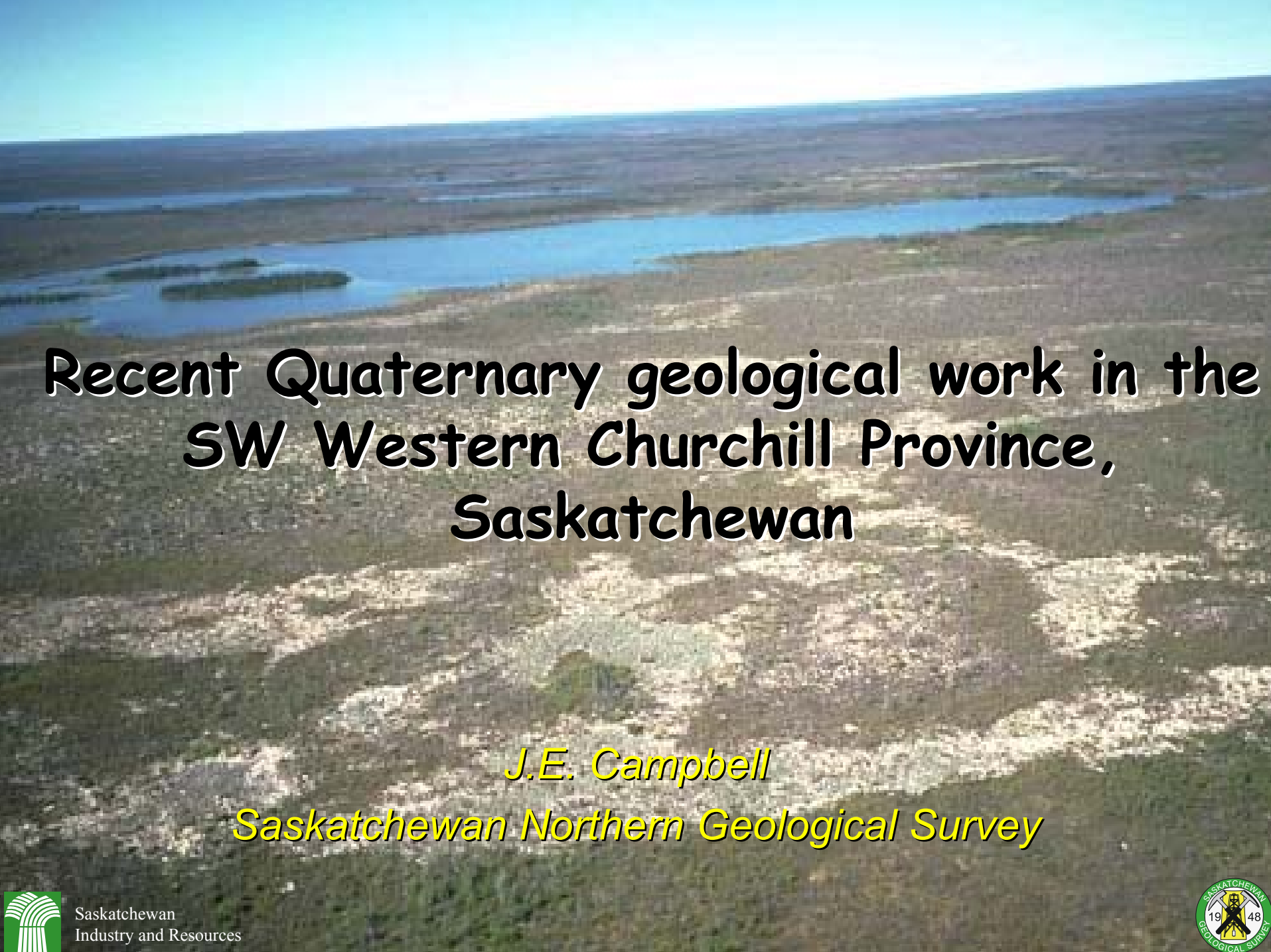


Recent Quaternary geological work in the SW Western Churchill Province, Saskatchewan

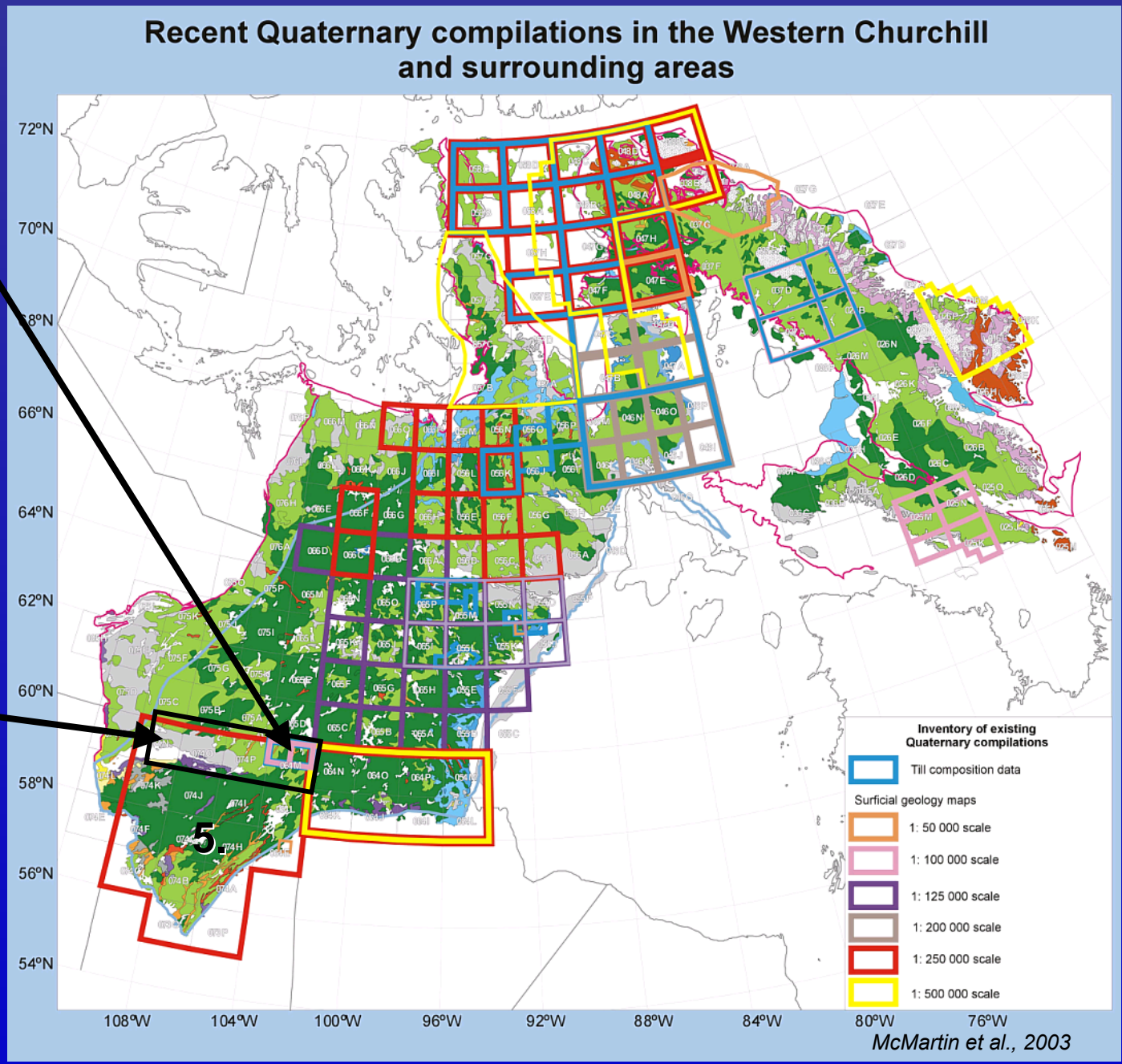
J.E. Campbell

Saskatchewan Northern Geological Survey

Saskatchewan
Industry and Resources

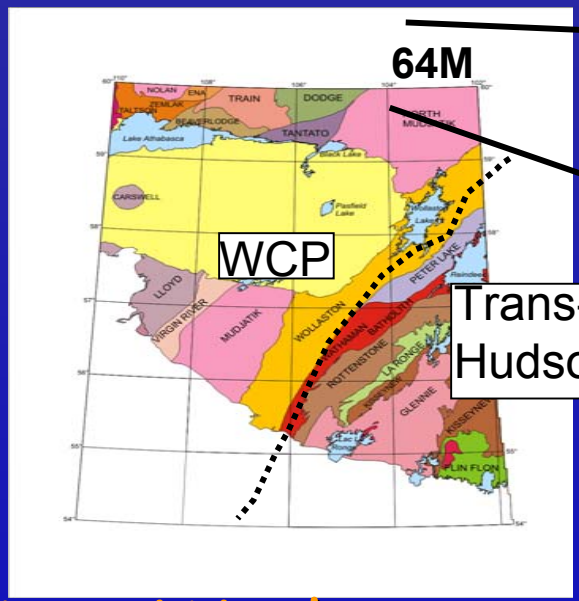
1. Phelps Lake Project: 2001-2002

2. WCMP Regional till geochemical database: 2004

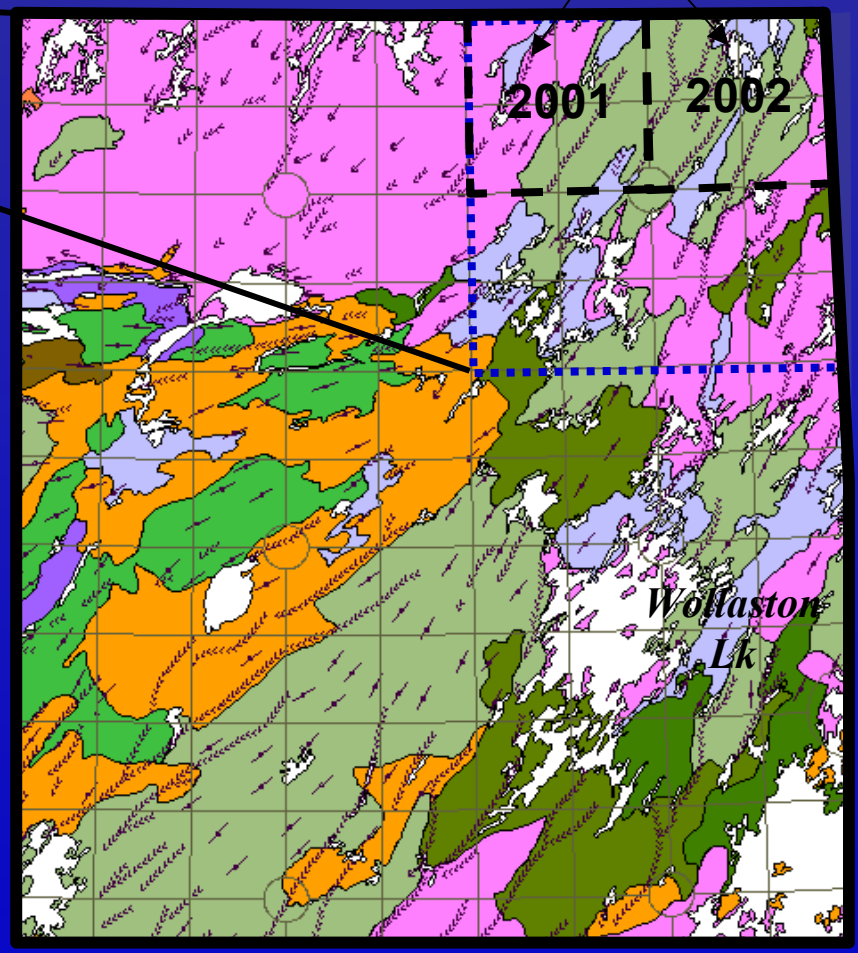


Phelps Lake Project: Quaternary mapping

Lithostructural Domains



Areas of geological & surficial mapping



From 1:1 M compilation surficial geology map

Previous Work

- Mapped at 1:250,000 scale (McNamara, 1884, 1987)
- Compiled at 1:100,000 scale (Schreiner, 1984)

