



MODELLING RUNOFF AND SEDIMENT YIELD FROM A SMALL FOREST WATERSHED IN SHIVALIK FOOT-HILLS USING WEPP MODEL

ABRAR YOUSUF¹, ANIL BHARDWAJ², A. K. TIWARI³ & V. K. BHATT⁴

¹Student, Department of Soil and Water Engineering, PAU, Ludhiana, Punjab, India

²Professor, Department of Soil and Water Engineering, PAU, Ludhiana, Punjab, India

³Head, CSWCRTI, Research Centre, Chandigarh, India

⁴Principal Scientist, CSWCRTI, Research Centre, Chandigarh, India

ABSTRACT

Hydrologic models play an important role in understanding the erosion process, quantification of runoff and sediment yield at the watershed scale and to identify the best management practices. In this study, the WEPP watershed model has been applied to simulate storm wise runoff and sediment yield from a small forest watershed having an area of 21.3 ha located in Shivalik foot-hills. The watershed was divided into 35 hillslopes and 25 channels. Climate file was generated by CLIGEN software using observed meteorological data. For each hillslope and channel, soil, slope and land use management files were prepared. The sensitivity analysis of the model shows that the model output is sensitive to hydraulic conductivity, rill erodibility, inter-rill erodibility, and critical shear of the soil. The model was calibrated and validated using observed data on runoff and sediment yield pertaining to 22 storms (2001-2004). The model simulated storm runoff with reasonable accuracy as corroborated by low values of RMSE (4.59 mm), percent error (11.36) and high values of correlation coefficient (0.96), and model efficiency (87.54%). The model also performed satisfactorily in simulating sediment yield as indicated by the values RMSE of 0.33 Mg/ha, percent error 13.83, correlation coefficient of 0.85 and model efficiency of 83.18%. In quantifying total runoff and sediment yield, the percent simulation error was well within the acceptable limits. The results of the study indicate the suitability of the WEPP model for its future application in Shivalik foot-hills.

KEYWORDS: Forest Watershed, Hydrologic Models, Runoff Simulation, Sediment Yield Simulation, WEPP Model