

IN-STREAM WOODCHIP DENITRIFYING BIOREACTOR TRIAL, SOUTH CANTERBURY

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Woodchip denitrifying bioreactors (WDBs) are an edge-of-field nitrogen mitigation measure that conceivably might be applied to the challenge of farming within nutrient load limits, such as imposed by the National Policy Statement for Freshwater Management. Whether such water treatment systems are a viable nutrient mitigation measure in New Zealand's agricultural landscape however has yet to be properly assessed.

We are trialling an in-stream WDB in an open drain on a dairy farm in South Canterbury. Being conscious that the performance of in-stream WDBs is often compromised by sediment clogging issues, we have incorporated a set of sediment control measures into the bioreactor design. Working within the physical constraints set by the drain geometry and planning rules, we applied stochastic methods to the design problem. Varying a suite of uncertain physico-chemical variables, the metrics of: bioreactor size vs cost vs under/over treatment of water entering the WDB were evaluated, and an optimal design identified.

The 75-m long WDB contains 430 m³ of 20-50 mm nominal diameter woodchip, processed from virgin *Pinus radiata*. It has been designed to intercept 6 L/s of drain water, containing, on average, 6 mg/L nitrate-N. We predict it should remove about 4,030 kg of nitrogen over what we expect to be a 10-year operational life. This is equivalent to 34% of the total nitrogen load in the farm drain.

When the experimental WDB becomes operational, its performance will be closely monitored. Leaching of dissolved organic carbon, mobilisation of phosphorus from suspended sediment and greenhouse gas production are potential pollution swapping phenomena that will be examined.

Editor's note: *An extended manuscript has not been submitted for this presentation.*
