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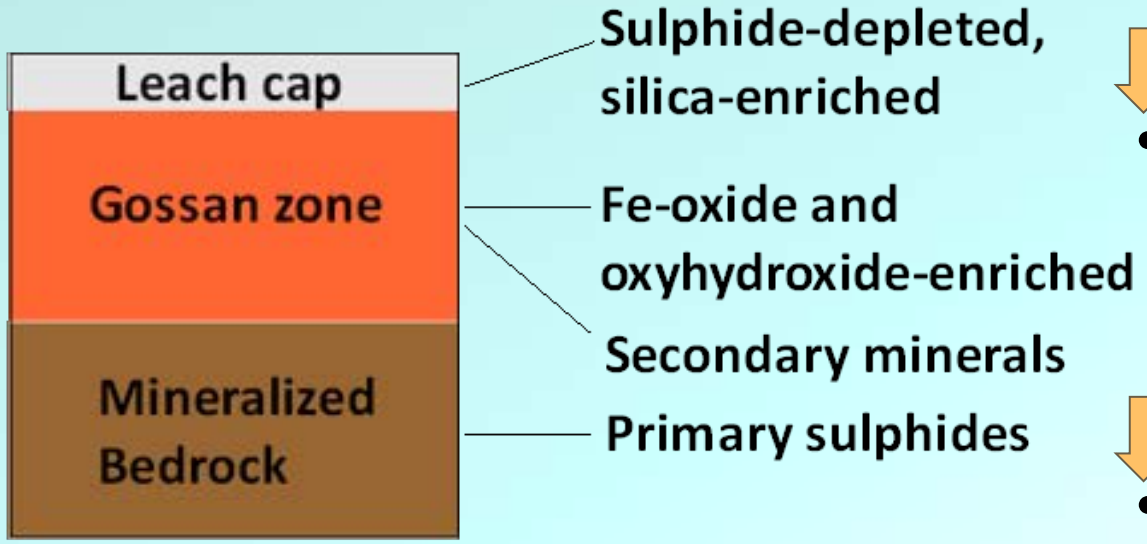
Gossans as vectors to critical minerals deposits: An overview of project results for Nunavut

Marie-Claude Williamson

NRCan-Geological Survey of Canada

Canada

Methodology



Percival and Williamson (2016)

- Highly weathered Fe-rich soils overlying sulphide-rich bedrock.
- Remote predictive mapping using satellite imagery: detection, extent, morphology, mineralogy.
- Identify gossans with elevated values of base and noble metals.
- Mineralized bedrock

Jeanne Percival, GSC

Ron Peterson,
Queen's University

Rick McNeil, GSC

Éloïse Brassard
U de Sherbrooke

Rob Rainbird, GSC

Jackson Froome,
Queen's University

Derek Wilton, MUN

Steve Day, GSC

Jeff Harris, GSC

Benoit Saumur,
UQÀM

Erin Bethell
U of Ottawa

Cole Kingsbury,
Carleton University

Myriam Lemelin
U de Sherbrooke

Pouran Behnia, GSC

NRCan-GSC Arctic Gossans Project 2011-2023

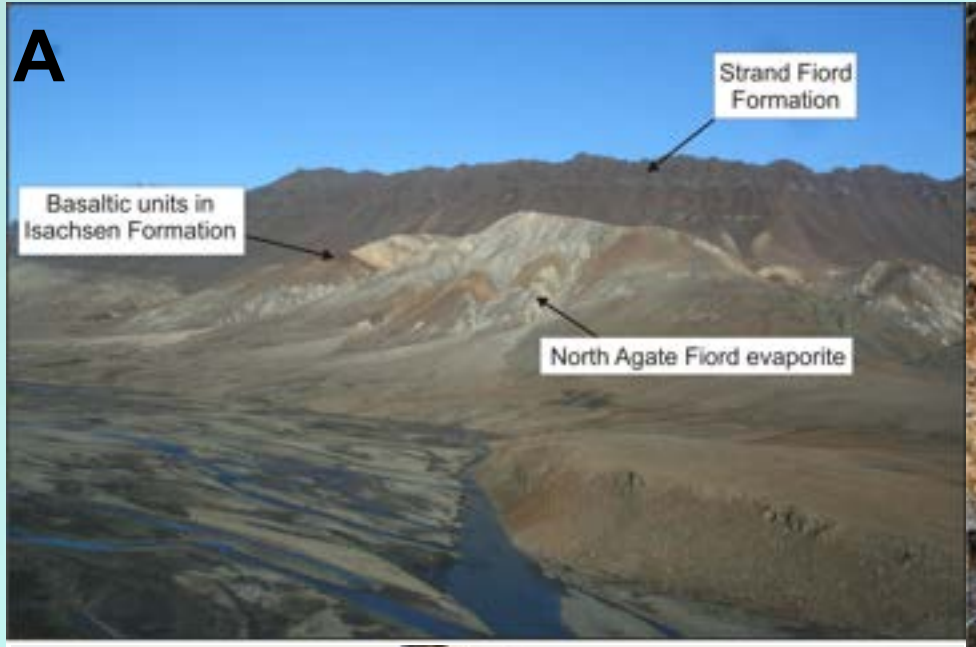
OUTLINE

- The Arctic Gossans mapping project
- Detecting gossans using satellite imagery
- The Baffin Island desktop study
- The Muskox intrusion feeder dyke
- Conclusions and future work

