

Surficial Mapping and Sampling Activities in Southwest Nova Scotia

D. M. Brushett

Introduction

A surficial geology program was initiated in the summer of 2016 to assess the mineral potential in southwest Nova Scotia, a zone of rare-metal, base-metal, and gold mineralization where recent exploration interest has focused on tin, lithium and indium of the Meguma Group metasedimentary rocks and peraluminous South Mountain Batholith of the Meguma terrane. In the first of this multiyear program, surficial mapping and geochemical sampling were undertaken in the Wentworth Lake and Tusket map areas (NTS 21A/04 and 20P/13) (Fig. 1). Within this region, many mineral occurrences have been documented that are associated with the East Kemptville shear zone, a zone of pervasive tectonic shearing along the north edge of the South Mountain Batholith near East Kemptville (e.g. O'Reilly and Kontak, 1992; Horne et al. 2006). The most notable mineralization in the area is the greisen-hosted tin deposit at East Kemptville, where it is associated with Zn, Cu and Ag. Other granite- and metasediment-hosted Sn-Zn-Cu-In mineral occurrences include Duck Pond (Sn), Brazil Lake (Li), Fanning Lake (Au), Pearl Lake (Sn-Cu) and Dominique (Sn) (O'Reilly et al. 2016).

Bedrock mapping and mineral exploration programs in southwest Nova Scotia have been hindered by thick glacial overburden deposited by a complex sequence of glacial flow of varying provenance and dynamic style that conceals much of the bedrock surface (Stea and Grant, 1982). To overcome the challenges to exploration posed by these deposits, the southwest Nova Scotia surficial geology program will 1) map surficial deposits and ice-flow features to aid in reconstructing paleo-ice environments; 2) provide information relating to the underlying bedrock and mineral occurrences; 3) describe glacial sediment dispersal mechanisms; and 4) delineate prospective areas for exploration using surficial geochemistry.

Methods

Field observations, such as surficial units (e.g. till veneer and blankets, glaciofluvial sediment), ice-flow indicators (e.g. striations, till fabrics) and surficial landforms (e.g. crag-and-tail forms, flutes, drumlins, eskers), were recorded at each sample site. A total of 93 till samples, spaced approximately 1 km apart, were collected from the C- horizons of hand-dug pits along roads following sampling protocols outlined by Spirito et al. (2011) and McClenaghan et al. (2013) (Fig. 1). A ~3 kg sample was collected from each site for till-matrix geochemical analysis, grain-size analysis, Munsell colour determination and archiving. Samples were submitted to Activation Laboratories Ltd. (Actlabs) for dry sieving and geochemical analysis on the silt/clay fraction (<0.063 mm). Samples were analyzed by instrumental neutron activation analysis (INAA), inductively coupled plasma mass spectrometry (ICP-MS) and inductively coupled plasma optical emission spectrometry (ICP-OES) following near-total 4-acid digestion (Code UT3) as well as pressed pellet XRF (Code 4C1-Sn) for tin (Actlabs, 2017). Analysis of indicator minerals from the sand-sized (0.25-2.0 mm) heavy mineral concentrate of till is in progress, as is the lithological analysis of till clasts.

In addition to new till geochemical studies, 175 legacy till samples from NTS map sheets 21A/04 and 20P/13 (collected as part of the South Mountain Batholith Pleistocene mapping project (Finck et al. 1990, Boner et al. 1990)) were reanalyzed. These samples were previously analyzed by INAA for Ni, Cr, Ba, Th, Sc, Pb, Zn, Cu, As, Rb, Sb, Ta, W, U, Fe and Mn from the -230 mesh till fraction and Sn from heavy mineral concentrates. The reanalysis will provide geochemical data for a broader suite of elements at lower detection limits using modern ICP-MS techniques.

