CORDILLERAN SECTION

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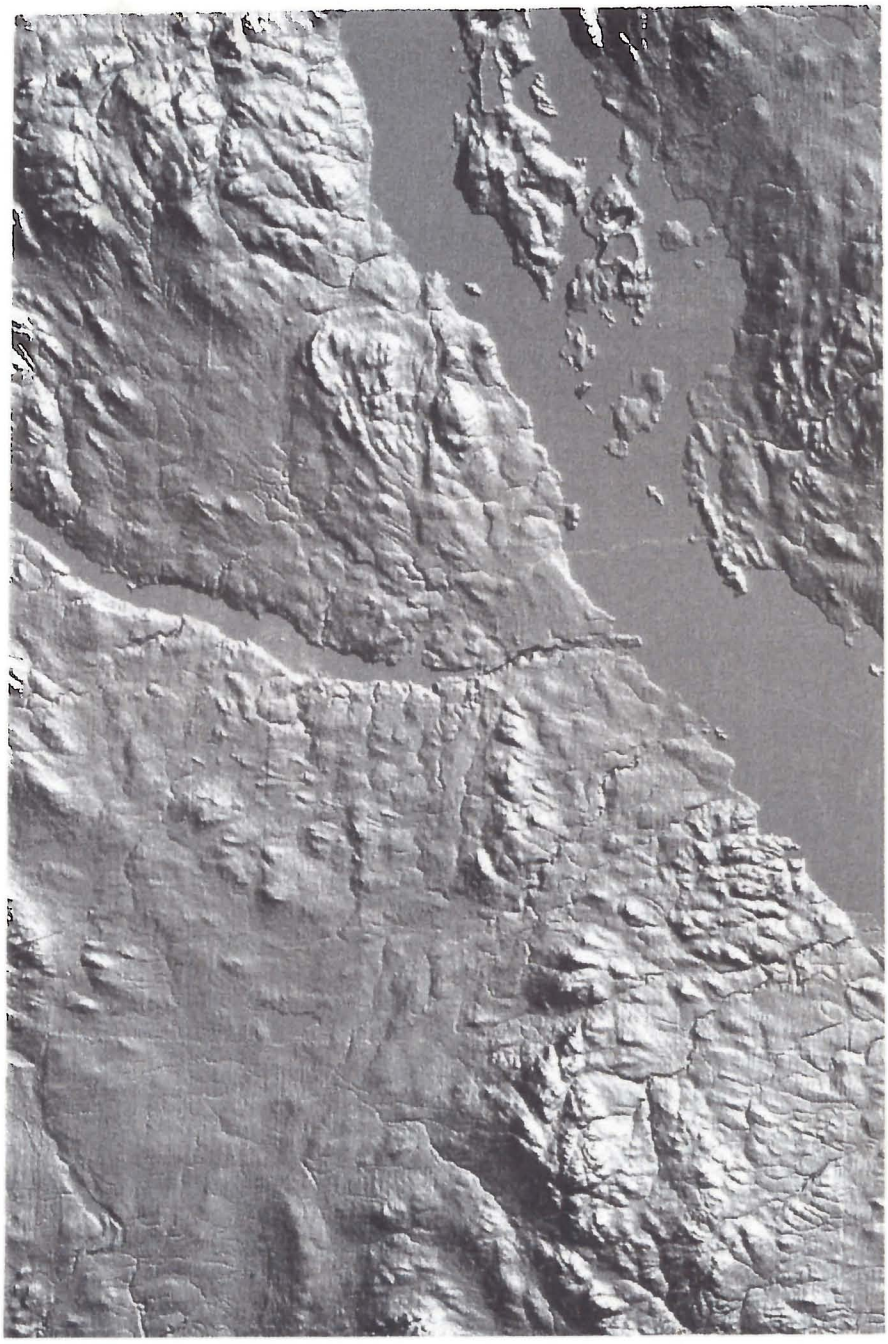
GEOLOGICAL ASSOCIATION OF CANADA

