SOIL, STREAM AND ROCK GEOCHEMICAL SURVEYS OF THREE NEWFOUNDLAND GRANITOIDS

by

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INTRODUCTION

During the summer of 1982, the Geochemistry Section began a study of the geochemistry of surficial material over portions of three granitoid bodies in south-central Newfoundland. The principal aims are to determine optimum geochemical prospecting methodologies for mineral exploration in granites and to further assess the mineral potential of the three granites studied. In addition to surficial material, numerous samples of mineralization, wall rock and unmineralized granite were collected. The three granitoid terrains are located in (1) the Granite Lake area of central Newfoundland, (2) the southern part of the Ackley Granite near Grand Le Pierre, southwestern Newfoundland, and (3) the François area centred 12 km northeast of François on the south coast (see Figure).

The areas were selected on the basis of favorable lake sediment geochemistry and geology. The first two areas have granite-hosted mineralization (W-Mo at Granite Lake and Sn-Mo in the Ackley Granite). The François area has no known mineral occurrences, but it has received very little prospecting attention and no detailed geological information is available.

GRANITE LAKE AREA

This study area is located in the northwestern part of N.T.S. map 12A/2 and occupies about 165 km^2. Access is by gravel road from Millertown, 75 km (3 hours) from the central part of the area.

Relief is moderate and drainage is fair to poor, with considerable bog in low areas. Vegetation density ranges from thickly wooded to sparse.

Previous Work

Recent exploration interest in the area stems directly from an open file release of data from a regional lake sediment survey (Butler and Davenport, 1978). The sediments were enriched in several elements, including Mo, Ag and U and, to a lesser extent, Cu, Pb and Zn. The centre of the anomaly was staked immediately by several exploration companies, including Falconbridge Nickel Mines Limited, Noranda Exploration Company Limited, Northgate Exploration Limited, Riocanex Limited, and Teck Explorations Limited. During the following period of active exploration, the discovery of widespread wolframite led to a shift in focus from Mo to W as the principal metal of interest. Exploration methods have relied largely on soil sampling to delineate targets for trenching. The most recent geological mapping in the area is that of Dickson (1981) at 1:50,000 scale.

Bedrock and Glacial Geology

Dickson (1981) recognized four granitoid units in the area. The northeastern region is underlain by a weakly foliated, uniform, medium grained biotite granodiorite and tonalite. A small region in the southeast is underlain by a biotite ± muscovite granite. Most of the remainder is underlain by a pink to red, medium to coarse grained, massive to weakly deformed biotite-muscovite granite, which is locally altered and sheared and cut by quartz veins. In the southern part of the area, this unit is distinguished by an absence of quartz veining, a more buff coloration, and the presence of garnetiferous pegmatites. Molybdenite occurs as disseminations, along fractures, and in quartz veins in the biotite-muscovite granite and in the