Project Objectives

To provide basic geological information on:

- surficial geology,
- Quaternary stratigraphy,
- glacial history,
- till composition, and
- dispersal patterns

- Assist with bedrock mapping and
- Aid mineral exploration, environmental assessment and resource management

Integration of Quaternary data with bedrock geology and air borne radiometrics

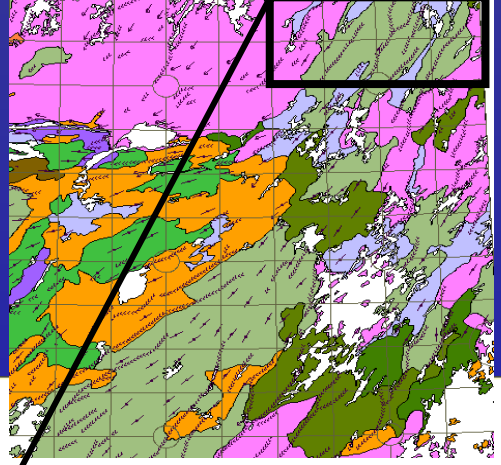
Project Components

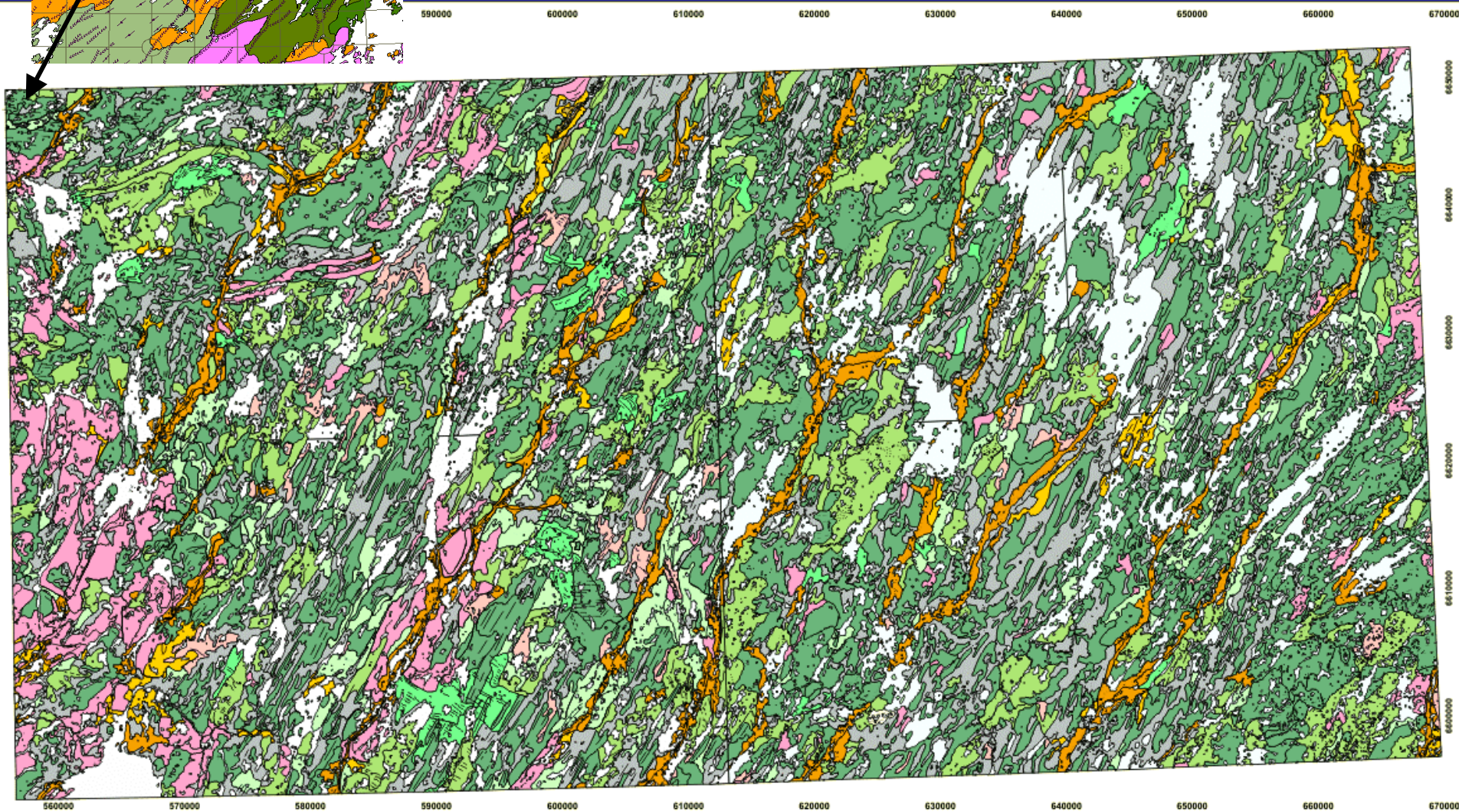
- Mapping of the surficial sediments and ice flow indicators 1:100,000 scale

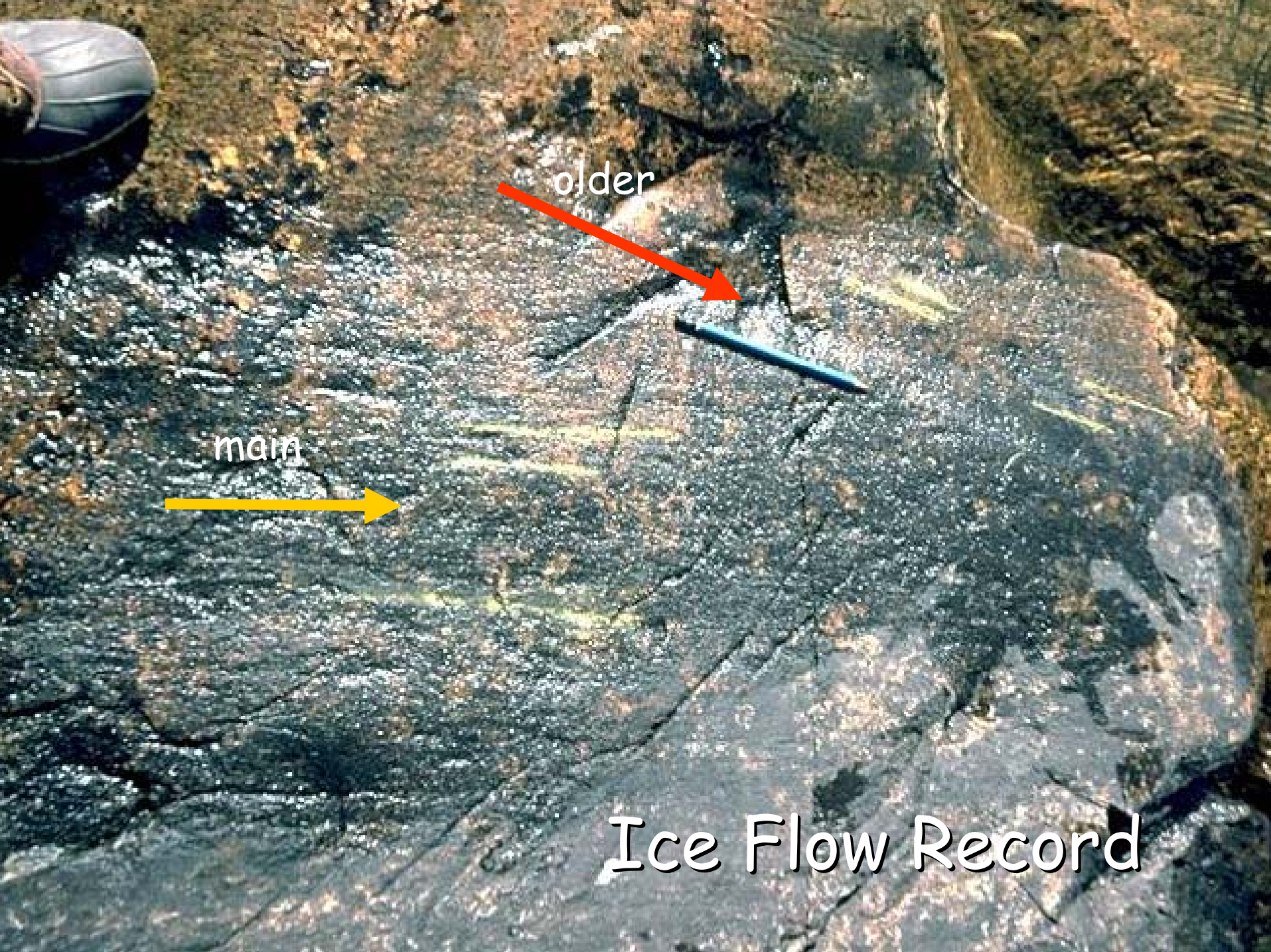
- Collection of bulk till samples for composition (geochemical, textural and pebble lithology), Au grain and diamond indicator analyses
  - ~ 1sample /5 sq km – 238 samples