New Geological Constraints on Mesozoic to Tertiary Metallogenesis and on Mineral Exploration in central British Columbia: Nechako NATMAP project



Short Course Extended Abstracts

A short course organized by the
Geological Association of Canada,
Cordilleran Section
Simon Fraser University,
Harbour Centre Campus
Vancouver, British Columbia
March 27, 1998

Coordinators and Editors:
L.C. Struik, Geological Survey of Canada,
Pacific Division, Vancouver
D.G. MacIntyre,
British Columbia Geological Survey,
Victoria

Nechako

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New Geological Constraints on Mesozoic to Tertiary Metallogenesis and on Mineral Exploration in central British Columbia: Nechako NATMAP project

27 March, 1998
Simon Fraser University
Harbour Centre Campus

A Short Course Sponsored by the Cordilleran Section of the Geological Association of Canada

Course Program

08:25 Struik, L.C. and MacIntyre, D.G.
Introduction

08:30 Anderson, R.G.
Influence of Eocene tectonics and magmatism on the Mesozoic arc and orogenic collapse: New developments in Nechako River map area.

09:15 Dunn, C. and Cook, S.
Application of geochemical surveys to mapping and mineral exploration in the Nechako/Babine region.

10:00 Coffee

10:15 Levson, V.
Glaciation and its effects on the dispersal and burial of mineral deposits in west-central British Columbia.

10:50 Stumpf, A.
Ice-flow and its implications for drift prospecting in central British Columbia.

11:25 Plouffe, A.
History of glacial lakes and an overview of the till geochemistry as an aid for mineral exploration on the Nechako Plateau.

12:00 Lunch

13:00 Lowe, C. and Enkin, R.
New constraints on bedrock geology and mineral exploration in central British Columbia: analyses of aeromagnetic, paleomagnetic and gravity data

13:45 MacIntyre, D.G.
Late Cretaceous to Early Tertiary tectonics, magmatism and mineral deposits, central British Columbia.

14:30 Schiarizza, P.
Sitlika rocks of the Kutcho Assemblage and their tectonic relationship to the Cache Creek and Takla groups near Takla Lake.

15:15 Coffee

15:30 Struik, L.C. and Orchard, M.J.
Cache Creek Group: Its paleoenvironment, structural stacking, stratigraphy, and implications for the Pinchi Fault.

16:15 Anderson, R.G., Whalen, J.B. and Villeneuve, M.E.
Triassic to Eocene composite intrusions and molybdenum metallogeny: the Endako Batholith redefined.

17:00 End

An overview of regional till geochemistry as an aid for mineral exploration in central British Columbia

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Extended abstract

Regional till sampling programs have been implemented in central British by the Geological Survey of Canada as part of the Canada-British Columbia Agreement on Mineral Development (1991-1995) and the Nechako NATMAP project (1995-2000). By the end of these two projects, regional till geochemistry data will be available for accessible portions of three 1:250 000 scale NTS map sheets, namely 93F (Nechako River), 93K (Fort Fraser) and 93N (Manson River) (Fig. 1). The sample interval on these map sheets averages five kilometres along forestry roads. In addition, the British Columbia Geological Survey Branch has completed regional till sampling with a closer sampling interval (two kilometers on average) over six 1:50 000 scale NTS map sheets: 93 F/2, F/3, F/7, L/16, M/1, and M/8. In terms of regional till geochemistry, this represents the best covered region of the province.

Till geochemistry used in combination with ice-flow data is a key information source for mineral exploration purposes. Areas with anomalous metal concentrations are depicted on the maps and highlight regions for potential follow-up exploration. A less well understood usage of regional till geochemistry, is its value in demonstrating natural metal variation over different bedrock lithologies. With present strict environmental regulations, this type of geochemical data is pertinent in the development and evaluation stages of new mine sites. For example, this data may be used to demonstrate that potentially toxic metals (e.g. Cd, Hg, As) are naturally high in the environment because of their primary enrichment in bedrock.

