Proposed Field Work for April 2024

Natural Resources Canada | Ressources naturelles Canada

Status Update on NRCan's Proposed Dustfall Monitoring Project: Overview of the Collaborative Development of a Research Proposal

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Dust Audit Committee–February 2024

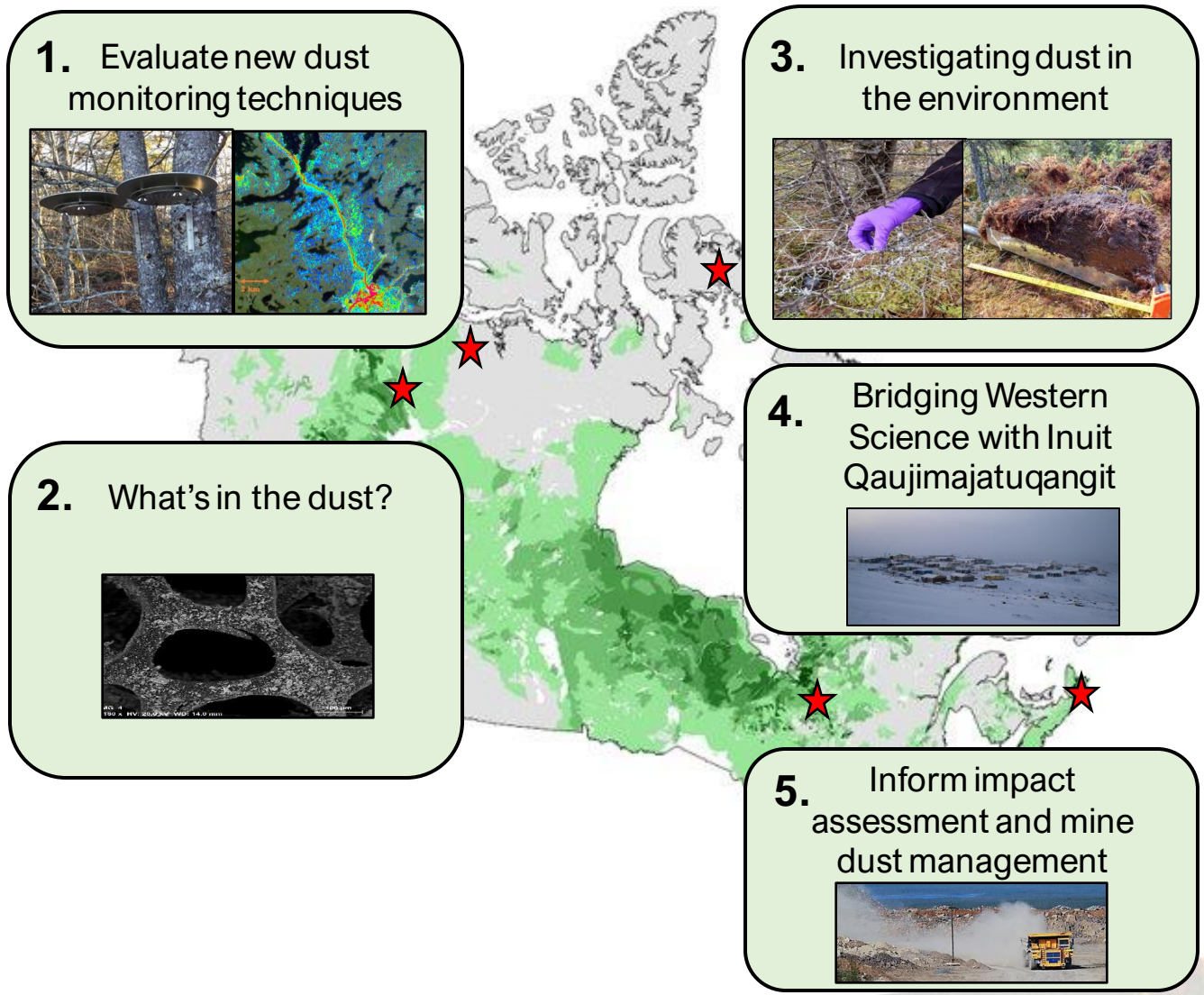
Canada

Introduction to NRCan Fugitive Dust Research Program

Who are we?

- Proposing a tri-lateral project (between NRCan, Mittimatalik Community Members and Baffinland) to investigate the dust at Mary River
- Goal to bridge Western Science, Industry Monitoring and Inuit Qaujimajatuqangit

Objectives



Engagement to Date with Mittimatalik Community Members

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Ikaarvik

Top Image: Eric Soloman-Ikaarvik
Bottom Image: Justin Milton-Ikaarvik

What did NRCan learn?

