



# Great Barrier Reef Catchment Loads Monitoring Program

Report Summary 2014–2015

The Great Barrier Reef Catchment Loads Monitoring Program (GBRCLMP) is a large-scale water quality monitoring program conducted along the east coast of Queensland. It provides measures of annual loads of total suspended solids and nutrients (nitrogen and phosphorus) from 14 priority basins and both annual loads and summed annual toxic loads of pesticides from 12 priority basins that discharge to the Great Barrier Reef. This program is part of the Reef Water Quality Protection Plan (Reef Plan), and the Paddock to Reef Integrated Monitoring, Modelling and Reporting Program (Paddock to Reef Program). It also 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 2014–2015.



## Monitoring sites



Thirty-five basins along the east coast of Queensland flow into the reef lagoon. A total of 25 sites were monitored within 14 of these basins (Figure 1). These consist of 12 end-of-catchment<sup>1</sup> sites and 13 sub-catchment sites that were monitored for total suspended solids and nutrients. A subset of 10 end-of-catchment sites and five sub-catchment sites were monitored for pesticides, including the 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.

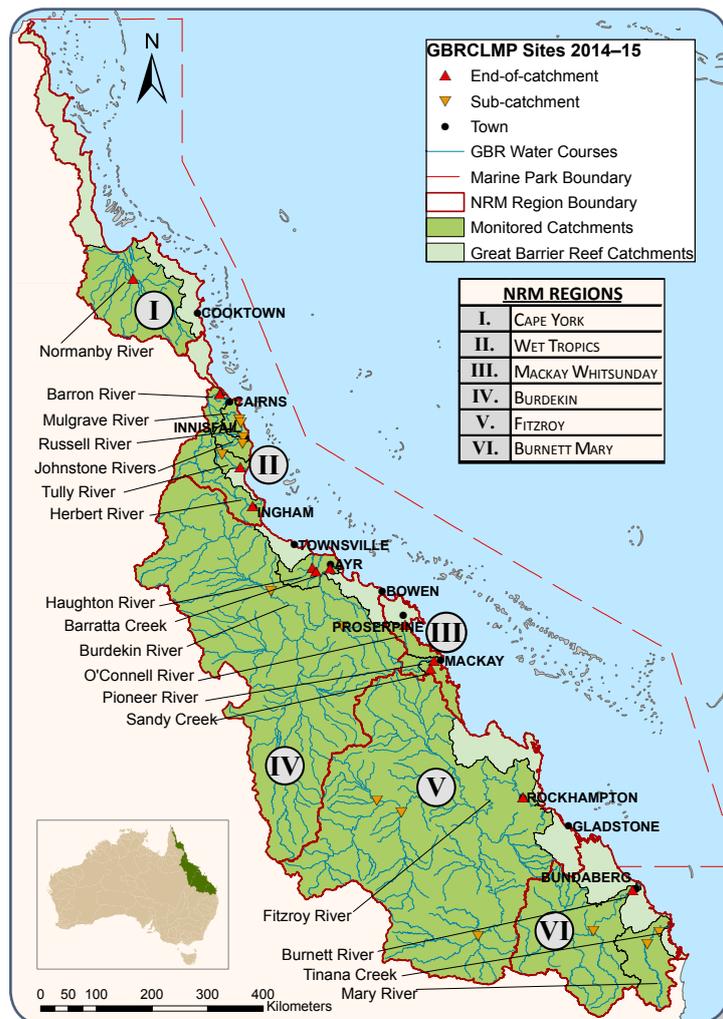


Figure 1 Natural resource management regions, catchments and sites monitored in 2014–2015.

## Rainfall



Annual rainfall was below average to very much below average across the monitored catchments in the Cape York, Wet Tropics, Burdekin and Mackay Whitsunday regions (Figure 2). The monitored catchments of the Fitzroy and Burnett Mary regions generally received average rainfall. The lower southern Fitzroy catchment and northern Burnett catchment received above average rainfall owing to Tropical Cyclone Marcia that crossed the coast north of Rockhampton in late February 2015.