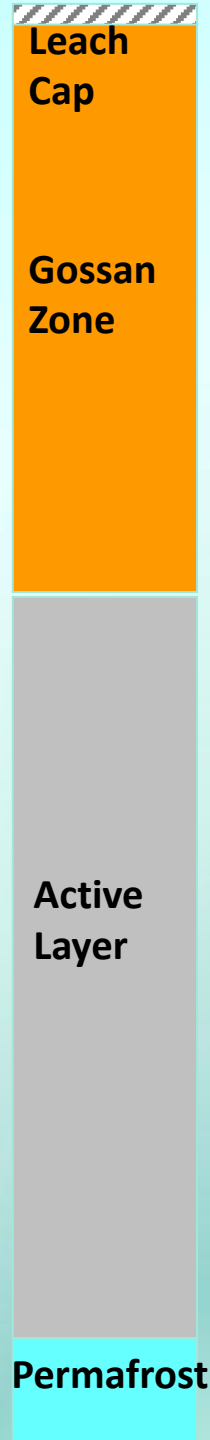
Gossans mapped in Nunavut

Fieldwork

2004
2008
2011
2013
2015
2022

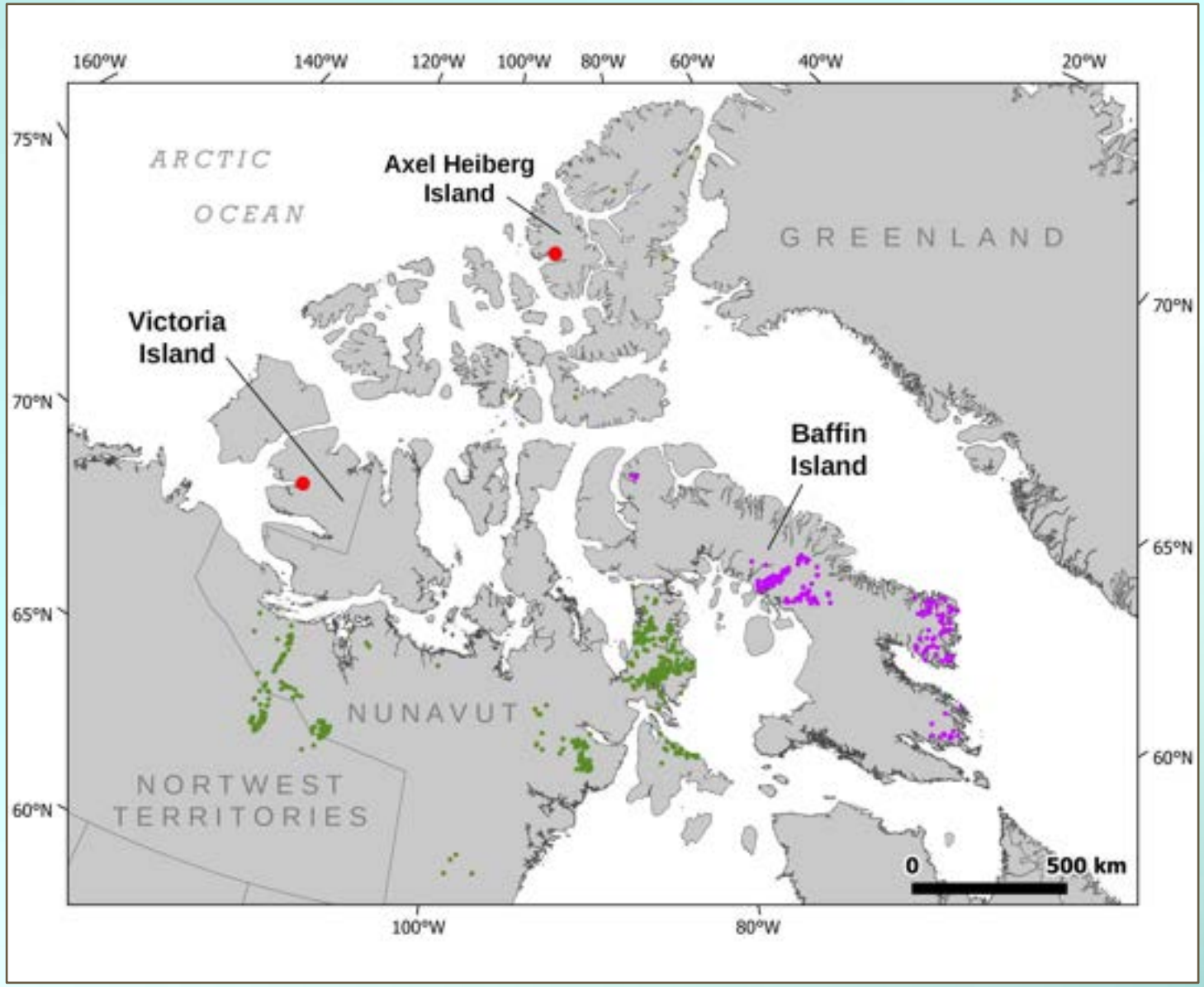


Williamson et al. (2011)

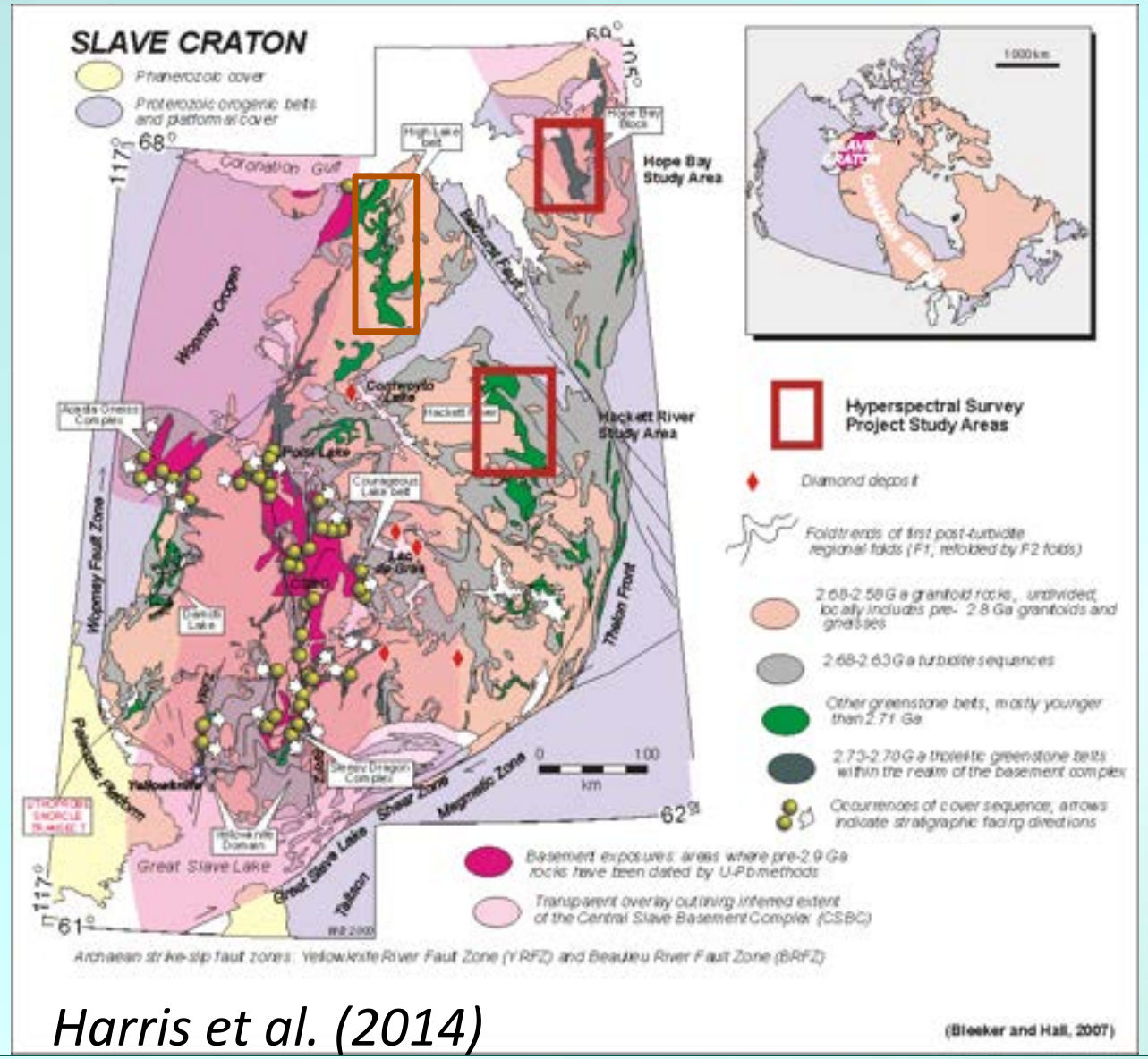


Gossans mapped in Nunavut

GEM GeoNorth
2021-2023



Detecting gossans using satellite imagery



Harris et al. (2014)

