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Impacts of Urbanization on Stream Temperature and Stream Response Within the Piedmont Region, Greenville, South Carolina

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Abstract

The Piedmont region of South Carolina, like many areas across the southeastern United States, is experiencing significant residential and commercial development. Relatively undisturbed forested areas are being rapidly cleared and urbanized. The impact that this conversion of land cover has on stream hydrology, biology, and ecology is an area of great concern and poses a significant threat to the ecological health and functioning of Piedmont streams.

Since 1996, Furman University has been conducting a 10 week summer undergraduate research program, the *River Basins Research Initiative,* which has focused on the systematic characterization of both rural and urban watersheds to develop an understanding of the extent of human impact, particularly urbanization, on river systems in the piedmont of South Carolina.

During the summer of 2006, two of my students conducted a multi-stream comparative survey among two rural, three residential, and three commercially drained Piedmont streams in Greenville, South Carolina in an effort to assess the impact of land use differences on in-stream water temperature and a stream's storm response.

Stream stage and water temperature were measured at three sites (one rural, one residential, and one commercial) at 5 minute intervals from June – October 2006 using a pressure transducer and water temperature sensor. In addition, water temperature was measured at five secondary sites (one rural, two residential, and two commercial) in analogous stream environments (water depth, shading, flow velocity) for the same period of record.

The residential and commercial stream sites exhibit (1) a larger, flashier, and more rapid stage response to storm events, (2) a larger, more rapid water temperature increase in response to storm events, and (3) a higher overall water temperature compared to the rural sites. The observed differences in stage and temperature appear to be explicitly linked to the increase in impervious surface, the presence of stormwater conveyance systems, the loss of riparian cover, and the warming of surface runoff on exposed surfaces that accompanied urbanization.

Assessing the ecological effect of these temperature differences and stage responses is an area for future study, but a tandem study on the fish populations at these sites suggests that these alterations have degraded stream habitat, as measured by Simpsons Fish Diversity Index.