A Method for Measuring the Percentage of Exposed Soil Associated with Forest Management Activities

Thomas L. Arnold, S. C. Krieger, and A. E. Tiarks

Have you ever needed to know the percentage of exposed soil over a large area following a timber harvest or site preparation activity? If you have worked with the Universal Soil Loss Equation (USLE) in predicting soil erosion, you have. It is part of the C factor. Have you ever needed to know the percentage of soil exposed following an activity to comply with a Best Management Practice? Well, the U.S. Forest Service in Mississippi did. A method was needed to measure the National Forests in Mississippi needed a method to measure the percentage of soil exposed prior to and following the piling of woody debris for site preparation for the National Forests in Mississippi. Woody debris, following some timber harvests, is raked into windrows on the contour to prepare the sites for machine planting of pine (Pinus spp.) seedlings. There is a limit to the amount of soil that can be exposed by the operation to reduce the erosion hazard and help maintain site productivity by not removing too much surface organic matter.

Several methods for measuring percentage bare soil were explored (Brown, 1954; Hartwig and Laflen, 1978; Laflen et al., 1981; Richards et al., 1984; Sloneker et al., 1977; USDA-SCS, 1992), but each had distinct disadvantages that would make their use inefficient. Line transects are made by counting the number of spots with bare soil under a rope with equally spaced marks. However, it is extremely difficult to stretch a rope or wire through the woody residue left after a logging operation. Point sampling is done by counting the number of times bare soil is under the toe of a boot in a fixed number of steps. In woody residue this method is subject to bias because of the walker’s preference to step on a smooth surface rather than logs, limbs, or leaf piles. Also, these methods do not mesh well with other tasks already being done by personnel in the field.

New Method

For our new method we designed a template to be used for measuring the amount of exposed soil. The template was named for the authors Krieger, Arnold, and Tiarks, and shortened to KAT. The KAT template is illustrated in Fig. 1. The template fixes the location of the sample points, maintaining consistency between different personnel recording data. Four sample points are taken along the circumference of a circle having a radius of 16.7 ft. The four sample points are located in a cardinal direction. A fifth sample point is taken randomly within the circle. One circle is considered a sample plot (Fig. 2). The KAT template is dropped to the ground. Those holes in the template that have 50% or more bare soil are recorded as bare soil (Fig. 3, sample of record sheet). It takes less than 2 min to measure and record data per sample plot.

1 T.L. Arnold and S.C. Krieger, soil scientists, National Forests in Mississippi, Jackson, MS; and A.E. Tiarks, soil scientist, Southern Forest Experiment Station, Pineville, LA.