New Surficial Geology Maps for north half 64M

1:100,000 scale

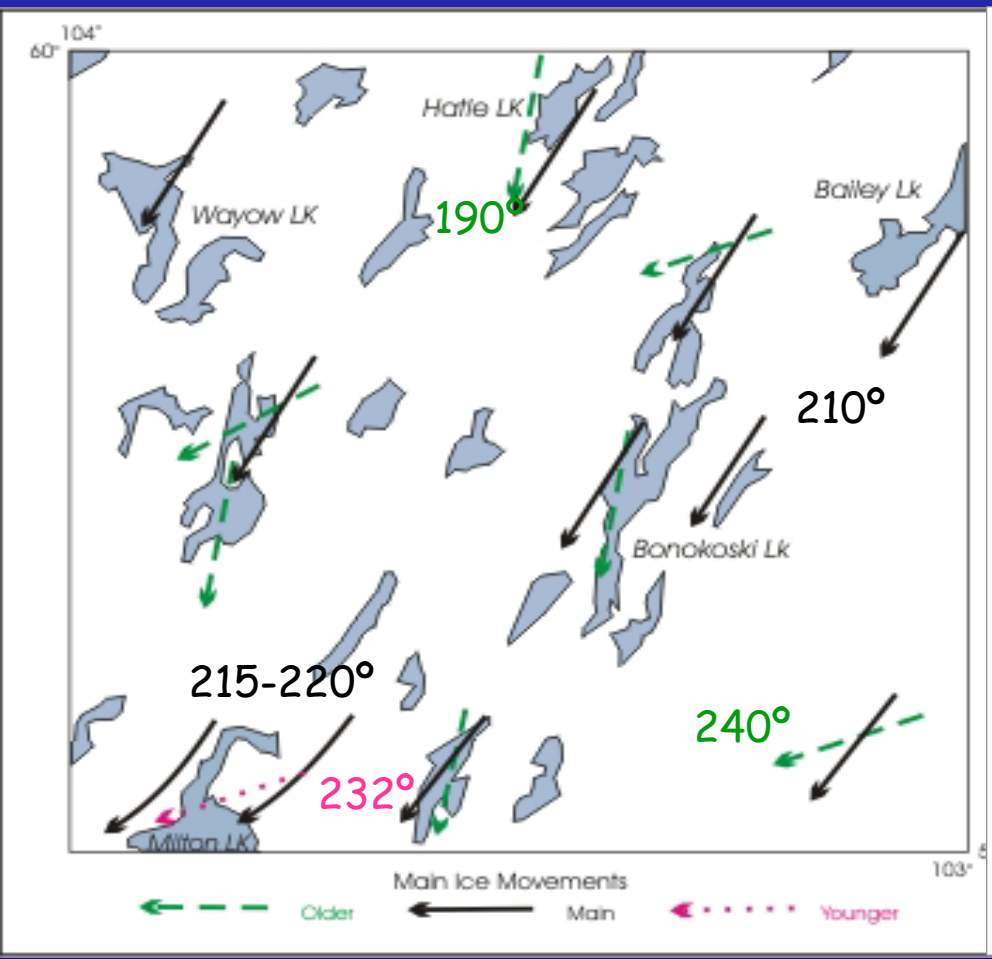


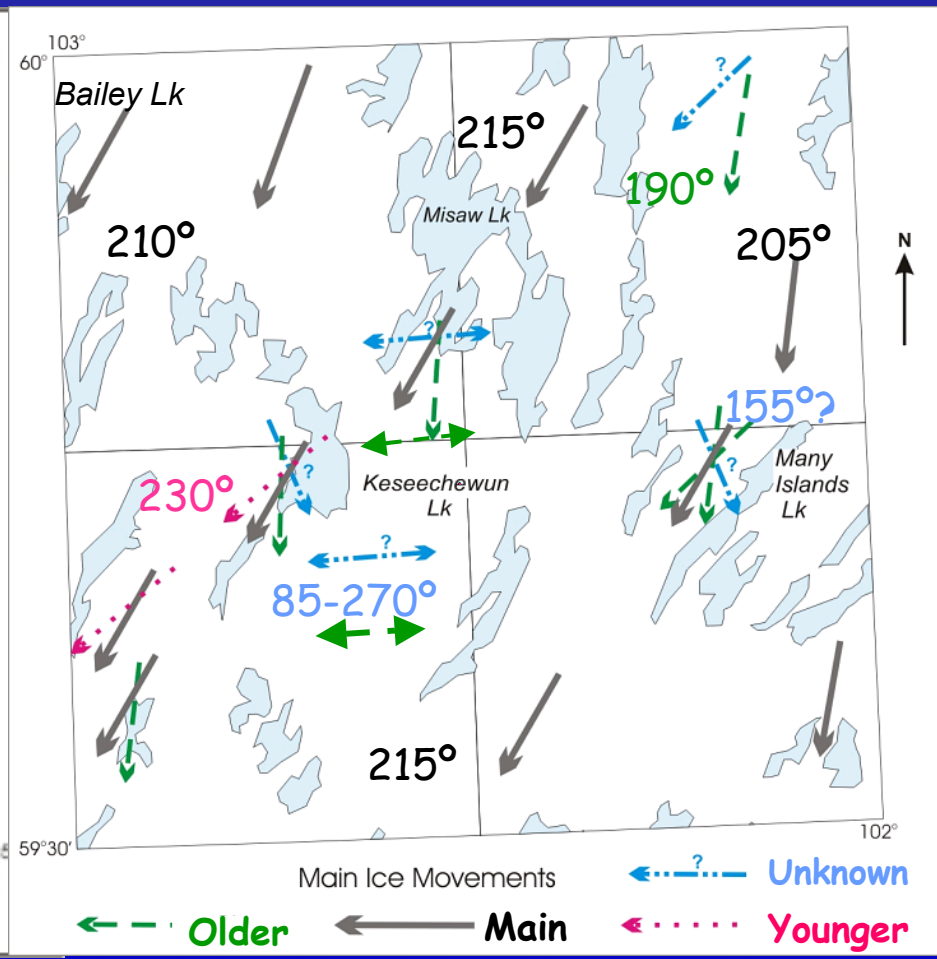



older
main
Ice Flow Record

Multiple ice flow directions identified

Main ice flow to the south west with earlier E, S and SW-W directions.





Extensive drift cover (less than 10% outcrop)

- Till, boulder fields and organic terrain are the dominant surface materials.


Rogen moraine


Low relief streamlined moraine


Hummocky bouldery moraine


Bouldery thin till veneer

Extensive drift cover (less than 10% outcrop)

- Till, boulder fields and organic terrain are the dominant surface materials.

Felsenmeer and locally-derived boulder fields

- Monolithologic, angular boulders of similar size are prominent features.
- Used to map the bedrock in areas of no bedrock exposure.


Felsenmeer


Boulder field

Megaboulders

locally derived, mega-huge erratics

Presence of short-lived, high elevation proglacial lake(s), NE Quadrant

Cobble beach at ~ 425 m

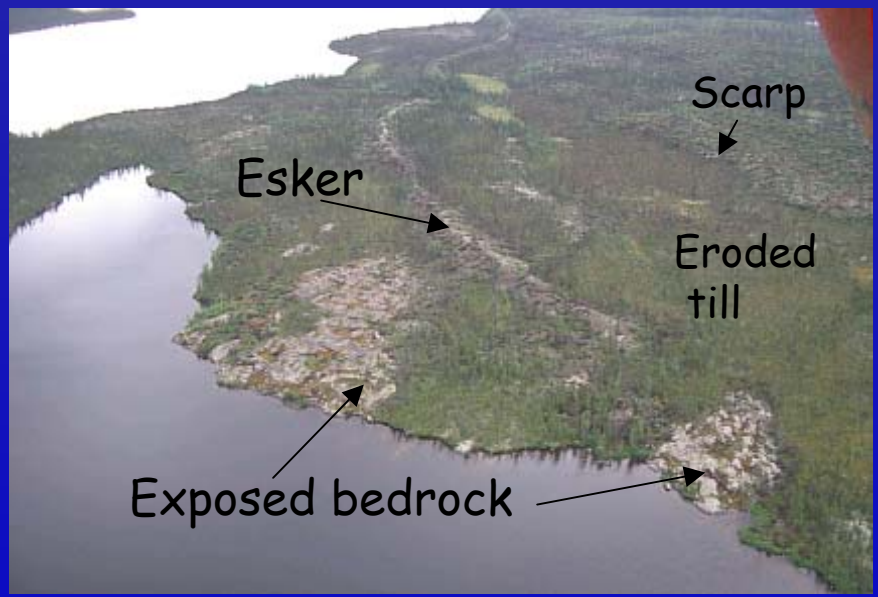
- Wave cut terraces, littoral sand spits, pebble and cobble beaches, washed/winnowed till, subaqueous diamicts and ice contact deltas

- Ice front formed northern lake shore

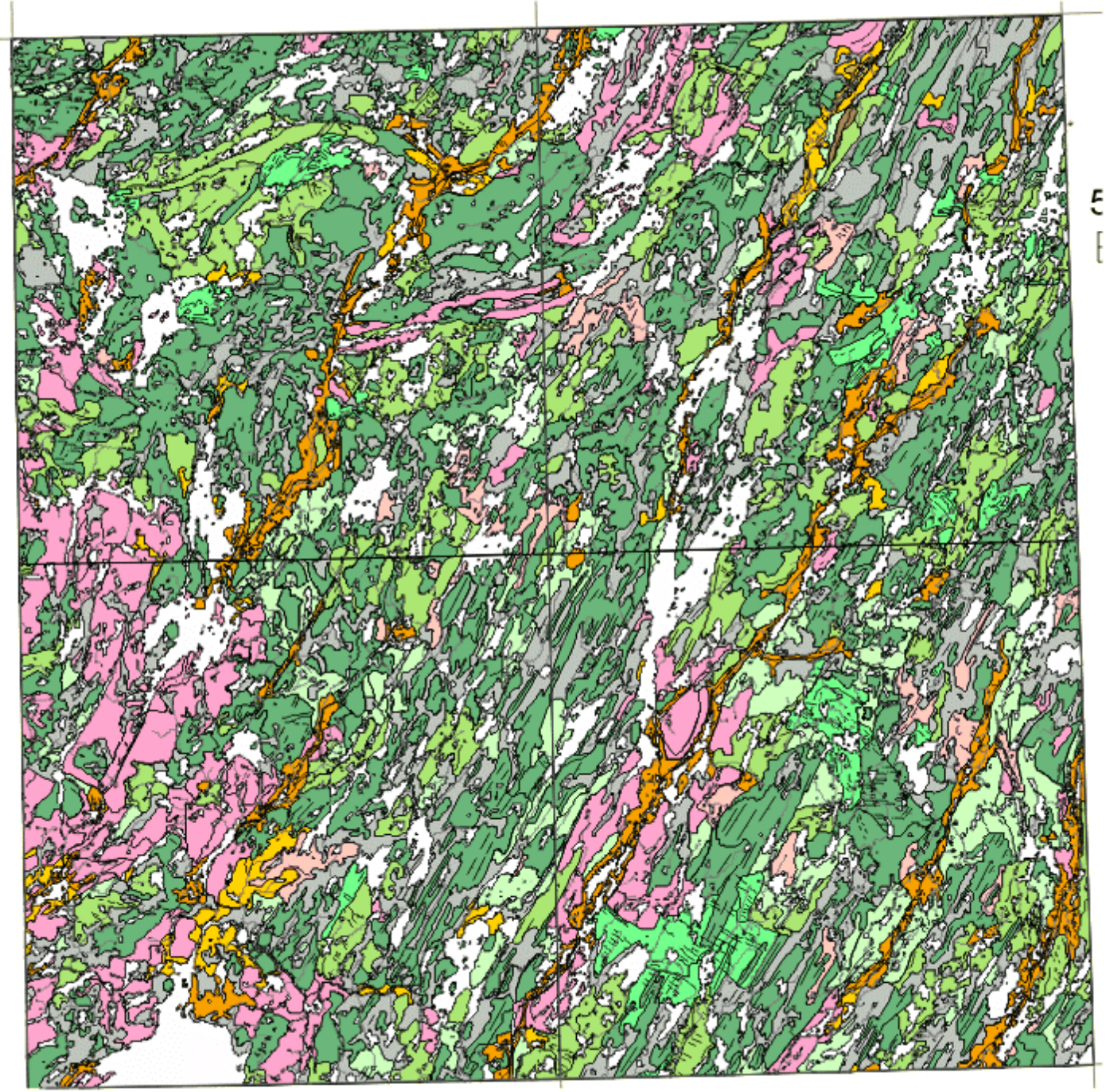
Subglacial meltwater

- Played significant role in the development of the present day landscape.
- Depositional and erosional features
- Large NE-SW trunk esker systems

Tunnel Valley – McKenzie Ck.

