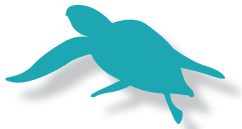
Great Barrier Reef Catchment Loads Monitoring Program

Report Summary 2013–2014

The Great Barrier Reef Catchment Loads Monitoring Program is a large-scale water quality monitoring program conducted along the east coast of Queensland. It measures annual loads (mass) of total suspended solids and nutrients from 14 priority catchments and both annual loads and annual toxic loads of pesticides from 12 priority catchments that discharge to the Great Barrier Reef. This program is part of the Reef Water Quality Protection Plan (Reef Plan), updated in 2013, and the Paddock to Reef Integrated Monitoring, Modelling and Reporting Program (Paddock to Reef Program). It provides loads data to validate and improve catchment models, which assist in evaluating progress towards the water quality targets of Reef Plan. This summary outlines the monitored loads data for 2013–2014.



Australian Government

Queensland Government

Monitoring sites

Thirty-five catchments along the east coast of Queensland flow into the Reef lagoon. A total of 25 sites were monitored within 14 of these catchments (Figure 1). These consist of 12 end-of-system[1] sites and 13 sub-catchment sites monitored for total suspended solids and nutrients (phosphorus and nitrogen), while 10 end-of-system sites and five sub-catchment sites were monitored for five photosystem II inhibiting pesticides (ametryn, total atrazine, total diuron, hexazinone and tebuthiuron). Loads were calculated for the monitored portion of each catchment and as such do not represent the total load discharged to the Reef lagoon.

Rainfall

Annual rainfall was average to above average in the Cape York region, average in the Wet Tropics, average to below average in the Mackay Whitsunday region, average to very much below average in the Burdekin region, average to lowest on record in the Fitzroy region, and below average to the lowest on record in the Burnett Mary region (Figure 2).

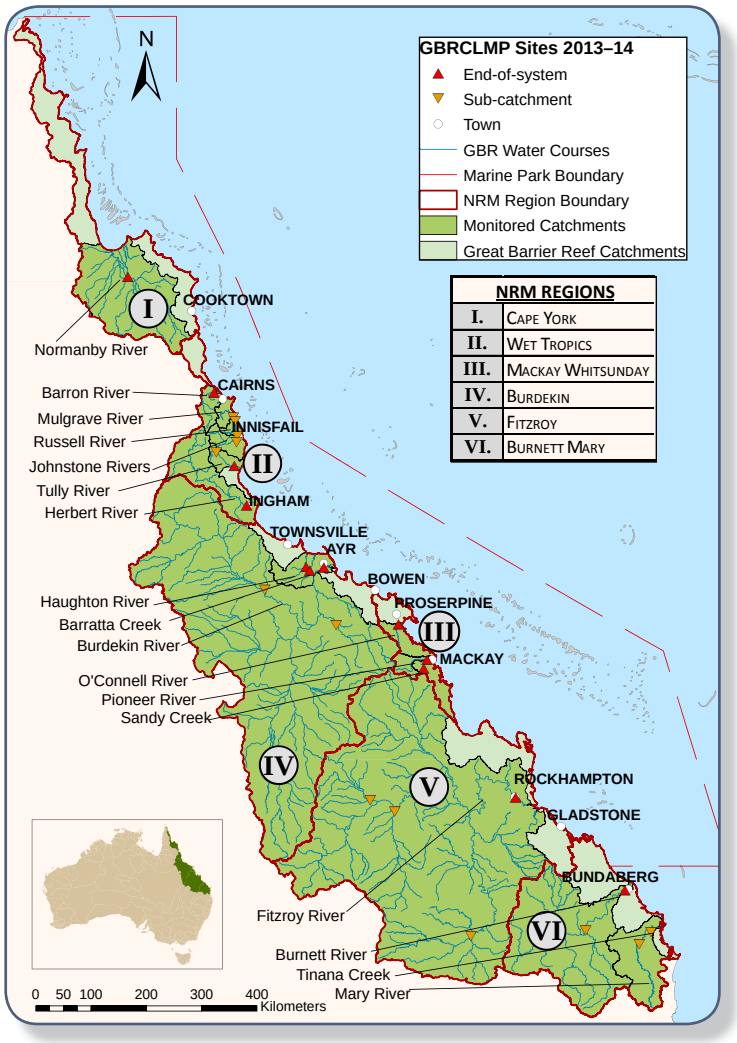


Figure 1 Natural resource management regions, catchments and sites monitored in 2013–2014.

