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PRELIMINARY RESULTS OF BIOGEOCHEMICAL STUDIES IN THE LYNN LAKE AREA

by

M.A.F. FEDIKOW

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INTRODUCTION

The application of vegetation geochemistry or biogeochemistry to problems of mineral exploration in the Lynn Lake area was undertaken in an attempt to provide the mineral exploration industry with a geochemical tool applicable to the search for buried or blind gold mineralization in areas of little or no outcrop. This biogeochemical study forms part of a larger geological-geochemical investigation concerned with gold mineralization in the Lynn Lake area, and in particular the Agassiz Au-Ag deposit.

Geological studies in the Lynn Lake area have defined a sequence of characteristic rock units with a probable strike length of greater than 35 km that host the Agassiz mineralization as well as the Dot Lake gold occurrences to the west and other smaller gold occurrences to the east. Unfortunately, conventional exploration of this metallotect has been restricted by the lack of outcrop. Geophysical investigations have successfully indicated a more or less continuous linear zone of coincident magnetic and electromagnetic anomalies that impart a characteristic gradiometric signature to the Agassiz Metallotect. To date, scattered diamond drilling of primarily geophysical targets along the metallotect has failed to intersect significant gold mineralization in terms of grade and tonnage.

The biogeochemical studies were undertaken, therefore, to identify local areas of anomalous geochemistry along the metallotect by examining the definition of the response of particular species of vegetation to the trace and minor element content of the overburden developed over known gold mineralization. Characteristically, the study area is marked by the ubiquitous presence of black spruce (Picea mariana) and

Labrador tea (Ledum groenlandicum) and initially, sampling of these species was conducted over the Agassiz deposit. On the basis of the results obtained in the Agassiz study the sampling was expanded to include the Dot Lake area to the west and the Arbour Lake area to the east of the Agassiz deposit. A suite of black spruce samples was collected over the Frances Lake Zn-Cu-Au massive sulphide deposit as an orientation study to examine the biogeochemical signature of base metal massive sulphide deposits.

In addition to biogeochemical studies an ongoing program of basal till geochemistry in the area is being undertaken and the preliminary results have been described by Nielsen (1982, 1983); a brief summary of these studies is given in this report. A program of permafrost peat bog coring was initiated in the vicinity of the Agassiz deposit to assess the viability of the sampling and analysis of peat bog and the underlying sediments during geochemical exploration programs for gold mineralization in the Lynn Lake area. Preliminary results for each of these programs are discussed herein. Analytical results, analytical reproducibility, statistical summaries of analytical data, correlation coefficients and selected histograms are presented in Appendices 1 through 5, respectively. In addition, profiles for all chemical elements across mineralized zones are available for viewing upon request.

PREVIOUS WORK

The determination of the trace element constituents in vegetation and peat bog samples has a long history of application to geochemical exploration problems. Since Lungwitz (1900) reported the gold content in the ash of hardwood trees a number of studies have been undertaken to examine trace metal concentration in a variety of plant species. Warren and Delavault (1949; 1955) and Warren et al. (1955) discussed the application of biogeochemical exploration methods in northern latitudes and the problems encountered in sampling and analysis of samples. Marmo (1953) reviewed the application of biogeochemical investigations in Finland. A literature review concerning the occurrence of gold in vegetation has been presented by Jones (1970) and the mechanisms of the acquisition and siting of gold by plants is discussed by Girling and Peterson (1978; 1980). The analysis of biogeochemical samples by neutron activation analysis is presented by Schiller et al. (1973). Practical applications of the method in exploration for a wide range of mineral commodities have been described in the literature. Cannon (1960) and Dunn (1983) describe the application of biogeochemistry to the search for uranium in the Colorado Plateau and in the Athabasca Sandstone in Saskatchewan, respectively. The effectiveness of biogeochemical surveys in the search for silver is discussed by Hornbrook (1971) in the Cobalt, Ontario area and by Warren et al. (1984) in British Columbia. Deposits of stratiform Cu-Pb-Zn in South Africa, Australia and Great Britain, Fe deposits in South America and phosphate deposits in Australia and their botanical expressions are reviewed by Cole (1980). Biogeochemical exploration for gold in Canada has most recently been discussed by Hoffman and Brooker (1983). The biogeochemical expression of metal-bearing till near Hopetown, Ontario has been described by Dilabio et al. (1982).

A significant body of literature also exists for the utilization of peat bogs in geochemical exploration. Szalay (1964) describes cation exchange properties of humic acids in peat and Jackson et al. (1978) review numerous aspects of the hydrogeochemistry of naturally occurring organic acids and their relation to interactions between metal, sediment and waters. Salmi (1955, 1956, 1959) describes the use of peat geochemical surveys around titanium, antimony, molybdenum, nickel, copper and zinc deposits as well as the physico-chemical characteristics of peat. Borovitskii (1970) discusses the successful application of peat moss sampling in the vicinity of polymetallic and molybdenum deposits in western Transbaikal and the gold ore deposits of Yakutia, U.S.S.R. Meineke et al. (1977) present data from a case history study of a peat geochemical survey associated with copper-nickel mineralization in Minnesota. Smee (1983) provides a thorough laboratory and field study on the utilization of organic soil layers in geochemical exploration in the presence of lacustrine clay deposits.

In short, there exists numerous examples of vegetation and peat bog geochemical surveys successfully undertaken in a variety of climatic and geological environments, worldwide. To date, the most complete texts describing sampling, analysis, case history descriptions and the design of geochemical exploration programs utilizing vegetation and peat bog samples are provided by Brooks (1972; 1983).

REGIONAL GEOLOGY

The regional geology of the Lynn Lake area has been presented by Gilbert et al. (1980). This report describes the geology and geochemistry of the rock units that characterize the Northern and Southern Belts of the Lynn Lake Greenstone Belt. The following brief summary of the regional geological setting of the study area is taken from their report. For more detailed information the reader is referred to Gilbert et al. (1980). A generalized geological map is presented in Figure 1.

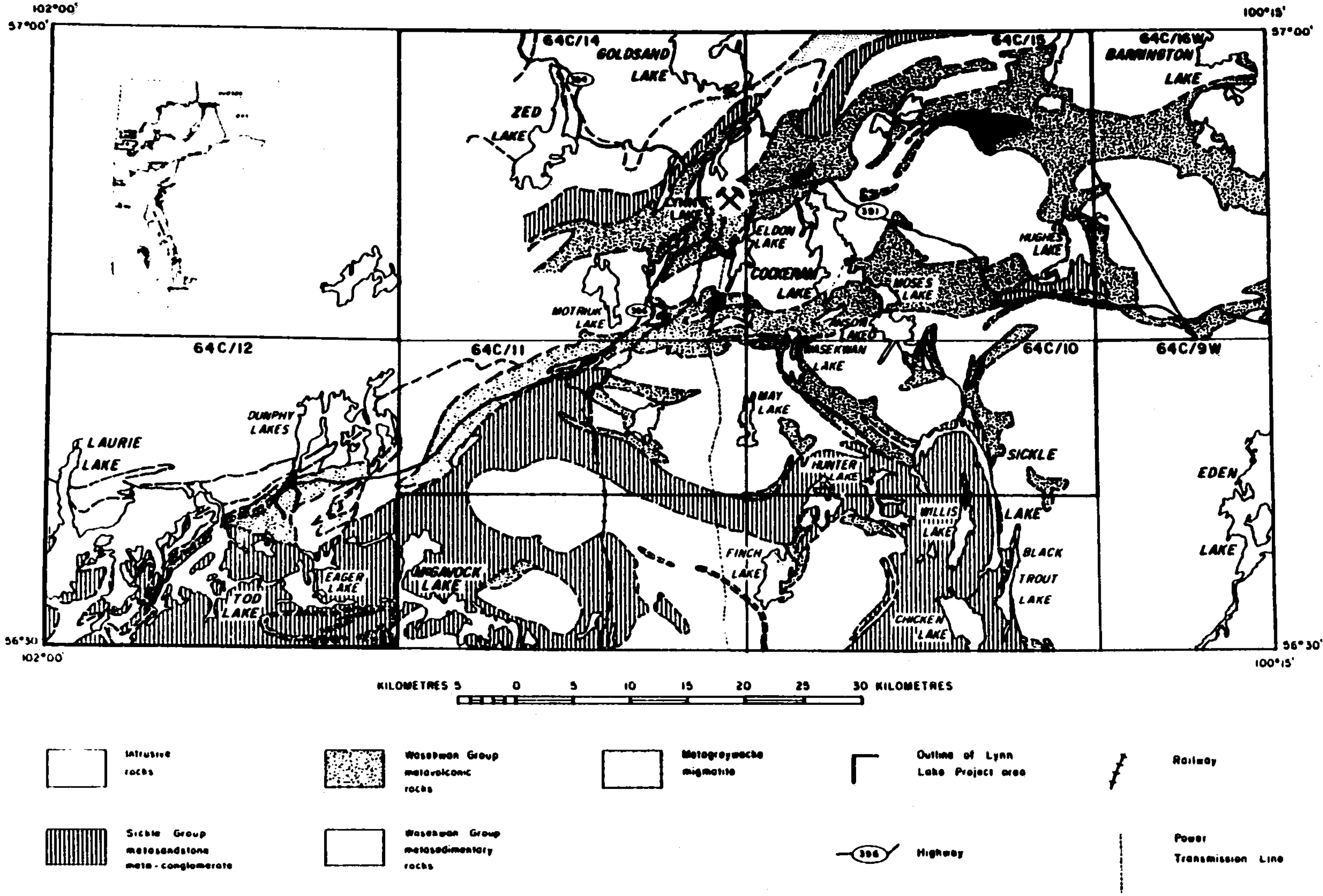


Figure 1. Simplified regional geology of the Lynn Lake area (after Gilbert et al., 1980). The location of the Agassiz deposit is marked by the crossed hammer symbol.

The Lynn Lake Greenstone Belt is an east-trending sequence of rocks 160 km long and 60 km wide that is characterized by metamorphosed volcanic, sedimentary and plutonic rocks with an Aphebian age of deposition, intrusion and metamorphism (Clark, 1980). The sedimentary and volcanic rocks have been assigned to the Wasekwan Group (Bateman, 1945) and are unconformably overlain by Sickle Group sandstone and conglomerate (Norman, 1933). Following deposition of the Sickle Group rocks the margins of the greenstone belt were extensively deformed and intruded. Regional metamorphism attained upper greenschist to upper amphibolite conditions.

The Lynn Lake Greenstone Belt is divided into an older Southern Belt and a younger Northern Belt. The Southern Belt is characterized by greater than 2000 m of tholeiitic, aphyric and porphyritic basalt overlain by discontinous units of sedimentary rocks in the western portion of the belt and a variety of mafic, intermediate and felsic rocks elsewhere. The Northern Belt is characterized by mafic volcanic rocks interlayered with felsic and intermediate rock units. The Northern Belt rocks are chemically distinct from those of the Southern Belt and comprise tholeiitic basalt and andesite interlayered with high alumina basalt and andesite ($Al_2O_3 \geq 18\%$). The Northern Belt has been divided into 6 main divisions. These divisions are, from stratigraphic bottom to stratigraphic top:

Division E (450m) basaltic tuff, flow, breccia

Division D (900-3300m) basaltic flow, breccia, tuff with subordinate intermediate and felsic flow, breccia, tuff.

Division C (350m) greywacke, siltstone, conglomerate with subordinate volcanic flow, breccia and tuff.

Division B (450-2000m) basalt, andesite, breccia, tuff with subordinate felsic flow, breccia.

Division A (2500m) rhyolite with subordinate mafic to intermediate volcanic rocks.

The biogeochemical study area is centered on the Agassiz Au-Ag deposit which is hosted by rocks of Division D. These rocks are described in more detail in the following section.

GEOLOGICAL SETTING OF THE AGASSIZ AU-AG DEPOSIT

The Agassiz deposit is hosted by a sequence of steeply dipping clastic and chemical sedimentary rocks interlayered with high Mg and Cr mafic rocks that have been interpreted as basalt and basaltic tuff (Gilbert et al., 1980). More recent geochemical studies suggest that these high Mg-Cr rocks may be, in part, chemical sedimentary rocks. A detailed report on the geochemistry of the host rocks is in preparation. The local geology is illustrated in Figure 2.

The clastic sedimentary units and the high Mg-Cr rocks vary in thickness and may range from 8 cm to 10 m. Laterally restricted oxide facies (magnetite-chert) iron formation occurs within the sedimentary units. Gold mineralization in the Agassiz deposit occurs as discrete particles throughout the host rocks and at the interface between sulphide and silicate minerals. Ag occurs in the native form as well as with freibergite. Discontinuous quartz-carbonate-sulphide (pyrrhotite, pyrite, galena, arsenopyrite, sphalerite) laminae are present in both the clastic sedimentary rocks and the high Mg-Cr mafic rocks. These laminae are interpreted as veinlets that have been boudined and rotated into the N65°E foliation that overprints the rocks.

Higher gold grades are associated with these laminae, the highest gold assays are obtained where these laminae are associated with the clastic sedimentary rocks. Intense but localized zones of carbonatization occur in the clastic sedimentary rocks. Solid sulphide layers (10 cm thick) of laterally continuous sphalerite occur within the high Mg-Cr mafic rocks; barren iron sulphide layers are common in the clastic sedimentary rock units. The barren iron sulphide layers and the solid sulphide sphalerite together with the oxide facies iron formation provide a reasonable explanation for the gradiometric signature that characterizes the Agassiz metallotect.

The stratigraphic sequence at the Agassiz deposit is:

Hanging wall	Aluminous, amygdaloidal and fragmental basalt; mafic debris flows
Mineralized Zone	Interlayered clastic, chemical sedimentary rocks and high Mg-Cr mafic rock units
Footwall	High Mg-Cr mafic rocks (basalt) with lesser clastic sedimentary rocks

The interlayered clastic and chemical sedimentary rocks and high Mg-Cr mafic rocks characterize the "Agassiz Metallotect" and this rock sequence represents the most prospective site for gold deposition either as syngenetic protore or mobilized, epigenetic mineralization. All biogeochemical surveys related to gold mineralization were conducted over mineralized zones within the Agassiz Metallotect.

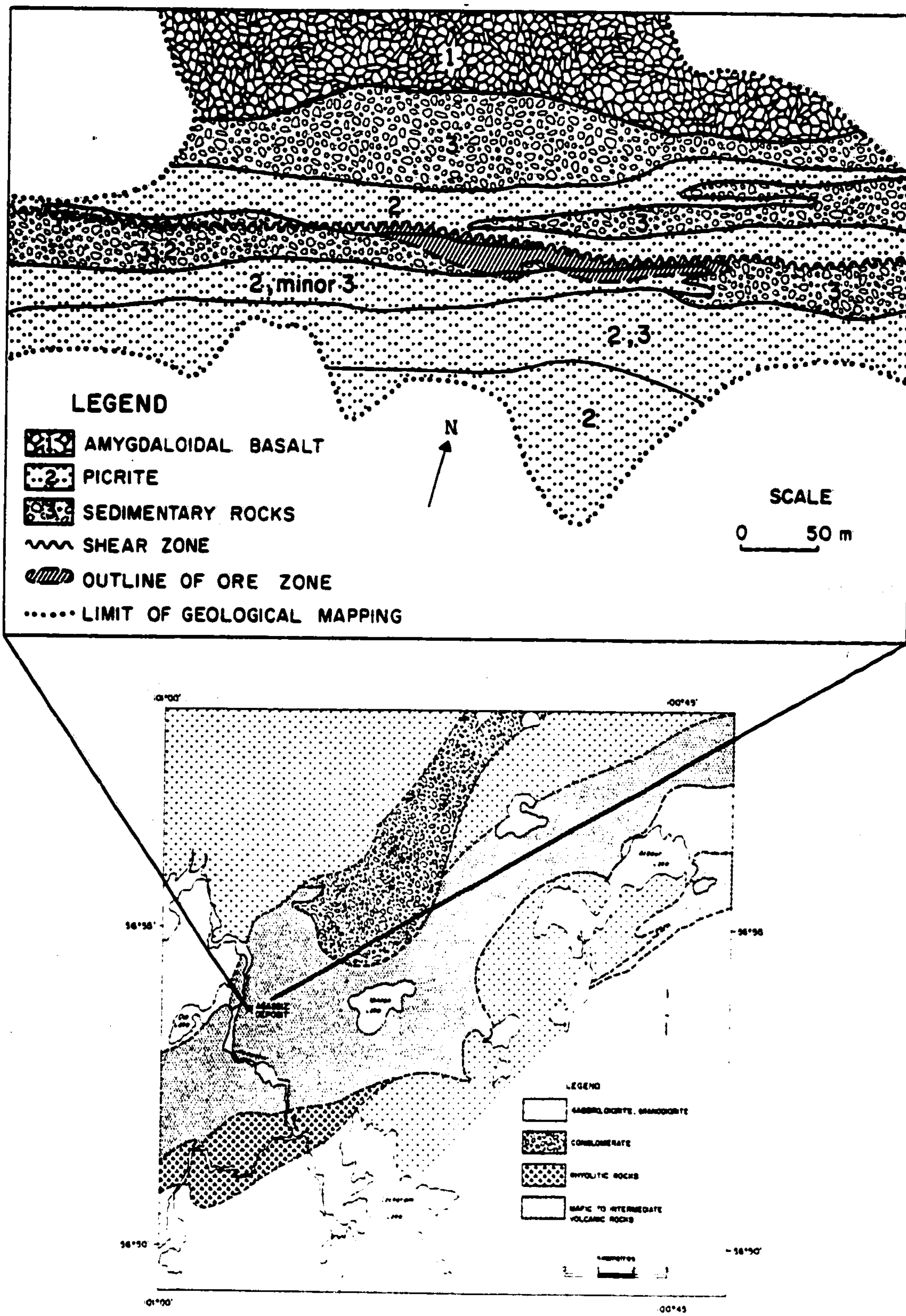


Figure 2. Detailed geological setting of the Agassiz deposit

BIOGEOCHEMICAL SURVEYS

Introduction

Biogeochemical sampling was initiated in the Lynn Lake area in 1983 (Fedikow, 1983) with the collection of vegetation samples from the vicinity of the Agassiz deposit and from mineralization in the Dot Lake, Arbour Lake and Frances Lake areas. The biogeochemical survey at the Agassiz deposit served as an orientation study to determine which plant species or plant organs, if any, were characterized by anomalous trace element content with proximity to the deposit. Analytical methods and sampling techniques for biogeochemical samples were also investigated during this orientation survey. At the Agassiz deposit samples of Black Spruce (*Picea mariana*) and Labrador Tea (*Ledum groenlandicum*) were collected.

Sampling Methodology and Preparation

Samples of black spruce and Labrador tea were collected from sampling lines orientated perpendicular to the strike of the rock units hosting the Agassiz mineralization. The lines or transects were sited where a high sample recovery could be expected and are therefore somewhat unevenly spaced. Sampling lines were sited over the East, West and Main or Central Zones of the Agassiz deposit; however, lines over most of the Central Zone are incomplete owing to an area of bulldozed alluvium and hydraulically washed outcrop, representing the subcropping Agassiz deposit. Along the sampling lines biogeochemical samples were collected at 10 ft. (3 m) intervals. The black spruce samples are composed of 5 branches; a single branch was collected from 5 individual trees up to 15 ft. (5 m) on either side of the sampling line. The branches were collected at chest height and did not exceed 6 mm in diameter. After discarding first year growth from the sample the branches were stored together in pre-labelled, ventilated plastic sample bags and allowed to dry. Following an approximate 3-4 week drying period, during which time the needles dropped from the branches, the needles and twigs were separated and stored in labelled, cloth sample bags. Labrador tea was sampled in the same manner as the black spruce. Leaves were separated from stems and stored separately in labelled cloth sample bags.

At the Agassiz deposit a total of 368 Black Spruce samples was collected from 12 lines and 67 Labrador Tea samples were collected from 2 sampling lines over the deposit. Figure 3 illustrates the location of the sampling sites with respect to the Agassiz mineralization. Samples used in the orientation survey were collected from line 6551.

Analysis of Biogeochemical Samples

Biogeochemical samples were analyzed using atomic absorption spectrophotometry (AAS) and instrumental neutron activation analysis (INAA). The AAS analyses were undertaken by Bondar-Clegg & Co. Ltd. (Ottawa) and the INAA by Nuclear Activation Services Ltd. (Hamilton). Sample preparation for these analytical methods are described below.

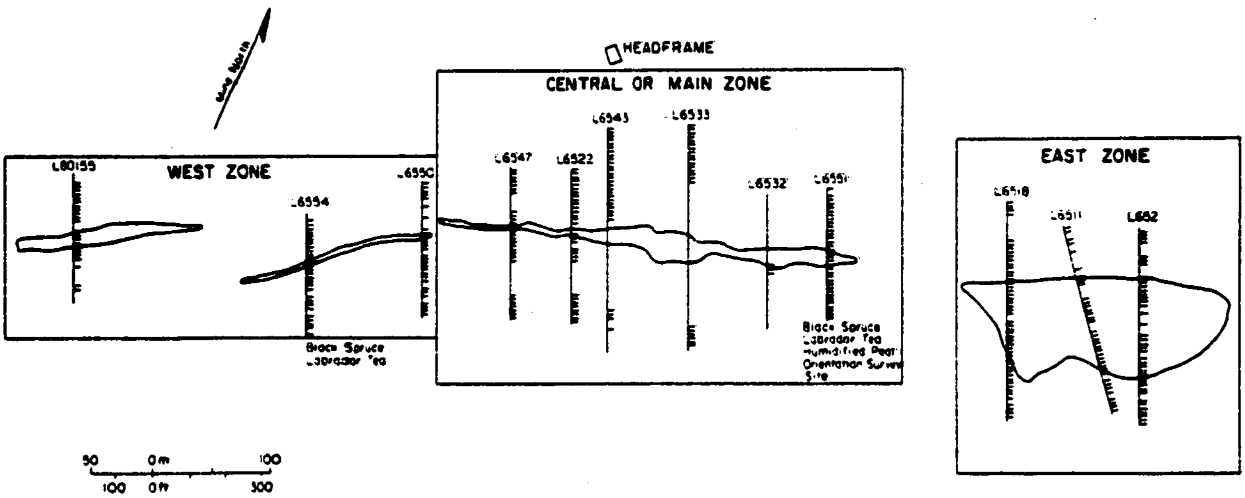
Atomic Absorption Spectrophotometry (AAS)

The technique of atomic absorption spectrophotometry is well established as an inexpensive, rapid analytical tool for the determination of trace metals in geologic materials and therefore the theory of AAS will not be repeated here. Biogeochemical samples analyzed for trace metals by AAS were first prepared by milling in a Wiley mill. The pulps were homogenized and a representative split of -20 mesh was prepared according to the specifications for the analysis of the elements of interest. For the analysis of Cu, Pb, Zn and Mn a fixed weight of pulp was ashed at 450°C and the ash digested using a hot HNO_3 - HCl treatment. Au was determined by carbon rod AAS after preconcentration by fire assay and dissolution with agua regia. The per cent ash yield was determined gravimetrically. Analyses by AAS, therefore, are based upon (i) ppm of Cu, Pb, Zn and Mn in ash, and (ii) ppb of Au in raw sample. The reproducability of AAS analyses generally falls within ±20%.

