

Southeastern Section - 58th Annual Meeting (12-13 March 2009)

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Presentation Time: 8:30 AM-12:30 PM

IDENTIFYING NITROGEN SOURCES AND TRANSFORMATIONS IN URBANIZED HEADWATER STREAMS USING GEOCHEMICAL AND ISOTOPIC APPROACHES

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Headwater streams comprise over seventy percent of the total stream length in the eastern United States. Increasingly, human transformation of land cover alters these headwaters. In particular, elevated nitrate concentrations in headwaters are associated with urbanization. Thus, it is important to determine the sources and transformations of nitrogen within urban watersheds. This study investigated headwaters within two urbanized watersheds in the Enoree River basin, South Carolina. Water samples were collected along finer-scale transects from the headwater springs to between 320 and 535 m downstream, as well as along watershed-scale transects from 4000 to 12000 m downstream. Urban storm runoff also was collected. Nitrate concentrations in urban storm runoff exceeded 1.4 mg N/L, while ammonium concentrations exceeded 0.63 mg N/L. Headwater nitrate concentrations ranged from 0.10 to 3.4 mg N/L, and ammonium concentrations ranged from below 0.01 to 0.24 mg N/L, both significantly higher than concentrations in nearby forest streams. Nitrate concentrations generally decreased with increasing distance downstream, with most changes occurring within the first 150 to 700 m. In slowly-flowing areas within 100 to 600 m from the headwater springs, nitrate and dissolved oxygen concentrations decreased and nitrite, ammonium, and dissolved organic carbon concentrations increased. Such stream sections may be hot spots for denitrification and other biogeochemical processes. Relatively constant concentrations of chloride, sodium, silicon, and magnesium along the stream reaches indicate a minimal role for dilution in altering nitrate concentrations. We will use paired isotopic analyses of $\delta^{15}\text{N}$ and $\delta^{18}\text{O}$ values for nitrate from 18 samples, in combination with chemical composition data, to constrain the sources and transformations of nitrate in runoff and in streams. Preliminary isotopic and chemical data suggest that nitrification of storm water within the shallow groundwater system is a major contributor of nitrate through the oxidation of ammonium. If denitrification plays a major role in nitrate removal within upper piedmont streams, generally increasing $\delta^{15}\text{N}$ and $\delta^{18}\text{O}$ values further downstream are expected.

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[General Information for this Meeting](#)

Session No. 16--Booth# 23

[Undergraduate Research \(Posters\)](#)

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