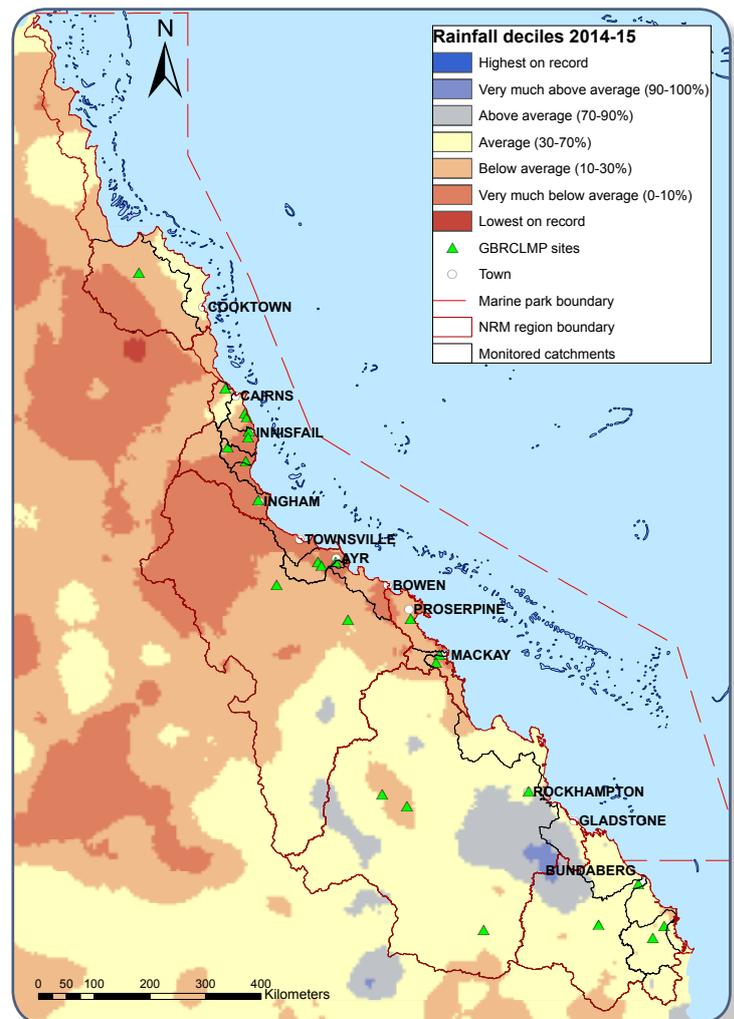
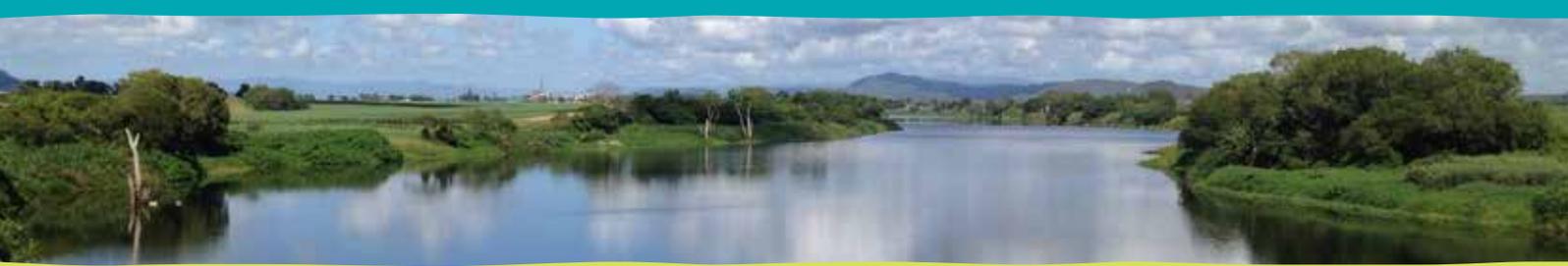


Figure 2 Queensland 2014–2015 rainfall deciles with respect to long term mean rainfall.

