APPENDIX B-2

Estimating Soil Erosion With the Universal Soil Loss Equation (USLE)

Scientific planning for soil erosion reduction requires knowledge of the relations between those factors that cause loss of soil and water and those that help to reduce such losses. The Universal Soil Loss Equation (USLE) is used to estimate the quantity of soil erosion (sheet and rill) caused by water and to design water erosion control systems.

Developing equations to calculate field soil loss began about 1940 in the Corn Belt. The USLE was developed by the USDA Agricultural Research Service (ARS) and 49 research locations across the U.S. contributed more than 10,000 plot years of basic runoff and soil loss data to ARS for summarizing and overall statistical analyses. Since the early 1960's, the USDA Natural Resources Conservation Service (formerly the Soil Conservation Service) and others have used the USLE to predict soil losses and to plan conservation treatment.

The USLE permits methodical decision making in soil conservation planning on a site basis. The USLE was designed to predict long-term average annual soil losses from sheet and rill erosion on given field slopes under specified land use and management.

Many variables and interactions influence sheet and rill erosion. The USLE groups these variables under six major erosion factors, the product of which represents the average annual soil loss.

The soil loss predicted by the USLE is that of soil moved off the particular slope segment in sheet and rill erosion. Sheet erosion is defined as the removal of layer of soil from the land surface by the action of rainfall and runoff. It is the first stage in water erosion. This is followed by rill erosion. Rills are small, occur in cropland situations, are removed by normal farming operations, and usually do not reoccur in the same place.

Widespread use of the USLE has substantiated its usefulness and validity for cropland, pasture and hay land, forest land and for non-agricultural conditions such as construction sites.

The USLE does not predict sediment deposition or soil erosion caused by gully, streambank, streambed, mass movement, or wind erosion.

Detailed instructions for using the USLE are in Agriculture Handbook No.537, USDA, *Predicting Rainfall Erosion Losses.*

The USLE is:

$$A = R\,K\,LS\,C\,P$$

A is the computed average annual soil loss in tons per acre per year.

R is the rainfall factor. The R factor value quantifies the raindrop impact effect. Rainfall energy is directly related to rain intensity. The energy of a rainstorm is a function of the amount of rain and of all the storm's component intensities. Median raindrop size increases with rain intensity and the terminal velocity of free-falling waterdrops increase with increased dropsize.

The R factors assigned represent 22-year average annual values for the delineated areas. In Georgia, USLE R factor values range from 250 to 425. They are listed by county on Table B-2.1, p. B-2-4.

K is the soil erodibility factor. Some soils erode more readily than others even when all other factors are the same. The K factors assigned to soils found in Georgia range from 0.05 to 0.43 and may be obtained from the USDA Natural Resources Conservation Service.

LS is the topographic factor. Both the length and the steepness of the land slope substantially affect the rate of soil erosion by water.

Slope length is defined as the distance from the point of origin of overland flow of water to the point where either the slope gradient decreases enough that deposition begins, or the runoff water enters a well-defined channel (terrace channel, concentrated flow area, gully, ditch, grass waterway, etc.). It is not the total length or width of the field in most cases.

The two effects have been evaluated separately in research. In field applications, however, the two are considered as a single topographic factor. LS factors are listed in Table B-2.2, p. B-2-6.

C is the cover and management factor. C is the ratio of soil loss from land with a specified type and amount of cover to the corresponding loss from a clean tilled, continuous fallow site. The C for a continuous fallow condition is 1.00. Any amount of ground cover present (canopy or residue) reduces the C factor and the soil loss for the site. C factor values are listed for different land uses in Table B-2.3 through B-2.5, p. B-2-7 through B-2-10.

P is the support practice factor. P is the ratio of soil loss with a specific support practice to the corresponding loss with up-and-down slope farming. The maximum P factor value is 1.00. Conservation practices that reduce the P factor are contour farming, cross-slope farming, and stripcropping. P is used only in USLE calculations for row cropped land. In all other land uses, the P is always 1.00.

Soil Loss Tolerance

The term "soil loss tolerance", sometimes called the "T" value, denotes the maximum level of soil erosion that will permit a high level of crop productivity to be sustained economically and indefinitely. Any cropping and management combination for which the predicted erosion rate is less than the tolerance may be expected to provide satisfactory erosion control. Soil loss tolerances range from 1 to 5 tons/acre/year for soils of the U.S.

