



# Constraining Mineral Potential of the Alexander Terrane near Porcher Island, Northwestern British Columbia



Kadulski, B.M., Potter, J.J., Mahoney, J.B.

## Abstract

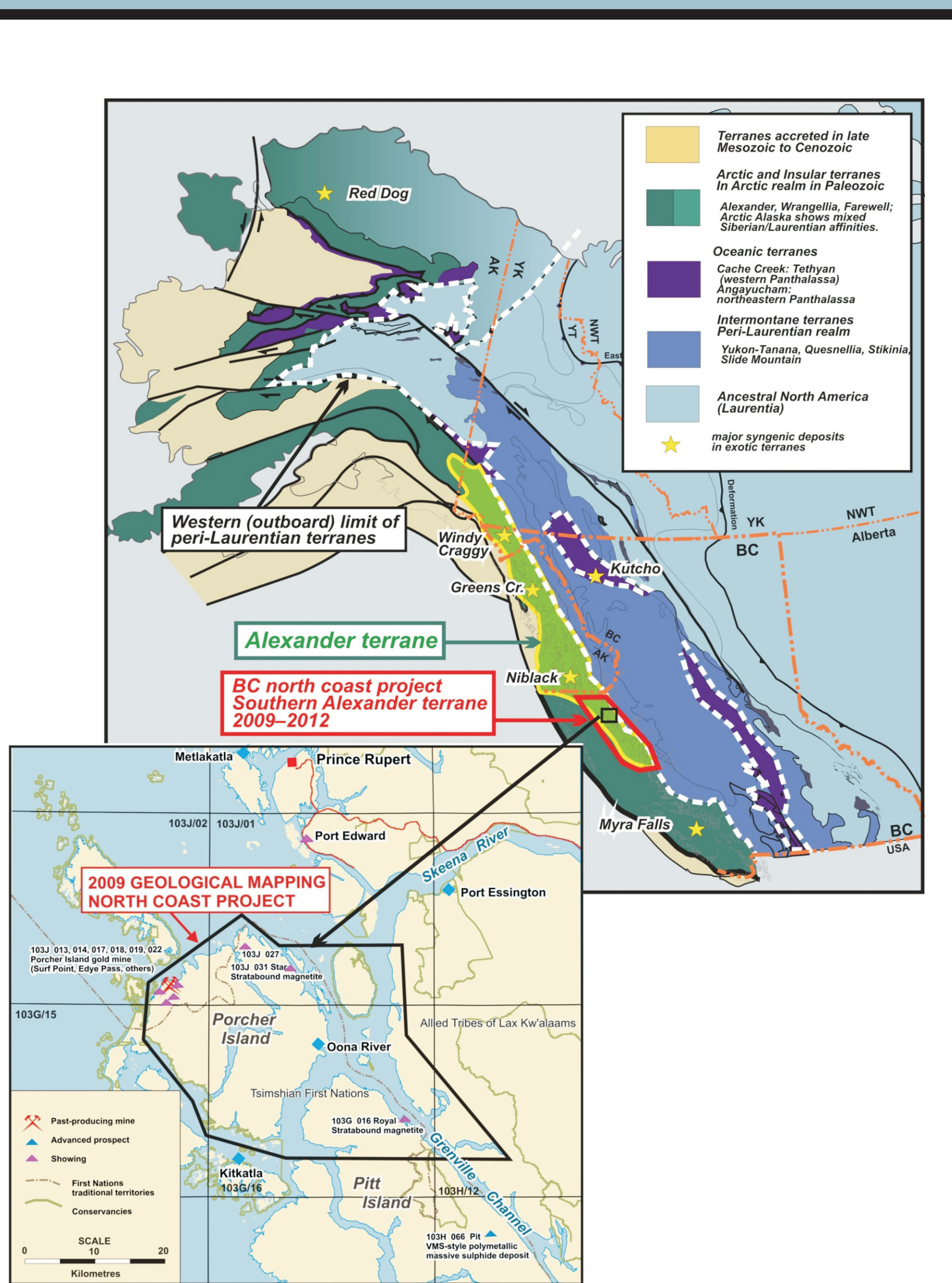
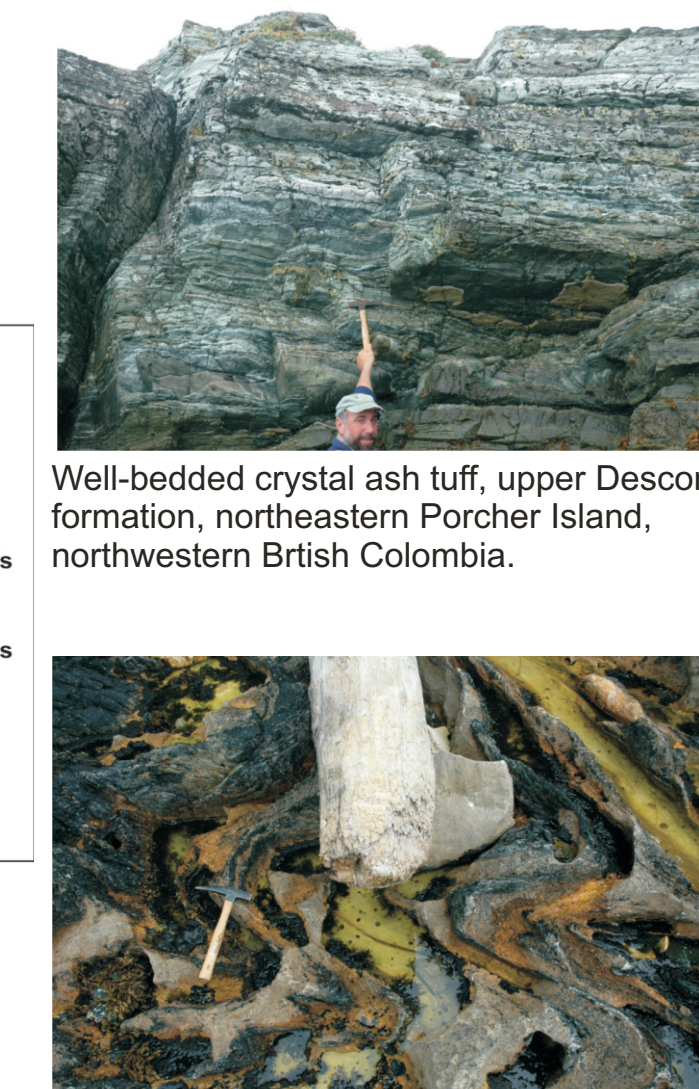
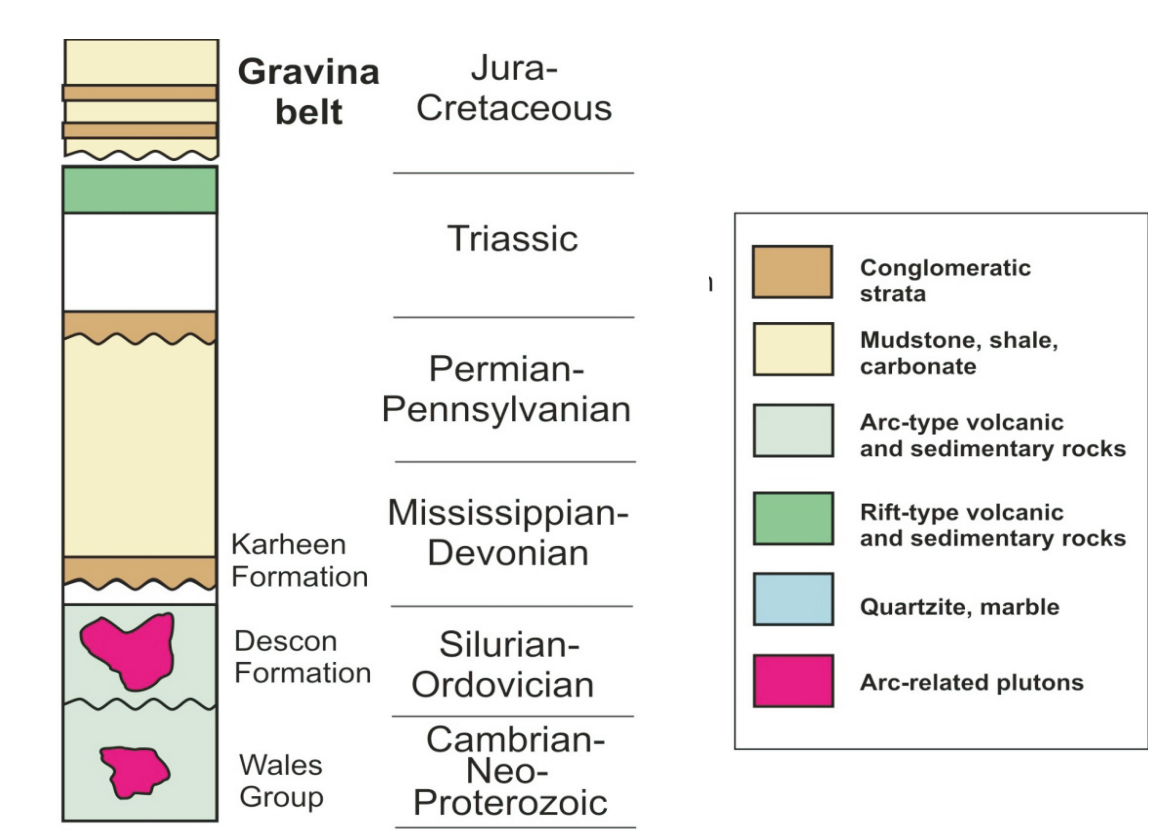
The Paleozoic Alexander terrane in northern British Columbia and Alaska contains two island arc sequences, including the late Proterozoic to Cambrian Wales Group and the early Ordovician to late Silurian Descon Formation. Both of these sequences are thought to represent volcanic arc assemblages composed of sedimentary, volcanic, and plutonic rocks and their metamorphic equivalents. Both the Wales Group and Descon have significant volcanic massive sulfide potential based on alteration patterns, prospects, showings, and favorable rock types. Mapping and sampling of the Wales Group and Descon Formation on Porcher Island, along with geochemical and geochronological data is critical for understanding and constraining the VMS economic mineral potential of the Alexander terrane. Preliminary geochemical data suggests that the Wales Group consists of two geochemically distinct rock packages, primarily based on Ba and Pb enrichment and depletion. Primary volcanic rocks are limited in the Descon formation, but limited data suggests the Descon represents a subduction related typical calc alkaline volcanic arc assemblage.