Questions and concerns raised by Mittimatalik community members:

Bold= Overlap with NRCan's skill set

- **What does the dust contain?**
  - **Are there heavy metals?**

- How it affects
  - **Plants (accumulation)**
  - Animals
  - **Water quality**
  - Humans
- Sediments and fish spawning
- **Rate of snow/ice melt**

- **Inuit are observing dust where industry techniques do not detect it (below detection levels)**
- Lack of baseline studies (IQ can be used as the baseline)

- Changing the experience on the land affects Inuit identity
  - Cultural impacts, traditional food impacts
  - Is snow when travelling safe and palatable to drink?
  - Mental health impacts: uncertainty, concern


Photo Credits: Eric Soloman-Ikaarvik

Engagement to Date with Baffinland

Interactions between NRCan and Baffinland

- Presented at TEWG June 2022
  - Gave an overview of our research at other sites
- Site Visit in April 2023
  - Helicopter Tour of the Site (mine site, tote road, Milne Inlet to Bruce Head)
  - Tour of stockpiles and crusher
  - Walked a dust sampling transect along the Tote Road
- Presented at TEWG December 2023
  - Gave overview of our proposed research at Mary River
- Baffinland has reviewed the draft research proposal and continues to meet with NRCan to help with field logistics

What did NRCan learn?

Challenges raised by Baffinland Employees:

- Industry Standard/Recommended Method is:
  - Not designed for Arctic conditions
  - Not adequately sensitive
  - Not highly transportable or practical
  - Unable to perform detailed dust characterization studies

- Challenges accessing sites year-round
- Open to trying new techniques

Tri-Lateral Approach to Research

Goal: Inclusive and fuller understanding of Mine Dust around Mary River

Researchers' Role

- Neutral Third Party
- Research within their scope of knowledge
- Train and build capacity with interested community members
- Oversees the project

Communities' Role

- Drive Research Questions
- Co-design the field program (sampling locations, timing, logistics)
- Participate and lead field work at community chosen locations
- Involvement in interpreting results as desired

Baffinland's Role

- Logistical support (access to mine site, etc.)
- Oversee sampling of onsite sampling locations (to compare dust monitoring techniques)
- Insight on operations to support interpretation of results
- Sharing of current monitoring program results

The team is always open to adapt to suggestions and feedback.

Current Status:

Applying for a Nunavut Research License

- Reviewed and approved by Nunavut Planning Commission (NPC) and Nunavut Research Institute (NRI)
- Access to Inuit Owned Lands under review

Topics Covered in the Proposal:

1.

Community Guidance

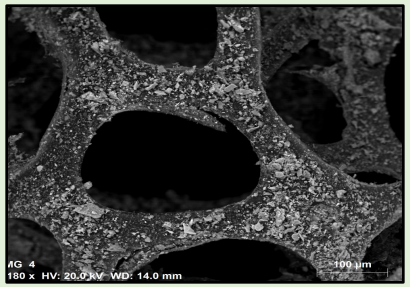
2.

Evaluation of new dust monitoring techniques

(Comparison with industry standard deployed by Baffinland)

3.

What's in the dust? Are there heavy metals?



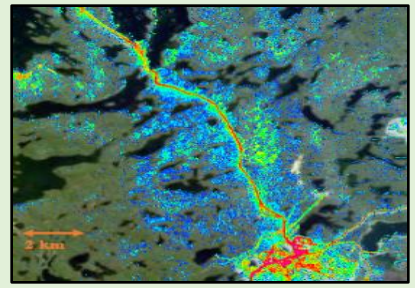
4.

Investigating dust in the environment

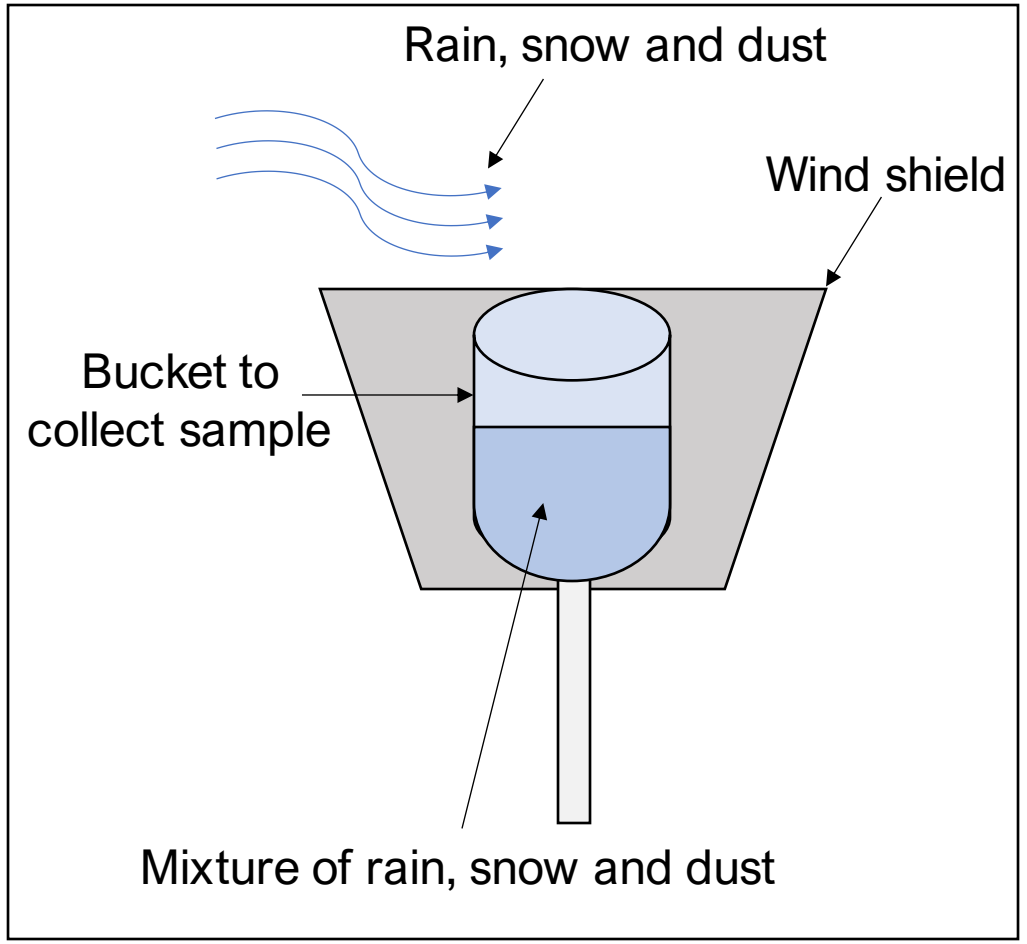
(snow and lichen)

