

Solids and Nutrient Loads Exported by Preserved and Impacted Low-Order Streams: A Comparison among Water Bodies in Different Latitudes in Brazil

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Abstract : Estimating the relative contribution of nonpoint or point sources of pollution in low-order streams is an important tool for the water resources management. The location of headwaters in areas with anthropogenic impacts from urbanization and agriculture is a common scenario in developing countries. This condition can lead to conflicts among different water users and compromise ecosystem services. Water pollution also contributes to exporting organic loads to downstream areas, including higher order rivers. The purpose of this research is to preliminarily assess nutrients and solids loads exported by water bodies located in watersheds with different types of land uses in São Carlos - SP (Latitude. -22.0087; Longitude. -47.8909) and Caxias do Sul - RS (Latitude. -29.1634, Longitude. -51.1796), Brazil, using regression analysis. The variables analyzed in this study were Total Kjeldahl Nitrogen (TKN), Nitrate (NO₃-), Total Phosphorus (TP) and Total Suspended Solids (TSS). Data were obtained in October and December 2015 for São Carlos (SC) and in November 2012 and March 2013 for Caxias do Sul (CXS). Such periods had similar weather patterns regarding precipitation and temperature. Altogether, 11 sites were divided into two groups, some classified as more pristine (SC1, SC4, SC5, SC6 and CXS2), with predominance of native forest; and others considered as impacted (SC2, SC3, CXS1, CXS3, CXS4 and CXS5), presenting larger urban and/or agricultural areas. Previous linear regression was applied for data on flow and drainage area of each site ($R^2 = 0.9741$), suggesting that the loads to be assessed had a significant relationship with the drainage areas. Thereafter, regression analysis was conducted between the drainage areas and the total loads for the two land use groups. The R^2 values were 0.070, 0.830, 0.752 e 0.455 respectively for SST, TKN, NO₃- and TP loads in the more preserved areas, suggesting that the loads generated by runoff are significant in these locations. However, the respective R^2 values for sites located in impacted areas were respectively 0.488, 0.054, 0.519 e 0.059 for SST, TKN, NO₃- and P loads, indicating a less important relationship between total loads and runoff as compared to the previous scenario. This study suggests three possible conclusions that will be further explored in the full-text article, with more sampling sites and periods: a) In preserved areas, nonpoint sources of pollution are more significant in determining water quality in relation to the studied variables; b) The nutrient (TKN and P) loads in impacted areas may be associated with point sources such as domestic wastewater discharges with inadequate treatment levels; and c) The presence of NO₃- in impacted areas can be associated to the runoff, particularly in agricultural areas, where the application of fertilizers is common at certain times of the year.

Keywords : land use, linear regression, point and non-point pollution sources, streams, water resources management

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