## Introduction

The first year of a three year mapping project to explore bedrock geology of British Columbia and the potential to host significant mineral deposits has been completed. This project focuses on the north coast of British Columbia, specifically Porcher Island and the surrounding area. The northern coastal area of British Columbia is underlain by rocks of the southern Alexander terrane. The Alexander terrane is a large crustal fragment that is of considerable interest for its volcanogenic massive sulphide (VMS) deposits, such as those hosted at Niblack and on the southern Prince of Wales Island just north of the British Columbia and Alaska border. Bedrock mapping of the north coast is part of the larger co-operative project Edges (Multiple Metals-Northwest Canadian Cordillera (Yukon, BC)). The Edges project aims to increase the understanding of exotic terranes that comprise the western edge of the Canadian Cordillera and to explore their metallic mineral potential. Edges contributors include groups from the Geological Survey of Canada, the BC Geological Survey and both Canadian and American Universities. Mapping this year focused on Porcher Island because of its proximity to the known VMS deposits, as well as the more identifiable stratigraphic sequences.

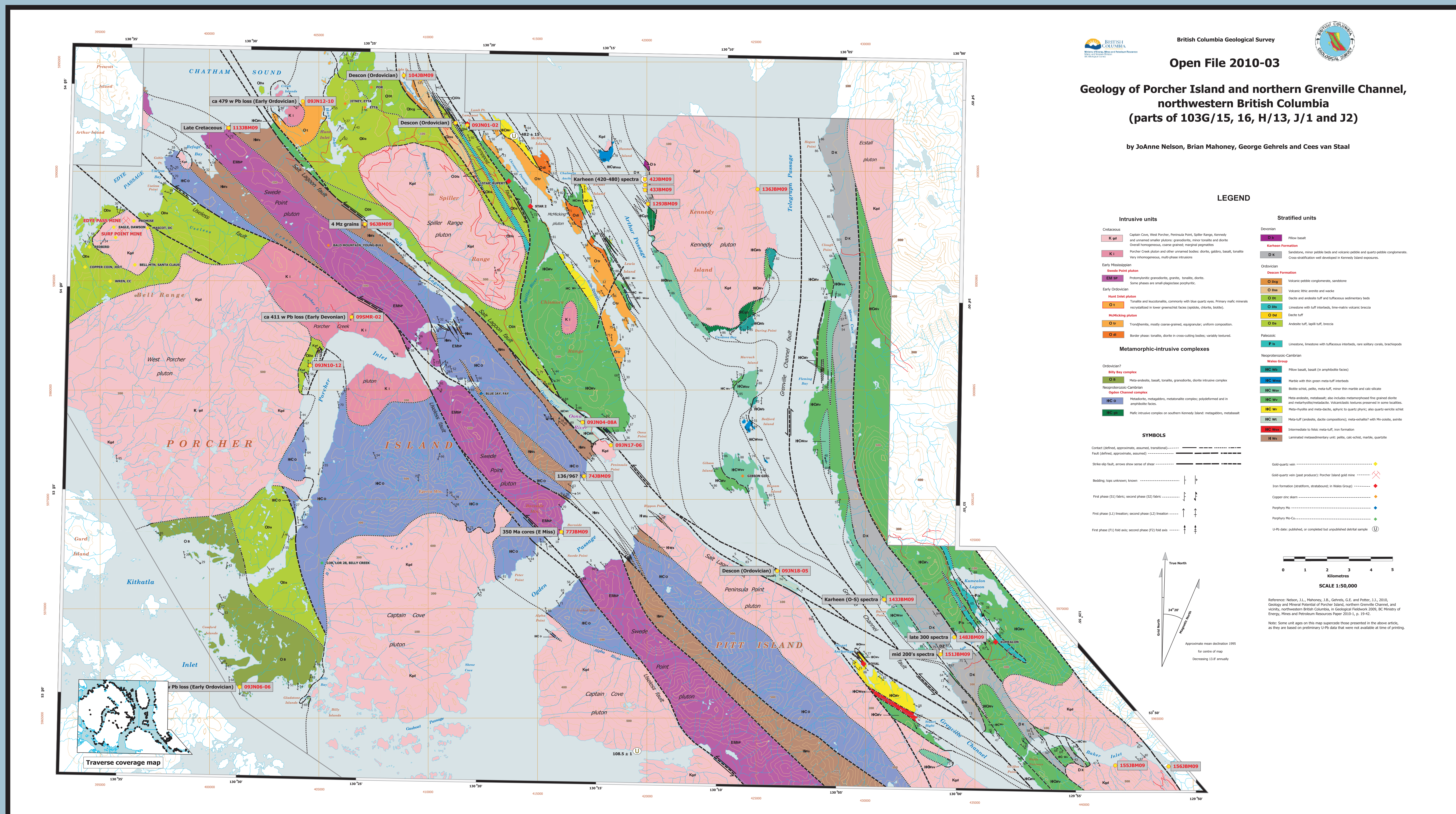
## Stratigraphy

The Alexander terrane of Northern British Columbia is composed of a range of volcanic, sedimentary, and plutonic rocks, as well as their metamorphic equivalents. The Alexander terrane is subdivided into separate groups based on metamorphic