REGIONAL DRAINAGE SEDIMENT AND WATER GEOCHEMICAL DATA

SOUTH NECHAKO BASIN & CARIBOO BASIN, CENTRAL BRITISH COLUMBIA (parts of NTS 92N, O, P, 93A & B)

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INTRODUCTION

During the 2006 field season, Geoscience BC funded a reconnaissance-scale lake sediment and water survey that was completed in central British Columbia (Figure 1). These types of surveys contribute to an ongoing effort to complete first-level geochemical coverage of the province, complement existing publicly available geochemical data sets and provide the mining and exploration community with new, high-quality geochemical information.

Geoscience BC Report 2007-6 includes results of the 2006 South Nechako Basin and Cariboo Basin survey. The data has been provided in a variety of digital formats. PDF files include survey descriptions and details regarding methods, field and analytical data listings, summary statistics, sample location map, geology map and maps for individual metals. Raw digital data files used in the production process are included in XLS and DBF formats.

SURVEY AREA DESCRIPTION

Within the mountain pine beetle (MPB) infestation area of central BC there has been a significant gap in regional geochemical survey (RGS) coverage. Although this region was included in previous RGS stream sediment programs, subdued topography and poor drainage limited the availability of suitable stream sample sites. In fact, large parts of the surveyed areas had not been sampled. In order to expand the first level sample density of this region, a total of 1370 lakes were sampled as part of the 2006 south Nechako Basin and Cariboo Basin lake sediment and water geochemical survey.

The survey covers approximately 18 000 km^2 of the Nechako Basin, the Fraser River Basin and the Cariboo Basin. Straddling highways 20 and 97, the project area extends southeast from Puntzi Lake to 70 Mile House and includes the larger communities of Williams Lake and 100 Mile House. The relatively subdued topography varies from exposed grasslands to rolling hills covered with pine and spruce forests (Photo 1). Opportunely, the upland surfaces of the plateau are dotted with over 11 000 lakes and ponds, including 6500 potential sample sites, ranging in size from 4000 to 400 000 m^2

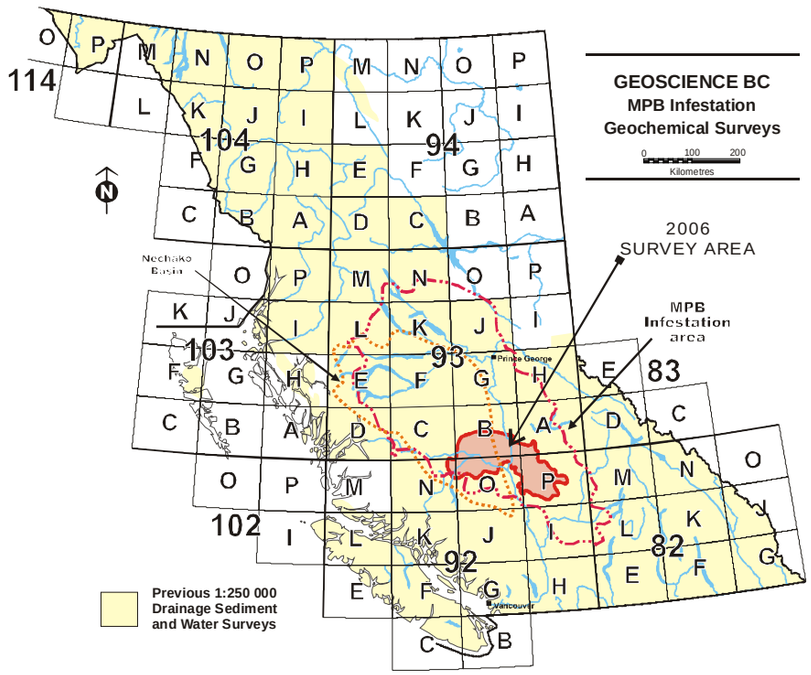

Figure 1. Location of survey area, central British Columbia.

Extensive Tertiary to recent age volcanic flows and thick glacial deposits cover much of the survey area. Underlying this material are Middle Jurassic to Tertiary marine and nonmarine sedimentary and lesser volcanic rocks. East of the project area, Late Triassic to Early Jurassic Cache Creek Group and Permian to Triassic Quesnel Terrane rocks can be found.

Within the survey area, the MINFILE database lists only 12 metallic mineral occurrences. The most notable is a Cu±Mo±Au porphyry prospect named Newton (092O 050). Adjacent to the region are several significant porphyry deposits such as producing mines Mount Polley (093A 008) and Gibraltar (093B 012) plus developed prospects Prosperity (092O 041) and Frasergold (093A 150). Other local targets include

Photo 1. Typical landscape in southern Nechako Plateau.

polymetallic veins represented by the Pellaire (092O 045) developed prospect and epithermal precious metal deposits such as the Blackdome mine (092O 053) and skarn mineralization found at the Spout Lake (092P 120) developed prospect.