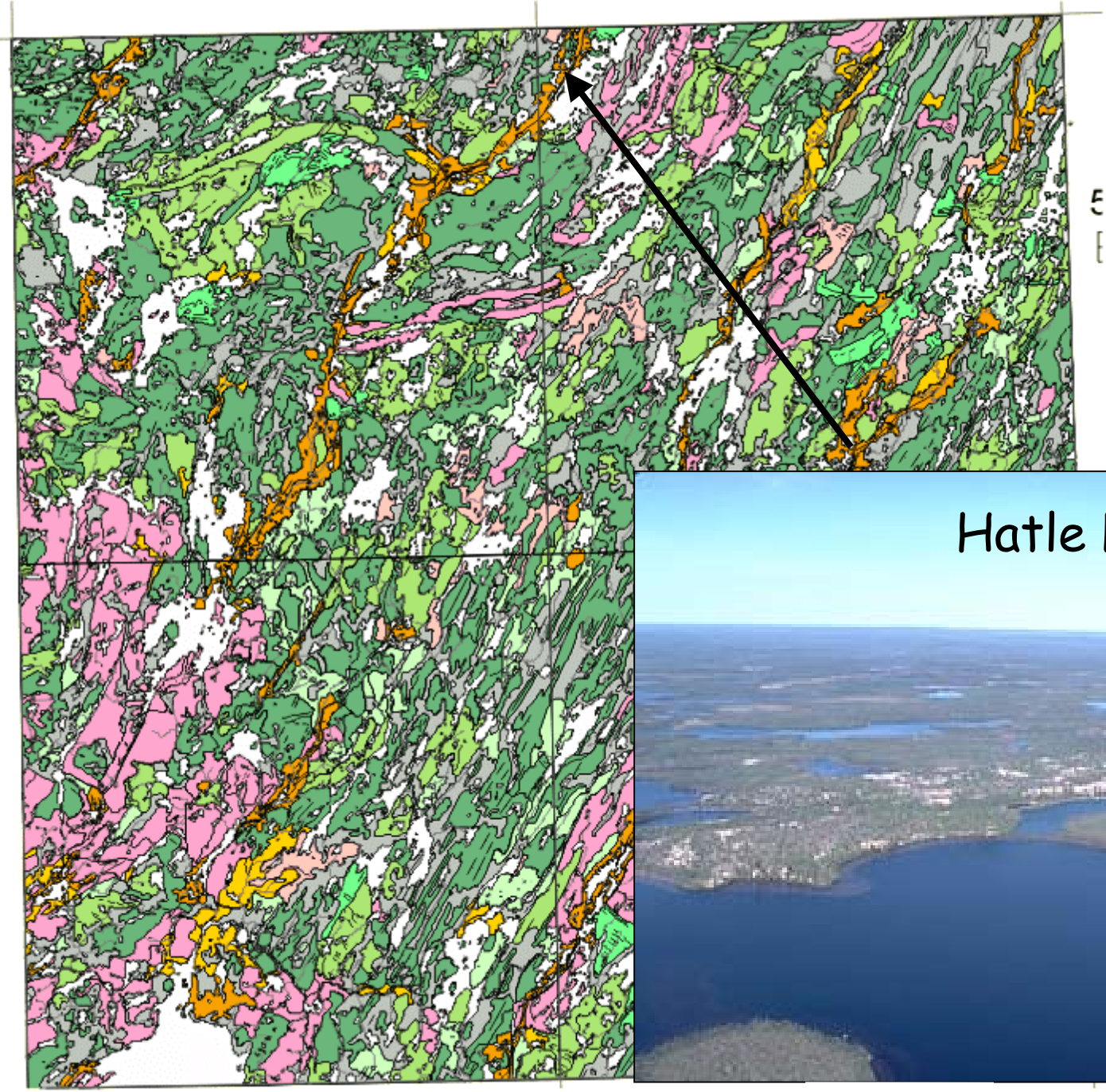


Eroded scarps and streamlined till landforms carved by subglacial meltwater floods



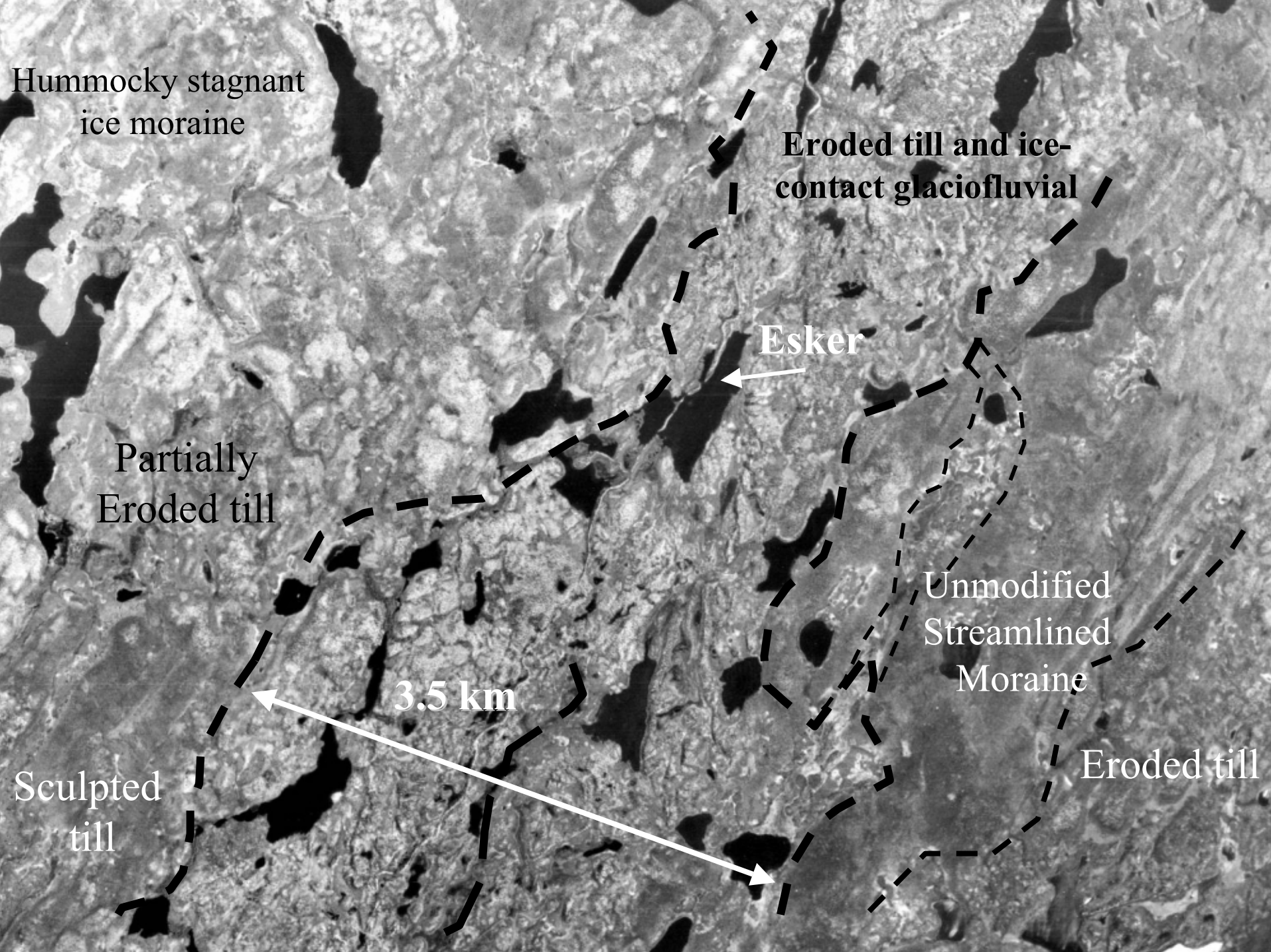
N

Trunk Esker Systems

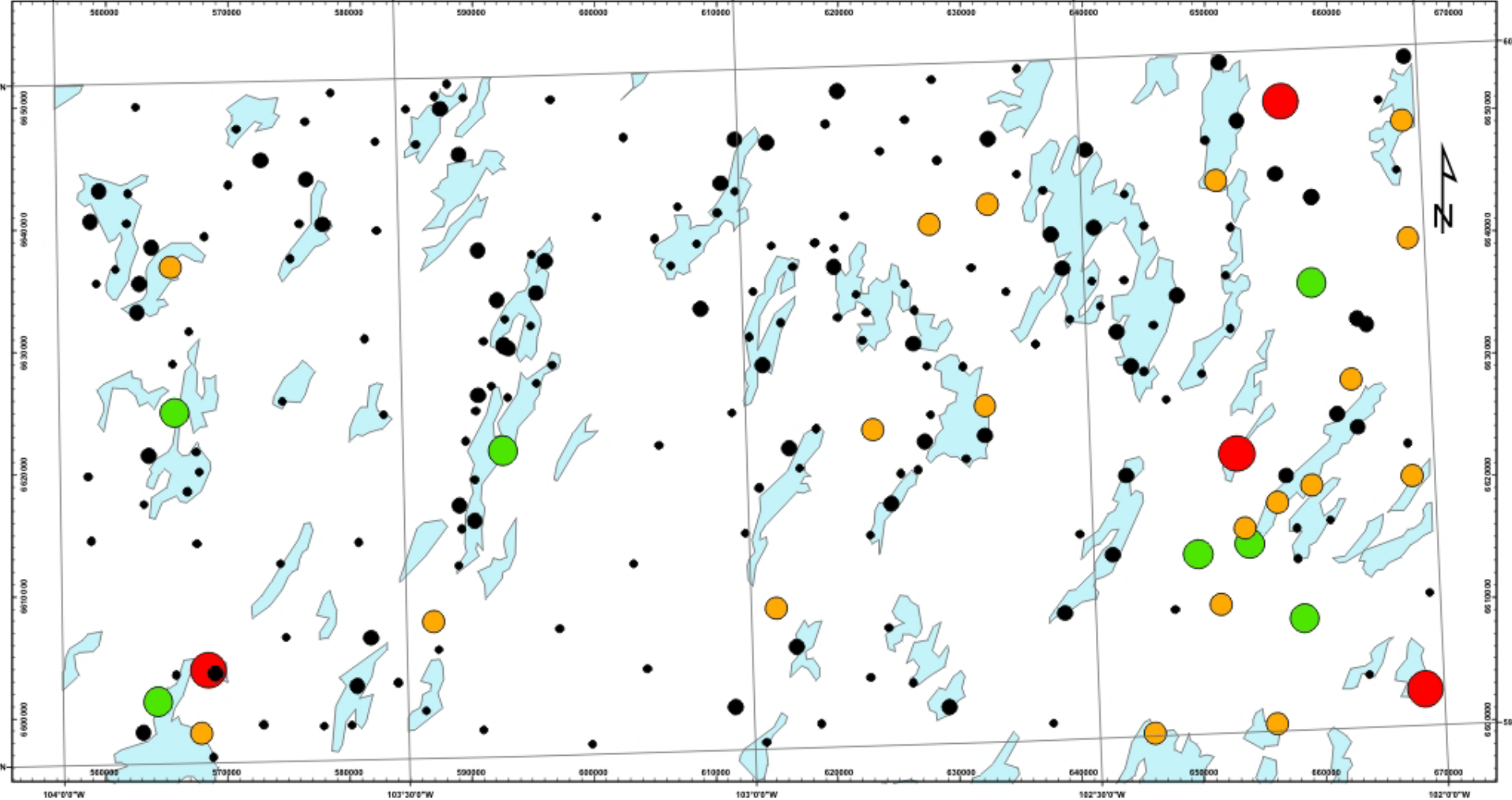


N

Trunk Esker Systems


Hummocky stagnant ice moraine
Eroded till and ice-contact glaciofluvial
Esker
Partially Eroded till
Unmodified Streamlined Moraine
3.5 km
Eroded till
Sculpted till