Example: High Lake, NU

A. LANDSAT 7

Natural Colour Composite

1:100,000

Spatial resolution 30 m

B. HYPERSPECTRAL

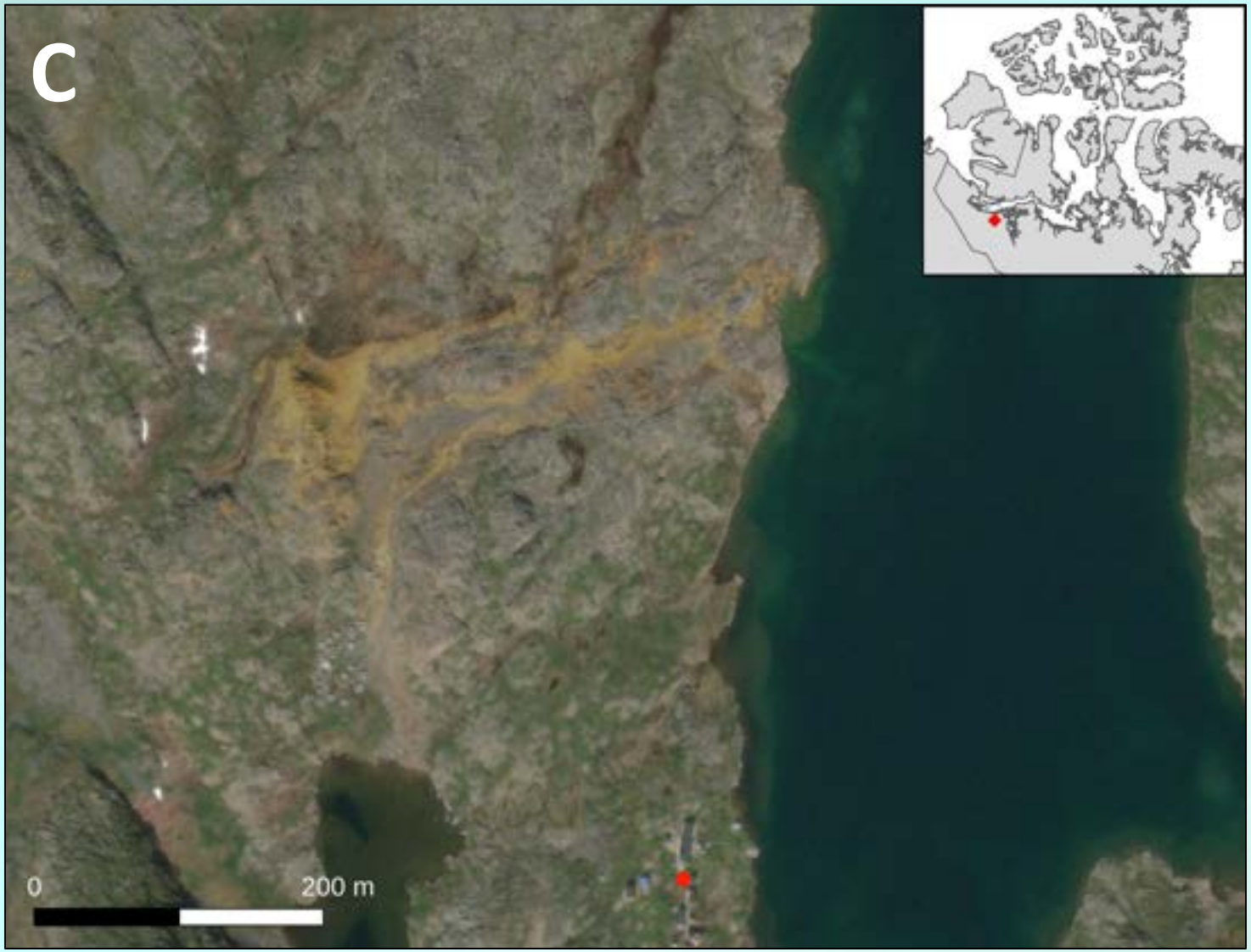
Natural Colour Composite

1:10,000

Spatial resolution 1 m

A

B



High Lake, NU

C. ESRI World Imagery

Spatial resolution 1.5 m

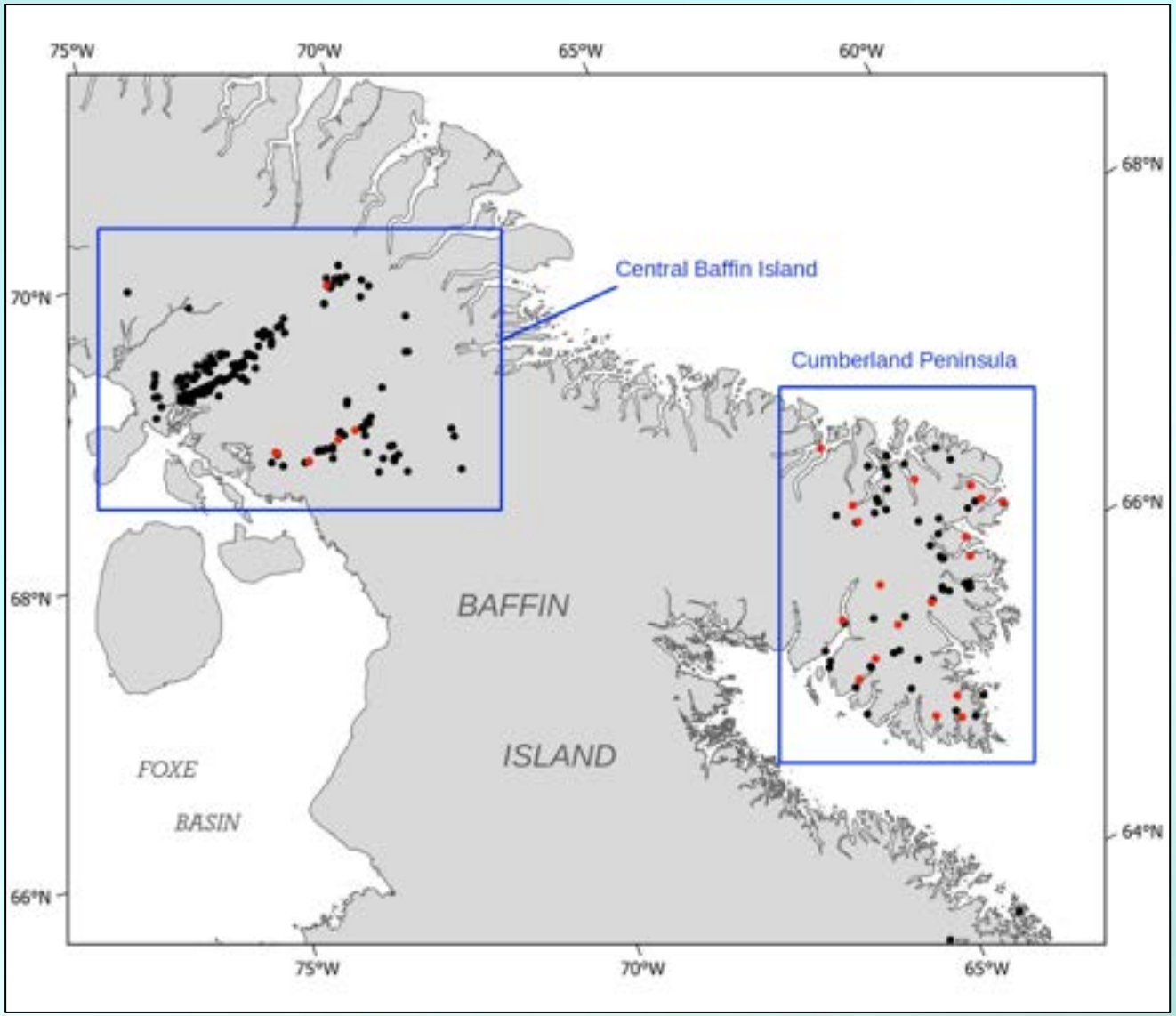
- Detect gossans
- Morphology

