Great Barrier Reef Catchment Loads Monitoring Program
Total suspended solids, nutrient and pesticide loads summary for 2012–2013

**Background**

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 11 priority catchments and annual loads of pesticides from eight priority catchments that discharge to the Great Barrier Reef.

The Catchment Loads Monitoring Program is part of the Reef Water Quality Protection Plan and the Paddock to Reef Integrated Monitoring, Modelling and Reporting Program. It provides loads data for the validation and improvement of catchment models. These models are used to report on progress towards meeting water quality targets in the annual Reef Plan Report Card.

This summary outlines the monitored loads data for the 2012–2013 year.
Regional profile

Thirty-five catchments flow into the Great Barrier Reef lagoon, and cover an area of approximately 424,000 square kilometres. These catchments extend from the tropics to the subtropics over 2300 kilometres of Queensland's coastline. Across the study area, there are substantial climatic differences within and between catchments, with highly variable rainfall, hydrology and geology. These factors contribute to the high variability in discharge and loads of total suspended solids, nutrients and pesticides between catchments.

Land use change is considered the main cause for elevated anthropogenic (man-made) loads of total suspended solids, nutrients and pesticides exported to the Great Barrier Reef lagoon.

The majority of pollutant loads are generated during the wet season as runoff during flood events from catchments adjacent to the Great Barrier Reef.

Monitoring sites

A total of 25 sites, located in 11 priority catchments, were monitored (Figure 1). These consist of 10 end-of-system sites and 15 sub-catchment sites monitored for total suspended solids and nutrients (phosphorus and nitrogen).

Eight end-of-system sites and one sub-catchment site were also monitored for five priority photosystem II inhibiting (PSII) pesticides.

Flooding limited monitoring at some sites during 2012–2013. Loads were calculated for the monitored area of each catchment and as such do not represent the total load discharged to the Great Barrier Reef lagoon.
Land use

Grazing is the dominant land use1 in the monitored areas of the Normanby, Herbert, Haughton, Burdekin, Fitzroy and Burnett catchments (Figure 2). Conservation is the dominant land use in the monitored areas of the North and South Johnstone2 and Tully catchments. No single land use dominates the monitored areas of the Barron or Pioneer catchments, which have a mixture of grazing, conservation, forestry, sugarcane and cropping. The largest proportional use of land for sugarcane occurs in the Plane, Pioneer, Haughton and Tully catchments.

Rainfall and river discharge

Annual rainfall across the priority reef catchments during 2012–2013 was generally average to below average in the Cape York, Wet Tropics and Burdekin Natural Resource Management regions with few flood events occurring (Figure 3).

Rainfall in the Mackay Whitsunday Natural Resource Management region was average to above average. The eastern section of the Fitzroy and Burnett catchments received very high rainfall associated with ex-Tropical Cyclone Oswald in late-January 2013, which contributed to these areas receiving above average to very much above average rainfall. However, the monitored western Fitzroy sub-catchments had below average to very much below average annual rainfall.

Annual river discharge in the Cape York, Wet Tropics and Burdekin Natural Resource Management regions was generally below the long-term mean. It was above average in the Mackay Whitsunday Natural Resource Management region, end-of-system Fitzroy site and Burnett catchment.

1. Based on the 2009 land use map from the Queensland Land Use Mapping Program (QLUMP) (DSITIA, 2012)
2. The North and South Johnstone rivers combined act as an end of system site
Total suspended solids

The combined 2012–2013 monitored annual load of total suspended solids (TSS) for the 11 priority catchments was 9.6 million tonnes, with the majority derived from the Burnett (39%), Burdekin (26%) and Fitzroy (26%) catchments (Figure 4).

All other monitored catchments each contributed less than five per cent of the annual total suspended solids load. In the Burdekin catchment, the Bowen River sub-catchment load was 2.3 million tonnes, which is equal to 90 per cent of the Burdekin end-of-system load. This was likely to have been influenced by above average rainfall in that sub-catchment, and very much below average rainfall in the other Burdekin sub-catchments.

