Arctic Vegetation Plots at Atqasuk, Alaska, 1975, 2000, and 2010

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Summary

This data set provides vegetation species abundance data collected in 1975 from 60 sites on the Arctic Coastal Plain near Atqasuk, Alaska, as well as environmental and species data for 31 of the sites that were revisited in 2000 and 2010. The study sites are located on Arctic tundra near the Meade River, about 60 miles southwest of Barrow. Data includes baseline plot information for vegetation and site factors for the study plots subjectively located in 9 plant communities. Specific attributes include: site characteristics such as altitude, slope, aspect, and topographic position; soil pH and organic layer depth; and dominant plant communities. This product brings together for easy reference all of the available information collected from the plots that has been used for the classification, mapping, and analysis of geo-botanical factors at the Atqasuk research sites and across Alaska.

The data set includes four data files and one companion file in *.csv format and an additional companion file in *.pdf format.

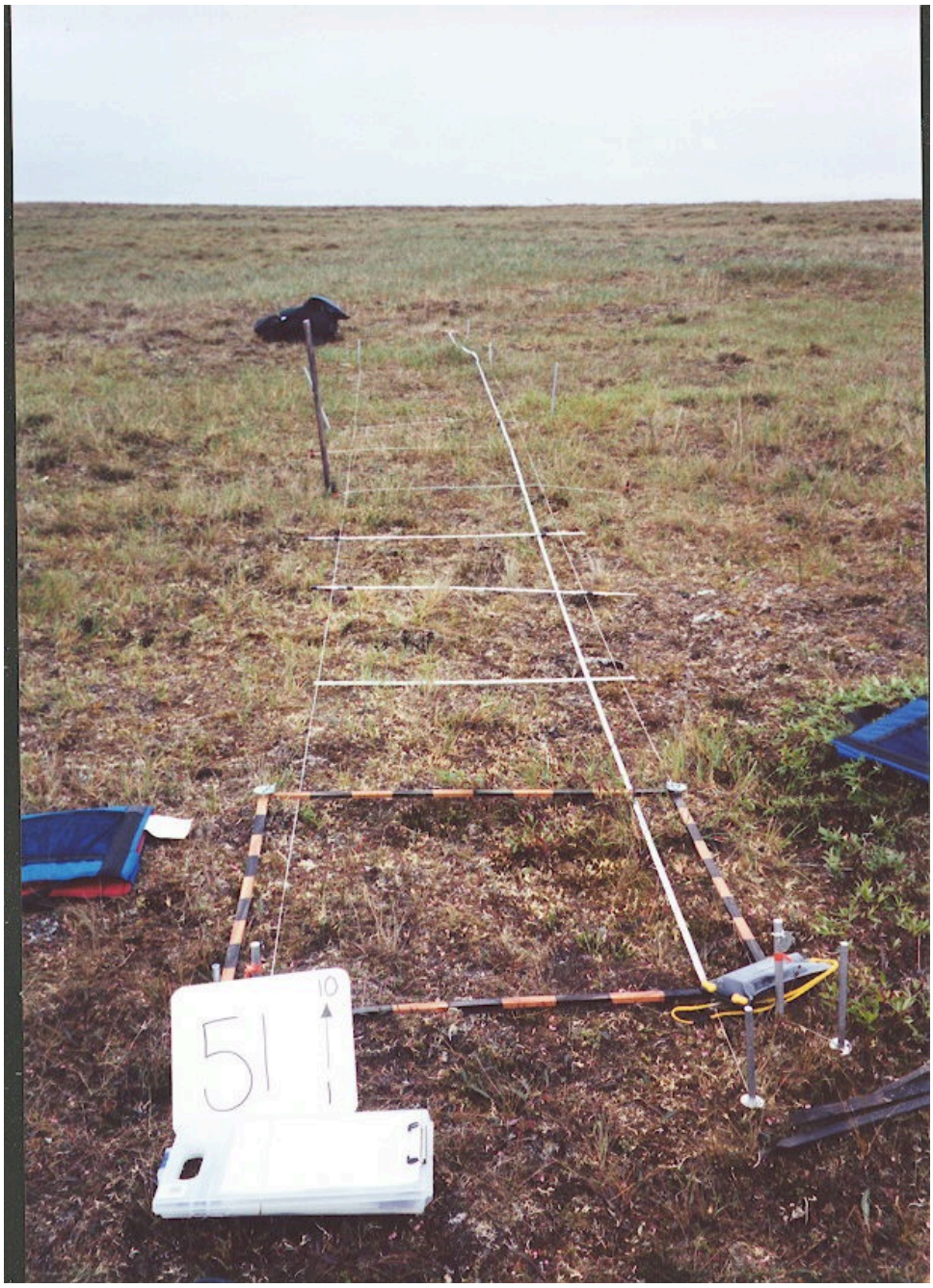

Figure 1. Site 51 sub-plots 1 through 10 from field investigation in July 2000. Additional photos available in Atqasuk_Veg_Plots_Photos.pdf

