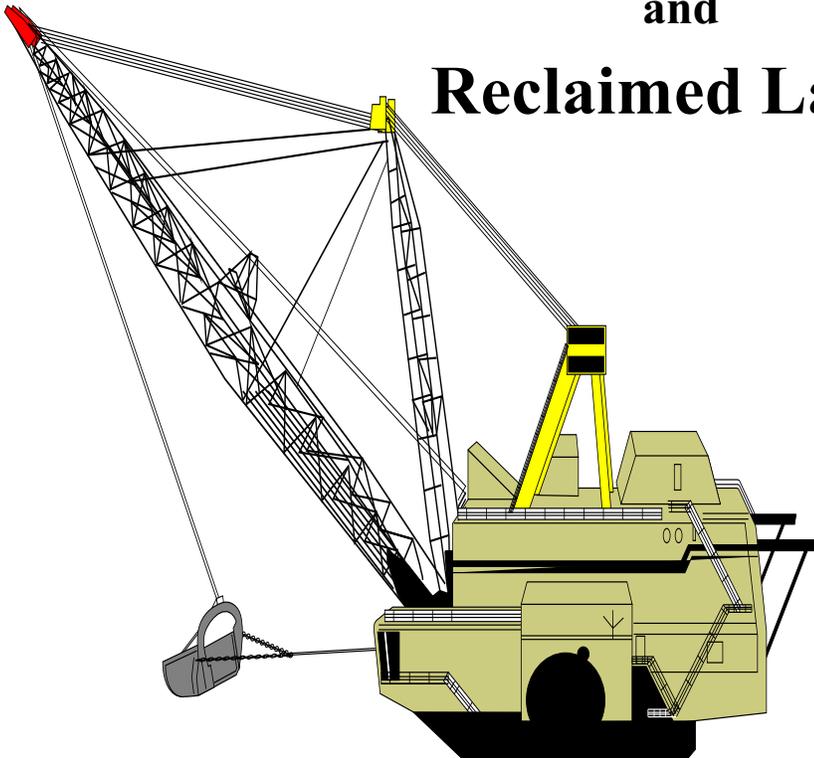


Guidelines
for the
Use of the
Revised Universal
Soil Loss Equation
(RUSLE)
Version 1.06
on
Mined Lands,
Construction Sites,
and
Reclaimed Lands

Table of Contents

Terrence J. Toy and
George R. Foster
Co-editors

Joe R. Galetovic
Publishing Editor



Guidelines
for the Use of the
Revised Universal Soil
Loss Equation
(RUSLE)
Version 1.06
on
Mined Lands,
Construction Sites,
and
Reclaimed Lands

Terrence J. Toy and George R. Foster
Co-editors

Joe R. Galetovic
Publishing Editor

August 1998

For additional copies, please contact:

**Joe R. Galetovic, Technical Coordinator
The Office of Technology Transfer
Western Regional Coordinating Center
Office of Surface Mining
1999 Broadway, Suite 3320
Denver, CO 80202-5733**

Voice:(303) 844-1448

Fax:(303) 844-1546

[E-mail:jgaletov@osmre.gov](mailto:jgaletov@osmre.gov)

Acknowledgments

These Guidelines are the product of the RUSLE Task Working Group established by Joe R. Galetovic, Technical Coordinator, Office of Technology Transfer, Office of Surface Mining and Reclamation (OSM), Western Regional Coordinating Center, Denver, Colorado.

The chair of the working group and co-editor of the Guidelines was Terrence Toy, Department of Geography, University of Denver. The co-editor of the Guidelines and person responsible for the scientific and technological innovation to adapt RUSLE version 1.06 for mined lands, construction sites, and reclamation lands situations was George Foster, U.S. Department of Agriculture (USDA), Agricultural Research Service (ARS).