<sup>1</sup> End-of-catchment 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 Herbert catchment in the southern Wet Tropics region, and all monitored catchments of the Burdekin and Mackay Whitsunday regions was less than half the long-term mean (<50% of long-term average discharge), with discharge in the Burdekin River only attaining nine per cent of the long-term mean with an exceedance probability<sup>2</sup> of 88 per cent. In the Barron, North Johnstone, Tully, Fitzroy and Burnett catchments, discharge was approximately half the long-term mean (51–54% of long-term average discharge). At the northern end of the monitored reef catchments, discharge in the Normanby catchment on Cape York was 62 per cent of the long-term mean. At the southern end of the monitored reef catchments, discharge in the Mary River was 80 per cent of the long-term mean. The Russell River was the only catchment where discharge was equivalent to the long-term mean.

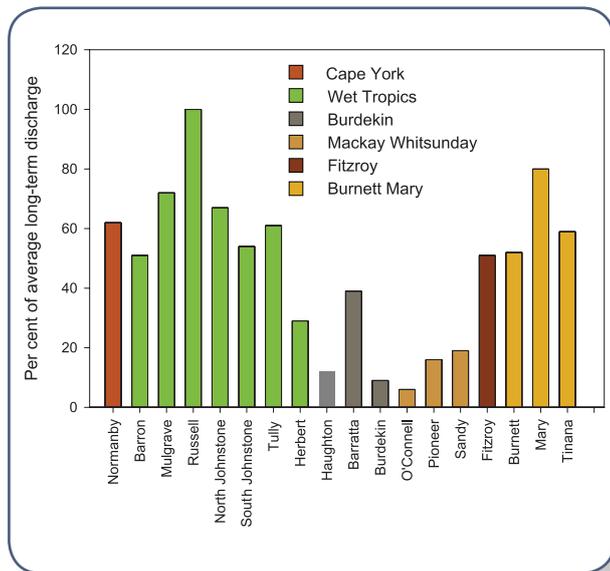


Figure 3 Per cent of average long-term discharge for 2014–2015. Natural resource management regions are grouped by colour.

## Total suspended solids



The combined monitored annual load of total suspended solids for the monitored catchments was 2400 kilotonnes (kt). The main contributing catchments were the Fitzroy (900 kt) and Burdekin (700 kt) catchments, with moderate loads also monitored in the Mary (230 kt) and North Johnstone (180 kt). The remaining monitored catchments contributed 14 per cent of the combined monitored load. The lowest monitored annual load of total suspended solids during the 2014–2015 monitoring year was in the Haughton catchment (0.62 kt).

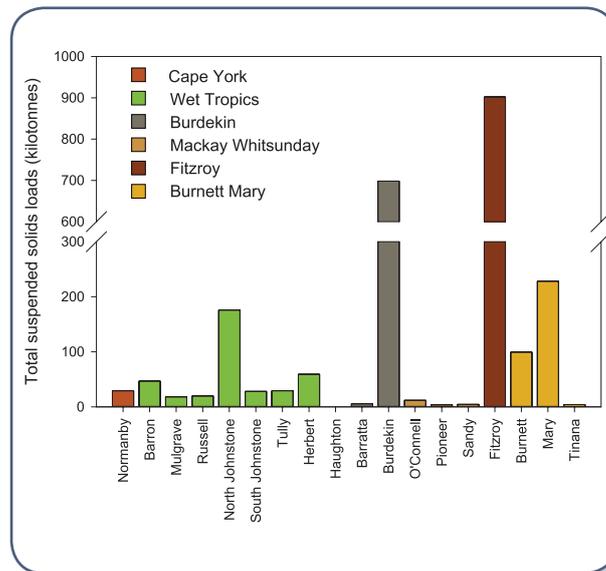


Figure 4 Annual monitored total suspended solids loads for 2014–2015. Natural resource management regions are grouped by colour.

