Dataset methodological details

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This document presents the details to reproduce the vegetation survey realized at the Canadian Forces Station Alert, as well as the description of the variables in the dataset "Cover data of vascular plants, cryptogams, and ground substrates at Alert (Ellesmere Island, Nunavut) in 2018-2019".

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Methodology

The study area surrounds Canadian Forces Station Alert (82°30′N, 062°20′W) and is located on the north-eastern tip of Ellesmere Island, Nunavut, Canada. A random stratified design was used, based on a habitat map of the study area (ca. 170 km^2) described in Desjardins et al. 2021a, to select the locations of the vegetation plots (Figure 1A). Each vegetation plot corresponded to five 1 m × 1 m quadrats, each located 5 m from a central point and at equal distance from one another (Bay 1998; Figure 1B). During two summers (28 July to 24 August 2018 and 3 July to 2 September 2019), a total of 264 vegetation plots were surveyed (corresponding to 1,320 m^2-quadrats).

A quadrat consisted of a frame with a distended rope grid in two layers, forming 100 intersections per layer (Figure 1C; see Walker 1996 for construction details). Following the point-intercept method of the International Tundra Experiment (ITEX; Walker 1996), the frame was placed horizontally above the vegetation using metal poles at each corner. At each rope intersection, a metal pin was lowered along the two rope layers and the first plant encountered was recorded (the observer called out the vascular species/cryptogam code and the scribe wrote it down on the data sheet; Figure 1D). Vascular plants were identified to the species, whereas cryptogams were identified as lichen, moss, biological soil crust (white or black), blue-green algae, or macrofungus. If no plant was touched by the lowered pin, the ground substrate was noted (bare soil or rock). We slightly modified the ITEX protocol as follows: when a dead plant was touched by the pin (meaning in the case of a vascular plant that the entire individual was dead but still rooted in the substrate, or in the case of moss that the part touched by the pin was discolored (gray in color), dry, and friable), the letter "d" was added to the data sheet immediately following the vascular species/cryptogam code. When a living plant was touched by the pin (whether the touched part of the plant was alive or not; e.g., a brown leaf attached to a green stem; e.g., a brown leaf attached to a green stem), only the vascular species/cryptogam code was noted. When detached material on the ground, whether dead or alive, was touched, the ground substrate under the detached material was noted.

Using a Panasonic FZ70 (resolution: 180 dots per inch), a Samsung ST150F (resolution: 72 dots per inch), or an iPhone SE (resolution: 72 dots per inch), oblique color photographs of quadrats were taken and archived as Joint Photographic Experts Group (JPEG) file. A few quadrats (12 out of 1,320) could not be photographed for technical reasons.

For 250 quadrats from 50 vegetation plots, holes left in the ground after removing the metal poles from the quadrat corners were permanently marked using two 20-cm metal nails hammered into the ground at opposite corners of the quadrats (bottom-left and top-right or bottom-right and top-left). One nail was tagged using a small numbered metal plate. This permanent marking will allow retrieval of plots with a metal detector, and thus replication of our quantitative vegetation survey with the same protocol.

An index of absolute cover for each vascular species, cryptogam, and ground substrate was calculated for each quadrat as the total number of times the vascular species, cryptogam, and ground substrate was touched by the pin at a rope intersection, divided by 100 (Walker 1996). All vascular species/cryptogams inside the quadrats but not touched by the pin were identified and assigned a cover value of 0.5%.

Material list

- Crafted quadrat (1 m x 1m) with two rope layers (see construction details in Walker 1996)
- 5 pigtails (4 for each corner and 1 as pin)
- 4 rubber pieces in which to insert the corner pigtails so as to adjust the height of the quadrat
- 1-2 levels to place the quadrat in a horizontal position
- Knee pads
- 20-cm metal nails to mark the quadrats (2 per quadrat)
- Hammer
- Metal plates with unique number (1 per quadrat)
- Camera
- GPS receiver
- Waterproof data sheets with pen

