Reconnaissance Soil Mapping of a Small Watershed Using Electromagnetic Induction and Global Positioning System Techniques

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New technologies are changing the way soil scientists conduct field investigations. Innovative field techniques, such as electromagnetic induction (EM) and ground-penetrating radar (GPR), have been used by soil scientists to extend the depths of observation, increase the amount of data collected, and provide greater confidence in the assessments of sites.

Electromagnetic induction techniques provide measurements of the apparent conductivity of earthen materials. Apparent conductivity values are seldom diagnostic in themselves. However, lateral and vertical variations in these measurements can be used to infer changes in soils and soil properties (Corwin and Rhoades, 1982, 1990; Hoekstra et al., 1992; Jaynes et al., 1993; Kachanoski et al., 1988; Zalasiewicz et al., 1985).

Data collected with geophysical techniques are often displayed, processed, analyzed, and summarized using computer graphic packages. To effectively integrate EM and computer graphic techniques, the coordinates of field measurement sites are required. Typically, EM measurements are recorded at fixed intervals along parallel traverse or grid lines. In the past, EM surveys required either the establishment of grid lines (a relatively tedious process), or the use of topographic maps or aerial photographs and traverse lines established normal to identifiable terrain feature (a relatively imprecise method). The lack of acceptable procedures to efficiently and expeditiously locate the coordinates of field measurement sites has limited the use of EM techniques for mapping soils and soil properties over large areas (Rhoades et al., 1990). Global positioning system (GPS) technology offers a solution to this limitation.

The purpose of this study, in a test area of about 3,725 ha, was to assess the application of new techniques: the use of EM and GPS technologies to map values of apparent conductivity combined with computer graphics to prepare interpretative maps.

Materials and Methods

Equipment

A portable Trimble Basic Plus GPS receiver manufactured by Trimble Navigation (Sunnyvale, CA) was used to locate the coordinates of observation sites. The coordinates of each observation site were derived by direct reading of the

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