5.

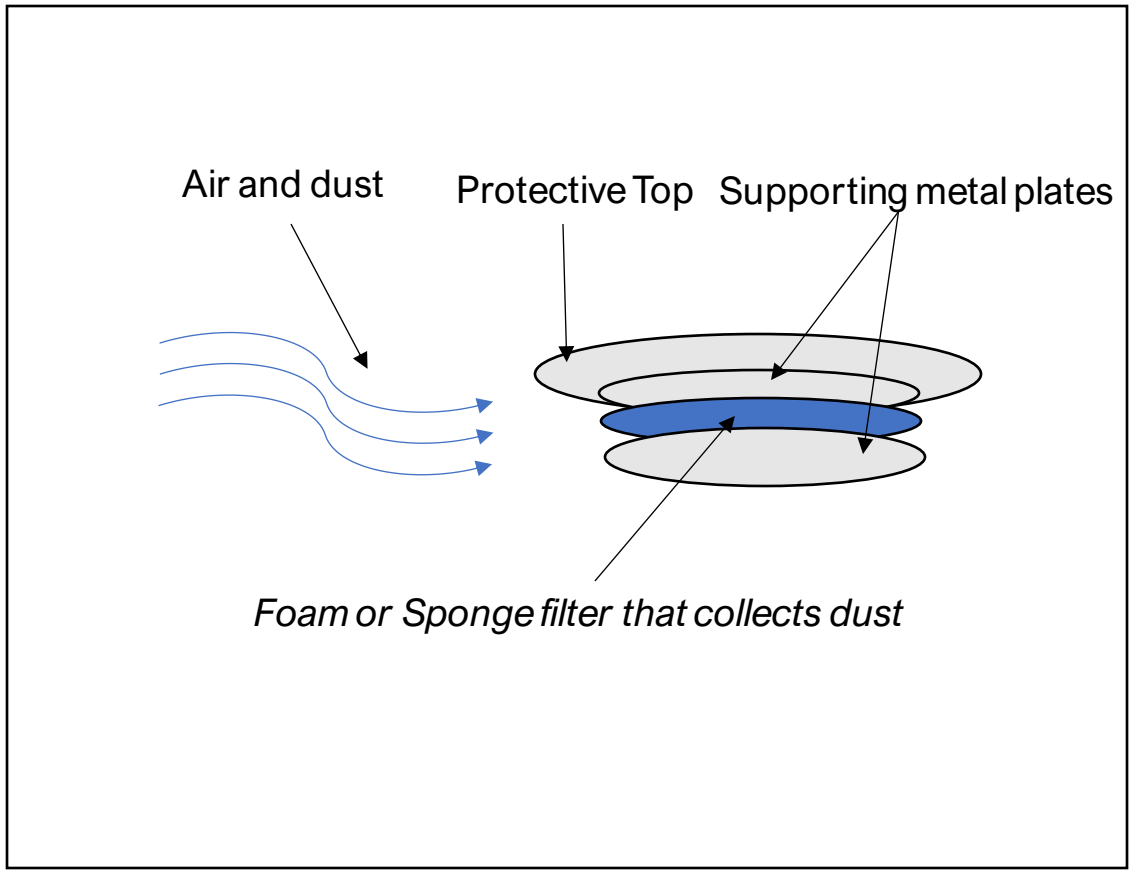
Satellite imagery to investigate dust distribution and snow melt



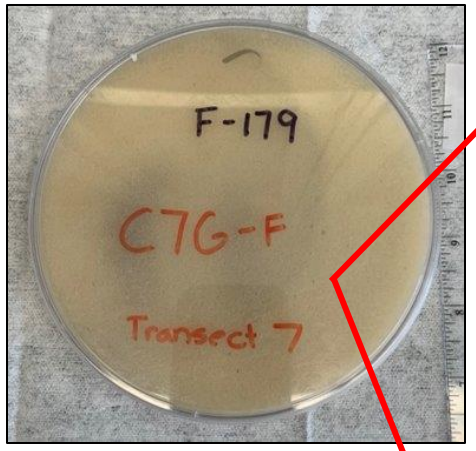
Dust Monitoring Device (1): Dust Canisters

