The effects of catchment land use on water quality and macroinvertebrate assemblages in Otara Creek, New Zealand

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Abstract

The effect of catchment land use on water quality and macroinvertebrate communities was examined by using data gathered during a 2004 reconnaissance of nine sites in the Otara Creek, New Zealand. Data collected included macroinvertebrate, water chemistry and sediments characteristics. Macroinvertebrate data were used in metric and index calculations. A total of 61 macroinvertebrate taxa, with 3032 total individuals, were identified from the macroinvertebrates samples collected from nine sites in Otara Creek. The greatest number of macroinvertebrate taxa was recorded within bush sites (mean>25), while the urban sites had the least number of taxa (mean=10). Pasture sites were intermediate with the mean>17. Taxa number differed significantly across land use. Mean macroinvertebrates abundance varied across the sites and land uses. The highest macroinvertebrates mean abundance was recorded in urban and pasture sites, while bush sites had significantly lower mean abundance. Physico-chemical parameters decreased from bush toward urban streams. Biotic indices were sensitive to changes in macroinvertebrates community structure across land uses with mean scores decreasing from bush to urban and pasture streams. Ordination of biological data showed a clear separation of bush from urban and pastures streams. Analysis of similarities revealed significant differences in macroinvertebrates between both stream groups and land-use groups. The observed macroinvertebrate assemblage pattern was best correlated with a single variable, conductivity, temperature, turbidity, nitrate and dissolved oxygen. The combination of these environmental variables best explained the changes in the macroinvertebrate assemblages between sites. This study demonstrates that catchment land use may significantly affect the water quality and macroinvertebrate communities in an ecosystem.

Keywords

catchment,
land use,
water quality,
macroinvertebrates,