SAMPLE COLLECTION

Methods and specifications are based on standard lake sediment geochemical survey strategies used elsewhere in Canada for the National Geochemical Reconnaissance (NGR) program (Friske, 1991[1]), as well as prior orientation studies and regional lake sediment surveys completed in BC (Cook, 1997[2]; Jackaman, 2006[3]).

Helicopter-supported sample collection was carried out in August 2006, during which 1445 lake sediment and water samples were systematically collected from 1370 sites. Average sample site density was one site per 13 km^2 over the 18 000 km^2 survey area. Field duplicate sediment and water samples were routinely collected in each analytical block of 20 samples.

Lake sites were accessed using a float-equipped Bell Jet Ranger helicopter (Photo 2). The sampling crews collected sediment material with a torpedo-style sampler, and water samples were saved in 250 mL bottles. Samples were successfully collected from most of the lakes targeted in the survey area. However, some of the smaller ponds were not sampled due to poor sampling conditions, and samples were not collected from several very large and deep lakes. In general, lake bottom samples sent for analysis represent a 35 cm section of material obtained from below the water-sediment interface. Samples typically consisted of organic gels with varying amounts of inorganic sediment and organic matter. Field observations and site locations were recorded for each site.

SAMPLE PREPARATION

The bags containing the sediment samples were catalogued and drip-dried at a field camp. At the end of the field program, samples were shipped to a commercial lab, where they were air-dried at temperatures below 40ºC. After drying, lake sediment samples were pulverized to approximately minus 150 mesh (100 µm) in a ceramic ring mill. To monitor and assess accuracy and precision of analytical results, control reference material and analytical duplicate samples were routinely inserted into each block of twenty sediment samples.

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[1] Friske, P.W.B. (1991): The application of lake sediment geochemistry; *in* mineral exploration; in Exploration Geochemistry Workshop, *Geological Survey of Canada*, Open File 2390, pages 4.1-4.20.
[2] Cook, S.J. (1993a): Preliminary report on lake sediment geochemistry in the northern Interior Plateau, Central British Columbia; *in* geological fieldwork 1992, *BC EMPR*, Paper 1993-1, pages 475-481.
[3] Jackaman, W. (2006): Regional drainage sediment and water geochemistry of part of the Nechako River and Anahim Lake map areas (NTS 93C and 93F); *Geoscience BC*, GBC Report 2006-4.

Photo 2. Regional lake sediment and water sampling in the Nechako Plateau.

SAMPLE ANALYSIS

The sediment samples were analyzed for base and precious metals, pathfinder elements and rare earth elements by inductively coupled plasma – mass spectrometry (ICPMS) and instrumental neutron activation analysis (INAA). Loss-on-ignition and fluorine were also determined for sediment material. Fluoride, conductivity and pH were determined for the water samples. A complete list of elements and analytical detection limits is provided in Tables 1 and 2.

Table 1. Detection Limits: ICPMS.

Element		Detection Limit	Units	Method
Aluminum	Al	0.01	%	ICPMS
Antimony	Sb	0.02	ppm	ICPMS
Arsenic	As	0.1	ppm	ICPMS
Barium	Ba	0.5	ppm	ICPMS
Bismuth	Bi	0.02	ppm	ICPMS
Cadmium	Cd	0.01	ppm	ICPMS
Calcium	Ca	0.01	%	ICPMS
Chromium	Cr	0.5	ppm	ICPMS
Cobalt	Co	0.1	ppm	ICPMS
Copper	Cu	0.01	ppm	ICPMS
Gallium	Ga	0.1	ppm	ICPMS
Gold	Au	0.2	ppb	ICPMS
Iron	Fe	0.01	%	ICPMS
Lanthanum	La	0.5	ppm	ICPMS
Lead	Pb	0.01	ppm	ICPMS
Magnesium	Mg	0.01	%	ICPMS
Manganese	Mn	1	ppm	ICPMS
Mercury	Hg	5	ppb	ICPMS
Molybdenum	Mo	0.01	ppm	ICPMS
Nickel	Ni	0.1	ppm	ICPMS
Phosphorus	P	0.001	%	ICPMS
Potassium	K	0.01	%	ICPMS
Scandium	Sc	0.1	ppm	ICPMS
Selenium	Se	0.1	ppm	ICPMS
Silver	Ag	2	ppb	ICPMS
Sodium	Na	0.001	%	ICPMS
Strontium	Sr	0.5	ppm	ICPMS
Sulphur	S	0.01	%	ICPMS
Tellurium	Te	0.02	ppm	ICPMS
Thallium	Tl	0.02	ppm	ICPMS
Thorium	Th	0.1	ppm	ICPMS
Titanium	Ti	0.001	%	ICPMS
Tungsten	W	0.1	ppm	ICPMS
Uranium	U	0.1	ppm	ICPMS
Vanadium	V	2	ppm	ICPMS
Zinc	Zn	0.1	ppm	ICPMS

Table 2. Detection Limits: INAA, F, LOI and Waters.

