Northeastern Section (39th Annual) and Southeastern Section (53rd Annual) Joint Meeting (March 25–27, 2004)

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Presentation Time: 10:00 AM-10:20 AM

INFLUENCES OF A RAPIDLY EXPANDING URBAN AREA ON STREAM SOLUTE CHEMISTRY IN THE SOUTH CAROLINA PIEDMONT

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Urban areas influence the chemistry and biology of rivers through both point sources (e.g., wastewater treatment effluents) and non-point sources (e.g., runoff, septic tanks) of nutrients. Presently, some of the most rapid rates of urban expansion in the United States occur in the upper piedmont of South Carolina. We examined spatial and temporal variations in the nutrient chemistry of Big Brushy Creek, a fourth-order tributary of the Saluda River in South Carolina. The headwaters of Big Brushy Creek drain from the city of Easley. Outside of the urban and suburban areas, land use in the watershed is a mixture of low-density residential areas, pasture, and forest. A wastewater treatment plant (WWTP) is located along the river's eastern branch downstream of Easley. We collected water samples for chemical analysis from throughout the watershed during June-July 2003 and at several sites in October 2003. Nitrate, total dissolved nitrogen, dissolved organic nitrogen, sulfate, phosphate, sodium, chloride, and potassium concentrations were typically highest for about 2.7 km downstream of the WWTP. In addition, concentrations of algal chlorophyll from ceramic tiles placed in the river were higher downstream of the WWTP than upstream. In some cases, solute concentrations at the urban sites were nearly as high as sites downstream of the WWTP. For example, nitrate concentrations downstream of the WWTP ranged from about 3.4 to 15.1 mg/L, while concentrations in urban areas ranged from 3.1 to 9.1 mg/L. By comparison, nitrate concentrations in suburban and rural areas ranged from 1.1 to 3.2 mg/L. Calcium, magnesium, and dissolved organic carbon concentrations showed little if any change downstream of the WWTP. For the western branch, nitrate, sulfate, sodium, potassium, magnesium, calcium, silicon, and chloride concentrations were highest in the urban headwaters and declined downstream. No consistent increases or decreases in dissolved organic nitrogen occurred with distance downstream. Altogether, our results demonstrate that non-point sources of nutrients in urban areas can be of similar importance to point sources. Together, these anthropogenic influences increase the complexity of spatial and temporal patterns in river chemistry.

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