**RiS IDs: 11968 & 12016**

<https://www.researchinsvalbard.no/project/a2960000-1219-0a01-39d2-08da0b200c42/project-info>

<https://www.researchinsvalbard.no/project/ef070000-f231-1ecb-8928-08da449593f4/project-info>

**Data Owner & Contact person**

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Datasets on herbivory and vegetation N-content will be added by Michiel Bontje. Data on insect abundance and emergence will be added by Carla Sunol-Escribano. Data on litter decomposition and root traits will be added by Violet van Rooijen.

**Description of datasets provided**

**irrigationlog.csv**

Status: Finished, available

Variables:

* *Plot* Plot code (Location – Treatment – Replicate)
* *Treatment* C = control, I = irrigated I 2022, ES = irrigated in early summer 2023, LS = irrigated in late summer 2023
* *Location* Code (1-5). 1 = Adventdalen (Old Aurora Station), 2 = Adventdalen (Polygonal Tundra), 3 = Endalen (River Terrace), 4 = Endalen (North-facing Slope), 5 = Ny-Ålesund (Old mining area, Esker)
* *Amount [cumulative, mm]* Cumulative amount of rainfall addition up unto and including this session
* *Date* Date that rainfall was supplied
* *Year* Year in which rainfall was supplied
* *DOY* Julian day number on which rainfall was supplied
* *Time* Local time at which rainfall was supplied
* *Water Temperature [oC]*  Temperature of the water used for irrigation (if available)
* *Note* Any noteworthy exceptions or observations.

Collected by: Rúna Magnússon, Mo Verhoeven, Christian Menheere, Alexandra Hamm, Michiel Bontje, Manon van den Dolder, Violet van Rooijen & Carla Suñol-Escribano

Methods: Manually noted down times at which irrigation was supplied to treatment plots. Each treatment received 5 x 10mm water to simulate a summer with 5 heavy rainfall days. The treatments were supplied with approximately 3 days in between. Water temperatures were measured with a K-couple thermometer in 2022, and an iButton logger (left in the water tied to a stick) in 2023. Local meltwater was used (ponds, meltwater streams).

**watercompositon.xlsx**

Status: Finished, available

Variables:

* *Location* Code (1-5). 1 = Adventdalen (Old Aurora Station), 2 = Adventdalen (Polygonal Tundra), 3 = Endalen (River Terrace), 4 = Endalen (North-facing Slope), 5 = Ny-Ålesund (Old mining area, Esker)
* *Description* Description of the sample
* *N\_NO3\_mgL* Concentration of N in the form of NO3 in mg/L, measured on AutoAnalyzer
* *N\_NH4\_mgL* Concentration of N in the form of NH4 in mg/L, measured on AutoAnalyzer
* *P\_PO4\_mgL* Concentration of P in the form of PO4 in mg/L, measured on AutoAnalyzer
* *S\_SO4\_mgL* Concentration of S in the form of SO4 in mg/L, measured on AutoAnalyzer
* *Na\_mgL* Concentration of Na, measured via Atomic Absorption Spectroscopy
* *Ca\_mgL* Concentration of Ca, measured via Atomic Absorption Spectroscopy
* *Mg\_mgL* Concentration of Mg, measured via Atomic Absorption Spectroscopy
* *K\_mL* Concentration of Ka, measured via Atomic Absorption Spectroscopy
* *Cl\_mgL* Concentration of Cl, measured via Atomic Absorption Spectroscopy
* *added NO3\_mg* mg of added N-NO3 with 50mm irrigation based on sample concentration
* *added NH4\_mg* mg of added N-NH4 with 50mm irrigation based on sample concentration
* *added PO4\_mg* mg of added P-PO4 with 50mm irrigation based on sample concentration

Collected by: Rúna Magnússon, Mo Verhoeven

Methods: Water was sampled from the ponds/streams from which we irrigated and from rainfall using a funnel. Samples were passed through a .45 um filter and added into a 50mL HDPE bottle with citric acid grains (leaving minimal space for air bubbles). Samples were analyzed for main nutrients and minerals on an auto-analyzer and AAS. Calculated total additions based on 50mm / m2 irrigation treatment. Also provided reference values for average wet deposition from literature.

