Outcomes Factsheet

Tropical Water Quality Hub
National Environmental Science Programme

Project 5.8 What's really damaging the Reef? Tracing the origin and fate of the environmentally detrimental sediment and associated bioavailable nutrients - *Dissolved inorganic nitrogen in riverine sediment plumes of the Great Barrier Reef*

This research has for the first time, helped to quantify dissolved inorganic nitrogen (DIN) generation associated with sediment in riverine plumes entering the Great Barrier Reef (GBR) lagoon. This is the first step in assessing the risk to the GBR lagoon from this source of DIN. If the sediment that produces larger DIN loads is targeted as part of catchment management actions, considerable benefits to improve water quality flowing to the GBR could be achieved. Quantifying the magnitude of DIN generation in riverine sediment plumes and identifying what controls these processes, can improve our understanding about the risk of particulate nutrients to GBR ecosystems.

A series of water samples taken from end-of-river sites and at different positions in riverine sediment plumes generated from the Burdekin River catchment and the Tully River in the Wet Tropics were analysed in the laboratory. The amount of DIN that could potentially become bioavailable (i.e., released) was quantified. This DIN was released from the organic and particulate nitrogen pool via ammonium desorption and microbial processing in estuarine flood plumes (**Figure 1**).

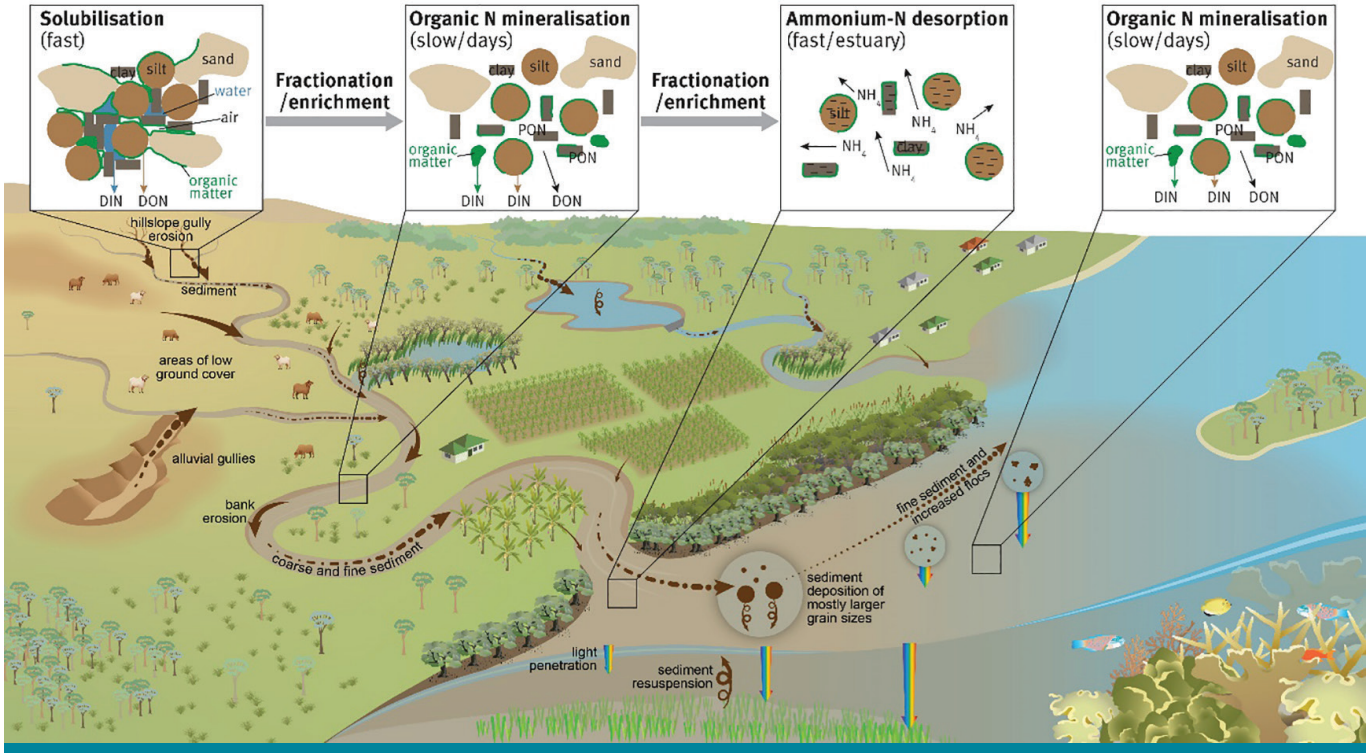


Figure 1. The main processes generating DIN as soil eroded from gullies, hillslopes and streambanks is transported through catchments to the coast (Garzon-Garcia et al., submitted, In prep). Baseline map courtesy of the NESP Tropical Water Quality Hub

Key Findings

The research showed that DIN generation in riverine sediment plumes is considerable and as such the risks to the GBR lagoon from this source needs to be assessed and managed.

The estimated potential DIN load generated from the organic and particulate nitrogen in the Burdekin River plumes (from end-of river to where the plumes reached in the GBR lagoon) was equivalent to approximately 9-30% of the corresponding end-of-river DIN load in 4 to 5 days of plume travel time.

Sediment and associated particulate nitrogen have the potential to continue to produce DIN once deposited on the marine floor and/or resuspended. Large DIN concentrations and a different source/type of organic matter in the Tully and one of the Burdekin plumes explain why the generation of DIN was negligible in those cases.

These findings imply the need to target both the key sources of sediment to the Reef lagoon together with the sediment sources that generate a larger load of DIN. Preliminary tracing data suggests the highest contributing soil types for DIN generation appear to be different to that for sediment load.

These results, together with a large existing database of DIN generation from sediment types in the Bowen River catchment (Projects **RP128G**, **RP178a**), can support the prioritisation of gully sites for remediation to address both sediment and DIN generation from sediment in this catchment.





Figure 2. Left: Sampling sediment and nutrients in riverine sediment plumes (Image: Jeff Maurice). Right: Incubation experiments to quantify the conversion of particulate (and dissolved) organic nitrogen to DIN by microbial communities (Chem Centre -Department of Environment and Science)

Outcomes

Outcomes from this project will contribute to the next Scientific Consensus Statement. It could also be used to improve the Paddock to Reef and eReef models, monitoring and reporting towards meeting load targets entering the GBR lagoon, and better understanding the risk of particulate nutrients to reef ecosystems.

These outcomes are useful in assessing the benefits of developing a Reef Credit method to stack sediment and DIN generation from sediment in grazing catchments. This work reinforces the importance of taking measures to minimise erosion in grazing and cropping lands to protect surface soil from being lost in rainfall run-off to waterways flowing to the GBR lagoon.

Acknowledgements

This project is funded by the Australian Government's National Environmental Science Program (NESP) Tropical Water Quality (TWQ) Hub with additional funding from the Queensland Government's Reef Water Quality Program and in-kind support from the Chemistry Centre, Landscape Sciences, Department of Environment and Science (DES). We thank the laboratory staff at the Chemistry Centre, Department of Environment and Science and TropWATER, James Cook University for analysis of samples. We especially thank Leigh Smith, project manager (DES). We also thank Megan Prance for helping with the incubation and extraction of plume samples in the lab. We thank Barbara Robson for her guidance towards calculating plume travel times used in the calculation of mineralised dissolved inorganic nitrogen in the plumes.

This research has been carried out by the Queensland Department of Environment and Science (DES). It is dedicated to the memories of Jon Brodie and Phil Moody.

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This project is supported through funding from the Australian Government's National Environmental Science Program