Soil loss limits are sometimes established primarily for water quality control. The criteria for defining field soil loss limits for this purpose are not the same as those for tolerances designed to preserve cropland productivity. If the soil loss tolerance designed for sustained cropland productivity fails to attain the desired water quality standard, flexible limits that consider other factors should be developed rather than uniformly lowering the soil loss tolerance. Limits of sediment yield would provide more uniform water quality control than lowering the limits on soil movement from field slopes.

Sample Problem #1

Present Condition (Before Treatment):

Location: Cobb County, GA (R = 300)
Land Use: Cropland, Soybeans, Conventionally Tilled (C = 0.46)
Soil Type: Cecil sandy loam (K = 0.28)
Length of Slope: 120 feet
Slope: 5% (LS = 0.59)
Row Pattern: Up and Down Hill Farming (P = 1.0)

A = RKLSCP
A = 300 x 0.28 x 0.59 x 0.46 x 1.0 = 22.8 tons/acre/year

Future Condition (After Treatment):

Location: Cobb County, GA (R = 300)
Land Use: Tall fescue pasture, 95 - 100% cover (C = 0.003)
Soil Type: Cecil sandy loam (K = 0.28)
Length of Slope: 120 feet
Slope: 5% (LS = 0.59)

A = RKLSCP
A = 300 x 0.28 x 0.59 x 0.003 x 1.0 = 0.15 tons/acre/year

Sample Problem #2

Present Condition (Before Treatment):

Location: Thomas County, GA (R = 400)
Land Use: Disturbed Construction Site (C = 1.0)
Soil Type: Orangeburg sandy loam (K = 0.24)
Length of Slope: 120 feet
Slope: 20% (LS = 4.47)

A = RKLSCP
A = 400 x 0.24 x 4.47 x 1.0 x 1.0 = 429 tons/acre/year

Future Conditon: (After Treatment):

Location: Thomas County, GA (R = 400)
Land Use: Weeping lovegrass (60% cover) (C = 0.042)
Soil Type: Orangeburg sandy loam (K = 0.24)
Length of Slope: 120 feet
Slope: 20% (LS = 4.47)

A = RKLSCP
A = 400 x 0.24 x 4.47 x 0.042 x 1.0 = 18 tons/acre/year

Additional Soil Erosion Prediction Models

Revised Universal Soil Loss Equation (RUSLE)

The revised Universal Soil Loss Equation (RUSLE) has been developed by USDA/ARS. The RUSLE retains the six factors of the USLE, but the technology has been altered and new data has been added. The technology has been computerized to assist with the calculations. Soil loss calculations can be made with the RUSLE for some conditions not included in the USLE if the fundamental information is available.

Copies of the RUSLE program may be purchased from:

Soil and Water Conservation Society of America
7515 N.E. Ankeny Road
Ankeny, Iowa 50021-9764
Phone: (515) 289-2331
1-800-THE-SOIL

Water Erosion Prediction Project (WEPP)

The development of a new generation of technology for predicting water erosion is under way by a USDA team in the Water Erosion Prediction Project (WEPP). Working with other agencies and academic institutions, the goal of the WEPP is a process oriented model or family of models that are conceptually superior to the lumped model RUSLE and are more versatile as to the conditions that can be evaluated. The WEPP technology is expected to replace RUSLE sometime in the future.

