RUSLE2

Model Uses RUSLE is a physical model that can be used for assessing run-off and erosion.

Major Categories Geomorphology

Minor Categories Erosion

Model Type Physical Model

Subject Knowledge Level
Intermediate

Technical Difficulty Level
Intermediate

Geographic in Nature?
No

Abstract
RUSLE2 estimates rates of rill and interrill soil erosion caused by rainfall and its associated overland flow. Detachment (separation of soil particles from the soil mass) by surface runoff erodes small channels (rills) across the hillslope. Erosion that occurs in these channels is called rill erosion. Erosion on the areas between the rills, the interrill areas, is called interrill erosion. Detachment on interrill areas is by the impact of raindrops and waterdrops falling from vegetation. The detached particles (sediment) produced on interrill areas is transported laterally by thin flow to the rill areas where surface runoff transports the sediment downslope to concentrated flow areas (channels).

The four major factors of climate, soil, topography, and land use determine rates of rill and interrill erosion. A RUSLE2 user applies RUSLE2 to a specific site by describing field conditions at the site for these four factors. RUSLE2 uses this field description to compute erosion estimates.

RUSLE2 is land use independent. It is based on equations that describe how basic features like plant yield, vegetative canopy and rooting patterns, surface roughness, mechanical soil disturbance, amount of biomass on the soil surface and in the upper layer of soil, and related factors affect rill and interrill erosion. The RUSLE2 user conveniently selects information in the RUSLE2 database to describe these variables at a specific field site. The RUSLE2 user is not required to collect field data on these variables.

RUSLE2 takes advantage of the fact that erosion is directly related to the forces applied to the soil by erosive agents in relation to the soil's resisting forces regardless of the land use. RUSLE2 can be applied to cropland, rangeland, disturbed forestland, mined land, construction sites, reclaimed land, landfills, military training sites, parks, and any land where mineral soil is exposed to the direct forces of waterdrop impact and surface runoff generated by rainfall intensity being greater than the infiltration rate of water into the soil.

Overview of Major Factors

Climate: The most important climatic variable used by RUSLE2 is rainfall erosivity, which is related to rainfall amount (how much it rains) and intensity (how hard it rains). Another important climatic variable is temperature because temperature and precipitation together determine the longevity of biological materials like crop residue and applied mulch used to control erosion. Climate varies by location, and choosing a location in RUSLE2 chooses the erosivity, precipitation, and temperature values needed to apply RUSLE2 at a particular site.

Soils: Soils vary in their inherent erodibility as measured in a standard test involving a "unit plot." A unit plot is 72.6 ft (22.1 m) long on a 9% slope and is maintained in continuous tilled fallow (no vegetation) using periodic tillage up and down slope to leave a "seedbed-like" soil condition. The USDA-NRCS has assigned soil erodibility values for most cropland and similar soils across the US. RUSLE2 includes a procedure for estimating soil erodibility for highly disturbed soils at construction sites and reclaimed mined land. The RUSLE2 user typically selects a soil by soil-map unit name from a list of soils in the RUSLE2 database.

Topography: Slope length, steepness, and shape are the topographic characteristics that most affect rill and interrill erosion. Site-specific values are entered for these variables. See the section on Definitions for additional information concerning these variables.

Land Use: Land use is the single most important factor affecting rill and interrill erosion because type of land use and land use condition are features that can be most easily changed to reduce excessive erosion. RUSLE2 uses the combination of cover-management (cultural) practices and support practices to describe land use.

Cover-management: Cover-management practices affect both the forces applied to the soil by erosive agents and the susceptibility of the soil to detachment. For a given land use like cropland, important features include the crops that are grown, yield level, and the type of tillage system such as clean, reduced, or no till. Important features on a construction site include whether or not the land is bare, the soil material is a cut or fill, mulch has been applied, or the slope has been recently reseeded. Important features on range and reclaimed land include the native or seeded vegetation, production level, and degree of ecological maturity. The description of any cover-management practice is created, named, and stored in the RUSLE2 database. When RUSLE2 is run, the cover-management practice that fits the site-specific field condition is selected from the menu of choices. Changes can be made in key variables such as production (yield) level or mulch application rate so that the practice fits the local climate, soil, and other conditions.

Support practaces: Support practices include ridging (e.g., contouring), vegetative strips and barriers (e.g., buffer strips, strip cropping, fabric fence, gravel bags), runoff interceptors (e.g., terraces, diversions), and small impoundments (e.g., sediment basins, impoundment terraces). These practices reduce erosion primarily by reducing the erosivity of surface runoff and by causing deposition. Support practices are selected from a list of these practices in the RUSLE2 database. Site-specific information, such as the location of a diversion on the hillslope, is entered as required for each practice.

Future Developments
None noted

Model Limitations
None noted

Model Features
Unknown

Required Data Types
RUSLE2 is very easy to use. With the exception of topography, the RUSLE2 user describes the site-specific field conditions by selecting database entries from menus. When a menu selection is made, RUSLE2 "pulls" values stored in the RUSLE2 database and uses them as input values to compute erosion. The user enters site-specific values for slope length and steepness to represent topography.

Model Outputs
Graphs and tables

Source
United States Department of Agriculture, Agricultural Research Service,
National Sedimentation Laboratory, P. O. Box 1157, Oxford, MS 38655
Telephone: (662) 232-2940
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Source (URL)
http://www.sedlab.olemiss.edu/Rusle/

Hardware Requirements
None noted.

Supported Platforms

DOS	☐	**UNIX**	☐
Windows	☒	**Macintosh**	☐

Software Requirements
Window 95 or later with Internet Explorer 4.0 or later

Cost, Licensing and Availability
Free. Download from web.