BRITISH COLUMBIA
The Best Place on Earth
Ministry of Energy, Mines & Petroleum Resources

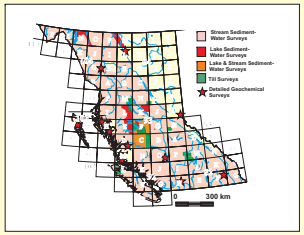
Nuggets Buried in the BC Regional Geochemical Survey Database

Ray E.Lett and Britt Bluemel

For more information contact:
Ray Lett, Geochemist, BC Geological Survey, Victoria, BC, Canada. email: Ray.Lett@gov.bc.ca
250-952-0396
Britt Bluemel, University of Victoria, Victoria, BC, Canada. email: bluemel@uvic.ca

Mining the BC Regional Geochemical Survey Database

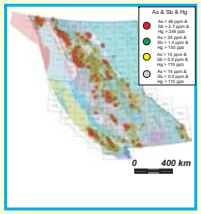
Low-density (typically 1 sample/10 km^2) stream and lake sediment geochemical surveys have proven to be very cost effective for identifying areas of higher mineral potential. British Columbia is ideally suited for utilizing such surveys, so a joint Federal-Provincial government regional stream sediment-water survey (RGS) program started in 1976 has produced field and analytical data for over 50 000 samples. These samples were collected at an average density of 1 sample/13 km^2 covering roughly 70 percent of the province. Over half of these samples have been re-analysed by neutron activation (INAA) and/or inductively coupled plasma mass spectrometry (ICPMS). RGS data are valuable exploration tools for detecting mineralized belts and even individual deposits because the analyses are of very high quality and include ore indicator (e.g Au, Cu, Mo) and pathfinder elements (e.g. As, Sb, Hg).



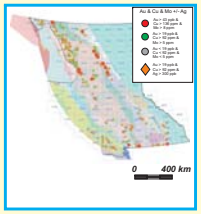
Extent of reconnaissance scale lake and stream sediment-water survey in BC. The low-density RGS is complemented by more detailed till and stream sediment sampling to better identify mineral exploration targets.

RGS geochemistry can help map geoterranes and outline mineral belts

Geoterranes have a distinctive bedrock geochemistry and can host different types of mineral deposit. RGS data helps identify the individual terranes and map the mineral-rich Belts.



Arsenic, antimony and mercury are pathfinders for epithermal gold-silver mineralization. Anomalous sediment samples with this signature identify several mineral-rich belts including Vancouver Island and NW BC where the Eskay Creek gold mine is located.



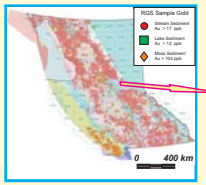
A gold - copper - molybdenum stream sediment signature can reflect porphyry Cu - Mo and Cu-Au mineralization whereas gold - copper - silver stream geochemistry could indicate alkalic Cu-Au deposits. Anomalous values for all of these elements highlight several mineral-rich belts in NW and NE BC including the Toodoggone River area.

RGS Benefits

- ***High quality, seamless geochemical database, conforming to national (NGR) standards***
- ***Stimulates mineral exploration by identifying geochemical anomalies***
- ***Stream sediment and stream water data are compatible with industry survey results***
- ***Verification of new sampling, analytical and data interpreting techniques***
- ***Application to environmental monitoring and land use evaluation***

Still More Buried Gold Nuggets in the RGS database

For example, in McLeod Lake Area (NTS 93J) ----



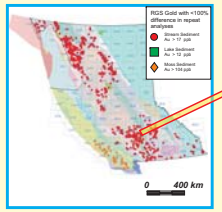
Aqua regia digestion-ICPMS re-analysis in 2005 of archived RGS drainage sediment samples taken in 1986 detected up to 61 ppb gold near Great Beaver Lake in the western half of the McLeod map sheet. Other sediment samples near the Pinchi Fault have an anomalous arsenic-antimony-mercury signature. Northwest of Great Beaver Lake sediment samples have a high chromium and nickel content. This area is relatively unexplored for minerals because of the poor bedrock exposure.

Several multi-element geochemical anomalies were identified by the follow-up sampling in the area. One sediment sample had over 1 ppm gold. Six anomalies are summarised in the Table below. ND = Not Detected.