Table B-2.1. – Rainfall-Erosion Index Factor "R" Values

County	R	County	R	County	R
Appling	350	Clay	375	Franklin	300
Atkinson	325	Clayton	300	Fulton	300
Bacon	350	Clinch	350	Gilmer	275
Baker	375	Cobb	300	Glascock	250
Baldwin	275	Coffee	325	Glynn	400
Banks	300	Colquitt	350	Gordon	300
Barrow	275	Columbia	250	Grady	400
Bartow	300	Cook	350	Greene	250
Ben Hill	325	Coweta	325	Gwinnett	300
Berrien	350	Crawford	300	Habersham	300
Bibb	300	Crisp	325	Hall	275
Bleckley	300	Dade	275	Hancock	250
Brantley	375	Dawson	275	Haralson	325
Brooks	375	Decatur	425	Harris	325
Bryan	350	DeKalb	300	Hart	275
Bulloch	325	Dodge	300	Heard	325
Burke	275	Dooly	325	Henry	300
Butts	300	Dougherty	350	Houston	300
Calhoun	375	Douglas	300	Irwin	325
Camden	400	Early	400	Jackson	275
Candler	300	Echols	350	Jasper	275
Carroll	325	Effingham	350	Jeff Davis	325
Catoosa	275	Elbert	250	Jefferson	275
Charlton	375	Emanuel	300	Jenkins	300
Chatham	350	Evans	325	Johnson	300
Chattahoochee	350	Fannin	275	Jones	275
Chattooga	300	Fayette	300	Lamar	300
Cherokee	300	Floyd	300	Lanier	350
Clarke	275	Forsyth	275	Laurens	300

County	R
Lee	350
Liberty	350
Lincoln	250
Long	350
Lowndes	350
Lumpkin	275
McDuffie	250
McIntosh	400
Macon	325
Madison	275
Marion	325
Meriwether	325
Miller	400
Mitchell	375
Monroe	300
Montgomery	300
Morgan	275
Murray	275
Muscogee	325
Newton	300
Oconee	275
Oglethorpe	250
Paulding	300
Peach	300
Pickens	275
Pierce	350
Pike	325
Polk	300
Pulaski	300

County	R
Putnam	275
Quitman	375
Rabun	300
Randolph	350
Richmond	250
Rockdale	300
Schley	325
Screven	300
Seminole	425
Spalding	300
Stephens	300
Stewart	350
Sumter	325
Talbot	325
Taliaferro	250
Tattnall	325
Taylor	325
Telfair	325
Terrell	350
Thomas	400
Tift	350
Toombs	325
Towns	300
Treutlen	300
Troup	325
Turner	325
Twiggs	300
Union	300
Upson	325

County	R
Walker	275
Walton	275
Ware	350
Warren	250
Washington	275
Wayne	375
Webster	350
Wheeler	300
White	300
Whitfield	275
Wilcox	325
Wilkes	250
Wilkinson	275
Worth	350

Table B-2.2 – Slope-Effect Table (Topographic Factor, LS)

