Quaternary Geology and Till Geochemistry of the Bulkley River Valley, West-Central British Columbia (NTS 093L)

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Introduction

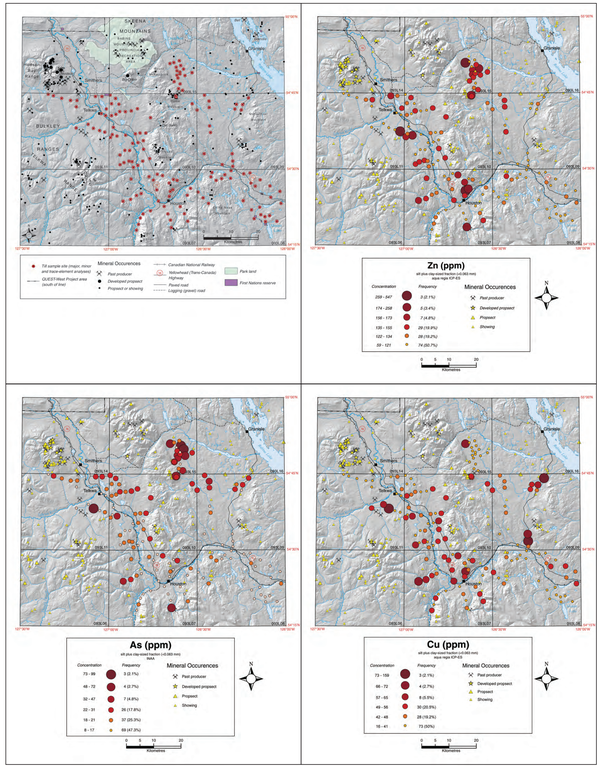
A two-year Geoscience BC-funded project is under way in west–central British Columbia in the 093L 1:250 000-scale National Topographic System (NTS) map sheet. The study area is centred along the Bulkley River valley from its headwaters located west of the District of Houston northwest to the town of Smithers in NTS 093L/14. The Bulkley River valley lies within portions of the Nechako Plateau, and the Hazelton and Skeena Mountains of the Coast Mountain Range. The project is being undertaken in an area that is within the Geoscience BC's QUEST-West Project area and Mountain Pine Beetle–Impacted Zone.

Bedrock geology

The study area is underlain by rocks of the Stikine Terrane that include subaerial to submarine calcalkaline volcanic, volcaniclastic, and sedimentary rocks ranging in age from Upper Triassic to Eocene-Lower Miocene. Three major magmatic events during the Early Jurassic, Late Cretaceous, and Eocene associated with subduction of oceanic crust along the leading edge of the North American plate produced a distinctive suite of plutonic rocks. Many of the mineral deposits in the region are associated with emplacement of these intrusions. The most economically important exploration targets are mesothermal and epithermal precious metal veins and polymetallic Ag-Pb-Zn, porphyry copper and molybdenum deposits, and stratabound polymetallic massive sulphide deposits.

Till Geochemistry Study

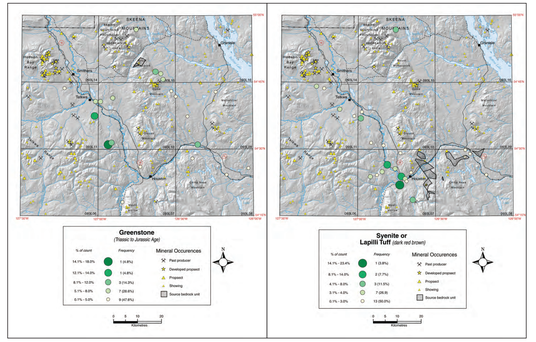
A total of 135 till samples were collected in 1996 as part of till geochemistry and Quaternary geology studies in the Babine porphyry copper district. Sites were selected to set the greatest density of samples along transects perpendicular to the dominant ice-flow direction. Samples of basal till (the preferred sampling medium for till geochemistry programs) were collected from natural and man-made exposures. The <0.063 mm fraction from each sample was analyzed by instrumental neutron activation analysis (INAA) at Activation Laboratories Limited and inductively coupled plasma–emission spectrometry (ICP-ES) after aqua-regia digestion and flameless atomic absorption (CAA) spectroscopy at AcmeLabs Prelminary results indicate that geochemical anomalies in till are present down-ice or in the vicinity of known mineral deposits. Anomalies for zinc (Zn) and arsenic (As) occur near Dome Mountain in NTS 093/L15 and 10, north of Houston, and south of Telkwa. Anomalies for copper (Cu) occur in the Bulkley River valley and in NTS 93/L09.



Clast Lithology Study

From each till sample, the lithology of 50 to 100 clasts in the 25 to 100 mm size range were identified and grouped into broad lithological categories to reflect major provenance areas. The objective of this analysis was to determine the direction and distance of glacial transport from source bedrock units.

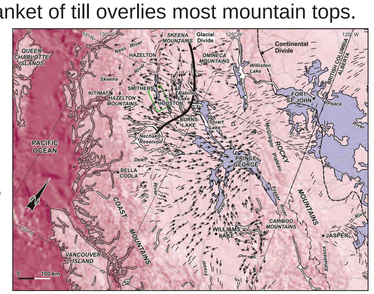
Clast of greenstone were found in till southeast and southwest (both down-ice) of source bedrock at Mount McKendrick. Numerous clasts of microsyenite and lapilli tuff were found in till near of Houston, greater than 20 kilometers down-ice to the west–southwest from source bedrock.



Quaternary Geology and Ice-Flow History

This area is characterized by broad U-shaped drift–filled valleys, bordered by glacially rounded high mountains. Thick deposits of glacial sediment (locally >50 m thick) drape valley bottoms. A discontinuous veneer or blanket of till overlies most mountain tops.

Three main phases of ice flow have been recognized in from interpretation of the ice-flow indicators. At the onset of glaciation, cirques and valley glaciers expanded from accumulation centres in the Skeena and Hazelton mountains and flowed west along the Bulkley River valley into the Skeena River valley and south and east onto the Nechako Plateau. At this time, the direction of glacier flow was controlled primarily by uplands bordering the valleys. Upon further accumulation, expansion and thickening of the ice, the glaciers eventually formed a single (Cordilleran) ice sheet. At its maximum extent, the ice sheet reached a thickness over 2000 metres, at which time the centres of accumulation had shifted to the east of the study area over the Nechako Plateau. This reconfiguration in the ice sheet caused a major reversal in glacier flow across the study area.



The ice sheet was able to flow unobstructed, above major topographic barriers in the Skeena and Hazelton mountains. Subsequently, glacier flow was from east to west across the Bulkley River valley, away from ice centres located further inland, then across coastal mountains to the Pacific Ocean. This reversal continued well into the glaciation period until the drawdown of the ice lowered the surface of the glaciers below topographic barriers in the Skeena and Coast mountains. At this time, the centres of growth shifted west to the Skeena and Hazelton mountains causing the pattern of glacier flow to shift back to the configuration of the early (advance) glacial phase. These reversals are not only recognized by mapping ice-flow indicators, but also by the pattern of glacial transport determined from till geochemistry surveys and tracing erratics back to the bedrock source.

Value of Project

This project will provide the mineral exploration community additional information characterizing the glacial materials, which in this region forms a near-continuous cover masking the bedrock surface. Combined with existing geological and geophysical data collected by Geoscience BC, and historical databases archived at the BCGS and GSC, this information will assist companies to identify new exploration targets and re-evaluate known mineral occurrences. These activities will promote further investment in the resource exploration and development sector in this part of BC.

Acknowledgments

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