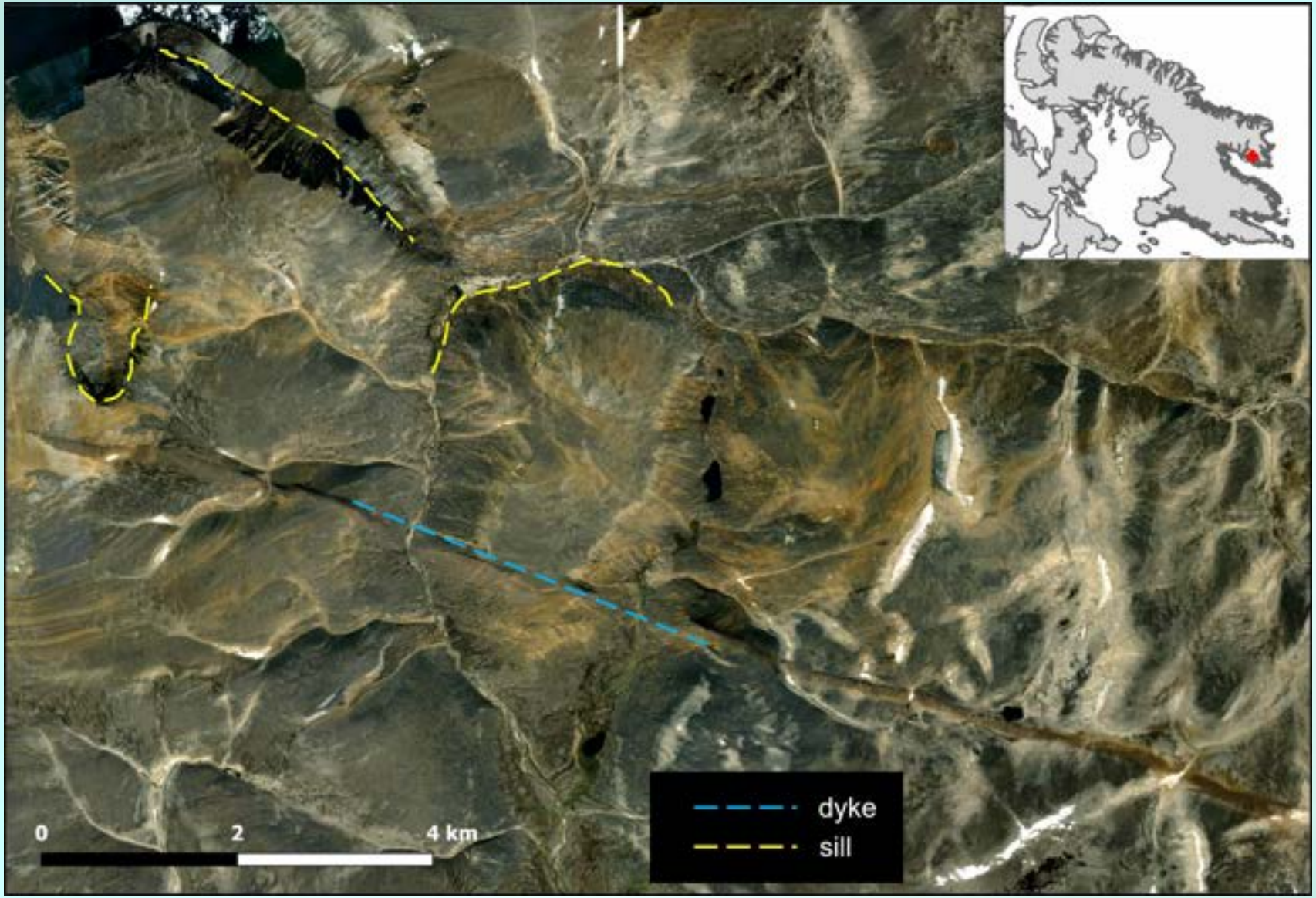
D. PRISMA (Hyperspectral)

Spatial resolution 30 m

- Spectral signatures

A closer look at gossans mapped on Baffin Island

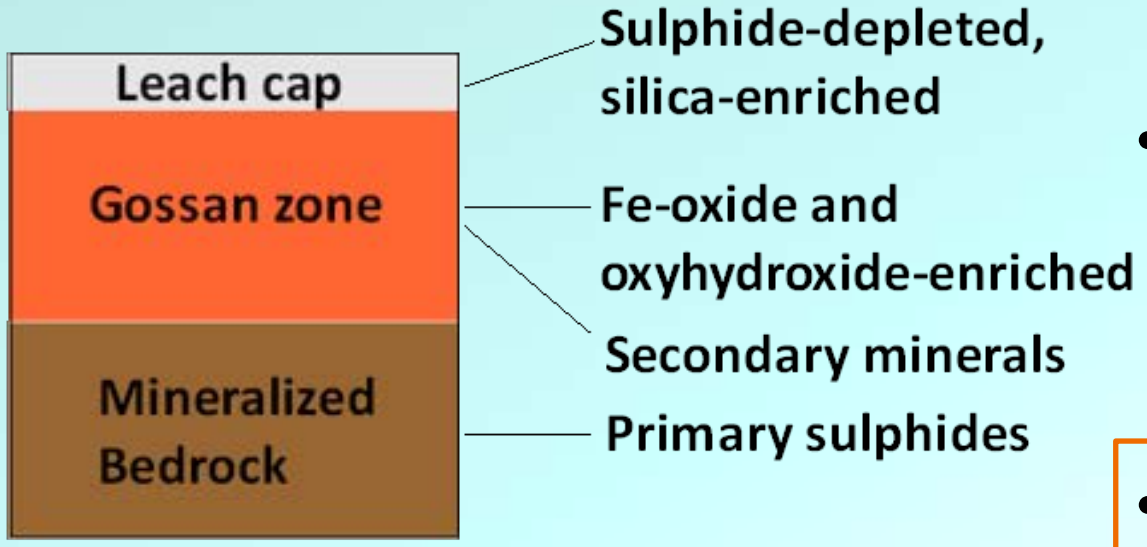




GSC OPEN FILE

Williamson, M.-C., Bethell, E.M., and Brassard, É. ***Geomorphic attributes and spectral signatures of gossans on Baffin Island, Nunavut***; in preparation.

