

**Great Lakes Basin Program for Soil Erosion and Sediment Control  
Estimated Soil Savings Calculations for GLBP Projects 2005 Application**

Use the following formulas to calculate estimated soil savings for common best management practices (BMP) you are proposing to install.

<b>BMP</b>	<b>Equation</b>
X grade stabilization structures	Gully Erosion Equation
X grassed waterways	Gully Erosion Equation
X critical area planting in gullied areas	Gully Erosion Equation
X water and sediment control basins	Gully Erosion Equation
X fencing livestock out of a stream	Stream/Channel Erosion Equation
X bank stabilization using vegetation	Stream/Channel Erosion Equation
X bank stabilization using armoring	Stream/Channel Erosion Equation
X crop, pastureland, and construction site BMPs to control sheet and rill erosion	Revised Universal Soil Loss Equation

**1) Gully Erosion Equation:**

This equation will enable you to determine how much soil is lost from an eroded area and, from there, how much is saved after installation of a BMP which is assumed to control all gully erosion.

Tons of sediment lost (X) = (top width + bottom width)/2 x depth x length x soil weight

-- All measurements on the top line are in linear feet except soil weight which is in tons/cubic ft.  
(See Table 1)

**TABLE 1  
Soil Weights (Dry Density)**

<b>Soil Textural Class</b>	<b>Soil Weight tons/ft<sup>3</sup></b>
sands, loamy sands	0.055
sandy loam	0.0525
fine sandy loam	0.05
loams, sandy clay loams, sandy clay	0.045
Silt loam	0.0425
silty clay loam, silty clay	0.0375
clay loam	0.0375
clay	0.035
organic	0.011

**2) Stream/Channel Erosion Equation**

The Stream/Channel Erosion Equation is used to calculate estimated soil savings for streambanks, ditches and lakeshores.

Soil loss in tons/year (X) = length x height x lateral recession rate x dry density soil weight

-- All measurements are in feet except lateral recession rate (see Table 2) and dry density soil weight (see Table 1). This calculation is for one bank only, to calculate total where both banks are treated you will require to estimate for both banks.

**Table 2  
Stream Erosion**

Please Note: If you have an accurate actual measurement of the recession rate for your streambank, please use this number. Otherwise estimate from the chart below.

Lateral Recession Rate ft/yr	Category	Description
0.01-0.05	slight	some bare bank, but active erosion not readily apparent; some rills but no vegetative overhang; no exposed tree roots
0.06-0.2	moderate	bank is predominantly bare with some rills and vegetative overhang; some exposed tree roots but no slumps or slips
0.3-0.5	severe	banks is bare with rills and severe vegetative overhang; many exposed tree roots and fallen trees, slumps and slips; some changes in cultural features such as fence corners missing or realignment of roads and trails; channel cross section becomes more U-shaped rather than V-shaped
0.5+	very severe	bank is bare with gullies and severe vegetative overhang; many fallen trees, drains and culverts eroding and changes in cultural features as above; massive slips or washouts common; channel cross section is U-shaped and stream course or gully may be meandering

Once you have categorized the erosion, note whether all the symptoms are present, if only a few are observable you may want to use the lower range of the recession rate for that category.

### 3) Revised Universal Soil Loss Equation

The Revised Universal Soil Loss Equation (RUSLE) is a tool to predict long term average soil loss in tons/acre/year from specific conditions using specific management systems.

RUSLE:

$$A=RxKxLSxCxP$$

**A** is the predicted average annual soil loss measured in tons/acre/year

**R** is the rainfall-runoff erosivity factor, which USDA has calculated for each county; please contact your local USDA office for the value assigned to your county.

**K** is the soil erodibility factor, which USDA has calculated for each county; please contact your local USDA field office for the value assigned for your county.

**LS** is the length and slope factor and accounts for the effect of topography on erosion. Slope length (**L**) is the horizontal distance from the origin of flow to the point where either (1) the slope gradient decreases enough that deposition occurs or (2) runoff becomes concentrated in a defined channel. Slope lengths will rarely exceed 400 feet in length unless grading has been done. Deposition usually begins to occur along a slope gradient at the point where the slope decreases by about 5%. Slope length is best determined by pacing or measuring the field. The slope steepness factor (**S**) reflects the influence of slope gradient on erosion. Slope is measured in the field by the use of an inclinometer, Abney level or similar device. A contour map may be used if it is recorded at the two-foot contour interval. **LS** values are not absolute but measured in reference to a base **LS** measure of 1, which represents a 72.6 foot slope length with a 9% steepness. **LS** values less than 1 represent a site which erodes less than the base **LS** measure and **LS** values greater than 1 indicate conditions more erosive than the base measure. Slopes

which are convex, i.e. the slope tends to increase on the downslope are more erosive than concave slopes which tend to decrease on the downslope.

4) **Total Estimated Soil Savings over the life of the BMP.**

Using the table below multiply the annual soil loss calculated above by the number of years of the lifespan of the BMP.

<b>BMP</b>	<b>Lifespan of BMP in years</b>
Filter Strips	15
Conservation Tillage	1
Waterways	12
Critical Area Planting	15
Construction Sites	2
Streambank Stabilization	10
Shoreline Stabilization	10
Grade Stab. Structures	10
WASCOBS	15