Bulk Till Sample Survey



Meters
6,400 3,200 0 6,400

Till Geochemistry

AU

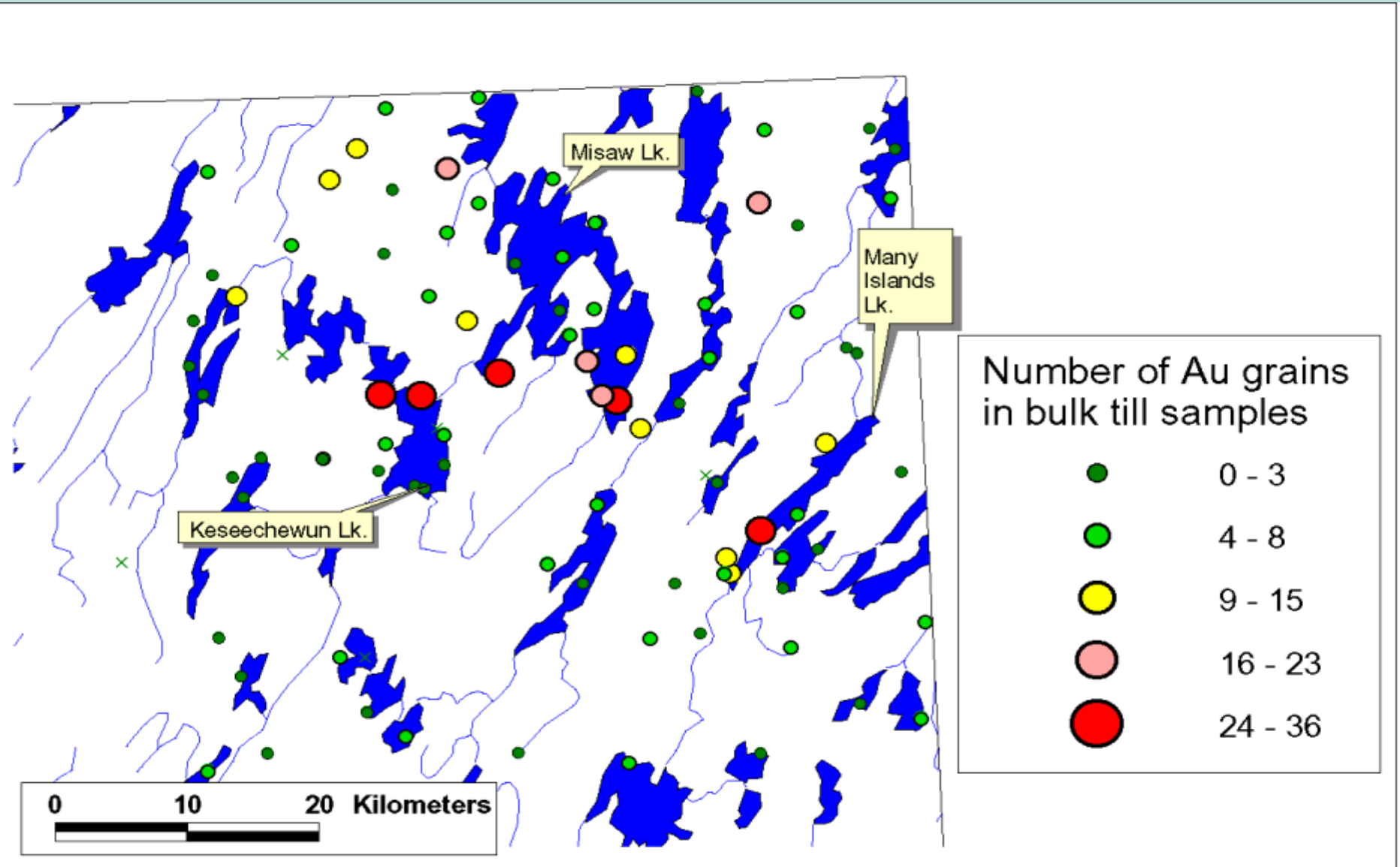
- 1 - 5
- 6 - 12
- 13 - 23
- 24 - 41
- 42 - 83

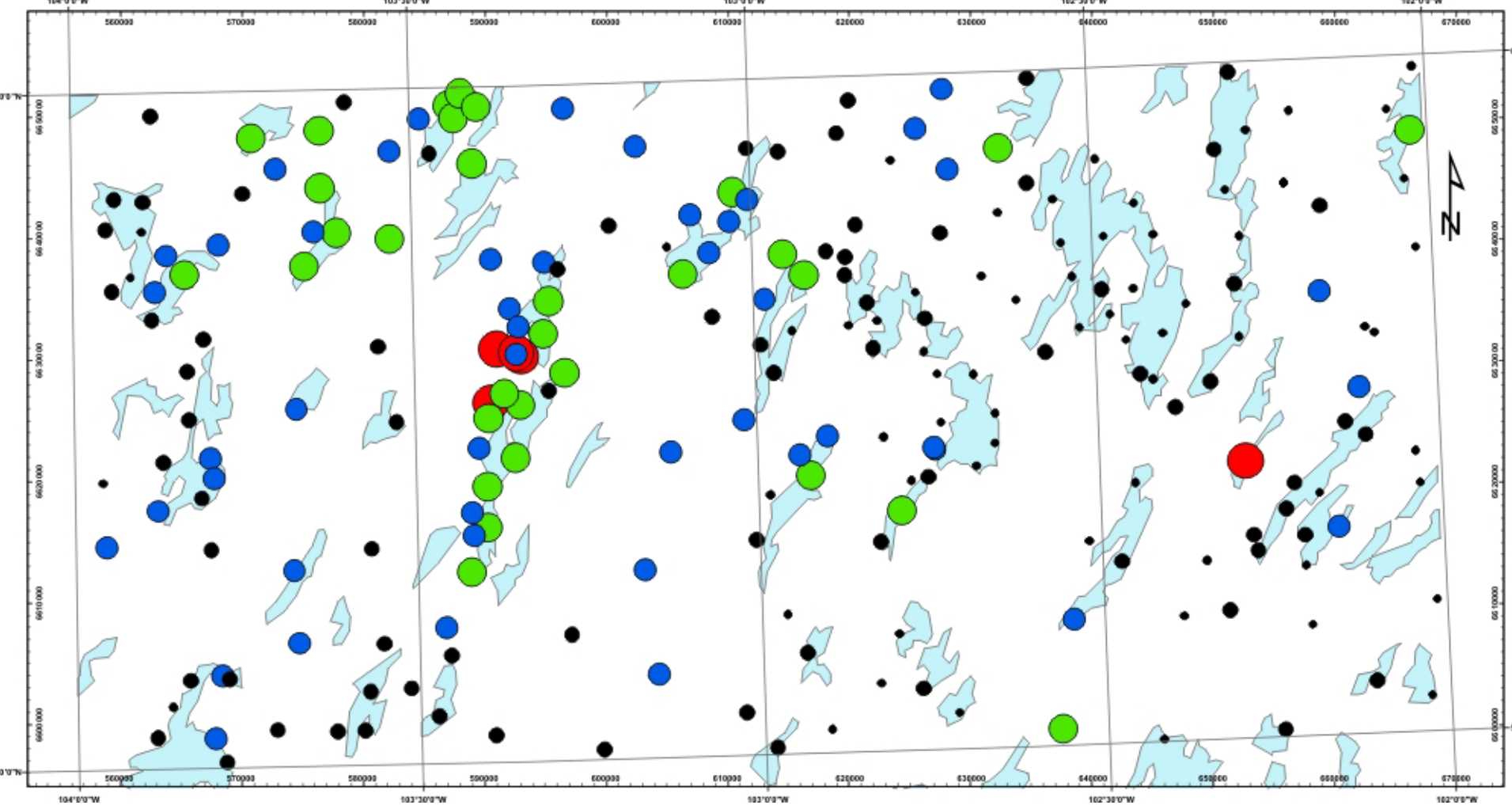
Till Geochemistry: -0.063 mm size fraction

Au ppb

Newly Released: Gold Grains in Till

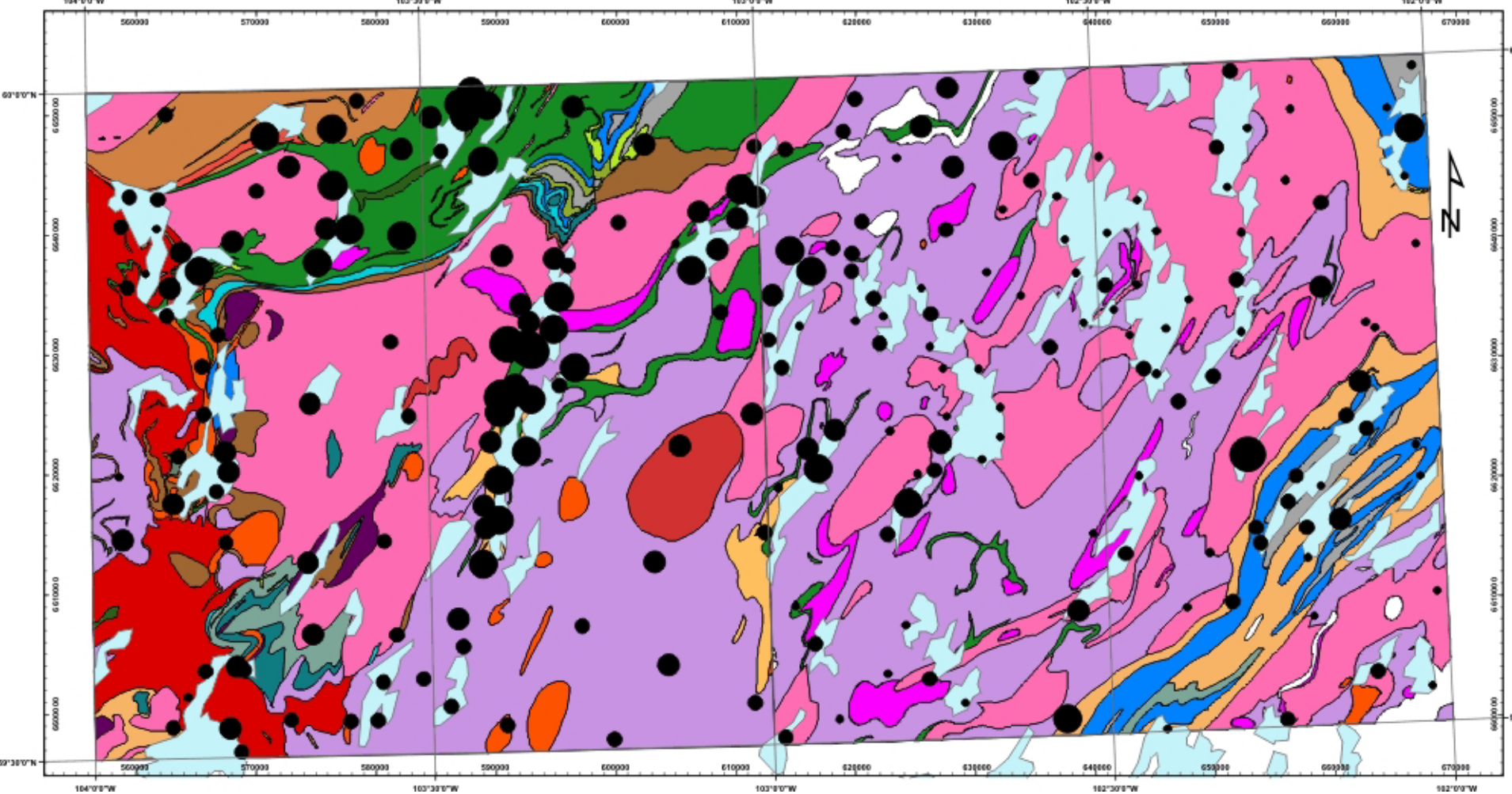
In Data File with till geochemistry, kimberlite indicator minerals and MMSIMs.