Instrumental Neutron Activation Analysis

The application of neutron activation analysis to geological and organic materials has provided the geologist with an analytical technique capable of determining a wide range of chemical elements at low levels of concentration and in an accurate and reproducable manner. This technique allows high sample throughput and the problems of sample loss and contamination are avoided.

The analysis of biogeochemical samples from the area of the Agassiz deposit was, in part, accomplished using direct irradiation instrumental neutron activation analysis for Au, As, Sb, and Zn. The method is described below.



Biogeochemical and humus sample location map; Agassiz Au-Ag deposit. Black Spruce (Picea mariana), Labrador tea (Ledum groenlandicum) collected from lines L6554 and L6551; humified peat also collected from L6551; black spruce samples only collected from remainder of sample lines. The horizontal bar represents a single sample location on the sampling line.

Figure 3. Biogeochemical sampling sites. Agassiz deposit.

Theory

Using instrumental neutron activation analysis (INAA) for biogeochemical samples, such as needles and twigs from black spruce, requires that the sample is dry and free of inorganic material. The sample is macerated, homogenized and 8 grams of material are pressed into a briquette. This briquette is irradiated in a neutron flux by inserting the samples into a nuclear reactor core (such as the SLOWPOKE nuclear generator). The majority of elements in the sample become radioactive and emit gamma radiation marked by characteristic wavelengths. After a fixed time of exposure to the neutron flux the sample is removed and stored in proximity to a gamma-ray detector. This detector is usually a germanium crystal maintained at the temperature of liquid nitrogen. The interaction of gamma-rays being emitted by the sample with the germanium detector results in the production of discrete voltage pulses that are proportional in height to the incident gamma-ray energies. The detector is equipped with a multichannel analyzer that separates the voltage pulses according to size and then digitally constructs a spectrum of gamma-ray energies versus intensities. A comparison of internal standards and spectral peak positions and areas allows the qualitative and quantitative identification of the elements in the sample.

Results

Trace Element Content of Plant Organs

The needles and twigs from 19 samples of black spruce and the leaves and twigs from 29 samples of Labrador tea collected from line 6551 over the Agassiz deposit were analysed for Au, As, Sb and Zn by I.N.A.A. Sb was generally at or below the limits of detection for the majority of samples and subsequently is not discussed further. The results of these analyses are presented in terms of trace element concentration in needles versus twigs for black spruce and for leaves versus twigs for Labrador tea. Figures 4, and 5 illustrate the selective enrichment of the various plant organs in each of the elements of interest. In the black spruce samples Au and Zn are concentrated in the needles whereas the twigs overwhelmingly concentrate As. The results are similar for Labrador tea samples with Au and Zn concentrated in the leaves and As divided equally between leaves and twigs.

In terms of the metal content of the various plant organs the black spruce needles and the Labrador tea leaves preferentially accumulate Au and Zn whereas As may or not be concentrated in the twigs of both species.

Trace Element Variation with Proximity to the Agassiz Deposit

Introduction

The following section describes the results of the geochemical analysis of black spruce, Labrador tea and humified peat samples collected from line 6551 over the Central Zone of the Agassiz deposit. The topography over which these samples were collected is variable. The subcropping exposure of the Agassiz mineralization is located midway on a gently sloping hillside with peat bog to the south and higher ground to the north. The high ground is capped by a thin layer of littoral sand and sandy till that gradually thickens and is overlain by peat bog downslope. Approximately 2/3 of the hillside is overlain by 8 - 10 cm of humified peat and sphagnum moss that also thickens downslope. This topographic setting indicates the potential for hydromorphic

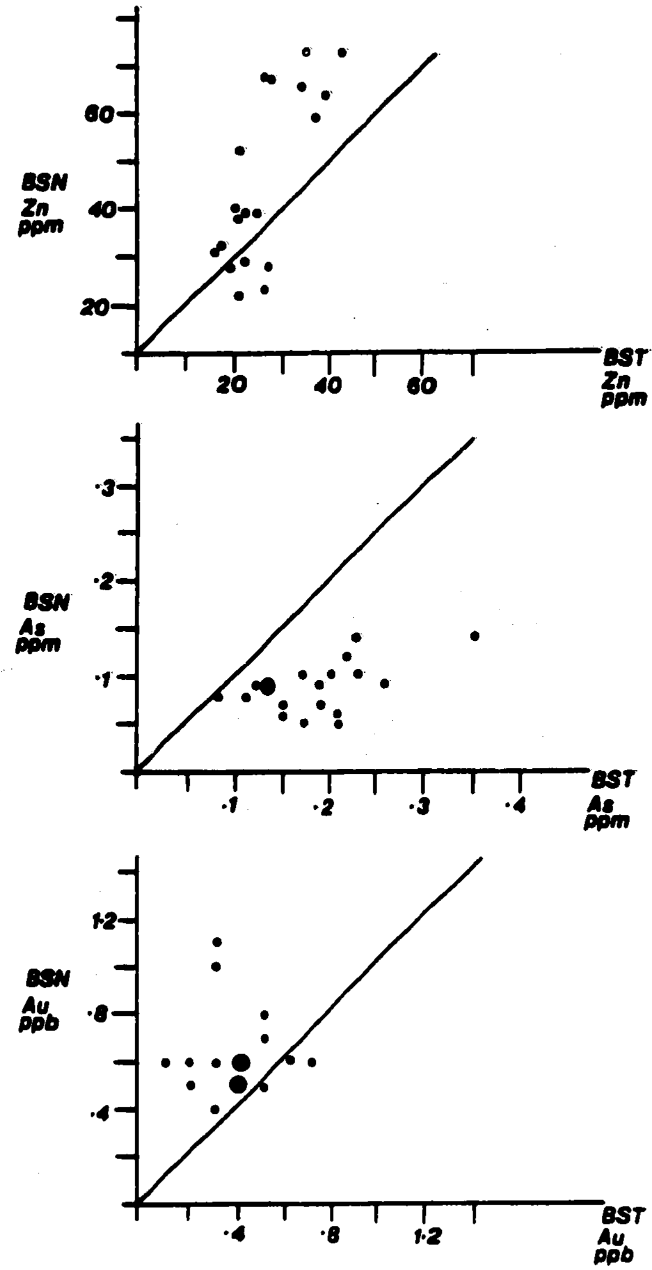


Figure 4. Comparison of Zn, As and Au contents in Black Spruce needles (BSN) and Black Spruce twigs (BST) (Picea mariana), Agassiz deposit. Large circle represents more than one sample.

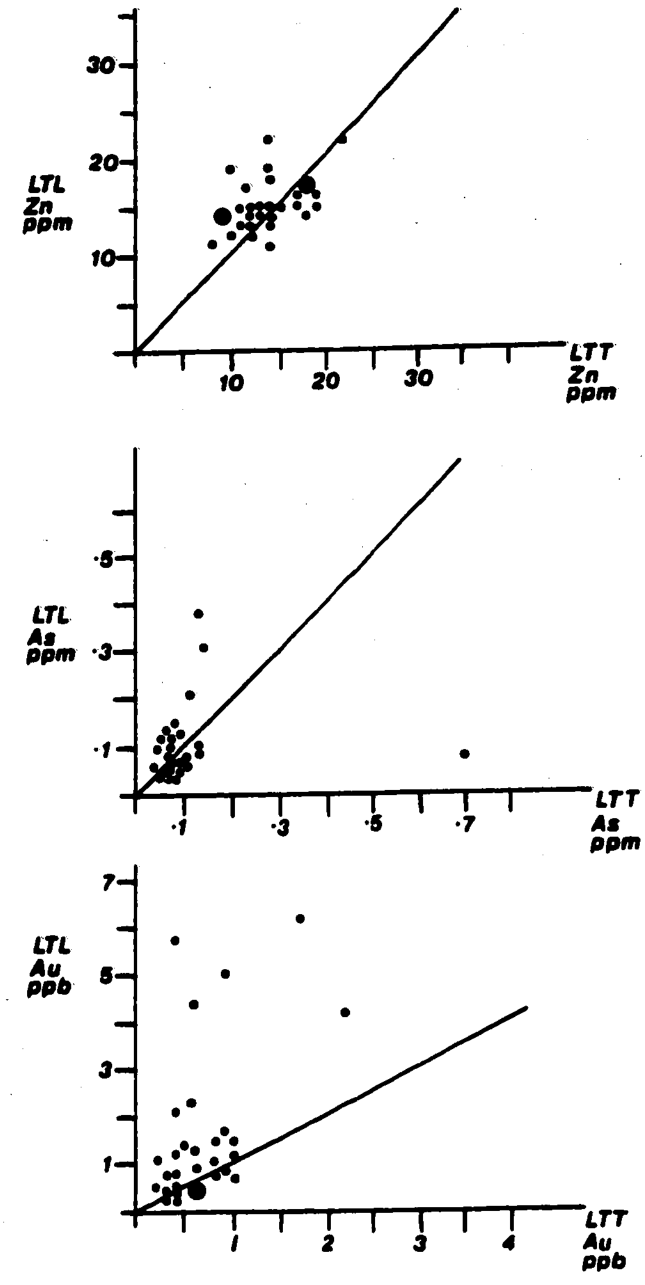


Figure 5. Comparison of Zn, As and Au contents in Labrador Tea Leaves (LTL) and Labrador Tea Twigs (LTT) (Ledum groenlandicum), Agassiz deposit.

dispersion of metals from the Agassiz deposit to a site lower down the hillside. Consideration must also be given to the presence of waste rock piles located on the higher ground to the north of the study area. Meteoric waters percolating through the waste rock and flowing downslope may be responsible for masking or altering the variation in concentration of trace metals in biogeochemical samples collected from the site of the orientation survey.

Black Spruce (Picea mariana)

A total of nineteen samples were collected from line 6551 over the Central Zone of the Agassiz deposit. The samples were divided into needles and twigs and each was analysed separately for Au, As, Sb and Zn by INAA.

Black spruce needles are characterized by abrupt increases in the Zn and As concentration with proximity to the Agassiz mineralization (Fig. 6). The increase in Zn ranges from 20 - 45 ppm representing apparent background to 45 - 75 ppm over the 120 ft. (37 m) anomalous portion of the trend. As gives a less well-defined anomaly; nevertheless, the increase in concentration is from 0.05 - 0.10 ppm to 0.10 - 0.14 ppm. The Zn anomaly progressively increases downslope and may be reflecting hydromorphic dispersion of Zn, enrichment in Zn at the lip of the peat bog and subsequent uptake by the Black Spruce.

Black spruce twigs are characterized by marked increases in the concentration of Au, As and Zn with proximity to mineralization (Fig. 7). The anomalies occur for approximately 100 ft. (30 m) along line 6551. Au increases from 0.1 - 0.4 ppb to 0.4 - 0.7 ppb; As increases from 0.12 - 0.23 to 0.23 - 0.35; and Zn increases from 30 - 37 ppm to 38 - 53 ppm. The twigs, as

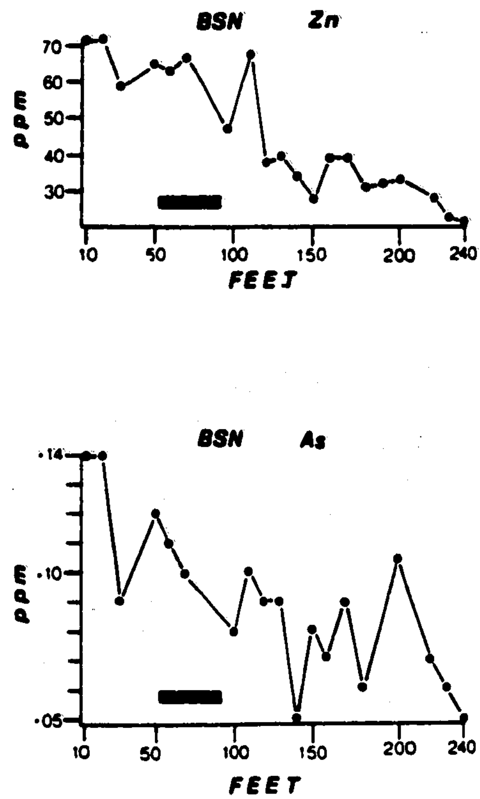


Figure 6. Variation in concentration of Zn and As in Black Spruce needles (BSN) with proximity to Agassiz deposit (solid bar). Solid circles represent analysis of BSN from five trees.

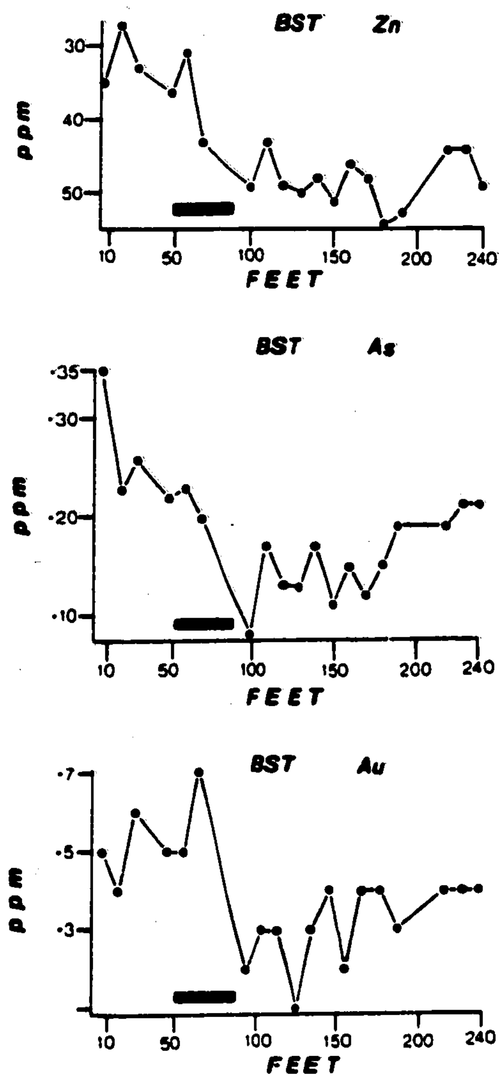


Figure 7. Variation in concentration of Zn, As and Au in Black Spruce twigs with proximity to the Agassiz deposit (solid bar). Solid circle represents an analysis of BST from five trees.

well as the needles, of the black spruce appear to be reflecting anomalous concentrations of Au, As and Zn. These anomalies occur, in part, over the subcropping Agassiz mineralization but also from black spruce growing in the edge of the peat bog to the south. The ability of peat bogs to fix trace metals, in this case from downslope migration of metal enriched meteoric waters, may provide a partial explanation for the observed biogeochemical anomalies in the black spruce samples.

Labrador tea (*Ledum groenlandicum*

A total of 30 samples of Labrador tea were collected from line 6551 over the Central Zone of the Agassiz deposit. Each sample was divided into leaves and twigs and analyzed for Au, As, Sb and Zn by INAA.

The trace element content of the Labrador tea leaves does not suggest proximity to mineralization. Progressive increases in As and Zn concentrations in the leaves occur downslope towards the peat bog with the highest As and Zn in leaves from Labrador tea growing in the thickest part of the peat bog. Accompanying this topographic change As increases from 0.10 ppm to 0.10 - 0.40 ppm and Zn increases from 14 ppm to 15 - 22 ppm.

The use of Labrador tea as a biogeochemical sampling medium to define anomalous concentrations of Au, As, Sb and Zn related to Agassiz-type mineralization cannot be recommended. As and Zn contents in the leaves and Zn contents in the twigs suggest the distribution and deposition of trace metals has been modified by hydromorphic dispersion phenomena to such an extent as to mask any anomaly related to the deposit.

Dot Lake Area

Introduction

An occurrence of a 10 - 20 m thick zone of gold-bearing iron sulphide and base metals characterized by high As content (3%) has been outlined by Sherritt Gordon Mines Ltd. in the vicinity of Dot Lake west of the Agassiz deposit. This occurrence is associated with oxide facies iron formation (interlayered chert, magnetite $\pm$ iron sulphide), clastic sedimentary rocks and high Mg-Cr basalt. The geological setting of this mineralization indicates it forms part of the "Agassiz Metallotect".

This occurrence was selected for biogeochemical investigations because samples could be collected from a well drained area of high outcrop density over Agassiz-type mineralization. In this way any identifiable patterns of metal enrichment and depletion in the samples could be related to the uptake of metals by vegetation from overburden developed over the mineralization without total masking of the trends by drainage phenomena. The thickness of overburden in the vicinity of this occurrence is generally less than 0.5 m. Topography slopes gently northwestward over the extent of the sampling traverse.

Method

Samples of black spruce needles and twigs were collected along a 450 ft. (137 m) line that cuts the mineralized zone at right angles. The sampling procedure and preparation is consistent with that used for the Agassiz study. Black Spruce needles were analysed for Cu, Pb, Zn and Mn by AAS and the twigs were analysed for Au and As by INAA.

Results

Figures 8 illustrates the variation in concentration of Zn and Mn in the black spruce needles and As in the black spruce twigs collected from the sampling traverse. The results indicate that patterns of enrichment and depletion in the needles and twigs are present with proximity to the mineralized zone. Each element is discussed in turn; Cu, Pb and Au are not illustrated.

Black Spruce Needles

Zinc

A broad halo of zinc in the needles is apparent in Figure 8. The halo is characterized by an increase in Zn concentration from approximately 750 ppm to 2000 ppm with a maximum of 2500 ppm corresponding to a sampling point directly over the mineralized zone. Increased scatter of the chemical data is observed with proximity to the mineralization. The halo probably extends farther than the limits of sampling.

Manganese

A marked increase in the Mn concentration occurs over a distance of 300 ft. (91 m) along the sampling traverse with proximity to the mineralized zone. The anomaly is marked by an increase in concentration from an apparent background concentration of 1.6% to a high of 6%. The westward shift of the anomaly is attributed to the downslope hydromorphic dispersion of Mn; accordingly the westward limits of the anomaly are unknown. Increased variability of the chemical data with proximity to mineralization is observed.

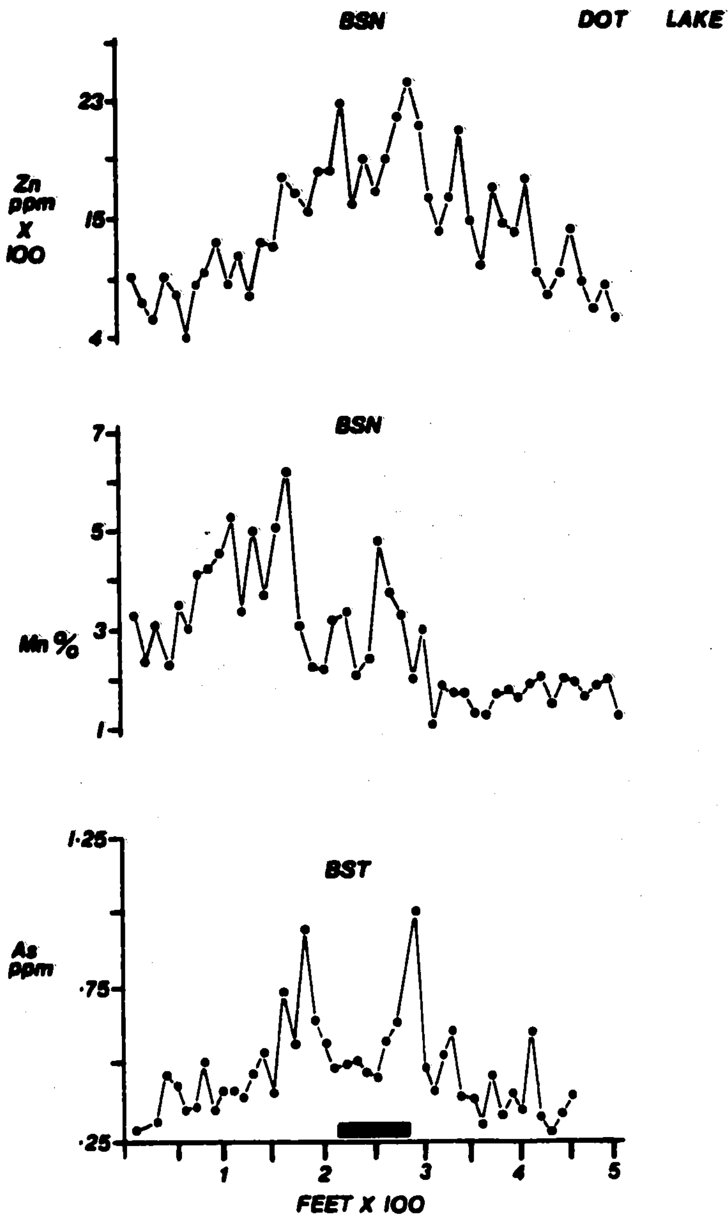


Figure 8. Variation in concentration of Zn and Mn in BSN and As in BST, with proximity to the Rushed Showing, Dot Lake area.

Copper

An irregular, spiked pattern for Cu is observed along the sampling traverse. Nevertheless, a broadly defined Cu anomaly is present with an increase from 40 - 45 ppm to 70 - 80 ppm in proximity to mineralization. Anomalous concentrations of Cu are observed along most of the traverse suggesting that the limits of the anomaly have not been identified.

Lead

Lead concentrations represent a spatially restricted anomaly with respect to the mineralization. The trend is characterized by a general range of 20 - 30 ppm over the most of the traverse with a single sample anomaly of 65 ppm corresponding to a sample collected directly over the mineralization. A secondary seven sample anomaly occurs immediately east of the single sample anomaly. Overall, anomalous samples represent a spatially restricted zone that is less extensive than the mineralization.

Black Spruce Twigs

Arsenic

A broadly defined As anomaly is apparent in Figure 8. The anomaly is characterized by a "rabbit's ear" configuration in proximity to mineralization with As concentrations ranging from 0.9 to 1.1 ppm. The flanks of the anomaly are marked by subtle increases of 0.3 to 0.7 ppm. The limits of the anomaly are undefined.