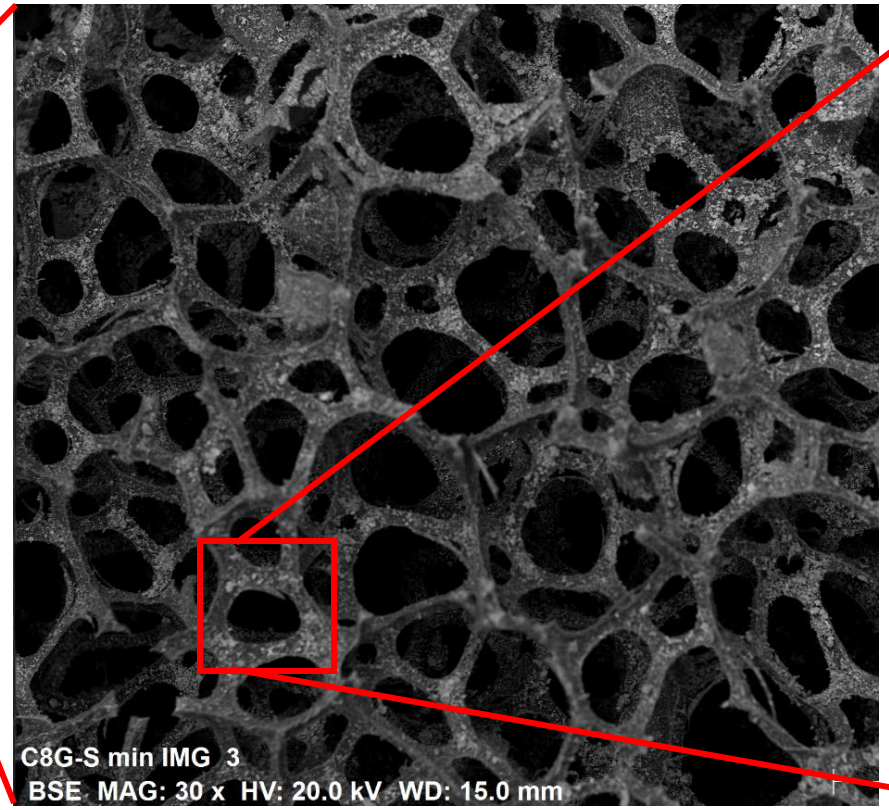


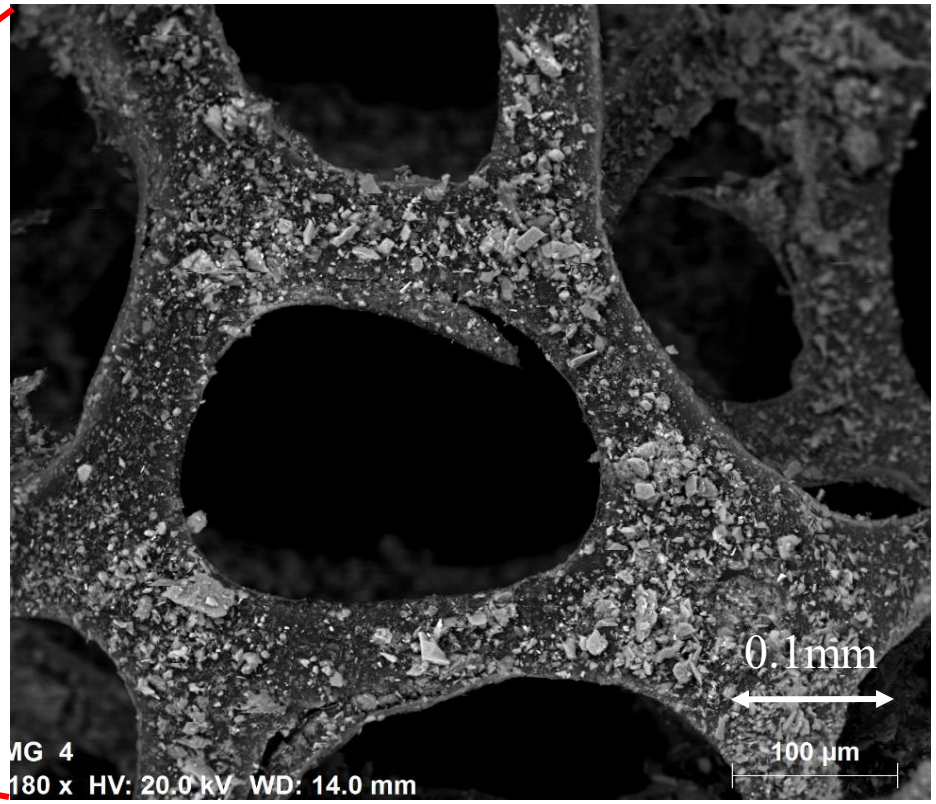
Dust Monitoring Device (2): Passive Dry Deposition Collectors (Pas-DD)



