



US DEPARTMENT OF THE INTERIOR (DOI), OFFICE OF SURFACE MINING RECLAMATION AND ENFORCEMENT (OSM)

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DEVELOPING WEPP-MINE: A MANAGEMENT TOOL FOR WESTERN ALKALINE SURFACE COAL MINES

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Project Description and Objectives:

This project was designed to develop WEPP-Mine, a practical computer simulation tool for evaluating site-specific sediment control and reclamation plans for National Pollutant Discharge Elimination System (NPDES) Western Alkaline Coal Mining Subcategory by EPA.

The main objectives were:

- (1) to develop WEPP-Mine, a user-friendly computer package for evaluating site-specific sediment control and reclamation plans in western alkaline coal mining operations;
- (2) to develop templates containing datasets pertinent to climate, topography, soil, and land management for representative western US surface coal mines (Rosebud and Big Sky Mines, southeast Montana);
- (3) to assess the performance of the WEPP-Mine through comparison with field-observed streamflow and sediment data; and
- (4) to disseminate the developed WEPP-Mine tool through various technology transfer venues, including workshops for regulatory authorities, consultants, and the mining industry, presentations at professional meetings, and scientific publications.

Applicability to Mining and Reclamation:

WEPP-Mine allows regulatory authorities, coal mine operators, consultants, and others to simulate watershed discharge and sediment yield under pre- and post-disturbance conditions, and to assess the effectiveness of reclamation activities and alternative management practices for erosion and sediment control, as required by OSM,

EPA, and state regulations. WEPP-Mine can also be used as a cost-effective prediction tool for general planning and management, e.g., in determining cumulative watershed hydrologic and erosion effects. With the customization functions and newly developed data templates in the package, WEPP-Mine can be readily applied to common alkaline coal mines in western US and other regions in the country.

Methodology:

WEPP-Mine (<http://wepponlinegis.bsyse.wsu.edu/osm>) was developed based on the USDA's Water Erosion Prediction Project (WEPP) model and the recently developed WEPP Watershed Online GIS interface. New functions developed in this study and incorporated in WEPP-Mine allow (i) the use of user-specified DEMs and reclamation maps to properly characterize the changes in topographic, land cover, and soil conditions in mining and reclamation areas, and (ii) the assessment of Best Management Practices (BMPs), such as sediment pond, silt fence, and revegetation, for erosion and sediment control.

In developing WEPP-Mine and the data templates, we have carried out extensive literature review and synthesized data pertaining to soil properties and vegetation parameters for surface coal mines in western US and other regions in the country and the world.

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Methodology (continued):

In collaboration with the Montana Department of Environmental Quality, we have compiled and analyzed relevant topographic, climatic, soil, vegetation and streamflow data for the Rosebud and Big Sky Mines, Colstrip, MT, for testing and refining the WEPP-Mine model. As another major component of the project, we have conducted field sampling and performed laboratory experiments to determine soil hydraulic properties as impacted by surface mining. The default input templates in WEPP-Mine were customized to properly represent the dry climate and landuse and soils typical of western US conditions.

WEPP-Mine performance was evaluated by comparing the model simulation results with field observations at the Big Sky Mine. Commonly applied reclamation practices for erosion and sediment control were simulated and contrasted, and recommendations on future research work were provided.

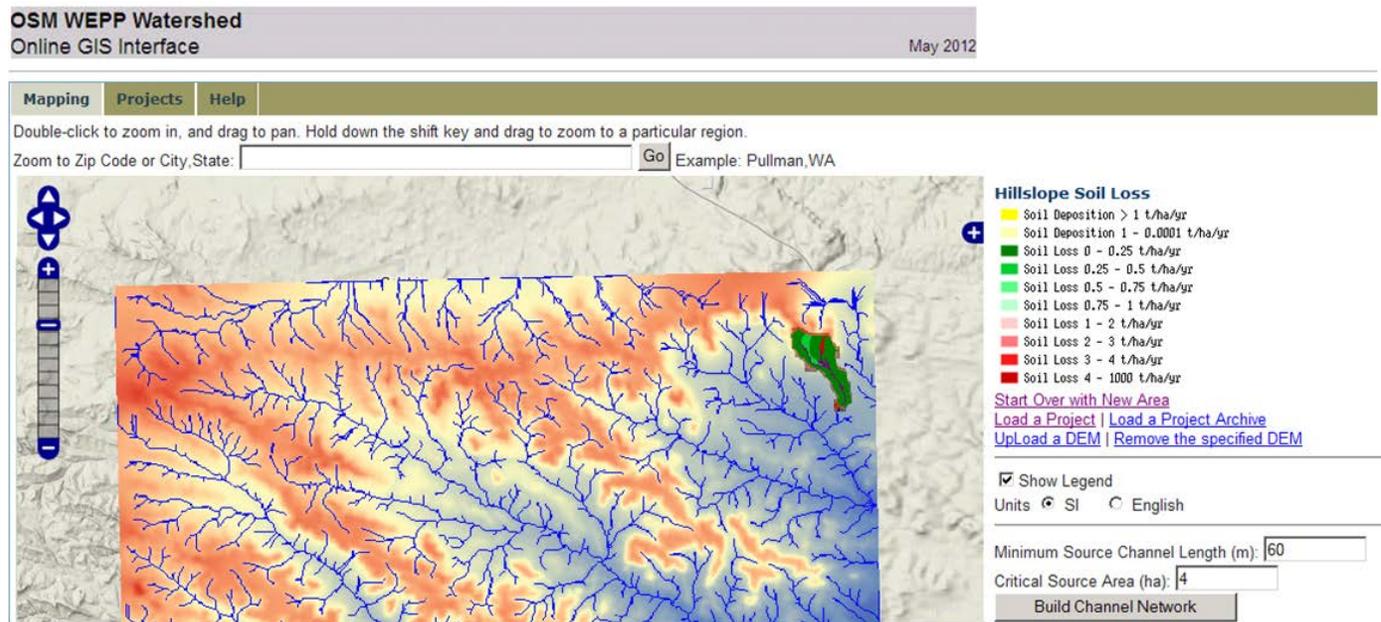
Highlights:

WEPP-Mine is developed as a user-friendly web-based computer package for use by regulatory authorities, consultants, the mining industry, and other practitioners and researchers to evaluate site-specific sediment control and reclamation plans for alkaline surface coal mines in western US and other regions.

A WEPP-Mine workshop was successfully conducted in Helena, MT on August 14, 2012. Additionally, a MS thesis is completed, and a manuscript has been submitted for publication in the SME's Mining Engineering Magazine. These outreach efforts will go a long way in promoting WEPP-Mine as a cost-effective and reliable modeling tool for hydrologic and erosion assessment in mining operations.

Results/Findings:

WEPP-Mine simulates runoff and sediment yield with user-specified inputs and allows for a comparison of different erosion control BMPs (see Figure below).



ABOVE FIGURE: A user-specified DEM and the soil loss map simulated with WEPP-Mine

Website Information:

The final project report can be found at www.techtransfer.osmre.gov/NTTMainSite/appliedscience.shtm

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