Till Geochemistry: -0.063 mm size fraction

Ni ppm



Meters

6,400 3,200 0 6,400

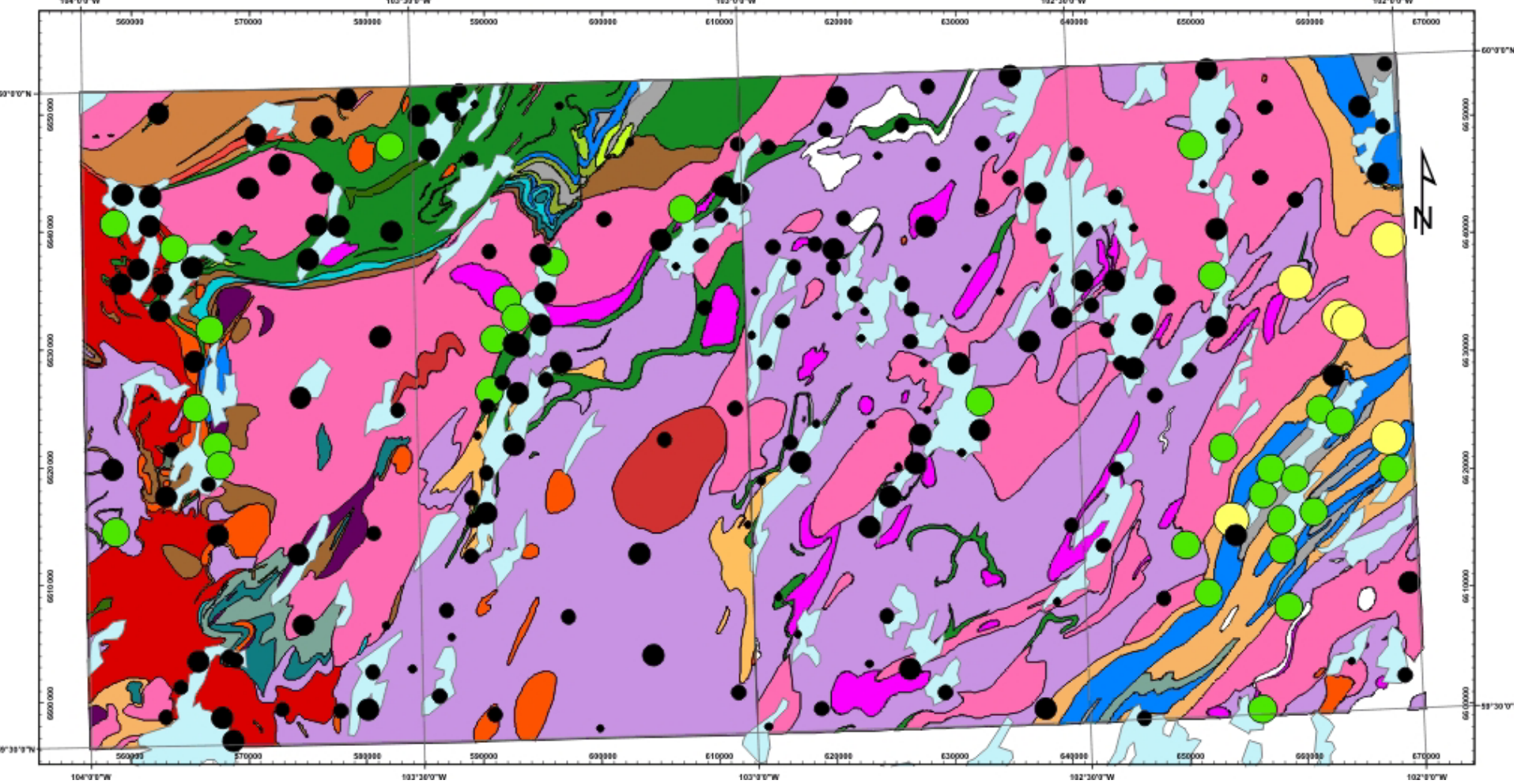
Till Geochemistry: -0.063 mm size fraction

Ni ppm

Till Geochemistry

NI

- 8 - 14
- 15 - 19
- 20 - 24
- 25 - 35
- 36 - 62



Till Geochemistry: -0.063 mm size fraction

Ce ppm

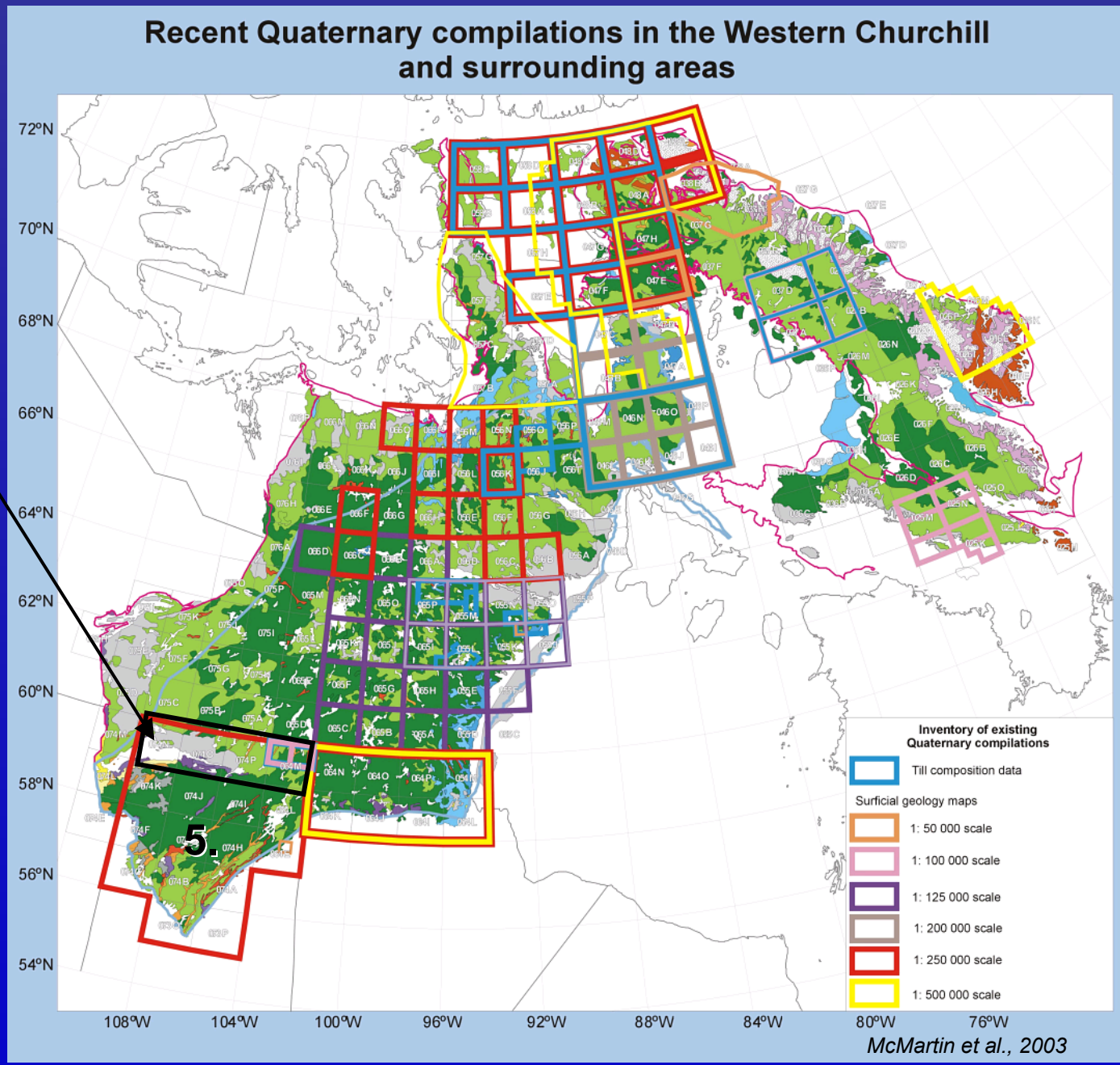
Implications for drift prospecting

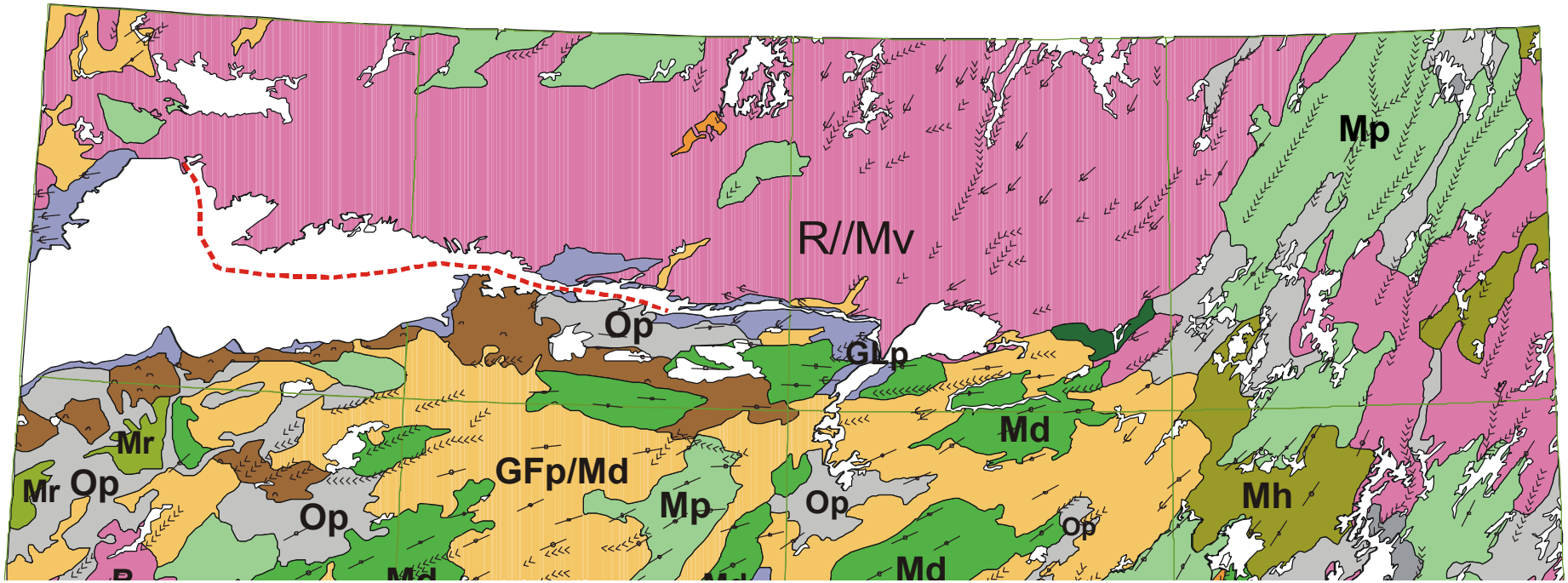
- Extensive but thin drift cover
- Surface till composition reflects local bedrock - variations are mainly due to: till thickness, degree of re-entrainment of previously deposited sediments, and ice flow history
- Abundance of locally derived boulders and felsenmeer
- Areas of stagnant ice moraine and ice contact deposits (kames , eskers) - Increase in exotic debris, degree of sorting and transport distances.
- Discontinuous permafrost - frozen sediments

