

# Sources of Sediment and Nutrient exports to the Great Barrier Reef

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**Presented at SIRC 2003 – The 15<sup>th</sup> Annual Colloquium of the Spatial Information Research Centre  
University of Otago, Dunedin, New Zealand  
December 1<sup>st</sup>-3<sup>rd</sup> 2003**

## ABSTRACT

Agricultural land uses on the Great Barrier Reef (GBR) catchment are causing an increase in pollutant loads discharging to the Great Barrier Reef World Heritage Area (GBRWHA). Research and monitoring have clearly established that changed land use activity on the catchment of the GBRWHA is directly contributing to an increase in the load of pollutants discharging to the area. Discharged pollutants are degrading GBR ecosystems, particularly those close to the coast. Pollutant loads are increasing and show no sign of reduction. Similar pollution has caused the decline of coastal ecosystems around the world.

To begin to manage sediment and nutrient exports it is essential to identify the sources of sediment and nutrient that are exported to the coast. This is quite a different problem to mapping soil erosion and nutrient loss in the contributing catchments. The present study used the models, SedNet and its nutrient version ANNEX, calibrated using water quality data, to identify the sources. The sources that contribute to export at the coast were identified by modelling spatially distributed sediment and nutrient budgets in the contributing catchments. These budgets map the sources, sinks and transport of sediment and nutrients river link by river link, as it is transported to the coast. The modelling allows extrapolation into catchments and sub-catchments for which there is no water quality monitoring data, and allows us to predict where remedial measures will have the greatest ability to reduce future loads.

Catchments with high levels of land clearing, beef grazing and/or fertilized cropping show the greatest increases in sediment and nutrient export. The modelling shows that soil erosion is the dominant process supplying 63 % of sediment to the rivers. Gully erosion and river bank erosion are relatively minor sources at the GBR catchment scale, although they are important in some catchments. Overall, 70 % of sediment exported to the coast comes from just 20 % of the total catchment area. Areas of high contribution are all relatively close to the coast. Targeting the areas with a disproportionately high level of contribution and large difference to natural contribution should be a priority as this will have the greatest effect on reducing sediment export to the coast.

The spatial patterns of total N and P contribution to streams largely reflect the soil erosion predictions. Hillslope (soil) erosion is by far the largest source of particulate nutrients because of its dominance as a sediment source and the higher nutrient concentrations on surface soils. Gully and riverbank erosion make up less than 10% of the total nutrient sources. Our results predict that about 30 % of total nitrogen sources comes from dissolved forms in runoff, and about 15 % of phosphorus is derived from dissolved sources.