



INTEGRATION OF LANDSAT, GEOPHYSICAL, AND GEOLOGICAL DATA AS AN AID TO MINERAL EXPLORATION IN THE MANITOUWADGE AREA, ONTARIO

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ABSTRACT

As part of the Canada-Ontario Subsidiary Agreement on Northern Development (1991–1995), the Geological Survey of Canada initiated a program of surficial mapping and sampling near Manitouwadge as an aid to mineral prospecting. One phase of the project involved investigation of relationships between Landsat imagery, airborne geophysical data and geological data using a GIS. The aim of this work was to characterize the surficial materials (including some bedrock units related to economic mineralization), with respect to the above data types, in order to identify similar units in poorly known areas. The first step in the characterization involved establishing training sites in representative areas of thin till, thick till, glaciofluvial and outwash sands and gravels, glaciolacustrine silts, organics and rock outcrop. For each training site, the following data sets were captured: TM bands 1–7, aeromagnetic, radiometric, and bedrock lithology. When data for each variable were compared, there was generally a strong overlap in the signatures for each surficial unit, but, in most cases, units could be distinguished based on the signature of at least one variable. For example, TM7 reflectance levels were much lower for glaciofluvial sands and gravels than for all other units. In areas mapped as rock outcrop, there are marked differences in the radiometric response for most bedrock units whereas the TM reflectance response was less variable. The thorium equivalent is lower for migmatites while the potassium equivalent is higher for carbonatites and lower for migmatites compared to the other bedrock units. Statistical inferences for the different data types for surficial and bedrock units from this area were used to generate thematic maps for some nearby but poorly known test areas in similar geologic terrain where the mineral potential is suspected to be high.