Information gathered from the Filters



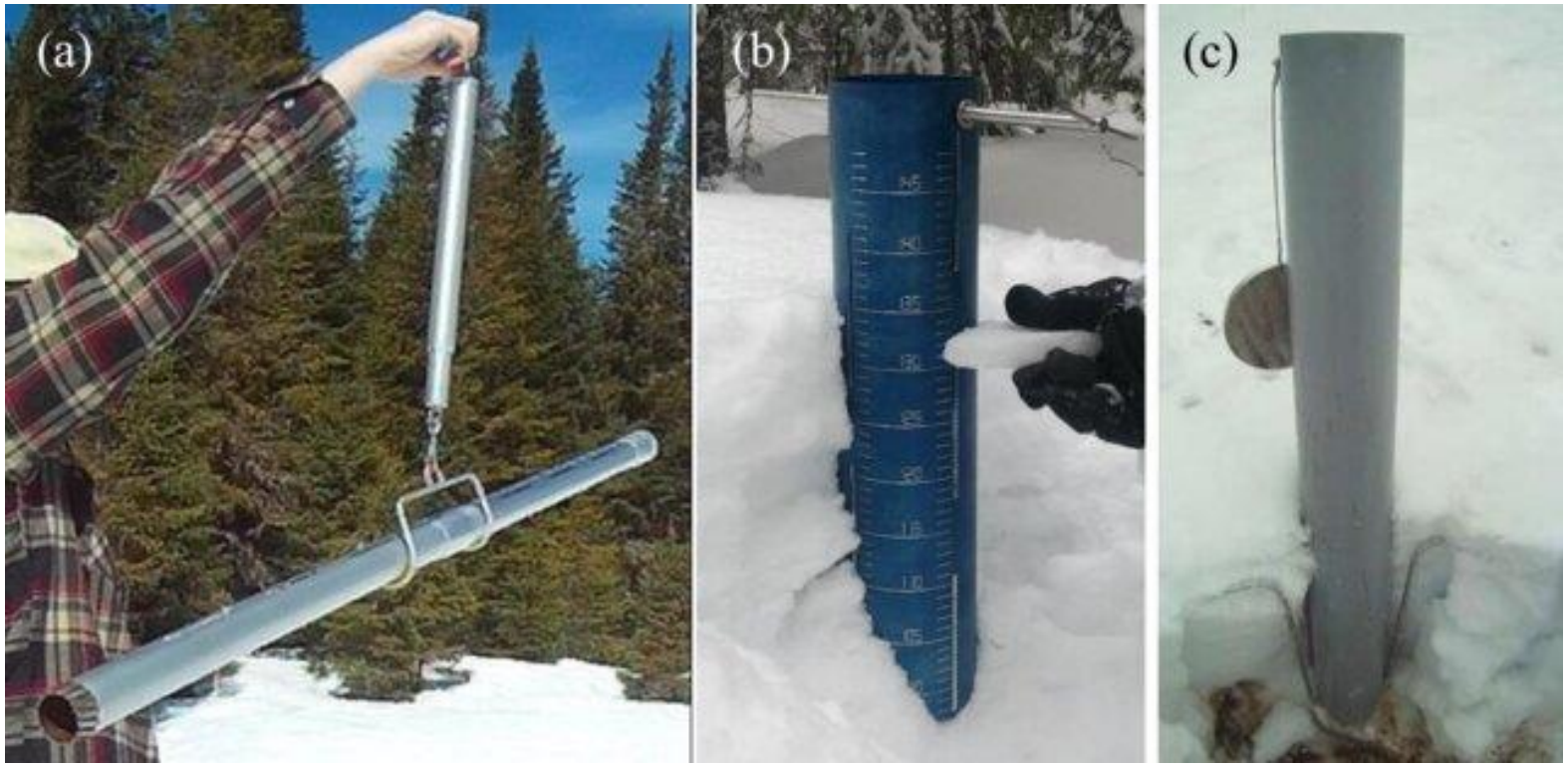




We can look at filters under microscopes to determine the compound hosting the metals or elements of concern.

How Can This Support Evaluation of Environmental Effects?

Snow Sampling



https://doi.org/10.5194/tc-16-3199-2022

We can measure the amount of dust captured, metal concentrations and the presence and abundance of algae.