Element		Detection Limit	Units	Method
Antimony	Sb	0.1	ppm	INAA
Arsenic	As	0.5	ppm	INAA
Barium	Ba	50	ppm	INAA
Bromine	Br	0.5	ppm	INAA
Cerium	Ce	5	ppm	INAA
Cesium	Cs	0.5	ppm	INAA
Chromium	Cr	20	ppm	INAA
Cobalt	Co	5	ppm	INAA
Europium	Eu	1	ppm	INAA
Gold	Au	2	ppb	INAA
Hafnium	Hf	1	ppm	INAA
Iron	Fe	0.2	%	INAA
Lanthanum	La	2	ppm	INAA
Lutetium	Lu	0.2	ppm	INAA
molybdenum	Mo	1	ppm	INAA
Rubidium	Rb	5	ppm	INAA
Samarium	Sm	0.1	ppm	INAA
Scandium	Sc	0.2	ppm	INAA
Sodium	Na	0.02	%	INAA
Tantalum	Ta	0.5	ppm	INAA
Terbium	Tb	0.5	ppm	INAA
Thorium	Th	0.2	ppm	INAA
Tungsten	W	1	ppm	INAA
Uranium	U	0.2	ppm	INAA
Ytterbium	Yb	2	ppm	INAA
Sample Weight	Wt	0.01	gm	GRAV
Fluorine	F	10	ppm	ION
Loss on Ignition	LOI	0.1	%	GRAV
pH	PH			ISE
Fluoride	FW	20	ppb	ION
Conductivity	CND	0.01	uS	ISE

Inductively Coupled Plasma Mass Spectrometry (ICPMS)

For the determination of 36 elements listed in Table 2, a 0.5-gram sample was leached with 3 ml of a mixture of HCl, HNO_3, and distilled, deionized water (2:2:2 v/v) at 95°C for one hour. The sample solution was diluted to 10 ml and analysed by inductively coupled plasma emission spectroscopy on a Jarell-Ash instrument and inductively coupled plasma mass spectroscopy on a Perkin-Elmer Elan instrument. Data for boron was not published because of inadequate detection limits and/or precision.

Instrumental Neutron Activation Analysis (INAA)

Weighed and encapsulated samples were packaged for irradiation along with internal standards and international reference materials. Samples and standards were irradiated together with neutron flux monitors in a two-megawatt pool type reactor. After a seven-day decay period, samples were measured with a high-resolution germanium detector. Typical counting times were 500 seconds. Elements determined by INAA are listed in Table 1. Data for silver, cadmium, iridium, nickel, selenium, tin, tellurium, zinc, and zirconium are not published because of inadequate detection limits and/or precision.

Other Sediment Analyses

Loss-on-ignition was determined using a 1-gram sample. The sample, weighed into a Leco® crucible, was placed into a 100ºC muffle furnace and brought up to 500° C for one hour. The oven was cooled to 100ºC and crucibles transferred to a desiccator for cooling to room temperature. The crucibles were re-weighed, and the difference was reported as loss-on-ignition (GRAV).

To measure fluorine, a 0.25-gram sample was fused with 1-gram of sodium carbonate-sodium nitrate. After being leached with metal free water for 1 hour, 10 ml of 10% citric acid solution is added. Fluoride was measured using specific ion electrode analysis (ION).

Water Analysis

The pH of waters was determined using a Hanna Instruments pH/EC/TDS meter with automatic temperature compensation, a range of 0.00 to +14.0 pH, resolution of 0.01 pH and an accuracy of ±0.01 pH. Meters were calibrated using commercial buffer solutions with pH values of 4.0, 7.0 and 10.0.

Conductivity of waters was determined using a Hanna Instruments pH/EC/TDS meter with automatic temperature compensation and a range of 4000 µS/cm, a resolution of 1 µS/cm and a full-scale accuracy of ±1%. Meters were calibrated using commercial conductivity standards.

Fluoride in waters was determined by specific ion electrode analysis (ION).

DATA PRESENTATION

Geochemical information compiled in this report includes field and analytical results from samples collected during a regional lake survey conducted in 2006 (N = 2068). Results from the survey have been determined to be accurate and complete. The 2006 data package has been prepared as a PDF document and presents survey results in three appendices that are described as follows:

Appendix 'A': Is a complete listing of site location information, field observations and analytical results for the 2006 survey. Tables preceding the data listings define codes used for field observations and underlying geology.

Appendix 'B': Presents summary statistics for individual elements and a more detailed summary based on the underlying bedrock geology determined at each sample site. The calculations have been determined from raw data and values reported by the labs at less then detection limit have been set to half the detection limit.

Appendix 'C': Includes a sample location map, simplified geology and mineral occurrence map and proportional symbol maps for each element. Symbol size and colour reflects data ranges that are based on the 30^{th}, 50^{th}, 70^{th}, 90^{th} and 95^{th} percentiles as determined from the raw data. Maximum symbol size is assigned to values greater than the 95^{th} percentile. Portraying high values with large, bold symbols, with background values represented by relatively smaller dots, helps highlight regional trends and anomalous sample sites.

The data summary presented in this package is not considered exhaustive. In order to accommodate more detailed assessments, raw digital data files have been included in XLS and DBF formats.

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