WEPP Erosion Prediction Technology

The USDA-ARS National Soil Erosion Research Laboratory (NSERL) conducts research into processes, control, and prediction of soil erosion by water. This federal facility is located on the campus of Purdue University. There is a long history of development of erosion prediction technology at this location - the Universal Soil Loss Equation (USLE), was developed by ARS researchers at Purdue in the 1950's - 1970's and the erosion component of the CREAMS/GLEAMS models was developed in the 1970's. The Revised Universal Soil Loss Equation (RUSLE) was initially developed at the NSERL beginning in the late 1980’s, and the Water Erosion Prediction Project (WEPP) model was developed here beginning in 1985. WEPP maintenance, enhancement, and application efforts are still ongoing at the NSERL.

WEPP is a process-based model that simulates important hydrologic and erosion physical processes. A climate generator program is used to create a string of typical daily climate inputs to WEPP based upon long-term weather station statistics. If rainfall is predicted for a given day, the model computes infiltration and runoff. If runoff is predicted, the rates of soil detachment by raindrop impact and flowing water are estimated. Results for all storm events during the period of simulation are summed to come up with long-term average annual runoff, soil loss, and sediment yield predictions. Model results can also be used to calculate return periods and conduct risk analyses.

WEPP can be used for estimates of soil erosion and sediment yield on hillslope profiles and small watersheds up to about 260 hectares. The size of the area of application is limited conceptually by the processes to be simulated (WEPP simulates interrill, rill, ephemeral gully and channel erosion due to overland flow from excess rainfall, snowmelt or irrigation.) A large amount of WEPP-related research and model validation results can be found in the peer-reviewed literature.

Some recent WEPP activities have focused on creation of easy-to-use and powerful user interface programs. A stand-alone Windows interface allows simulation of hillslope profiles and small watersheds. Internet browser interfaces (http://milford.nserl.purdue.edu) allow users to rapidly get an estimate of soil loss for any location in the United States, including easily delineating and running small watershed simulations in a web-based GIS with existing databases. A more powerful GIS interface (GeoWEPP) is an ArcView or ArcGIS extension that can utilize user-specific digital elevation model (DEM) and other spatial data to display and automatically delineate a watershed boundary, channels, and contributing hillslopes, and predict runoff and erosion.

WEPP is available via the NSERL web site. The largest number of model users are Research/Teaching (75%), Government (15%), and Consulting (<10%).

For further information on erosion prediction research and other research activities at the National Soil Erosion Research Laboratory, please check our Web sites at:

http://topsoil.nserl.purdue.edu
http://www.ars.usda.gov/Research/docs.htm?docid=10621