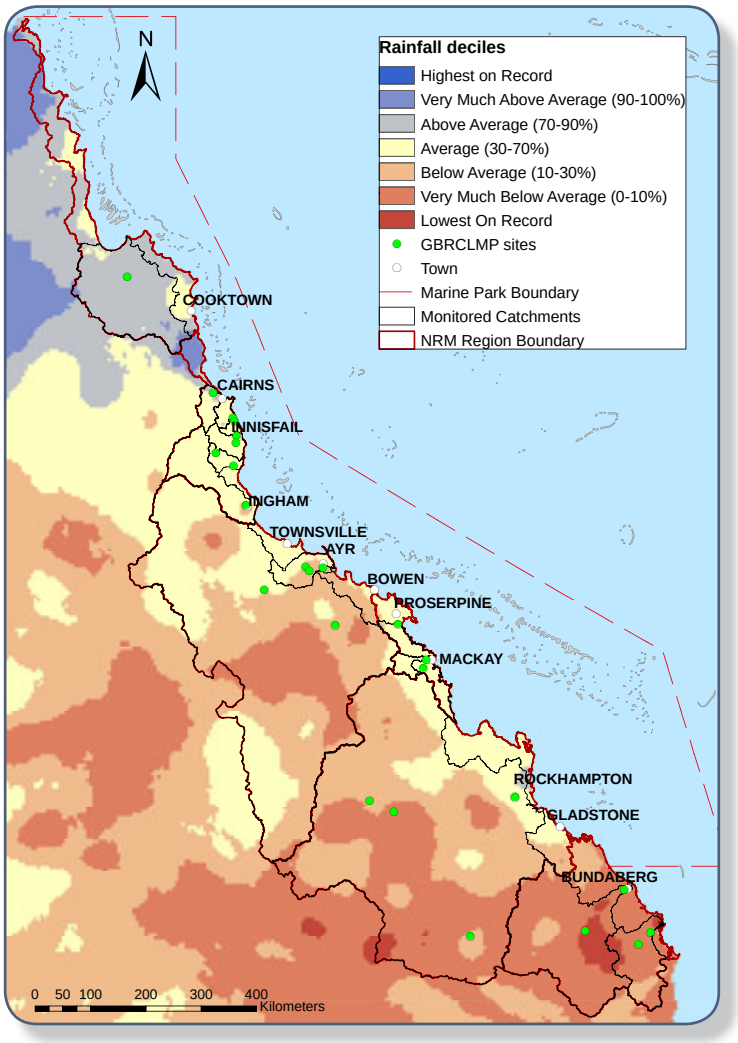


Figure 2 Queensland 2013–2014 rainfall deciles with respect to long term mean rainfall.

1 End-of-system sites are defined as sites located at the lowest point in a river or creek where the volume of water passing that point can be accurately measured.

River discharge

River discharge in the Burdekin, O'Connell, Fitzroy, Burnett and Mary rivers was very much below long-term averages (<50% of long-term average discharge). Discharge in the Normanby, Barron, Haughton and Pioneer rivers and in Barratta, Tinana and Sandy creeks was below long-term averages (50% – 95% of long-term average discharge). River discharge in the North and South Johnstone, Tully and Herbert rivers was above long-term averages (>105% of long-term average discharge) (Figure 3).

Rainfall associated with severe Tropical Cyclone Ita contributed a significant fraction of the annual discharge in the Normanby, Barron and Herbert rivers.

