



# California Water and Environmental Modeling Forum

Promoting Excellence and Consensus in Water and Environmental Modeling

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## Technical Workshop on

# Watershed Modeling with HEC-HMS

(U.S. Army Corps of Engineers,  
Hydrologic Engineering Center's Hydrologic Modeling System)

May 28, 2008  
9:00 a.m. to 4:00 p.m.

Sacramento City Hall Council Chambers, (New) City Hall,  
915 "I" Street, Sacramento, California

## Workshop Purpose

The purpose of the workshop is to introduce participants to the U.S. Army Corps of Engineers Hydrologic Engineering Center's Hydrologic Modeling System, HEC-HMS, including the model's: (1) theory and structure, (2) applications and (3) calibration and validation techniques.

## Model Description

The Hydrologic Modeling System (HMS) is designed to simulate the precipitation-runoff processes of dendritic watershed systems. Its design allows applicability in a wide range of geographic areas for solving diverse problems including large river basin water supply and flood hydrology, and small urban or natural watershed runoff. The program features a completely integrated work environment including a database, data entry utilities, computation engine, and results reporting tools. The model choices include gridded and area-averaged methods for event or continuous simulation.

The model is used for design and operation of flood control projects, regulating floodplain activities, monitoring water use, local and regional watershed planning, water availability studies, urban drainage design, flow forecasting, determining urbanization impacts on waterways, reservoir spillway design, determining flood damage reductions, and real-time system operation of flood events. For more information, please visit: <http://www.hec.usace.army.mil/software/hec-hms/>.

See next page for links to PowerPoint presentations

## Agenda

8:30 a.m. **Registration and Refreshments**

9:00 a.m. [Welcome / Introduction](#) (.ppt; 93 KB)  
George Nichol, PhD, PE, California Water and Environmental Modeling Forum,  
Sacramento

9:10 a.m. [General Overview of Watershed Modeling](#) (.ppt; 2 MB)  
Eric Berntsen, PH, State Water Resources Control Board, Sacramento

A short discussion of how such earlier watershed models as TR-20 and TR-55 have been and are being applied for event-based simulations, and how the larger watershed models such as HEC-HMS, WARMF, HSPF, SWMM, and others are coming into play for both event-based and continuous simulations of watershed hydrologic processes.

9:30 a.m. [HEC-HMS Model Overview](#) (.ppt; 0.4 MB)  
William Scharffenberg, HEC-HMS Lead Developer, HEC, Davis

The program has been designed to be widely applicable for solving water resource problems. The types of problems where it is applicable will be described, along with important limitations. The components used for configuring models and obtaining simulation results will be described. A brief demonstration will also be included.

10:40 a.m. [USGS Streamflow-Gaging Program in California](#) (.ppt; 19 MB)  
Charles Parrett, PH, Surface Water Specialist, USGS California Water Science Center,  
Sacramento

The USGS currently operates a network of more than 400 streamflow-gaging stations in California that provide streamflow data on a near real-time basis. Historically, streamflow data are available and web accessible for more than 2,000 gages in California. The USGS streamflow-gaging network and the available data and methods of collection will be described. Costs for gage installation and operation also will be discussed.

11:20 a.m. [Assessing Fire Effects in the Angora Creek Watershed, Lake Tahoe](#) (.ppt; 17 MB)  
Ed Wallace, PE, Principal, Northwest Hydraulic Consultants, Sacramento/Pasadena

In July 2007, the Angora fire burned nearly 3,100 acres surrounding Angora Creek near Lake Tahoe, CA. The potential effects of the fire were assessed by the USFS (BAER team) and post-fire restoration treatments were developed and implemented. The California Tahoe Conservancy funded additional analysis to consider the potential hydrologic and sediment effects on restoration projects downstream. An HMS model was developed to represent hydrophobic soil conditions resulting from the fire and estimate potential increases in peak flows downstream. The HMS model provided results for peak flow increases that generally agreed with empirical estimates by the USFS.

12:00 noon **Lunch**

- 1:00 p.m. [Development of a Hydro-Geomorphic Model for the Laguna Creek Watershed](#)  
Gary Palhegyi, PE, D.WRE, Geosyntec Consultants, Oakland (.ppt; 19 MB)

The structure and function of riparian systems are controlled by their hydrology, geomorphology, biology, water quality and connectivity. Urbanization modifies natural hydrologic and geomorphic processes by introducing impervious surfaces and drainage infrastructure into a watershed, which ultimately modifies runoff, stream flows, and sediment dynamics in receiving streams. A calibrated HEC-HMS model is used to link hydrology and land development with the physical processes that tend to control erosion, sediment transport, and morphology of streams. A key element is the use of long-term continuous simulation to analyze changes in the timing, magnitude, frequency and cumulative duration of all erosive flows. The approach assists resource managers in evaluating the likelihood of potential impacts on riparian systems and the effectiveness of proposed stormwater management systems.

- 1:40 p.m. [Miner's Ravine Detention Basin Project](#) (.ppt; 5 MB)

Pal Hegedus, PE, D.WRE, Vice President, RBF Consultants, Sacramento

The presentation will focus on the models RBF developed for the evaluation of the Miners Ravine (Roseville area) Detention Basin Project. The work included the conversion of an existing HEC-1 model to HMS and provided routing for the comparison of project alternatives. The interesting aspect of the modeling approach also included the use of a HEC-RAS model to evaluate detention basin operations.

- 2:20 p.m. **Break**

- 2:40 p.m. [Pine Flat Watershed Snowmelt Modeling and Hydrologic Studies](#) (.ppt; 1.5 MB)

Rachael Hersh-Burdick, U.S. Army Corps of Engineers

- [Long Valley Creek: A Rainfall-Runoff Modeling Story](#) (.ppt; 6 MB)

Rob Thompson, U.S. Army Corps of Engineers

The experience of using HEC-HMS to represent snowmelt volume and timing in the Pine Flat Watershed will be presented, highlighting some of the challenges encountered when calibrating the model to historical data. The ultimate goal of the Pine Flat Model will be to have a real-time operations model. The use of HEC-HMS in the Pine Flat study will be contrasted with applications of HEC-HMS in other hydrologic studies.

- 3:20 p.m. [Forcing the Lid: Calibrating HEC-HMS for Flood Management Studies](#) (.pdf; 2 MB)

David Ford, PhD, PE, and Mike Konieczki, David Ford Consulting Engineers, Inc., Sacramento

The HEC-HMS applications guide suggests 9 steps for using that program. Step 5 is "...fit the model and verify the fit..." That step falls into the *easier-said-than-done* category. For fitting, some HEC-HMS models parameters can be estimated from watershed and channel properties; others have no obvious relationship to those properties. For some applications, precipitation and runoff data are available for fitting; for others, they are not. For some applications, parameters and boundary conditions are considered static; for others they are not. Fitting requires flexibility, not forcing the lid to make the model fit. In this presentation, we categorize decisions required and models available, and suggest procedures for estimating parameters, using HEC-HMS features coupled with common sense. We illustrate the procedures with runoff studies from California and Texas.

- 4:00 p.m. **Adjourn** (Evaluations will be emailed to workshop participants.)