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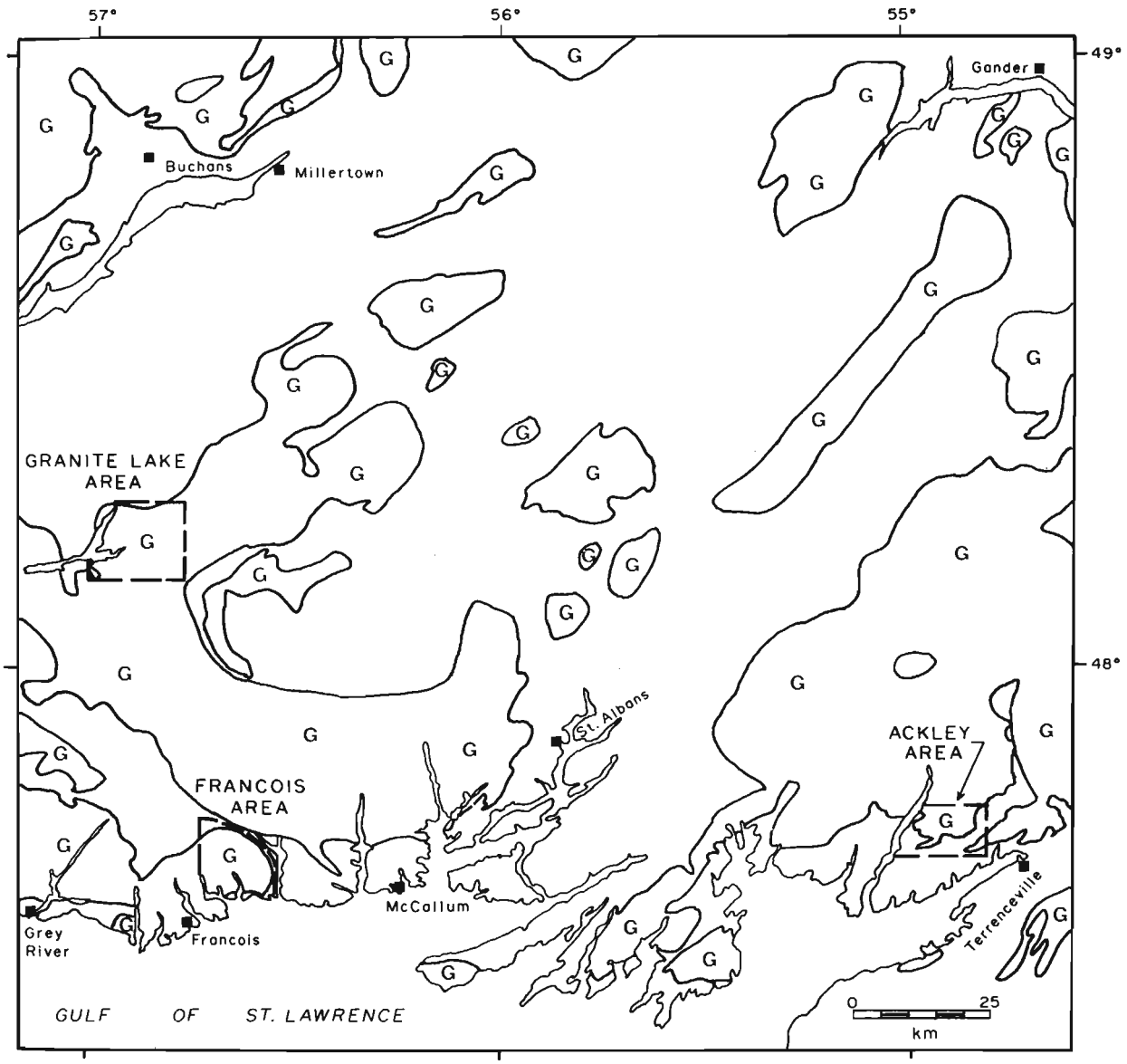

Location of study areas.

granodiorite. Most of the wolframite is associated with quartz veins cutting the granodiorite. Ages of the granitoids are uncertain but have been postulated by Dickson to be Silurian or Devonian.

No detailed mapping of the glacial deposits has been done. The area is extensively till-covered with little outcrop. Angular cobbles and boulders of local bedrock are common, whereas rounded cobbles and boulders of metasedimentary and metavolcanic rocks similar to those found several kilometres to the north are widespread but form a minor constituent of the till. Consequently, most of the till is believed to have been locally derived. Podzolic soil profiles are generally well developed. Typically, a leached gray or buff A_2 horizon and a reddish orange B horizon overlie a sandy yellow till classified as C horizon. Transport direction of the till is considered to have been generally southerly.

Sampling Approaches

The field program included sampling a variety of surficial, organic and bedrock materials at two scales with the aim of determining how dispersion patterns from W and Mo occurrences could be best identified. Site parameters which might affect or correlate with the chemistry of a sample were recorded on field data forms.

