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**Effects of exotic forestry on stream
macroinvertebrates: the influence of scale in North
Island, New Zealand streams**



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ABSTRACT

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The effects of exotic forestry, particularly harvesting, on stream macroinvertebrate community structure was assessed in four regions, Lismore, Tawarau, Pirongia and Te Wera, of central North Island, New Zealand. A survey of 42 streams draining exotic forest (of different ages), native forest or pasture catchments was conducted in January and February 1997. Stream macroinvertebrate communities in 12 of these streams were further monitored every two months for 11 months, to assess changes in macroinvertebrate communities following harvesting and road construction.

Recent forest harvesting (within six years) was associated with an increase in the abundance of pollution tolerant taxa (e.g., Oligochaeta, Crustacea and Mollusca) and a decrease in the abundance of Ephemeroptera and Plecoptera, indicating a shift in community structure. Diversity was not affected by harvesting however. Communities in streams draining mature exotic forest were similar to those in streams draining native forest, both being dominated by Ephemeroptera. Similarly, streams in harvested and pasture catchments were comparable. However, invertebrate response to forestry differed in the four regions, with Lismore and Te Wera forests showing distinct differences in community composition between streams in mature exotic forest and those in harvested exotic forest, while Pirongia and Tawarau showed little or no difference. Large scale factors such as geology were important in determining the response of communities to forest harvesting through their influence on substrate characteristics and susceptibility to erosion, and masked clear differences between land use types when compared between regions. Within regions however, communities differed more between land use types.

Pre and post harvest monitoring revealed that changes in community composition were immediate from commencement of harvesting. Road construction had little effect on community composition but did lead to increased abundance of invertebrates. Physiochemical characteristics associated with differences in macroinvertebrate community structure between streams in harvested and mature exotic forest included

sedimentation, stream stability and removal of riparian vegetation which altered light and water temperature regimes, and invertebrate food sources.

The effect of sedimentation was tested experimentally for 21 days in three streams draining mature exotic forest catchments and two draining pasture catchments. Total abundance of macroinvertebrates decreased significantly with light and heavy sedimentation, and community composition showed a change from Ephemeroptera to Coleoptera dominated. Taxa most affected by sedimentation were Ephemeroptera and Plecoptera. Stream communities in exotic forest showed different responses to sedimentation than those in pasture, indicating that if pollution or sediment tolerant taxa are already present, sedimentation may not change the community significantly.

Keywords: community composition, exotic forestry, harvesting, land use, macroinvertebrates, riparian vegetation, sedimentation, spatial scale, temporal scale, water quality.