It is well known that most metals have a tendency to concentrate in the finer grain-size fractions of till. Consequently, geochemical analyses of till samples are typically conducted on one or both of the following two specific grain-size fractions: <0.002 mm and <0.063 mm (-230 mesh). In addition, the use of a specific grain-size fraction allows a certain degree of comparability between adjacent regions, by eliminating the effect of areal textural variation on geochemistry.

For a regional till survey to be successful, the proper sediment type only (till) has to be sampled. Till can be inaccessible where it is overlain by a thick cover of other glacial sediments. For instance, till sampling has been hindered in the Vanderhoof and Fort St. James region (Fig. 1) because of the thick and continuous cover of glacial lake sediments. These consist of fine sand, silt and clay derived from the matrix of other glacial sediments, predominantly till and glaciofluvial deposits. The transport history of these fines was controlled first by ice-flow direction and then by the meltwater drainage system that prevailed at the time of deglaciation. Therefore, the geochemistry of glacial lake sediments is of limited use for mineral exploration because the composition of these sediments reflect a regional background as opposed to local bedrock sources. In addition, glacial lake sediments have a complex transport history which greatly complicates tracing anomalies.

Central British Columbia offers potential for epithermal (e.g. Wolf) and porphyry and associated types (e.g. Mt. Milligan) of mineralization (Fig. 1). Mining is currently taking place in this region (e.g. Endako) and numerous mineral showings and prospects are sites of recent exploration (e.g. Trout). In light of the good potential for mineralization, including gold, the recently presented map of the gold content of till in the northern sector of the Nechako River map sheet (A. Plouffe's poster at Roundup '98) should be closely inspected (Fig. 2). Some sites, far from known showings, returned significant gold values (>15 ppb). The gold concentrations measured in till are obviously lower than the concentrations measured in mineralized rocks because of the dilution of metal levels in till by unmineralized rocks. Therefore, gold concentrations greater than 15 ppb could be significant because gold dispersal trains associated with known gold mineralization in the area contain subtle anomalies (>15 ppb) and the distance of transport (or length of the

dispersal trains) are usually short, that is in the order of 5 km (at the Wolf prospect and Mount Milligan) (Sibbick and Kerr, 1995; Levson and Giles, 1997) (Fig. 3). However, extensive field work should not be conducted around any of the sites with high gold concentrations shown on Figure 2 prior to testing the reproducibility of the anomalies using the same grain-size fraction, that is <0.063 microns (-230 mesh) in the case of gold analyses.

The highest molybdenum concentrations detected occur in the vicinity of the Endako Mine (Mo deposit) and Nithi Mountain (Mo showing) (Figs. 1 and 4). Recently published data on lake sediment geochemistry (Cook et al., 1997) revealed a zone with notably high molybdenum concentrations, east of Tezzeron Lake (Fig. 1). No till samples were collected at these anomalous sites because of the thick cover of glaciolacustrine sediments, but till samples north of Tezzeron Lake, i.e. down-ice from the high molybdenum concentrations in lake sediments, do contain significant molybdenum concentrations.

High mercury concentrations in till of central British Columbia are largely controlled by the occurrence of cinnabar mineralization along faults (Plouffe, 1995a; 1995b; 1997). A series of mercury anomalies in the central part of the northern sector of the Nechako River map sheet could be related to the presence of a concealed fault zone(s).

In conclusion, regional till geochemistry should be considered as an additional tool available to alert exploration geologists and geochemists. It not only contains data useful to mineral exploration but also information of environmental significance. Metal concentrations in till associated with bedrock mineralization are subtle and more subdued than in bedrock because of the dilution from unmineralized rocks.