Gold

Generally, the pattern for the distribution of gold along the sampling traverse is erratic without indication of the presence of mineralization except for a three sample anomaly directly over the mineralized zone. This anomaly has the range of 2.8 - 3.3 ppb whereas the remainder of the samples have the range 0.4 - 1.7 ppb. A possible area of interest might be in the vicinity of the 400 ft. (122 m) station on the sampling traverse where a peak of 3.5 ppb is obtained in association with a variable (1 - 1.8 ppb) multi-sample data population.

Summary

This orientation survey illustrates the variability of Au, As, Cu, Pb, Zn and Mn in black spruce needles and twigs with proximity to the Dot Lake mineralization. The elements studied indicate that hydromorphic dispersion of anomalies may occur when samples are collected from undulating topography (cf. Fig. 8; Mn) and that the configuration of anomalies can be distorted, possibly by electrochemical processes (cf. Fig. 8; As). The biogeochemical halos are much larger than the mineralized zone; the 10 - 20 m thick mineralized zone at Dot Lake has both a Zn and an As halo of about 140 m. Biogeochemical samples analyzed for Zn, Mn, Cu and As would be most useful in defining the overall geochemical anomaly while Au and Pb could be used to more closely define the mineralization.

Arbour Lake Area

A series of three trenches exposing solid sulphide to near solid sulphide Po - Py mineralization occurs on the northwest shore of Arbour Lake (Fig. GS-15-3; Fedikow, 1983). The host rocks for this occurrence are rusty-weathering siliceous siltstone and "dacite" (Gilbert et al., 1980) overlain by fragment-bearing basalt and basaltic tuff (Fig. 9). The occurrence forms part of the Agassiz metallotect in the vicinity of Arbour Lake and as such a series of three short biogeochemical sampling traverses were sited in the area. A total of 31 black spruce (Picea mariana) samples were collected over the mineralization. The collection and preparation of the sample was consistent with the techniques used in the Agassiz study. The black spruce needle samples were ashed and analyzed for Cu, Pb, Zn and Mn by AAS; twigs were analyzed for Au and As by INAA.

Results

The results of this biogeochemical survey indicate weak to erratic responses in the trace element content of Black Spruce needles and twigs with proximity to the predominantly iron sulphide mineralization exposed in the trenches. The indistinct trace element responses may be attributed to the failure to extend sampling lines far enough from the zone of mineralization in order to attain "background" geochemical concentrations in the sample. Another possibility is the lack of available base and precious metal in the overburden, derived from the mineralized zone. If this is true then the biogeochemical samples are indicating the presence of barren iron sulphides rather than a layer enriched in base metals and gold. In an attempt to derive more useful information from the Arbour Lake data multiplicative, additive and

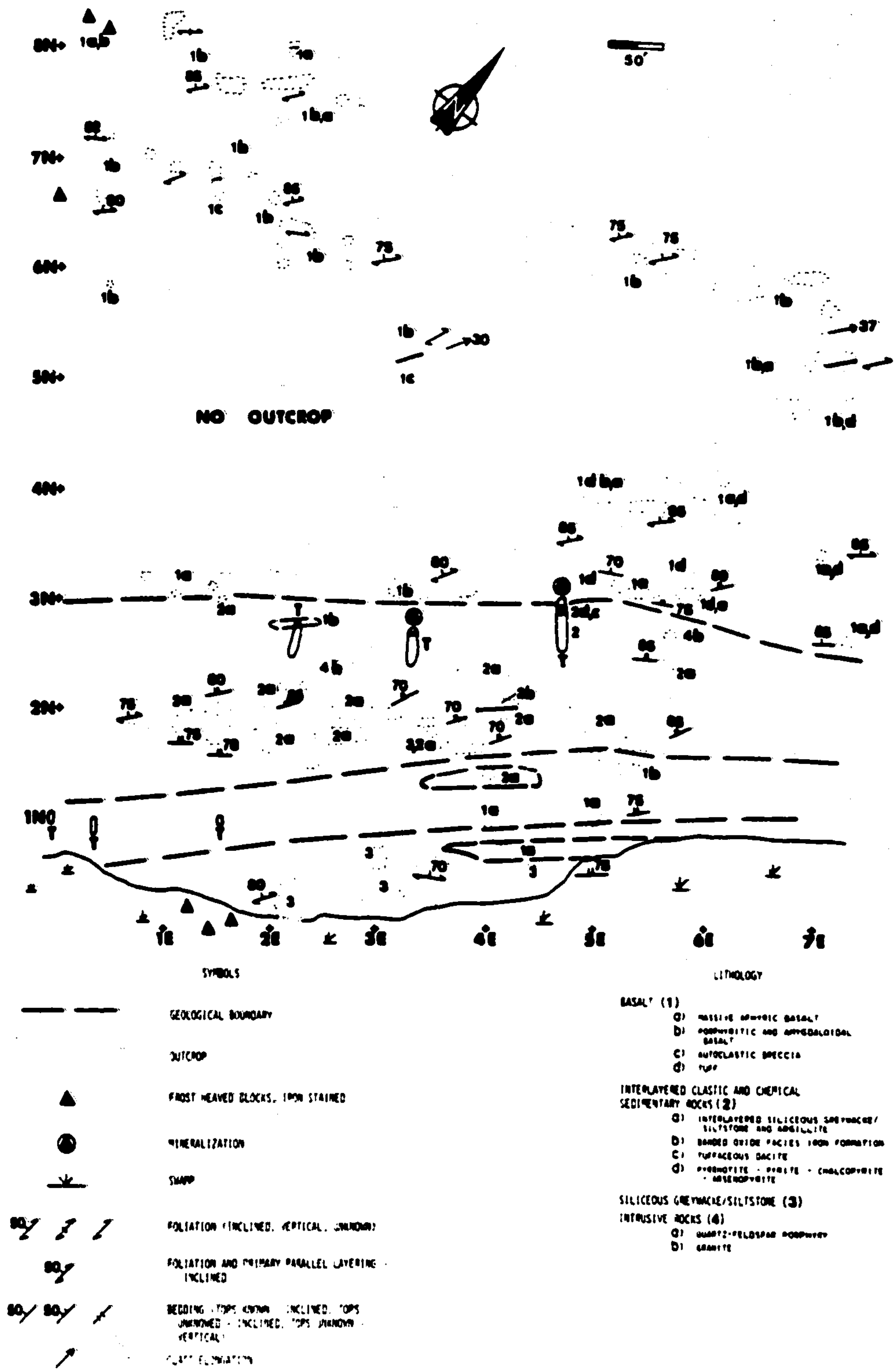


Figure 9. Detailed geology of the Arbour Lake sulphide occurrence.

dividitive ratios were calculated and plotted for the three sampling lines. The results of the ratioing of the trace element data marginally improved the response of the samples to the presence of the mineralization. The best indicator was found to be Cu x Pb x Zn/Mn which produced a spatially restricted peak or anomaly over the mineralized zones and Cu + Pb + Zn/Mn which produced a trough over the mineralization (Fig. 10). The Au and As contents of black spruce twigs were ineffective in defining the mineralized zones.

Frances Lake Area

Introduction

A single line of Black Spruce (Picea mariana) samples (n=56) were collected over the Frances Lake deposit using the same sample collection and sample preparation procedures as were utilized in the Agassiz study. The deposit is represented in diamond drill core by several irregular 1 - 2 m intersections of Zn-Pb-Ag-Au mineralization hosted by siliceous, tuffaceous (reworked pyroclastic?) quartz and feldspar phyric volcanic rocks. The deposit is overlain by a variety of surficial deposits including peat bog and sandy till. Outcrop is rare in the immediate vicinity of the deposit. Overburden depth is variable, ranging from less than 1 m to 10 m. The sampling line traversed topography varying from sandy till to the north progressing southward to gradually thinning sandy till to sphagnum and peat bog. Black spruce needles were analyzed by AAS for Cu, Pb, Zn, and Mn and black spruce twigs were analyzed for Au and As by INAA.

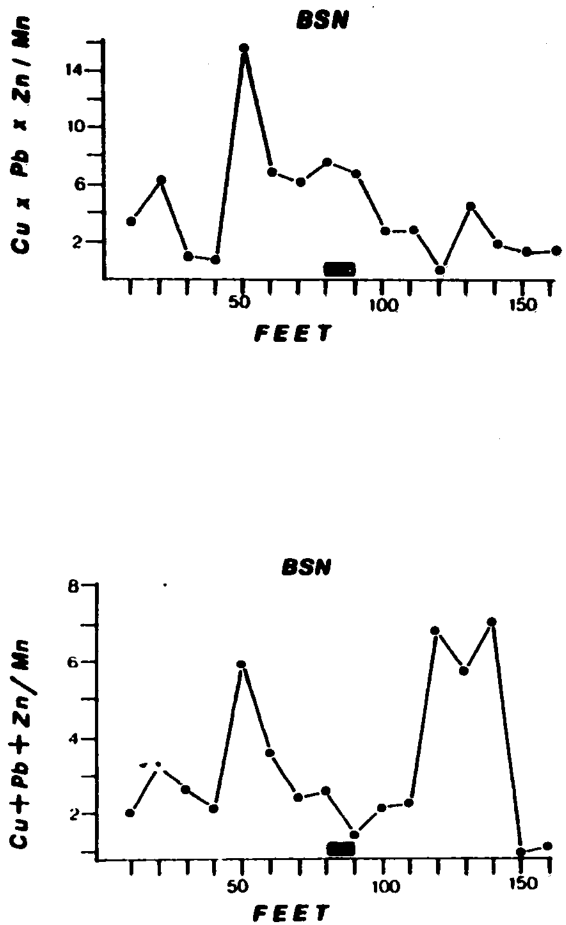


Figure 10. Additive and multiplicative halo in Black Spruce needles with proximity to the Arbour Lake occurrence (solid bar).

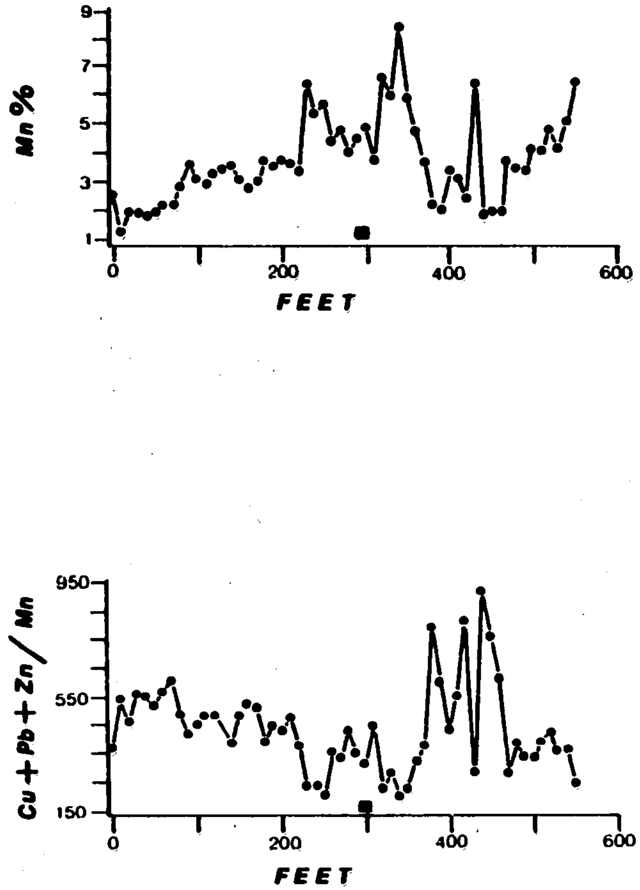


Figure 11. Variation in concentration of Mn, and Cu, Pb and Zn as an additive ratio with proximity to the Frances Lake massive sulphide deposit, (solid bar), Lynn Lake area.

Results

With the exception of Mn, single element profiles were relatively ineffective in defining anomalous geochemical patterns related to the Frances Lake deposit. Within 100 ft. (31 m) of the deposit along the sampling traverse there is a marked increase in the concentration of Mn as well as in the variability of the data (Fig. 11). Directly over the mineralization there is a trough of 4 - 5% Mn flanked on either side by Mn concentrations ranging from 5.5 - 9%. Additive Cu, Pb, Zn over Mn (Fig. 11) define a discrete peak with troughs on either side over a distance of approximately 100 ft. (31 m) centered on the surface projection of the mineralization. In this case the ratios have indicated a geochemically anomalous zone related to mineralization that is less extensive than the anomaly for Mn. The use of element ratios has not increased the extent, nor has it improved the resolution, of the geochemical anomaly.

PEAT BOG GEOCHEMICAL SURVEYS

Introduction

A total of 28 samples of humified peat were collected from the thin (8 - 10 cm), onlapping edge of a peat bog that overlies and extends south of the Agassiz deposit. The samples were collected from line 6551 over the Central Zone of the Agassiz deposit. The deeper frozen parts of the bog were sampled using a CRREL frozen peat corer which provided 40 samples from 7 cores (Fig. 12). The shallow, non-cored humified peat samples were collected from line 6551 where black spruce and Labrador tea samples were obtained. Figure 12 illustrates the location of the peat bog cores.

Sampling Methodology and Preparation

Humified peat samples were collected with a spade at 10 ft. (3 m) intervals along line 6551. These samples were stored in cloth sample bags and air dried. After drying the sample was macerated using a Waring commercial blender and a homogenized split removed for analysis. The peat cores were first logged and then split into appropriate sample lengths according to changes in colour, texture or components of the peat. When no obvious changes were observed sample length averaged 10 cm. As the lower portions of the core were frozen (below 50 cm) the peat cores were allowed to thaw, the water was drained and the peat allowed to dry. No pH measurements were taken; this measurement will be incorporated in future studies. After drying the peat was macerated in a Waring commercial blender, homogenized and a split removed for analysis.

Analysis of Peat Samples

Humified peat samples were analyzed for Au, As, Sb and Zn by INAA and also for Cu, Pb, Zn, Mn and Au in ash by AAS.

Results

Part 1: Humified Peat

Figure 13 illustrates the variation in concentration of As in peat samples with proximity to the deposit. The elements Cu, Pb, Zn, Mn, Au and Sb were ineffective in defining anomalous patterns or concentrations in humified peat with proximity to the mineralization. A trough of low As concentration forms an

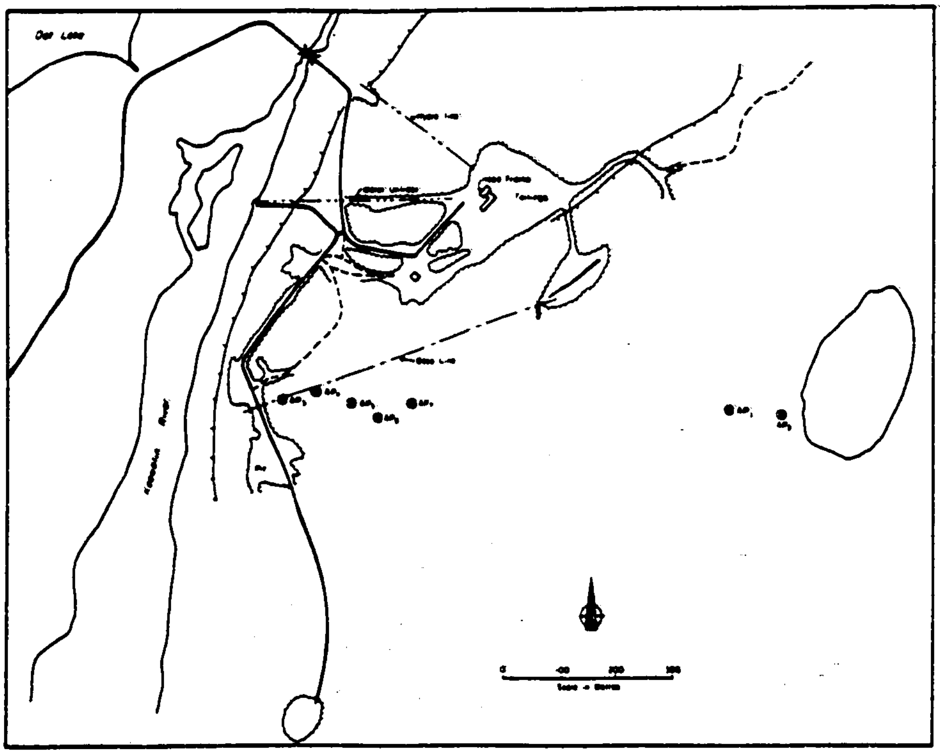


Figure 12. Location of permafrost peat bog cores in vicinity of the Agassiz deposit, Lynn Lake.

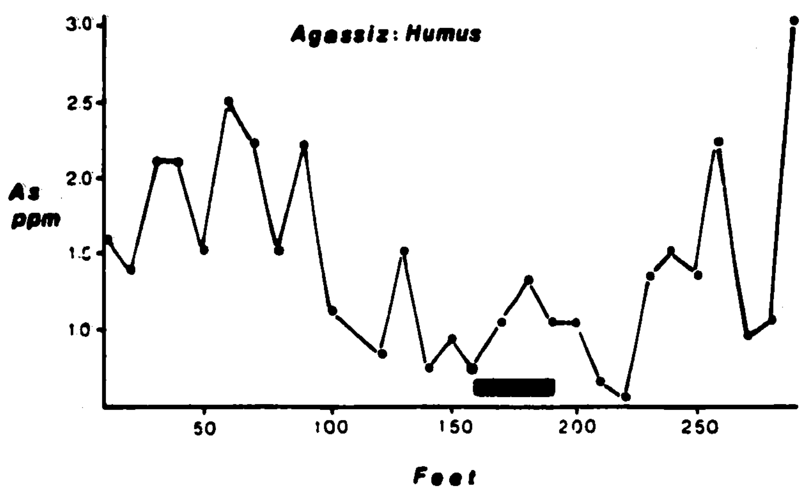


Figure 13. Variation in concentration of As in humus/humified peat with proximity to the Agassiz deposit (solid bar).

approximate 100-foot (30 m) zone directly over the mineralization. This trough is characterized by a range of 0.7 - 1.5 ppm As and is flanked on either side by higher As concentrations ranging from 1.5 ppm to 3.0 ppm. This pattern has been described as a "rabbit-ear" anomaly developed in response to the secondary dispersion of metals related to the self-potential effect. This phenomena is discussed in more detail at the end of this report.

Part 2: Permafrost Peat Bog Cores

The peat bog samples obtained by coring were analyzed for Cu, Pb, Zn and Mn in ash by AAS after a hot HNO_3 - HCl extraction; Au was analyzed by fire assay (carbon rod) after an aqua regia digestion. Peat bog profiles are presented in Figures 14, 15, 16 and 17.

This part of the peat bog geochemical study represented an orientation survey for a much larger program, namely, the coring of permafrost peat bog associated with the Agassiz Metallotect. The preliminary observations that can be made from the analysis of the peat cores are:

1. The highest concentration of all metals occurs in the active layer or non-permafrost peat bog which is usually the upper 50 cm of the cores. An exception to this rule is the peat core from site AP2. At that location the highest concentrations of Cu, Zn and Mn appear to increase down the length of the core. This may be explained in terms of the stratigraphy of the bog whereby the active or upper 50 cm of the bog upslope from AP2 is equivalent to the deeper portions of the bog in AP2.

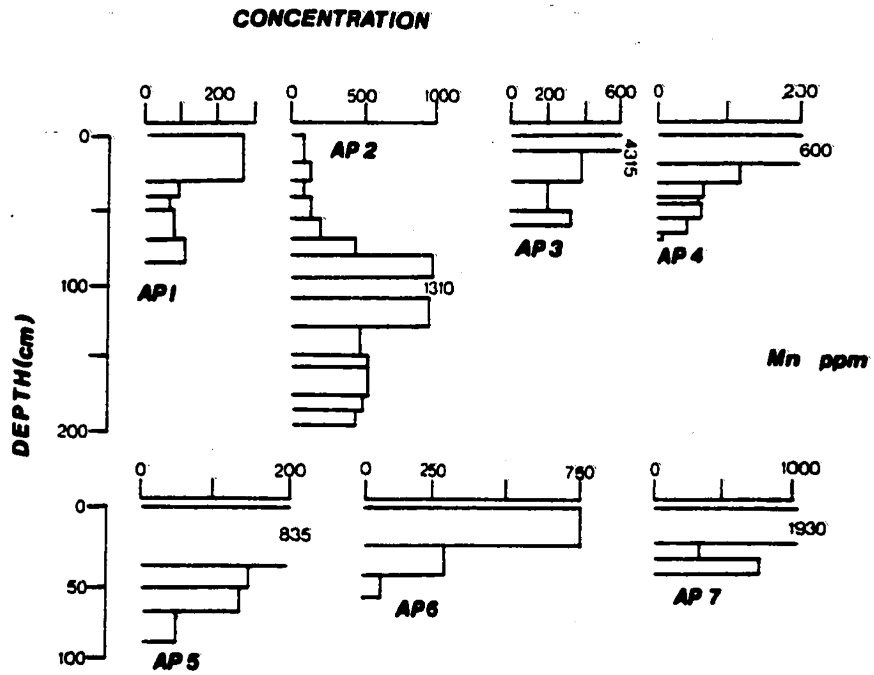


Figure 14. Vertical profiles illustrating the variation in concentration of Mn in permafrost peat bogs, Agassiz deposit.

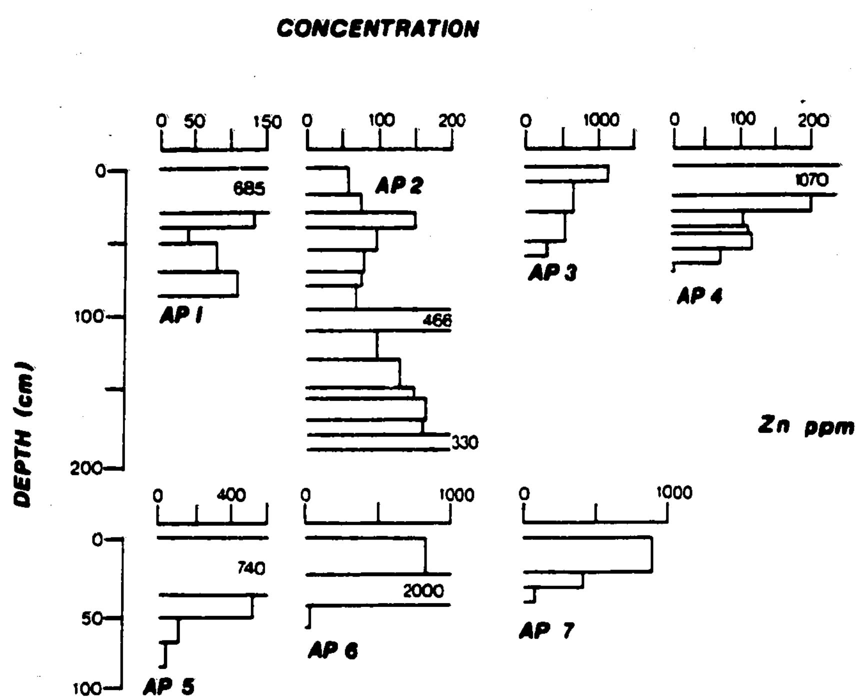


Figure 15. Vertical profiles illustrating the variation in concentration of Zn in permafrost peat bogs, Agassiz deposit.

