



Natural Resources
Canada

Ressources naturelles
Canada

Geo-mapping for Energy and Minerals (GEM) Mapping Canada's North



IQALUIT
April 10, 2018

The GEM Program



2008

FIRST LAUNCHED
to advance and modernize
geological knowledge of the North



2013

SECOND PHASE



2020

**MODERNIZING OUR
GEOSCIENCE KNOWLEDGE
OF THE NORTH BY 2020**

Maximizes
BENEFITS to
Northerners

Delivers
HIGH-QUALITY
geoscience

Lowers **RISK**
for Industry

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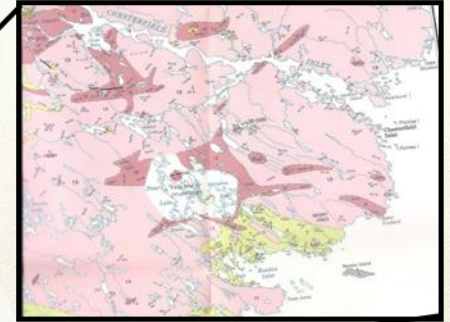
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Pre-GEM geoscience history...



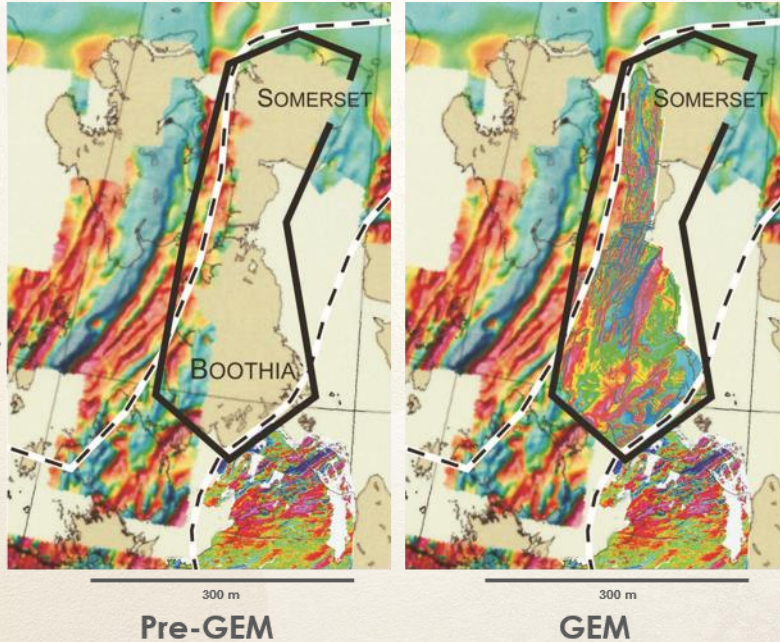
The first maps of the North were produced in the 1950s by heli-hopping.



**... old data + old models
= outdated conclusions**

Early maps covered large areas in 'reconnaissance' mode. Many areas have not been revisited.

GEM finds the haystacks...