Total suspended solids

The combined monitored annual load of total suspended solids for the monitored rivers was 1400 kilotonnes (kt). The main contributors were the Herbert (390 kt), Burdekin (220 kt) and the North and South Johnstone (200 kt) rivers (Figure 4). The remaining monitored rivers contributed 42 per cent of the monitored load. The lowest monitored total suspended solids load during 2013–2014 occurred in the Burnett River (1.3 kt).

The load from the Burdekin and Fitzroy rivers was the lowest recorded since 2006–2007. This is most likely a result of the lowest recorded discharge that occurred in these rivers since 2006–2007. The high-flow event associated with severe Tropical Cyclone Ita contributed a significant fraction of the annual total suspended solids load in the Barron, Tully and Herbert rivers.

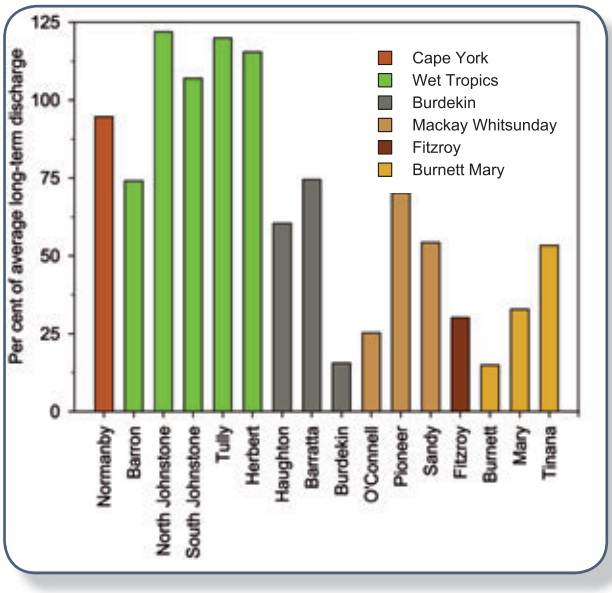


Figure 3 Per cent of average long-term discharge for 2013–2014. Natural resource management regions are grouped by colour.

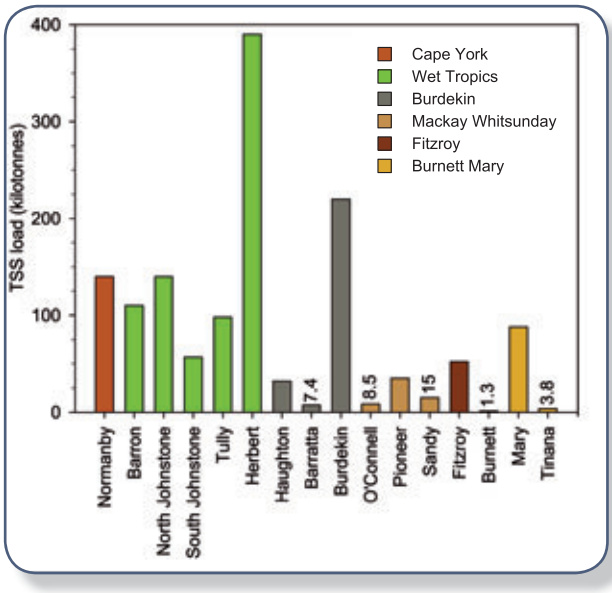


Figure 4 Monitored annual total suspended solids (TSS) loads for 2013–2014. Natural resource management regions are grouped by colour.

Image:Tourism Queensland

Nitrogen

The combined monitored annual load of total nitrogen for the monitored rivers was 12,000 tonnes (t), with the majority derived from the Herbert (2600 t), North and South Johnstone (1500 t) and Tully (1500 t) rivers (Figure 5).

The combined monitored annual load of dissolved inorganic nitrogen was 3000 tonnes, which accounted for 25 per cent of the total nitrogen monitored annual load. The largest proportions of dissolved inorganic nitrogen were derived from the Herbert (760 t) and Tully (640 t) rivers.

