An Evaluation of the Variability of Flood Frequency Estimates Generated From a Rainfall-Runoff Model

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Abstract: During the 1960s and 1970s, the U.S. Geological Survey (USGS) completed many rainfall-runoff modeling studies of small rural watersheds in cooperation with the Federal Highway Administration and various State highway departments. In these studies, a rainfall-runoff model developed by the USGS was first calibrated using short-term (approximately 10 years) concurrent rainfall, evaporation and runoff data. Using long-term (60-70 years) rainfall and evaporation data and the calibrated rainfall-runoff model, a long series of peak flows were simulated. The logarithms of the annual maximum peak flows were fit to a Pearson Type III distribution to define a synthetic flood frequency estimates (2- to 100-year events).

Previous investigations by this author in the mid 1980s have shown that the synthetic flood frequency estimates have less variability than those based on gaging station data. That is, the synthetic 2-year flood discharges tend to higher than those based on gaging station data and the synthetic 100-year discharges tend to be less. These observations were based on data at 173 gaging stations in 10 states in the eastern half of the United States. All gaging stations used in the analysis had at least 20 years of year of record with statewide average record lengths ranging from 20 to 26 years.

Some of the 173 gaging stations now have an additional 20 years of record implying a total of 40 or more years of record. A new comparative analysis will be performed comparing the previously determined synthetic frequency estimates to updated gaging station estimates at those gaging stations with additional years of record.
Statistical analyses will be performed comparing the variability of the synthetic flood estimates to those based on the updated gaging station data. The implications of any loss of variance of model estimates will be discussed.