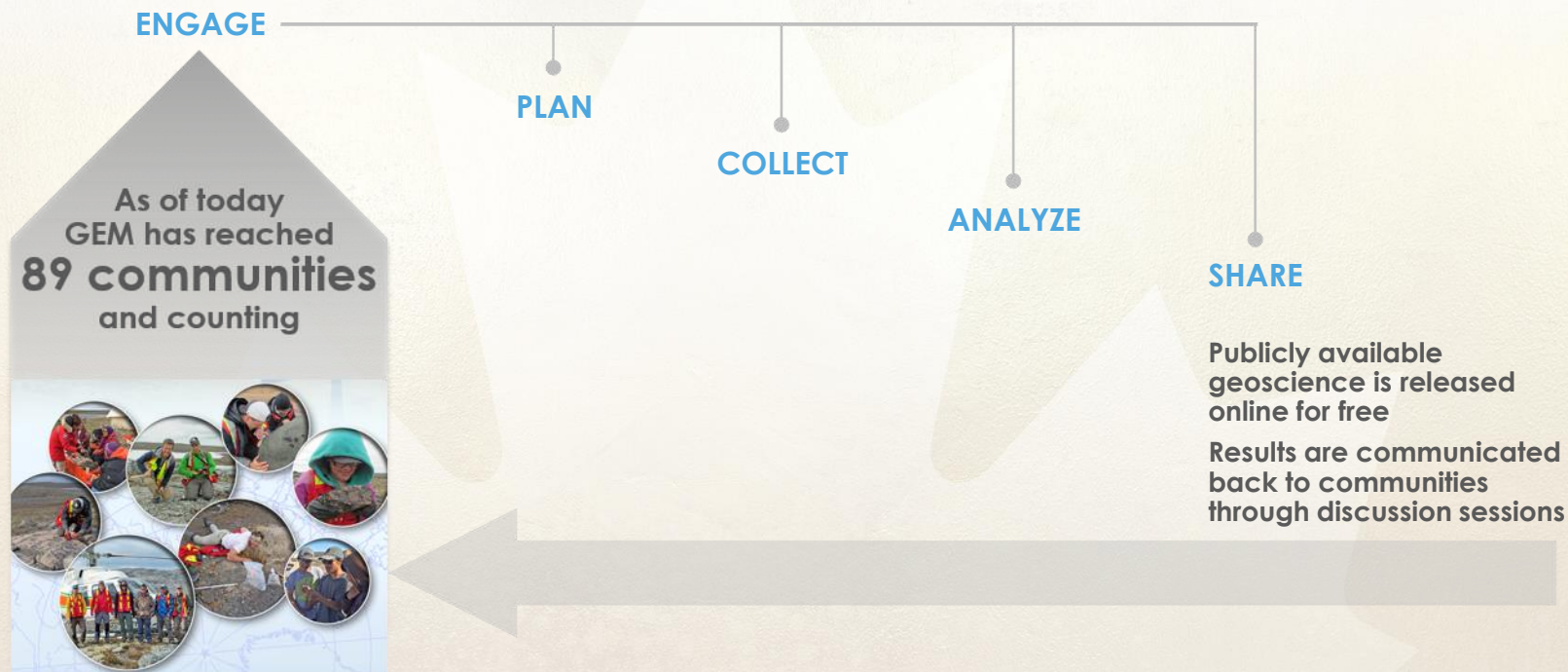


GEM finds areas with and without resource potential by understanding the regional geological context

INVESTMENT EXPLORATION DISCOVERY DEVELOPMENT

...and industry searches for the needles.

Northern perspectives are valued in all stages



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5

GEM seeks advice from... to provide insight on:



Community engagement

Capacity building, skills development

Training opportunities

Integrating knowledge and data into decision-making

Integrating local expertise and traditional knowledge helps us in the planning of our work:



Wildlife presence and habits



Culturally significant areas



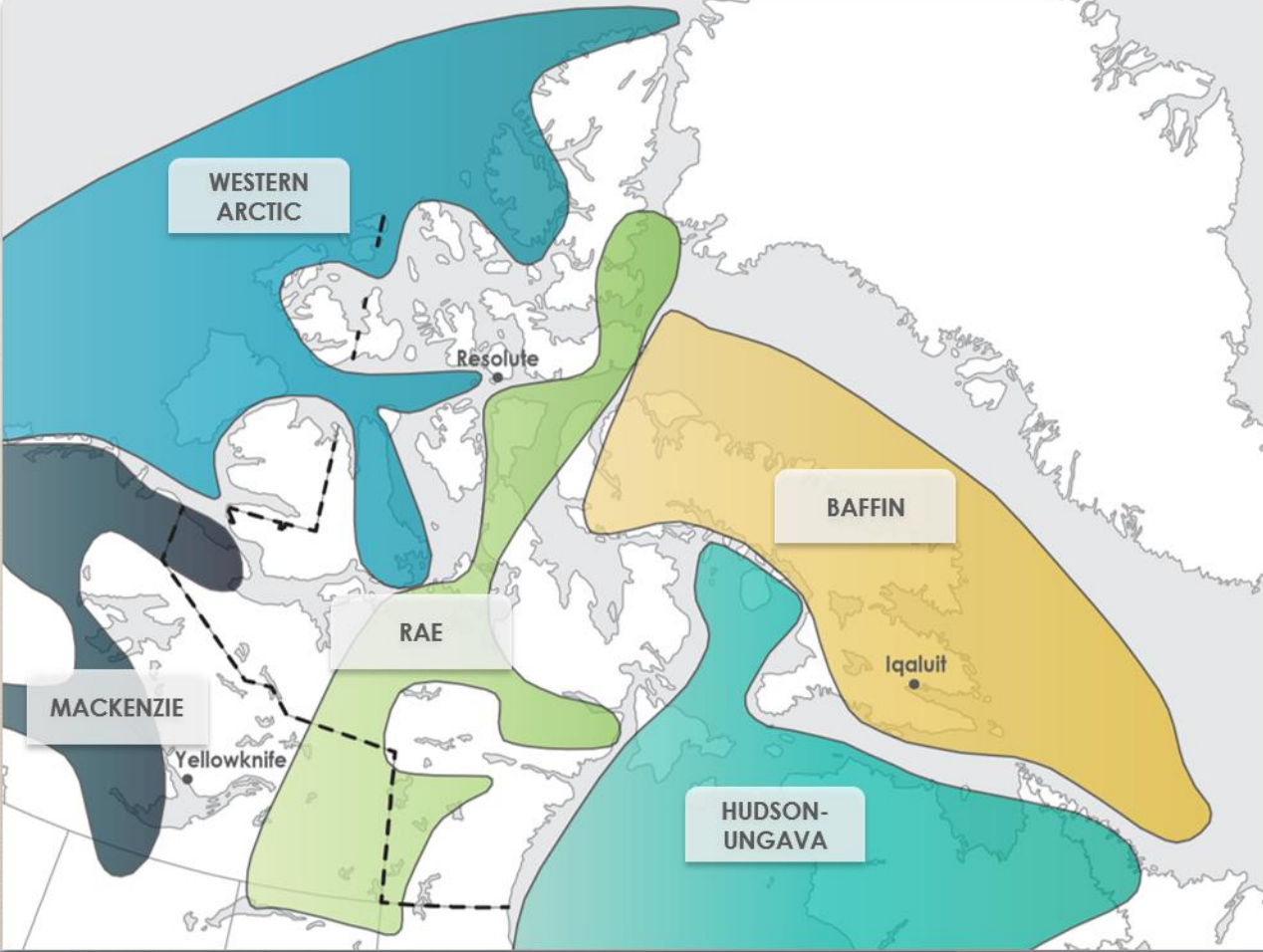
Unique landscapes and rocks



Local businesses and tradespeople



Opportunities and input welcome



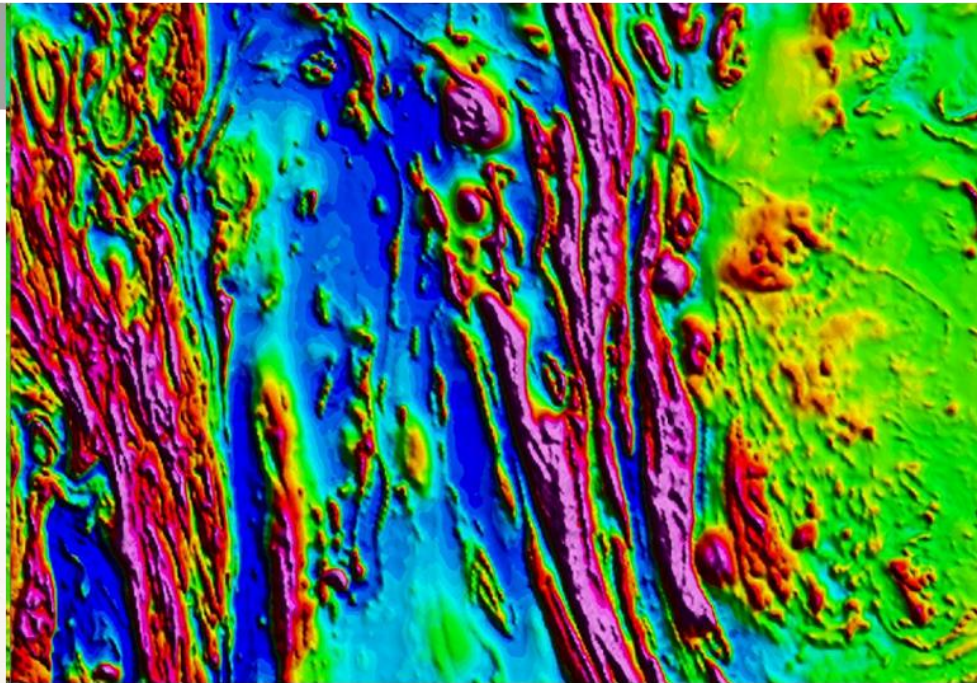
GEM geoscientific highlights in Nunavut From 2017