The principal chapter authors were: (1) Terrence Toy, Department of Geography, University of Denver and Ken Renard, USDA, ARS; (2) Ken Renard, USDA, ARS; (3) Glenn Weesies, USDA, Natural Resources Conservation Service (NRCS); (4) Steve Schroeder, North Dakota Public Service Commission; (5) William Kuenstler, USDA, NRCS; (6) Gary Wendt, Peabody Western Coal Company, and (7) Richard Warner, Department of Biosystems and Agricultural Engineering, University of Kentucky, and George Foster, U.S. Department of Agriculture (USDA), Agricultural Research Service (ARS).

Other working group members providing technical support for the chapters included William Agnew, Revegetation Environmental Consultants; Scott Davis, U.S. Department of the Interior, Bureau of Land Management; and James Spotts, OSM, Appalachian Regional Coordinating Center. Technical and programming support for RUSLE version 1.06 was furnished by Daniel Yoder, Department of Agricultural and Biosystems Engineering, University of Tennessee - Knoxville.

The external reviewers for the guidebook and RUSLE version 1.06 were: Jennifer Back, David Berry, David Bickel, Priscilla Burton, Dwight Cabalka, Wayne Erickson, Doyl Fritz, Donald McCool, Keith McGregor, Roger Simanton, Brian Wood, Lih-An Yang.

Additional logistical support was provided by the Department of Geography, University of Denver.

Table of Contents

Acknowledgments	ii
List of Figures	v
List of Tables	vii
Chapter One / Introduction	1-1
Chapter Two / R factor: Rainfall/Runoff Erosivity	2-1
Chapter Three / K factor: Soil Erodibility	3-1
Chapter Four / LS factor: Hillslope Length and Gradient	4-1
Chapter Five / C factor: Cover-Management	5-1
Chapter Six / P factor: Support-Practice	6-1
Chapter Seven / Applications of RUSLE	7-1
References	8-1

List of Figures

<i>Figure</i>	<i>Page</i>
1-1 A general flowchart of the RUSLE software.	1-5
2-1 CITY CODE Database file for station 3004, Tombstone, AZ	2-2
3-1 RUSLE screen for Seasonally Variable K Factor	3-4
3-2 RUSLE screen for entering inputs and displaying outputs for non-volcanic soils	3-5
3-3 RUSLE screen for estimating K values using the soil-erodibility nomograph . . .	3-5
3-4 The effect of rock fragments in the soil profile can be accounted for on the soil- erodibility nomograph screen	3-6
3-5 RUSLE screen for selecting K-factor option for volcanic soils in Hawaii	3-7
3-6 RUSLE screen for volcanic soils in Hawaii, showing sample inputs and output .	3-7
3-7 Seasonal variability of K is shown for the Barnes soil near Morris, MN and the Loring soil near Holly Springs, MS.	3-11
3-8 RUSLE screen for displaying the seasonally variable K value.	3-12
4-1 LS-factor screen from the RUSLE program.	4-2
4-2 Effect of terraces on hillslope length	4-4
4-3 Typical hillslope lengths (Dissmeyer and Foster 1980).	4-7
4-4 Examples of LS calculations hillslopes in a rangeland watershed	4-9
4-5 LS values for a uniform hillslope profile	4-13
4-6 LS values for a convex hillslope profile	4-13
4-7 LS values for a concave hillslope profile	4-14
4-8 LS values for a complex hillslope profile	4-14
5-1 Fall heights from canopies of different shape	5-4
5-2 Relationship of percent canopy cover to the RUSLE canopy cover sub-factor . .	5-5
5-3 Graphic representation of varying percent surface cover	5-10
5-4 Relationship between percent residue cover and the RUSLE surface cover sub-factor	5-12
5-5 Random roughness versus range in surface elevation (Soil and Water Conservation Society, 1993).	5-15
5-6 Example C-factor value for a site in the Eastern U.S.	5-19
5-7 Example C-factor value for a site in the Western U.S.	5-19
6-1 Two views of Contour Furrows	6-3