<sup>2</sup> The probability that the observed annual discharge will be exceeded in any given year based on the historical flow records available for the monitoring site.



Image: Queensland Department of Science, Information Technology and Innovation



# Nitrogen



The combined monitored annual load of total nitrogen for the monitored catchments was 12,000 tonnes (t); equal to the monitored load of total nitrogen in the 2013–2014 monitoring year. The majority of the total nitrogen load was derived from the Fitzroy (3200 t) catchment with moderate loads also monitored in the Mary (1400 t), North Johnstone (1200 t), Burdekin (1000 t) and Burnett (840 t) catchments (Figure 5).

The combined monitored annual load of dissolved inorganic nitrogen was 2600 tonnes, which accounted for 22 per cent of the total nitrogen monitored annual load. The largest monitored annual loads of dissolved inorganic nitrogen were in the Fitzroy catchment (470 t) with moderate loads in the Tully (380 t), Mary (310 t) and Russell (270 t) catchments.

The combined monitored annual load of particulate nitrogen was 5400 tonnes, which accounted for 46 per cent of the total nitrogen monitored annual load. The Fitzroy catchment contributed 30 per cent (1600 t) of the monitored particulate nitrogen load, with moderate loads also derived from the North Johnstone (820 t), Burdekin (620 t) and Mary (620 t) catchments.



Image: Tourism and Events Queensland

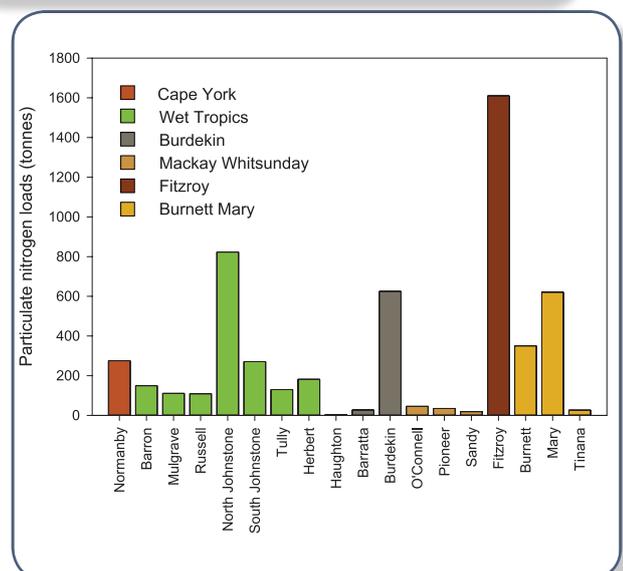
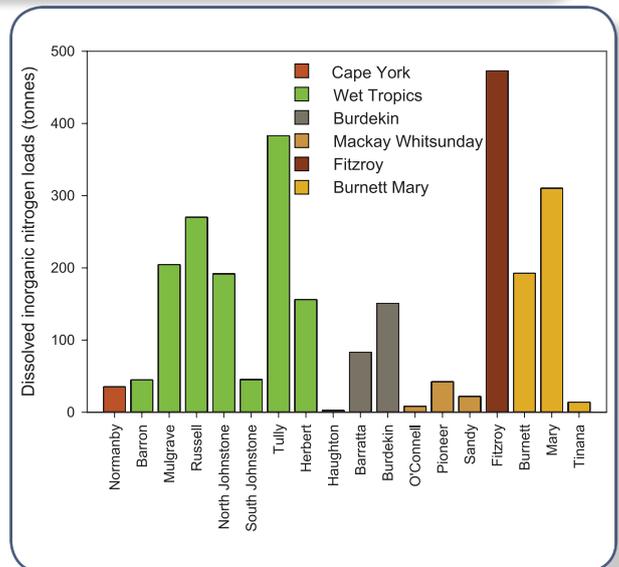
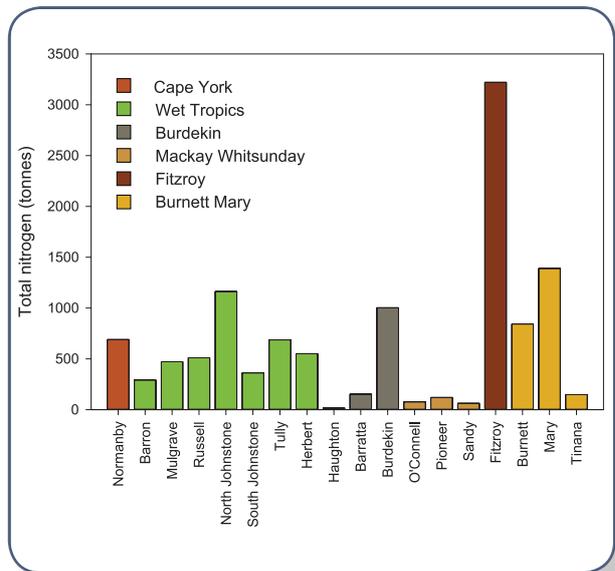