Cautions

- Within the corridors produced by subglacial meltwater drainage, streamlined features likely the result of glaciofluvial erosion rather than glacial ice erosion.
- Eroded vs non-eroded till - surface till from different horizons/depths within the till deposit. Implications for interpretation of geochemical results and prediction of source distances.
- Knowledge of the Quaternary geology and ice flow history important
- Know what your are sampling

2. Regional till geochemical database: 2004

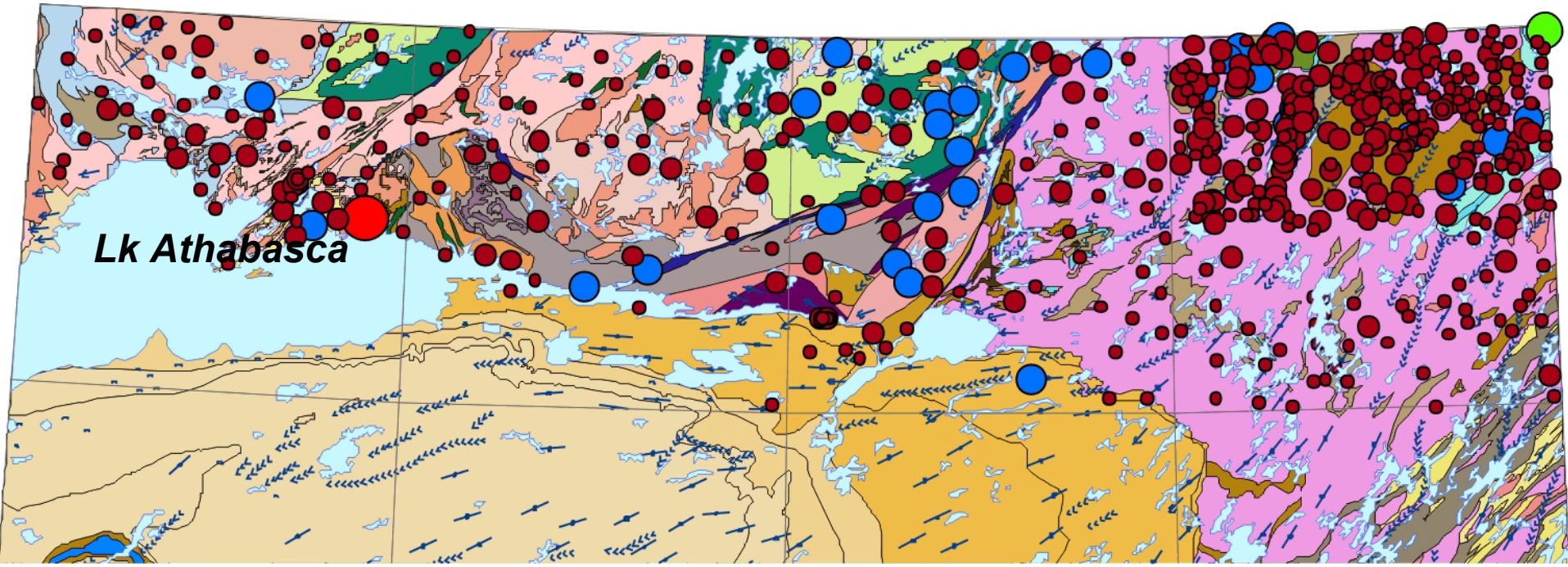




From 1:1 M compilation surficial geology map

Surficial Geology Framework: Reconnaissance 1:250,000 scale Maps

Till Geochemistry: -0.63 mm size fraction

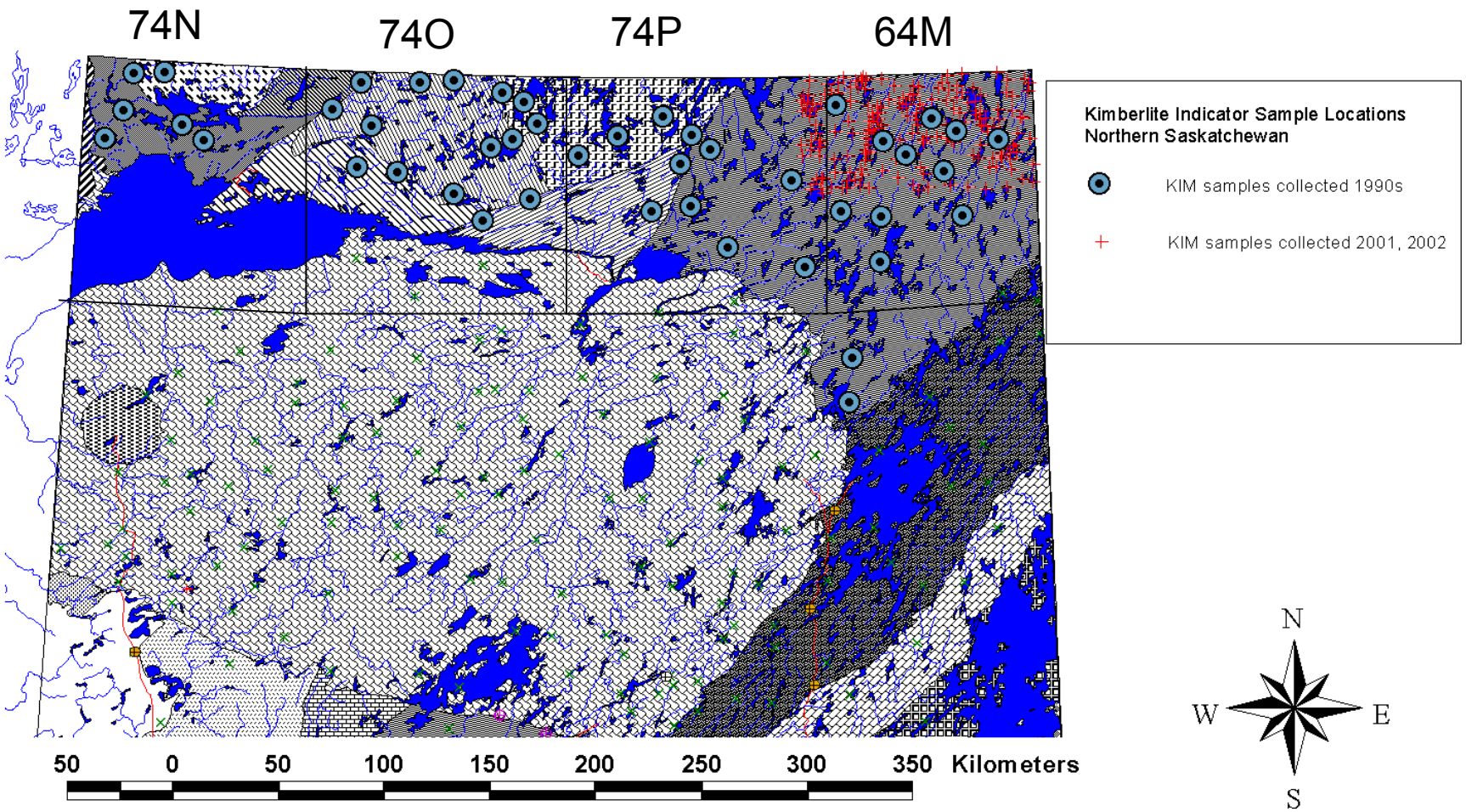


- NTS Mapsheets 64M, 74N, O & P
- *56 elements*
- *compilation - ~500 samples*

Cu ppm
1 - 11
12 - 31
32 - 91
92 - 162
163 - 627

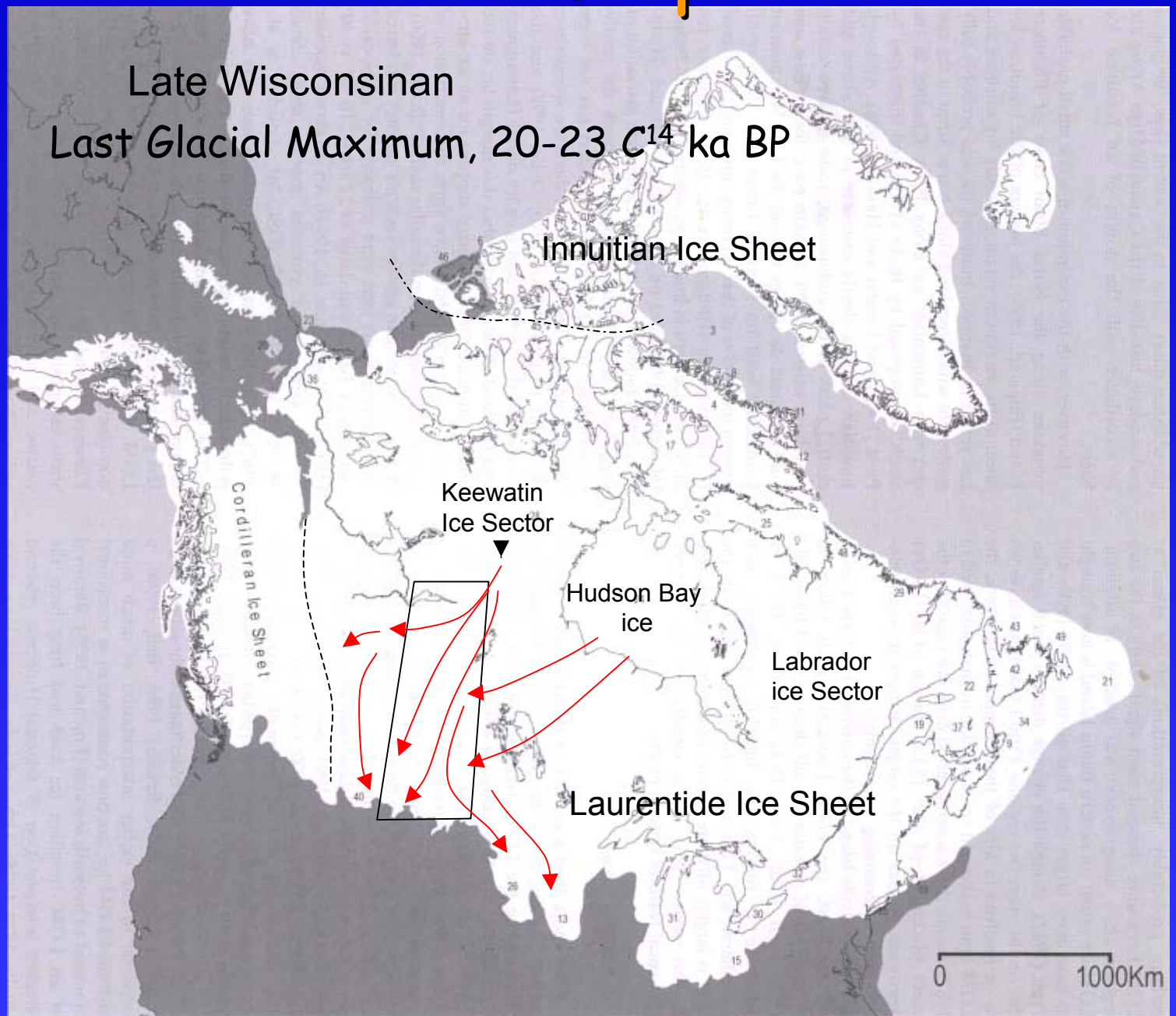
http://www.ir.gov.sk.ca/Default.aspx?DN=3673,3440,3385,2936,Documents

