Assessing the ability of detainment bunds to attenuate sediment and phosphorus transported by surface runoff in the Lake Rotorua catchment

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Abstract

Excess nutrients entering Lake Rotorua have impaired water quality since the 1960s. A 10 t/yr reduction of phosphorus (P) delivered to the lake is the target set by the 2012 Lake Rotorua Nutrient Management Plan in order to improve water quality. Storm periods present significant opportunities to mitigate dissolved P and sediment bound P loss from agriculture, which has been identified as a significant source of P entering the lake. A detainment bunds (DB) is a novel mitigation strategy, comprised of a low earthen dam constructed on productive pasture, which is capable of temporarily ponding large quantities of stormwater delivered by ephemeral streams. Prior research on DBs and sedimentation basins serve as a proof of concept for the technology, however there is no quantitative data available on the capacity of the strategy to attenuate contaminants under New Zealand conditions. This study reports data from a DB receiving runoff from 19.7 ha within the Lake Rotorua catchment over three storm events. The results indicate that ponding water in DB’s resulted in
suspended sediments and phosphorus loads transported downstream decreasing by 24-82%.

Contaminant attenuation was influenced by the size of the runoff event and the amount of water which infiltrated the soil during ponding. Quantification of DB performance is essential to implementing the technology at regional or national scales, and to effectively model treatment efficacy using nutrient management tools such as OVERSEER®.