

TECHNICAL NOTES

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EFFECTIVENESS OF INCREASING MULCH RATES IN REDUCING SOIL MOVEMENT ON STEEP SLOPES, AND MULCH VOLUME WEIGHT AND TEXTURE AS CONDITIONS IN ESTIMATING MULCH NEEDS

It has been generally established by field experience and limited research that soil removal from steep slopes in runoff is reduced as the rate of mulching material applied is increased. Mulches reduce soil movement from sloping lands primarily by:

1. Reducing the energy from raindrops that causes splash erosion;
2. Reducing runoff; and
3. Reducing runoff velocity.

Recent work by Meyer, Wischmeier and Foster of USDA, Agricultural Research Service¹ used wheat straw on silt loam slopes of 15 percent to determine the effectiveness of increasing straw mulch rates. Simulated rainfall was used at an intensity of 2.5 inches per hour for one hour with two thirty minute applications separated by fifteen minutes the following day. The following table is constructed from their data and should be helpful to conservationists in recommending mulching rates using straw or similar organic materials. In reviewing their data, the authors indicated that variables in the 1,000 pound per acre replications made them appear less effective than they ordinarily would be.

Mulch Lb/Ac	Percent	Percent Soil by Weight in Runoff:	Soil Loss		Runoff	
	of Soil Surface Covered by Straw		Tons Per Acre	Cubic Yards Per Acre	Inches	Rate in Feet Per Second
0	0	7.2	80.0	105.0	3.4	0.455
500	34	2.6	26.0	34.0	3.0	0.232
1000	49	2.3	24.6	32.3	3.3	0.226
2000	71	1.3	14.8	19.4	3.4	0.184
4000	92	0.4	3.2	4.2	2.8	0.173
8000	95+	0.3	1.9	2.9	3.0	0.196

Erosion and runoff data from 5 inches simulated rainfall on 15 percent slope silt loam protected by the straw mulch rates shown in column 1.

A most significant item is the reduction in soil loss by the small 1/4 ton per acre mulch application when compared to no mulch. Also, the data appears to substantiate the excellence of the standard 2 ton per acre rate used in most Soil Conservation Service recommendations.

In attempting to apply this data to mulch materials other than straw, it is important to note the close correlation between percent of soil surface covered by the mulch and the reduction in soil losses. This appears to indicate that protecting a soil surface from the impacting forces of raindrops is the most important function of mulch. Thus, one would anticipate using comparable volumes rather than comparable weights of various mulch materials to obtain equal degrees of soil protection.

Work by B.W. Grib^{2/} illustrates the variable character of straw mulches in providing soil cover as follows:

<u>Type of Straw</u>	<u>Approximate Pounds Per Acre for 100 Percent Soil Cover</u>
Winter wheat	3,240
Spring barley	2,070
Spring oats	3,240
German millet	7,300
Sudan	6,100
Grain sorghum	14,700

This data shows more mulch is needed for complete cover using coarser-textured materials. Field observations indicate that lightweight, fine-textured materials do provide more protection against water erosion than do similar weights of the heavier and/or coarser materials.

Based on visual observations, I have assumed the following approximations: One ton of straw or grass hay equals one ton wood fiber mulch, equals one ton wood shavings, equals two tons coarsely chopped or shredded corn or sorghum stalks, equals three tons corn cobs, wood chips, or bark in ability to reduce soil losses from rainfall when the materials are spread evenly over the soil surface and anchored in place. This "rule of thumb" has produced generally good results when used as a guide to making recommendations for mulching to provide temporary protection while establishing vegetation.

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References Cited

1. Meyer, L.D. and Associates. "Mulch rates required for erosion control on steep slopes". Soil Science Society of America Proceedings, Vol. 34, No. 6, November - December 1970.
2. Grib, B.W. "Percent soil cover by six vegetative mulches". Agronomy Journal, Vol. 59, pp. 610-611, 1967.