Anomaly	Au (ppb)	Media	Elements
1	ND	Silt	Mo, Cu, Ni [Ni]
2	ND	Sed-Till	Cr, Ni, V, Cu, Co, [Fe]
3	289	Sed	Au, Cr, Mn
4	1000	Till	Au
5	ND	Till	As,Hg, Sb, Mo
6	ND	Water	As, Mn, Cu, Ni

The McLeod Lake area is heavily glaciated and bedrock is covered by a till blanket (> 1 m) deposited by ice advancing from the SW. The view above shows an exposure of till on Takla Group rocks near Mount Prince. There are also extensive glacio-fluvial deposits surrounding Great Beaver Lake and along the Salmon River valley. Further studies will focus mineral identification and analysis of till heavy mineral concentrates to better identify the source of the anomalous metals.

------ and in the French Bar Creek area north of Lillooet



Most RGS samples with anomalous gold are routinely re-analysed to confirm the gold content. Of the estimated 6000 RGS samples with detectable gold there are 4052 with more than 17 ppb gold in sediment, 104 ppb gold in moss sediment and 12 ppb gold in lake sediment. Of these, 906 samples have less than 100% difference between the initial and re-analysed gold value. One of the RGS samples taken in 1980 from French Bar Creek, North of Lillooet, BC, contained 243 ppb gold with a repeat value of 565 ppb. The presence of the anomalous gold suggested follow-up with more detailed stream sediment, moss sediment, till and rock geochemistry.

Anomaly followup included stream sediment, moss sediment, heavy minerals, soil and rock sampling. Eight multi-element anomalies identified are summarized in the Table below.

Anomaly	Au (ppb)	Media	Elements
1	50.4	Moss - Sed	Au, Zn, Cu, Fe, As, Sb, Hg, V
2	435	Sed	Au
3	560	Water	RED
4	5.2	Sed	Au, As Mo, Mn, Hg, V
5	110	Moss	Au, Rb
6	200	Moss	Au, Ag, As, Ni, Hg, Se, Zn
7	110	Sed	Au, Cu, Zn
8	28	Sed-Till	Au, As, Rb

Moss sediment anomalies in Roderick Creek may reflect gold in Jackass Mountain rocks. This rock sample from Roderick Creek shown below has up to 200 ppb gold.

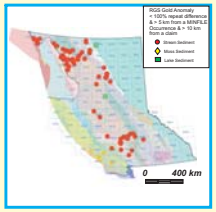
------ For More information about regional geochemistry

Interactive access to RGS data through the BCGS MapPlace http://www.em.gov.bc.ca/Mining/Geolsurv/MapPlace/

Data downloads from the BCGS Geochemistry Page http://www.em.gov.bc.ca/Mining/Geolsurv/Geochinv/geochem.htm

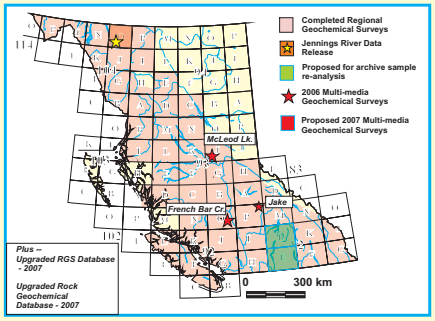
More Targets for Gold Exploration

There are 906 RGS samples with anomalous gold that have less than 100% difference between the initial and re-analysed gold value. Of these, 191 sites are more than 5 km from a MINFILE mineral occurrence.



Screening the 191 anomalous sites based on their proximity to mineral claims identified 83 that are more than 10 kilometres from a mineral claim as of January 1, 2007.

Future RGS Data Additions



Acknowledgements

Rudi Durfeld very generously provided accommodation during fieldwork and Gwendy Hall, Head of the Environmental Geochemistry Laboratory, Geological Survey of Canada, Ottawa kindly analyzed the water samples. Support from Mike Roberts and Rimfire Minerals for the Jake Prospect survey is much appreciated.

References

Lett, R.E.W. And Bluemel, B. (2007); Multi-media Geochemical Surveys in the Lillooet and McLeod Lake Map Sheets (NTS 92O and 93J); *in* Geological Fieldwork 2006, BC Ministry of Energy, Mines and Petroleum Resources, Paper 2007-1.
Lett, R.E.W. and Bluemel, B. (2006): Re-analysis of regional geochemical survey stream sediment samples from the McLeod Lake area, NTS 93J; BC Ministry of Energy, Mines and Petroleum Resources, Geofile 2006-09.