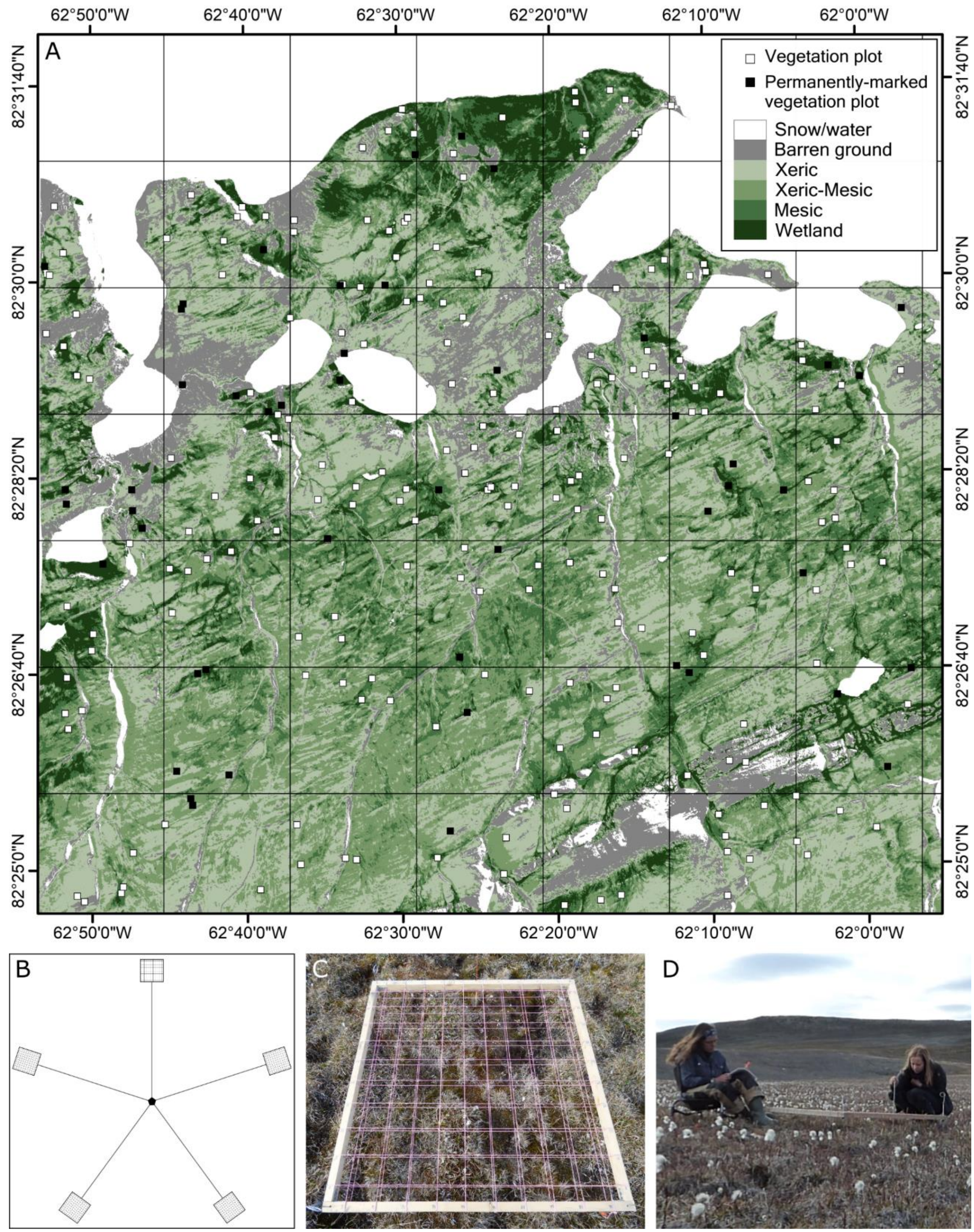

Figure 1. A. Map of the study area showing locations of 264 vegetation plots (squares) randomly distributed in five habitat types: barren ground, xeric habitat, xeric-mesic habitat, mesic habitat and wetland. Closed squares indicate locations of permanently marked plots**. B.** Set up of a vegetation plot with five 1 m × 1 m quadrats. **C.** Top view of a quadrat. **D.** Vegetation sampling by a scribe (left), and an observer (right).

Descriptive variables

Table 1. List and description of variables in the database.

Column variable	Description	Code
quadrat_ID	Unique identification of each surveyed quadrat based on the year of the survey, the vegetation plot number, and the quadrat number	20XX_XXX_X (year of the survey_vegetation plot number_quadrat number) Possible values: 2018-2019_001-201_1-5
vegetation_plot_location_lat	Latitude of the GPS location of the vegetation plot center (Figure 2)	XX.XXXX°N (decimal degrees)
vegetation_plot_location_long	Longitude of the GPS location of the vegetation plot center (Figure 2)	XX.XXXX°W (decimal degrees)
quadrat_location_lat	Latitude of the GPS location of the quadrat (Figure 2)	XX.XXXX°N (decimal degrees)
quadrat_location_long	Longitude of the GPS location of the quadrat (Figure 2)	XX.XXXX°W (decimal degrees)
date	Date of the survey	20XX-XX-XX (year-month-day)
nails	If the quadrat is marked or not	NA (if not marked) or BL-TR/BR-TL (if marked on bottom-left and top-right corners or bottom-right and top-left corners; Figure 2)
nail_ID	Number on the metal plate identifying the quadrat	NA (if not marked) or if marked: XXX (001-250)
ID_nail_corner	The quadrat corner with the metal plate	NA (if not marked) or if marked: BL, BR, or TR
rock	Cover data for various types of rocks: boulder, frost-shattered rock, gravel	
soil	Cover data for ground substrate (mostly till, clay, or silt)	
algae	Cover data for blue-green algae (macroscopic sheet colonies dominated by *Nostoc* sp.)	
bsc_black	Cover data for cohesive black biological soil crust (mainly composed of cyanobacteria)	
bsc_white	Cover data for cohesive white biological soil crust (mainly composed of lichen)	
lichen	Cover data for lichen (on the rocks or on the soil)	
macrofungus	Cover data for spore-bearing fruiting body of a fungus	
moss	Cover data for moss	
alomag-tarphy (followed with "_d" if specimen is dead)	Cover data for vascular plant species (see section below for species codes)	

