

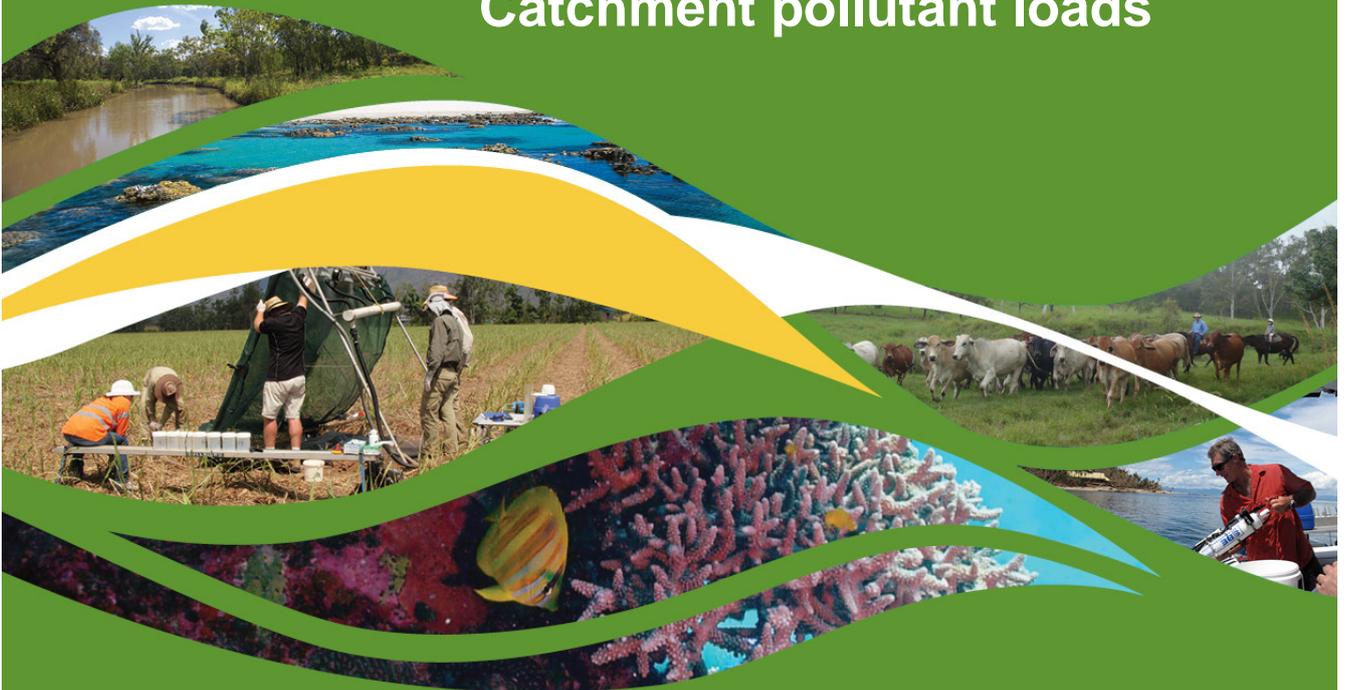
# Great Barrier Reef

Report Card 2011

Reef Water Quality Protection Plan

## Methods

### Catchment pollutant loads



Australian Government

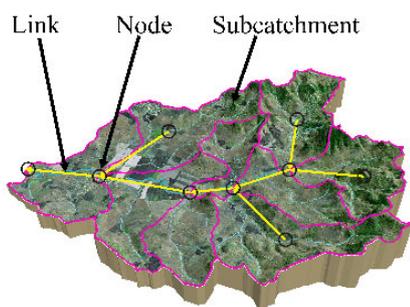


Queensland Government

## Catchment pollutant loads methods

### Catchment modelling

The Source Catchments modelling framework (eWater 2010) is used to report pollutant loads for the 35 catchments in the Great Barrier Reef region. It is a catchment scale water quantity and quality model which uses a node link network to represent the stream. The model generates runoff and pollutant loads for each landuse within a sub-catchment, and runoff and pollutants are transported through the node link stream network to the end of the catchment.



*Example of a node link network generated in Source Catchments to represent a catchment and stream network.*

Source Catchments runs at a daily time step which allows exploration of the interactions of climate and management at a range of time-steps. However, for the report card, average annual catchment loads are reported.