**plot\_coordinates.csv**

Status: Finished, available

Variables:

* *Location* Code (1-5). 1 = Adventdalen (Old Aurora Station), 2 = Adventdalen (Polygonal Tundra), 3 = Endalen (River Terrace), 4 = Endalen (North-facing Slope), 5 = Ny-Ålesund (Old mining area, Esker)
* *Plot* Plot code (Location – Treatment – Replicate)
* *Longitude* WGS84 longitude in decimal degrees
* *Latitude* WGS84 longitude in decimal degrees
* *Elevation* To be added later based on a digital elevation model
* *Note* Any noteworthy exceptions or observations

Collected by: Rúna Magnússon

Methods: Plot coordinates were recorded with a Garmin handheld GPS, with an accuracy of several meters depending on daily conditions and terrain. No coordinates are available for Ny-Alesund, due to restrictions to the use of telecommunication, but an approximate location for the sites is provided.

**SoilTParsed.csv**

Status: Finished, available

Variables:

* *Time* Date and time of reading
* *Temp [oC]* Temperature at sensor, in degrees C
* *Plot* Plot in which the logger is placed (Location – Treatment – Replicate)
* *Depth [cm]* Depth at which the logger is situated, in cm (5cm or 20cm)
* *Location* Code (1-5). 1 = Adventdalen (Old Aurora Station), 2 = Adventdalen (Polygonal Tundra), 3 = Endalen (River Terrace), 4 = Endalen (North-facing Slope), 5 = Ny-Ålesund (Old mining area, Esker)
* *Day* Day of temperature reading
* *Month* Month of temperature reading
* *Year* Year of temperature reading
* *Hour* Hour of temperature reading
* *Min* Min of temperature reading
* *TimeParsed* Standardised datestring for temperature reading: m/d/y hh:mm
* *Treatment* Treatment for plot: C = control, I = irrigated I 2022, ES = irrigated in early summer 2023, LS = irrigated in late summer 2023

Collected by: Rúna Magnússon, Mo Verhoeven

Methods: iButton DS1921G-F5# loggers were buried in selected plots per site, at standard depths of 5cm and 20cm below the organic soil layer. Temperatures were read each 4hr 15min interval. Several loggers were placed 1cm aboveground (depth = “air”).

**ibuttons\_overview.csv**

Status: Finished, available

Variables:

* *Location* Code (1-5). 1 = Adventdalen (Old Aurora Station), 2 = Adventdalen (Polygonal Tundra), 3 = Endalen (River Terrace), 4 = Endalen (North-facing Slope), 5 = Ny-Ålesund (Old mining area, Esker)
* *Plot* Plot in which the logger is placed (Location – Treatment – Replicate)
* *loc\_in\_plot* Nearest measurement points in the plot (A-I)
* *depth* Depth at which the logger is situated, in cm (5cm or 20cm)
* *iButton\_filename* Filename of iButton.
* *veg\_height\_cm* Mean vegetation height above iButton [cm] above moss
* *moss\_thickness\_cm* Thickness of moss layer [cm]
* *OL\_thickness\_abovelogger\_cm* Thickness of organic layer [cm]
* *note* Soil profile description

Collected by: Rúna Magnússon

Methods: Metadata for iButtons, with soil profile and vegetation height description at place of sensor. Moss height, organic layer thickness measured with ruler. Vegetation height measured with +/- 15cm diameter pasture disk.