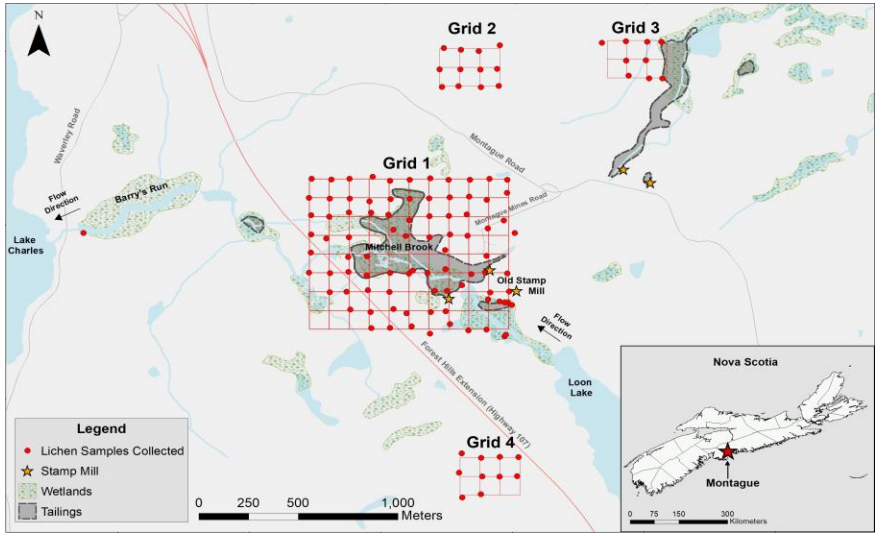
How Can This Support: Evaluation of Environmental Effects?

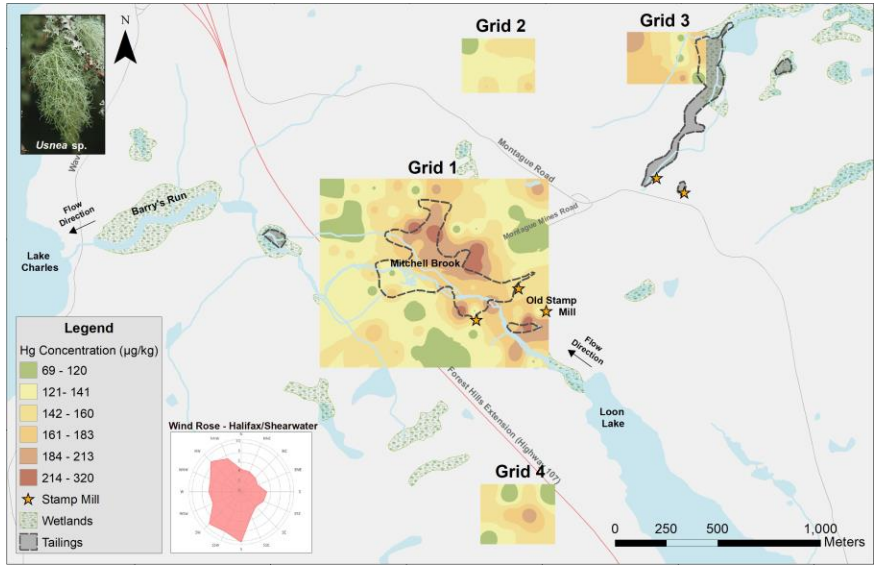
Lichen or Vegetation Survey

Old man's beard

Varied rag lichen

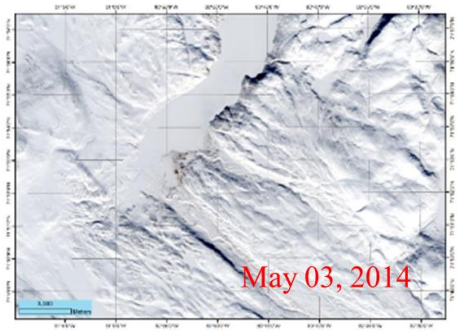
At sites in Nova Scotia, we measured metal concentrations in the tissue of different lichen species and mapped the spatial patterns. Explore the potential for either broadleaf vegetation or lichen study.



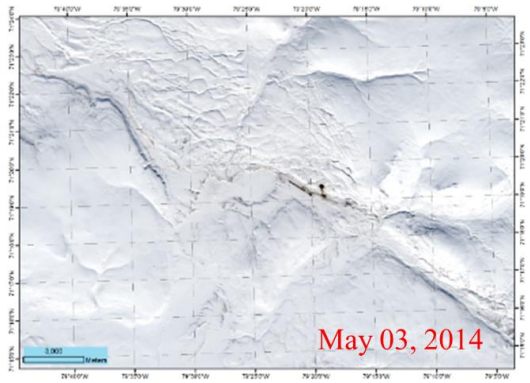


Smith, 2021

Remote Sensing: Imagery of the area is freely and openly available from many sites



From Landsat Imagery

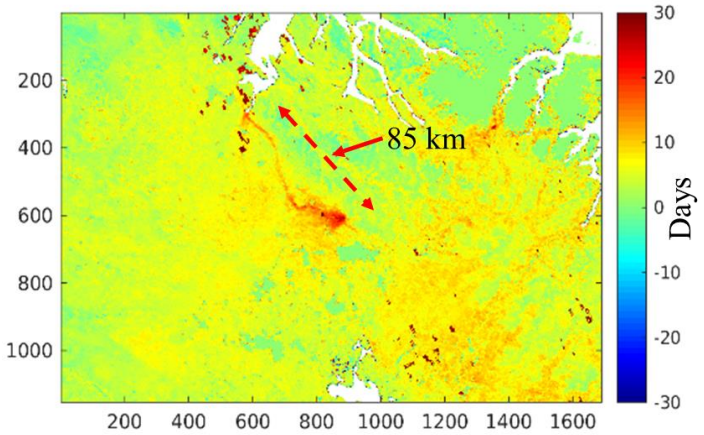


Imagery from orbital sensors are freely and openly available.

