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Soil Erosion: How Much?

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Each year erosion carries away topsoil. Dryland cropping areas in Idaho lose an average of 14 tons per acre annually.* This average, though, does not tell you how much erosion is affecting your fields or farm.

Few producers really know how much topsoil they are losing. This knowledge is becoming increasingly valuable to managers making decisions for areas with special needs. Critical or severely eroding areas, which are usually limited in size, can represent most of the soil loss that occurs.

The eroded soil also represents a loss of organic matter and nutrients. The soil left behind becomes less productive and even more erodible because of changes in its physical properties. The loss of 1 inch of topsoil can mean a loss of 1 to 3 bushels of wheat per acre for each planting. Yield reductions caused by soil loss have been masked or minimized because of continued improvements in technology that have kept yields high.

Concern over soil erosion has recently taken on even more significance. Sediment is now recognized as the leading pollutant by volume in the state's streams, lakes and rivers. Idaho has joined in the national effort to protect water quality and has adopted an Agricultural Pollution Abatement Plan to reduce the sediment and nutrients coming from agricultural sources. This plan relies on the voluntary cooperation of each land manager in identifying critically eroding areas and in preventing sediment in runoff from reaching surface waters.

Measuring Soil Losses

An accurate method of measuring soil losses is the Alutin or rill method. This procedure is good for measuring losses from rill erosion but not for measuring sheet erosion or erosion in larger gullies.

The soil loss in tons per acre from rills is equal to the total cross-sectional area in square inches of all the rills when measured along a strip 12½ feet long. Follow these steps when using the rill method:

1. Choose a representative line across the slope and perpendicular to the general direction of the rills.
2. Measure off along this line a distance of 12½ feet (or an even multiple such as 25 feet or 37½ feet).
3. Measure the average width and depth of each rill along the line (Fig. 1).
4. Compute the area of each rill in square inches and sum the total area of all rills along the sample line (Table 1). The total area in square inches is equal to the soil loss measured in tons per acre when the rills are tabulated along

Fig. 1. You can measure soil erosion losses by determining the length and width of rills. The total area of rills in square inches measured along a 12½ foot line is equal to the soil loss in tons per acre.

*Soil Conservation Service Estimate.

Fig. 2. Soil loss on this field is 10 tons per acre.

Fig. 3. Soil loss measured 25 tons per acre on this field.

a 12½ foot line. If you use a longer line (25 feet or 37½ feet), divide the total number of square inches by the multiple of 12½.

Example: Number of tons per acre =

$$\frac{\text{sum of rill areas in a } 37\frac{1}{2} \text{ foot line}}{3}$$

Selecting representative sites for measurements is essential in making an accurate appraisal of erosion damage. On longer slopes, choose two or three separate lines across the hill, one below another.

Estimating Soil Losses

Although severe rainstorms sometimes contribute to soil loss, nearly all annual soil loss occurs during critical erosion periods of high runoff, minimum surface protection and limited infiltration. These conditions are prevalent during winter and early spring when snowmelt and rainfall occur on frozen or saturated soil. The best time to estimate annual soil losses, then, is in early spring when erosion from the previous winter is visible.

To maintain long-term productivity and meet water quality objectives, 5 tons per acre annually has been set as the maximum acceptable soil loss on most soils. Shallow soils may be able to afford only a 1 to 3 ton per acre loss. (One ton of soil evenly distributed over an acre of land would equal a layer of soil the thickness of two pieces of paper.)

Fig. 2, 3, 4 and 5 provide a visual comparison of soil erosion losses. Note the differences in the number of rills as well as their size. As a general rule if rills can be seen in a field, soil loss is greater than 5 tons per acre.

Table 1. Example of rill data taken along a 25-foot line.

Rills		
Avg. width	**Avg. depth**	**Area**
(inches)	(inches)	(sq. inches)
2	2	4
4	1	4
6	2	12
4	3	12
1	1	1
2	3	6
3	1	3
a. Subtotal		42
b. Divide by no. of multiples of 12½ feet.		2
c. Tons per acre (a/b)		21 tons/acre

Conclusions

Table 2 gives a relative comparison of erosion rates. Remember that management decisions should include soil erosion considerations. The best management practices to reduce soil losses effectively vary in different dryland areas. some proven practices include:

- **No-till planting** — planting directly into the stubble of the previous crop.
- **Minimum tillage** — limiting tillage operations to only those essential for crop production.
- **Annual cropping** — growing a crop every year where rainfall permits.
- **Cross slope farming** — performing tillage operations across the slope.

The soil loss here is 60 tons per acre. Up and down slope tillage created this uniform pattern.

Fig. 5. Soil loss on this field exceeded 150 tons per acre.

- **Divided slopes** — farming a short slope in two strips so that one strip is always in an erosion protecting crop.
- **Strip cropping** —farming longer slopes with a series of strips that alternate crops with high and low erosion protection.
- **Grass waterways** — using a stable channel to handle surface runoff.
- **Terracing** — using earth embankments constructed across slopes to intercept and handle runoff in a nonerosive manner.
- **Debris basins or gully plugs** — using barriers or dams constructed across a waterway to collect sediment from runoff.
- **Seeding critical areas** — planting trees, shrubs, grasses or legumes on areas subject to severe erosion.

Choose the practices or combination of practices which will be most beneficial to your farming operation. Contact your local Cooperative Extenstion Service or Soil Conservation Service office for additional information and assistance.

Table 2. Comparison of soil loss rates.

Tons/acre/year	Depth of soil lost in 1 year	Years to lose 1 inch of soil
	(inches)	
2	1/75	75
5	1/30	30
10	1/15	15
20	1/8	8
40	1/4	4

150 tons/acre inch

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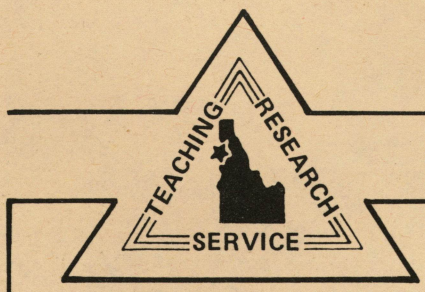

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