Southeastern Section - 57th Annual Meeting (10–11 April 2008)

Paper No. 31-21

Presentation Time: 1:30 PM-5:30 PM

ORIGINS OF ELEVATED NITRATE CONCENTRATIONS IN URBANIZED HEADWATER STREAMS, ENOREE RIVER BASIN, SOUTH CAROLINA

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Understanding the impact of urban land cover on nitrogen loading in headwater streams is important because they constitute more than seventy percent of total stream length in the eastern United States. Urbanized headwater streams of the upper piedmont of South Carolina typically have nitrate concentrations four or more times higher than streams in forested watersheds. This study combines water chemistry analysis and $\delta^{15}N$ and $\delta^{18}O$ isotopic composition of nitrate in order to increase our understanding of the sources and transformations of nitrogen in small headwater streams unaffected by point sources of nitrogen. Surface water samples were collected at the headwater springs and approximately 500 m downstream at seven localities. Groundwater samples were collected at four of these localities. Samples of storm water runoff were collected from parking lots and rooftops to capture a composite sample of wet deposition and dry deposition that had accumulated on impervious surfaces. Samples were analyzed for concentrations of major cations and anions, alkalinity, dissolved organic carbon, total dissolved nitrogen, and ammonium. Eight samples were collected for $\delta^{15}N$ and $\delta;^{18}O$ analysis. Headwater concentrations of nitrogen were highly variable, ranging from 7 µmol/L to over 200 µmol/L for nitrate and < 1 µmol/L to 138 µmol/L for ammonium. Storm water runoff had concentrations of nitrate exceeding 75 µmol/L and concentrations of ammonium greater than 35 µmol/L. Preliminary interpretations suggest that the storm water is being nitrified in the shallow groundwater system transforming the ammonium to nitrate. Headwater springs with a deep incision tend to have higher concentrations of nitrate suggesting that the groundwater table is being disconnected from the rooting zone diminishing the system's capacity to transform nitrate. Springs with a shallow incision tended to have lower nitrate concentrations, suggesting more efficient denitrification. We suggest that the accumulation of dry deposition on and runoff from impervious surfaces combined with the disconnection of the groundwater table from the riparian rooting zone results in elevated concentrations of nitrogen in the stream. Isotopic data will be used to help interpret sources and transformations of nitrogen in headwater stream environments.

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General Information for this Meeting

Session No. 31--Booth# 32
Undergraduate Research Session (Posters) II
Hilton Charlotte University Place: University Lake Ballroom Suites A, B, C
1:30 PM-5:30 PM, Friday, 11 April 2008

Geological Society of America *Abstracts with Programs*, Vol. 40, No. 4, p. 75