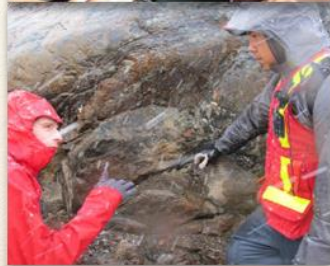
BAFFIN

Bedrock Mapping of Baffin Island

- Research over the past 10 years had already identified areas with potential for diamond exploration and GEM-2 removed any uncertainty pertaining to the potential for Cu and Ni
- After 2 years of integrated fieldwork on southern Baffin Island, and new similar research being conducted in northern Baffin Island, greater geologic knowledge is leading to a Baffin-wide understanding of composite mineral potential. Results of this research and its findings are currently available online with new bedrock geological maps being released in the next few weeks and shared directly with Nunavut stakeholders



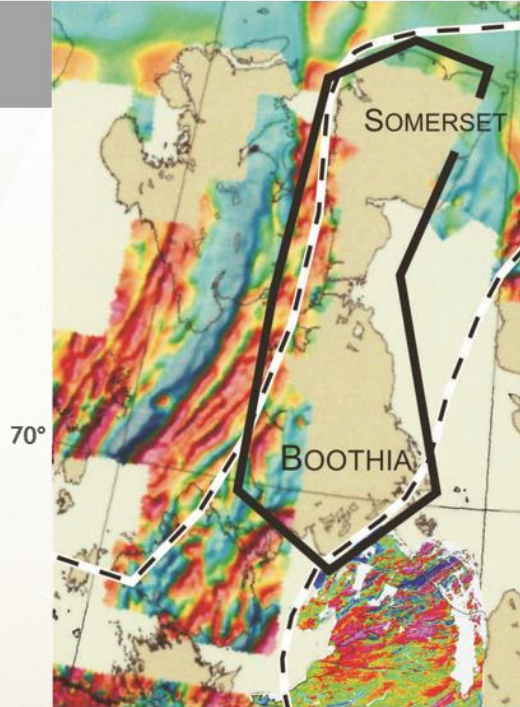
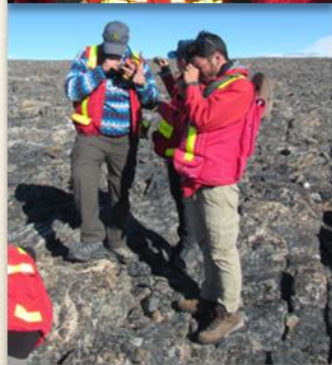
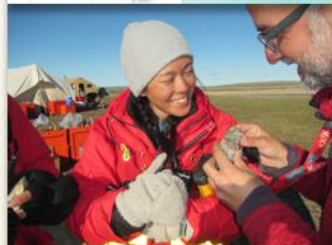
Glacial valley west of Chidliak Bay



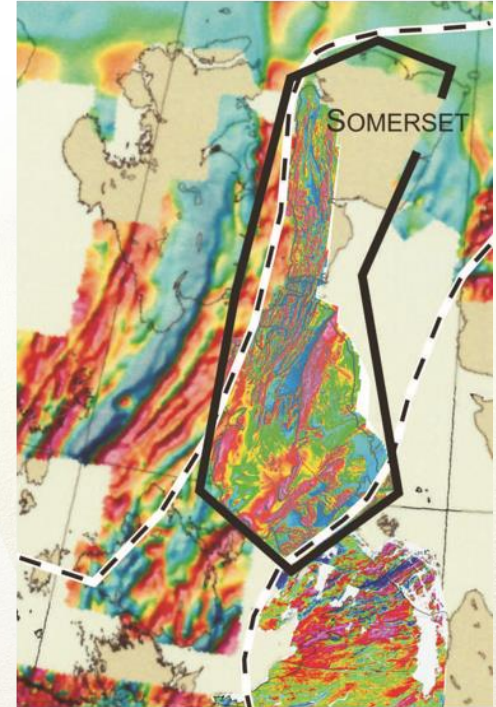
RAE

Mapping of Boothia Peninsula and Somerset Island area

- Boothia Peninsula is underlain by rocks that are part of a distinctive, extensive 2.56-2.3 billion year old terrane never before recognized in Nunavut!
- Analytical data and a second year of mapping will allow this distinctive crustal terrane to be characterized and sampled for metals, especially a newly recognized 2.48-2.49 Ga mafic-intermediate plutonic suite which may host base-metal mineralization.