The combined monitored annual load of particulate nitrogen was 4500 tonnes, which accounted for 38 per cent of the total nitrogen monitored annual load. Approximately 24 per cent of the load was derived from the Herbert river (1100 t). The North and South Johnstone (790 t) and Tully (500 t) rivers were also moderate contributors.

Image: Benjamin Ferguson DSITI

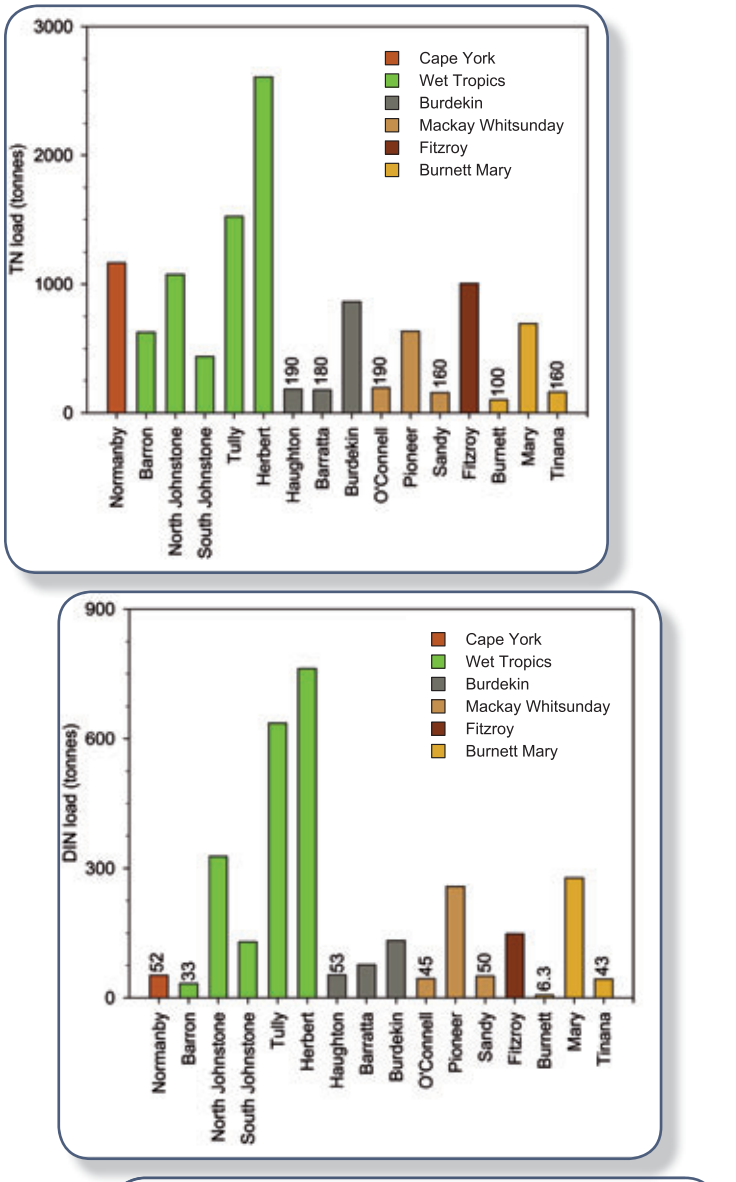
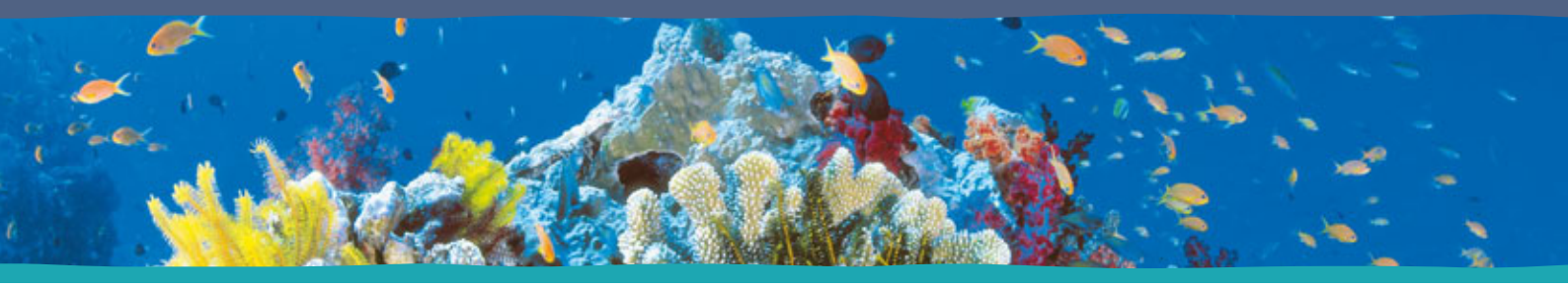


