

## **Effects of Four Catchment Modifications on Urban Runoff**

J.P. Davis<sup>1</sup>, C.A. Rohrer<sup>2</sup>, and L.A. Roesner<sup>3</sup>

Urban Infrastructure Laboratory, Department of Civil Engineering, Colorado State University

**Abstract.** Urbanization often produces detrimental impacts on receiving stream ecology due to an increased volume and velocity of storm runoff. Nine case studies compiled by the United States Environmental Protection Agency (1997) document the hydrologic effects of urbanization, including: increases in bankfull events, increased flooding, increased peak flows, decreased baseflow, stream enlargement, stream incision, severe stream bank erosion, sedimentation, changes in morphology, increased instream sediment load, increased sediment transport, aesthetic degradation, degradation of designated uses, and loss of fish populations.

The purpose of this study is to determine how different physical characteristics of a watershed affect the peak discharges of runoff events produced by fifty years of continuously modeled precipitation. The Runoff and Statistical Blocks of the EPA Stormwater Management Model (SWMM4.4h) and rainfall from three climatically different cities were used to generate flow frequency curves that illustrate changes in subcatchment imperviousness, slope, runoff length, and Horton infiltration parameters. Historical rainfall hyetograph information for Fort Collins, Colorado; Atlanta, Georgia; and Seattle, Washington were used to determine the effects of different rainfall patterns. The watershed examined was composed of three subcatchments with areas of 6.47, 5.67, and 9.96 Hectares. These were modeled without channels or pipes.

Results indicate urbanization has the greatest impact on the peak discharge of catchment runoff and caused all flow frequency curves in all three cities modeled to shift upward. While changes in slope, runoff length, and infiltration produced no alteration in runoff magnitude and frequency for some storms (seen through the convergence of the flow frequency curves), the impact of urbanization on the frequency and magnitude of runoff events was apparent in all scenarios run. As the level of urbanization changed, some response was always visible, no matter how the three other variables were altered.

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<sup>1</sup> Graduate Research Assistant, EIT, Member of ASCE; Urban Infrastructure Laboratory, Department of Civil Engineering, Colorado State University, Fort Collins, Colorado 80523-1372; (970)471-2838; email [Pauline@engr.colostate.edu](mailto:Pauline@engr.colostate.edu)

<sup>2</sup> Graduate Research Assistant, PE, Member of ASCE; Urban Infrastructure Laboratory, Department of Civil Engineering, Colorado State University, Fort Collins, Colorado 80523-1372; (970)471-2838; email [Christine.Rohrer@colostate.edu](mailto:Christine.Rohrer@colostate.edu)

<sup>3</sup> Professor, PhD, PE, Fellow of ASCE; Urban Infrastructure Laboratory, Department of Civil Engineering, Colorado State University, Fort Collins, Colorado 80523-1372; (970)471-7430; email [Larry.Roesner@colostate.edu](mailto:Larry.Roesner@colostate.edu)