Pre-GEM gap in data & knowledge

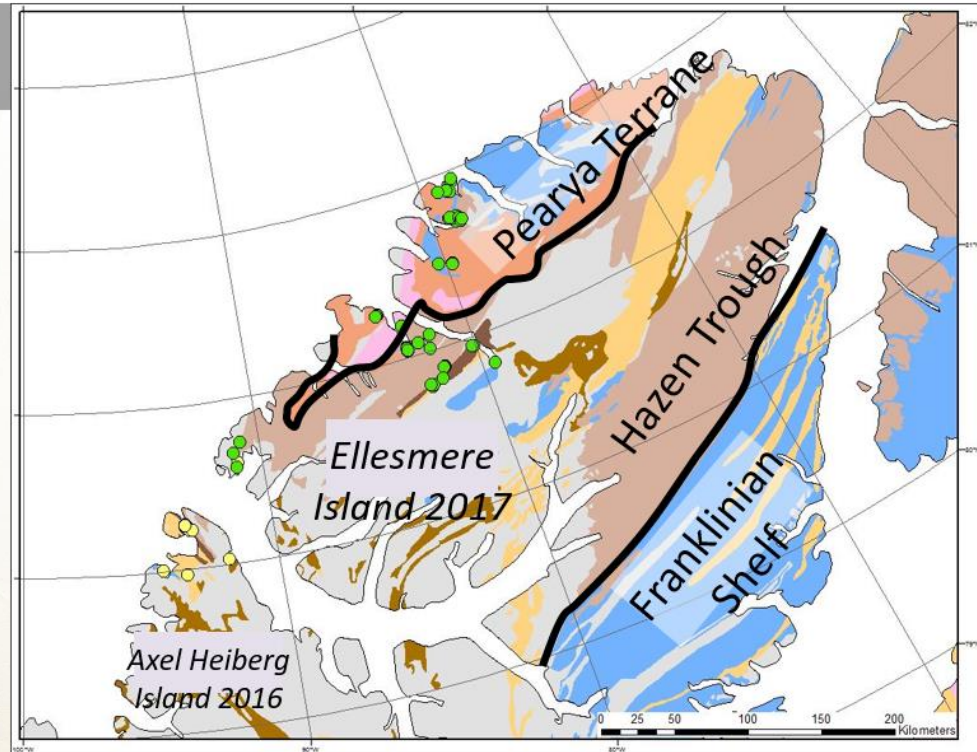


GEM acquired aero-magnetic coverage

WESTERN ARCTIC

Pearya Terrane, northern Ellesmere Island

- Results from this field research will help to resolve one of the last outstanding plate tectonic questions on earth; how and when the Arctic Ocean formed
- 2017 fieldwork led to the discovery of peridotites, which may represent the presence of oceanic crust on the Pearya Terrane.



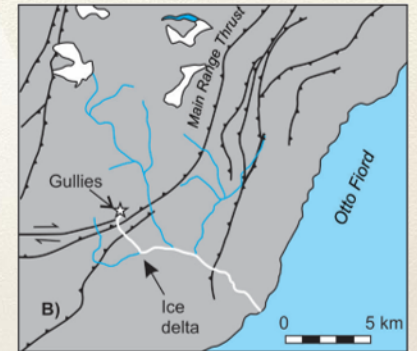
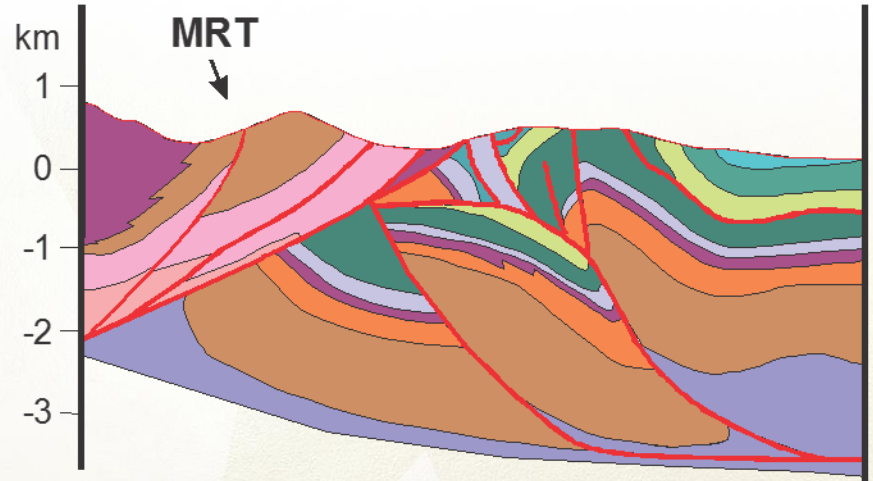
Pearya Terrane, northern Ellesmere Island Map



