ABSTRACT

TITLE:	Nitrate Loading: An Analysis of Land-Use Impacts on Topsoils Within the Rio Java Watershed, Las Cruces Biological Research Station, Costa Rica
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ABSTRACT: The modification of natural landscapes to agriculture, pasturelands, and urban areas has been wide-spread throughout Costa Rica since the late 1790s. These land-use priorities have had their greatest impact on the south-central county of Coto Brus. Degradation of water and soil quality, including excess nitrate levels, is some of the resulting concerns of these practices. Four study sites (representing pasture lands, secondary/primary forests, and urban areas) were chosen within the boundaries of the Rio Java watershed (located in Coto Brus County). At the time this study was conducted, little to no research focused directly on soil NO3- in this watershed. Costa Rican soils are generally classified as Ultisols, which are characterized as having high leaching rates. The study focused on the impacts and risks associated with land-use management practices on soil NO3- in tropical environment of the Rio Java watershed. Nitrate (NO3-) concentrations, percolation rates, and nitrate loading rates (NLR) were analyzed throughout the four sites. Eighteen soil samples and percolation rate tests were conducted at each site. Subsequent topsoil pore water and nitrogen loading rates (NLR) ([NO3] mg/l * percolation rates (L/sec)= NLR (mg/sec)) were analyzed to assess the potential risk for nitrate contamination of groundwater at each land-use type. Two-way ANOVA with post-hoc Tukey tests (=0.05) were run to determine if statistically significant differences of NO3- concentrations and NLR exist between sites. Statistically significant differences of NO3 concentrations and NLR were found between the four different land-use management sites (p=0.01). This preliminary study indicated that the secondary forest has the highest mean NLR and NO3- values >25 ppm. Soil NO3- >25 ppm is considered above sufficient for plant nutrient needs. These excessive NO3- values in conjunction with high NLR, may lead to leaching of NO3- into groundwater, posing a risk to human health and the environment.