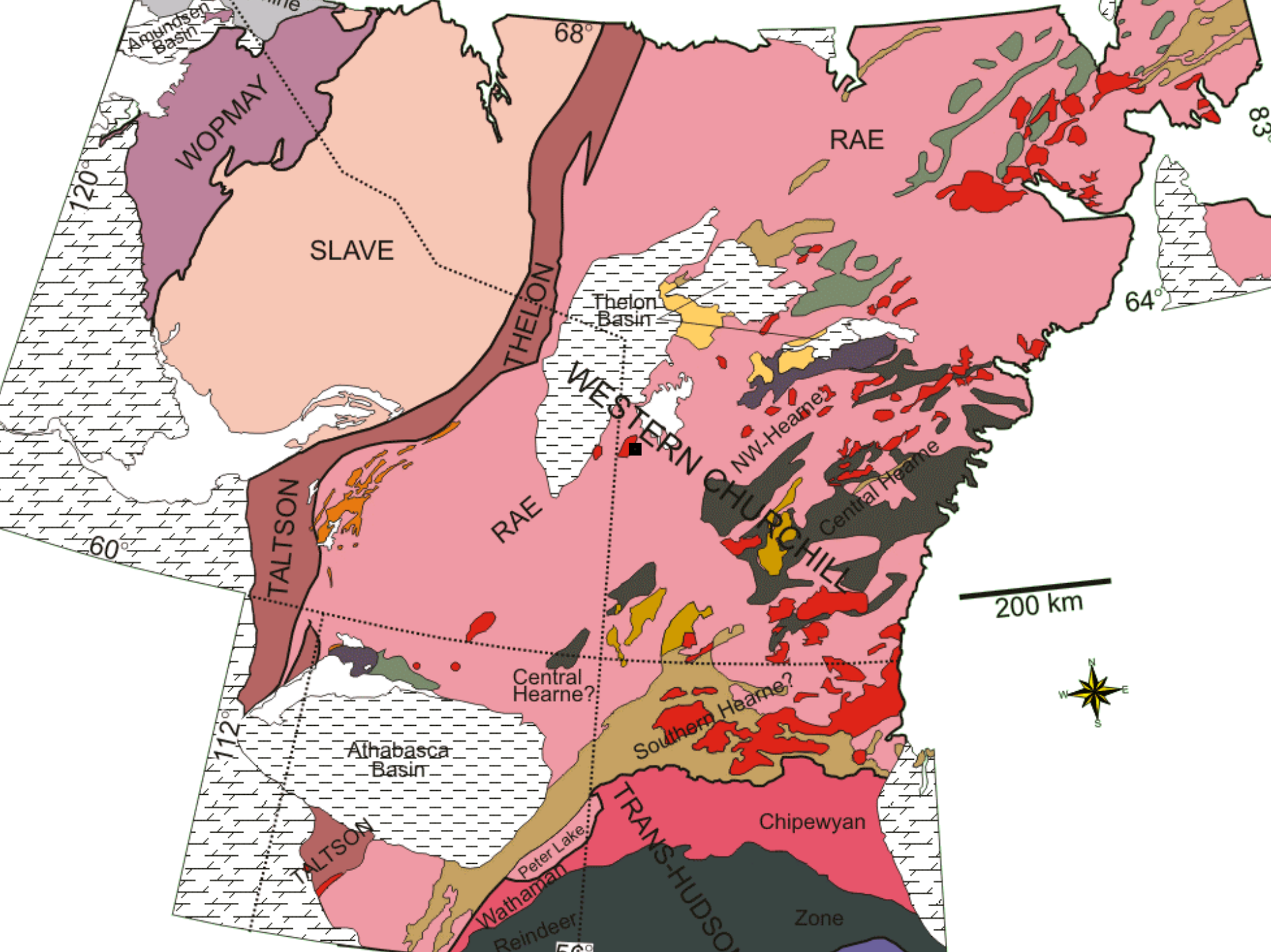
Kimberlite Indicator Mineral Database



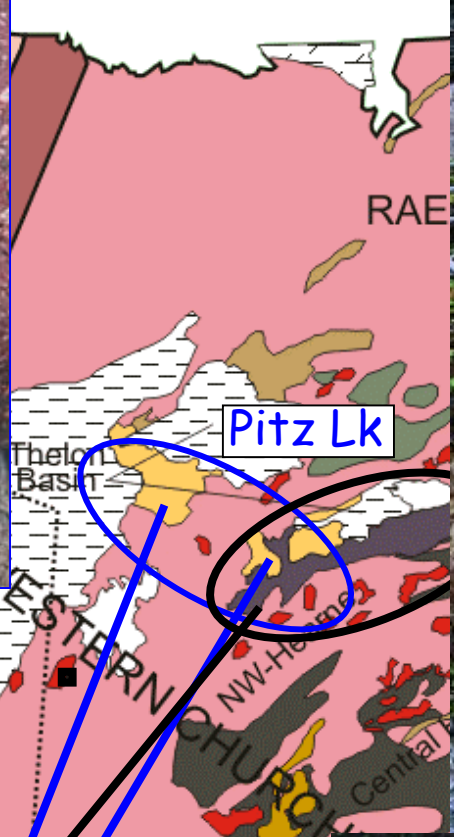
1990's Kim's on bulk **eskers**, 74N, O, P, & 64M = 45 samples (circle)
2001-2002 Kim's on bulk **tills**, 64 M (north half) = 210 samples (cross)

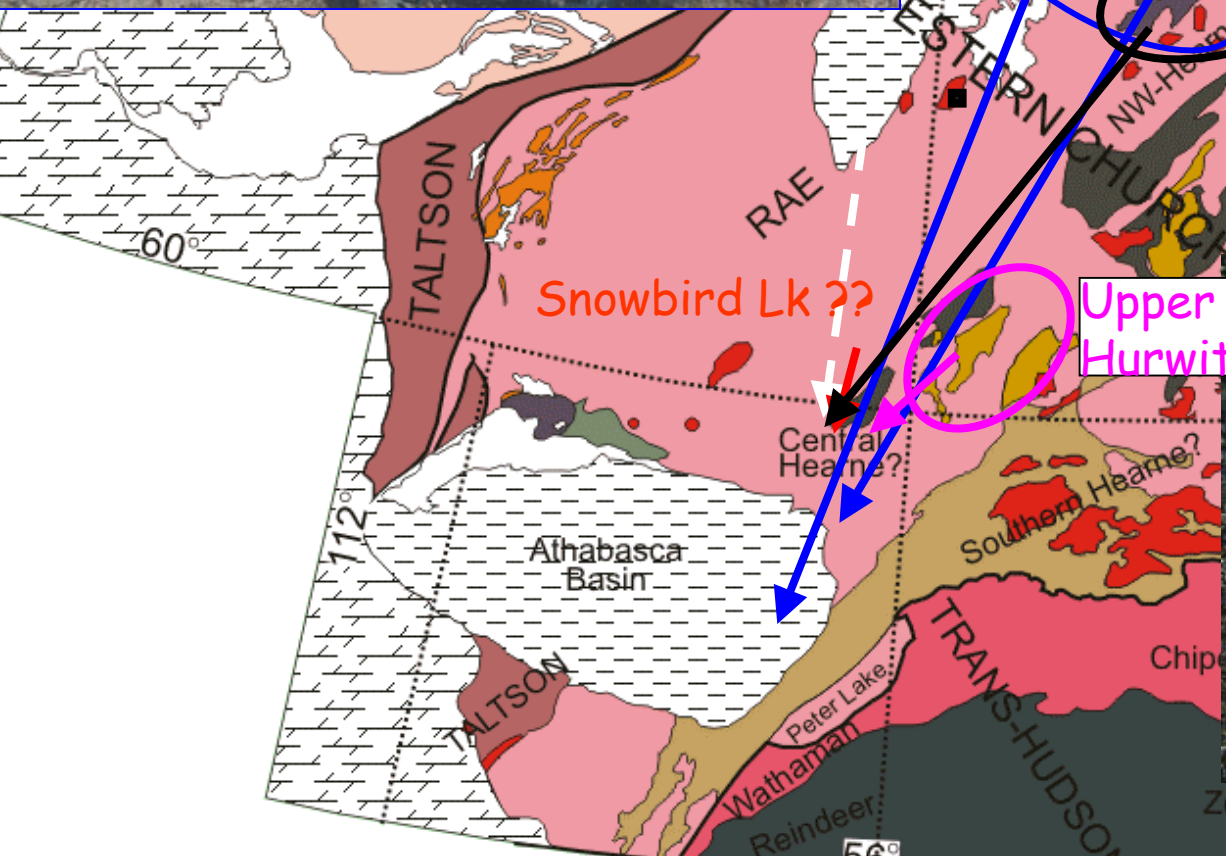
Glacial Dispersal




Amundsen Basin
68°
WOPMAY
120°
SLAVE
THELON
RAE
Thelon Basin
WESTERN CHURCHILL
NW-Hearne?
Central Hearne
64°
83°
TALTSON
60°
RAE
200 km
Central Hearne?
Southern Hearne?
112°
Athabasca Basin
TALTSON
Peter Lake
Watham
Reindeer
TRANS-HUDSON
Chipewyan
Zone
56°


NATGAM


RAE
Pitz Lk
Thelon Basin
NW-Hearne
Central


TALTSON
RAE
Snowbird Lk ??
Upper Hurwitz
60°
112°
Athabasca Basin
Central Hearne?
Southern Hearne?
TRANS-HUDSON
Peter Lake
Wathaman
Reindeer
Zone

Future Work- Sask.

- Surficial mapping and till sampling – 2004 eastern Peter Lake Domain (64M/NE); proposed 2005 – Eastern Wollaston Lk Domain (64E)
- Compilation of till geochemical, Au grains, KIM and MMSIN databases- web based
- WCMP Synthesis work – SW to Central regions –ice flow history