Percent Slope	Slope Length in Feet 10	20	40	60	80	100	120	140	160	180	200	250	300	350	400	500	600	800	1000
0.5	0.05	0.06	0.08	0.08	0.09	0.10	0.10	0.11	0.11	0.12	0.12	0.13	0.14	0.14	0.15	0.16	0.17	0.18	0.20
1.0	0.06	0.08	0.10	0.11	0.12	0.13	0.14	0.14	0.15	0.15	0.16	0.17	0.18	0.19	0.20	0.21	0.22	0.24	0.26
2.0	0.10	0.12	0.15	0.17	0.19	0.20	0.21	0.22	0.23	0.24	0.25	0.26	0.28	0.29	0.31	0.33	0.34	0.38	0.40
3.0	0.14	0.18	0.22	0.25	0.27	0.29	0.30	0.32	0.33	0.34	0.35	0.38	0.40	0.42	0.44	0.47	0.49	0.54	0.57
4.0	0.16	0.21	0.28	0.33	0.37	0.40	0.43	0.46	0.48	0.51	0.53	0.58	0.62	0.66	0.70	0.76	0.82	0.92	1.01
5.0	0.17	0.24	0.34	0.41	0.48	0.54	0.59	0.63	0.68	0.72	0.76	0.85	0.93	1.00	1.07	1.20	1.31	1.52	1.69
6.0	0.21	0.30	0.43	0.52	0.60	0.67	0.74	0.80	0.85	0.90	0.95	1.06	1.17	1.26	1.35	1.50	1.65	1.90	2.13
7.0	0.26	0.37	0.52	0.64	0.74	0.83	0.90	0.98	1.04	1.11	1.17	1.30	1.43	1.54	1.65	1.84	2.02	2.23	2.51
8.0	0.31	0.44	0.63	0.77	0.89	0.99	1.09	1.17	1.25	1.33	1.40	1.57	1.72	1.86	1.98	2.22	2.43	2.81	3.14
9.0	0.37	0.52	0.74	0.91	1.05	1.17	1.29	1.39	1.48	1.57	1.66	1.86	2.03	2.20	2.35	2.62	2.87	3.19	3.57
10.0 (10:1)	0.43	0.61	0.87	1.06	1.23	1.37	1.50	1.62	1.73	1.84	1.94	2.17	2.37	2.56	2.74	3.06	3.36	3.87	4.33
12.0	0.57	0.81	1.14	1.40	1.61	1.80	1.98	2.14	2.28	2.42	2.55	2.85	3.13	3.38	3.61	4.04	4.42	5.10	5.71
14.0	0.73	1.03	1.45	1.78	2.05	2.29	2.51	2.72	2.90	3.08	3.25	3.63	3.98	4.29	4.59	5.13	5.62	6.49	7.26
16.0	0.90	1.27	1.80	2.20	2.54	2.84	3.11	3.36	3.59	3.81	4.01	4.49	4.92	5.31	5.68	6.35	6.95	8.03	8.98
18.0	1.09	1.54	2.17	2.66	3.07	3.43	3.76	4.06	4.34	4.61	4.86	5.43	5.95	6.43	6.87	7.68	8.41	9.71	10.86
20.0 (5:1)	1.29	1.82	2.58	3.16	3.65	4.08	4.47	4.83	5.16	5.47	5.77	6.45	7.07	7.63	8.16	9.12	9.99	11.54	12.90
25.0 (4:1)	1.86	2.63	3.73	4.56	5.27	5.89	6.45	6.97	7.45	7.90	8.33	9.31	10.20	11.02	11.78	13.17	14.43	16.66	
30.0	2.52	3.56	5.03	6.16	7.11	7.95	8.71	9.41	10.06	10.67	11.25	12.58	13.78	14.88	15.91	17.79	19.48	22.50	
33.33 (3:1)	2.99	4.22	5.97	7.32	8.45	9.45	10.35	11.18	11.95	12.67	13.36	14.93	16.36	17.67	18.89	21.12			
40.0 (2½:1)	4.00	5.66	8.00	9.80	11.32	12.65	13.86	14.97	16.01	16.98	17.90	20.01	21.92	23.67	25.31	28.30			
50.0 (2:1)	5.64	7.97	11.27	13.81	15.94	17.82	19.53	21.09	22.55	23.91	25.21	28.18	30.87	33.35	35.65	39.86			
60.0	7.32	10.35	14.64	17.93	20.71	23.15	25.36	27.39	29.29	31.06	32.74	36.61	40.10	43.31	46.30	51.77			
66.67 (1½:1)	8.43	11.93	16.87	22.66	23.85	26.67	29.21	31.56	33.73	35.78	37.72	42.17	46.19	49.89	53.34	59.63			

Table B-2.3 – CROP MANAGEMENT "C" FACTORS FOR GEORGIA (All Medium Yields)

Rotation Cycle (Years)	Crop Sequence	Conventional Tillage Systems		Conservation Tillage Systems				Combinations of Tillage Systems					
				No-till[1] Systems	All Crops Conservation Tilled			Summer Crop Conven. & Winter Cons. Till.			Summer Crop Cons. Till. & Winter Conventional		
		RdL	RdR		30%[2]	50%	70%	30%	50%	70%	30%	50%	70%
1	Corn	0.33	0.50	0.07	0.15	0.11	0.07	–[4]	–	–	–	–	–
1	Corn & Small Grain	0.31	0.44	0.04	0.16	0.11	0.08	0.30	0.29	0.28	0.17	0.14	0.13
1	Cotton	0.48	0.54	0.23	0.25	–	–	–	–	–	–	–	–
1	Cotton & Small Grain	0.45	0.52	0.18	0.22	–	–	0.48	–	–	0.24	0.22	0.21
1	Grain Sorghum	0.37	0.55	0.12	0.22	0.17	0.12	–	–	–	–	–	–
1	Grain Sorghum & Small Grain	0.32	0.42	0.06	0.15	0.10	0.07	0.30	0.29	0.28	0.16	0.13	0.11
1	Peanuts	0.46	0.58	0.27	0.27	–	–	–	–	–	–	–	–
1	Peanuts & Small Grain	0.38	0.44	0.07	0.16	0.11	–	0.40	–	–	0.19	0.16	0.13
1	Soybeans	0.46	0.60	0.27	0.27	–	–	–	–	–	–	–	–
1	Soybeans & Small Grain	0.41	0.54	0.08	0.19	0.12	–	0.35	–	–	0.23	0.19	0.17
1	Tobacco	0.41	0.44	0.17	0.21	–	–	–	–	–	–	–	–
1	Tobacco & Small Grain	0.41	0.43	0.16	0.23	0.19	–	0.35	0.34	–	0.26	0.22	0.20
1	Millet	0.27	0.52	0.09	0.13	0.11	0.09	–	–	–	–	–	–
1	Millet & Small Grain	0.25	0.30	0.05	0.10	0.08	0.05	0.22	0.21	0.20	0.14	0.12	0.10
1	Small Grain[3]	0.13	0.26	0.07	0.09	0.08	0.07	–	–	–	–	–	–

