Reconnaissance Biogeochemical Survey using Spruce Tops in the West Road (Blackwater River) Area, Fraser Plateau, British Columbia (parts of NTS 093C/14, /15 and 093F/02, /03)

TREK Project

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Geoscience BC

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INTRODUCTION

Objectives of the TREK project include promoting mineral exploration in underexplored parts of the Interior Plateau, BC, a region with potential to host porphyry copper, porphyry molybdenum and epithermal gold deposits (Figure 1). Historically, exploration activities have been hindered by Neogene Chilcotin Group basalt flows and extensive glacial drift that obscure the underlying, and potentially prospective, bedrock units. The TREK project produces information from surface geochemical, airborne geophysical, and geological initiatives to provide a foundation for more advanced resource development in this region.

Surficial geochemistry components of the TREK project include the collection of 1233 subglacial till samples and 281 lake sediment samples. In addition, 1711 archived till samples have been reanalyzed and geochemical data from previous geochemical surveys have been compiled. This has resulted in one of the highest quality and most comprehensive geochemical datasets available today (Jackaman et al., 2015; Sacco and Jackaman, 2015).

Although over 4500 geochemical samples have been collected from lake- and stream-sediment, water, till and biological media since the 1990s, several key tracts of prospective ground still have limited or no geochemical coverage. This lack of data is largely due to thick vegetation cover, few lakes and limited road networks, which significantly limits the types of survey techniques that can be applied.

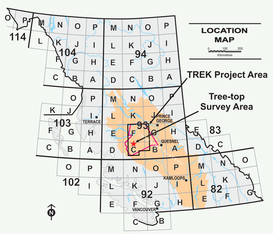

Figure 1. Project location.

To address these gaps in coverage, a helicopter-supported, spruce-top twig-and-needle survey was conducted in 2015. The project is located 40 km north of Anahim Lake within the Fraser Plateau. It extends north from the Itcha and Ilgachuz mountain ranges to the upper Blackwater River Basin (Figure 2). This area is characterized by gentle north-facing slopes that are blanketed with glacial drift and dissected by streams that flow into the flat-floored valley (Photo 1). Interspersed throughout the 1000 km^2 survey area are stands of lodgepole pine (Pinus contorta), white spruce (Picea glauca) and Engelmann spruce (Picea engelmannii).

Photo 1. Survey area, Fraser Plateau.

The survey area is underlain by Hazelton Group and Ootsa Lake Group rocks, and Chilcotin Group volcanic rocks (Figure 3). Several developed prospects that contain Au, Ag, Zn, Pb and Cu mineralization are located in the region. The Blackwater-Davidson intermediate sulphidation epithermal Au-Ag deposit (NTS 093F/02; MINFILE 093F 037; BC Geological Survey, 2015) is located 15 km north of the survey area, and the 3Ts polymetallic Ag–Pb–Zn±Au deposit (NTS 093F/03; MINFILE 093F 068) is situated on the northern survey boundary. No recorded mineral occurrences exist within the survey area south of Blackwater River.

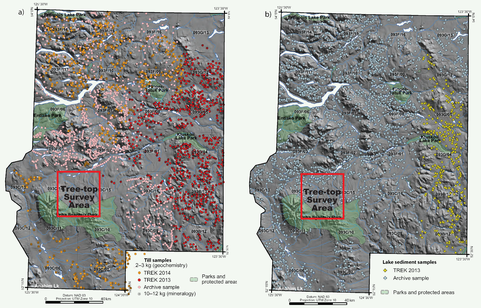

Figure 2. Location of previous till, lake geochemical samples and 2015 tree-top survey in the TREK project area.

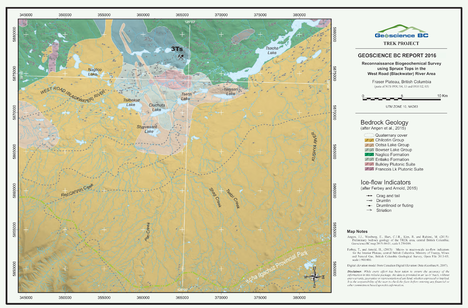

Figure 3. Generalized bedrock and surficial geology of the 2015 tree-top survey area.

SAMPLE COLLECTION

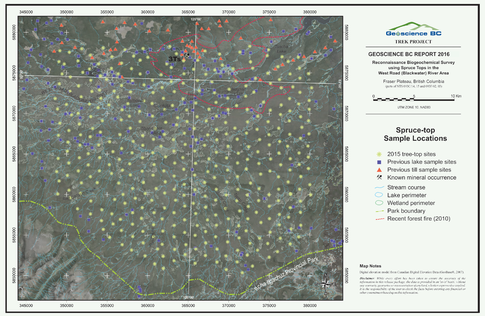

Figure 4. 2015 biogeochemcial survey area.