The end-of-system monitored annual load in the Burnett catchment was exceptionally high compared to previous years and this was mainly caused by a major flow event resulting from ex-Tropical Cyclone Oswald, which contributed around 90 per cent of the annual load.
Nitrogen loads

The combined 2012–2013 monitored annual load of total nitrogen (TN) was 34 thousand tonnes, with the majority derived from the Burnett (35%), Fitzroy (27%) and Burdekin (16%) catchments (Figure 5).

Approximately 42 per cent of the total monitored annual particulate nitrogen (PN) load of 17 thousand tonnes was derived from the Burnett catchment. The Fitzroy (25%) and Burdekin (18%) catchments were also significant contributors.

The combined monitored annual load of dissolved inorganic nitrogen (DIN) was 6.6 thousand tonnes. The main contributors were the Burnett (30%) and Herbert (23%) catchments with substantial loads also contributed by the Fitzroy (14%), Burdekin (12%) and Tully (11%) catchments.

Figure 5: For priority catchments in 2012–2013, the monitored annual load of total nitrogen (TN), particulate nitrogen (PN) and dissolved inorganic nitrogen (DIN) is shown in block colours, and the ratio of annual discharge to annual mean discharge is represented by black dots. Natural resource management regions are grouped by colour. The Normanby site was excluded as there were insufficient samples.
Phosphorus loads

The combined 2012–2013 monitored annual load of total phosphorus (TP) was approximately 9.4 thousand tonnes.

The majority of the total phosphorus load was produced by the Fitzroy (39%), Burnett (31%) and Burdekin (20%) catchments (Figure 6).

The monitored annual particulate phosphorus (PP) load (6.9 thousand tonnes) accounted for approximately 75 per cent of the monitored annual total phosphorus load which is consistent with previous monitoring years.

The majority of the monitored annual particulate phosphorus load was derived from the Burnett (38%), Fitzroy (30%) and Burdekin (22%) catchments.

Particulate phosphorus accounted for more than 75 per cent of the total phosphorus load at all end-of-system monitoring sites except Sandy Creek in the Plane catchment (36%), Barratta Creek in the Haughton catchment (50%) and the Fitzroy catchment (57%).

Figure 6: For priority catchments in 2012–2013, the monitored annual load of total phosphorus (TP) and particulate phosphorus (PP) is shown in block colours, and the ratio of annual discharge to annual mean discharge is represented by black dots. Natural resource management regions are grouped by colour. The Normanby site was excluded as there were insufficient samples.
The combined 2012–2013 monitored annual loads of the five priority photosystem II inhibiting pesticides were 5100 kilograms of tebuthiuron, 2600 kilograms of total atrazine\(^3\), 1900 kilograms of diuron, 440 kilograms of hexazinone and 100 kilograms of ametryn. Tebuthiuron was the least frequently detected herbicide. Only total atrazine and diuron were detected at all eight end-of-system monitoring sites, which is consistent with the previous monitoring year. There were no detections of diuron in the Comet River sub-catchment, hexazinone in the Burdekin catchment and Comet River sub-catchment, and no ametryn in the Fitzroy catchment.

The largest monitored annual load of tebuthiuron was recorded in the Fitzroy catchment (98%) with comparatively small loads in the Burnett and Burdekin catchments (Figure 7).

The largest monitored annual loads of total atrazine were recorded at Barratta Creek in the Haughton catchment (20%), the Fitzroy (18%) and the Pioneer catchments (18%). In all other end-of-system sites the monitored load of total atrazine was less than 12 per cent.

The greatest contributions to the total monitored annual diuron load were from the Tully (30%) and Pioneer (23%) catchments, Sandy Creek in the Plane catchment (16%) and the Herbert catchment (14%). The largest monitored annual load of hexazinone was recorded in the Tully catchment (30%), followed by the Pioneer (21%), Herbert (19%) and Burnett (16%) catchments.

The largest monitored annual loads of ametryn occurred in the Pioneer (28%) and Burnett catchments (27%), which together accounted for over half the total monitored ametryn load.

---

\(^3\) This is atrazine including its breakdown products desethyl atrazine and desisopropyl atrazine.
Further information on pollutant loads and yields (load divided by land surface area) is available in the report:


Acknowledgements

The Great Barrier Reef Catchment Loads Monitoring 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 that collected water samples.


GPO Box 5078

© The State of Queensland (Department of Science, Information Technology and Innovation) 2015.

Image credits: Tourism and Events Queensland.