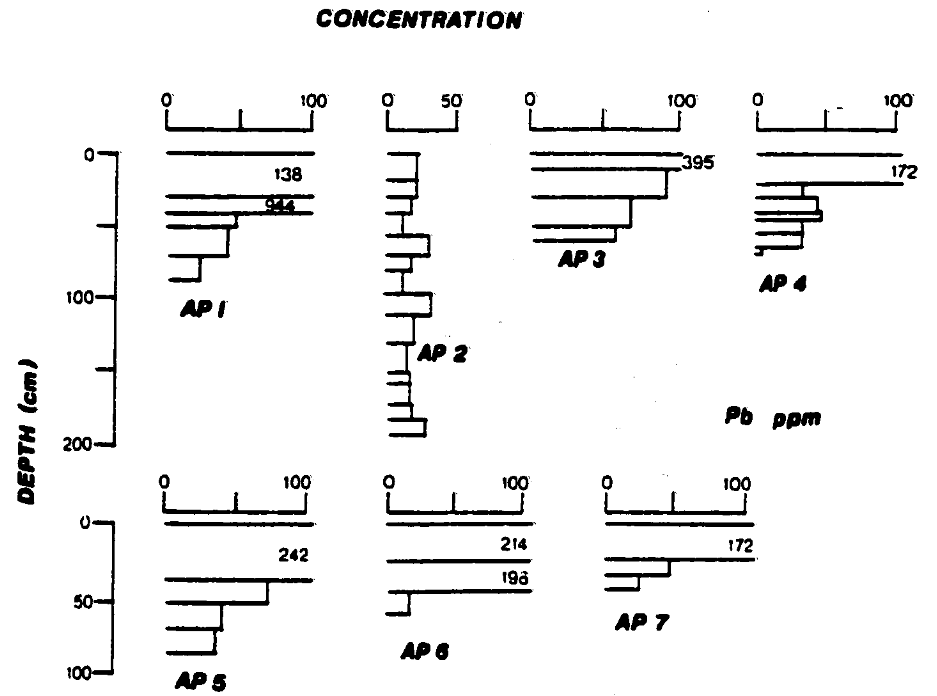


Figure 16. Vertical profiles illustrating the variation in concentration of Pb in permafrost peat bogs, Agassiz deposit.

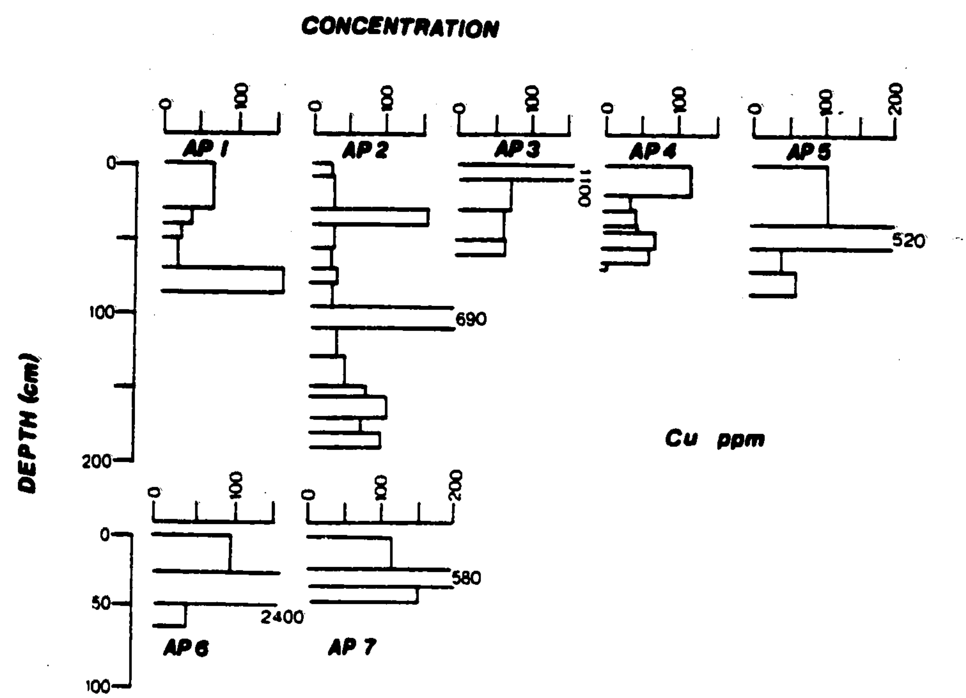


Figure 17. Vertical profiles illustrating the variation in concentration of Cu in permafrost peat bogs, Agassiz deposit.

2. The high concentration of trace metals in the active layer may be the result of contamination from waste rock/muck at the Agassiz deposit.

3. The unconsolidated sandy till underlying the peat bog has very much lower trace element content than the peat, albeit this observation is based on a single sample.

4. Airborne pollution from past mining activity in the vicinity of Lynn Lake other than at the Agassiz deposit may have contributed to the levels of trace metals in the active layers of the peat bog.

BASAL TILL GEOCHEMICAL SURVEYS

A preliminary account of sampling methods, analytical techniques and results has been presented by Nielsen (1982, 1983). Only the most important results of that survey and the implications for biogeochemical surveys are discussed here.

Results

Basal till samples were collected from 42 sites at an average depth of 1 m using a backhoe and shovel (Fig. 18). The till samples were divided into a heavy mineral fraction (S.G. > 2.96) using a shaker table and heavy liquids and a clay-sized fraction (< 2 μ) after centrifuging. The heavy mineral fraction was analyzed by fire assay (carbon rod) and the results for Au presented in Figure 19. The < 2 μ fraction was analyzed by AAS for Cu, Ph, Zb and Ni; after an aqua regia digestion; As was determined colorimetrically. Results for Cu, Pb, Zn, Ni, and As are presented in Figures 20, 21, 22, 23 and 24.

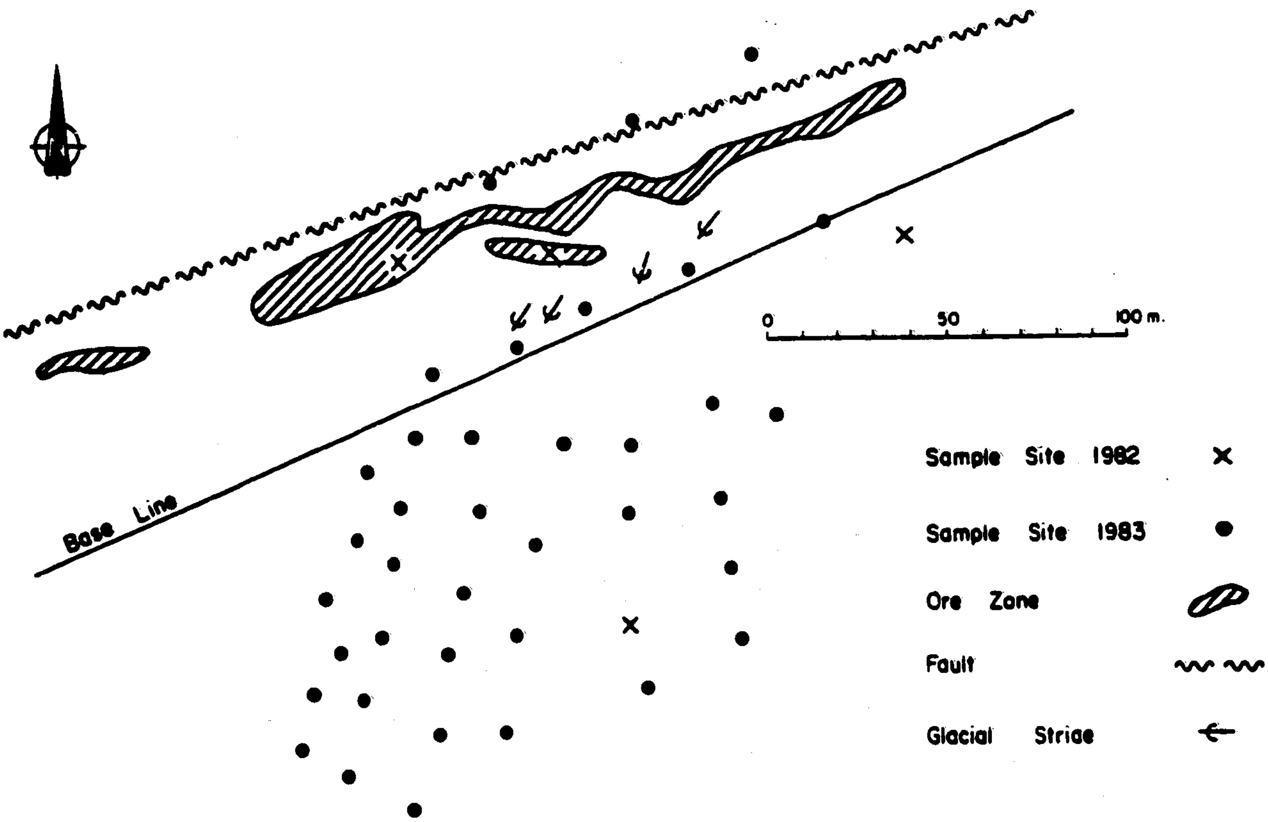


Figure 18. Basal till sample locations, Agassiz deposit.

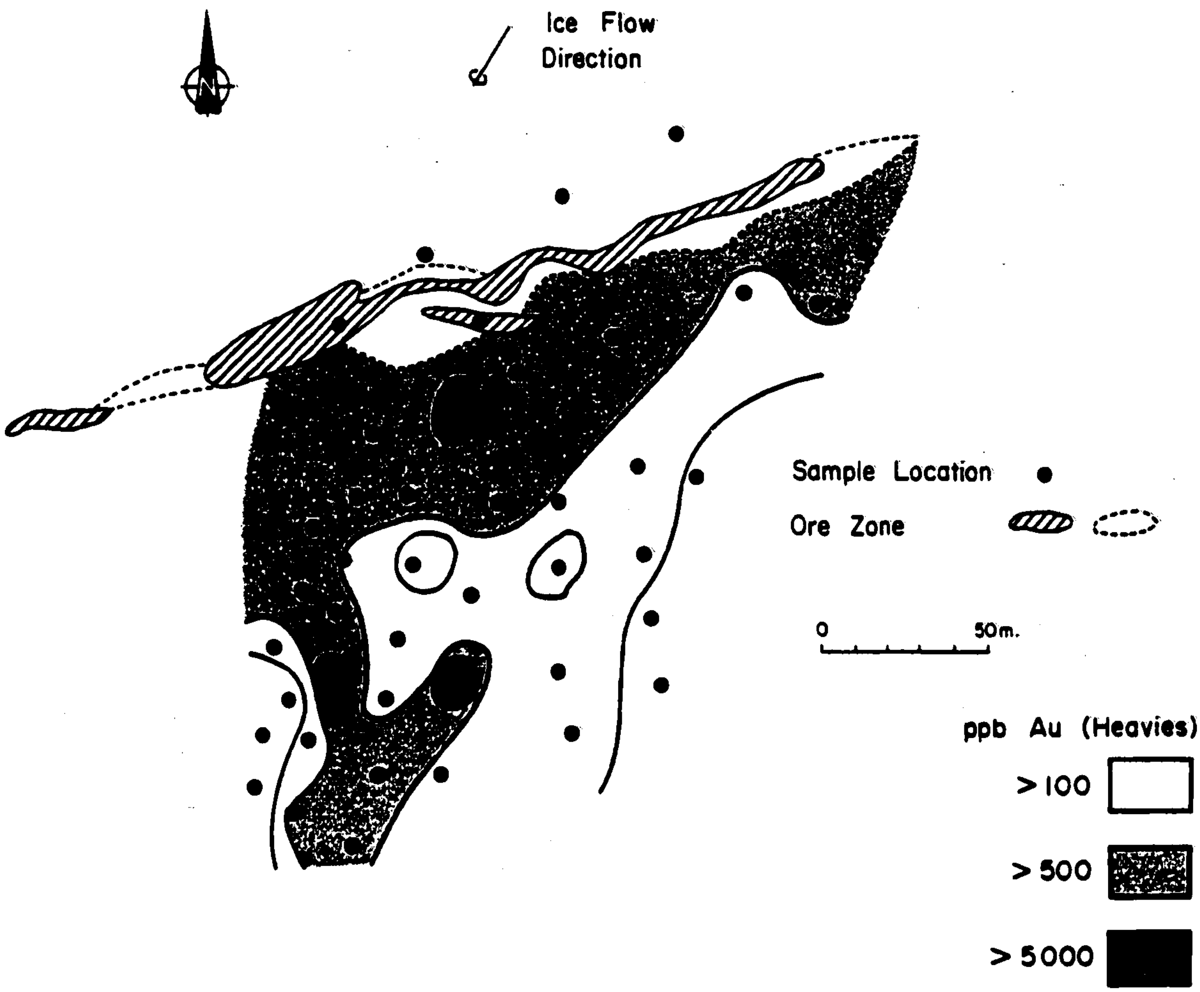


Figure 19: The variation in concentration of Au in the heavy mineral fraction (S.G 2.96) of basal till samples, Agassiz deposit.

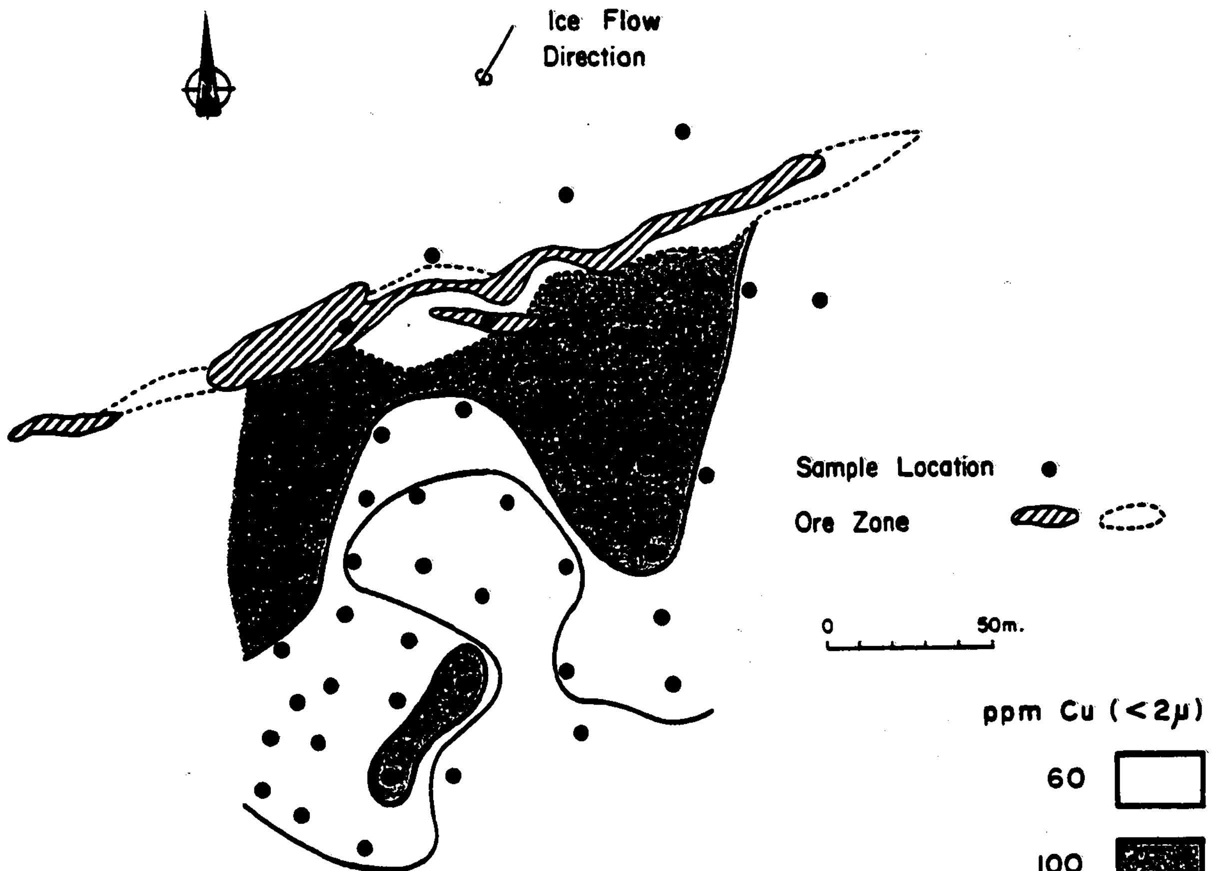


Figure 20: The variation in concentration of Cu in the less than two micron size fraction of basal till samples, Agassiz deposit.

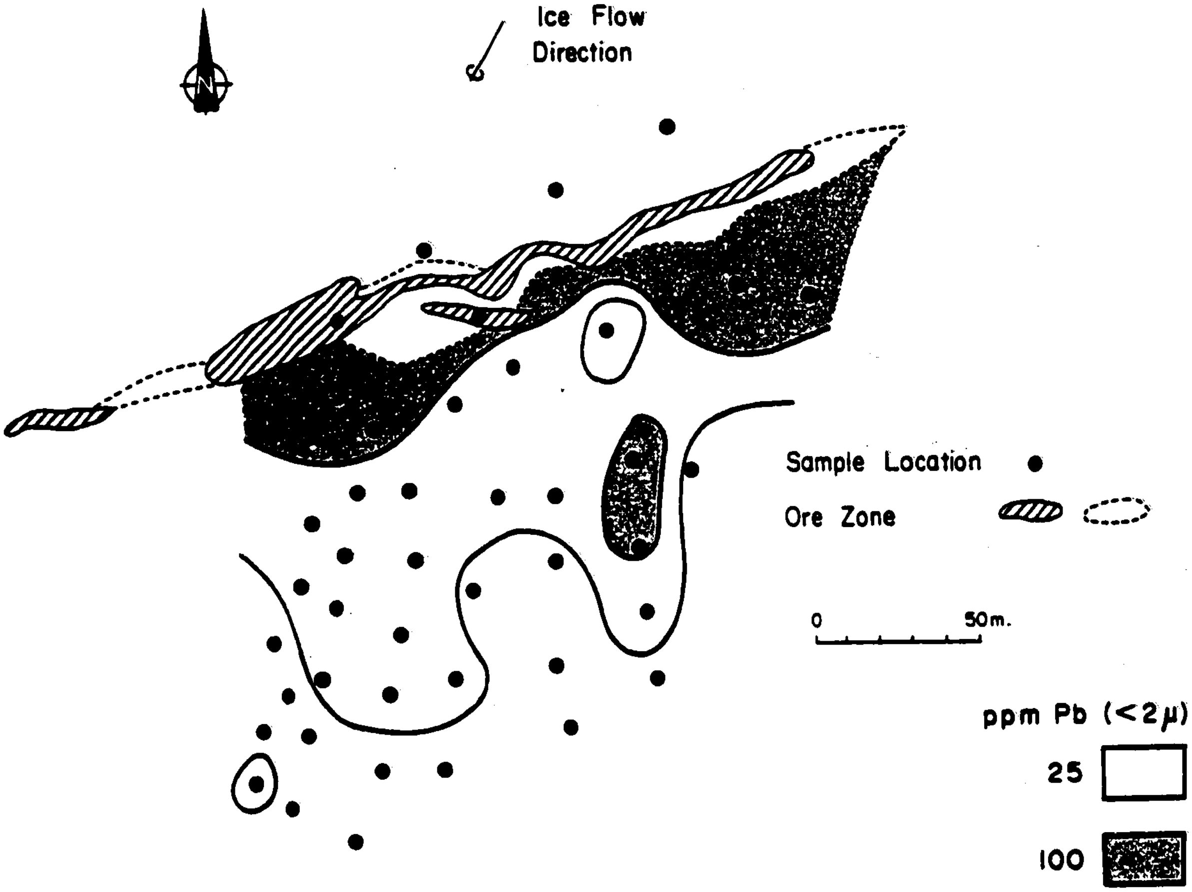


Figure 21: The variation in concentration of Pb in the less than two micron size fraction of basal till samples, Agassiz deposit.

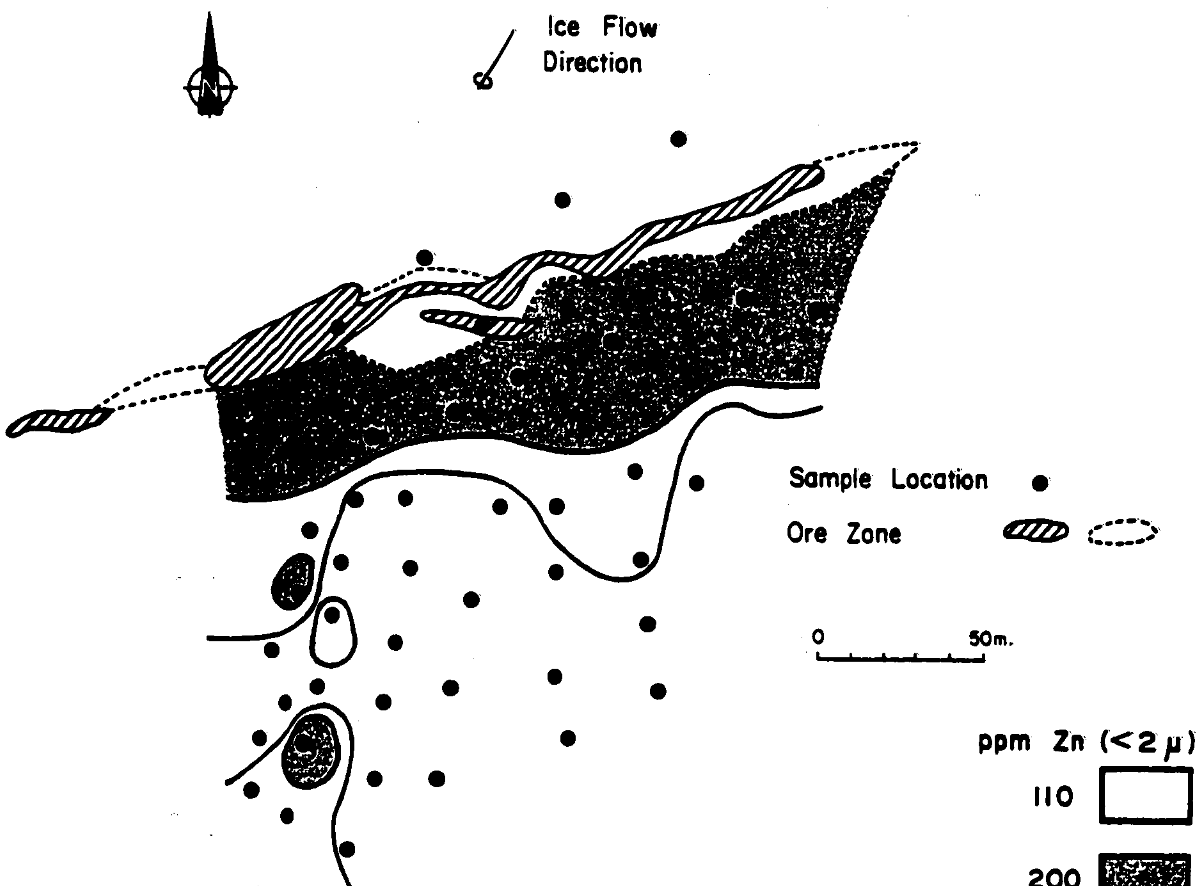


Figure 22: The variation in concentation of Zn in less than two micron size fraction of basal till samples, Agassiz deposit.

