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Northern Resources Development Program

La mise en valeur des ressouces du Nord

Indicator Mineral Content and Geochemistry of Stream and Glacial Sediments from the Etsho Plateau Region as an Aid to Kimberlite and Base Metal Exploration, Northeast British Columbia (NTS 94I, 94P)

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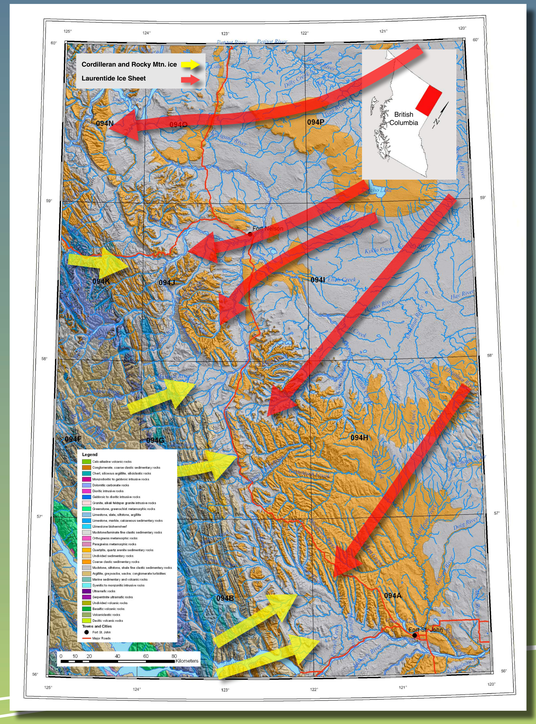
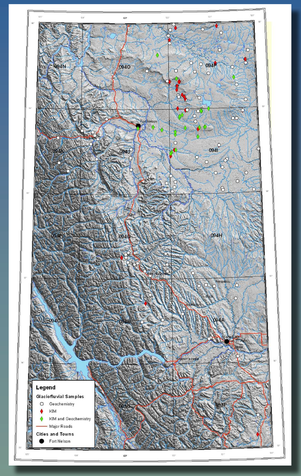
ABSTRACT

A two-year reconnaissance-scale stream and glacial sediment sampling project funded under Geoscience British Columbia was carried out in northeast British Columbia. Geochemical and mineralogical data from glacial and stream sediments were evaluated to determine the resource potential for a number of commodities, including diamond-bearing kimberlites, gold and base metals. Kimberlite indicator minerals were recovered from the heavy mineral fraction of most of the stream sediment samples, and about half of the glacial sediment samples, suggesting that further exploration is warranted. Elevated zinc, lead, and silver concentrations in the heavy mineral concentrates of stream sediments and the presence of sphalerite grains in some stream and glacial sediment samples suggest potential for sedimentary-hosted base metal mineralization.

GEOLOGY



METHODOLOGY

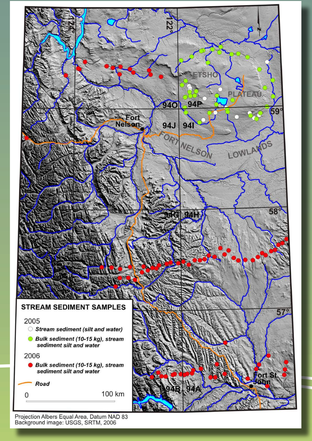


Jan Bednarski, GSC, takes notes at a glaciofluvial sediment sampling site in northeast British Columbia (contributed by J. Bednarski, GSC).

Travis Ferbey, BCMEMPR, takes notes at a glaciofluvial sediment sampling site in northeast British Columbia (contributed by T. Ferbey, BCMEMPR).

Tanya Demchuk, University of Victoria, and Travis Ferbey, BCMEMPR, at a glaciofluvial sediment sampling site in northeast British Columbia (contributed by T. Ferbey, BCMEMPR).

Trucks, helicopters and all-terrain vehicles are used to reach sites from which glaciofluvial and stream sediment samples are collected. Bulk samples of sediment, 20-25 kg for glaciofluvial samples and 10-15 kilograms for stream samples, are collected for kimberlite indicator mineral analysis. Smaller samples, 2 to 4 kilograms, are collected for geochemical analysis.



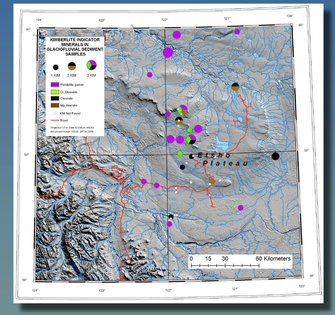
Alain Grenier, GSC, prepares to sample a stream west of Fort Nelson, British Columbia (contributed by S. Day, GSC).