Figure 5 Annual monitored total nitrogen (TN), dissolved inorganic nitrogen (DIN) and particulate nitrogen (PN) loads for 2014–2015. Natural Resource Management regions are grouped by colour.



## Phosphorus



The combined monitored annual load of total phosphorus was 2900 tonnes (t) with the largest contributor being the Fitzroy (1300 t) catchment and moderate loads delivered by the Burdekin (410 t), North Johnstone (390 t), Mary (260 t) and Burnett (150 t) catchments (Figure 6).

The combined monitored annual load of dissolved inorganic phosphorus was 360 tonnes with 67 per cent derived from the Fitzroy catchment (240 t). The proportionally high contribution of the Fitzroy catchment is consistent with previously monitored years between 2009 to 2013 (range 56 to 74%). All other catchments each contributed less than seven per cent of the combined monitored annual load, with the lowest dissolved inorganic phosphorus load occurring in the Haughton catchment (0.43 t).

The combined monitored annual load of particulate phosphorus was 2400 tonnes, which accounted for 83 per cent of the total phosphorus monitored annual load. Similar to total suspended solids and particulate nitrogen loads, the largest monitored annual loads of particulate phosphorus were derived from the Fitzroy (960 t), Burdekin (380 t), North Johnstone (380 t) and Mary (230 t) catchments.



Image: Queensland Department of Science, Information Technology and Innovation

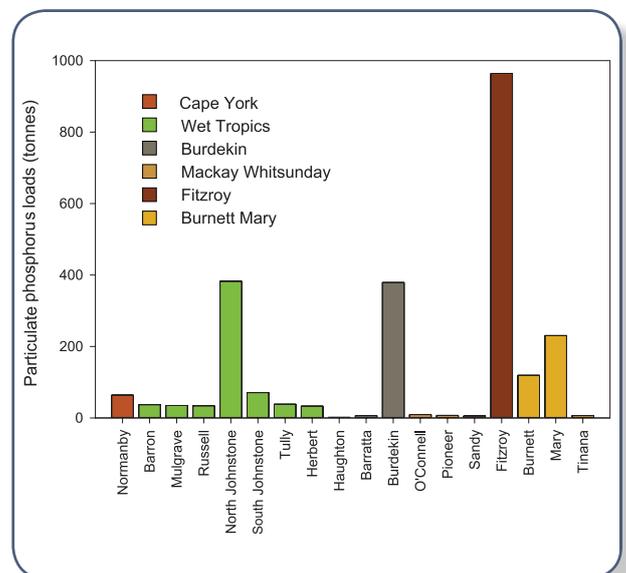
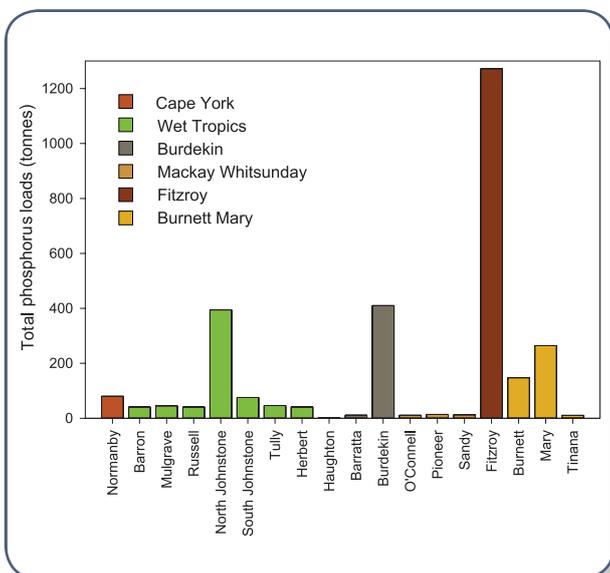


