
AWRA 2011 ANNUAL WATER RESOURCES CONFERENCE
Albuquerque, New Mexico

November 7-10, 2011

Copyright © 2011 AWRA

CHALLENGES AND SUCCESSES IN MODELING WATERSHEDS

Peter E. Black*

ABSTRACT: This paper describes the establishment, operations, materials and challenges to successful modeling of real world phenomena, including rainfall simulation, and adaptation of new electronic equipment to produce usable hydrographic records. The paper is more about the nature of the project than it is about the findings (the individual studies are published elsewhere and listed in the “Publications” of this paper). Resolution of the basic question concerned with whether project results could even be derived from the testing, output, and analysis of watershed models or small watersheds, was of prime importance in the utility of the project results. Ultimately, the response raises the more fundamental question: “What can we learn from models that will be useful for real world watershed management?” The response to these questions provide context for this report, but the project also had to include consideration of underlying questions concerning how to go about detecting and utilizing research results obtained in the process of constructing, operating, and interpreting the results of simulated rainfall events on iconic watershed models in a rainfall simulator. Do the watershed models accurately represent real world watersheds? Should they thus be classified as small watersheds? What materials to use to mimic real world watershed components? What sets of models to duplicate with ranges of physical characteristics of real world data sets? Which precipitation and physical watershed characteristics that impact storm runoff behavior should be evaluated? How scale precipitation depth on a three-square foot model? What constitutes a peak flow on a model? What should be the dimensions of soils? What is the best way to model storage behavior, infiltration, and percolation processes along with an experimental rainfall simulator’s operations and characteristics? Emulating hydrologic monitoring field devices required reliable equipment for comparison of model and prototype runoff characteristics was also a challenge. As a research facility, the project was a boon to educational goals and understanding hydrologic processes. It also provided the challenge of creating more than “look-alike” physical models: they had to be capable of undergoing rigorous rainfall events coupled with model runoff monitoring equipment for analysis of a wide range of models and real-world watersheds. Eight project-specific papers from specific studies have been published, and many of the concepts, principles, and issues related to model/prototype challenges and solutions have been put to practical use, as well as become important information in the classroom. An educational film was also produced. While the project equipment has been disassembled, many of the concepts that were the subjects of study are products of the project. Recent cogitation by the author on several ramifications of similitude issues prompted this (very) post-project paper. Its educational value in a variety of watershed management situations also remains pertinent.

* Professor Emeritus, SUNY ESF, One Forestry Drive, Syracuse, NY 13210 USA, Phone: 315-470-6571, Email: peblack@esf.edu