

Introduction

Geoscience BC's QUEST project was designed to stimulate mineral exploration in central British Columbia.



Location of the QUEST Project area

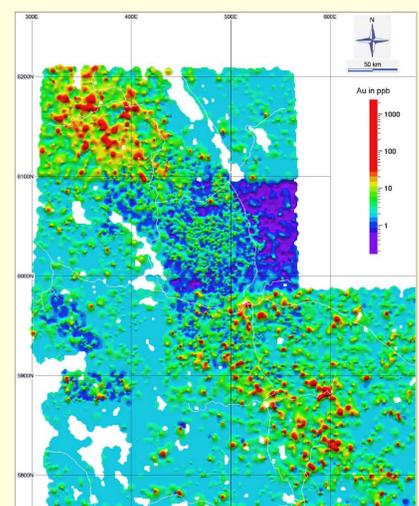
During 2007, about 2100 new lake and stream sediment samples were collected, and almost

5000 older drainage sediment pulps were re-assayed, to improve the geochemical data base in the project area. One of the programs initiated in 2008 was to discover what might be learned from a systematic analysis and evaluation of the new multi-element geochemical data.

As a start, we have applied various clustering methods to the 42 element data. The results show marked correlations with geology. This leads to the idea of using a neural network to model the geochemistry in areas where the geology is known, and then to apply this model to infer the bedrock geology in the non-outcropping areas.

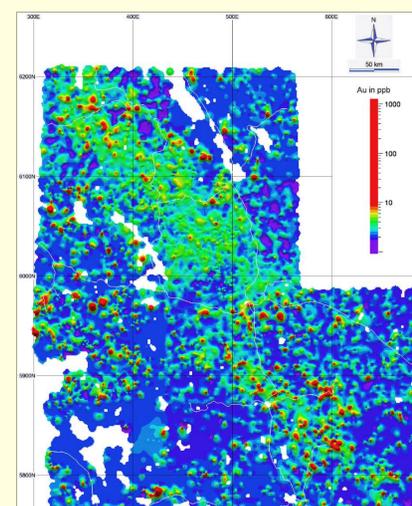
These results show that geochemistry combined with neural networks can provide a powerful tool for mapping bedrock geology concealed by a thin veneer of glacial overburden.

Levelling



Raw gold assays from stream and lake sediments

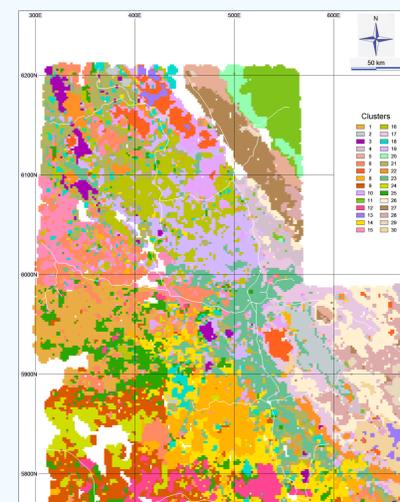
Since the various geochemical surveys in the QUEST area were collected from different sample media (lake and stream sediments) and anal-



Levelled gold assays from stream and lake sediments

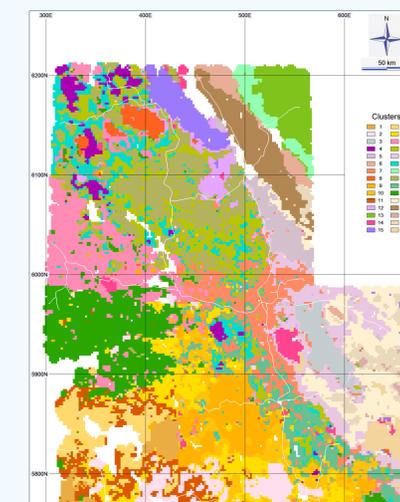
ysed by different laboratory techniques over a period of nearly 30 years, the first step was to level the data. Shown here is a comparison for gold.

Clustering



K-means clustering of 42-element geochemistry

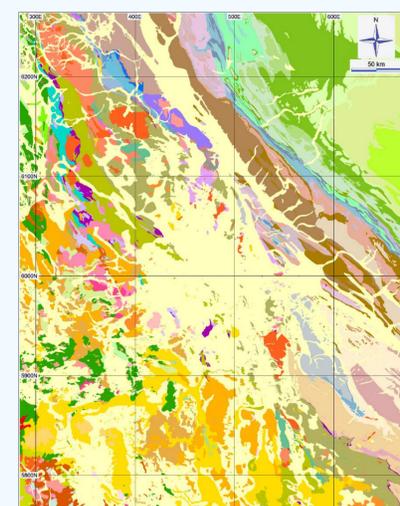
The resulting full suite of 42 element assays can be analysed in various ways. Clustering is a classic approach. Two such clusterings, known as k-



Spectral clustering of 42-element geochemistry

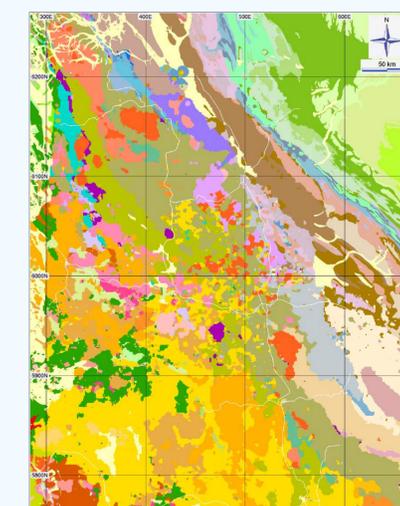
means and spectral clustering, have been derived. It can be seen that each resembles the mapped surficial geology, shown below left.

Inferred Geology



Mapped surficial geology

The neural network was trained in the region where both geology and geochemistry are known. The resulting inferred geology is almost identi-



Inferred bedrock geology

cal to mapped geology in areas of outcrop, and blends well with mapped geology along the margins, where there is no geochemistry.