# Compiling a stacked data set for large scale lichen mapping in NWT, Canada

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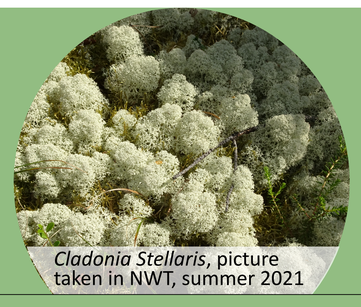
## Context

We compiled a stacked data set that includes data from ground field work, drone and airborne missions from NASA's ABoVE project, as well as Landsat data. The data set was created as part of a large-scale caribou lichen mapping effort for the NWT. Caribou lichen (*Cladonia spp.*) are important winter forage for caribou (*Rangifer tarandus*) and lichen maps can thus help to better understand the availability of high-quality caribou habitat. Caribou were listed as threatened species on a pan-Candaian scale, a state partly caused by habitat alteration. Protecting high-quality habitat is thus key to long-term recovery and conservation of caribou. This poster presents an overview of the stacked data set.

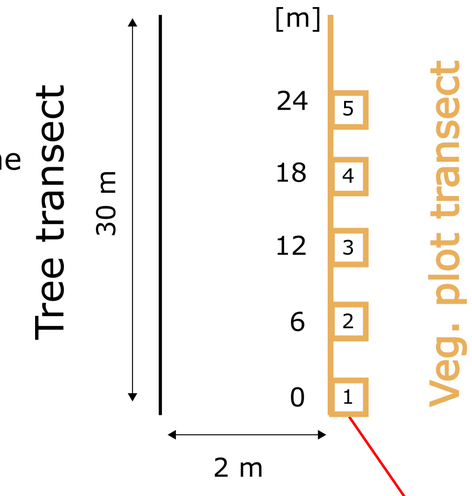


*Cladonia Stellaris*, picture taken in NWT, summer 2021

**Stacked data set with increacing resolution**

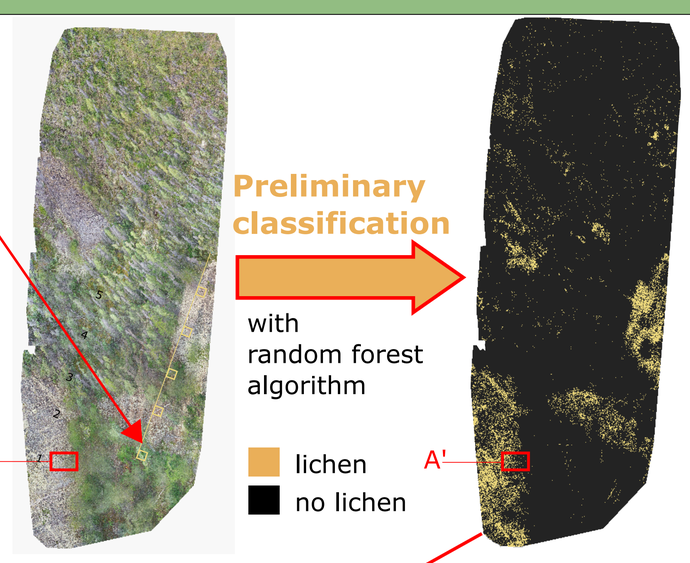
in situ

- **Ground field work**
  - Plot network comprises ~600 plots
  - Plot set-up consists of one tree & one vegetation transect (see right)
  - 5 quadrats with resolution of 1 m² are placed along the vegetation transect
  - Measurements within the quadrats include lichen cover and depth



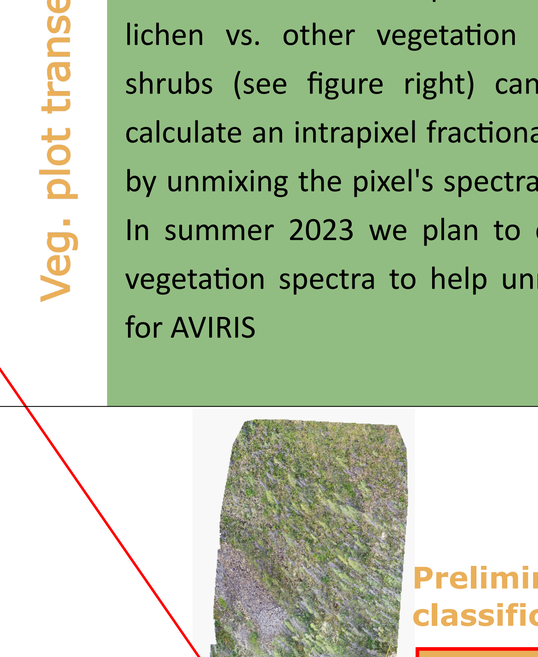

0.5 cm

- **Small drone missions (N=48)**
  - Area is 350 m² per mission and covers the ground plots
  - For accurate alignment with ground data, the plot position is highlighted with orange quadrats in each mission
  - Sampling design for AI lichen classification: 300 randomly sampled points per mission are manually labeled
  - lichen classification is validated with ground plot data




1 cm

- **Large drone missions (N=48)**
  - Area is 19600 m² per mission and covers small missions and ground plots
  - Sampling design for AI classification: after alignment and upscaling of the small mission, labels are transfered from the small to the large mission
  - lichen classification is validated by splitting the labeled data set 80/20 into training and validation data



5 m

- **AVIRIS flightlines**
  - 249 flightlines in mainland NWT cover an area of 48 935 km²
  - to obtain subpixel lichen cover we plan to use an unmixing approach (see also box in top right corner)
  - all 48 drone missions are overflown by AVIRIS resulting in ~30 000 overlapping pixels between AVIRIS and our classified drone data that can be used for validating subpixel lichen cover.

30 m

- **Landsat satellite data**
  - covering the entire mainland NWT
  - In NWT, there are ~ 55 million overlapping pixels between Landsat and AVIRIS which can be used to validate Landsat derived lichen cover. However, the classification approach for Landsat data is yet to be determined.

### Using lichen spectral signature to unmix AVIRIS data

Differences in the spectral signature of lichen vs. other vegetation like moss or shrubs (see figure right) can be used to calculate an intrapixel fractional lichen cover by unmixing the pixel's spectral information. In summer 2023 we plan to collect in situ vegetation spectra to help unmixing efforts for AVIRIS







## In summary...

... the **stacked dataset** we use for a lichen mapping effort in NWT **contains**:

- **3 500 in situ observations**, resulting from 600 ground plots
- 4**8 very high resolution drone missions**, all within AVIRIS flight lines and which allow for **~30 000 validation points for AVIRIS** data,
- **249 AVIRIS flight lines** covering an area of ~50 000 km², and
- **Landsat data covering the entrie mainland NWT**.

## Acknowledgements

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