

# STORMWATER RUNOFF IN WATERSHEDS: A SYSTEM FOR PREDICTING IMPACTS OF DEVELOPMENT AND CLIMATE CHANGE

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The Stormwater Runoff Modeling System (SWARM) enhances understanding of impacts of land-use and climate change on stormwater runoff in watersheds. We developed this single-event system based on US Department of Agriculture, Natural Resources Conservation Service curve number and unit hydrograph methods. We tested SWARM using US Geological Survey discharge and rain data. Multi-site validations conducted for both undeveloped and developed watersheds support the robustness of our system in quantifying and simulating runoff: rainfall to runoff differences between measured and modeled volumes ranged from 3 to 11 percent;  $r^2$  for hydrograph curves ranged from 0.82 to 0.98. Key applications of SWARM are: (1) comparing runoff among watersheds representing different environmental settings (e.g., levels of development, soil types, a range of sizes, topography); (2) evaluating and illustrating (singularly or in combination) effects of primary drivers of runoff amount and flashiness including development level, soil type, antecedent runoff conditions, rainfall amount; (3) predicting runoff under a range of development scenarios within a watershed; and (4) integrating effects of urbanization and projected climate change scenarios. User-friendly templates make SWARM a good tool for scientific research, for resource management and decision making, and for community science education. The modeling system supports investigations of social and economic impacts to communities as they plan for increased development and climate change. SWARM currently is used in several research projects including one led by South Carolina Department of Natural Resources / ACE Basin NERR to identify estuarine waterways sensitive to stormwater runoff volume in Beaufort County, SC. Although we calibrated SWARM specifically to the southeast coastal plain, it can be applied to other regions by recalibrating parameters and modifying calculation templates.

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