

The futility of calibrating hydrologic models

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Hydrologic models such as HEC-HMS and SWMM provide the hydrograph from a watershed given the rainfall amount and pattern, and given watershed properties, such as soil type and land use. The calibration of these models to discharge data has always been viewed as a necessary step for accurate prediction. The hydrologist attempts to use as many storms as possible to validate the model, which results in a bias toward small to mid-size storms, because large storms are rare. In addition, when using the Geographic Information System (GIS) one uses the DEM to extract the cross sections, which inherently, do not contain information on the depth of water in the channel. Because the DEM are usually obtained under normal flow conditions, the channel depth could be neglected when compared to the flood depth resulting from large storms. However, such is not the case for small to mid-size storms where the channel depth is as large as half of the flood-level depth. Neglecting such depth would greatly slow water flow, because a smaller depth results in higher friction per unit water mass with the bottom. We present data from the Pennypack watershed along with hydraulic analyses to highlight the challenge, and we propose comparison to historic watermarks as an alternative for calibrating hydrologic models.