Constructed wetlands assist in lake restoration: Results from a study of the Lake Okaro constructed wetland

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Lake Okaro was identified as one of the most degraded lakes in the Bay of Plenty Region. In 2004, the Trophic Level Index was 5.5, indicating a hyper-eutrophic, phytoplankton-dominated water body. In response, a Lake Action Plan was developed, becoming operational in 2005. The Action Plan identified nutrient target concentrations for the lake, as well as a range of actions in the catchment draining into the lake. These strategies were intended to reduce inputs of nitrogen and phosphorus to the lake. The most visually obvious outcome has been the construction of a wetland, which intercepts the flow from the two major inflows.

The wetland inflows and outflow have been measured continuously since September 2007. A series of time- and flow-dependent grab water quality samples have been collected since January 2008, from which concentrations of soluble and particulate-bound phosphorus and nitrogen were determined. More recently, samples were analysed for suspended sediment and faecal indicator bacteria concentrations.

Contaminant loads were estimated from concentration and flow data, using a variety of modelling techniques. We compared the nutrient removal performance observed with the targets identified in the Lake Okaro Action Plan. Over the period January 2008 – December 2010, the wetland considerably exceeded the nutrient removal target for total phosphorus (16 kg), and met the target for attenuation of the total nitrogen load (348 kg) from the catchment (Figure 1.1). The wetland removed more that 85% of the incoming sediment load. A two- to three-log reduction in faecal indicator loads was also indentified (Figure 1.2).

While the performance of the wetland varied seasonally and in response to specific rainfall events, our results indicate a general reduction in contaminant loads to Lake Okaro. We conclude that constructed wetlands can contribute to surface water and lake restoration strategies. We also note that constructed wetlands should be regarded as just one of a number of complementary mitigation strategies that could be used to reduce contaminants loads arising from agricultural catchments.

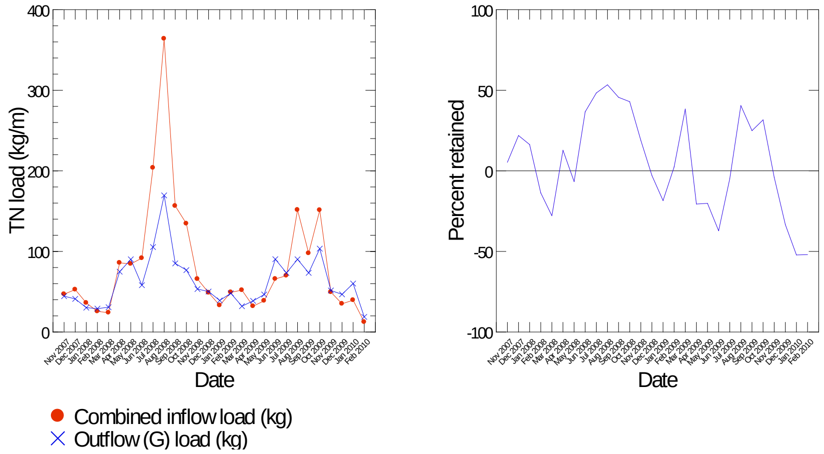

Figure 1.1 Comparison of combined wetland inflow and outflow total nitrogen loads (left), and performance of the wetland in terms of retention of inflowing load (right).

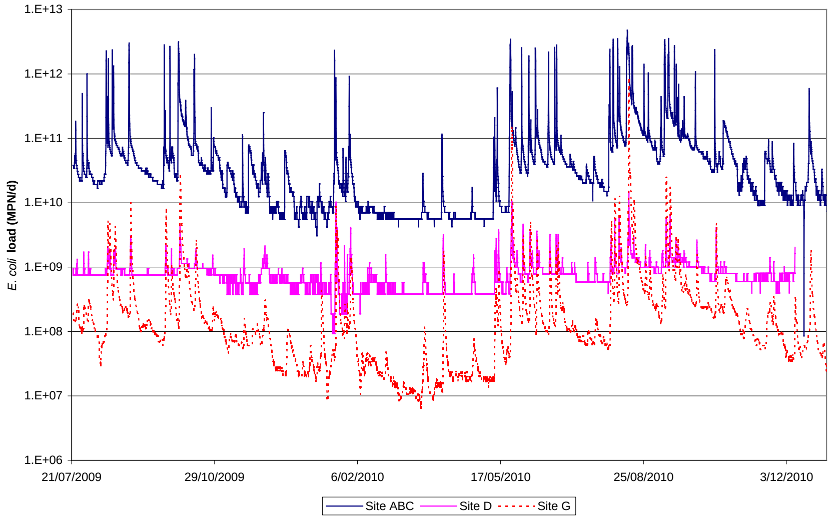

Figure 1.2 Comparison of wetland inflow and outflow faecal indicator loads. Site ABC is the major wetland inflow, Site D the minor wetland inflow and Site G the wetland outflow.