**all\_meltdates.csv**

Status: Finished, available

Variables:

* *Location* Code (1-5). 1 = Adventdalen (Old Aurora Station), 2 = Adventdalen (Polygonal Tundra), 3 = Endalen (River Terrace), 4 = Endalen (North-facing Slope). No data for Ny-Ålesund plots.
* *Treatment* Treatment for plot: C = control, I = irrigated I 2022, ES = irrigated in early summer 2023, LS = irrigated in late summer 2023
* *Pair* Replicate number
* *Plot `* Plot code (Location – Treatment – Replicate)
* *meltdate (interp.)* Approximate date of snowmelt interpolated from snow cover observations (see note)
* *meltdate DOY* Julian day number for snowmelt date
* *earliest* Earliest possible snowmelt date (based on latest observation with snow cover present)
* *latest* Latest possible snowmelt date (based on first observation without snow cover present)
* *note* Snowcover estimates on which estimated snowmelt date is based.

Collected by: Simone Lang, Sil Schuuring, Clara Wilcock, Rúna Magnússon

Methods: Snowmelt dates derived from regular observations of %- snow cover in experimental plots. We estimated the approximate date of complete snowmelt through linear interpolation between %-cover observations and provide uncertainty ranges where possible.

**all\_thawdepth.csv**

Status: Finished, available

Variables:

* *Location* Code (1-5). 1 = Adventdalen (Old Aurora Station), 2 = Adventdalen (Polygonal Tundra), 3 = Endalen (River Terrace), 4 = Endalen (North-facing Slope). No data for Ny-Ålesund plots.
* *Treatment* Treatment for plot: C = control, I = irrigated I 2022, ES = irrigated in early summer 2023, LS = irrigated in late summer 2023
* *Pair* Replicate number
* *Plot `* Plot code (Location – Treatment – Replicate)
* *Point* Measurement point (A, C, E, G or I)
* *Date* Measurement date
* *Year* Year of measurement
* *DOY* Julian day number for measurement date
* *cumLS2022* Cumulative amount of irrigation provided in 2022 in this plot at time of measurement
* *cumES2023* Cumulative amount of irrigation provided in early summer treatment 2023 in this plot at time of measurement
* *cumLS2023* Cumulative amount of irrigation provided in late summer treatment 2023 in this plot at time of measurement
* *TD [cm]* Thaw depth [cm]
* *Note* Anything noteworthy

Collected by: Rúna Magnússon, Sil Schuuring, Alexandra Hamm, Anna Johansson, Christian Menheere, Simone Lang, Clara Wilcock, Michiel Bontje, Manon van den Dolder, Violet van Rooijen, Carla Sunol Escribano

Methods: Mechanical probing of thaw depth with metal rod with blunt tip. Measurements from location 3, 4 and 5, especially later in the season, are lacking and otherwise rather unreliable due to rocky soils. Recommended to use only locations 1 and 2 for reliable thaw progression data.

**all\_soilmoisture.csv**

Status: Some data from Location 5 still needs to be added.

Variables:

* *Location* Code (1-5). 1 = Adventdalen (Old Aurora Station), 2 = Adventdalen (Polygonal Tundra), 3 = Endalen (River Terrace), 4 = Endalen (North-facing Slope), 5 = Ny-Ålesund (Old mining area, Esker)
* *Treatment* Treatment for plot: C = control, I = irrigated I 2022, ES = irrigated in early summer 2023, LS = irrigated in late summer 2023
* *Pair* Replicate number
* *Plot `* Plot code (Location – Treatment – Replicate)
* *Date* Measurement date
* *DOY* Julian day number for measurement date
* *Year* Year of measurement
* *cumLS2022* Cumulative amount of irrigation provided in 2022 in this plot at time of measurement
* *cumES2023* Cumulative amount of irrigation provided in early summer treatment 2023 in this plot at time of measurement
* *cumLS2023* Cumulative amount of irrigation provided in late summer treatment 2023 in this plot at time of measurement
* *A* Soil moisture in top 5cm of soil in measurement point A [vol-%]
* *B* Soil moisture in top 5cm of soil in measurement point B [vol-%]
* *C* Soil moisture in top 5cm of soil in measurement point C [vol-%]
* *D* Soil moisture in top 5cm of soil in measurement point D [vol-%]
* *E* Soil moisture in top 5cm of soil in measurement point E [vol-%]
* *F* Soil moisture in top 5cm of soil in measurement point F [vol-%]
* *G* Soil moisture in top 5cm of soil in measurement point G [vol-%]
* *H* Soil moisture in top 5cm of soil in measurement point H [vol-%]
* *I* Soil moisture in top 5cm of soil in measurement point I [vol-%]
* *Round* Measurement round (0 = pre treatment)
* *Note* Anything noteworthy

Collected by: Rúna Magnússon, Violet van Rooijen, Christian Menheere, Alexandra Hamm, Michiel Bontje, Carla Sunol-Escribano, Manon van den Dolder.