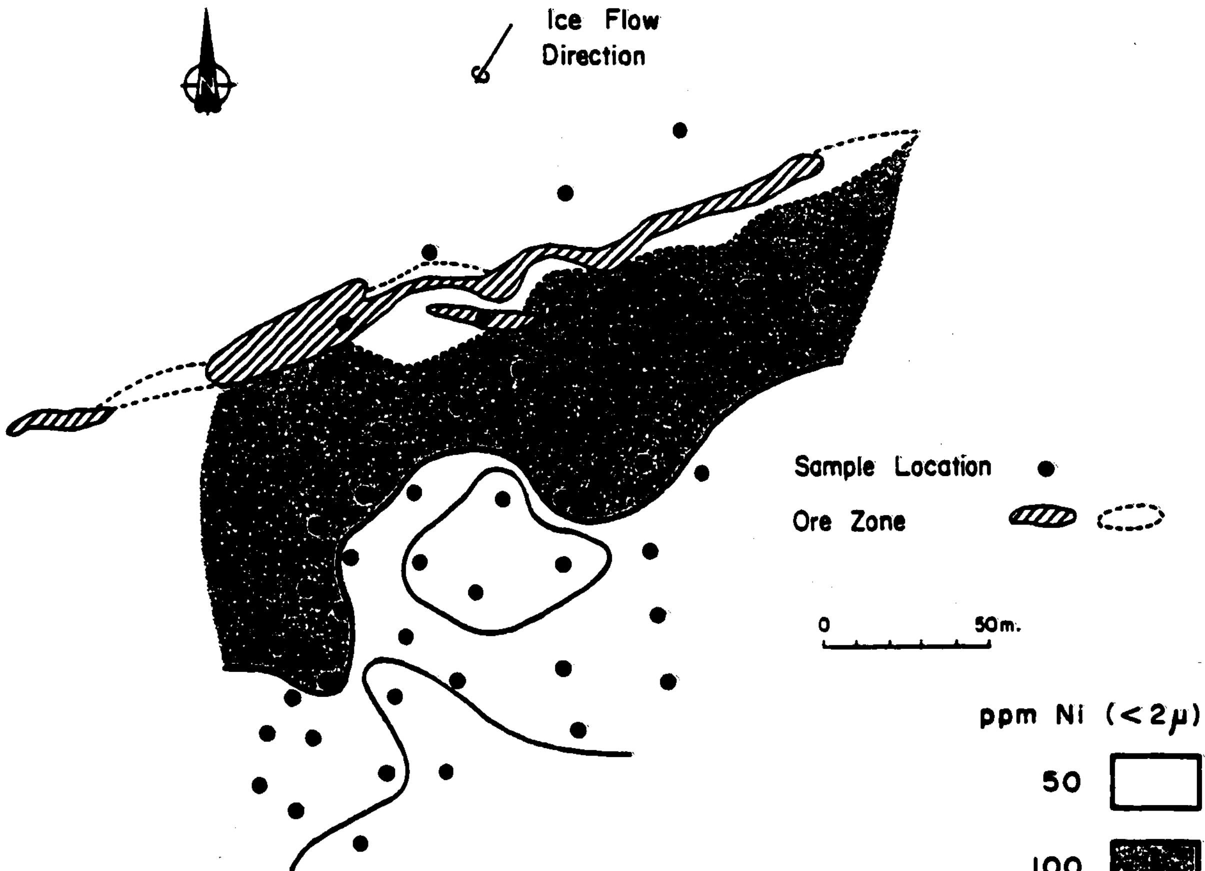


Figure 23: The variation in concentation of Ni in the less than two micron size fraction of basal till samples, Agassiz deposit.

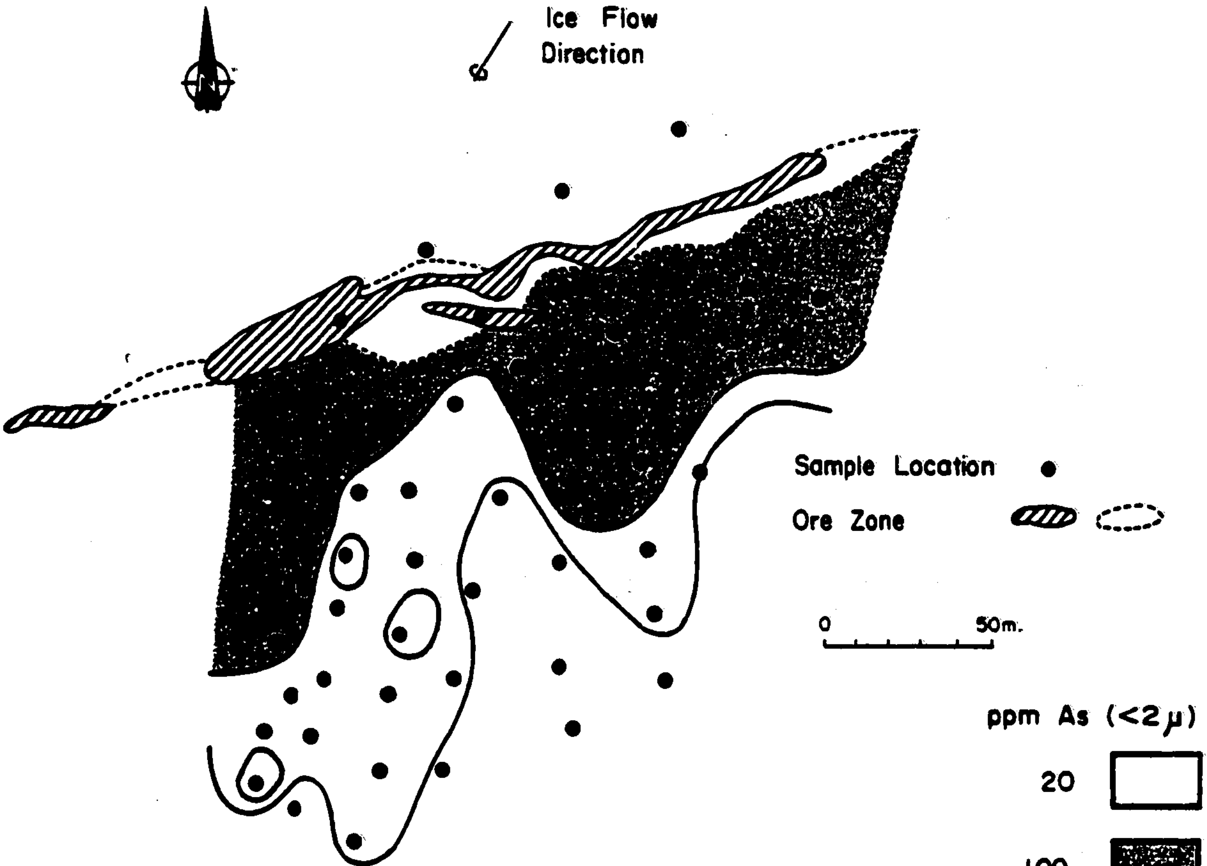


Figure 24: The variation in concentration of As in the less than two micron size fraction of basal till samples, Agassiz deposit.

An approximate 150 m dispersion fan of Cu, Pb, Zn, Ni, As and Au is reflected in the basal till samples collected down-ice from the Agassiz deposit. The exact definition of this fan is uncertain due to the limited availability of suitable samples; however, some 400 m to the south across a swamp, basal till samples reflect erratic but anomalously high values for the same suite of elements. This suggests the dispersion fan is, in fact, more extensive than the 150 m depicted in Figures 19 through 24.

In terms of biogeochemical surveys, the overburden hosting the root systems of the black spruce is characterized by high concentrations of a variety of trace elements within a minimum of 150 m of the mineralized zones. It is not surprising, therefore, that samples of black spruce needles and twigs reflect high concentrations of these trace elements. It appears that basal till sampling provides not only an effective exploration tool for Agassiz-type gold mineralization but aids in the explanation for the source of the high trace metal concentrations in the Black Spruce needle and twig samples in proximity to the mineralized zones. Although the extent of till deposits associated with the Agassiz Metallotect is limited to islands of till surrounded by peat bogs these studies can be incorporated into the overall geochemical study and utilized for the effective selection of geochemically anomalous regions.

DISCUSSION

Evaluation of Sampling Technique

Black spruce and Labrador tea biogeochemical samples were collected using the same sampling technique. Sampling lines or transects were orientated perpendicular to the strike of the mineralization and the host rocks. When more than one line of samples was collected sampling lines were generally equidistant. Sample sites along the lines were 10 ft. (3 m) apart. Initially, this close sample spacing was considered necessary because the magnitude of the response of the trace element concentration in the vegetation to the trace element content of the overburden was unknown. Sampling extended for up to 10 times the thickness of the mineralized zone on either side of the target. The extent of sampling was considered to be necessary in order to attempt to approximate background concentrations of trace elements in the biogeochemical samples. Each sample consisted of 5 branches of black spruce or Labrador tea collected from 5 separate trees/shrubs up to 20 ft. (6 m) on either side of the sampling line. The area of influence of the sample at each site along the sampling line is, therefore, 40 ft. (12 m). The sampling line represents, in fact, a 40 ft. (12 m) wide path comprised of 10 ft. (3 m) sampling sites each of which averages 5 black spruce trees or Labrador tea bushes. Individual samples were collected at chest height without regard for the exact age of the branch. The maximum diameter of any branch never exceeded 1/4 inch (6 mm). Some samples became mouldy during transport, however, this did not affect trace metal abundance in the sample.

Ideally, samples should be collected from well drained areas from standardized topography, avoiding vegetation in areas of ponded rainwater. The topography inherent to the study area, however, makes this impossible and samples collected from swampy or poorly drained areas invariably show some differences in trace metal concentration from samples collected over well drained outcrop or sand ridges. The results of this orientation study indicate that the element most affected by drainage is Mn. Samples collected from a gently sloping ridge in the Dot Lake area (cf. Fig. 8, Dot Lake) indicated a Mn anomaly, associated with mineralization, that was displaced approximately 150 ft. (46 m) in a downslope direction. This pattern may be attributed to the hydromorphic dispersion of Mn as meteoric waters drained downslope. Generally, Cu, Pb, Zn, Au and As were not affected to the same extent as Mn in this way.

Based on preliminary results the sampling technique utlized for this study appears to be suitable. For biogeochemical surveys attempting to define more regional trace element anomalous zones, the sampling procedure should be modified. Because root systems of vegetation samples may unevenly distribute trace metals throughout the tree or shrub, one branch of the tree may contain high trace metal concentration whereas another branch may not. To avoid "missing" an anomaly 3 or 4 equally spaced branches should be collected from around the perimeter of each tree within a 10 m^2 area. This method has been described and implemented by Brooks (1983) and is considered to provide a representative analysis of a particular trace metal at a single sampling site.

Evaluation of the Analytical Methods

The methods of analysis utilized for this study were atomic absorption and instrumental neutron activation. Samples collected over mineralized zones were analyzed using both of these techniques with similar results in each case. Generally, the absolute concentration of an element in the biogeochemical samples determined by INAA is lower than that by AAS. Matrix interference effects in the AAS scheme may explain this difference. Both methods are, however, acceptable over the more conventional concentration range, say greater than 5 ppm. The analysis of biogeochemical samples, however, requires lower limits of detection in the order of 0.1 ppb for gold and 0.2 ppm for As.

The analyses must also be reproducible at these lower concentration levels. For this reason the use of INAA has an advantage in that counting times of irradiated samples may be adjusted in order to attain the lower limits of detection while maintaining reproducability.

For the determination of Cu, Pb, Zn, Fe and Mn in biogeochemical samples the use of AAS will give reproducible results upon which interpretations regarding trace and minor element concentrations can be made. Due to the low levels of concentration of Au and As in the vegetation analyzed for this study the use of INAA is recommended. The INAA results are probably best suited for determining "high" or "low" concentrations of an element since slight inhomogeneities at extremely low limits of detection may result in non-reproducible results.

Inter-element Relationships

Correlation coefficients for the biogeochemical samples collected from each study area are summarized in Table 1. Although deriving meaningful information from correlation coefficients calculated on the basis of small sample populations is tenuous, some interesting observations can be drawn from the data in Table 1. The correlations of Cu and Zn with ash yield (Dot Lake, Arbour Lake, Frances Lake) suggest ash content may be an important consideration when interpreting Cu and Zn trends from these three areas and that some form of normalization of trace element data to a standard LOI concentration, such as:

$$N\ \text{element} = \frac{\text{Element Concentration}}{(1-\text{LOI}/100)}$$

AREA	SAMPLE	N	r(95%; 2 sided)		SIGNIFICANT ELEMENT PAIRS
Agassiz	Humified Peat (AAS; INAA)	28	.375		Au-Pb; As-Sb Cu-Zn; Zn-Ash
	BSN; BST (INAA)	19	.456	BSN BST	As-Zn Au-Zn; Au-As Au-Sb; As-Zn
	LTL; LTT (INAA)	30	.361	LTL LTT	As-Zn As-Zn
Dot Lake	BSN; BST (AAS; INAA)	45	.297	BSN BST	(Cu-Ash); (Zn-Ash); (Cu-Zn)
Arbour Lake	BSN; BST (AAS; INAA)	31	.356	BSN BST	(Cu-Ash); (Pb-Zn)
Frances Lake	BSN; BST (AAS; INAA)	56	.254	BSN BST	Cu-Zn; Zn-Mn; Zn-Ash (As-Au)

Table 1 : Summary of correlation coefficients for element pairs in biogeochemical samples. N - number of samples; r - correlation coefficient or measure of relationship at 95% confidence limits; BSN - Black Spruce needles; BST - Black Spruce twigs; AAS - atomic absorption spectrophotometry; INAA - instrumental neutron activation analysis. Brackets enclosing element pairs indicates a negative correlation.

may have to be considered. The remainder of the apparently significant element pairs are explainable in terms of the concentrations of Cu, Pb, Zn, Mn, Au, As and Sb in the overburden tapped by the root systems of Picea mariana. Nielsen (1983) indicated heavy metal dispersion fans in a down-ice direction from the Agassiz deposit for a variety of elements including most of those mentioned above. These heavy metal fans characterize the overburden in the vicinity of the study areas; the reflection of these anomalies in biogeochemical samples rooted in the overburden is not surprising. Further, the correlation between many of the trace metals indicates that anomalies present in the biogeochemical samples should be reflected by either of the correlatable elements thereby reducing the number of potential indicator elements that are required for a more regional survey.

Trace Element Content of Sampling Media

The relative abundance of Zn, Au and Sb in basal till, peat, Labrador tea and black spruce is given below.

Zn Till($< 2\mu$) > Humified Peat > BSN > BST > LTL > LTT

Au Till (>2.96S.G.) > Humified Peat > LTL > LTT > BSN > BST

Sb Humified Peat > BSN > BST > LTL > LTT

In summary, the overburden (till, peat) is marked by containing higher concentrations of Zn, Au and Sb than the black spruce and Labrador tea.

CONCLUSIONS

This preliminary study, concerned with the chemical analysis of vegetation samples and logically extrapolated to include peat and basal till geochemistry, indicates the following:

1. Black spruce (Picea mariana) can be used as a geochemical exploration sampling medium for Agassiz-type gold mineralization whereas Labrador tea (Ledum groenlandicum) cannot.

2. The needles and twigs of the black spruce as well as the leaves and stems of the Labrador tea selectively concentrate a specific suite of chemical elements.

3. Analysis of these organs in proximity to gold mineralization indicates broad (>140 m) trace element geochemical halos which represent a significantly enhanced exploration target. Biogeochemical samples collected over barren iron sulphides were unsuccessful in defining anomalous concentrations of Au, As, Cu, Pb, Zn and Mn.

4. Analysis of these materials can be undertaken using AAS and INAA. AAS appears to be more suitable above the concentration range of 5 ppm for Cu, Pb, Zn and Mn; however, INAA can be used to obtain values indicating high or low concentrations of elements such as Au, As and Sb.

5. In the interpretation of analytical results the problem of the variation of trace metals with ash yield must be addressed; normalization of trace metals to a fixed ash content may be required.

6. Trace metal anomalies can be distorted by hydromorphic dispersion phenomena directly related to the drainage and topography of the study area. Of the elements surveyed in this study, Mn was affected the most by hydromorphic phenomena.

7. The use of peat samples in geochemical exploration programs for Agassiz-type gold mineralization appears to have application for the definition of geochemically anomalous areas; however, the optimum place to sample a permafrost peat bog (active layer? permafrost?) is, as yet, undetermined. This suggests the need for continued vertical and lateral profile sampling of peat bogs.

8. The high chelating or "filtering" capacity of peat bogs with respect to trace elements indicates the need for an understanding of the groundwater flow regime in the study area. The edge or lip of peat bogs will undoubtedly reflect high trace metal content due to scavenging from groundwater runoff.

9. Selective digestions will be required for peat bog analyses in order to distinguish between the clastic component and hydromorphically diffused ions that may be related to mineralization.

10. Trace metal abundances in each of the sampling media utilized during this study reflect a progression from high to lower concentrations from basal till to peat to vegetation samples.

11. Extensive statistical manipulation of biogeochemical data was found to be unnecessary in order to make preliminary interpretations of the data.

12. Basal till sampling represents an effective geochemical exploration tool in the search for Agassiz-type gold mineralization. It also provides a partial explanation for the source of the metals in the biogeochemical samples.

ACKNOWLEDGEMENTS

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Appendix 1	:	Analytical Results
Part 1	:	Black Spruce Needles and Twigs, Agassiz Deposit
Part 2	:	Labrador Tea Leaves and Twigs, Agassiz Deposit
Part 3	:	Humus/Humified Peat, Agassiz Deposit
Part 4	:	Black Spruce Needles and Twigs, Rushed Showing, Dot Lake
Part 5	:	Black Spruce Needles and Twigs, Arbour Lake
Part 6	:	Black Spruce Needles and Twigs, Frances Lake Deposit

Part 1 : Black Spruce Needles and Twigs, Agassiz Deposit

SAMPLE NUMBER	Zn (ppm)	As (ppm)	Sb (ppm)	Au (ppb)
AGB-0-BSN	21	0.11	0.01	0.5
AGB-1-BSN	23	0.10	0.01	0.3
AGB-6-BSN	24	0.10	0.01	0.7
AGB-8-BSN	40	0.10	n.d.	0.5
AGB-9-BSN	30	0.28	0.01	0.4
AGB-10-BSN	35	0.16	n.d.	0.4
AGB-11-BSN	23	0.30	0.01	0.5
AGB-12-BSN	32	0.51	n.d.	0.1
AGB-13-BSN	36	0.31	0.01	0.8
AGB-14-BSN	33	0.23	n.d.	0.3
AGB-15-BSN	32	0.13	n.d.	0.4
AGB-18-BSN	35	0.06	n.d.	0.3
AGB-19-BSN	34	0.10	n.d.	0.4
AGB-20-BSN	33	0.10	n.d.	0.6
AGB-21-BSN	37	0.07	0.01	0.5
AGB-22-BSN	30	0.07	n.d.	0.6
AGB-23-BSN	25	0.06	0.01	0.3
AGB-24-BSN	30	0.08	n.d.	0.8
AGB-25-BSN	31	0.07	0.01	0.4
AGB-26-BSN	29	0.12	n.d.	0.6
AGB-27-BSN	22	0.10	n.d.	0.4
AGB-28-BSN	28	0.06	n.d.	0.5
AGB-29-BSN	20	0.05	n.d.	0.4
AGB-30-BSN	29	0.07	n.d.	0.5
AGB-203-BSN	72	0.14	0.01	0.5
AGB-204-BSN	72	0.14	0.01	0.5
AGB-205-BSN	59	0.09	0.01	0.6
AGB-207-BSN	65	0.12	0.02	0.7
AGB-208-BSN	63	0.11	0.01	0.8
AGB-209-BSN	67	0.10	n.d.	0.6
AGB-212-BSN	52	0.08	0.01	0.6
AGB-213-BSN	67	0.10	0.01	0.6
AGB-214-BSN	38	0.09	0.01	1.1
AGB-215-BSN	40	0.09	0.01	0.6
AGB-216-BSN	34	0.05	0.01	0.4
AGB-217-BSN	28	0.08	n.d.	0.5
AGB-218-BSN	39	0.07	n.d.	0.5
AGB-219-BSN	39	0.09	n.d.	0.6
AGB-220-BSN	31	0.06	n.d.	0.5
AGB-221-BSN	32	0.09	n.d.	1.0
AGB-224-BSN	28	0.07	0.01	0.6
AGB-225-BSN	23	0.06	n.d.	0.5
AGB-226-BSN	22	0.05	0.01	0.4

Agassiz Au-Ag Deposit - Biogeochemistry
Black Spruce Needles (*Picea mariana*)
I.N.A.A.

n.d. - not detected, below the limits of detection for this analytical method

<u>SAMPLE NUMBER</u>	Zn (ppm)	As (ppm)	Sb (ppm)	Au (ppb)
AGB-0-BST	44	0.29	0.04	1.3
AGB-1-BST	42	0.23	0.10	0.6
AGB-6-BST	44	0.22	0.03	0.7
AGB-8-BST	44	0.23	0.03	1.2
AGB-9-BST	44	0.36	0.09	2.4
AGB-10-BST	48	0.27	0.04	0.8
AGB-11-BST	49	0.24	0.03	0.4
AGB-12-BST	48	0.25	0.07	0.8
AGB-13-BST	45	0.21	0.02	1.2
AGB-14-BST	39	0.15	0.35	0.6
AGB-15-BST	43	0.15	0.03	1.0
AGB-18-BST	40	0.15	0.02	1.7
AGB-19-BST	50	0.25	0.07	1.7
AGB-20-BST	38	0.20	0.03	1.1
AGB-21-BST	38	0.21	0.02	0.4
AGB-22-BST	32	0.14	0.02	0.4
AGB-23-BST	35	0.16	0.02	0.4
AGB-24-BST	32	0.17	0.03	0.8
AGB-25-BST	43	0.16	0.06	0.8
AGB-26-BST	34	0.16	0.03	1.6
AGB-27-BST	31	0.13	0.12	1.4
AGB-28-BST	29	0.14	0.04	0.6
AGB-29-BST	30	0.16	0.02	1.8
AGB-30-BST	27	0.14	0.03	0.7
AGB-203-BST	45	0.35	0.03	0.5
AGB-204-BST	53	0.23	0.02	0.4
AGB-205-BST	47	0.26	0.02	0.6
AGB-207-BST	44	0.22	0.02	0.5
AGB-208-BST	49	0.23	0.02	0.5
AGB-209-BST	37	0.20	0.01	0.7
AGB-212-BST	31	0.08	0.01	0.2
AGB-213-BST	37	0.17	0.01	0.3
AGB-214-BST	31	0.13	0.01	0.3
AGB-215-BST	30	0.13	0.01	0.1
AGB-216-BST	32	0.17	0.01	0.3
AGB-217-BST	29	0.11	0.01	0.4
AGB-218-BST	34	0.15	0.01	0.2
AGB-219-BST	32	0.12	0.01	0.4
AGB-220-BST	26	0.15	0.01	0.4
AGB-221-BST	27	0.19	0.01	0.3
AGB-224-BST	36	0.19	0.02	0.4
AGB-225-BST	36	0.21	0.02	0.4
AGB-226-BST	31	0.21	0.02	0.4

Agassiz Au-Ag Deposit - Biogeochemistry
Black Spruce Twigs (<u>Picea mariana</u>)
I.N.A.A.