grade and lithology. These include, from oldest to youngest, the Wales Group, the Descon Formation, the Karheen Formation, and the Gravina belt. The Late Proterozoic to Cambrian Wales Group consists of mafic to felsic meta-volcanics; with lithic units ranging in thickness from a few meters to hundreds of meters. Protoliths of the Wales include pillow flows, breccia, tuffaceous breccia, and tuff. The Wales Group is overlain by a series of less deformed and metamorphosed volcanic and sedimentary rocks, known as the Descon formation. The protoliths of the Descon are similar to those of the Wales, with the exception of little to no marble within the Descon. These Paleozoic sequences are unconformably overlain by the Devonian Karheen Formation, which is composed of basal conglomerate and sandstones, mafic volcanics, and limestones. The youngest package observed in the Alexander terrane, the Gravina Belt, is an upper Jurassic to lower Cretaceous package containing clastic strata and mafic volcanic rocks.



## Regional Geology

Northern British Columbia is underlain by a series of accreted oceanic island volcanic arcs which are represented by metasedimentary and metavolcanic rock packages. The four major rock assemblages, from west to east, include the Banks Island assemblage, the Alexander terrane, the Gravina belt and the Yukon-Tanana terrane. These terranes can be followed north into southeast Alaska where their metamorphic grade is decreased. These less metamorphosed rocks are correlated south to the more highly metamorphosed terranes in northern British Columbia.