WESTERN ARCTIC

Discovery of Northern-most Perennial Spring

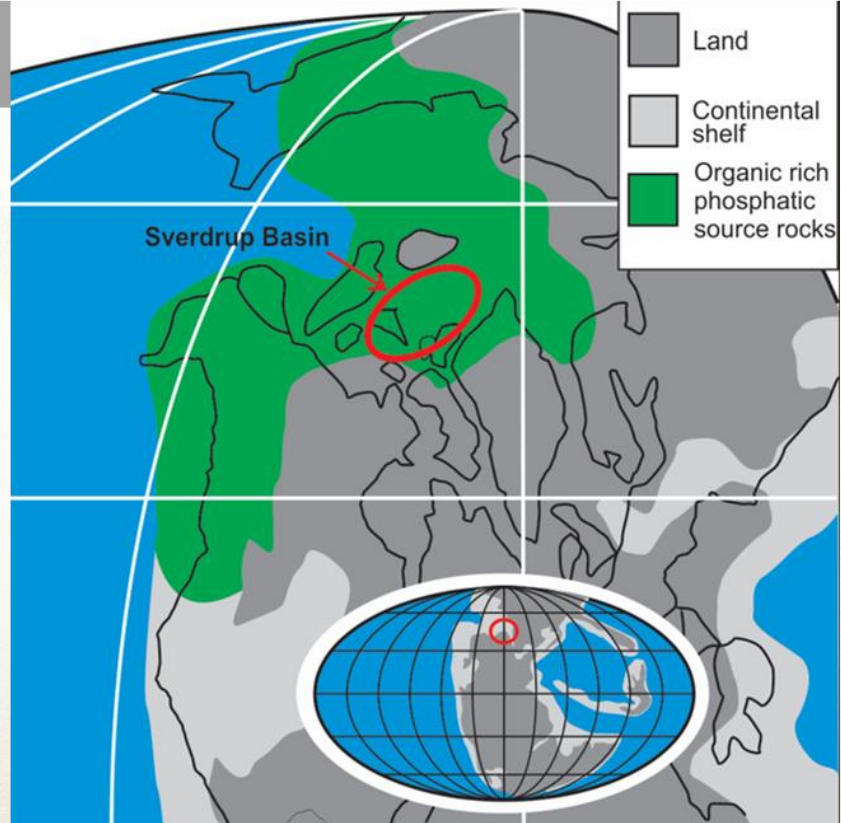
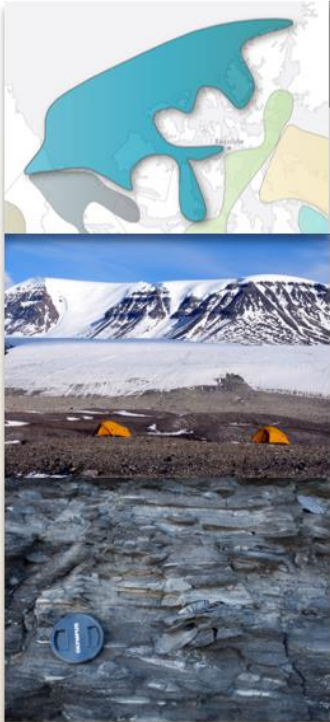
- As part of GEM related field work, researchers have explored parts of Canada's north that are rarely visited.
- Discovered a large saline spring discharging from the ground at ~520 litres per second, an enormous rate for any spring system.
- Data loggers left in the spring recorded above zero temperatures throughout the winter which confirmed its perennial nature.



WESTERN ARCTIC

Organic Rich Shale Units

- found significant new evidence that shows organic rich shales were deposited across the circum-arctic region during the same narrow period of earth history.
- This was an anomalous event related to significant global climate change occurring at that time.
- These results greatly increase the likelihood of similar shales occurring in the Canada Basin – increasing the potential of undiscovered petroleum systems.



