Southeastern Section - 54th Annual Meeting (March 17–18, 2005)

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Presentation Time: 8:00 AM-12:00 PM

RELATIONSHIPS BETWEEN URBAN LAND COVER AND NITROGEN BIOGEOCHEMISTRY IN STREAMS OF THE SOUTH CAROLINA PIEDMONT, PART II: THE BRUSHY CREEK WATERSHED

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Land cover, particularly urbanization, affects the biogeochemistry of streams and rivers. Of particular concern for downstream ecosystems are the elevated concentrations and fluxes of nitrogen in rivers draining urban areas. The purpose of this study was to determine the relationship between urban land cover and the nitrogen biogeochemistry of a small river system. We studied the 38.2 km^2 Brushy Creek watershed, which has 66 % urbanized land cover concentrated in the headwater region. The lower portion of the watershed is more forested. A study of the watershed in 2000 indicated that it had the highest and most variable nitrate concentrations of tributaries of the Enoree River in northwestern South Carolina.

From June to August 2004, we collected water samples for chemical analyses from 15 sites which had been sampled in 2000 and from an additional 11 sites which were located near headwaters, constructed ponds, and suspected point-sources of contamination. Nitrate concentrations in 2004 ranged from 0.36 mg/L to 9.28 mg/L, with a watershed average of 3.75 mg/L. At most localities, nitrate concentrations were greater in 2004 than in 2000 (mean increase=0.30 mg/L), perhaps related to higher rainfall (and presumably N inputs) in 2004. Six sites sampled in the upper headwaters in 2004 had an average nitrate concentration of 5.80 mg/L and included the highest nitrate concentrations in the watershed. Four sites sampled upstream of ponds had an average nitrate concentration of 4.18 mg/L, whereas sites immediately downstream of the ponds had an average nitrate concentration of only 1.29 mg/L. Localities further downstream showed decreases in nitrate concentrations. We hypothesize that denitrification and dissimilatory nitrate reduction in the ponds accounted for this decline. Ammonium concentrations were typically less than 0.10 mg/L but at a few sites were as high as 0.38 mg/L. Total dissolved nitrogen generally followed the same spatial pattern as nitrate concentrations.

High concentrations of nitrate associated with heavily urbanized headwaters suggest that nitrogen from atmospheric deposition has saturated the system. Fertilizer may also contribute to stream nitrogen, however. Downstream, nitrate concentrations are modified by dilution along with denitrification and dissimilatory nitrate reduction in ponds.

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General Information for this Meeting

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Undergraduate Research (Posters)
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8:00 AM-12:00 PM, Friday, March 18, 2005

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