Methods: Measured volumetric moisture content of the top 5cm of the soil with a thetaprobe ML2x handheld sensor. ‘r’ means rocks where present and the sensor could not be inserted. ‘at’ means the soil was near saturation (thetaprobe indicates moisture content over >90% and reads ‘at table’, but no standing water). ‘sat’ means the soil is saturated (moisture content = 100%, standing water present). ‘sc’ means that the measurement point is still snow covered and no reading could be taken. ‘p’ means permafrost is close to the surface (<5cm) and sensor could not be inserted.

**ol\_mos\_veg\_points.csv**

Status: Finished, available

Variables:

* *Location* Code (1-5). 1 = Adventdalen (Old Aurora Station), 2 = Adventdalen (Polygonal Tundra), 3 = Endalen (River Terrace), 4 = Endalen (North-facing Slope), 5 = Ny-Ålesund (Old mining area, Esker)
* *Treatment* Treatment for plot: C = control, I = irrigated I 2022, ES = irrigated in early summer 2023, LS = irrigated in late summer 2023
* *Pair* Replicate number
* *Plot `* Plot code (Location – Treatment – Replicate)
* *Point* Measurement point (A, C, E, G or I)
* *Date* Measurement date
* *OL\_depth\_cm* Depth of organic layer (measured from underneath moss) in cm
* *moss\_height\_cm* Height of moss, if present, in cm
* *veg\_height\_cm* Height of vegetation, if present, in cm
* *note* Any noteworthy exception or observation
* *clay layer\_loc 34* Depth of clay layer above rocky soil (only observed in Loc. 3 & 4)

Collected by: Rúna Magnússon, Manon van den Dolder, Carla Sunol Escribano

Methods: Moss height, organic layer thickness measured with ruler in a soil profile extracted with peat corer. Data were gathered at the same measurement points for which thaw depth was recorded (A, C, E, G and I). Vegetation height measured with +/- 15cm diameter pasture disk. NA = not available.

**Senescence\_SalixPolaris.xlsx**

Status: Finished, available

Variables:

* *Location* Code (1-5). 1 = Adventdalen (Old Aurora Station), 2 = Adventdalen (Polygonal Tundra), 3 = Endalen (River Terrace), 4 = Endalen (North-facing Slope), 5 = Ny-Ålesund (Old mining area, Esker)
* *Plot `* Plot code (Location – Treatment – Replicate)
* *Treatment* Treatment for plot: C = control, I = irrigated I 2022, ES = irrigated in early summer 2023, LS = irrigated in late summer 2023
* *Pair* Replicate number
* *Date* Measurement date
* *nr\_leafs\_senescent* number of senescent leaves (out of 10 observed)
* *nr\_leafs\_partly* number of partly senescent leaves (out of 10 observed)
* *nr\_leafs\_green* number of green leaves (out of 10 observed)
* *notes* Any noteworthy exception or observation

Collected by: Rúna Magnússon, Manon van den Dolder, Carla Sunol Escribano

Methods: In each plot we randomly threw a pencil into the plot from multiple sides and recorded whether the Salix polaris leaf closest to the tip of the pencil was green (>90% of leaf area green), partly senescent (10-90% of green leaf area) or senescent (<10% of green leaf area). Leaves that had fallen off (litter) or appeared damaged were not considered, in this case the next nearest leaf was observed.