[1] The soil is left undisturbed prior to all plantings. Planting is completed in a narrow seedbed. Weeds are controlled primarily with herbicides.
[2] Percent of soil surface covered by crop residues immediately following planting.
[3] Followed by weeds.
[4] Does not apply, or either the crops do not provide this much residue.

NOTE: Add 0.05 to the "C" value when the cover crop is grazed. For example: "C" for Corn & Small Grain (conven.) = 0.31
If grazed, add 0.05 +0.05
Use "C" value of 0.36

Table B-2.4 – AVERAGE ANNUAL "C" FACTOR VALUES
"C" Factors for Undisturbed Forest Land[1]

Percent of area covered by canopy of trees and undergrowth	Percent of area covered by duff	Factor "C" [2]
100 - 75	100-90	.0001 - .001
70 - 45	85-75	.002 - .004
40 - 20	70-40	.003 - .009

[1] Where effective litter cover is less than 40 percent or canopy cover is less than 20 percent, use factors from Table II. Also use Table II where woodlands are being grazed, harvested, or burned.

[2] The ranges listed in "C" values are caused by ranges in the specified forest litter and canopy covers and by variations in effective canopy heights. Use lower range where heavy ground litter is present or where low understory vegetation is dense.

Table B-2.5 – AVERAGE ANNUAL "C" FACTOR VALUES

Factors for Perennial Pasture, Idle Land, or Grazed Woodland[1]

Vegetative Canopy		Cover That Contacts the Surface						
Type and Height of Raised Canopy[2]	Canopy Cover[3] %	Type[4]	Percent Ground Cover 0	20	40	60	80	95-100
No appreciable canopy		G	.45	.20	.10	.042	.013	.003
		W	.45	.25	.15	.090	.043	.011
Canopy of tall weeds or short brush (0.5m or 20 inches fall height)	25	G	.36	.17	.09	.038	.012	.003
		W	.36	.20	.13	.082	.041	.011
	50	G	.26	.13	.07	.035	.012	.003
		W	.26	.16	.11	.075	.039	.011
	75	G	.17	.10	.06	.031	.011	.003
		W	.17	.12	.09	.068	.038	.011
Appreciable brush or brushes (2m or 79 inches fall height)	25	G	.40	.18	.09	.040	.013	.003
		W	.40	.22	.14	.085	.042	.011
	50	G	.34	.16	.09	.038	.012	.003
		W	.34	.19	.13	.081	.041	.011
	75	G	.28	.14	.08	.036	.012	.003
		W	.28	.17	.12	.077	.040	.011
Trees but no appreciable low brush (4m or 157 inches fall height)	25	G	.42	.19	.10	.041	.013	.003
		W	.42	.23	.14	.087	.042	.011
	50	G	.39	.18	.09	.040	.013	.003
		W	.39	.21	.14	.085	.042	.011
	75	G	.36	.17	.09	.039	.012	.003
		W	.36	.20	.13	.083	.041	.011

[1] The listed "C" values assume that the vegetation and mulch are randomly distributed over the entire area.

[2] Average fall height of waterdrops from canopy to soil surface: m = meters.

[3] Portion of total-area surface that would be hidden from view by canopy in a vertical projection (a bird's-eye view).

[4] G: Cover at surface is grass, grasslike plants, or decaying compacted duff.

W: Cover at surface is mostly broadleaf herbaceous plants (as weeds with little lateral-root network near the surface) or undecayed residues or both.