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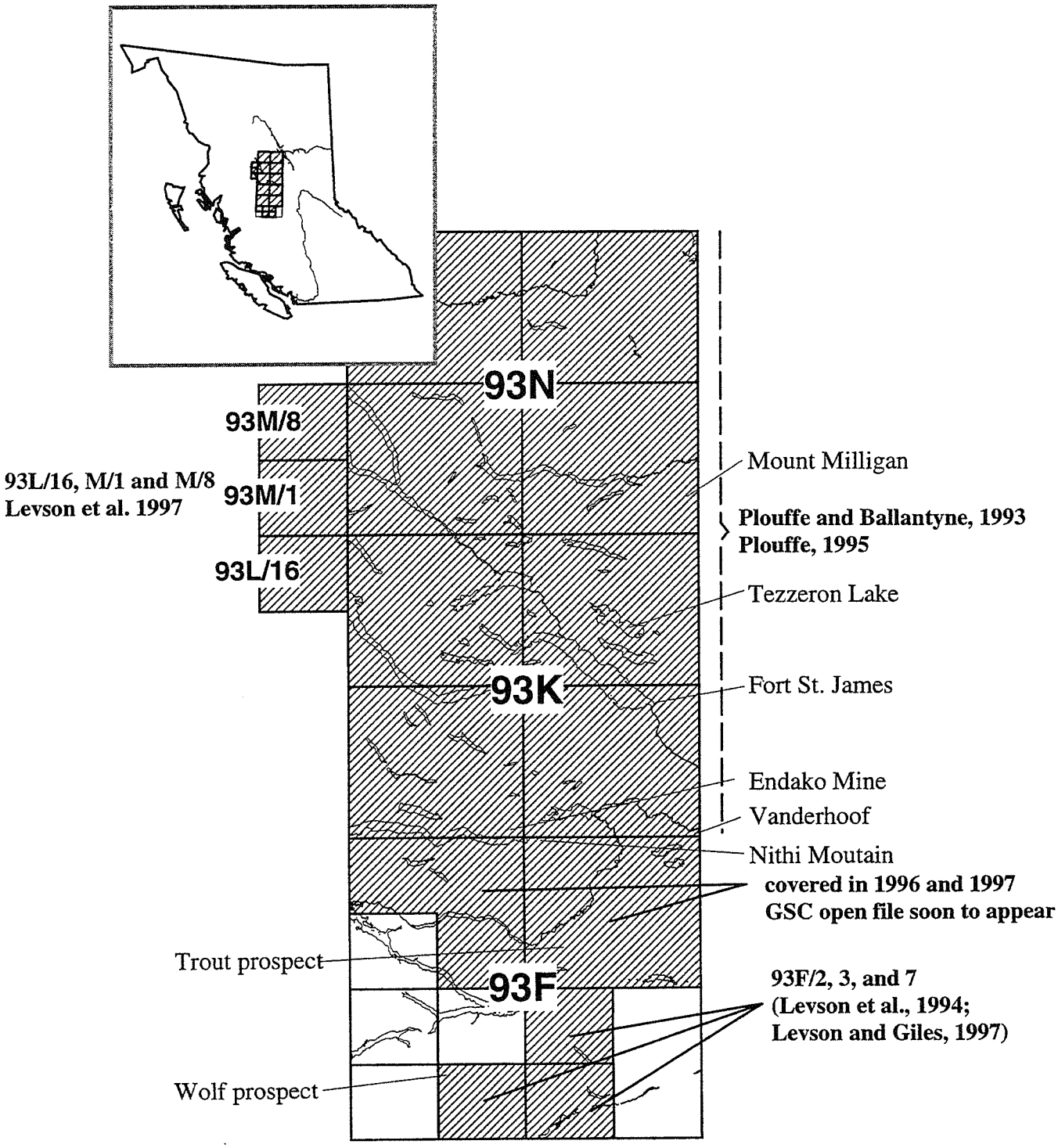

Figure 1. Status of regional till geochemistry in central British Columbia.