Photo 2. Typical spruce-top sample site.

Photo 3. Navigation and field data recording.

HISTORY

Previous vegetation sampling has not been attempted in the 2015 biogeochemical survey area; however, several regional biogeochemical surveys and research programs have been conducted in other parts of the TREK project area. To the north of the current study, ground-based regional surveys were completed using lodgepole-pine bark (Dunn and Hastings, 1998, 1999, 2000), and to the south, a helicopter-supported reconnaissance survey was conducted over the Fish Lake property (NTS 092O/05E; MINFILE 092O 041) using lodgepole-pine tops (Dunn et al., 1994). In addition, several research programs have investigated the application of biogeochemical techniques in areas of thick glacial sedimentary rocks and Neogene Chilcotin Group basalt flows (Dunn, 1995; Dunn and Levson, 2010; Heberlein et al., 2013).

SURVEY METHODS

- The 2015 spruce tree-top sampling program was conducted over a 1000 km^2 area during a six-day period in June 2015 (Figure 4). Protocols guiding field survey methods, sample preparation and analysis were based on previous field programs, orientation investigations and detailed research (Dunn, 1995, 2007).
- Using predetermined flight-lines along an offset grid with 1500 m spacing, a total of 421 side-branch samples, comprising 1 kg of twigs, needles and cones, were systematically collected from the top 2 m of each targeted spruce tree (Photo 2). Samples were taken from the distal-most lateral branches and varied from 3 to 7 years in age.
- The target spruce trees were healthy, 80–100 years old, 20–25 m tall and commonly extended 2–3 m above a lower canopy of lodgepole pine, which typically showed effects of the mountain pine beetle infestation. A recent forest fire in the northern part of the survey area and several immature patches of forest regeneration limited the availability of spruce for a small number of the predetermined sites.
- Navigation along the predetermined flight lines and the recording of sample site location co-ordinates were completed using tablet based mapping and GPS programs (Photo 3).

PROJECT SUMMARY

- Extending geochemical coverage for the TREK project area has required innovative approaches to access challenging locations to collect appropriate sample material.
- Ongoing research supports the effectiveness of biogeochemistry, and combined with advances in analytical methods, has established these types of surveys as valid exploration options for generating geochemical information. In addition, helicopter supported tree-top programs can be a relatively economic method to quickly acquire samples over large inaccessible areas.
- Coniferous trees such as spruce are useful as a biogeochemical sample medium since they can tolerate and maintain many trace elements. Extracted from underlying materials such as soil, overburden, groundwater and bedrock, elements are absorbed and transported throughout the tree including twigs and needles where elements can be locally concentrated.
- Analytical data derived from the analysis of tree-top samples that that have been systematically collected and prepared can be used to identify point-source anomalies and geochemical trends (Dunn and Hastings, 1999).
- Biogeochemistry is a complex science that involves the interaction of many organic and inorganic processes. To be successful, the Interpretation of analytical results must consider the chemical relationships and mechanisms associated with the uptake and the concentrating of individual elements.

ACKNOWLEDGEMENTS

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SAMPLE PREPARATION & ANALYSIS

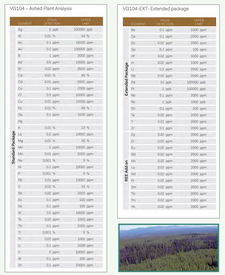
After collection, each 1 kg sample was systematically processed in the field prior to shipment to the commercial laboratory. Cones were removed and the branches were trimmed to include only 5–7 years of growth (Photo 4). Each of the field-processed samples weighed approximately 500 g and were delivered to the Bureau Veritas Commodities laboratory (Vancouver, BC). After the samples were oven dried at 60°C, the needles and twigs were separated. The twigs were macerated to 1 mm and analyzed for 53 elements by inductively coupled plasma–mass spectrometry (ICP-MS) following aqua-regia digestion. Needles were reduced to ash at 475°C and 0.5 g of ash material was analyzed for 53 elements plus rare-earth elements by ICP-MS following aqua-regia digestion.

Photo 4. Sample collection and field processing of tree-top samples.

In addition to in-house quality control procedures offered by the commercial lab, each batch of 20 sequential samples includes one field duplicate and one analytical duplicate to monitor analytical variability, plus one reference standard to measure accuracy and precision.

MACERATED TWIGS

ASHED NEEDLES



DATA RELEASE

Field and analytical data package consisting of descriptions of survey methods, data listings, statistics, element maps and digital data files will be published in early spring 2016. Release notifications will be distributed by Geoscience BC.

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