

# Nutrient transport to Lake Rotorua: What happens when it rains?

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**Keywords:** Nitrogen; phosphorus; sediment; storm flow

Rainfall in a catchment has the potential to mobilise and transport high loads of nutrients over short time periods. Such episodic events are often inadequately included in routine monitoring programmes and can therefore be a source of uncertainty when calculating nutrient loads to receiving water bodies.

A high frequency sampling programme has been undertaken in the catchment of Lake Rotorua (New Zealand) to better characterise nutrient flux following heavy rainfall. Streams were sampled at 1-2 hour intervals using automatic water samplers deployed prior to the onset of rainfall. Analysis of samples relating to seven separate events during one year indicates that temporal variation in nutrient concentrations can be considerable in the hours immediately following rainfall.

In particular, total phosphorus concentration (TP) correlates strongly with discharge (Q). During the largest storm sampled (maximum Q = 12 times base flow) the estimated TP load transported in one stream over a 24-hour period was 331 kg; equivalent to the sum of the TP load in base flow over 39 days. There is a weaker correlation between total nitrogen and Q while dissolved nutrients typically exhibit a negligible or dilution response to increased Q, although nitrate and ammonium concentrations may become elevated during the recessing limb of the hydrograph.

This hysteretic response suggests sub-surface transfer of nutrients (e.g. nitrate) or mobilisation of sources in the upper catchment that are distant from the sampling location. Catchment-based models need to reflect the differing responses of nutrients to elevated stream discharge and actions to minimise sediment erosion will reduce phosphorus loading to the lake.