Imagery shows areas of lower albedo correlated with mining activity.

Validation of how this lower albedo relates to dust dispersion in the environment is required.

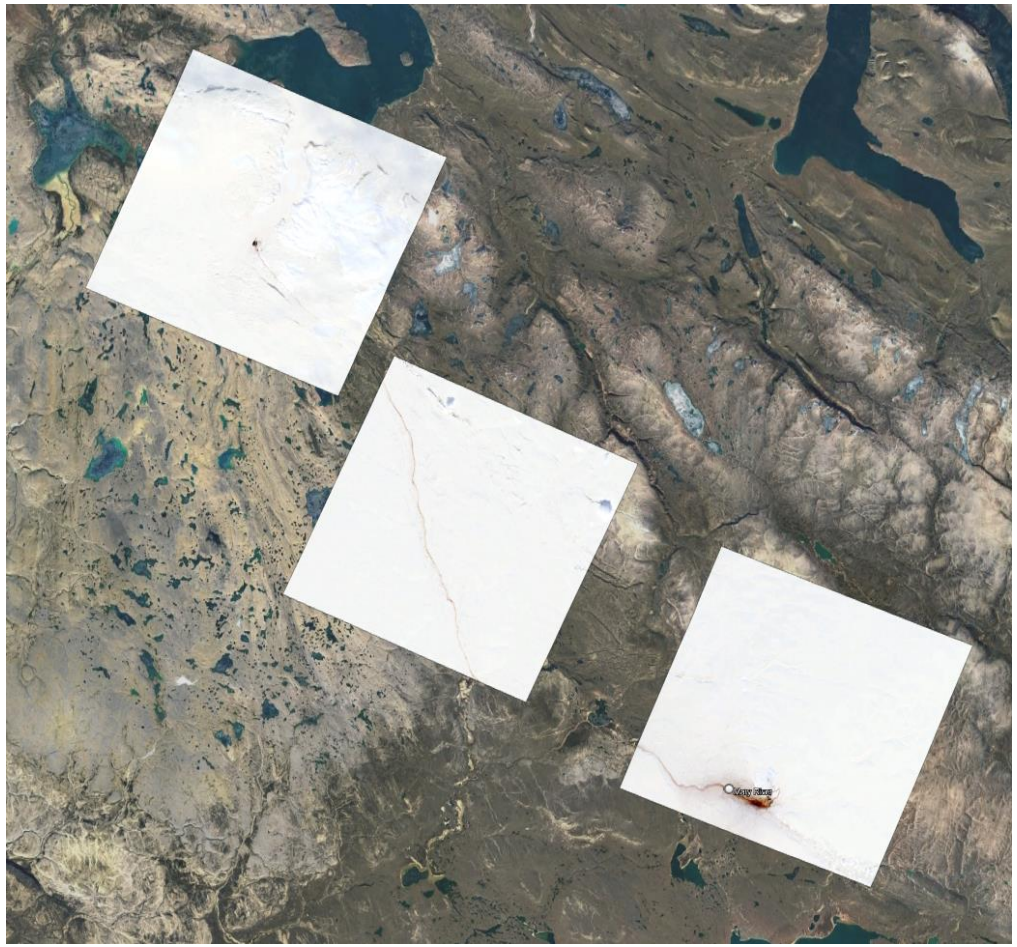
Indicators suggest snowmelt date is advanced



From MODIS imagery

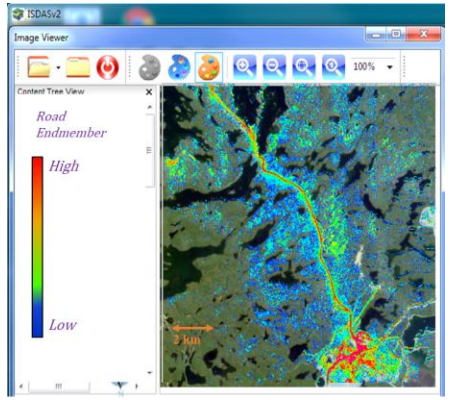
Images were enhanced for visualization and the colors are not accurate.