Table B-2.5 – "C" FACTORS AND SLOPE LENGTHS FOR CONSTRUCTION SITES

Type Cover	Tons/Acre	Slope Per Cent	C Value	Maximum Allowable Slope Length
Bare (No cover)	–	All	1.0	–
Straw[1] [2] (Tied down by anchoring equipment)	1	5	.20	200
		6-10	.20	100
	1.5	5	.12	300
		6-10	.12	150
	2.0	5	.06	400
		6-10	.06	200
		11-15	.07	150
		16-20	.11	100
		21-25	.14	75
		26-50	.18	35
Crushed Stone (Road gravel)	60	15	.07	200
	135	15	.05	200
		16-20	.05	150
		21-33	.05	100
		34-50	.05	75
	240	20	.02	300
		21-33	.02	200
Wood Chips[2]	7	15	.08	75
		16-20	.08	50
	12	15	.05	150
		16-20	.05	100
		21-33	.05	75
	25	15	.02	200
		16-20	.02	150
		21-33	.02	100

Seeding	Mulch	C Value for Cover Stages: 3-5 weeks	C Value for Cover Stages: 4-10 weeks[3]
Temporary or (permanent with fast-growing grass)	0	.50 - .70	.05 - .10
	1 T/Ac Straw	.20	.07
	1 1/2 t/Ac Straw	.12	.05

Permanent Seedings - Remainder of first year - .05
Permanent Seedings - Second Year - .01
Sod - Immediately - .01

[1] Double the C value if straw not anchored to control rilling beneath the mulch on soils having a K value greater than .30 or slopes steeper than 10 per cent.
[2] The effective life of all mulches except stone will vary from 2 months to 6 months. Thereafter, the C value for mulches reverts to 1.0 if vegetation is not established.
[3] The plants used, time of seeding, temperature, moisture, and fertility all affect establishment time of vegetation.

GUIDE FOR DEVELOPING THE SOIL ERODIBILITY FACTOR (K) IN THE UNIVERSAL SOIL LOSS EQUATION

The soil erodibility factor (K) used in the universal soil loss equation is a measure of the susceptibility of soil particles to detachment and transport by rainfall and runoff. It is a value determined experimentally for selected benchmark soils. Based on knowledge of the behavior of soil properties and their interactions, these data are synthesized and values assigned to other kinds of soil.

A single K value can be given the dominant textural phase of a soil series if the erosion potential is about the same for all horizons and textural phases of that series. Where horizons or textural phases of a series differ greatly in erosion potential, say two or more K value classes, more than one K value needs to be assigned to the named kind of soil.

K values that have been obtained experimentally range from .01 to .64. For ease of use, twelve K value classes are used as follows: .10,.15,.17,.20,.24, .28, .32,.37,.43,.49,.55 and .64.

In developing K values for soils, use all applicable data. In additon, consider the following soil properties that have been found to affect soil erodibility:

1. Soil texture, especially percent of silt plus very fine sand.
2. Percent of sand greater than 0.10 mm.
3. Soil organic matter content.
4. Soil structure (type, grade).
5. Soil permeability.
6. Clay mineralogy.
7. Coarse fragments in soil layer being evaluated.