6-2	Towner Disk	6-4
6-3	Reclaimed hillslope with terrace at the Black Mesa Mining Complex, Peabody Western Coal Company	6-6
6-4	Residual Furrows	6-13
6-5	RUSLE screen for barriers	6-16
7-1	Primary Program Option Screen	7-3
7-2	Vegetation Inputs	7-9
7-3	Results by Vegetation and by Operations	7-10
7-4	Results by 15-day Period	7-11
7-5	C-factor Inputs	7-14
7-6	Results by Vegetation Operations	7-14
7-7	Results by 15-day Period	7-15
7-8	Field Operation Data Base	7-17
7-9	Results by 15-day Period The estimated soil loss, based on a C value of 0.055, is 26 tons/ac/year.	7-18
7-10	Alternative Hillslope Configurations	7-20
7-11	Seasonally Variable K Factor	7-23
7-12	Relation between the range in surface elevation and random roughness	7-24
7-13	Hillslope Segment Input Screen for Concave Hillslope	7-26
7-14	Hillslope Segment Inputs Screen for Convex Hillslope	7-27
7-15	LS Values by Hillslope-Profile Segment	7-30
7-16	Input Screen for P-factor Strips	7-32
7-17	Time Invariant C Factor Inputs	7-36
7-18	Terrace Input Screen and Result	7-38

List of Tables

<i>Number</i>		<i>Page</i>
1-1	Sample of Literature Pertaining to the Erosion of Disturbed Lands	1-8
3-1	Typical pedon of a reclaimed mine soil in northern Arizona.	3-9
4-1	Hillslope length-gradient (LS) values for hillslopes of 100 and 600 ft lengths with various gradients and land uses.	4-11
5-1	General situations represented by b values used in RUSLE	5-7
5-2	C factor values for mulch under disturbed-land conditions	5-9
5-3	C values for bare soil at construction site	5-13
5-4	C values for various types of vegetation cover	5-14
5-5	Roughness values for rangeland field conditions	5-16
5-6	Attributes of Typical Tillage Implements ¹	5-16
5-7	Comparison of site characteristics	5-19
6-1	P values for contour furrowing on a 300 ft hillslope with a 10% gradient at Lexington, Kentucky and hydrologic soil group A	6-4
6-2	P values for contour furrowing on a 300 ft hillslope with a 10% gradient at Lexington, Kentucky and hydrologic soil group B	6-4
6-3	P values for contour furrowing on a 300 ft hillslope with a 10% gradient at Lexington, Kentucky and hydrologic soil group D	6-5
6-4	P values for contour furrowing on a 300 ft hillslope with a 10% gradient at Denver, Colorado and hydrologic soil group B	6-5
6-5	Critical hillslope length (ft) for contour furrowing on a 300 ft long hillslope with a 10% gradient near Lexington, Kentucky	6-7
6-6	Critical hillslope length (ft) for contour furrowing on a hillslope with a hydrologic group B soil	6-7
6-7	Critical hillslope length (ft) for contour furrowing on a hillslope with a 10% gradient and a hydrologic group B soil	6-7
6-8	Sediment-delivery ratios for graded terraces on a sandy loam soil with a hillslope length of 300 ft and a 10% gradient	6-9
6-9	Sediment-delivery ratios for graded terraces as a function of soil textures	6-9
6-10	Sediment-delivery ratios for the same conditions of a 300 ft hillslope with a 10% gradient and a terrace grade of 0.1% at three locations with different climates	6-10

6-11	Common Mechanical Practices Applied to Rangelands, Reclaimed Mined Lands, and Construction Sites	6-11
6-12	Effect of the degree of concavity	6-14
6-13	Width of pond used to compute P values for sediment-control barriers	6-17
6-14	Some typical P values for barriers constructed on a silt loam soil	6-18
6-15	Sediment-delivery ratios for sediment basins that are well designed, constructed, and maintained with full sediment-storage capacity	6-21
6-16	Effect of concave hillslope segments, sediment-control barriers, and basin sequences on the effectiveness of sediment basins	6-22