

United States
Department of
Agriculture

Soil
Conservation
Service

Northeast NTC
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Subject: Ground-penetrating radar
technical assistance; Maine,
14-19 May 1989

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To: Charles Whitmore
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Purpose:

To use ground-penetrating radar (GPR) field techniques to estimate the depth to bedrock in several upland map units in Piscataquis and Washington Counties.

Participants:

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Activities:

Sites for bedrock studies were selected prior to the arrival of the GPR. The unit arrived in Bangor during the evening of 14 May. On 15 to 17 May, field studies were conducted in the vicinity of Dover-Foxcroft, Piscataquis County. During the afternoon of 17 May the GPR unit was relocated to Machais. Bedrock investigations were conducted on two sites in Washington County on 18 May. Field results were summarized and the GPR unit returned to Bangor on 19 May for departing instructions. The unit departed Maine for field studies in Vermont on the morning of 20 May.

Equipment:

The unit is the SIR System-8 which consists of the model 4800 control unit, the ADTEK SR-8004H graphic recorder, and the ADTEK DT-6000 tape recorder. The 200 MHz and the 120 MHz antennas were used.

Results:

Five grids were established during this technical assistance field trip. In Piscataquis County, a 300 by 100 foot area of

Penquis-Monson silt loams, 2 to 8 percent slopes, and two areas of Elliotsville-Chesuncook silt loams, 3 to 6 percent slopes were gridded (at 10 foot intervals) and systematically sampled with the GPR. The the dimensions of the areas of Elliotsville-Chesuncook soils were 110 by 120 feet and 110 by 110 feet.

The taxonomic classifications of these soils are: Chesuncook, coarse-loamy, mixed, frigid Typic Haplorthods; Elliotsville, coarse-loamy mixed, frigid Typic Haplorthods; Monson, loamy, mixed, frigid Lithic Haplorthods, and Penquis, coarse-loamy, mixed, frigid, Typic Haplorthods. Elliotsville and Penquis soils are moderately deep (20 to 40 inches), and Chesuncook soils are very deep (> 60 inches) to bedrock.

The composition of the Penquis-Monson silt loam, 2 to 8 percent slopes, (map unit 200B) is 60 percent Penquis and 25 percent Monson soils. The composition of the Elliotsville-Chesuncook silt loams, 3 to 8 percent slopes, (map unit 219B) is 45 percent Elliotsville and 40 percent Chesuncook soils. These estimated map unit taxonomic compositions compare favorably with the results of the systematic GPR sampling (see Table 1). The gridded areas of map unit 219B were distinguished in the field as being predominantly composed of either concave (Area A) or convex (Area B) slopes. Differences in depth to bedrock and taxonomic composition with slope type can be observed in the data.

TABLE 1

Taxonomic Composition of Selected Areas
of Map Units 200B and 219B
in Piscataquis County

SOIL	DEPTH CLASS	MAP UNITS		
		200B	219B	219B
			Area B	Area A
Monson	shallow	60%	42 %	13%
Elliotsville	mod. deep	--	43%	39%
Penquis	mod. deep	37%	--	--
	deep	3%	14%	24%
Chesuncook	very deep	--	17%	24%

In Washington County, two areas (90 by 180 foot and a 90 by 150 foot) of Lyman-Tunbridge-Abram complex, 0 to 15 percent slopes, very stony, were gridded (at 10 foot intervals) and systematically sampled with the GPR.

The taxonomic classifications of these soils are: Abram, loamy, mixed, acid, frigid Lithic Haplorthods; Lyman, loamy, mixed, frigid Lithic Haplorthods; and Tunbridge, coarse-loamy, mixed, frigid Typic Haplorthods. Abram soils are very shallow (1 to 10 inches), Lyman soils are shallow (10 to 20 inches) and Tunbridge soils are moderately deep to bedrock.

The composition of the Lyman-Tunbridge-Abram complex, 0 to 15 percent slopes, very stony, (map unit 263C) is 35 percent Lyman, 30 percent Tunbridge, and 15 percent Abram soils. These estimated map unit taxonomic compositions compare favorably with the results of the systematic GPR sampling (see Table 2).

TABLE 2
Taxonomic Composition of Selected Areas
of Map Unit 263C
in Washington County

<u>SOIL</u>	<u>DEPTH CLASS</u>	<u>COMPOSITION</u>	
	exposed bedrock	0%	10%
Abram	v. shallow	26%	9%
Lyman	shallow	42%	35%
Tunbridge	mod. deep	32%	41%
	deep	0%	5%
	very deep	17%	24%

The data from these studies will be plotted with the SURFER software program into two-dimensional contour plots and three-dimensional surface net block diagrams. These plots can be incorporated into soil survey reports or used as instructional guides to soil scientist. The results and graphics will be summarized and later, if suitable, described in a brief article(s) in Soil Survey Horizons.

Recommendations:

I find glaciated upland areas in Maine to be complex in terms of drainage, slopes, depth to bedrock, and bedrock lithologies. These factors affect the accuracy and speed of soil mapping. In order to better comprehend the distribution and patterns of soil occurrence and to facilitate soil mapping, I encourage the continuation of these soil-bedrock studies.

Enclosure A is a comprehensive list of the terminology used to describe the sediments and landforms in Maine. This list is applicable to most areas of New England and northern New York. In articles written about the soil-bedrock relationships in this area, I have been urged by Bob Rourke to use the terms "weathered till" and "dense till" in preference to "ablation till" or "basal till." Furthermore, reviewers have asked that terms such as "basal till" and "ablation till" be described and substantiated by referenced, authoritative studies. Also, having worked in the mid-west, the term "till plain" conjures up a visual image which I can not see in the glaciated, till mantled uplands of Maine. I can offer little advice concerning the present terminology used. It is the best available. However, for consistency between regions and to improve our understanding and definition of soil-landscape relations, I recommend that soil-geomorphologists from the National Soil Survey Investigation Staff continue to work with soil scientists in the northeast to improve the adequacy of documents such as enclosure A, and provide direction for future soil-bedrock and perhaps soil-bedrock-landscape studies in Maine, and other New England states.



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