Part 2 : Labrador Tea Leaves and Twigs, Agassiz Deposit

SAMPLE NUMBER	Zn (ppm)	As (ppm)	Sb (ppm)	Au (ppb)
AGB-351-LTL	17	0.13	0.01	1.1
AGB-352-LTL	15	0.12	0.01	1.3
AGB-353-LTL	19	0.15	0.02	0.5
AGB-354-LTL	22	0.31	0.01	0.5
AGB-355-LTL	17	0.38	n.d.	1.5
AGB-356-LTL	15	0.12	0.01	0.4
AGB-357-LTL	17	0.10	0.02	0.3
AGB-358-LTL	22	0.13	0.01	1.2
AGB-359-LTL	19	0.12	0.01	2.1
AGB-360-LTL	15	0.21	0.01	5.7
AGB-361-LTL	18	0.10	0.04	0.9
AGB-362-LTL	14	0.08	0.04	2.3
AGB-363-LTL	14	0.08	0.01	0.8
AGB-364-LTL	15	0.07	0.01	1.5
AGB-365-LTL	13	0.08	0.13	4.4
AGB-366-LTL	15	0.08	0.01	1.4
AGB-367-LTL	14	0.09	0.02	1.7
AGB-368-LTL	15	0.07	0.01	1.2
AGB-369-LTL	15	0.07	0.01	0.4
AGB-370-LTL	13	0.04	0.01	4.2
AGB-371-LTL	11	0.05	0.01	0.5
AGB-372-LTL	12	0.06	0.01	0.8
AGB-373-LTL	13	0.10	0.06	6.1
AGB-374-LTL	16	0.06	0.01	0.9
AGB-375-LTL	16	0.05	0.01	0.5
AGB-376-LTL	14	0.04	0.01	1.1
AGB-377-LTL	12	0.06	0.01	0.8
AGB-378-LTL	15	0.07	n.d.	0.3
AGB-379-LTL	14	0.06	n.d.	0.7
AGB-380-LTL	11	0.03	0.04	5.0
AGB-381-LTL	15	0.06	0.03	0.4
AGB-382-LTL	12	n.d.	0.02	0.4
AGB-383-LTL	14	0.05	0.01	0.5
AGB-384-LTL	14	0.07	0.02	0.9
AGB-385-LTL	18	0.06	0.02	1.0
AGB-386-LTL	17	0.09	0.01	0.6
AGB-387-LTL	16	0.04	0.01	0.4
AGB-388-LTL	15	0.07	0.01	3.3
AGB-389-LTL	13	0.06	0.01	0.3
AGB-390-LTL	14	0.03	0.03	1.4
AGB-391-LTL	17	0.07	0.01	0.3
AGB-392-LTL	18	0.08	0.01	0.9
AGB-393-LTL	16	0.05	0.02	0.5
AGB-394-LTL	13	0.06	0.03	0.4

SAMPLE NUMBER	Zn (ppm)	As (ppm)	Sb (ppm)	Au (ppb)
AGB-395-LTL	15	0.04	0.02	0.6
AGB-396-LTL	15	0.04	0.06	0.1
AGB-397-LTL	11	0.04	0.01	0.3
AGB-398-LTL	11	0.04	0.01	0.3
AGB-399-LTL	13	0.06	0.01	0.5
AGB-400-LTL	18	0.04	0.01	0.5
AGB-401-LTL	10	0.05	0.01	0.4
AGB-402-LTL	12	0.08	0.02	0.6
AGB-403-LTL	13	0.06	0.01	0.7
AGB-404-LTL	15	0.10	n.d.	1.1
AGB-405-LTL	12	0.10	0.02	0.5
AGB-406-LTL	17	0.07	0.01	0.5
AGB-407-LTL	16	0.05	n.d.	0.6
AGB-408-LTL	16	0.09	0.03	5.0
AGB-409-LTL	17	0.09	n.d.	1.9
AGB-410-LTL	18	0.09	0.01	0.7
AGB-411-LTL	16	0.10	0.01	0.6

Agassiz Au-Ag Deposit - Biogeochemistry
Labrador Tea Leaves (*Ledum groenlandicum*)
I.N.A.A.

n.d. - not detected, below the limits of detection for this analytical method.

SAMPLE NUMBER	Zn (ppm)	As (ppm)	Sb (ppm)	Au (ppb)	Pb (ppm)
AGB-351-LTT	18	0.09	0.01	0.8	-
AGB-352-LTT	15	0.12	0.01	0.6	-
AGB-353-LTT	14	0.08	0.02	0.3	-
AGB-354-LTT	22	0.14	0.01	0.2	-
AGB-355-LTT	18	0.13	n.d.	1.0	-
AGB-356-LTT	19	0.05	0.01	0.3	-
AGB-357-LTT	12	0.07	n.d.	0.3	-
AGB-358-LTT	14	0.06	0.01	1.0	-
AGB-359-LTT	10	0.07	0.04	0.4	-
AGB-360-LTT	14	0.11	0.01	0.4	-
AGB-361-LTT	14	0.13	n.d.	0.6	-
AGB-362-LTT	13	0.06	0.01	0.6	-
AGB-363-LTT	9	0.10	0.01	0.3	-
AGB-364-LTT	13	0.08	0.02	0.8	-
AGB-365-LTT	14	0.70	n.d.	1.1	-
AGB-366-LTT	12	0.08	0.01	0.5	-
AGB-367-LTT	18	0.13	0.02	0.9	-
AGB-368-LTT	11	0.07	n.d.	0.4	-
AGB-369-LTT	17	0.08	0.02	0.4	-
AGB-370-LTT	12	0.06	0.01	2.2	-
AGB-371-LTT	14	0.06	0.01	0.4	-
AGB-372-LTT	10	0.07	0.01	0.8	-
AGB-373-LTT	11	0.04	0.01	1.7	-
AGB-374-LTT	19	0.10	0.02	0.9	-
AGB-375-LTT	17	0.09	n.d.	0.6	-
AGB-376-LTT	12	0.05	n.d.	0.2	-
AGB-377-LTT	12	0.05	n.d.	0.4	-
AGB-378-LTT	15	0.09	n.d.	0.4	-
AGB-379-LTT	9	0.03	0.10	1.0	-
AGB-380-LTT	8	0.08	0.01	0.9	-
AGB-381-LTT	15	0.06	0.16	0.5	-
AGB-382-LTT	17	0.08	0.03	0.4	-
AGB-383-LTT	11	0.04	n.d.	0.6	-
AGB-384-LTT	13	0.06	0.05	0.7	-
AGB-385-LTT	11	0.05	0.07	0.6	-
AGB-386-LTT	22	1.0	0.01	1.1	6
AGB-387-LTT	15	0.03	0.01	0.9	6
AGB-388-LTT	13	0.05	0.01	1.5	4
AGB-389-LTT	12	0.03	0.01	1.1	4
AGB-390-LTT	17	0.09	0.01	2.5	6
AGB-391-LTT	21	0.03	0.01	0.7	4
AGB-392-LTT	17	0.03	0.01	0.4	4
AGB-393-LTT	12	0.03	0.01	0.7	6
AGB-394-LTT	19	0.03	0.01	0.9	5

SAMPLE NUMBER	Zn (ppm)	As (ppm)	Sb (ppm)	Au (ppb)	Pb (ppm)
AGB-395-LTT	14	0.6	0.01	1.0	4
AGB-396-LTT	16	0.3	0.01	0.2	4
AGB-397-LTT	14	0.7	0.01	0.5	2
AGB-398-LTT	20	1.1	0.01	0.8	4
AGB-399-LTT	19	1.5	0.01	0.7	4
AGB-400-LTT	13	1.3	0.01	0.8	4
AGB-401-LTT	15	1.7	0.01	1.0	6
AGB-402-LTT	8	1.2	0.01	0.7	4
AGB-403-LTT	13	4.0	0.01	0.7	5
AGB-404-LTT	18	2.1	0.01	1.2	6
AGB-405-LTT	14	2.5	0.01	0.6	2
AGB-406-LTT	12	0.05	n.d.	0.3	-
AGB-407-LTT	17	0.06	0.01	0.6	-
AGB-408-LTT	14	0.07	0.03	1.1	-
AGB-409-LTT	14	0.08	n.d.	0.7	-
AGB-410-LTT	15	0.05	0.02	0.2	-
AGB-411-LTT	18	0.10	0.04	0.4	-

Agassiz Au-Ag Deposit - Biogeochemistry
Labrador Tea Twigs (*Ledum groenlandicum*)
I.N.A.A.

n.d. - not detected, below the limits of detection for this analytical method.

Part 3 : Humus/Humified Peat, Agassiz Deposit

SAMPLE NUMBER	Cu (ppm)	Pb (ppm)	Zn (ppm)	Mn (ppm)	Au (ppb)	Ash Yield (%)
AGB-412	132	24	84	200	3	26.20
AGB-413	124	40	76	650	5	12.62
AGB-415	110	14	42	540	2	19.89
AGB-415	154	22	54	1100	n.d.	14.87
AGB-416	106	16	32	1450	2	10.48
AGB-417	74	10	32	920	n.d.	11.85
AGB-418	109	14	31	2435	3	10.45
AGB-419	56	4	26	1850	2	17.38
AGB-420	148	6	26	3000	2	9.11
AGB-421	106	70	30	2200	2	16.18
AGB-422	76	14	28	335	4	12.87
AGB-423	62	12	14	395	2	10.30
AGB-424	64	12	24	94	2	7.37
AGB-425	114	9	18	78	3	8.48
AGB-426	56	12	28	85	1	11.10
AGB-427	176	24	56	51	1	14.29
AGB-428	136	18	52	27	2	9.71
AGB-429	86	28	28	28	n.d.	12.88
AGB-430	54	12	33	27	1	10.30
AGB-431	78	36	24	34	3	14.45
AGB-432	58	16	32	46	n.d.	7.64
AGB-433	66	18	28	50	1	7.37
AGB-434	52	16	26	59	2	14.22
AGB-435	78	20	30	94	2	6.87
AGB-436	62	20	30	380	2	5.99
AGB-437	69	19	25	182	2	8.83
AGB-438	68	216	22	640	1	5.78
AGB-439	58	32	20	114	2	7.04

Agassiz Au-Ag Deposit - Humified Peat Geochemistry
AAS

n.d. - not detected, below the limits of detection for this analytical method.

SAMPLE NUMBER	Zn (ppm)	As (ppm)	Sb (ppm)	Au (ppb)	Pb (ppm)
AGB-412	11	3.1	0.1	5.0	10
AGB-413	10	2.2	0.2	6.0	4
AGB-414	n.d.	1.4	0.1	6.1	4
AGB-415	8	1.4	0.2	3.9	6
AGB-416	n.d.	1.7	0.1	3.6	4
AGB-417	7	3.6	0.6	9.4	2
AGB-418	n.d.	1.5	0.2	4.9	3
AGB-419	13	1.5	0.1	2.8	8
AGB-420	n.d.	1.4	0.2	2.6	2
AGB-421	5	1.0	0.1	1.4	2
AGB-422	7	1.2	0.2	2.5	2
AGB-423	n.d.	0.7	0.2	3.5	2
AGB-424	n.d.	0.7	0.1	n.d.	2
AGB-425	n.d.	1.0	0.2	2.9	2
AGB-426	5	1.7	0.1	2.2	2
AGB-427	n.d.	1.0	0.1	2.3	4
AGB-428	5	6.6	0.7	2.8	4
AGB-429	10	2.3	0.3	2.8	2
AGB-430	n.d.	2.0	0.1	1.0	2
AGB-431	n.d.	1.5	0.1	3.1	n.d.
AGB-432	n.d.	2.1	0.3	1.7	2
AGB-433	5	2.1	0.2	1.8	n.d.
AGB-434	n.d.	1.7	7.0	2.2	n.d
AGB-435	n.d.	2.2	0.5	1.4	2
AGB-436	n.d.	2.4	0.6	1.9	2
AGB-437	5	2.0	0.4	2.4	2
AGB-438	n.d.	1.7	0.3	2.1	2
AGB-439	7	0.8	0.2	1.7	2

Agassiz Au-Ag Deposit - Humified Peat Geochemistry
I.N.A.A.

n.d. - not detected, below the limits of detection for this analytical method.

SAMPLE NUMBER	SAMPLE DEPTH (cm)	Cu(ppm)	Pb(ppm)	Zn(ppm)	Mn(ppm)	Au(ppm)	As(ppb)	Ash Yield (%)
AP1	0-30	68	138	685	267	4	n.d.	2.80
AP1	31-40	40	944	130	95	5	n.d.	2.57
AP1	41-50	24	46	40	68	1	n.d.	4.49
AP1	51-70	20	44	80	80	3	n.d.	4.55
AP1	71-86	160	26	110	147	1	n.d.	5.03
AP2	0-18	23	22	54	60	1	n.d.	5.42
AP2	19-30	28	22	76	128	1	n.d.	7.31
AP2	31-41	160	20	150	80	3	n.d.	7.64
AP2	42-56	29	14	98	128	2	n.d.	7.60
AP2	57-70	24	28	80	191	2	n.d.	6.23
AP2	71-80	35	20	76	440	1	n.d.	7.09
AP2	81-96	28	14	68	975	1	n.d.	5.84
AP2	97-110	690	30	466	1310	1	n.d.	6.45
AP2	111-129	32	22	98	950	n.d.	n.d.	6.12
AP2	130-148	48	18	130	480	1	n.d.	4.69
AP2	149-156	76	20	150	520	1	n.d.	5.06
AP2	157-170	107	20	164	510	1	0.4	4.93
AP2	171-180	68	22	160	490	2	n.d.	5.40
AP2	181-190	100	26	330	440	n.d.	n.d.	5.40
AP3	0-10	1100	395	1140	4875	n.d.	n.d.	1.07
AP3	11-31	76	90	685	380	n.d.	n.d.	2.49
AP3	31-50	65	68	533	200	3	n.d.	1.95
AP3	51-50	66	56	308	320	n.d.	n.d.	1.95
AP4	0-20	120	172	1070	600	5	n.d.	0.83
AP4	21-30	40	34	200	118	n.d.	n.d.	2.98
AP4	31-40	48	44	107	69	1	n.d.	2.24
AP4	41-45	50	46	110	60	n.d.	n.d.	3.31
AP4	46-55	72	34	118	63	n.d.	n.d.	3.11
AP4	56-65	68	34	72	42	2	n.d.	5.27
AP4	66-70	4	3	5	9	n.d.	n.d.	-
AP5	0-38	108	242	740	835	27	n.d.	1.03
AP5	39-53	520	68	500	142	2	n.d.	2.37
AP5	54-70	40	44	104	130	1	n.d.	4.09
AP5	71-86	64	40	40	46	1	n.d.	3.68
AP6	0-25	100	214	803	740	5	n.d.	0.84
AP6	26-45	2400	196	2000	287	22	n.d.	1.67
AP6	46-60	36	22	44	60	1	n.d.	8.40
AP7	0-23	116	172	870	1930	26	n.d.	1.75
AP7	24-34	580	42	400	327	2	n.d.	9.49
AP7	35-43	150	24	90	750	7	n.d.	11.80

Agassiz Au-Ag Deposit - Peat Geochemistry (Core)
A.A.S.

n.d. - not detected; below the limits of detection for this analytical method

Part 4 : Black Spruce Needles and Twigs, Rushed Showing Dot Lake

SAMPLE NUMBER	Cu (ppm)	Pb (ppm)	Zn (ppm)	Mn (%)	Ash Yield (%)
AGB-440-BSN	39	25	1110	3.29	4.85
AGB-441-BSN	43	21	940	2.39	4.46
AGB-442-BSN	41	25	820	3.10	4.17
AGB-443-BSN	41	22	1110	2.30	4.15
AGB-444-BSN	51	18	990	3.50	3.62
AGB-445-BSN	46	19	700	3.01	4.42
AGB-446-BSN	42	26	1055	4.09	4.57
AGB-447-BSN	40	32	1140	4.20	4.58
AGB-448-BSN	42	17	1335	4.50	4.27
AGB-449-BSN	67	30	1055	5.25	3.52
AGB-450-BSN	69	27	1250	3.36	3.27
AGB-451-BSN	72	20	980	4.98	3.75
AGB-452-BSN	45	24	1335	3.66	4.74
AGB-453-BSN	61	23	1305	5.00	3.85
AGB-454-BSN	54	22	1770	6.15	4.04
AGB-455-BSN	61	27	1655	3.05	4.26
AGB-456-BSN	67	21	1535	2.23	3.25
AGB-457-BSN	73	31	1810	2.14	3.66
AGB-458-BSN	61	24	1810	3.18	3.62
AGB-459-BSN	60	19	2270	3.30	3.68
AGB-460-BSN	61	23	1575	2.05	3.44
AGB-461-BSN	57	24	1885	2.39	3.59
ABG-462-BSN	54	23	1655	4.70	3.30
AGB-463-BSN	63	21	1885	3.70	3.84
AGB-464-BSN	72	65	2175	3.25	4.61
AGB-465-BSN	76	29	2405	1.96	3.04
AGB-466-BSN	-	-	-	-	-
AGB-467-BSN	67	32	2115	2.95	3.05
AGB-468-BSN	84	28	1615	1.05	3.30
AGB-469-BSN	79	28	1385	1.80	3.15
AGB-470-BSN	59	30	1615	1.68	4.14
AGB-471-BSN	44	29	2075	1.65	5.17
AGB-472-BSN	57	37	1470	1.26	4.17
AGB-473-BSN	53	26	1170	1.22	4.22
AGB-474-BSN	51	22	1690	1.64	4.63
AGB-475-BSN	54	22	1440	1.70	4.47
AGB-476-BSN	64	21	1375	1.55	3.51
AGB-477-BSN	60	26	1730	1.85	3.35
AGB-478-BSN	54	31	1110	1.96	3.92
AGB-479-BSN	64	19	960	1.42	4.73
AGB-480-BSN	66	26	1110	1.96	3.49
AGB-481-BSN	50	23	1390	1.85	4.54
AGB-482-BSN	49	27	1055	1.60	4.45
AGB-483-BSN	42	24	860	1.79	4.86
AGB-484-BSN	49	34	1025	1.88	4.83
AGB-485-BSN	45	28	800	1.16	3.69

Dot Lake - Biogeochemistry
Black Spruce Needles (*Picea mariana*)
A.A.S./Ash

SAMPLE NUMBER	As (ppm)	Au (ppb)
AGB-440-BST	0.27	1.4
AGB-441-BST	-	-
AGB-442-BST	0.30	1.2
AGB-443-BST	0.46	1.4
AGB-444-BST	0.42	0.8
AGB-445-BST	0.34	0.6
AGB-446-BST	0.35	1.2
AGB-447-BST	0.50	1.2
AGB-448-BST	0.34	0.8
AGB-449-BST	0.40	0.6
AGB-450-BST	0.40	1.4
AGB-451-BST	0.38	0.7
AGB-452-BST	0.46	0.7
AGB-453-BST	0.53	1.1
AGB-454-BST	0.40	0.8
AGB-455-BST	0.73	1.3
AGB-456-BST	0.56	1.1
AGB-457-BST	0.94	1.6
AGB-458-BST	0.64	0.8
AGB-459-BST	0.56	2.8
AGB-460-BST	0.48	3.2
AGB-461-BST	0.49	1.2
AGB-462-BST	0.40	0.9
AGB-463-BST	0.46	1.2
AGB-464-BST	0.45	3.0
AGB-465-BST	0.57	0.8
AGB-466-BST	-	-
AGB-467-BST	0.63	0.4
AGB-468-BST	1.30	0.7
AGB-469-BST	1.00	1.3
AHB-470-BST	0.48	0.5
AGB-471-BST	0.40	0.8
AGB-472-BST	0.52	0.9
AGB-473-BST	0.60	1.3
AGB-474-BST	0.38	1.0
AGB-475-BST	0.37	1.7
ABG-476-BST	0.29	0.5
AGB-477-BST	0.45	3.4
AGB-478-BST	0.32	0.7
AGB-479-BST	0.38	1.7
AGB-480-BST	0.33	1.2
AGB-481-BST	0.60	1.6
AGB-482-BST	0.31	0.9
AGB-483-BST	0.26	1.2
AGB-484-BST	0.32	1.8
AGB-485-BST	0.38	0.5

Dot Lake - Biogeochemistry
Black Spruce Twigs (*Picea mariana*)
I.N.A.A.

