

Important Soil Loss Equation Formulas PDF



Formulas
Examples
with Units

List of 17
Important Soil Loss Equation Formulas

1) Modified Universal Soil Loss Equation Formulas

1.1) Crop Management Factor given Sediment Yield from Individual Storm Formula

Formula

$$C = \frac{Y}{11.8 \cdot \left((Q_V \cdot q_p)^{0.56} \right) \cdot K \cdot K_{zt} \cdot P}$$

Evaluate Formula 

Example with Units

$$0.61 = \frac{135.7332 \text{ kg}}{11.8 \cdot \left((19.5 \text{ m}^3 \cdot 1.256 \text{ m}^3/\text{s})^{0.56} \right) \cdot 0.17 \cdot 25 \cdot 0.74}$$

1.2) Peak Rate of Runoff given Sediment Yield from Individual Storm Formula

Formula

$$q_p = \frac{\left(\frac{Y}{11.8 \cdot K \cdot K_{zt} \cdot C \cdot P} \right)^{\frac{1}{0.56}}}{Q_V}$$

Example with Units

$$1.256 \text{ m}^3/\text{s} = \frac{\left(\frac{135.7332 \text{ kg}}{11.8 \cdot 0.17 \cdot 25 \cdot 0.61 \cdot 0.74} \right)^{\frac{1}{0.56}}}{19.5 \text{ m}^3}$$

Evaluate Formula 

1.3) Sediment Yield from Individual Storm Formula

Formula

$$Y = 11.8 \cdot \left((Q_V \cdot q_p)^{0.56} \right) \cdot K \cdot K_{zt} \cdot C \cdot P$$

Evaluate Formula 

Example with Units

$$135.7332 \text{ kg} = 11.8 \cdot \left((19.5 \text{ m}^3 \cdot 1.256 \text{ m}^3/\text{s})^{0.56} \right) \cdot 0.17 \cdot 25 \cdot 0.61 \cdot 0.74$$

1.4) Storm Runoff Volume given Sediment Yield from Individual Storm Formula

Formula

$$Q_V = \frac{\left(\frac{Y}{11.8 \cdot K \cdot K_{zt} \cdot C \cdot P} \right)^{\frac{1}{0.56}}}{q_p}$$

Example with Units

$$19.5 \text{ m}^3 = \frac{\left(\frac{135.7332 \text{ kg}}{11.8 \cdot 0.17 \cdot 25 \cdot 0.61 \cdot 0.74} \right)^{\frac{1}{0.56}}}{1.256 \text{ m}^3/\text{s}}$$

Evaluate Formula 



1.5) Support Cultivation Practice given Sediment Yield from Individual Storm Formula

Formula

Evaluate Formula 

$$P = \frac{Y}{11.8 \cdot (Q_V \cdot q_p)^{0.56} \cdot K \cdot K_{zt} \cdot C}$$

Example with Units

$$0.74 = \frac{135.7332 \text{ kg}}{11.8 \cdot (19.5 \text{ m}^3 \cdot 1.256 \text{ m}^3/\text{s})^{0.56} \cdot 0.17 \cdot 25 \cdot 0.61}$$

1.6) Topographic Factor given Sediment Yield from Individual Storm Formula

Formula

Evaluate Formula 

$$K_{zt} = \frac{Y}{11.8 \cdot \left((Q_V \cdot q_p)^{0.56} \right) \cdot K \cdot C \cdot P}$$

Example with Units

$$25 = \frac{135.7332 \text{ kg}}{11.8 \cdot \left((19.5 \text{ m}^3 \cdot 1.256 \text{ m}^3/\text{s})^{0.56} \right) \cdot 0.17 \cdot 0.61 \cdot 0.74}$$

2) Universal Soil Loss Equation Formulas

2.1) Cover Management Factor given Soil Loss per unit Area in unit Time Formula

Formula

Example with Units

Evaluate Formula 

$$C = \frac{A}{R \cdot K \cdot L \cdot S \cdot P}$$

$$0.6134 = \frac{0.16 \text{ t/d}}{0.4 \cdot 0.17 \cdot 0.1 \cdot 0.6 \cdot 0.74}$$

2.2) Equation for Topographic Factor Formula

Formula

Evaluate Formula 

$$K_{zt} = \left(\left(\frac{Y}{22.13} \right)^m \right) \cdot \left(65.41 \cdot \sin(\theta)^2 + 4.56 \cdot \sin(\theta) + 0.065 \right)$$

Example with Units

$$36.4393 = \left(\left(\frac{4 \text{ m}}{22.13} \right)^{0.2} \right) \cdot \left(65.41 \cdot \sin(45)^2 + 4.56 \cdot \sin(45) + 0.065 \right)$$

2.3) Rainfall Erosivity Factor Formula

Formula

Example with Units

Evaluate Formula 

$$R = \frac{A}{K \cdot L \cdot S \cdot C \cdot P}$$

$$0.4022 = \frac{0.16 \text{ t/d}}{0.17 \cdot 0.1 \cdot 0.6 \cdot 0.61 \cdot 0.74}$$