Au in till - northern Nechako River map sheet (93F)

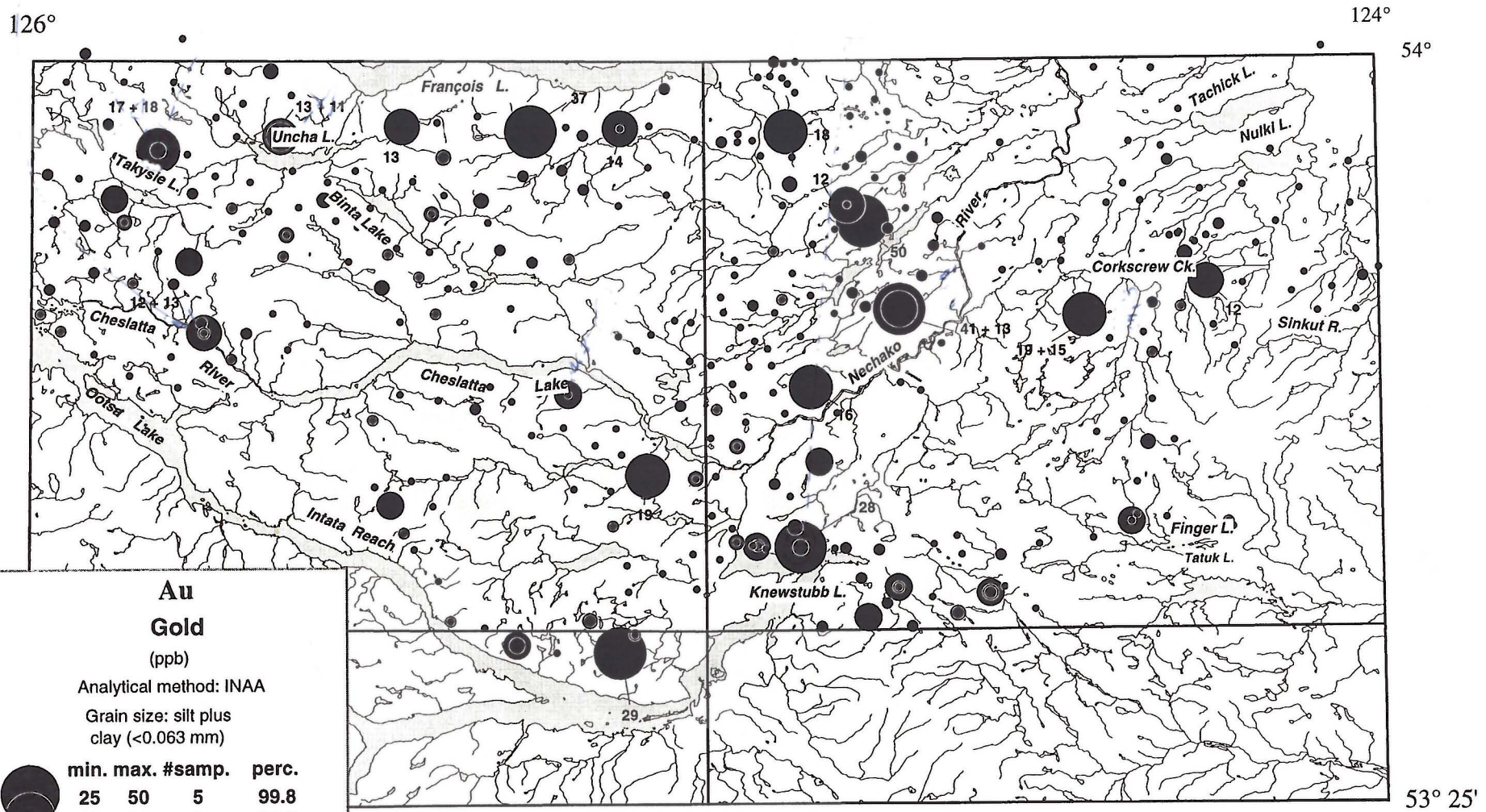

Figure 2

