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The dominance of landslides from steep native forest headwater areas to estuary sedimentation as determined by sediment fingerprinting in a small mixed landuse catchment in the North Island, New Zealand

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New Zealand's estuaries have high ecological and recreational values which are vulnerable to the impacts of increased sedimentation. The key to mitigating the effects of suspended sediment is the identification of the dominant region and process responsible for sediment generation. As a consequence the landuse activity of exotic forestry has been coming under increasing attention from land managers seeking to reduce sediment fluxes to the coastal margins. Little comparative data exist for sediment generation from the other main landuses of agriculture and native forests.

The sediment fingerprinting technique (Collins et al, 1997) is an advance on traditional indirect erosion measurement methods which typically measure sediment movement past one point in the landscape. Sediment fingerprinting seeks to link sediment source areas with the eventual sediment sink by developing a multi-parameter geochemical 'fingerprint' that will distinguish various sediment provenances from one another and allow their relative contribution to be quantified.

A sediment fingerprinting study was undertaken in the Whangapoua Harbour catchment (110km2), North Island, New Zealand, to determine the relative contributions of estuarine suspended sediment from the landscape unit of exotic forests (mid-slopes), as well as from native forests (steep upper slopes), and agricultural pastures (lowlands). The data assemblage for the sediment fingerprinting study was also designed to account for the relative contribution from potential sediment generation processes of landslide, surface, and streambank erosion.

Surprisingly, the results indicate that 62% of the Whangapoua estuarine suspended sediment was derived from the steep slopes of the catchment under native forest, although it comprises only 21% of the catchment area. Results also indicate that 79% of all estuarine sediment was from landslide erosion processes. The dominance of subsurface erosion process was validated using radionuclide tracers. It has been interpreted that the combination of steep slopes and higher levels of rainfall found in the headwater areas of the catchment trigger landslides from hillslopes that are well coupled to the drainage network. The steep native forest landscape unit is also less resistant to disturbance because of the selective logging of native kauri trees that grew preferentially on slopes with moderate to high landsliding risk. Thus slope and rainfall are the main drivers of erosion in the Whangapoua catchment, and not landuse.