**all\_NDVI.csv**

Status: Finished, available

Variables:

* *Location* Code (1-5). 1 = Adventdalen (Old Aurora Station), 2 = Adventdalen (Polygonal Tundra), 3 = Endalen (River Terrace), 4 = Endalen (North-facing Slope), 5 = Ny-Ålesund (Old mining area, Esker)
* *Plot `* Plot code (Location – Treatment – Replicate)
* *Treatment* Treatment for plot: C = control, I = irrigated I 2022, ES = irrigated in early summer 2023, LS = irrigated in late summer 2023
* *Pair* Replicate number
* *Date* Measurement date
* *NDVI\_Centre* NDVI at point I (0-1)
* *NDVI\_Grid* NDVI in vegetation composition grid (0-1)
* *note* Any noteworthy exception or observation

Collected by: Rúna Magnússon, Manon van den Dolder, Christian Menheere

Methods: NDVI was measured with a Skye SpectroSense 2+ field spectrometer in each plot above the centre (point I) in a circle with 0.35 m2 surface, and above the vegetation composition grid at point A in a 0.23 m2 surface.

**all\_fluorescence.csv**

Status: Finished, available

Variables:

* *Location* Code (1-5). 1 = Adventdalen (Old Aurora Station), 2 = Adventdalen (Polygonal Tundra), 3 = Endalen (River Terrace), 4 = Endalen (North-facing Slope), 5 = Ny-Ålesund (Old mining area, Esker)
* *Plot `* Plot code (Location – Treatment – Replicate)
* *Treatment* Treatment for plot: C = control, I = irrigated I 2022, ES = irrigated in early summer 2023, LS = irrigated in late summer 2023
* *Pair* Replicate number
* *Measuring date* Measurement date
* *Start time* Start time of actinic light exposure
* *End time* End time of actinic light exposure
* *Actinic Light level* Level of actinic light [PAR]
* *Y(II)* Photosynthetic yield of photosystem II
* *Leaf weight [field, g]* Leaf weight (right after field harvest, in g)
* *Notes* Any noteworthy exception or observation

Collected by: Rúna Magnússon, Manon van den Dolder, Christian Menheere

Methods: Fluorescence was measured with a Walz mini PAM II using a modified Actinic+Yield procedure with longer exposure to a high level of actinic light. Per plot one leaf of Salix polaris was saturated under high actinic light levels (1500 PAR) for 7 minutes and 30 seconds, and then received a saturating pulse (4850 PAR). The mini PAM reports the photosynthetic yield of photosystem II (Y\_II), from which we calculate the electron transfer rate (0.85 x 0.5 x Act\_Light x Y\_II). In some cases, leaf weights were noted.

**vegetation\_composition.csv**

Status: Finished, available

Variables:

* *Location* Code (1-5). 1 = Adventdalen (Old Aurora Station), 2 = Adventdalen (Polygonal Tundra), 3 = Endalen (River Terrace), 4 = Endalen (North-facing Slope), 5 = Ny-Ålesund (Old mining area, Esker)
* *Plot Plo*t code (Location – Treatment – Replicate)
* .. *all following column names indicate a species code, with rows per plot indicating the amount of hits for that species in that plot.*

Collected by: Rúna Magnússon, Juul Limpens

Methods: Point-intercept vegetation recording data. We laid out a 50x50grid at point A (so that the bottom left or bottom right corner is on point A) and marked the corner points. Each grid contained 36 grid intersection at which we lowered a small wooden pointed stick and recorded each plant or pyrophyte species that was hit. Some species were pooled to functional groups or families due to difficulties or time constraints in field identification. We noted hits up until the first ground layer hit. The ground layer could be either litter (subdivided into functional groups moss litter, forb litter, shrub litter, graminoid litter, lichen litter), bare ground (either mineral or organic) cryptogamic crust, a moss species, droppings, rocks, or mushrooms. Dead plant material that was not litter was recorded as “standing dead” and was not counted as a ground layer hit.

**vegetation\_composition\_codes.csv**

List of species codes used for vegetation composition recordings.