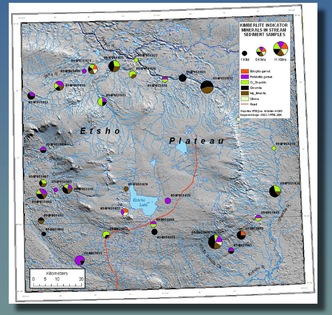
GSC employees Steve Adcock, Alain Grenier and Martin McCurdy collect a bulk sediment sample from a site along the Alaska Highway in northeast British Columbia (contributed by S. Day, GSC).

GSC employees Steve Adcock, Steve Day and Martin McCurdy sample a longitudinal gravel bar on Red Creek, west of Fort St. John (contributed by A. Grenier, GSC).

Bulk glacial and stream sediment samples undergo heavy mineral separation using a combination of a shaking table and heavy liquids (specific gravity 3.2) to separate the nonferromagnetic heavy mineral fraction. The heavy mineral concentrate (HMC) is picked for KIM and other indicators such as gold in the same laboratory. Gold grains, KIM and other heavy minerals are identified in the 0.25 to 2 mm fraction under binocular microscopes. Visual identification of mineral grains is made mainly on the basis of colour, crystal habit, lustre and alteration. Picked grains are analyzed by electron microprobe to confirm identification.

KIMBERLITE INDICATOR MINERALS



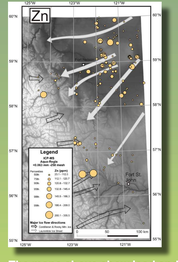


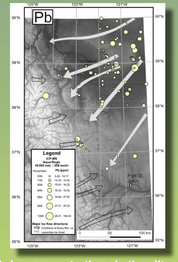
Of the 44 glacial sediment samples submitted for analysis, 23 samples yielded between 1 and 3 KIM in the 0.25 to 0.5 mm fraction. Most of the KIM were recovered from glaciofluvial sand and gravel deposits and only 2 out of 15 till samples contained a single KIM grain (one Mg-ilmenite and one peridotitic garnet). Concentrations of KIM were low in all samples (a total of 36 individual KIM were identified in the entire sample set), as was mineralogical diversity – only four samples had more than one type of KIM. Cr-pyrope garnet (20) was the most common KIM, followed by chromite (8) and lesser amounts of Cr-diopside (4) and Mg-ilmenite (4). With the exception of one ilmenite grain retrieved from the 0.5 to 1.0 mm fraction of sample SUV05329, all of the KIM identified were found in the smallest sand-size fraction, 0.25 to 0.5 mm.

KIM in stream sediments were visually identified from the heavy mineral concentrates of 34 out of 36 samples collected around the margins of the Etsho Plateau. Identified KIM include peridotitic garnet, eclogitic garnet, Cr-diopside, olivine, chromite and Mg-ilmenite. Total abundance of confirmed KIM varies from one grain (seven sites) to 11 grains.

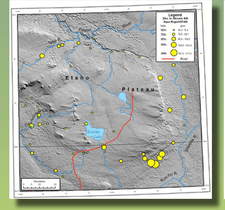
The distribution of KIM identified in stream samples is shown above right. Using the classification scheme of Grütter (2004), three garnets were classified as eclogitic (G3) garnets. Eclogitic garnets are extremely important pathfinder minerals in diamond exploration. A further 19 were classified as Cr-pyrope garnets derived from lherzolite (G9 garnets).

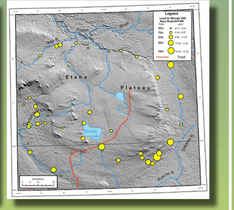
GEOCHEMISTRY OF GLACIOFLUVIAL AND STREAM SEDIMENTS





The maps above show lead and zinc concentrations in the silt and clay-sized fraction (-250 mesh, <0.063 mm), as measured by inductively coupled plasma mass spectrometry (ICP-MS) with aqua regia digestion, northeast BC.





Above, maps show lead and zinc concentrations in stream silts (<177 µm), determined by inductively coupled plasma mass spectrometry (ICP-MS) with aqua regia digestion, northeast BC.

Credits

Background DEM: USGS, SRTM, 2006
Geology Base: Digital Geology Map of British Columbia: Tile NO10 Northeast BC, BC Ministry of Energy and Mines, Geofile 2005-10
Hydrography, Roads, Place Names: National Atlas of Canada

Projection: UTM Zone 10, NAD 83

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