Major Middle Triassic Petroleum source rocks around the Arctic



MACKENZIE

Coppermine River Transect

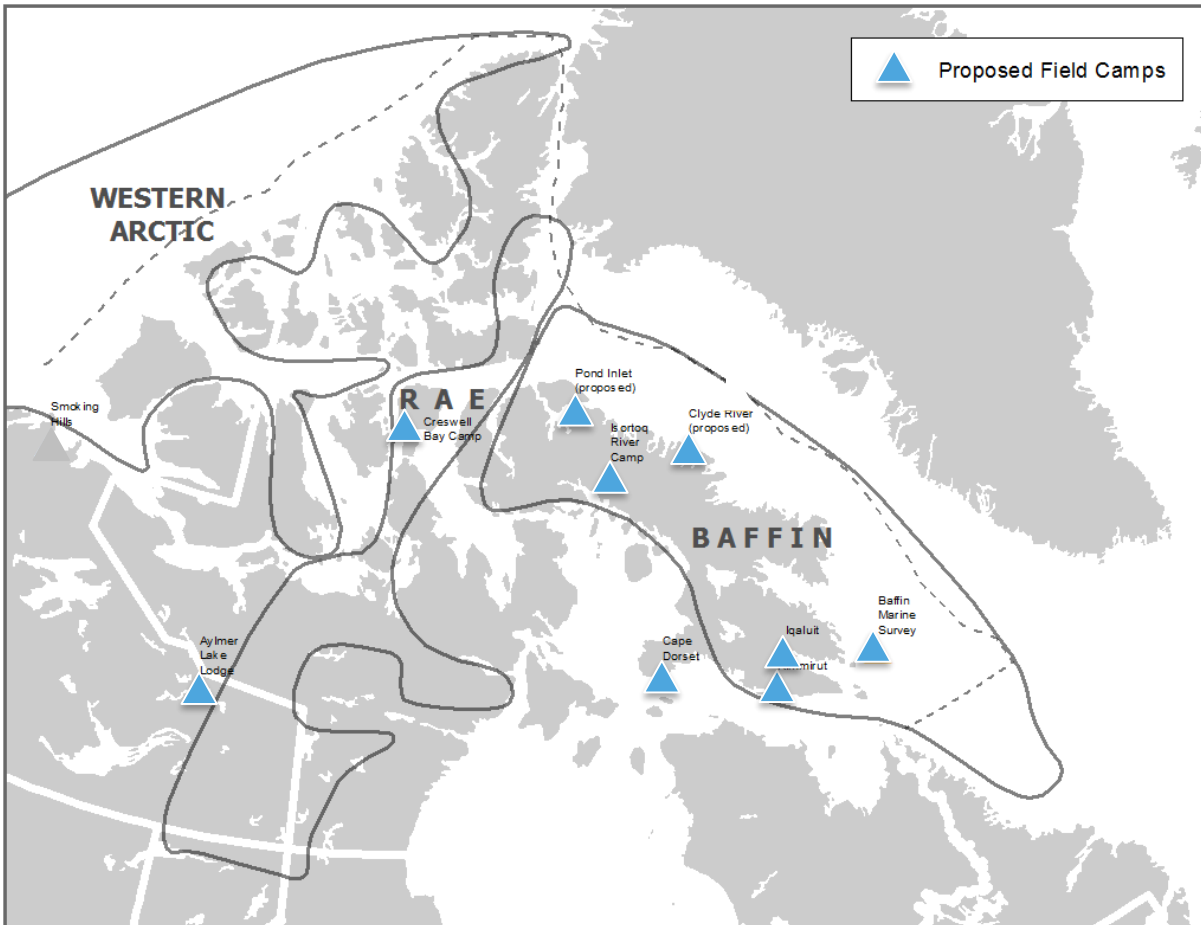
- A very successful field season in Nunavut using canoes on the Coppermine River, studying the history of the bedrock
- Modern lithogeochemical analyses on the Coppermine River basalts, including platinum group elements (PGE), will be used to explore the source(s) of mafic magmatism in the Mackenzie Large Igneous province in light of new work that questions existing models.



Surveying rapids on the Kendall River (tributary of Coppermine River)



2018 Proposed in Nunavut



Baffin

- Regional bedrock mapping of northern Baffin Island (Isortoq River)
- Proposed onshore stratigraphic study (Pond Inlet and Mary River Areas)
- Finishing up southern Baffin Island Transect (Cape Dorset, Iqaluit and Kimmirut)
- Proposed Baffin Marine Survey

Rae

- Boothia-Sumerset: Integrated geoscience along the Northwest Passage (Creswell Bay Camp)
- [Near Nunavut: Glacial history activity in the Kivalliq region (Aylmer Lake Lodge)]

GEM Synthesis³ Informing decision making



GEOSCIENTIFIC

For scientific and industry stakeholders

Synthesize all GEM data and knowledge to provide a coherent story of Canada's northern geology.



