

Effects of Land Use on River Water Quality and Benthic Macroinvertebrate Communities on Marinduque Island, The Philippines

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This study assessed stream water quality and benthic macroinvertebrate communities to monitor water quality in response to different land use types on Marinduque Island. Sixteen streams and wadeable rivers along a disturbance gradient related to land use (forested, agricultural, recreational, and mixed land use types) were evaluated to determine the possible effects of land use on the environmental and biological integrity of streams and rivers. Specifically, this study assessed the effects of land use on (1) water quality and (2) the community composition of benthic macroinvertebrates. Several macroinvertebrate-based community metrics and indices were tested, such as abundance, richness, macroinvertebrate density and diversity, functional feeding, and tolerance to water quality. Results from various multivariate analyses revealed a stark contrast between sites regarding water quality and biological integrity. Forested areas exhibited higher water quality and better biological integrity than recreational and mixed sites. This can be attributed to increased nutrient loading, recreational activities, decreased riparian zone vegetation, and hydrological stability in test sites. Improved water quality conditions also reflect variations in benthic macroinvertebrates (BMI), as forested and agricultural sites achieved higher biological quality scores (ASPT, BMWP, and EPT-C Index) compared to recreational and mixed sites, suggesting the effects of water quality significantly affect BMI assemblage. The results support using BMIs as a cost-effective alternative in synergy with water physiochemistry, which the province will use to address water resource conservation and sustainable management. Integrated watershed management must consider the effect of various anthropogenic stressors on water quality and aquatic biota. Improved water quality monitoring based on bioindicators leads to better management of water resources.