

The Furman University River Basins Research Initiative: a multidisciplinary examination of urban influences on piedmont streams

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Urban land cover correlates negatively with water quality both chemically and biologically in river systems. Urban streams also may support less diverse biological communities than streams in rural landscapes. Furthermore, stream biota may experience physiological stresses from pollutants and from altered stream hydrology and temperature regimes in urban environments. The expansion of urban land cover in the upper piedmont of South Carolina, especially in the Greenville-Spartanburg metropolitan area, is occurring at one of the most rapid rates in the United States. Over the past several years, our multidisciplinary undergraduate research program, the River Basins Research Initiative, has focused on the influence of urban land cover on streams in the Greenville vicinity. In particular, we have examined relationships between land cover, water quality, fish assemblages, and stream geomorphology. We have worked primarily in the Saluda and Enoree River basins, in which major land covers include forest, pasture, and urban (both high-density residential and commercial) cover. Concentrations of many solutes (especially nitrate) correlate positively both with percent urban land cover and impervious surface cover in sub-watersheds. However, stream turbidity tends to be higher in “rural” streams (draining mixed pasture and forest) than in streams draining mostly forested or mostly urban sub-watersheds. Concentrations of fecal indicator bacteria correlate more weakly with urban land cover than do solute concentrations. However, the highest concentrations of coliform bacteria tend to occur in the most urbanized sub-watersheds. Also, we have documented sharp increases in water temperatures during summer storm events in urban streams as rain water drains from heated impervious surfaces. Fish health appears to be lower in urban than rural streams. In addition, fish species richness and diversity tend to be lower in streams draining commercial land cover than in streams draining residential or rural land covers. However, streams in all land covers tend to be dominated by a relatively small number of tolerant species. Streams in residential areas tend to have greater width/depth ratios, but contrary to our expectations, we have found only weak relationships between stream channel incision and percent impervious cover. Incision of both rural and urban stream channels, as well as the relatively low fish diversity among land covers, perhaps reflects landscape alteration by intensive agriculture prior to the 1930’s. Currently, we are attempting to identify specific mechanisms underlying the correlations between land cover and stream characteristics that we have identified.