NORTHERNERS

For all northern organizations

Deliver data and knowledge for Northerners and their organizations to integrate GEM geoscience products within their decision-making processes.



GOVERNMENTAL

For future programs and OGDs

Make GEM geoscience available to government for decision making on policies, regulations, and roles.

The last 2 years of GEM will deliver a...

Geoscientific synthesis



NORTHERN CANADIAN SHIELD

How the core of the North American continent grew from 2.6 to 1.8 billion years ago

NORTHERN CANADIAN CORDILLERA

New insights from the Yukon and northern BC on oceanic and continental terrane assembly, magmatism, and mineralization

PHANEROZOIC BASINS OF THE CANADIAN ARCTIC

Mainland - islands - off-shore framework of Paleozoic and Mesozoic-Cenozoic basin architecture, evolution, and petroleum systems

SURFICIAL GEOLOGY OF NORTHERN CANADA

Overview of Laurentide and Alpine glacial materials and transport history: Yukon to Labrador

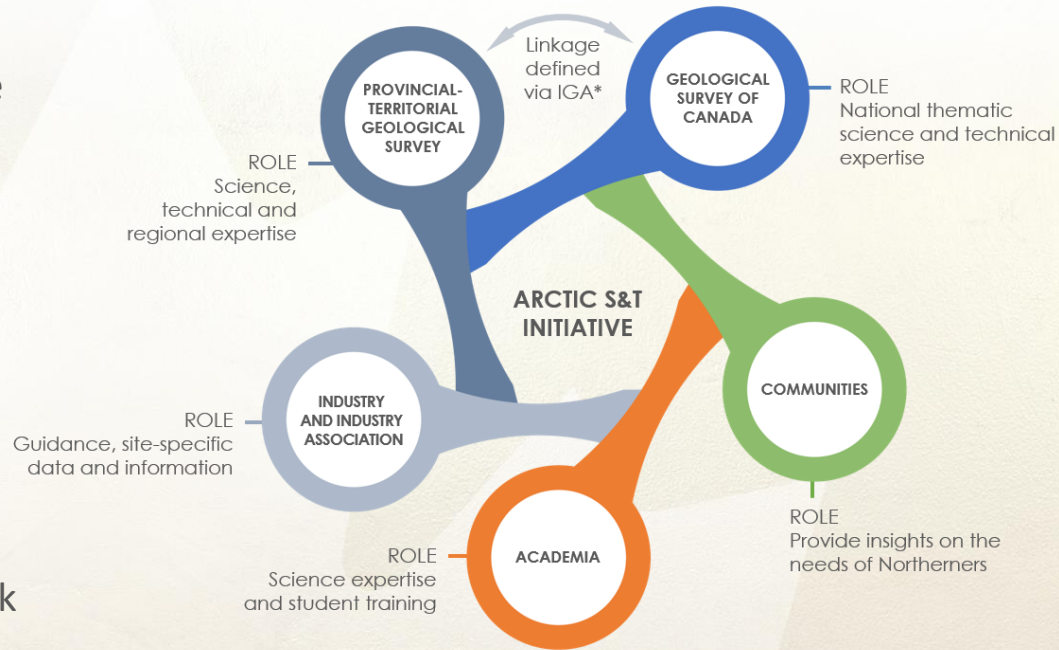


Next Step

Developing a proposed post-GEM Science Initiative in the Arctic to inform land-use decisions

Keep an eye out for the Stakeholder Engagement

- Discuss direction and identify gaps
- Determine priorities and scaling
- Co-development in the spirit of the Northern and Arctic Policy Framework



*The **Intergovernmental Geoscience Accord (IGA)** defines the complementary roles of Canada's geological surveys, as well as mechanisms for cooperation and collaboration

For more information

www.nrcan.gc.ca/gem

nrcan.gem-gem.rncan@canada.ca

 [@GSC_CGC](https://twitter.com/GSC_CGC)

Geological Survey/Commission géologique Canada



Engagement Session
April 12, 9:00 – 11:30
Frobisher Inn Hotel & Conference
Centre; Meeting Room Astro 1
Astro Hill Complex
Iqaluit, Nunavut

Join us to talk about the future of mining in Canada:

- What does success look like?
- What actions need to be taken to move ahead?
- Bring your ideas and thoughts