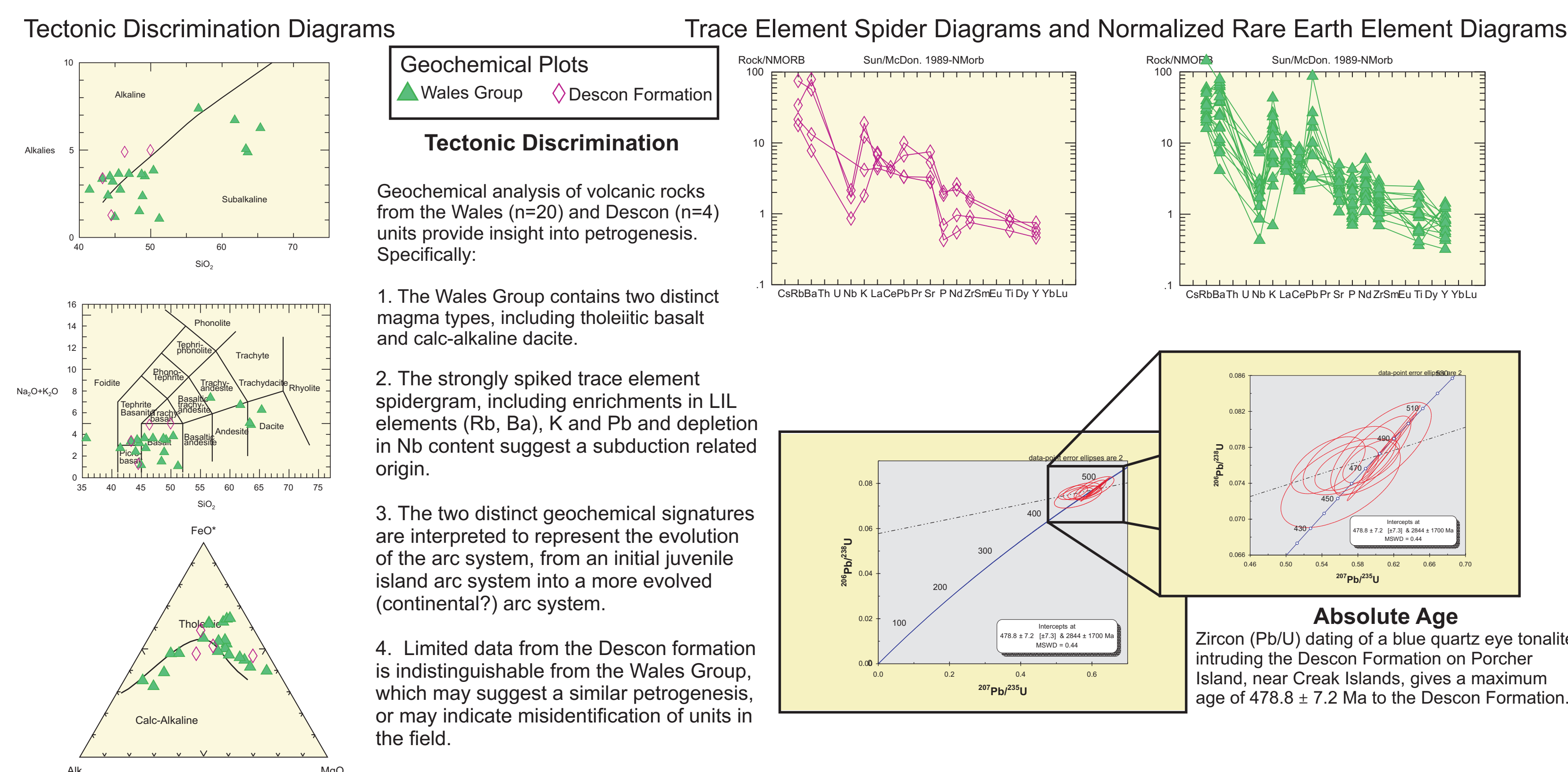


## Mineral Potential of the Alexander Terrane

The occurrence of VMS (Volcanogenic Massive Sulfide) mineralization of the Alexander terrane in southern Alaska has driven exploration of the Alexander terrane in northwestern British Columbia. Volcanic arc rocks of the Wales Group and Descon Formation have significant VMS potential.

- 1. Pyritic, siliceous quartz-sericite schist (meta altered rhyolite) in the Wales group near Moore Cove, northwestern British Columbia. Unit is 3m wide in the picture.
- 2. Magnetite laminations in siliceous, iron-rich metatuff, Wales Group near Stuart Anchorage, northwestern British Columbia. Pencil used as scale.
- 3. Layer of thinly laminated magnetite in the Wales Group metatuff, northeastern Porcher Island, northwestern British Columbia. Rock hammer used for scale.

## Geochronology and Geochemistry



## Results

- The majority of Porcher Island and the surrounding area is underlain by Descon Formation, which is constrained by Pb/U zircon dating to have a maximum age of 478.8 ± 7.2 Ma.
- Geochemical data indicates that both the Descon Formation and the Wales Group are dominated by subduction related tholeiitic basaltic magmatism, suggesting magmatism in a juvenile island arc system.
- The Alexander terrane in northwestern British Columbia has potential for VMS style mineralization similar to known deposits in southeastern Alaska.

## Future Work

Mapping will continue through 2011 in the exotic terranes of Northern British Columbia. Mapping during the 2010 summer field season will focus just south of Bella Coola in the southern most exposures of the Alexander terrane. Geochemical and geochronological (U-Pb dating) being conducted at the University Wisconsin-Eau Claire and the University of Arizona in Tuscan will aid to constrain and direct the future plans of the project.

## References and Acknowledgments

- Nelson, J.L., Mahoney, J.B., Gehrels, G.E., C. van Staal and Potter, J.J., 2009. Geology and Mineral Potential of Porcher Island, Northern Grenville Channel and Vicinity, Northwestern British Columbia, Geological Fieldwork, Paper 2010-1, pp. 19-41.
- A special thanks to Don Willson for guiding us safely on his boat, the *Phoebe*. Also, our first nations observer Richard Bryant.
- A thanks is also in order to Martin Pepper and Jim Gehrels for their assistance on the *Phoebe* and in the field.