The Application of GIS in Watershed Runoff and Erosion Modeling: a Case Study of EASI Model

X. Shawn Huang, Lyle W. Zevenbergen[1]
River Engineering, Ayres Associates

John N. Cochran
Environmental Hydrology, Peabody Western Coal Company

Abstract. In the semi-arid west of the United States, sediment yield is large and highly variable as erosion results from short-duration and high-intensity rainfall events of limited areal extent. Modeling and prediction of runoff and sediment yield require an accurate spatial representation of drainage networks, land uses, and soil types. In order to facilitate the management of all kinds of spatial data, ESRI's ArcGIS and Geodatabase have been widely applied in watershed modeling and research. **E**rosion **A**nd **S**edimentation **I**mpacts (EASI) is a sophisticated watershed runoff and sedimentation modeling program with a DOS interface. EASI considers a complex watershed as a network of hillslopes, subwatersheds, channels, and ponds, each with uniquely identified soil, rainfall, and management, topography. It calculates runoff and sediment yield for each hillslope, determines the sediment transport capacity of the channels, and deposits excess sediment or scours channels when a sediment deficit exists. EASI was previously applied at the Peabody Western Coal Company's Black Mesa Mine in Arizona. It was first calibrated using site-specific runoff and sediment measurements; then used to compare sediment loss under undisturbed and reclaimed mine land conditions. EASI is also listed by EPA as one of modeling tools to predict and assess the impacts of land disturbance and reclamation activities at surface coal mine sites. However, EASI's DOS interface still requires a user to manually enter parameters and network connections, which is intensive when the watershed becomes large in space. As a DOS program, EASI only outputs modeling results to a text file, which is not easy to review. To improve EASI's pre and post-processing, we designed a data model that stores geometries, geomorphic and hydrologic attributes, and modeling results in an organized fashion. ArcGIS is used as a platform to generate input files for EASI and analyze modeling outputs. The enhanced EASI model is currently applied again in the Black Mesa Mine. Results show the use of GIS technology can greatly increase the efficiency of EASI modeling.

[1] River Engineering
Ayres Associates
3665 JFK Parkway
Building 2, Suite 200
Fort Collins, CO 80525
Tel: (970) 223-5556