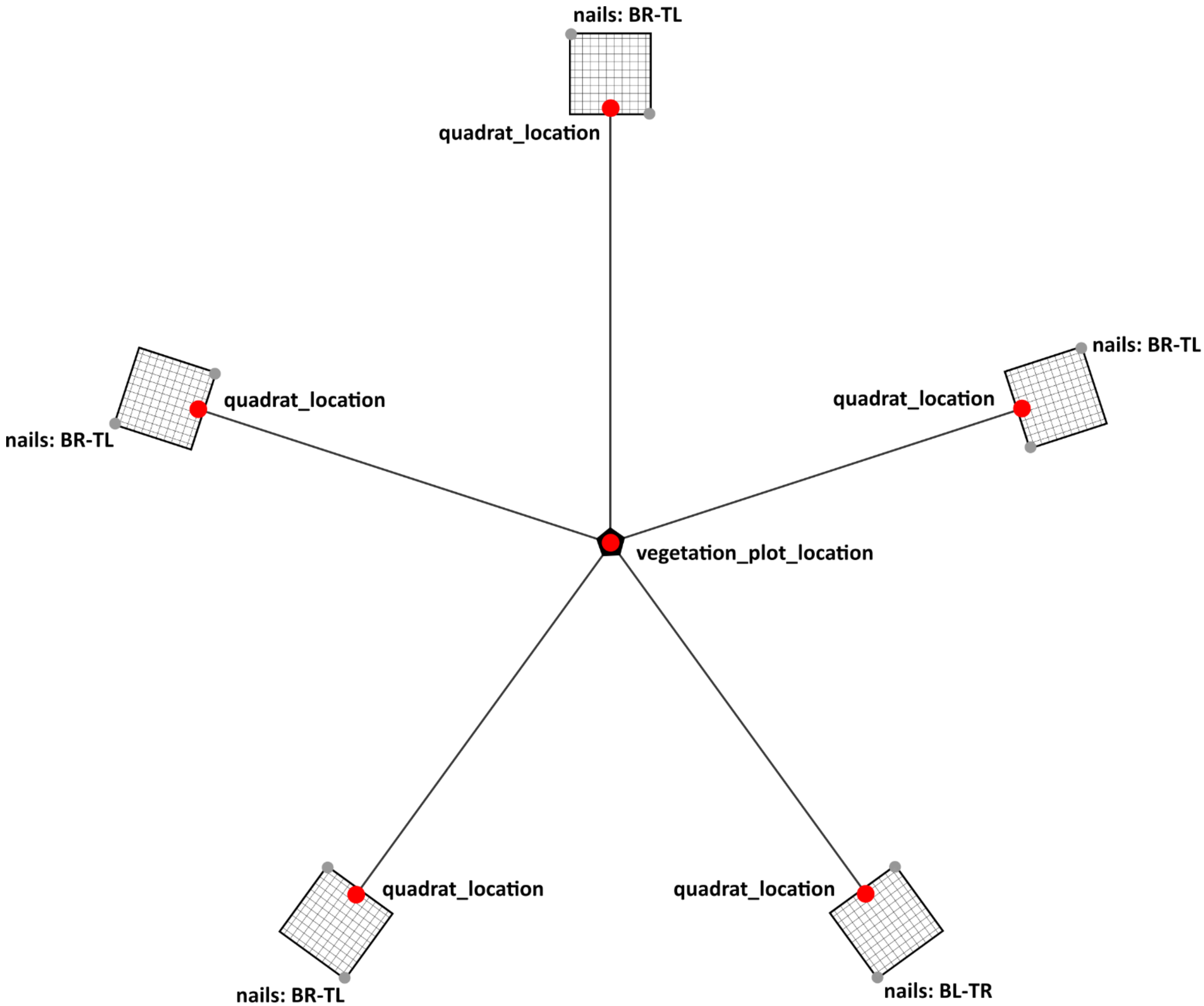

Figure 2. Set up of a vegetation plot with five 1 m × 1 m quadrats, showing the variables collected in the field. Red dots correspond to the records of GPS locations (center of vegetation plot and quadrats). Grey dots identify nails hammered in the ground (B, T, R, L stand for bottom, top, right, and left, respectively).