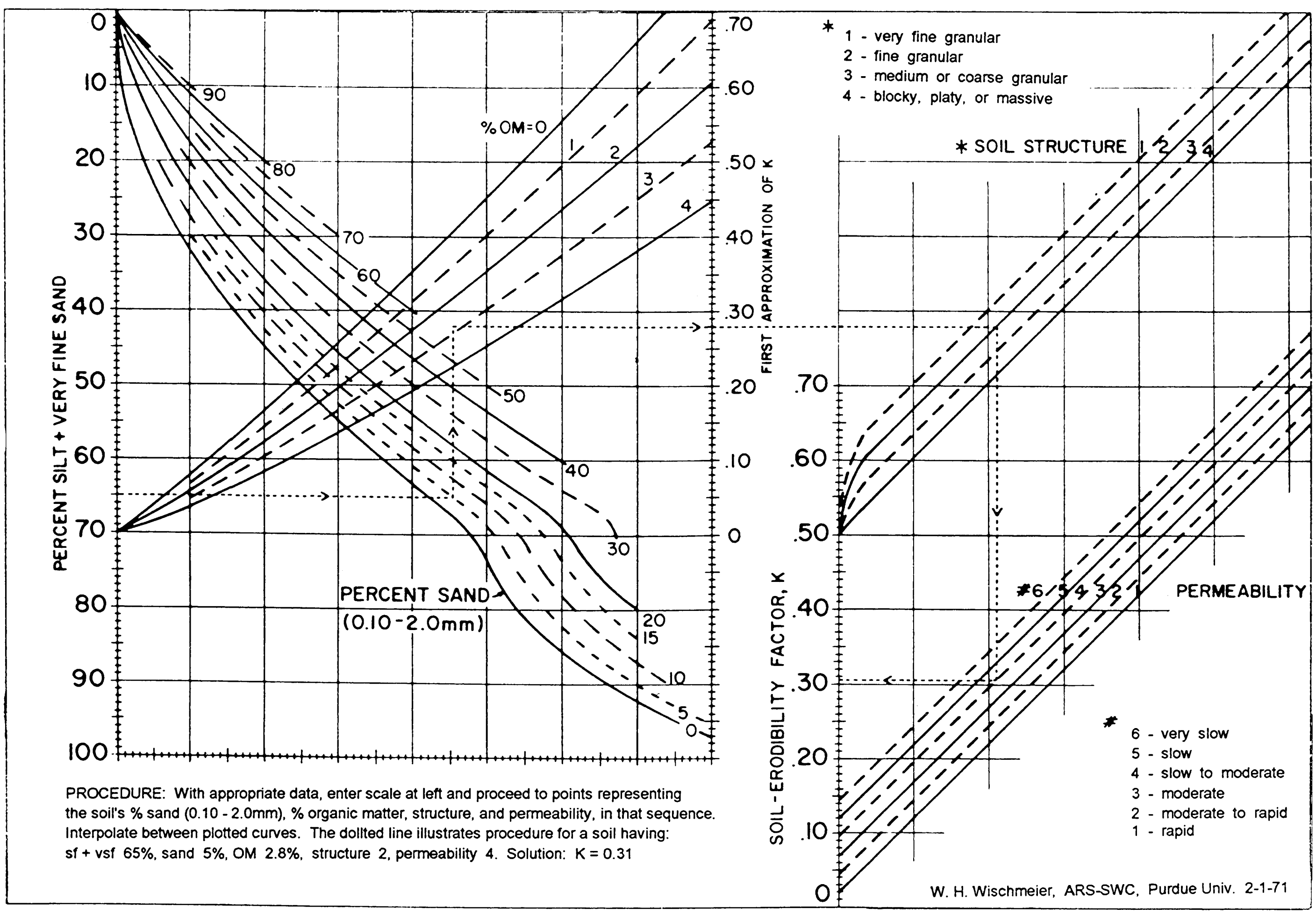
Rainfall intensity, distribution, amount, length and steepness of slope, vegetative cover and erosion control practices all influence soil erodibility but these are taken care of by other variables in the equation.

The Agricultural Research Service has developed a nomograph which shows the influence of various selected soil properties on K values (42). A copy of this nomograph is attached for information and guidance.

When using the nomograph, care should be taken to select those soil properties that are most representative of the horizon being considered. For horizons having organic matter in excess of 4 percent, do not extrapolate - use the 4 percent curve.

The K values derived from the nomograph must be adjusted for coarse fragments. K values for soils high

Figure B-2.1 – SOIL ERODIBILITY NOMOGRAPH



Reprinted from the Journal of Soil and Water Conservation
September-October 1971, Volume 26, Number 5

in coarse fragments (gravelly, chanery, shaly, slaty. cherty, cobbly, or flaggy) are reduced by one or two classes. Soils that are very gravelly, very chanery, very shaly, very slaty, very cherty, very cobbly. or very flaggy are reduced by two or three classes.

Soil scientists using the ARS nomograph have noted that for some soils, the K values obtained from the nomograph differ from those they have been using for many years. The nomograph commonly gives higher K values for silty soils and lower values for soils high in clay and in sand than values now in use. Where these values differ more than two K value classes, there is need to study the soils carefully and see how they behave under field conditions. For some soils, the best value may be somewhere between these two values. For other soils, the original estimated value may be more representative. The nomograph is based on a limited number of different kinds of soil and experience with its use is limited. Therefore, it should be used only as a guide at this time.