

UNDERSTANDING THE EFFECTS OF URBANIZATION ON STREAM GEOMORPHOLOGY

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Abstract

The geomorphology and habitat characteristics of natural streams depend on the land cover in the effective drainage area. As the urbanization proceeds, it results in increasing impervious surface within the watershed, causing increase in runoff volume in response to rainfall events. Often, in urban streams, runoff increase results in severe bank erosion, flash flooding, and changes in in-stream nutrient dynamics, that lead to increased sediment load, poor water quality, and degradation and eventual loss of habitat and riparian vegetation. Our objective is to understand the interactions between the land cover, impervious surface, and stream-reach characteristics. To achieve this, a total of eleven stream reaches draining a variety of land cover were selected from the Piedmont region of South Carolina. At each stream reach, measurements of detailed channel cross section at bank-full and flood levels and riparian and buffer vegetation characteristics were made. Because of variations in watershed sizes, we used three ratios: incision ratio, width/depth ratio, and entrenchment ratio to study the streams. These ratios, when plotted against percentage of imperviousness in the watershed show that the relationship is not always direct as expected (positive/negative correlation). Several factors such as presence or absence of rip-raps, bank stabilization, lakes/dams, and woody debris play a significant role in modifying the geomorphology. In addition, historic land use practices in the area must have played a significant role in channel incision and bank erosion. Hence further study of past land cover changes are necessary to completely understand current and future changes to channel geomorphology.

Key words: stream habitat, urban streams, impervious surface, watershed studies, Piedmont South Carolina

Citation

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