Stream sediments were collected as uniformly as possible over the area. Using a nominal sample spacing of 250 m, 150 samples of sediments were obtained. Active silt was collected where obtainable; otherwise, organic sediment was collected.

Reconnaissance till and soil samples were collected from three east-west lines totalling 30 km. B horizon soils were collected every 500 m. At every second site, separate samples were collected of A_0, A_2, B and C horizons. Bulk samples (3 L) for heavy mineral analysis were also obtained at these alternate sites. Where obtainable, C horizon material was taken; otherwise B horizon material was taken. In total, 60 reconnaissance sites were sampled.

Detailed soil and till sampling was done on small grids over two previously known wolframite occurrences. Multiple samples from each of 50 sites were obtained as described above, as well as several bedrock samples where subcrop had been exposed by trenching. Data from these small surveys should shed light on the nature and extent of dispersion in tills overlying mineralized bedrock.

Analyses

The <180 μm fraction of stream sediment, soil and till samples is being analyzed for W, Cu, Pb, Zn, Ni, Co, Ag, Mn, Fe, Mo, F and L.O.I. Heavy mineral separations of the bulk samples will be made and analyses performed on various size fractions.

Rock samples are being crushed, pulverized, and analyzed for major and minor elements as well as a suite of trace elements including Cu, Pb, Zn, Co, Ni, Ag, F, Mo, Be, Bi, As, Sn, W, Rb, Sr, Ba and Li. A representative portion is being retained in each case for other work if required.

ACKLEY GRANITE AREA

This study area is located in the northwestern portion of NTS map 1M/10 and occupies about 63 km^2. A well maintained gravel road between Grand Le Pierre and English Harbour East comes within 3 km of the southern contact of the granite. A footpath links the road to this area. Maximum relief is over 300 m but, generally, the area has a moderately rolling topography. The almost complete absence of trees and the smooth terrain over the granite make for rapid and pleasant traversing. The volcanic terrain, on the other hand, is characterized by thick vegetation in

many areas and by broken, blocky topography, making walking slow and arduous.

Previous Work

Occurrences of molybdenite were known from this part of the Ackley as early as the 1940's. In reports of detailed prospecting in 1953-54 by the American Zinc Company (Ricketts and Bumgarner, 1954) of showings in the Anesty Hill area, the molybdenite occurrences were interpreted to be disseminations in metasedimentary quartzites which form roof pendants in the batholiths. More recent investigators view the quartz-rich rocks as late stage derivatives of igneous activity (Dickson, 1982). Recent exploration activity was sparked by the release of reconnaissance lake sediment data (Butler and Davenport, 1979), which led Esso Minerals to acquire much of the anomalous area. These data showed pronounced enrichment in U, Mo, F, Pb and Zn. Subsequent rock analyses yielded Sn values as high as 221 g/t (Dickson, 1982).

Bedrock and Glacial Geology

Most of the area is underlain by the Ackley Granite. A fine grained border phase of the granite in contact with the sedimentary and volcanic rocks to the south was recognized by Dickson (1982). Up to 4 km wide, this phase differs from the predominant phase of medium to coarse grained biotite granite found to the north. Dickson considered the presence of miarolitic cavities and granophyric textures to be evidence of high level emplacement.

The area is covered by a thin mantle of glacial drift. The till is generally composed of poorly sorted sand and pebbles, with a few areas underlain by well sorted, presumably waterlaid sands. Soil profiles are generally poorly developed and B horizons are often not clearly distinguishable. Glacial striae trending due north-south were observed on one outcrop of polished quartzolite. Vanderveer (1982) reports that glacial transport was generally toward the south but the distance of transport is unknown.

