found in each system. Temperature and salinity were within acceptable ranges for both systems, as was dissolved oxygen in the Logue Brook. However, dissolved oxygen in the Harvey River was below the optimal conditions for fish species for some of the 24-hour sampling period.

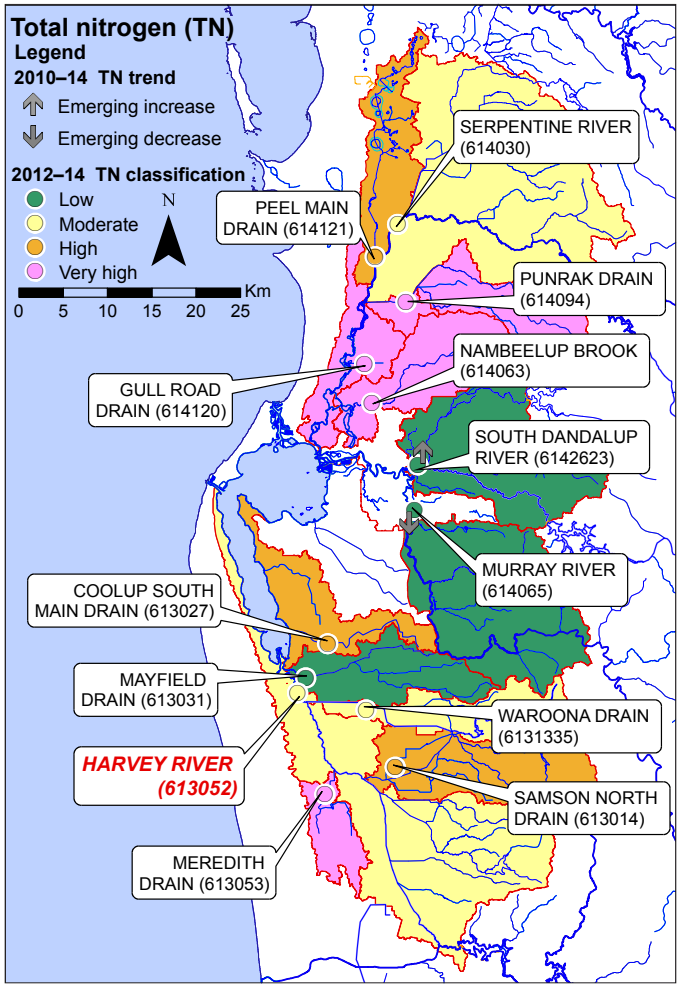
Fringing vegetation cover along the reaches of the Harvey River was high (over 90% of the reach lengths) with an average width of 30 m on each river bank. In Logue Brook there was fringing vegetation on around half the length of the reach, and the average width of vegetation was 20 m on each river bank. Over 75% of the groundcover vegetation at the field sites assessed in both systems was non-native.

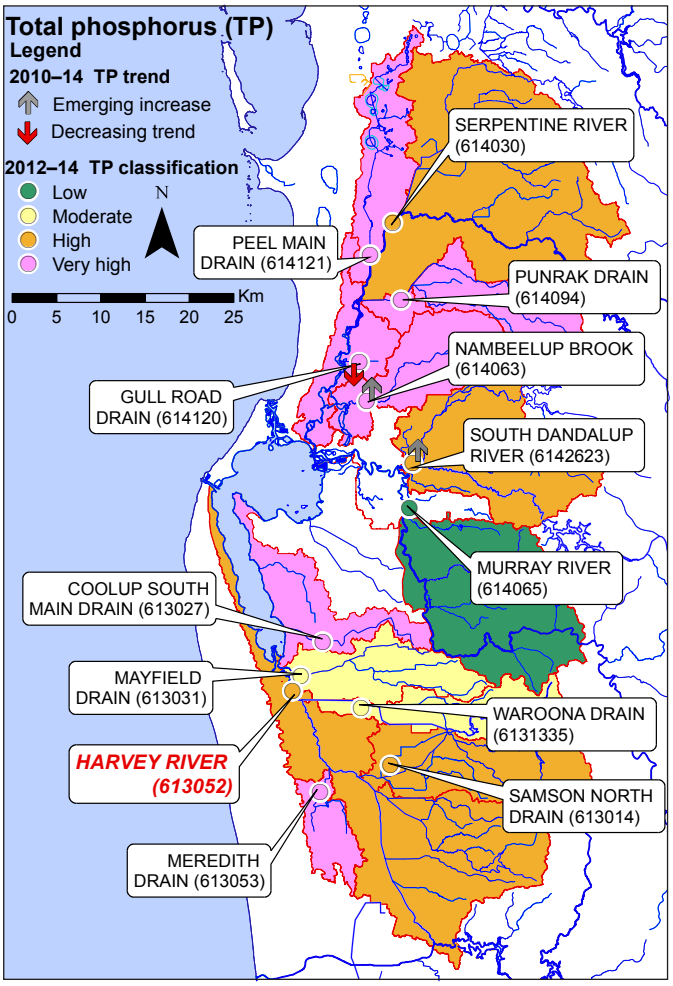
Erosion was prominent in Logue Brook.

How the Harvey River 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





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[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.

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