Remote Sensing: New Sensors are providing increased detail



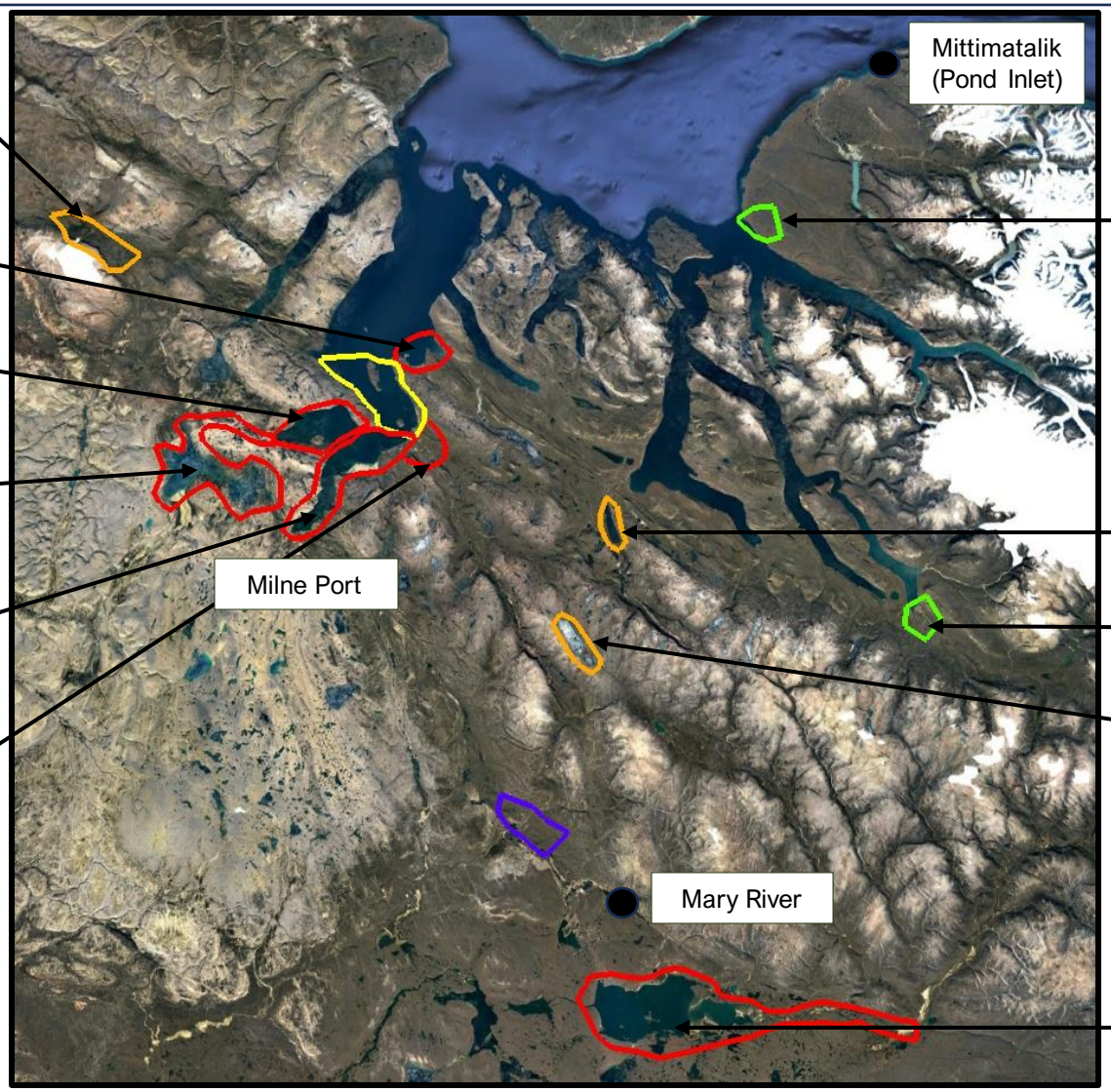
EnMAP Hyperspectral acquisitions:
Mary River Mine and Milne Port, April/May 2023

- With new orbital sensors, separation of low albedo areas from dust-on-snow versus shadow becomes possible
- Detecting the spectral signature of dust and relating that to quantity of dust on the surface requires field validation
- We will follow the protocols used at the Ekati Diamond Mine to highlight the spectral signature of dust and research how to extract that signature from the imagery in this environment



Ekati Mine and Misery Road. Left: Chris-on-Proba imagery analysis. Right: Landsat imagery analysis

Proposed Sampling Location Zones based on Inuit Qaujimajatuqangit



Tasirujaako

Ipiutaliarusiq and Area

Koluktoo Bay

Robertson River and Qurluqtuup Tasia

Milne Inlet

Area across from Bruce head (Tuugaat)

Proposed Reference Site (Tikiraalugjuak)

Iqaluit Lake (Tasialuk)

Tuniit

Icebound Lake

Angajurjualuk

- Areas of importance and observed dust by community members
- Extent of dust varied in this area
- Area of importance, no confirmed dust sightings, but monitoring suggested
- Dust is not a concern here
- Important berry-picking area for Inuit

Place Names Sourced from:
Inuit Heritage Trust
http://ihti.ca/eng/place-names/pn-goog.html
Please update us if names are incorrect.

Proposed Field Work for April 2024

- NRCan will deploy passives and collect snow samples at 15 of Baffinland's 43 dust sampling locations
- Additionally, 12 community-based sampling locations in the Milne Inlet, Koluktoo Bay and Robertson River will be targeted with a local guide for snow sampling
- Passives at these community-based sites will be installed in the Summer
- Pictures of the area will be taken for Satellite Imagery Validation

Proposed Community Sites

We are seeking feedback and thoughts from community members on these locations

Next Steps

- Planning the first field work session to be in April 2024
  - Working with MHTO, Ikaarvik and Baffinland to finalize field logistics
- Identifying community members interested in being involved in the project
- NRCan plans to develop a research agreement with communication and data sharing plans which are tri-lateral in nature

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Qujannamiik!!