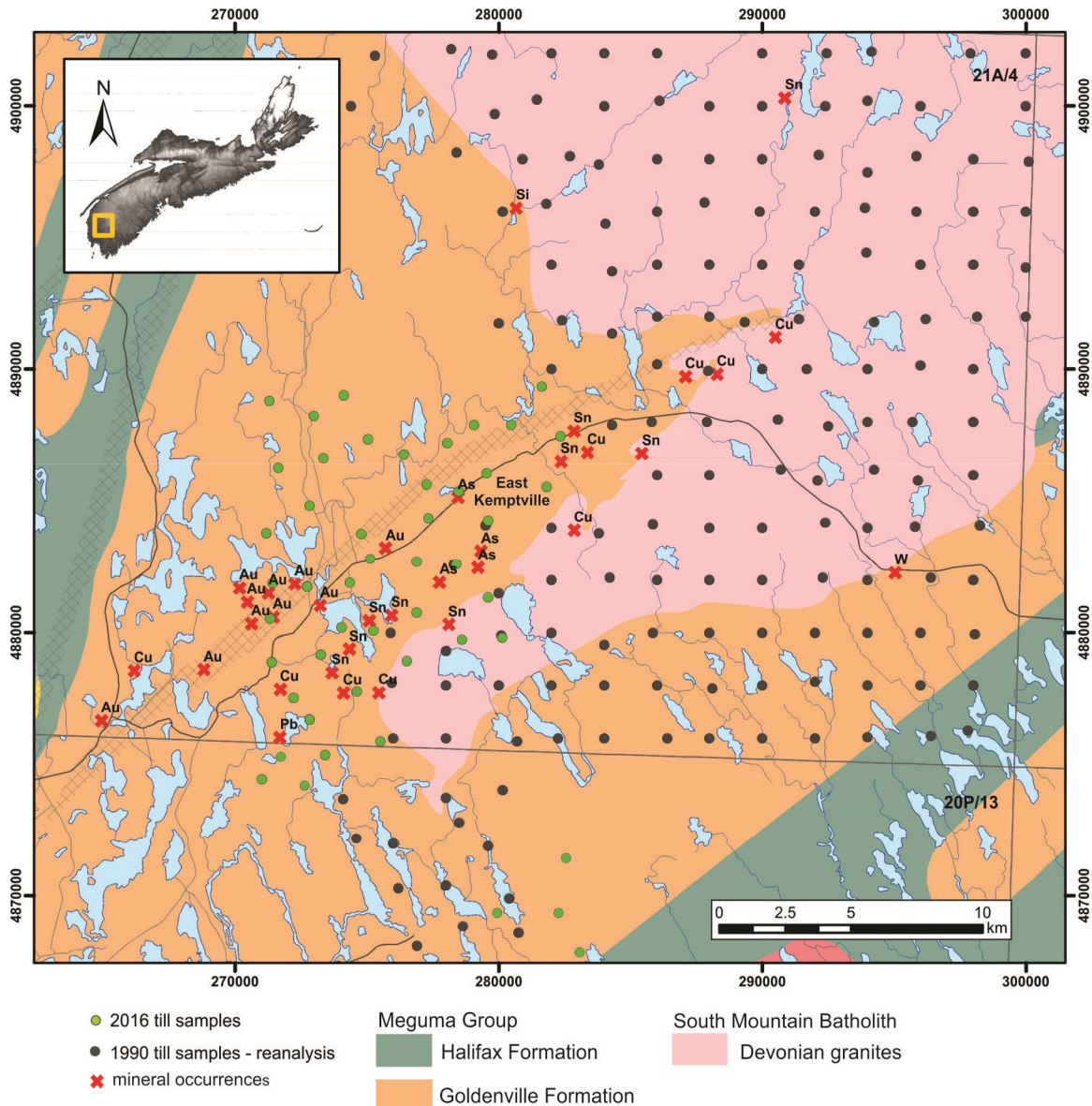


Figure 1. Location and regional geology map of the study area. Green dots show the location of till samples collected in 2016. Black dots show the location of legacy till samples that are currently being reanalyzed. Mineral occurrences are indicated by red xs. The East Kemptville Shear zone, where numerous granite- and metasediment-hosted mineral occurrences have been documented, is indicated by cross-hatched areas.

Future Work

Geochemical sampling and surficial mapping will continue in 2017. Results of geochemical analyses of till samples, till-clast lithological and grain-size analyses, field observations, individual-element contour maps and surficial maps will be used to establish a geochemical database that will be used in interpretations of surficial geochemistry and the

development of mineral exploration strategies. Data and their interpretation are anticipated to be released in an open file format in 2018.

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