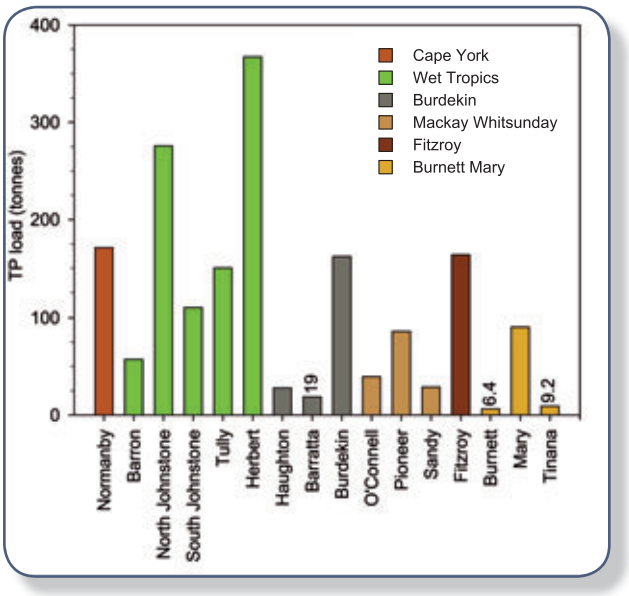
Figure 5 Monitored annual total nitrogen (TN), dissolved inorganic nitrogen (DIN) and particulate nitrogen (PN) loads for 2013–2014. Natural Resource Management regions are grouped by colour.



Phosphorus

The combined monitored annual load of total phosphorus for the monitored rivers was 1800 tonnes (t) with largest contributors being the North and South Johnstone (390 t), Herbert (370 t) and Normanby (170 t) rivers (Figure 6).

The monitored annual load of particulate phosphorus was 1400 tonnes, which accounted for 78 per cent of the total phosphorus monitored annual load (1800 t). The largest monitored annual loads of particulate phosphorus were derived from the North and South Johnstone (350 t) and the Herbert (330 t) rivers.



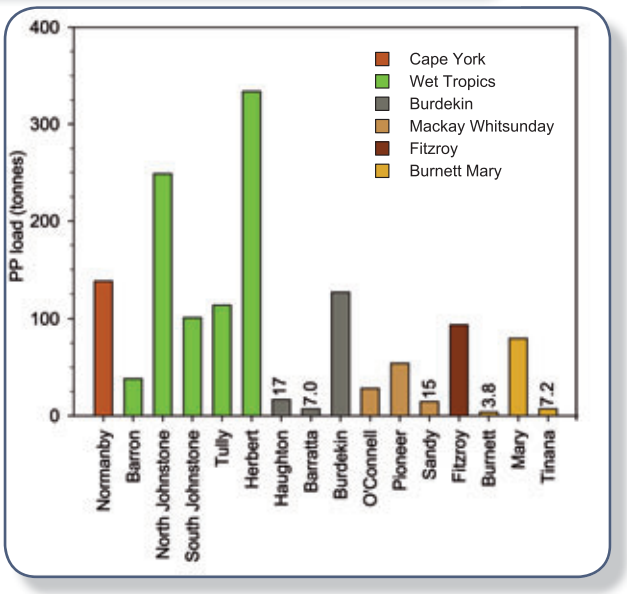


Figure 6 Monitored annual total phosphorus (TP) and particulate phosphorus (PP) loads for 2013–2014. Natural Resource Management regions are grouped by colour.