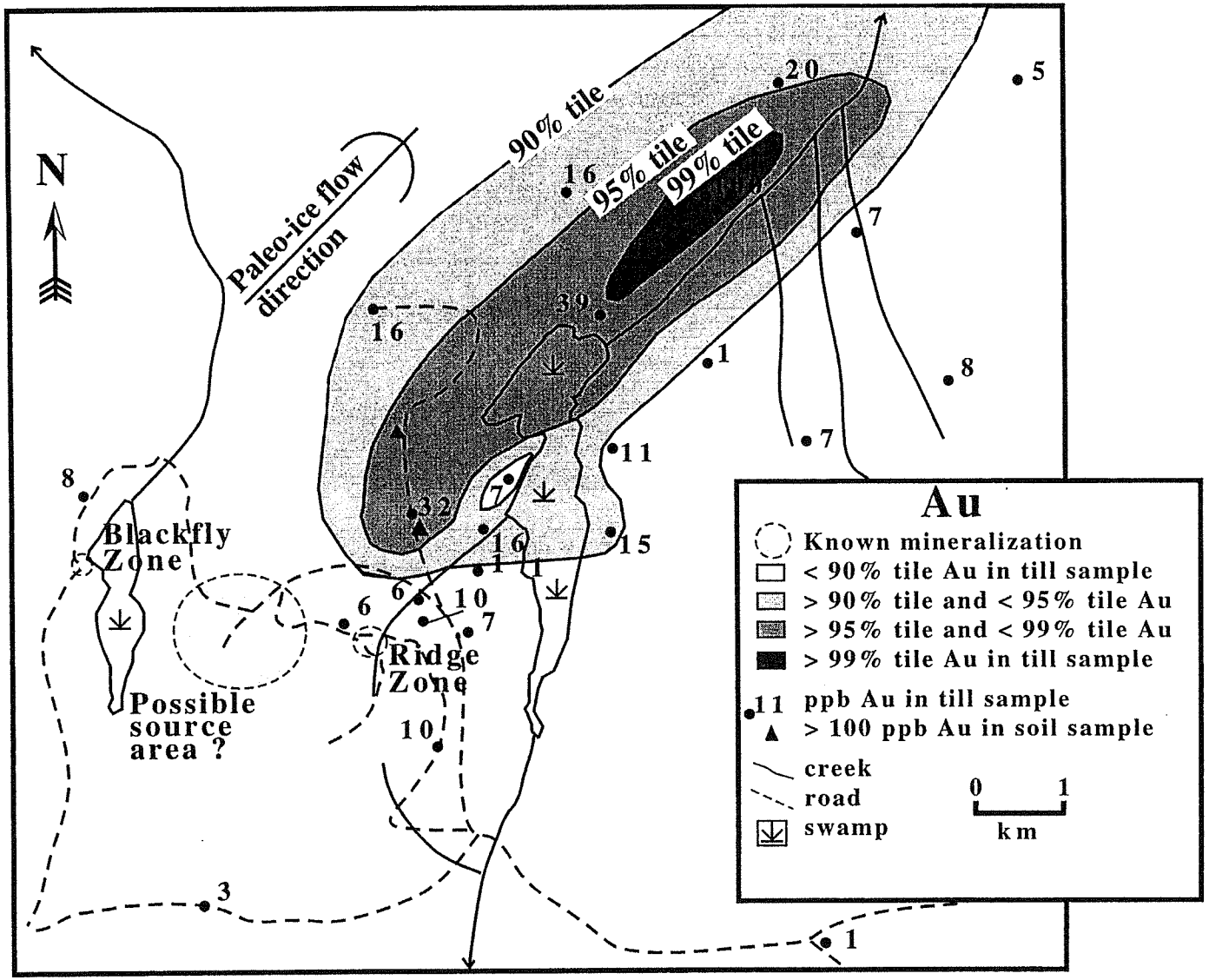

Figure 3. Gold concentrations in till, down-ice of the Wolf prospect (Levson and Giles, 1997).