2.4) Slope Steepness Factor given Soil Loss per unit Area in unit Time Formula

Formula

$$S = \frac{A}{R \cdot K \cdot L \cdot C \cdot P}$$

Example with Units

$$0.6033 = \frac{0.16 \text{ t/d}}{0.4 \cdot 0.17 \cdot 0.1 \cdot 0.61 \cdot 0.74}$$

Evaluate Formula 

2.5) Slope Length Factor given Soil Loss Per Unit Area in Unit Time Formula

Formula

$$L = \frac{A}{R \cdot K \cdot S \cdot C \cdot P}$$

Example with Units

$$0.1006 = \frac{0.16 \text{ t/d}}{0.4 \cdot 0.17 \cdot 0.6 \cdot 0.61 \cdot 0.74}$$

Evaluate Formula 

2.6) Soil Erodibility Factor given Soil Loss Per Unit Area in Unit Time Formula

Formula

$$K = \frac{A}{R \cdot L \cdot S \cdot C \cdot P}$$

Example with Units

$$0.1709 = \frac{0.16 \text{ t/d}}{0.4 \cdot 0.1 \cdot 0.6 \cdot 0.61 \cdot 0.74}$$

Evaluate Formula 

2.7) Soil Loss Per Unit Area in Unit Time Formula

Formula

$$A = R \cdot K \cdot L \cdot S \cdot C \cdot P$$

Example with Units

$$0.1591 \text{ t/d} = 0.4 \cdot 0.17 \cdot 0.1 \cdot 0.6 \cdot 0.61 \cdot 0.74$$

Evaluate Formula 

2.8) Support Practice Factor given Soil Loss per unit Area in Unit Time Formula

Formula

$$P = \frac{A}{R \cdot K \cdot L \cdot C \cdot S}$$

Example with Units

$$0.7441 = \frac{0.16 \text{ t/d}}{0.4 \cdot 0.17 \cdot 0.1 \cdot 0.61 \cdot 0.6}$$

Evaluate Formula 

2.9) Rainfall Erosivity Factor Formulas

2.9.1) Kinetic Energy of Storm given Rainfall Erosion Index Unit Formula

Formula

$$K_E = EI_{30} \cdot \frac{100}{I_{30}}$$

Example with Units

$$100_j = 0.0025 \cdot \frac{100}{15 \text{ cm/min}}$$

Evaluate Formula 

2.9.2) Maximum 30 Minutes Rainfall Intensity given Rainfall Erosion Index Unit of Storm Formula

Formula

$$I_{30} = \frac{EI_{30} \cdot 100}{K_E}$$

Example with Units

$$15 \text{ cm/min} = \frac{0.0025 \cdot 100}{100_j}$$

Evaluate Formula 



2.9.3) Rainfall Erosion Index Unit of Storm Formula

Formula

$$EI_{30} = K_E \cdot \frac{I_{30}}{100}$$

Example with Units

$$0.0025 = 100_j \cdot \frac{15 \text{ cm/min}}{100}$$








Evaluate Formula 



Variables used in list of Soil Loss Equation Formulas above

- **A** Soil Loss Per Unit Area in Unit Time (*Ton (metric) per Day*)
- **C** Cover Management Factor
- **El₃₀** Rainfall Erosion Index Unit
- **I₃₀** Maximum 30-Minutes Rainfall Intensity (*Centimeter per Minute*)
- **K** Soil Erodibility Factor
- **K_E** Kinetic Energy of the Storm (*Joule*)
- **K_{zt}** Topographic factor
- **L** Slope Length Factor
- **m** Exponent Factor
- **P** Support Practice Factor
- **q_p** Peak Rate of Runoff (*Cubic Meter per Second*)
- **Q_v** Runoff Volume (*Cubic Meter*)
- **R** Rainfall Erosivity Factor
- **S** Slope-Steepness Factor
- **Y** Sediment Yield from an Individual Storm (*Kilogram*)
- **γ** Field Slope Length (*Meter*)
- **θ** Angle of Slope

Constants, Functions, Measurements used in list of Soil Loss Equation Formulas above


- **Functions:** **sin**, **sin(Angle)**
Sine is a trigonometric function that describes the ratio of the length of the opposite side of a right triangle to the length of the hypotenuse.
- **Measurement: Length** in Meter (m)
Length Unit Conversion 
- **Measurement: Weight** in Kilogram (kg)
Weight Unit Conversion 
- **Measurement: Volume** in Cubic Meter (m³)
Volume Unit Conversion 
- **Measurement: Speed** in Centimeter per Minute (cm/min)
Speed Unit Conversion 
- **Measurement: Energy** in Joule (J)
Energy Unit Conversion 
- **Measurement: Volumetric Flow Rate** in Cubic Meter per Second (m³/s)
Volumetric Flow Rate Unit Conversion 
- **Measurement: Mass Flow Rate** in Ton (metric) per Day (t/d)
Mass Flow Rate Unit Conversion 



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