Part 5 : Black Spruce Needles and Twigs, Arbour Lake

SAMPLE NUMBER	Cu (ppm)	Pb (ppm)	Zn (ppm)	Mn (%)	As (ppm)	Au (ppb)
ALB-1-L1T3	48	38	2099	1.08	0.19	1.5
ALB-2-L1T3	60	34	1229	0.40	0.23	0.8
ALB-3-L1T3	24	18	1637	0.63	0.27	1.4
ALB-4-L1T3	22	18	1629	0.75	0.29	0.9
ALB-5-L1T3	52	58	725	0.14	0.20	0.8
ALB-6-L1T3	42	50	962	0.29	0.21	1.6
ALB-7-L1T3	45	60	1688	0.73	0.30	0.9
ALB-8-L1T3	60	52	1783	0.73	0.25	1.4
ALB-9-L1T3	63	86	704	0.56	0.25	1.0
ALB-10-L1T3	49	29	1766	0.85	0.19	0.8
ALB-11-L1T3	48	28	1619	0.75	0.20	1.0
ALB-12-L1T3	50	44	999	1.48	0.16	0.9
ALB-13-L1T3	57	138	785	1.40	0.25	1.4
ALB-14-L1T3	48	62	902	1.30	0.23	1.1
ALB-15-L1T3	44	38	708	0.79	0.24	1.3
ALB-16-L1T3	34	38	1156	1.06	0.18	1.0
ALB-17-L1T2	44	34	1301	0.65	0.19	1.1
ALB-18-L2T2	40	24	1706	0.53	0.17	1.0
ALB-19-L2T2	32	28	1445	0.30	0.26	0.6
ALB-20-L2T2	53	25	1765	0.69	0.23	8.6
ALB-21-L2T2	46	142	860	0.90	0.21	2.7
ALB-22-L2T2	48	56	1142	0.49	0.19	1.2
ALB-23-L2T2	36	20	1075	1.09	0.17	1.2
ALB-24-L2T2	64	26	1319	0.85	0.19	0.9
ALB-25-L3T1	53	32	1625	1.20	0.17	1.2
ALB-26-L3T1	53	36	1601	0.79	0.17	0.9
ALB-27-L3T1	46	102	1701	0.82	0.17	0.5
ALB-28-L3T1	36	66	1304	0.92	0.13	0.4
ALB-29-L3T1	46	38	2140	0.64	0.13	1.1
ALB-30-L3T1	46	43	979	0.62	0.11	0.8
ALB-31-L3T1	42	38	959	0.51	0.14	2.7

Arbour Lake Biogeochemistry
Black Spruce Needles
(Cu, Pb, Zn, Mn by A.A.S. in ash)
Black Spruce Twigs
(Au, As by I.N.A.A.)
(*Picea mariana*)

Part 6 : Black Spruce Needles and Twigs, Frances Lake Deposit

SAMPLE NUMBER	Cu (ppm)	Pb (ppm)	Zn (ppm)	Mn (%)	Ash Yield (%)
FLB-0-BSN	45	44	858	2.55	3.90
FLB-1-BSN	48	44	611	1.30	3.86
FLB-2-BSN	52	40	818	1.96	3.72
FLB-3-BSN	52	26	990	1.90	4.33
FLB-4-BSN	54	24	926	1.81	3.68
FLB-5-BSN	52	28	921	1.92	3.69
FLB-6-BSN	70	28	1149	2.18	3.26
FLB-7-BSN	52	34	1266	2.23	3.53
FLB-8-BSN	52	30	1280	2.83	3.92
FLB-9-BSN	44	20	1378	3.45	4.19
FLB-10-BSN	56	47	1273	3.04	3.41
FLB-11-BSN	52	30	1352	2.95	3.53
FLB-12-BSN	56	38	1488	3.25	3.99
FLB-13-BSN	50	146	1297	3.40	3.02
FLB-14-BSN	67	70	1194	3.45	3.08
FLB-15-BSN	62	48	1383	3.06	3.08
FLB-16-BSN	52	138	1253	2.76	2.93
FLB-17-BSN	52	34	1451	3.00	3.12
FLB-18-BSN	68	68	1303	3.65	2.67
FLB-19-BSN	70	56	1456	3.52	3.61
FLB-20-BSN	63	42	1474	3.66	2.88
FLB-21-BSN	62	30	1587	3.58	3.13
FLB-22-BSN	56	38	1150	3.35	3.40
FLB-23-BSN	50	58	1376	6.33	3.96
FLB-24-BSN	58	30	1146	5.31	3.77
FLB-25-BSN	63	42	1043	5.58	3.51
FLB-26-BSN	80	72	1380	4.38	3.42
FLB-27-BSN	70	38	1469	4.68	3.43
FLB-28-BSN	60	36	1587	3.93	3.62
FLB-29-BSN	52	28	1452	4.45	4.31
FLB-30-BSN	54	40	1381	4.72	3.58
FLB-31-BSN	54	36	1549	3.70	4.25
FLB-32-BSN	58	30	1377	6.55	4.05
FLB-33-BSN	62	32	1514	5.88	3.62
FLB-34-BSN	64	26	1534	8.39	3.93
FLB-35-BSN	63	30	1225	5.80	3.79
FLB-36-BSN	57	34	1346	4.60	3.49
FLB-37-BSN	56	24	1245	3.60	3.99
FLB-38-BSN	60	32	1632	2.20	4.07
FLB-39-BSN	46	30	1155	2.06	4.50
FLB-40-BSN	69	41	1313	3.31	4.07
FLB-41-BSN	60	60	1587	3.08	4.06
FLB-42-BSN	80	24	1830	2.40	4.08
FLB-43-BSN	65	44	1661	6.35	4.12
FLB-44-BSN	62	38	1581	1.85	3.77

SAMPLE NUMBER	Cu (ppm)	Pb (ppm)	Zn (ppm)	Mn (%)	Ash Yield (%)
FLB-45-BSN	62	16	1384	1.95	4.29
FLB-46-BSN	48	14	1146	1.98	4.86
FLB-47-BSN	52	40	893	3.59	4.60
FLB-48-BSN	40	18	1224	3.40	4.69
FLB-49-BSN	60	30	1034	3.40	3.92
FLB-50-BSN	52	25	1232	4.00	4.65
FLB-51-BSN	50	30	1451	3.99	3.63
FLB-52-BSN	50	72	1821	4.68	4.27
FLB-53-BSN	52	32	1348	4.08	5.02
FLB-54-BSN	54	46	1673	5.05	3.42
FLB-55-BSN	54	32	1433	6.33	4.28

Frances Lake Deposit - Biogeochemistry
Black Spruce Needles (*Picea mariana*)
A.A.S./Ash

SAMPLE NUMBER	As (ppm)	Au (ppb)
FLB-1000BST	0.18	0.9
FLB-1001BST	0.20	1.0
FLB-1002BST	0.19	0.7
FLB-1003BST	0.26	0.9
FLB-1004BST	0.22	0.8
FLB-1005BST	0.24	1.2
FLB-1006BST	0.28	3.2
FLB-1007BST	0.22	0.6
FLB-1008BST	0.23	0.8
FLB-1009BST	0.39	3.4
FLB-1010BST	0.26	14.0
FLB-1011BST	0.27	0.9
FLB-1012BST	0.23	1.3
FLB-1013BST	0.24	0.8
FLB-1014BST	0.29	0.6
FLB-1015BST	0.23	0.7
FLB-1016BST	0.23	0.9
FLB-1017BST	0.19	0.8
FLB-1018BST	0.26	1.0
FLB-1019BST	0.29	0.7
FLB-1020BST	0.22	0.7
FLB-1021BST	0.18	0.6
FLB-1022BST	0.23	1.1
FLB-1023BST	0.25	1.2
FLB-1024BST	0.21	0.5
FLB-1025BST	0.17	0.4
FLB-1026BST	0.22	0.5
FLB-1027BST	0.26	1.0
FLB-1028BST	0.21	0.7
FLB-1029BST	0.18	0.5
FLB-1030BST	0.21	0.7
FLB-1031BST	0.22	0.9
FLB-1032BST	0.15	0.9
FLB-1033BST	0.19	0.9
FLB-1034BST	0.20	0.8
FLB-1035BST	0.22	1.0
FLB-1036BST	0.26	1.0
FLB-1037BST	0.25	0.9
FLB-1038BST	0.25	1.1
FLB-1039BST	0.18	0.6
FLB-1040BST	0.21	0.9
FLB-1041BST	0.27	1.1
FLB-1042BST	0.22	0.9
FLB-1043BST	0.23	1.0
FLB-1044BST	0.24	2.4

SAMPLE NUMBER	As (ppm)	Au (ppb)
FLB-1045BST	0.22	1.4
FLB-1046BST	0.22	2.1
FLB-1047BST	0.17	1.8
FLB-1048BST	0.18	2.5
FLB-1049BST	0.19	3.0
FLB-1050BST	0.23	1.9
FLB-1051BST	0.20	1.9
FLB-1052BST	0.17	1.6
FLB-1053BST	0.24	1.6
FLB-1054BST	0.24	2.8
FLB-1055BST	0.32	22.0

Frances Lake Deposit - Biogeochemistry
Black Spruce Twigs (*Picea mariana*)
I.N.A.A.

Appendix 2 : Analytical Reproducibility

Part 1 : Black Spruce Needles and Twigs, Agassiz Deposit

Part 2 : Labrador Tea Leaves and Twigs, Agassiz Deposit

Part 3 : Humus/Humified Peat, Agassiz Deposit

Part 4 : Black Spruce Needles and Twigs, Rushed Showing, Dot Lake

Part 5 : Black Spruce Needles and Twigs, Arbour Lake

Part 6 : Black Spruce Needles and Twigs, Frances Lake Deposit

Part 1 : Black Spruce Needles and Twigs. Agassiz Deposit

SAMPLE NUMBER	Zn (ppm)		As (ppm)		Sb (ppm)		Au (ppb)	
	1	2	1	2	1	2	1	2
AGB-208-BSN	69	57	0.10	0.11	0.01	n.d.	1.1	0.4
AGB-216-BSN	36	32	0.06	0.04	0.01	n.d.	0.4	0.4
AGB-224-BSN	28	28	0.08	0.06	0.01	0.01	0.6	0.5

Trace element reproducibility of I.N.A.A. data in Black Spruce (Picea mariana) needles collected over the Central Zone of the Agassiz Deposit, line 6551.

SAMPLE NUMBER	Zn (ppm)		As (ppm)		Sb (ppm)		Au (ppb)	
	1	2	1	2	1	2	1	2
AGB-208-BST	44	54	0.22	0.23	0.01	0.02	0.3	0.7
AGB-216-BST	33	31	0.17	0.17	0.01	0.01	0.4	0.2
AGB-224-BSN	33	38	0.19	0.19	0.02	0.01	0.4	0.4

Trace element reproducibility of I.N.A.A. data in Black Spruce (Picea mariana) twigs collected over the Central Zone of the Agassiz Deposit, line 6551.

Part 2 : Labrador Tea Leaves and Twigs, Agassiz Deposit

SAMPLE NUMBER	Zn (ppm)		As (ppm)		Sb (ppm)		Au (ppb)	
	1	2	1	2	1	2	1	2
AGB-352-LTL	15	15	0.11	0.12	0.01	0.01	0.4	0.2
AGB-364-LTL	16	14	0.08	0.06	0.01	0.01	1.3	1.6
AGB-374-LTL	15	17	0.05	0.06	0.02	n.d.	1.1	0.7
AGB-384-LTL	14	14	0.07	0.07	0.02	0.02	0.9	0.9
AGB-394-LTL	13	12	0.02	0.08	0.05	0.01	0.3	0.4
AGB-403-LTL	13	12	0.04	0.11	0.01	0.01	0.5	0.9

Trace element reproducibility of I.N.A.A. data in Labrador Tea (*Ledum groenlandicum*) leaves collected over the Central Zone of the Agassiz Deposit, line 6551.

SAMPLE NUMBER	Zn (ppm)		As (ppm)		Sb (ppm)		Au (ppb)	
	1	2	1	2	1	2	1	2
AGB-352-LTT	14	16	0.09	0.14	0.01	0.01	0.6	0.6
AGB-364-LTT	14	11	0.07	0.08	0.02	0.01	0.9	0.6
AGB-374-LTT	16	21	0.10	0.09	0.03	0.01	1.2	0.6
AGB-384-LTT	15	10	0.08	0.04	0.09	0.04	0.8	0.6
AGB-394-LTT	18	19	0.03	0.03	0.01	n.d.	0.6	1.1
AGB-403-LTL	11	15	1.0	7.0	n.d.	n.d.	0.3	1.0

Trace element reproducibility of I.N.A.A. data in Labrador Tea (*Ledum groenlandicum*) twigs collected over the Central Zone of the Agassiz Deposit, line 6551.

Part 3 : Humus/Humified Peat, Agassiz Deposit

SAMPLE NUMBER	Zn (ppm)		As (ppm)		Sb (ppm)		Au (ppb)		Pb (ppm)	
	1	2	1	2	1	2	1	2	1	2
AGB-418	n.d	n.d.	1.3	1.6	0.1	0.2	4.4	5.4	4	2
AGB-425	n.d.	n.d.	0.9	1.0	0.2	0.1	3.5	2.4	4	n.d.
AGB-437	7	n.d.	1.5	2.5	0.2	0.5	2.0	2.7	4	n.d.

Trace element reproducibility of I.N.A.A. data in humified peat samples collected over the Central zone of the Agassiz deposit, line 6551.

Part 4 : Black Spruce Needles and Twigs, Rushed Showing Dot Lake

SAMPLE NUMBER	Cu (ppm)		Pb (ppm)		Zn (ppm)		Mn (%)		Ash Yield (%)	
	1	2	1	2	1	2	1	2	1	2
AGB-454-BSN	56	52	20	23	1810	1730	6.00	6.30	4.05	4.05
AGB-465-BSN	68	84	25	32	2500	2310	2.08	1.85	2.86	3.22
AGB-476-BSN	67	60	24	18	1440	1305	1.68	1.42	3.53	3.48

Trace element reproductibility of A.A.S. data in Black Spruce (Picea mariana) needles collected over the Rushed Showing, Dot Lake area.

SAMPLE NUMBER	As (ppm)		Au (ppb)	
	1	2	1	2
AGB-443-BST	0.47	0.45	1.0	1.8
AGB-465-BST	0.68	0.45	1.1	1.8
AGB-476-BST	0.29	0.29	0.6	0.4

Trace element reproducibility by of I.N.A.A. data in Black Spruce (Picea mariana) twigs collected over the Rushed Showing, Dot Lake area; Dot Lake.

Part 5 : Black Spruce Needles and Twigs, Arbour Lake

SAMPLE NUMBER	Cu (ppm)		Pb (ppm)		Zn (ppm)		Mn (%)		Ash Yield (%)	
	1	2	1	2	1	2	1	2	1	2
ALB-10-BSN	48	49	28	30	1819	1713	0.91	0.91	4.21	3.65
ALB-20-BSN	57	49	26	24	1698	1832	0.79	0.69	3.40	3.79
ALB-30-BSN	44	48	50	36	1027	931	0.98	0.68	3.00	3.07

Trace element reproducibility of A.A.S. data in Black Spruce (*Picea mariana*) needles; Arbour Lake area.

Part 6 : Black Spruce Needles and Twigs, Frances Lake Deposit

SAMPLE NUMBER	As (ppm)		Au (ppb)	
	1	2	1	2
ALB-10-BST	0.18	0.19	1.1	0.5
ALB-20-BST	0.25	0.21	14.0	3.1
ALB-30-BST	0.13	0.09	0.7	0.8

Trace element reproducibility of I.N.A.A. data in Black Spruce (*Picea mariana*) twigs; Arbour Lake area.

SAMPLE NUMBER	Cu (ppm)		Pb (ppm)		Zn (ppm)		Mn (%)		Ash Yield (%)	
	1	2	1	2	1	2	1	2	1	2
FLB-1010-BSN	52	59	62	32	1352	1194	3.33	2.76	3.59	3.23
FLB-1020-BSN	62	64	40	44	1483	1466	4.45	2.88	2.77	2.99
FLB-1030-BSN	60	48	26	54	1484	1278	4,68	4.75	3.55	3.60
FLB-1040-BSN	78	60	34	40	1254	1372	3.25	3.38	3.79	4.36
FLB-1050-BSN	50	54	26	24	1110	1353	4.00	3.40	4.62	4.69

Trace and minor element reproducibility of A.A.S. data in Black Spruce (*Picea mariana*) needles collected over the Frances Lake deposit, Lynn Lake area.

SAMPLE NUMBER	As (ppm)		Au (ppb)	
	1	2	1	2
FLB-1010-BST	0.32	0.20	1.0	27.0
FLB-1020-BST	0.20	0.24	0.6	0.7
FLB-1030-BST	0.19	0.22	0.6	0.8
FLB-1040-BST	0.25	0.17	1.1	0.6
FLB-1050-BST	0.20	0.25	2.3	1.5

Trace element reproducibility of I.N.A.A. data in Black Spruce (*Picea mariana*) twigs collected over the Frances Lake deposit, Lynn Lake area.

Appendix 3	:	Statistical Summary of Analytical Data
Part 1	:	Black Spruce Needles and Twigs, Agassiz Deposit
Part 2	:	Labrador Tea Leaves and Twigs, Agassiz Deposit
Part 3	:	Humus/Humified Peat, Agassiz Deposit
Part 4	:	Black Spruce Needles and Twigs, Rushed Showing, Dot Lake
Part 5	:	Black Spruce Needles and Twigs, Arbour Lake
Part 6	:	Black Spruce Needles and Twigs, Frances Lake Deposit

Part 1 : Black Spruce Needles and Twigs, Agassiz Deposit

Organ	Element	Range	Arithmetic Mean	Standard Deviation	Geometric Mean
BSN	Zn	31 - 72	46	18	43
BST		27 - 53	36	8	35
BSN	As	0.05 - 0.14	0.08	0.03	0.08
BST		0.08 - 0.35	0.18	0.06	0.17
BSN	Sb	0.01 - 0.02	0.01	0.002	0.01
BST		0.01 - 0.03	0.01	0.01	0.01
BSN	Au	0.4 - 1.1	0.6	0.2	0.6
BST		0.1 - 0.7	0.4	0.1	0.4

Summary of I.N.A.A. data for Black Spruce (Picea mariana) samples (n = 19) collected over the Central Zone of the Agassiz deposit. Values for Zn, As and Pb in ppm; Au in ppb. BSN - Black Spruce needles; BST - Black Spruce twigs.

Part 2 : Labrador Tea Leaves and Twigs, Agassiz Deposit

Organ	Element	Range	Arithmetic Mean	Standard Deviation	Geometric Mean
LTL	Zn	11 - 22	15	3	15
LTT		8 - 22	14	3	14
LTL	As	0.03 - 0.38	0.10	0.08	0.09
LTT		0.03 - 0.70	0.10	0.12	0.08
LTL	Sb	0.01 - 0.13	0.02	0.02	0.01
LTT		0.01 - 0.10	0.02	0.02	0.01
LTL	Au	0.3 - 6.1	1.7	1.7	1.1
LTT		0.2 - 2.2	0.7	0.4	0.6

Summary of I.N.A.A. data for Labrador Tea (Ledum groenlandicum) samples (n = 30) collected over the Central Zone of the Agassiz deposit, line 6551. Values for Zn, As and Sb in ppm; Au in ppb. LTL - Labrador Tea leaves; LTT - Labrador Tea twigs.

Part 3 : Humus/Humified Peat, Agassiz Depost

Element	Range	Arithmetic Mean	Standard Deviation	Geometric Mean
Cu	52 - 170	90	35	85
Pb	4 - 216	27	39	19
Zn	14 - 84	34	16	31
Mn	27 - 3000	609	830	223
Au	1 - 5	2	0.9	1.8
Ash Yield	5.8 - 26.2	11.6	4.6	10.8

Summary of A.A.S. data from humified peat samples, line 6551, (n = 28) Central Zone, Agassiz deposit. Values for Cu, Pb, Zn and Mn in ppm; Au in ppb; Ash Yield in %.

Element	Range	Arithmetic Mean	Standard Deviation	Geometric Mean
Zn	n.d. - 13	4	4	7
As	0.70 - 6.6	1.88	1.1	1.65
Sb	0.10 - 7.0	0.48	1.3	0.22
Au	n.d. - 9.4	3.0	1.9	2.7
Pb	n.d. - 10.0	2.8	2.2	2.8

Summary of I.N.A.A. data for humified peat samples (n = 28) collected over the Central Zone of the Agassiz deposit, line 6551. Values for Pb, Zn, As and Sb in ppm; Au in ppb.

Part 4 : Black Spruce Needles and Twigs, Rushed Showing, Dot Lake

Element	Range	Arithmetic Mean	Standard Deviation	Geometric Mean
Cu	39 - 84	57	12	55
Pb	17 - 65	26	7	25
Zn	700 - 2405	1412	426	1350
Mn	1.05 - 6.15	2.73	1.26	2.47
Ash Yield	3.04 - 5.17	4.00	0.57	3.97

Summary of A.A.S. analytical data for Black Spruce (<u>Picea mariana</u>) needles (n = 45) collected over the Rushed Showing, Dot Lake area. Values for Cu, Pb and Zn in ppm; Mn and Ash Yield in %.

Element	Range	Arithmetic Mean	Standard Deviation	Geometric Mean
As	0.26 - 1.30	0.48	0.2	0.45
Au	0.4 - 3.4	1.2	0.7	1.1

Summary of I.N.A.A. data for Black Spruce (<u>Picea mariana</u>) twigs (n = 45) collected over the Rushed Showing, Dot Lake area. Values for As in ppm; Au in ppb.

Part 5 : Black Spruce Needles and Twigs, Arbour Lake

Element	Range	Arithmetic Mean	Standard Deviation	Geometric Mean
Cu	22 - 64	46	10	45
Pb	18 - 142	48	31	42
Zn	704 - 2602	1365	472	1287
Mn	1400 - 14800	7719	3175	6985
Ash Yield	1.77 - 6.32	3.51	0.97	3.56

Summary of A.A.S. data for Black Spruce (Picea mariana) needles (n = 31) Arbour Lake area. Values for Cu, Pb, Zn and Mn in ppm; Ash Yield in %.

Element	Range	Arithmetic Mean	Standard Deviation	Geometric Mean
As	0.110 - 0.300	0.202	0.05	0.197
Au	0.4 - 8.6	1.38	1.43	1.12

Summary of I.N.A.A. data for Black Spruce (Picea mariana) twigs (n = 31), Arbour Lake area. Values for As in ppm; Au in ppb.

Part 6 : Black Spruce Needles and Twigs, Frances Lake Deposit

Element	Range	Arithmetic Mean	Standard Deviation	Geometric Mean
Cu	40 - 80	57	8	57
Pb	14 - 146	41	24	37
Zn	611 - 1830	1319	284	1293
Mn	1.30 - 8.39	3.68	1.47	3.41
Ash Yield	2.67 - 5.02	3.80	0.51	3.77

Summary of A.A.S. analytical data for Black Spruce (*Picea mariana*) needles (n = 56) collected over the Frances Lake deposit, Lynn Lake area. Values for Cu, Pb and Zn in ppm; Mn and Ash Yield in %.

