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EFFECTS OF CELL SIZE ON AGNPS INPUTS AND PREDICTIONS

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ABSTRACT
Distributed-parameter watershed models require division of a watershed into homogeneous areal units. The size of these units influences both model inputs and model accuracy. This study evaluated the response of the Agricultural Non-Point Source (AGNPS 5.0) model to different cell sizes. Red Rock Creek watershed, covering 135 km^2 of south-central Kansas, was modeled at four cell-size resolutions (260, 65, 16, and 4 ha), and 24-hr storm events with return periods of 0.05, 0.5, 2, 20, and 200 years were applied. Remotely sensed Landsat-5 TM images were used to obtain land-cover data, and soil and topographic data were extracted from GIS layers using an AGNPS-ARC/INFO interface. Runoff depth decreased with increasing cell size. However, sediment and nutrient yields decreased with increasing cell size from 4 ha to 16 ha and then increased with further increases in cell size. This was a result of two primary factors: flow-path length and slope estimates. Slopes were systematically underestimated for larger cell sizes by the AGNPS-GIS interface, resulting in decreases in overland erosion as cell size increased. Flow-path lengths were calculated internally by AGNPS and generally decreased with increasing cell size, causing decreases in channel erosion but increases in delivery ratios. The net effect was a local minimum at 16 ha for sediment yield. However, comparisons with measured stream flow and sediment yield indicated that cell size selection induced only a small model response compared to natural variability. We recommend cell size between (slope-length)^2 and the cell size that produces maximum modeled slope (in this study,0.5 to 4 ha). However, the large variability in measured runoff and sediment yields might make cell-size selection less important than other model factors, such as antecedent moisture condition.

Reference: *Mankin, K.R., S.J. Bhuyan and J.K. Koelliker; Effects of Cell Size on AGNPS Inputs and Predictions, Journal of Environmental Hydrology, Vol. 12, Paper 22, December 2004*

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Return to HydroWeb Homepage