Modelled loads were generated for the fixed climate period using 2008-2009 (baseline), 2009-2010 (Second Report Card) and 2010-2011 (Report Card 2011) landuse/land management following the adoption of improved management practices. A total of 17 pollutants were modelled including fine and coarse sediments, various nutrients and eight pesticides. Key land uses were modelled for the baseline scenario including open and timbered grazing, cane, cropping, horticulture and forestry.

### Management practice change

An ABCD management system framework was used to describe and categorise farming practices according to recognised water quality improvements at a paddock scale. Improvements in water quality as a result of adopting improved management practices are determined by linking paddock model time series outputs to catchment models.

Management practice change has been modelled for the sugarcane and grazing areas of the Great Barrier Reef catchments. Changes in riparian management, which weren't modelled in the Second Report Card 2010, have now also been modelled for most areas.

### Limitations

Water quality improvements from the baseline were not modelled for the horticulture, dairy and cotton industries. Modelling was not undertaken for these industries due to a lack of management practice data and/or limited experimental data on which to base load reductions. Dissolved inorganic nitrogen reductions have not been modelled in the grains system as there is no dissolved inorganic nitrogen model in HowLeaky?

There may also be some over estimate of load reductions as pesticide, nutrient and soil management practices were modelled as a whole system rather than representing the individual practices in which investments were

made. Any over estimates may be offset by the fact that some pollutants and industries could not be modelled, as outlined above.

### Linking paddock and catchment models

Two constituent generation approaches were used in Great Barrier Reef modelling. Firstly, the constituent time-series (e.g. load per day per unit area) for any spatial unit in the Source Catchments model was replaced with an output time-series from a paddock model. In the second approach, a scaling approach, GRASP model groundcover time-series outputs were used to relate changes in grazing system management to changes in the groundcover time-series (or Revised Universal Soil Loss Equation (RUSLE) C-factors). These were modelled and applied to a range of climates and pasture productivity levels and land types.

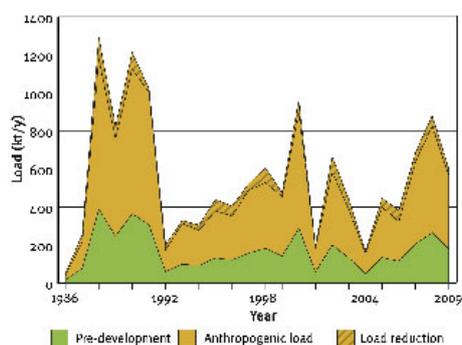
The outputs from each of the modelled land management practices were accumulated into a single landuse time-series for a sub-catchment. All loads were then aggregated at a sub-catchment scale and routed through the stream network.

### Total load

The total load was the load modelled as at 2008-2009 land use/land management within each Great Barrier Reef catchment. A pre-development land use map was also developed and modelled. The model was then run for a 23-year period to establish the total load over this period. Thus, the anthropogenic load was the total load less the pre-development load.

### Load reductions

The model was then re-run for the same climate period using updated proportions of A, B, C and D areas to reflect investment in improved management practices since 2008-09. The relative change in pollutant loads from the anthropogenic baseline after investment reflects the load reduction due to changes in management practices.



*Example of modelled loads for pre-development, anthropogenic baseline and the load reduction following investment in improved practices.*

### How the information is reported

Progress towards Reef Plan targets is measured by how much the pollutant load has reduced from the average annual anthropogenic baseline (total load less the pre-development load). This is calculated as a percentage reduction in average annual load.

Total suspended sediment, nitrogen, phosphorus and pesticides loads at the end of the catchment are reported for the total Great Barrier Reef region, six regions and the 35 catchments.

**The average annual percentage reduction in load is calculated from:**

$$\text{Reduction in load (\%)} = \frac{(\text{Anthropogenic baseline load less anthropogenic change}) \times 100}{\text{Anthropogenic baseline load}}$$

Where, anthropogenic baseline load = total load less pre-development load.

Catchment modelling is not informed by a spatially explicit management practice change dataset for all areas which means some assumptions are made when spatially distributing management change data in some areas. Depending on the availability of useful investment data, there may be instances where a load reduction is reported for a particular region or sub-catchment that in reality has had no investment in land management improvement. For this reason, load reductions are presented at the Great Barrier Reef and regional scales only in Report Card 2011. Processes are being established to report catchment scale load reductions for future report cards through the capture and reporting of spatially explicit management change data.

## References

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