Methodology



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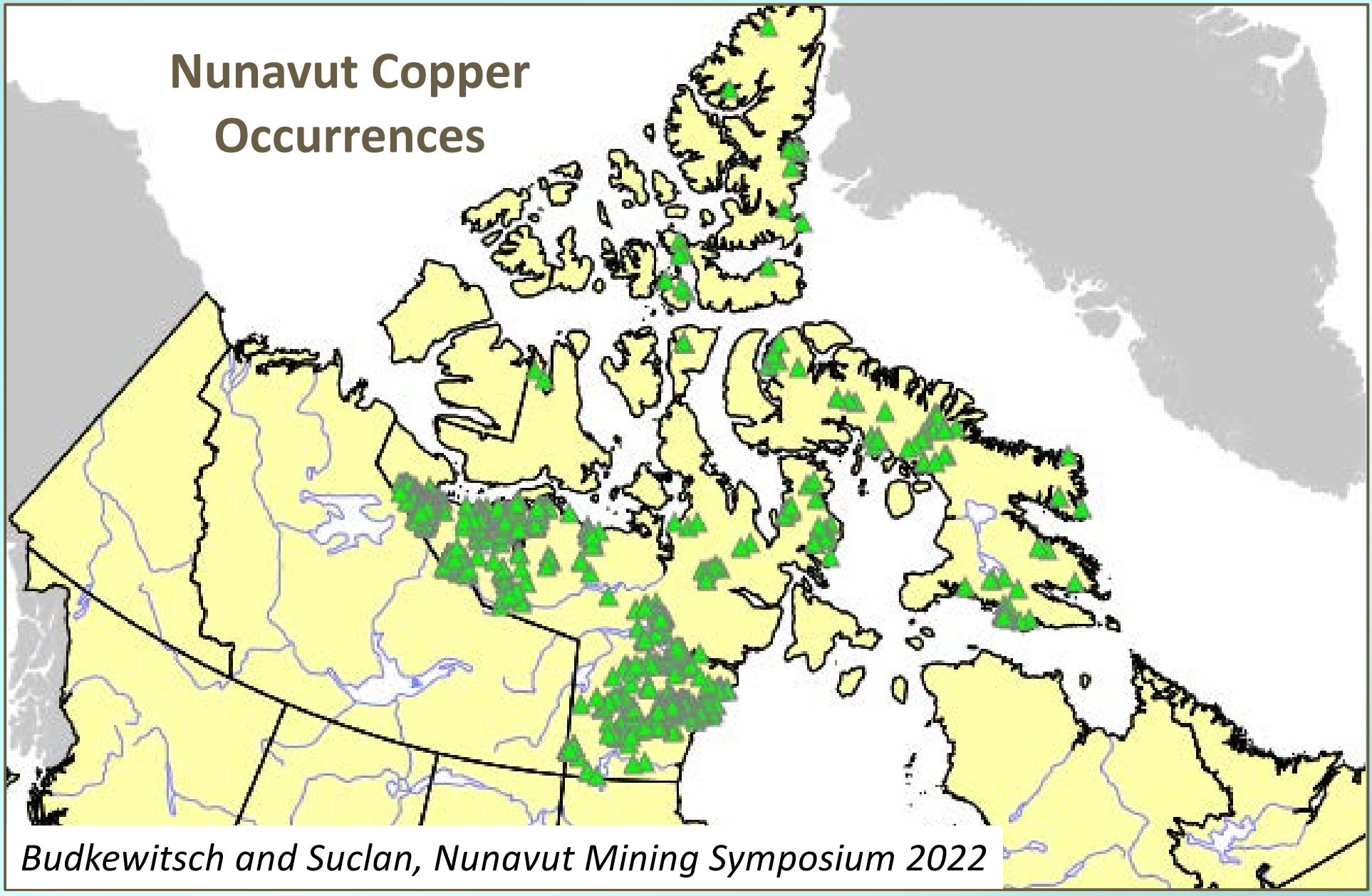
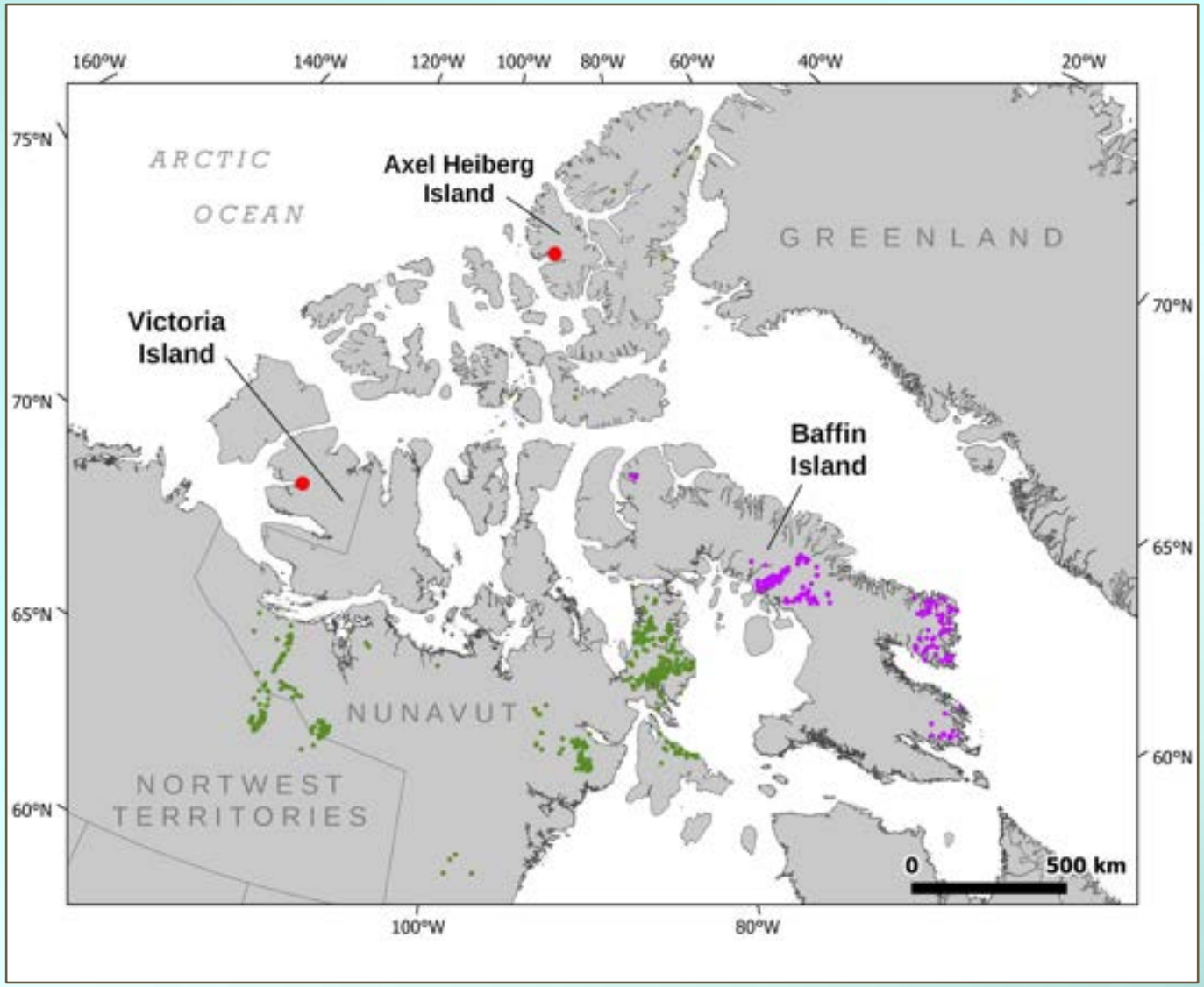
Nunavut Copper Occurrences