Element	Range	Arithmetic Mean	Standard Deviation	Geometric Mean
Au	0. 4 - 22.0	1.79	3.32	1.14
As	0.15 - 0.39	0.22	0.04	0.22

Summary of I.N.A.A. data for Black Spruce (*Picea mariana*) twigs (n = 56) collected over the Frances Lake deposit, Lynn Lake area. Values for As in ppm; Au in ppb.

Appendix 4	:	Correlation Coefficients
Part 1	:	Black Spruce Needles and Twigs, Agassiz Deposit
Part 2	:	Labrador Tea Leaves and Twigs, Agassiz Deposit
Part 3	:	Humus/Humified Peat, Agassiz Deposit
Part 4	:	Black Spruce Needles and Twigs, Rushed Showing, Dot Lake
Part 5	:	Black Spruce Needles and Twigs, Arbour Lake
Part 6	:	Black Spruce Needles and Twigs, Frances Lake Deposit

Part 1 : Black Spruce Needles and Twigs, Agassiz Deposit

	Zn	Sb	As	Au
Au	0.1872 (.303)	0.2443 (.253)	0.4333 (.023)	-
As	0.7272 (.001)	0.2650 (.196)	-	-
Sb	0.1824 (.360)	-	-	-
Zn	-	-	-	-

Kendall non-parametric correlation coefficient matrix for Black Spruce (<u>Picea mariana</u>) needles (n = 19) collected over the Central Zone of the Agassiz deposit, line 6551. Bracketed figure denotes the statistical significance of the correlation coefficient. I.N.A.A. data.

	Zn	Sb	As	Au
Au	0.2704 (.263)	0.2693 (.265)	0.4979 (.030)	-
As	0.8689 (.001)	0.3047 (.205)	-	-
Sb	0.2115 (.375)	-	-	-
Zn	-	-	-	-

Spearman non-parametric correlation coefficient matrix for Black Spruce (<u>Picea mariana</u>) needles (n = 19) collected over the Central Zone of the Agassiz deposit, line 6551. Bracketed figure denotes the statistical significance of the correlation coefficient. I.N.A.A. data.

	Zn	Sb	As	Au
Au	0.5834 (.009)	0.6118 (.005)	0.6898 (.001)	-
As	0.7525 (.001)	0.8456 (.001)	-	-
Sb	0.6671 (.002)	-	-	-
Zn	-	-	-	-

Spearman non-parametric correlation coefficient matrix for Black Spruce (*Picea mariana*) twigs (n = 19) collected over the Central Zone of the Agassiz deposit, line 6551. Bracketed figure denotes the statistical significance of the correlation coefficient. I.N.A.A. data.

	Zn	Sb	As	Au
Au	0.4277 (.018)	0.5463 (.008)	0.5527 (.002)	-
As	0.5758 (.001)	0.7348 (.001)	-	-
Sb	0.5511 (.005)	-	-	-
Zn	-	-	-	-

Kendall non-parametric correlation coefficient matrix for Black Spruce (*Picea mariana*) twigs (n = 19) collected over the Central Zone of the Agassiz deposit, line 6551. Bracketed figure denotes the statistical significance of the correlation coefficient. I.N.A.A. data.

Part 2 : Labrador Tea Leaves and Twigs, Agassiz Deposit

	Zn	Sb	As	Au
Au	-0.2658 (.156)	0.3202 (.085)	0.0694 (.715)	-
As	0.6702 (.001)	0.0289 (.880)	-	-
Sb	-0.1299 (.494)	-	-	-
Zn	-	-	-	-

Spearman non-parametric correlation coefficient matrix for Labrador Tea (Ledum groenlandicum) leaves (n = 30) collected over the Central Zone of the Agassiz deposit, line 6551. Bracketed figure denotes the statistical significance of the correlation coefficient. I.N.A.A. data.

	Zn	Sb	As	Au
Au	-0.2012 (.141)	0.2556 (.087)	0.0556 (.679)	-
As	0.5141 (.001)	0.0168 (.911)	-	-
Sb	-0.1004 (.514)	-	-	-
Zn	-	-	-	-

Kendall non-parametric correlation coefficient matrix for Labrador Tea (Ledum groenlandicum) leaves (n = 30) collected over the Central Zone of the Agassiz deposit, line 6551. Bracketed figure denotes the statistical significance of the correlation coefficient. I.N.A.A. data.

	Zn	Sb	As	Au
Au	-0.0676 (.723)	0.0837 (.660)	0.0309 (.871)	-
As	0.5088 (.004)	-0.0297 (.876)	-	-
Sb	0.0121) (.949)	-	-	-
Zn	-	-	-	-

Spearman non-parametric correlation coefficient matrix for Labrador Tea (Ledum groenlandicum) twigs (n = 30) collected over the Central Zone of the Agassiz deposit, line 6551. Bracketed figure denotes the statistical significance of the correlation coefficient. I.N.A.A. data.

	Zn	Sb	As	Au
Au	-0.0303 (.827)	0.0770 (.623)	0.0579 (.676)	-
As	0.3885 (.005)	-0.0304 (.845)	-	-
Sb	0.0152 (.922)	-	-	-
Zn	-	-	-	-

Kendall non-parametric correlation coefficient matrix for Labrador Tea (Ledum groenlandicum) twigs (n = 30) collected over the Central Zone of the Agassiz deposit, line 6551. Bracketed figure denotes the statistical significance of the correlation coefficient. I.N.A.A. data.

Part 3 : Humus/Humified Peat, Agassiz Deposit

	Pb	Au	Sb	As	Zn
Zn	0.3017 (.066)	0.2159 (.146)	-0.0145 (.918)	0.2132 (.158)	-
As	0.0539 (.723)	0.0821 (.551)	0.3885 (.009)	-	-
Sb	-0.2650 (.102)	-0.0454 (.756)		-	-
Au	0.3809 (.001)	-	-	-	-
Pb	-	-	-	-	-

Kendall non-parametric correlation coefficient matrix for humified peat samples (n = 28) collected over the Central Zone of the Agassiz deposit, line 6551. I.N.A.A. data.

	Pb	Au	Sb	As	Zn
Zn	0.3528 (.066)	0.2819 (.146)	-0.0109 (.956)	0.2672 (.169)	-
As	0.0572 (.773)	0.1339 (.497)	0.4906 (.008)	-	-
Sb	-0.3079 (.111)	-0.0480 (.808)	-	-	-
Au	0.5093 (.006)	-	-	-	-
Pb	-	-	-	-	-

Spearman non-parametric correlation coefficient matrix for humified peat samples (n = 28) collected over the Central Zone of the Agassiz deposit, line 6551. I.N.A.A. data.

	Ash	Au	Mn	Zn	Pb	Cu
Cu	0.3160 (.101)	0.2619 (.178)	0.2456 (.208)	0.4734 (.011)	0.2475 (.204)	-
Pb	0.0387 (.845)	0.0111 (.955)	-0.1208 (.540)	0.1901 (.333)	-	-
Zn	0.4177 (.027)	-0.1029 (.602)	0.0361 (.855)	-	-	-
Mn	0.1840 (.349)	0.2543 (.192)	-	-	-	-
Au	0.1646 (.403)	-	-	-	-	-
Ash	-	-	-	-	-	-

Spearman non-parametric correlation coefficient matrix for humified peat samples (n = 28) collected over the Central Zone of the Agassiz deposit, line 6551. Bracketed figure denotes the statistical significance of the correlation coefficient. A.A.S. analytical data.

	Ash	Au	Mn	Zn	Pb	Cu
Cu	0.2163 (.109)	0.2031 (.178)	0.1789 (.185)	0.3619 (.008)	0.1631 (.234)	-
Pb	0.0108 (.937)	0.0098 (.949)	-0.0839 (.539)	0.1572 (.256)	-	-
Zn	0.2819 (.039)	-0.0982 (.520)	0.0108 (.937)	-	-	-
Mn	0.0798 (.553)	0.2087 (.165)	-	-	-	-
Au	0.1220 (.417)	-	-	-	-	-
Ash	-	-	-	-	-	-

Kendall non-parametric correlation coefficient matrix for humified peat samples (n = 28) collected over the Central Zone of the Agassiz deposit, line 6551. Bracketed figure denotes the statistical significance of the correlation coefficient. A.A.S. analytical data.

Part 4 : Black Spruce Needles and Twigs, Rushed Showing, Dot Lake

	Ash	Mn	Zn	Pb	Cu
Cu	-0.6877 (.001)	-0.0509 (.740)	0.4611 (.001)	0.1455 (.340)	-
Pb	-0.0297 (.846)	-0.2387 (.114)	0.1827 (.230)	-	-
Zn	-0.3233 (.030)	0.0247 (.872)	-	-	-
Mn	-0.0735 (.631)	-	-	-	-
Ash	-	-	-	-	-

Spearman non-parametric correlation coefficient matrix for Black Spruce (Picea mariana) needles (n = 45) collected over the Rushed Showing, Dot Lake area. Bracketed figure denotes the statistical significance of the correlation coefficient. A.A.S. analytical data.

	Ash	Mn	Zn	Pb	Cu
Cu	-0.5203 (.001)	-0.0359 (.732)	0.3241 (.002)	0.0881 (.409)	-
Pb	-0.0176 (.868)	-0.1604 (.128)	0.1166 (.271)	-	-
Zn	-0.2292) (.028)	0.0285 (.784)	-	-	-
Mn	-0.0344 (.739)	-	-	-	-
Ash	-	-	-	-	-

Kendall non-parametric correlation coefficient matrix for Black Spruce (Picea mariana) needles (n = 45) collected over the Rushed Showing, Dot Lake area. Bracketed figure denotes the statistical significance of the correlation coefficient. A.A.S. analytical data.

KENDALL CORRELATION COEFFICIENTS

As r = 0.0519
with
Au sig. = .0632

SPEARMAN CORRELATION COEFFICIENTS

As r = 0.0794
with
Au sig. = .609

Non-parametric correlation coefficients for Black Spruce (Picea mariana) twigs (n = 45), Rushed Showing, Dot Lake area. I.N.A.A. analytical data.

Part 5 : Black Spruce Needles and Twigs, Arbour Lake

	Ash	Mn	Zn	Pb	Cu
Cu	-0.3580 (.048)	0.1285 (.491)	-0.0038 (.984)	0.2601 (.158)	-
Pb	-0.0669 (.535)	0.1243 (.505)	-0.4399 (.013)	-	-
Zn	0.1158 (.240)	0.0411 (.826)	-	-	-
Mn	0.2176 (.240)	-	-	-	-
Ash	-	-	-	-	-

Spearman non-parametric correlation coefficient matrix for Black Spruce (*Picea mariana*) needles (n = 31) Arbour Lake area. Bracketed figure denotes the statistical significance of the correlation coefficient. A.A.S. analytical data.

	Ash	Mn	Zn	Pb	Cu
Cu	-0.2666 (.039)	0.0970 (.453)	-0.0176 (.891)	0.1893 (.146)	-
Pb	-0.0503 (.695)	0.0789 (.539)	-0.3141 (.014)	-	-
Zn	0.0518 (.683)	0.0194 (.878)	-	-	-
Mn	0.1473 (.247)	-	-	-	-
Ash	-	-	-	-	-

Kendall non-parametric correlation coefficient matrix for Black Spruce (Picea mariana) needles (n = 31) Arbour Lake area. Bracketed figure denotes the statistical significance of the correlation coefficient. A.A.S. analytical data.

KENDALL CORRELATION COEFFICIENTS

As r = 0.0903
with
Au sig. = .602

SPEARMAN CORRELATION COEFFICIENTS

As r = 0.0940
with
Au sig. = .615

Non-parametric correlation coefficients for Black Spruce (Picea mariana) twigs (n = 31) Arbour Lake area. I.N.A.A. analytical data.

Part 6 : Black Spruce Needles and Twigs, Frances Lake Deposit

	Ash	Mn	Zn	Pb	Cu
Cu	0.2423 (.072)	0.2402 (.075)	0.3555 (.007)	0.1441 (.289)	-
Pb	0.1687 (.214)	0.1699 (.210)	0.1404 (.302)	-	-
Zn	0.3708 (.005)	0.3723 (.005)	-	-	-
Mn	0.0006 (.977)	-	-	-	-
Ash	-	-	-	-	-

Spearman non-parametric correlation coefficient matrix for Black Spruce (*Picea mariana*) needles (n = 56) collected over the Frances Lake deposit, Lynn Lake area. The bracketed figure denotes the statistical significance of the correlation coefficient. A.A.S. analytical data.

	Ash	Mn	Zn	Pb	Cu
Cu	0.1668 (.079)	0.1656 (.081)	0.2439 (.010)	0.1121 (.242)	-
Pb	0.1196 (.202)	0.1185 (.207)	0.0939 (.317)	-	-
Zn	0.2742) (.899)	0.2770 (.003)	-	-	-
Mn	0.0117 (.899)	-	-	-	-
Ash	-	-	-	-	-

Kendall non-parametric correlations coefficient matrix for Black Spruce (*Picea mariana*) needles (n = 56) collected over the Frances Lake deposit, Lynn Lake area. The bracketed figure denotes the statistical significance of the correlation coefficient. A.A.S. analytical data.

KENDALL CORRELATION COEFFICIENTS

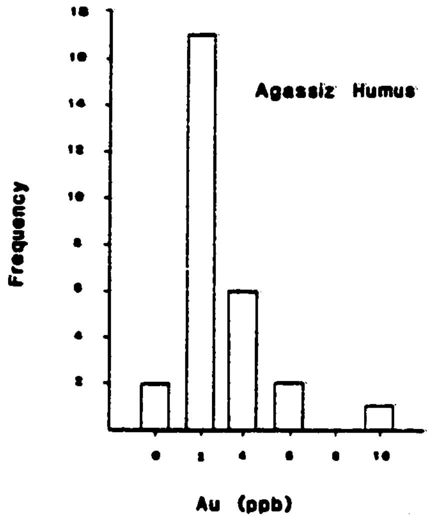
As r = -0.1776
with
Au sig. = .074

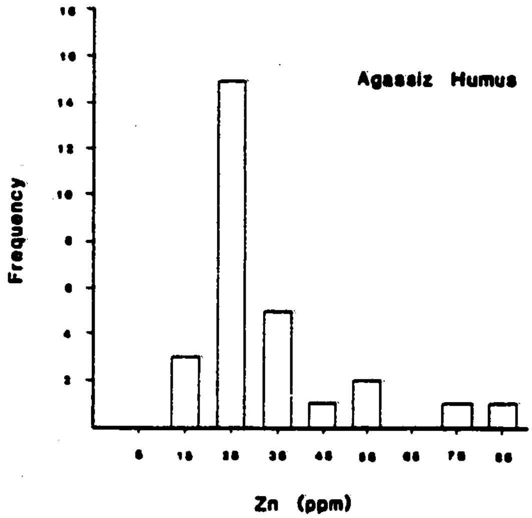
SPEARMAN CORRELATION COEFFICIENTS

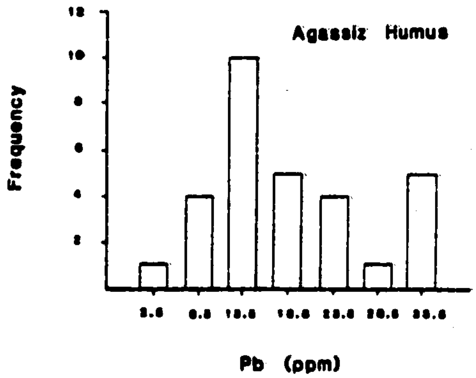
As r = -0.2574
with
Au sig. = .055

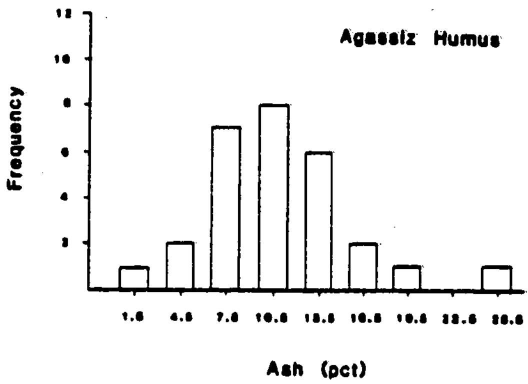
Non-parametric correlation coefficients for Black Spruce (*Picea mariana*) twigs (n = 56) collected over the Frances Lake deposit, Lynn Lake area. I.N.A.A. analytical data.

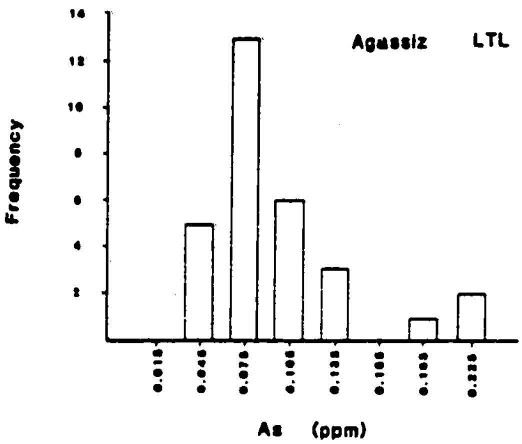
Appendix 5 : Selected Histograms

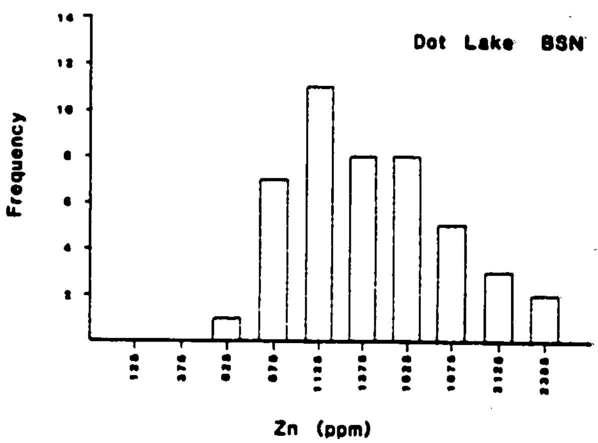


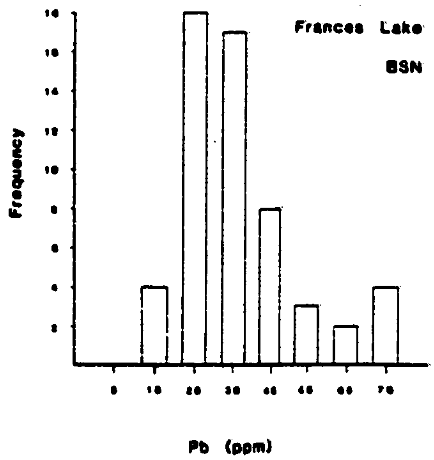


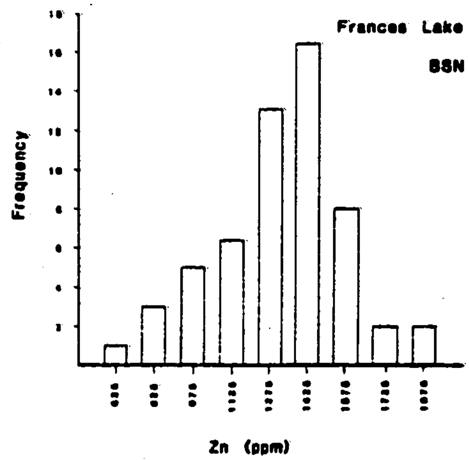


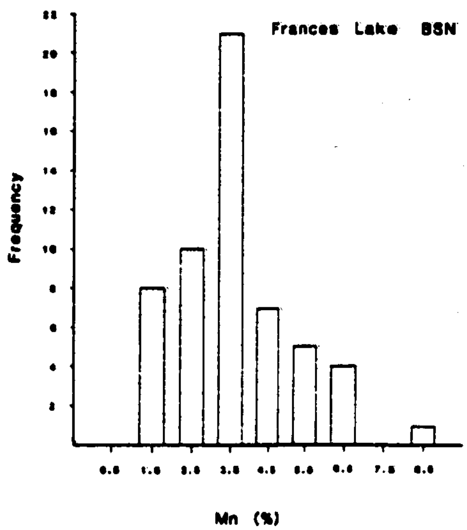


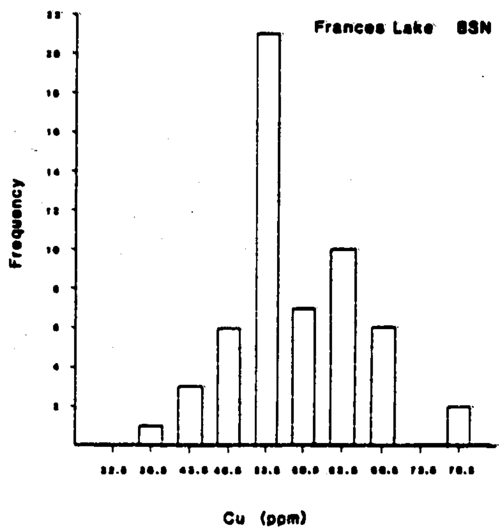


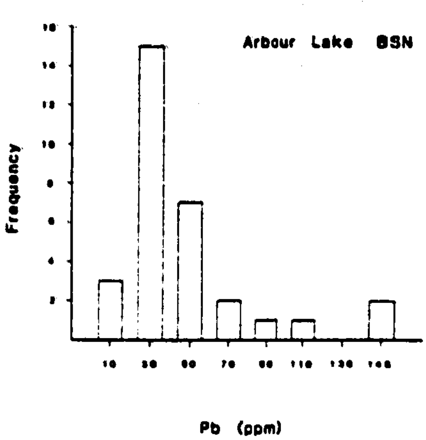


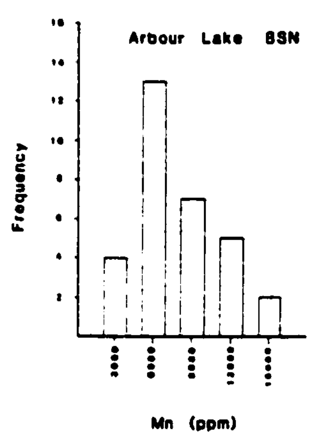

Frances Lake
BSN
Frequency
Pb (ppm)


Frances Lake
BSN
Frequency
Zn (ppm)


Frances Lake BSN
Frequency
Mn (%)


Frances Lake BSN
Frequency
Cu (ppm)


Arbour Lake BSN
Frequency
Pb (ppm)


Arbour Lake BSN
Frequency
Mn (ppm)