Figure 6 Annual monitored total phosphorus (TP) and particulate phosphorus (PP) loads for 2014–2015. Natural Resource Management regions are grouped by colour.



## Pesticides



The total monitored annual load of the five photosystem II inhibiting herbicides exported past the monitoring sites were (from largest to smallest): 1400 kilograms of total atrazine, 810 kilograms of total diuron, 410 kilograms of tebuthiuron, 280 kilograms of hexazinone and 7.7 kilograms of ametryn. Atrazine and diuron were the only photosystem II inhibiting herbicides detected at all monitored sites. Hexazinone was detected in all catchments except the Haughton and Burdekin catchments and ametryn was only detected in the Russell, Barratta, Pioneer and Sandy catchments. Tebuthiuron was detected at only five catchments, Barratta, Burdekin, O'Connell, Sandy and Fitzroy catchments.

## 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 930 kilograms of diuron (930 kg TEq<sub>diuron</sub>). Diuron was the largest contributor to the annual toxic load, accounting for 810 kilograms of the toxic load.

The catchments that contributed most to the toxic load were the Russell (220 kg TEq<sub>diuron</sub>), Tully (160 kg TEq<sub>diuron</sub>), Pioneer (110 kg TEq<sub>diuron</sub>), Mulgrave (84 kg TEq<sub>diuron</sub>), Sandy Creek (80 kg TEq<sub>diuron</sub>) and Herbert (76 kg TEq<sub>diuron</sub>) (Figure 7).

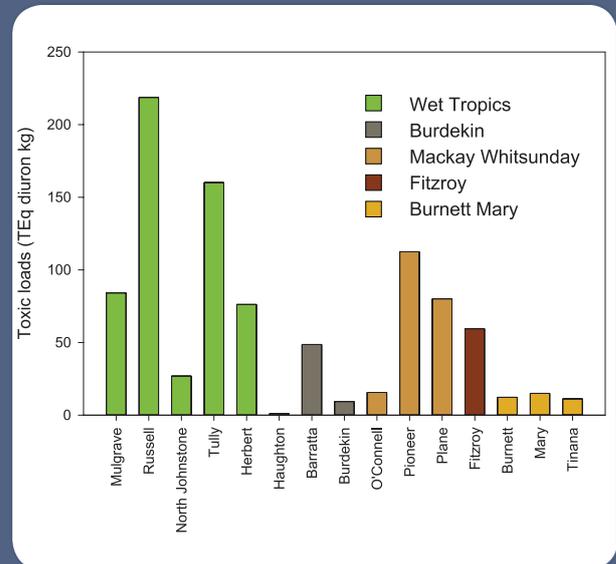


Figure 7 Annual toxic loads (diuron equivalent kg) for 2014–2015. Natural Resource Management regions are grouped by colour.

## 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:

R. Wallace, R. Huggins, O. King, R. Gardiner, B. Thomson, D. Orr, B. Ferguson, C. Taylor, Z. Severino, R. A. Smith, M. St. J. Warne, R. D. R. Turner, R. Mann. 2016. Total suspended solids, nutrient and pesticide loads (2014–2015) 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/>