Image: Tourism Queensland

Pesticides

The total monitored annual loads of the five photosystem II inhibiting pesticides were: 930 kilograms (kg) of total atrazine; 890 kilograms of total diuron; 230 kilograms of hexazinone; 160 kilograms of tebuthiuron; and 11 kilograms of ametryn. Only total diuron was detected at all end-of-system monitoring sites.

Toxic load

The toxic load of photosystem II inhibiting pesticides is the sum of the toxic loads of ametryn, atrazine, diuron, hexazinone and tebuthiuron. The toxic load of a pesticide is its load (mass) multiplied by a toxic equivalency (TEq) factor – this accounts for the relative toxicity of the pesticide compared to diuron.

The monitored annual toxic load of photosystem II inhibiting pesticides for the monitored catchments was equivalent to 980 kilograms of diuron (980 kg TEq_{diuron}). Diuron was the largest contributor to the annual toxic load, accounting for 890 kilograms of the 980 diuron equivalent kilograms. The waterways that contributed most to the toxic load were the Pioneer (280 kg TEq_{diuron}), Tully (270 kg TEq_{diuron}) and Herbert (120 kg TEq_{diuron}) rivers and Sandy (130 kg TEq_{diuron}) and Barratta (79 kg TEq_{diuron}) creeks (Figure 7).

The combined contribution to the annual toxic load of all remaining sites was less than five per cent.

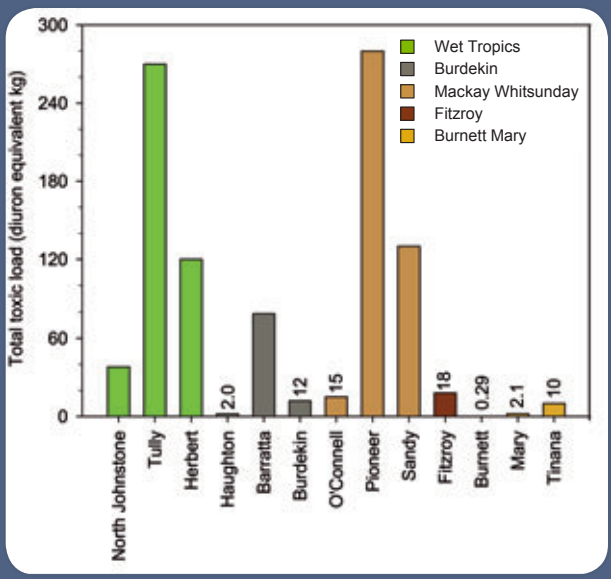


Figure 7 Annual toxic loads (diuron equivalent kg) for 2013–2014. Natural Resource Management regions are grouped by colour.

Acknowledgements

This Program was primarily funded by the Queensland Government. The Program would not be possible without the support of Queensland Government hydrographers and all the organisations and individuals that collected water samples.

Further information

More information on pollutant loads and yields (load divided by land surface area) is available in the report:
Garzon-Garcia, A., Wallace, R., Huggins, R., Turner, R.D.R., Smith, R.A., Orr, D., Ferguson, B., Gardiner, R., Thomson, B., Warne, M. St. J. 2015. Total suspended solids, nutrient and pesticide loads (2013–2014) for rivers that discharge to the Great Barrier Reef – Great Barrier Reef Catchment Loads Monitoring Program. Department of Science, Information Technology and Innovation. Brisbane.

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http://www.reefplan.qld.gov.au/measuring-success/paddock-to-reef/catchment-loads/