Mo in till - northern Nechako River map sheet (93 F)

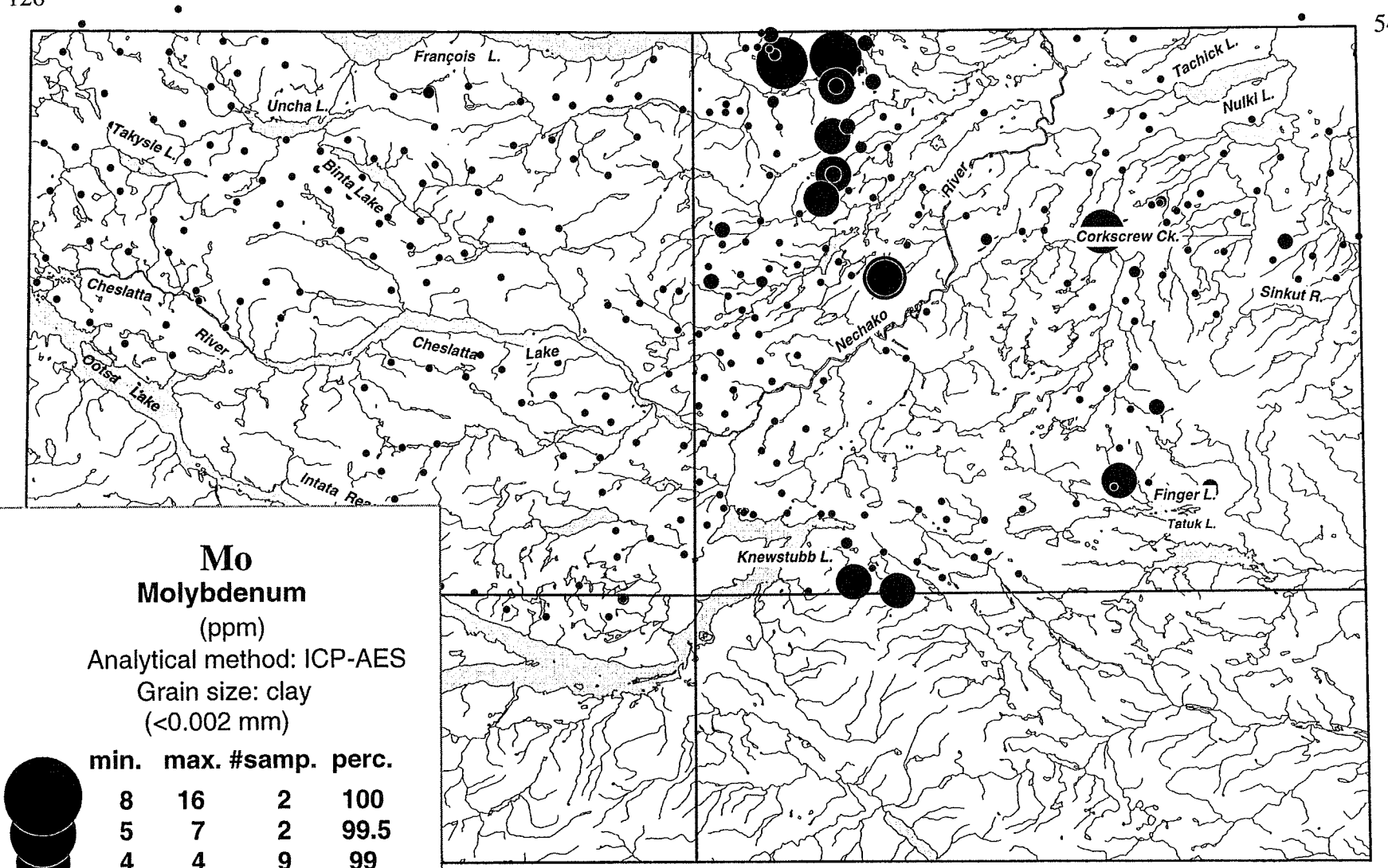

Figure. 4

Hg in till - northern Nechako River map sheet (93 F)

