United States Department of Agriculture

Soil Conservation Service

Northeast NTC
160 East 7th Street
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Subject: Ground-penetrating Radar Field Assistance in Wisconsin, 5-9 June 1989

Date: July 14, 1989

To: Duane L. Johnson
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4601 Hammersley Road
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File code: 430-13

Purpose:

To work with members of the Soil Conservation Service, Forest Service, and the University of Wisconsin-Extension, Geologic and Natural Histor Survey and explore the potential of using of the ground-penetrating radar (GPR) techniques for soil and site assessments in forested areas of northern Wisconsin.

Participants:

James Doolittle, Soil Specialist (GPR), SCS, Chester, PA
Rob Fallon, Civil Eng., USFS, Chequamegon N.F., Park Falls, WI
Bill Fiala, Soil Scientist, SCS, Ashland, WI
Kim Goerg, Soil Scientist, SCS, Ashland, WI
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Leonard Kempf, Soil Scientist, USFS, Chequamegon N.F., Park Falls, WI
Greg Knight, Soil Scientist, USFS, Chequamegon N.F., Medford, WI
Terry Kroll, Soil Scientist, SCS, Ashland, WI
Sam Kung, Ass't. Prof., University of Wisconsin, Madison, WI
Fred Madison, Assoc Prof.,Soil Science, U of Wisconsin, Madison, WI
Randy Rabideaux, Geologist, USFS, Chequamegon N.F., Park Falls, WI
Debra Sigmund, Soils Co-Op, USFS, Chequamegon N.F., Park Falls, WI
John Wirt, Soils Co-Op, USFS, Chequamegon N.F., Park Falls, WI

Activities:

An informal discussion was held with Dr Madison and Dr Kung on the afternoon of June 5, in the office of the Wisconsin Geologic and Natur History Survey. During this meeting, the use of ground-penetrating radar techniques for tracing the paths of water infiltration through coarse-textured soils was discussed.

Field studies were conducted with the GPR within Chequamegon National Forest on 6 through 8 June 1988. Field techniques, equipment selectio and calibration, and data interpretations were discussed at various sites within the National Forest. At several sites, the radar imagery was confirmed with ground truth soil borings or excavated pits.

Discussion:

Three goals of this field trip were to (i) field test the 900 MHz antenna and evaluate its performance in coarse textured soils, (ii) evaluate the suitability of the GPR for soils investigations in northe Wisconsin, and (iii) acquaint USDA soils scientist, geologists and engineers with ground-penetrating radar field techniques.

The Wisconsin Geologic and Natural History Survey had rented a 900 MHz antenna for use and evaluation during this field trip. In sandy soils the 900 MHz antenna provided exceptionally high resolution of subsurfa features to depths of 2 to 3 meters. However, the amount of subsurfac information was too great to digest and was superfluous to soil survey needs. Consequently, the 900 MHz antenna is not recommended for soil survey use or for soils research.

The radar was used to define the presence, depth to, lateral extent an variability of diagnostic subsurface soil horizons. In areas of predominantly coarse and moderately-coarse textured deposits, the 120 MHz antenna provided highly resolved profiles to depths of 10 to 50 feet. In areas of water-reworked tills, the radar profiles provided valuable insight into and helped to characterize the short-range variability of soil textures and horizonation.

The radar can be effectively used in northern Wisconsin by soil scientists as a rapid reconnaissance tool to evaluate map unit composition and the variability that exists between soil map units wit a minimum of ground-truthing. In areas of order 3 soil mapping, the G can provide the documentation needed for soil map units. In this area of Wisconsin, the radar can be used as an investigatory tool for soil research.

Soil scientists and engineers with the USFS were interested in the potential of using the GPR to define the location, extent and depth of sand and gravel deposits, and to characterize land-fill sites. Participants appeared favorably impressed by the radar's performances these areas of application.

This field trip provided participants with an excellent opportunity to exchange ideas on field techniques, data interpretations, equipment selection and calibration. Dr. Fred Madison is enthusiastic and well versed in the use of the ground-penetrating radar. His efforts in Wisconsin will be shared with and have an impact upon the uses of GPR techniques within the soil survey program.

During this field trip, I was able to share my experiences with the participants. I confirmed many of their interpretations while acquainting myself with developing areas of GPR applications.

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