A review on synthetic unit hydrograph methods

P.K. Singh (1), S.K. Mishra (2), M.K. Jain (3), and P.K. Bhunya (4)

(1,2) Dept. of Water Resources Development and Management, Indian Institute of Technology, Roorkee, Roorkee-247 667 UA, India

(3) Dept. of Hydrology, Indian Institute of Technology, Roorkee, Roorkee-247 667 UA, India

(4) Scientist, National Institute of Hydrology, Roorkee-247 667, UA, India

Many components of the rainfall-runoff process in a catchment are difficult to observe routinely and unambiguously as they require costly measuring facilities. An important component of this process is the runoff volume, whose temporal variation needed to determine yield of a catchment, besides use in many other hydrological applications. However, due to financial and other constraints, routine measurements of runoff are scanty, under these circumstances, the synthetic unit hydrographs (SUH) are of great help in determining design flood hydrographs, especially from ungauged catchments. The present study critically reviews the traditional SUH methods e.g. Snyder (1938), Taylor and Schwarz (1952), Soil Conservation Service (SCS, 1957), Gray (1961), and Espey and Winslow (1974) available in hydrologic literature and highlights the major inconsistencies associated them, and then focuses on some notable recent advancements in SUH methods or/predictions in ungauged basins (PUB) using probability distribution functions (pdfs) based methods and/pdf methods coupled with geomorphological model of catchment response. The study reveals that the probability distribution functions (pdfs) based SUH methods are easy to apply, easily met the UH criterion, i.e. the area under the curve is unity, and rely on a stronger mathematical base and sounder hydrologic perception.