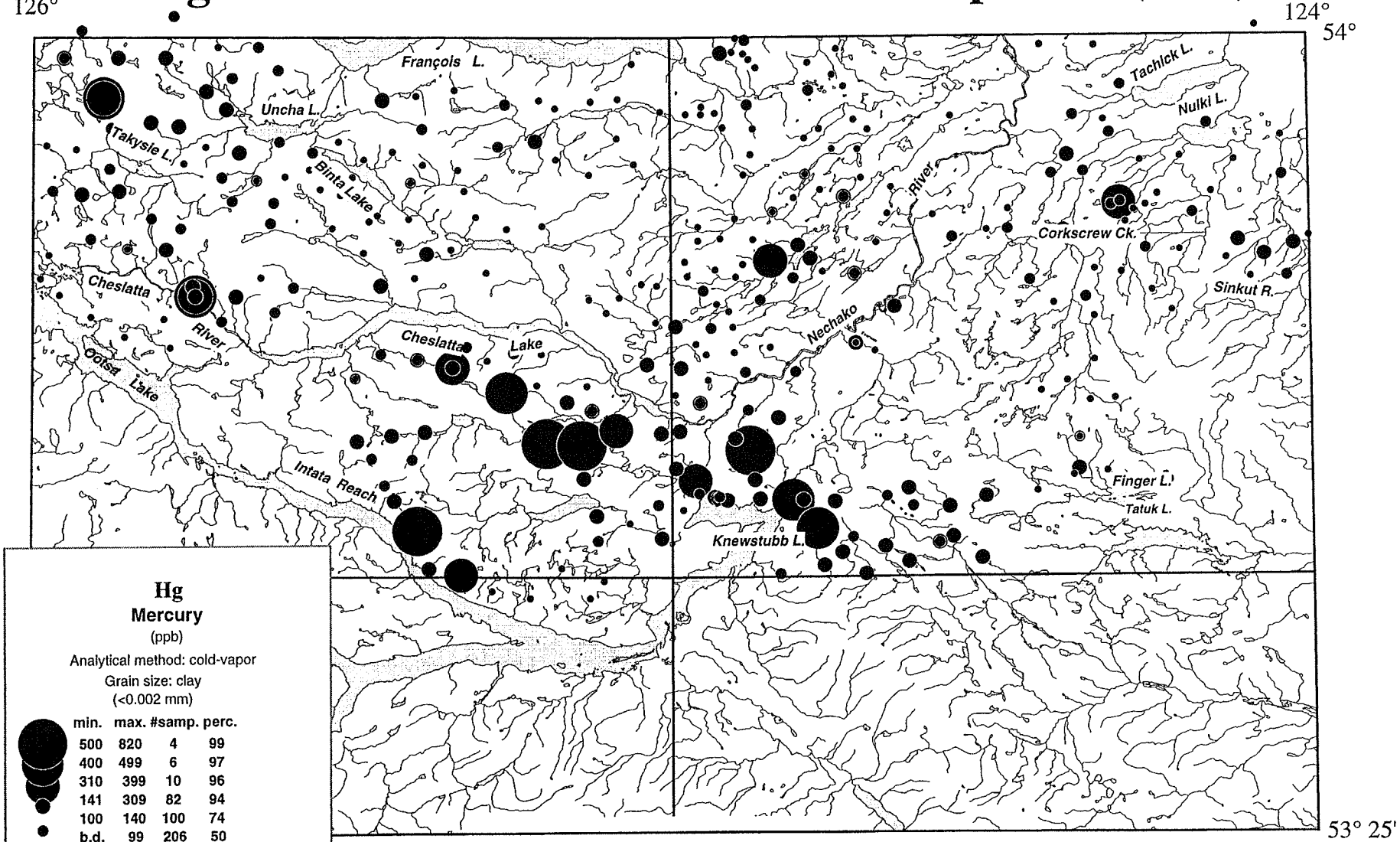

Figure 5