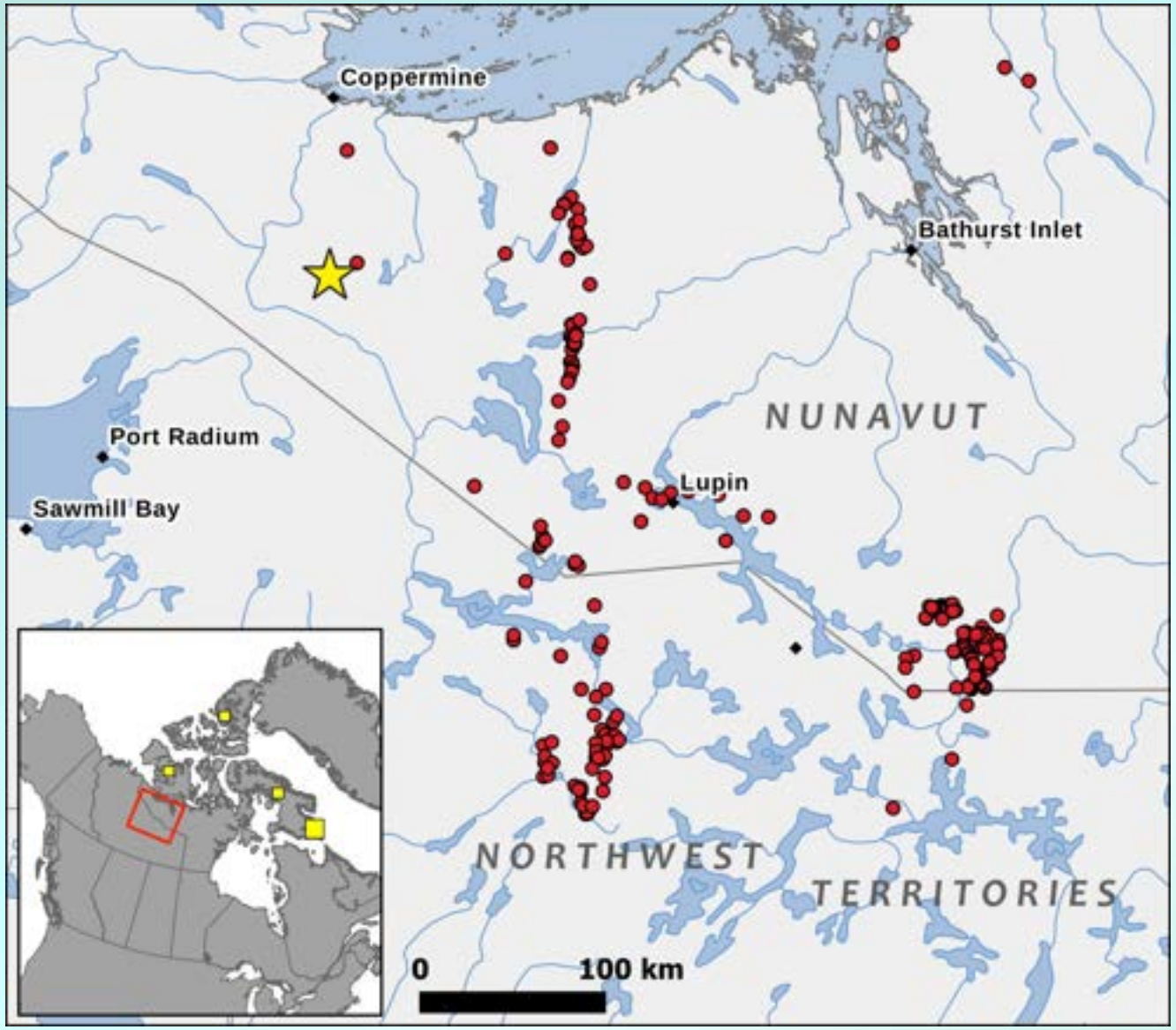


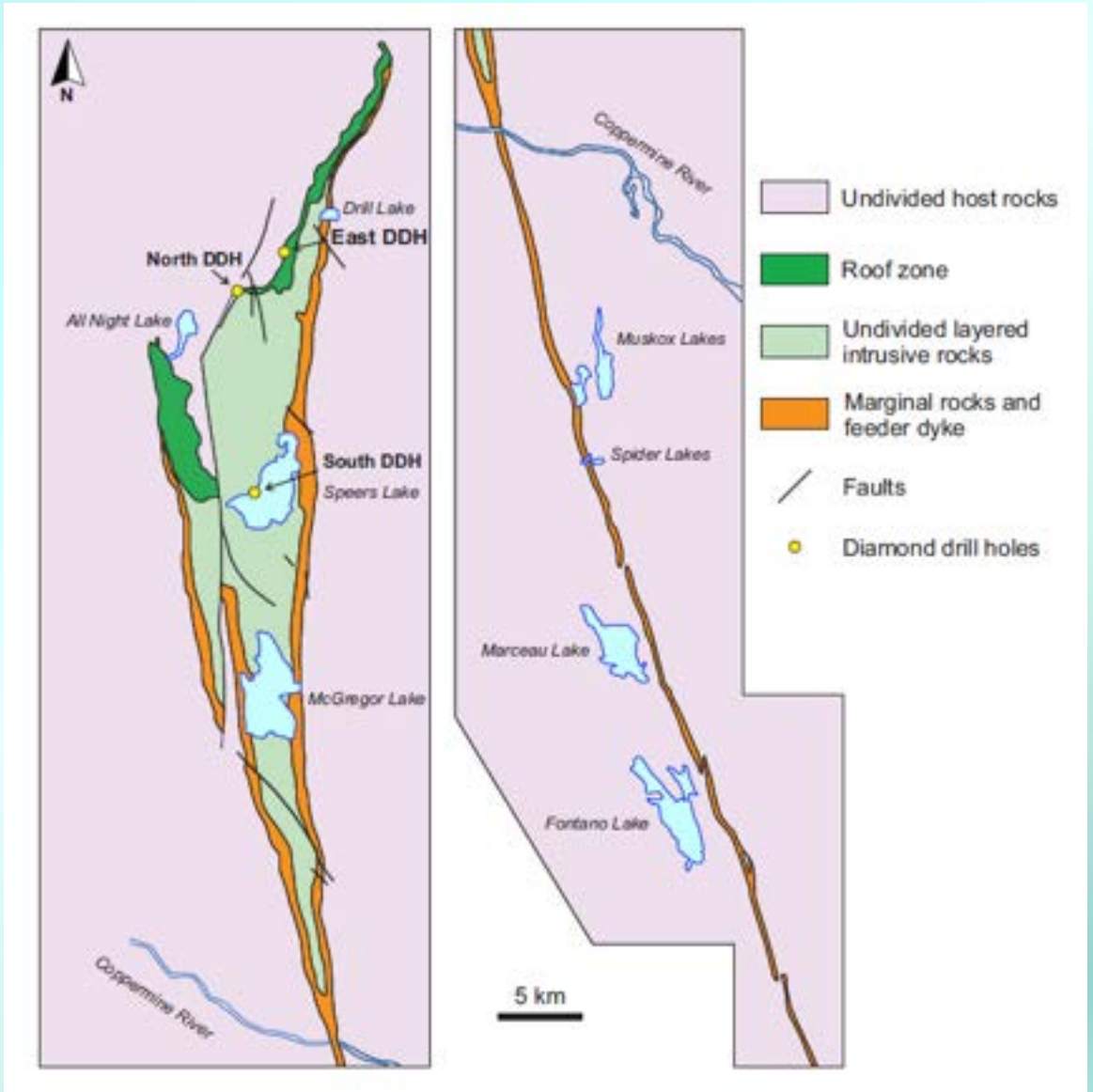
Budkewitsch and Suclan, Nunavut Mining Symposium 2022