Vascular species codes

Table 2. Codes associated with each vascular plant species found in the study area (Alert, Ellesmere Island, Nunavut, Canada) during our 2018–2019 vegetation inventory. Vascular plant names are based on the Database of Vascular Plants of Canada (VASCAN; Brouillet et al. 2010; Desmet and Brouillet 2013). Codes correspond to the combination of the first three letters of the genus and the first three letters of the species.

Vascular plants	Code
Asteraceae	
Taraxacum phymatocarpum J. Vahl	tarphy
Brassicaceae	
Braya purpurascens (R. Brown) Bunge ex Ledebour	brapur
Braya thorild-wulffii Ostenfeld subsp. *thorild-wulffii*	bratho
Cardamine bellidifolia Linnaeus	carbel
Cochlearia groenlandica Linnaeus	cocgro
Draba corymbosa R. Brown ex de Candolle	dracor
Draba lactea Adams	dralac
Draba micropetala Hooker	dramic
Draba pauciflora R. Brown	drapau
Draba subcapitata Simmons	drasub
Caryophyllaceae	
Cerastium arcticum Lange	cerarc
Cerastium regelii Ostenfeld	cerreg
Sabulina rossii (R. Brown ex Richardson) Dillenberger & Kadereit	sabros
Sabulina rubella (Wahlenberg) Dillenberger & Kadereit	sabrub
Silene uralensis (Ruprecht) Bocquet subsp. *uralensis*	silura
Stellaria longipes Goldie *subsp. longipes*	stelon
Cyperaceae	
Carex fuliginosa Schkuhr	carful

Eriophorum triste (Th. Fries) Hadac & Á. Löve	eritri
Equisetaceae	
Equisetum arvense Linnaeus	equarv
Equisetum variegatum Schleicher ex F. Weber & D. Mohr subsp. *variegatum*	equvar
Juncaceae	
Juncus biglumis Linnaeus	junbig
Luzula nivalis (Laestadius) Sprengel	luzniv
Orobanchaceae	
Pedicularis hirsuta Linnaeus	pedhir
Papaveraceae	
Papaver dahlianum Nordhagen	papdah
Poaceae	
Alopecurus magellanicus Lamarck	alomag
Arctagrostis latifolia (R. Brown) Grisebach subsp. *latifolia*	arclat
Deschampsia cespitosa subsp. *septentrionalis* Chiapella	desces
Festuca baffinensis Polunin	fesbaf
Festuca brachyphylla Schultes & Schultes f. subsp. *brachyphylla*	fesbra
Festuca edlundiae S.G. Aiken, Consaul, & Lefkovitch	fesedl
Festuca hyperborea Holmen ex Frederiksen	feshyp
Festuca viviparoidea Krajina ex Pavlick subsp. *viviparoidea*	fesviv
Phippsia algida (Solander) R. Brown	phialg
Pleuropogon sabinei R. Brown	plesab
Poa abbreviata R. Brown subsp. *abbreviata*	poaabb
Poa arctica R. Brown subsp. *arctica*	poaarc
Poa pratensis subsp. *colpodea* (Th. Fries) Tzvelev	poapra
Puccinellia angustata (R. Brown) E.L. Rand & Redfield	pucang

Puccinellia bruggemannii T.J. Sørensen	pucbru
Puccinellia vahliana (Liebmann) Scribner & Merrill*	pucvah
×*Pucciphippsia vacillans* (T. Fries) Tzvelev	pucvac
Polygonaceae	
Bistorta vivipara (Linnaeus) Delarbre	bisviv
Oxyria digyna (Linnaeus) Hill	oxydig
Ranunculaceae	
Ranunculus hyperboreus Rottbøll	ranhyp
Ranunculus sabinei R. Brown	ransab
Ranunculus sulphureus Solander	ransul
Rosaceae	
Dryas integrifolia Vahl subsp. *integrifolia*	dryint
Potentilla pulchella R. Brown	potpul
Salicaceae	
Salix arctica Pallas	salarc
Saxifragaceae	
Micranthes tenuis (Wahlenberg) Small	micten
Saxifraga cernua Linnaeus	saxcer
Saxifraga cespitosa Linnaeus	saxces
Saxifraga flagellaris subsp. *platysepala* (Trautvetter) A.E. Porsild	saxfla
Saxifraga oppositifolia Linnaeus subsp. *oppositifolia*	saxopp

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