

# WEPP

**Model Uses** The Water Erosion Prediction Project (WEPP) model is used to predict erosion on hillslopes and small watersheds.

**Major Categories** Geomorphology  
Hydrology and Water Use  
Decision Support

**Subject Knowledge Level**  
intermediate

**Minor Categories** Erosion  
Run Off  
Conservation  
Management

**Technical Difficulty Level**  
intermediate

**Model Type** Physical model

**Geographic in Nature?**  
Semi

## **Abstract**

The Water Erosion Prediction Project (WEPP) model is used to predict erosion on hillslopes and small watersheds. WEPP is a process-based, distributed parameter, continuous simulation, erosion prediction model. It is used to help land users understand and evaluate the impacts of land management practices on soil loss and sediment yields from their land. It is also used by scientists and others to inventory the amount of erosion which is occurring across agricultural regions, which provides information for developing national and regional soil conservation policy.

WEPP is based on fundamentals of stochastic weather generation, infiltration theory, hydrology, soil physics, plant science, hydraulics, and erosion mechanics.

## **Future Developments**

Expand the ability of WEPP to simulate the loss and transport of nutrients and pesticides.

Develop improved erosion model interface programs that can be used for WEPP, such as a completed Web-based WEPP Geographical Information Systems (GIS) interface.

Improve irrigation WEPP model interface screens and databases.

Enhance winter components of WEPP.

Expand management input databases for WEPP to be specific for each state, and this information incorporated into the Windows and Web-based interface programs.

Anticipated End date: Dec 22, 2006

## **Model Features**

- Weather Generation
- Winter processes—frost and thaw development, snow accumulation and snow melting
- Irrigation—accommodates stationary sprinkler systems and furrow irrigation systems
- Infiltration
- Overland flow hydraulics—surface runoff
- Water Balance
- Plant Growth—simulates temporal changes in plant variables that influence the runoff and erosion processes

## **Model Limitations**

For very dissected landscapes in which several different, distinct slope shapes exist, several hillslopes will need to be simulated either as separate runs or as a single watershed simulation in the Watershed Interface.

WEPP should not be applied to areas having permanent channels such as classical gullies and perennial streams, since the processes occurring in these types of channels are not simulated in WEPP.

Use of the watershed application of WEPP is necessary to simulate flow, erosion, and deposition in ephemeral gullies, grassed waterway, terrace channels, other channels and impoundments.

- Residue Decomposition—estimates decomposition of flat residue mass, submerged residue mass, and dead root mass.
- Soil Parameters—including random roughness, oriented roughness, bulk density, wetting-front suction, hydraulic conductivity, interrill erodibility, rill erodibility, and critical shear stress.
- Hillslope erosion and deposition
- Watershed Channel Hydrology and Erosion Processes
- Watershed impoundment component
- Options for single storm, continuous simulation, single crop, crop rotation, irrigation, contour farming, and strip cropping

### Required Data Types

Minimum Data:

- **Climate data file:** precipitation, temperatures, solar radiation, and wind information. This file is created using CLIGEN software.
- **Slope data file:** slope orientation, slope length, and slope steepness
- **Soil data file:** physical and hydrological parameters
- **Cropping/management data file:** tillage sequences and implement parameters, plant and residue management, initial conditions, contouring, subsurface drainage, crop rotations
- **Irrigation file** when irrigation is used on channels

### Model Outputs

Runoff and erosion summary information:

- Storm by storm, monthly, annual, or average annual basis
- Time-integrated estimates of runoff, erosion, sediment delivery, and sediment enrichment
- Spatial distribution of erosion on the hillslope
- Average annual detachment or deposition at specific points
- On-site and off-site effects of erosion
- Soil, plant, water balance and rangeland files

Watershed Simulation additionally requires:

- **Hillslope information pass file:** contains all information from each hillslope
- **Structure file:** describes watershed configuration
- **Channel file:** Channels length, width and slope
- **Impoundment file** if present in watershed

### Source

The National Soil Erosion Research Laboratory (NSERL) of the USDA Agricultural Research Service

### Source (URL)

<http://topsoil.nserl.purdue.edu/nserlweb/weppmain/wepp.html>

### Hardware Requirements

80386 CPU

Math coprocessor

At least 10 MB Hardrive space

MS-DOS 5.0+ operating system environment

	Supported Platforms		
DOS	<input checked="" type="checkbox"/>	UNIX	<input type="checkbox"/>
Windows	<input checked="" type="checkbox"/>	Macintosh	<input type="checkbox"/>

### Software Requirements

Windows 95/98/NT/2000/XP

CLIGEN version 4.3 and 5.1

### Cost, Licensing and Availability

WEPP and CLIGEN can be downloaded free of cost from

<http://topsoil.nserl.purdue.edu/nserlweb/weppmain/wepp.html>

WEPP can also be run through a web browser interface on servers at the NSERL, without having to download software.

Go to <http://octagon.nserl.purdue.edu/>.