Model Development and Applications at the USDA-ARS National Soil Erosion Research Laboratory

D.C. Flanagan[1], C. Huang[2], D.R. Smith[3], G.C. Heathman[4]

[1] *Dennis C. Flanagan, Research Agricultural Engineer, USDA-Agricultural Research Service, National Soil Erosion Research Laboratory, West Lafayette, Indiana, USA.*

[2] *Chi-hua Huang, Research Soil Scientist and Research Leader, USDA-Agricultural Research Service, National Soil Erosion Research Laboratory, West Lafayette, Indiana, USA.*

[3] *Douglas R. Smith, Research Soil Scientist, USDA-Agricultural Research Service, National Soil Erosion Research Laboratory, West Lafayette, Indiana, USA.*

[4] *Gary C. Heathman, Research Soil Scientist, USDA-Agricultural Research Service, National Soil Erosion Research Laboratory, West Lafayette, Indiana, USA.*

ABSTRACT

The United States Department of Agriculture (USDA) has a long history of development of soil erosion prediction technology, initially with empirical equations like the Universal Soil Loss Equation (USLE), and more recently with process-based models such as the Water Erosion Prediction Project (WEPP). This presentation will highlight past, current, and future water modeling activities at the National Soil Erosion Research Laboratory (NSERL) of the USDA's Agricultural Research Service (ARS), located in West Lafayette, Indiana on the campus of Purdue University. Recently a new five-year plan of research for water quality projects at the NSERL was approved, with several components related to model development and applications. In addition to continued maintenance and application of WEPP, other activities include development of a WEPP-Water Quality model, completion of a combined wind and water erosion model, application of the APEX and SWAT models to NSERL research watersheds, and evaluation of climate change utilizing various model applications. Also as part of the water quality research at the NSERL, the laboratory conducts extensive watershed monitoring in northeastern Indiana, at scales ranging from 2 to 19,000 hectares, measuring flow, nutrient, and pesticide losses. Measurements go back almost ten years, providing a rich database for testing, calibration, and validation of watershed water quality models at multiple scales. Some facets of NSERL research include use of measured soil moisture data in the watersheds with data assimilation techniques to enhance SWAT model predictions, with hopes in the future to also utilize remotely-sensed soil moisture. WEPP model enhancements include expansion of web-based GIS interfaces, expanded crop management databases, improved watershed channel hydrology and channel erosion options. Cooperative projects with other researchers will include evaluation and improvement of the tile drainage hydrology component of the WEPP model, and updating of the code to allow simulation of the impacts of global change and carbon dioxide enrichment of the atmosphere. Climate change studies planned will utilize GEM (Global Environmental Models) and downscale their predictions of changes in temperatures, precipitation, and atmospheric CO2 content to the watershed and hillslope scales common in WEPP and other models.

Keywords: Soil erosion, water quality, modeling, research, USDA