Sampling Approaches

Emphasis in this area was placed on obtaining bulk (5 L) till samples for both regular and heavy mineral analysis. Accordingly, samples were collected at 400 m intervals along three lines each 13 km long. These east-west lines were spaced 1 km apart and extended into volcanic/sedimentary terrain at each end. Similar samples were collected at closer intervals (250 m) along 22 km of granite/volcanic rock contact. Since most of the quartzolites observed were very close to the contact but within the granite, till samples from this line were collected over the granite but usually within 50 m of the contact. In addition, bulk till samples were collected at 1 km intervals along a 13 km line in the volcanic rocks; the samples were located about 500 m, on average, south of the granite/volcanic rock contact. Detailed bulk till/soil sampling was done over two small grids located over quartzolites known to carry Sn mineralization.

In total, 252 bulk samples and 245 normal size samples were collected. As well, 24 bedrock samples of quartzolite, granite and volcanic rocks were obtained.

Analyses

Analyses of soils, tills and rocks will be made in a similar manner to that described previously for the Granite Lake area. In addition, Sn will be analyzed.

FRANCOIS AREA

This study area occupies about 110 km^2 in the eastern half of N.T.S. map 11P/10. A seven-man camp was established in the central part and almost all regions could then be reached by foot

traverses. Access to the area was by CN coastal boat from Terrenceville to McCallum and, thence, by longliner for an additional 37 km along the coast. A helicopter was used to move material and personnel the final 5 km to camp.

Although the maximum relief is about 430 m, most of the area forms a plateau at an elevation of about 300 m which falls abruptly to sea level at the southern boundary and along the numerous fiords which dissect the area.

Outcrop is abundant (approximately 30%) and the remaining surface is covered by a thin veneer of till and vegetation.

Previous Work

There is little information published regarding detailed geological mapping or mineral exploration. Williams' (1971) 1:250,000 scale geological map shows the area to be underlain by Devonian granite lithologically similar to the large arcuate North Bay batholith to the north. Regional lake sediment data (Butler and Davenport, 1978), however, show the follow-up area to have a distinctly different geochemical response from most of the northern granitic terrain. Very high values of Pb and high U, Mo and F values are prevalent, suggesting that this granitoid is highly differentiated and enriched in elements characteristic of mineralized granites. Possible types of mineralization might include Sn, W, Mo, U and Be.

Bedrock and Glacial Geology

The bedrock of the area has been mapped only at a reconnaissance scale and the glacial deposits not at all. Although we made no attempt to map the area, a few observations might be pertinent.

Generally, the rock is a pink quartz-feldspar-biotite granite. Grain size varies from medium to very coarse. Large K-feldspar phenocrysts are common. The rock is massive except near a major northwesterly striking mylonite zone. Quartz-veining and hematite-staining are common there but scarce elsewhere. Aplite dikes are quite abundant throughout; they locally contain quartz veins and, in one instance, minor molybdenite. The only other evidence of mineralization noted was coarse grained, white to pale blue and green beryl crystals found in a talus slope. The source was not located but presumably lay upslope. Limited spectrometer surveying indicated that the granite is approximately twice as radioactive as an average granite.

Toward the sea, bedrock exposure approaches 60-70 percent. Inland, the till veneer progressively thickens and becomes more extensive.

Sampling Approaches

The scarcity of soil restricted its use as a sampling medium. Streams are numerous, however, and active sediment surprisingly abundant despite the relief and barren nature of the landscape. The granite, both here and at Granite Lake, seems to weather rapidly, as evidenced by skirts of quartz and feldspar crystals on the ground surrounding isolated boulders. One problem encountered was that of obtaining sufficient fine material for an adequate <180 μm fraction. In a few instances, two bags of sediment were collected to ensure an adequate sample. In the laboratory, it was found that a mechanical sieve shaker would usually yield sufficient material whereas hand sieving frequently would not.

Altogether 156 stream sediment samples were collected at a sampling interval of 300 m. Forty-three rock samples were also collected.

Analyses

Analyses of stream sediments and rocks are being done as described above for Granite Lake. Tin in sediments is also being analyzed. No heavy mineral separations are planned.

DATA RELEASE

It is expected that a preliminary open file release of data for the three areas will be made during the winter of 1983.

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