Gossans mapped in Nunavut



The Muskox intrusion feeder dyke





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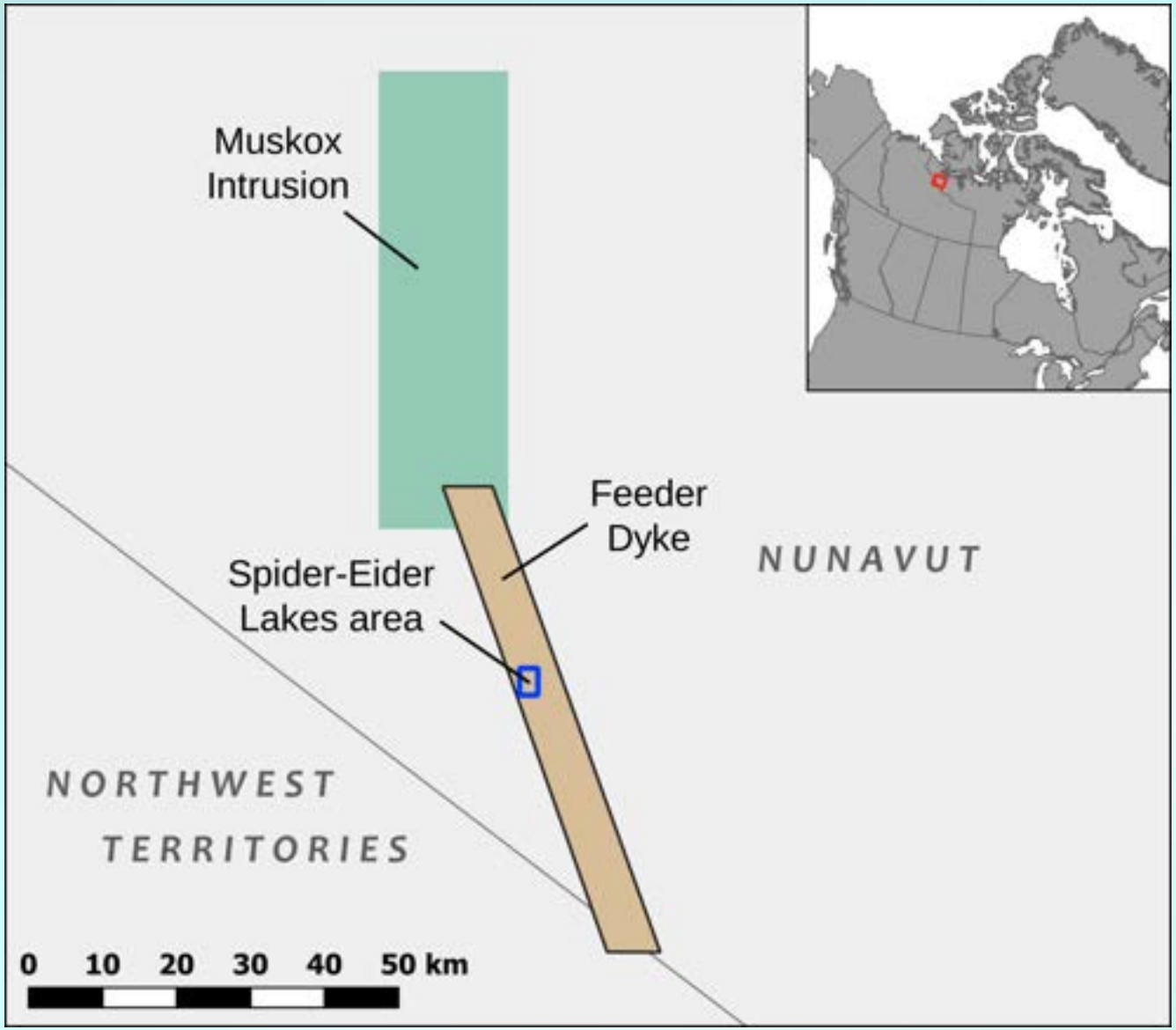
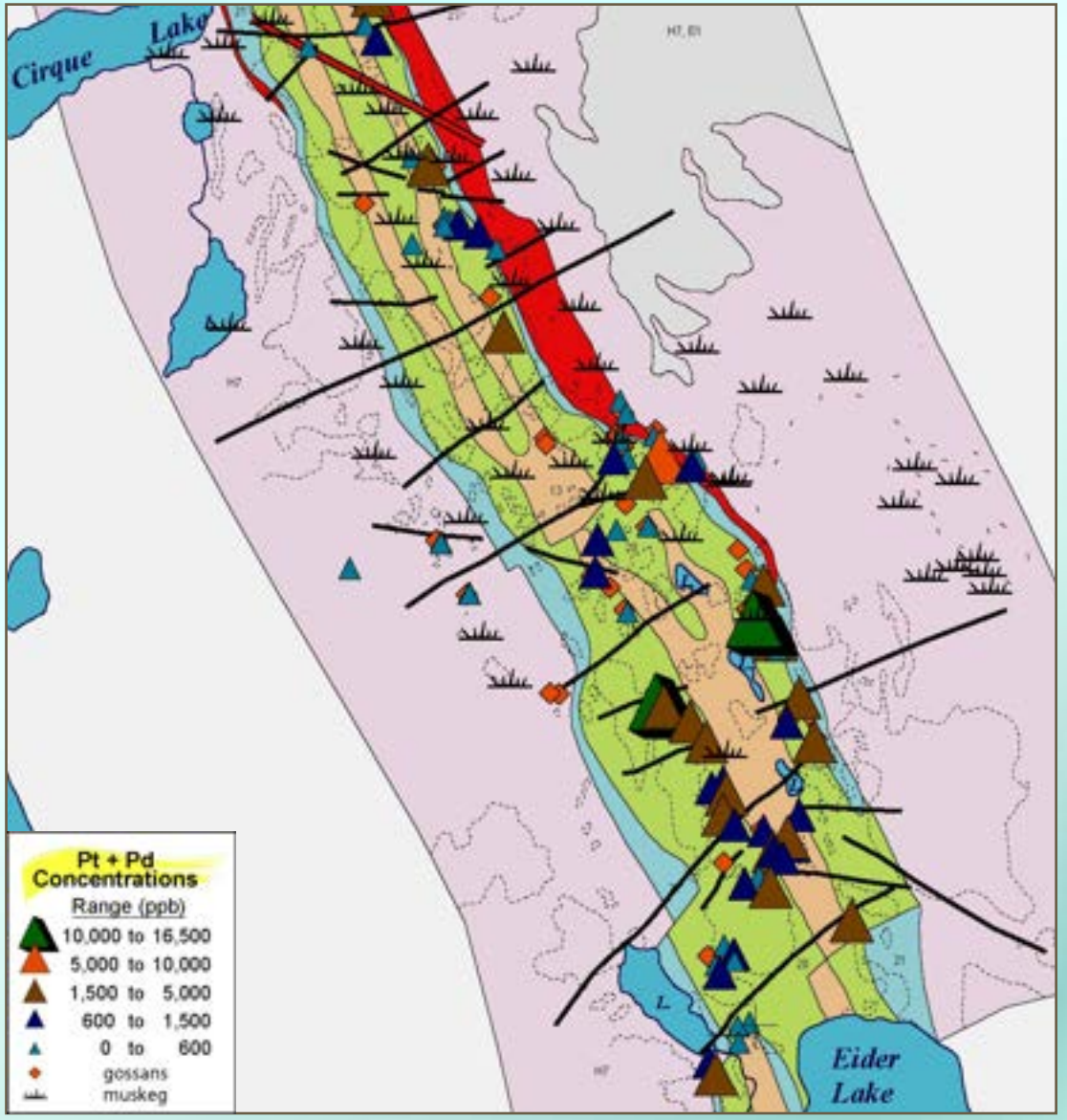
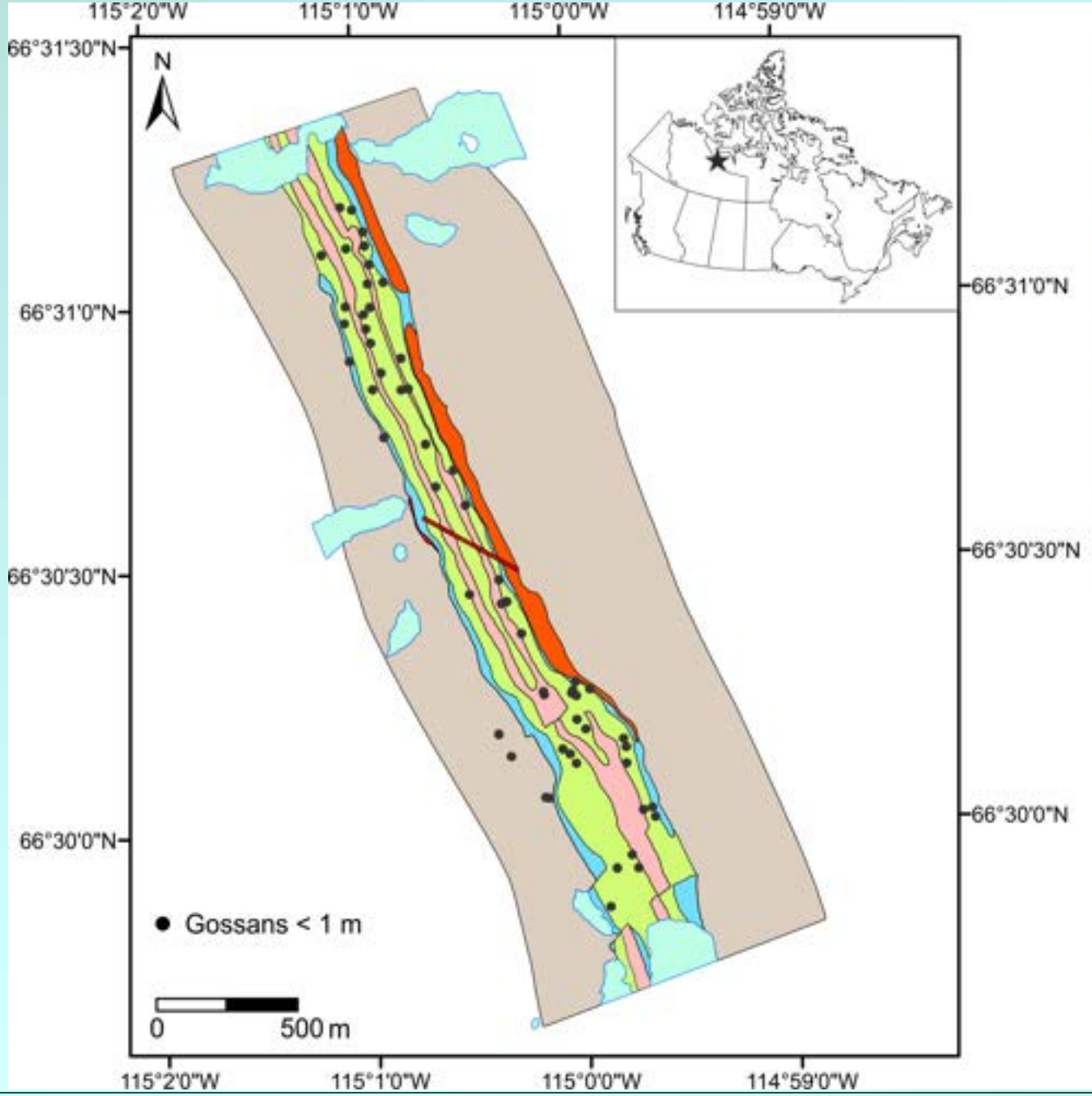
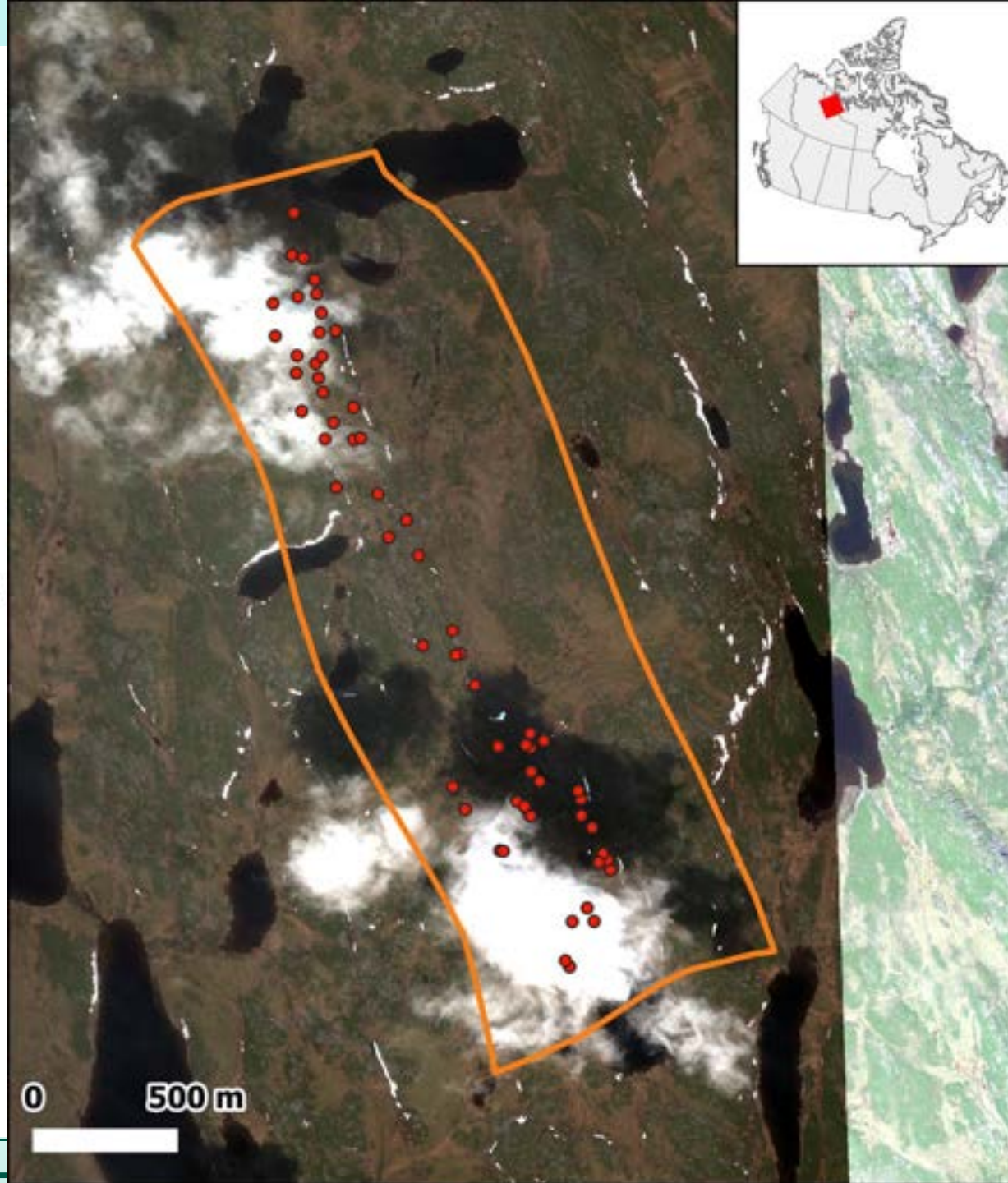


Bethell, Williamson and Brassard (2023)



Hulbert (2001) GSC Earth Materials Collection


115°2'0"W
115°1'0"W
115°0'0"W
114°59'0"W
66°31'30"N
66°31'0"N
66°30'30"N
66°30'0"N
N
Gossans < 1 m
0
500 m


0
500 m

Conclusions and Future Work

- Gossans exposed in Nunavut display a wide range of shapes and sizes. Some gossans contain high concentrations of critical minerals, others do not. A systematic approach using satellite imagery and RPM techniques focuses the search for significant mineral concentrations in the host bedrock.
- A collective effort is needed to (1) compare existing databases on mineral showings and gossans in their specific geological context, and (2) search the land for more gossans and mineral showings. The outcomes will be to reduce the uncertainties and costs of mineral exploration and increase the number of potential economic targets.