United States Department of Agriculture | Soil Conservation Service | Northeast NTC
160 East 7th Street
Chester, PA 19013

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Subject: GPR Field Investigations of Pocket Gopher Burrows, Manhattan, Kansas, June 3, 1988 Date:June 15, 1988

To: Rodney F. Harner
National Leader
National Soil Survey Quality Assurance Staff
Midwest National Technical Center
USDA - Soil Conservation Service
Federal Building, Room 345
100 Centennial Mall North
Lincoln, NE 68508-3866

File code:430

Purpose:

To evaluate the potential of using ground-penetrating radar (GPR) techniques to chart the distribution of pocket gopher burrows.

Participants:

Jim Benedix, Graduate Student, KSU, Manhattan, KS
Jim Doolittle, Soil Specialist (GPR), SCS, Chester, PA
Dr. Elmer Finck, Res. Ass't., Biology Dept., KSU, Manhattan, KS
Dr. Jim Reichman, Associate Professor, Biology Dept., KSU, Manhattan, KS
Dr. Tim Seasteadt, Ass't. Professor, Biology Dept., KSU, Manhattan, KS

Activities:

The GPR unit travelled from Columbia, Missouri, to Manhattan, Kansas, on the morning of 3 June 1988. Field studies were conducted at Konza Prairie and in an area adjacent to the Manhattan Airport on the afternoon of 3 June. The GPR unit departed Manhattan enroute to Durango, Colorado, on the morning of 4 June.

Discussion:

The distribution of burrows greatly affects plants and is dependent upon animal species, soil type, and plant communities. The distribution of individual gopher borrows is being studied at Kansas State University to gain insight into animal interactions and resource management.

Present methods of studying the distribution of animal burrows are slow, costly, time consuming, and often destructive. Because of these factors, researchers at Kansas State University are interested in

evaluating the potentials of using ground-penetrating radar (GPR) techniques for the study of gopher burrow distribution.

The principal study site is located in the Konza Prairie near Manhattan. Preliminary calibration tests were conducted with both the 300 and 500 MHz antennas. However, the use of the 300 MHz antenna was soon discontinued owing to its longer signal clear time and coarser resolution. The 300 MHz antenna and all lower frequency antennas (i.e. 250, 120, 80 MHz) have too coarse a resolution and can not discern the relatively small (0.9 cm) and shallow (< 40 cm) gopher burrows.

The 500 Mhz antenna, while depth restricted in the moist, silty clay loam surface layers, provided adequate penetration for the detection of gopher burrows. The majority of the gopher burrows are within 20 cm of and parallel with the soil surface.

The scanning time on the control unit was set at 15 ns, which based on a calculated velocity of propagation of 0.29 ft/ns, provided a probing depth of 26 inches. The 500 MHz antenna discerned many subsurface anomalies. Two of these anomalies, each believed to be a gopher burrow, were excavated to confirm the interpretations. Each anomaly was a gopher burrow.

The GPR system was also used on alluvial soils near the Manhattan Airport. Results were equally impressive at this site.

Results:

All participants were encouraged by the radar systems performance and the results. The GPR detected gopher burrows in moderately-fine textured soils of Kansas. Results should be more striking in coarser textured soils. While the GPR was impressive in detecting some burrows, the possibilities of errors of omission, survey procedures, and interpretations must be addressed in future studies. Also, even with the use of sophisticated software programs, it may be difficult to correctly interconnect the detected gopher burrows.

On the basis of this study, Dr. Reichman plans to consider the use of GPR techniques in his research program. He entertains hopes of introducing a proposal for a National Science Foundation Grant to purchase a radar and continue this research. I informed Dr. Reichman of the availability of a GPR unit from the National Geographic Society for applied research.

James A. Doolittle

JAMES A. DOOLITTLE
Soil Specialist (GPR)

cc: Dr O. J. Reichman, Assoc. Prof., Biology Dept., Kansas State Univ.