Citation

Tweedie, C.E., P.J. Webber, V. Komarkova, and S. Villarreal. 2018. Arctic Vegetation Plots at Atqasuk, Alaska, 1975, 2000, and 2010. ORNL DAAC, Oak Ridge, Tennessee, USA. https://doi.org/10.3334/ORNLDAAC/1371

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1. Data Set Overview

This data set provides vegetation species abundance data collected in 1975 from 60 sites on the Arctic Coastal Plain near Atqasuk, Alaska, as well as environmental and species data for 31 of the sites that were revisited in 2000 and 2010. The study sites are located on Arctic tundra near the Meade River, about 60 miles southwest of Barrow. Data includes baseline plot information for vegetation and site factors for the study plots subjectively located in 9 plant communities across the glaciated landscape. Specific attributes include: site characteristics such as altitude, slope, aspect, and topographic position; soil pH and organic layer depth; and dominant plant communities. This product brings together for easy reference all of the available information collected from the plots that has been used for the classification, mapping, and analysis of geo-botanical factors at the Atqasuk research sites and across Alaska.

The Pre-ABoVE vegetation plot datasets were curated to create the Alaska Arctic Vegetation Archive (AVA-AK; Walker et al. 2016b, Walker 2013). The AVA-AK is a regional database that is part of the larger Arctic Vegetation Archive (Walker 2016a, Walker et al. 2013, Walker and Raynolds 2011). The database contains vegetation plots from homogeneous plant communities with tables of cover or cover-abundance scores for all species and accompanying environmental site data. Field data were collected using Braun-Blanquet, US National Vegetation Classification protocols, or comparable methods.

Project: Arctic-Boreal Vulnerability Experiment (ABoVE)

The Arctic-Boreal Vulnerability Experiment (ABoVE) is a NASA Terrestrial Ecology Program field campaign that will take place in Alaska and western Canada between 2016 and 2021. Climate change in the Arctic and Boreal region is unfolding faster than anywhere else on Earth. ABoVE seeks a better understanding of the vulnerability and resilience of ecosystems and society to this changing environment.

Acknowledgements:

These data files were edited by Donald A. Walker, Amy L. Breen and Lisa A. Druckenmiller at the University of Alaska Fairbanks' Alaska Geobotany Center and obtained via the Arctic Geoecological Atlas (http://arcticatlas.geobotany.org/), which provides access to existing Arctic vegetation plot and map data in support of the ABoVE campaign.

2. Data Characteristics

Spatial Coverage: sites near Atqasuk, Alaska

ABoVE Grid Location: Ah01v00Bh01v01

Spatial Resolution: Point resolution

Temporal Coverage: The data represent three distinct observation periods in 1975, 2000, and 2010.

Temporal Resolution: The original 60 plots were sampled once in 1975. 31 of the sites were re-visited in 2000 and 2010.

Study Area: (All latitude and longitude given in decimal degrees)

Site	Westernmost Longitude	Easternmost Longitude	Northernmost Latitude	Southernmost Latitude
Atqasuk, Alaska	-157.41238	-157.34555	70.46432	70.44332

Data File Information

This data set includes four data files --- *Atqasuk_2000_Species_Data.csv*, *Atqasuk_2010_Species_Data*, *Atqasuk_Environmental_Data.csv*, *Atqasuk_Species_Index_Data.csv* --- and two companion files --- *Atqasuk_Species_Codes.csv* and *Atqasuk_Veg_Plots_Photos.pdf*. File contents are described in Table 1.

Table 1. Data and companion files

Data File Name	Description

Atqasuk_Species_Index_Data.csv	Species Index Values for each species and plot collected in 1975. See Section 5.
Atqasuk_2000_Species_Data.csv	Species cover data for Atqasuk research plots collected in 2000
Atqasuk_2010_Species_Data.csv	Species cover data for Atqasuk research plots collected in 2010
Atqasuk_Environmental_Data.csv	Comprehensive set of environmental characterization data for Atqasuk research plots including descriptive site factors collected in 2000 and 2010. Most measurement data have been processed to provide values at a common 10 cm depth. This measurement comparability facilitates analysis of geo-botanical relationships across Alaska.
Companion File Name	**Description**
Atqasuk_Species_Codes.csv	Species codes relate to data in *Atqasuk_Species_Index_Data.csv*
Atqasuk_Veg_Plots_Photos.pdf	Landscape, plot, and soil photos of the Atqasuk vegetation plots

Data Descriptions: The column names, their units and descriptions for each of the .csv data files are listed below.

Table 2. *Atqasuk_Environmental_Data.csv*

Column Name	Units	Description
RELEVE_NUMBER		TURBOVEG plot number
FIELD_RELEVE_NUMBER	YYYY-##	Field plot number
DATE	YYYYMM	Sample year and month
RELEVE_AREA	M^2	Area of the plot
RELEVE_SHAPE		Shape of the plot
REPEAT_SAMPLED	Y/N	Indicates whether site was sampled in both 2000 and 2010
COLLECTION_METHOD		Collection methods correspond to referenced publication
PLANT_COMMUNITY_NAME		Plant community name
NUMBER_OF_RELEVE_IN_TABLE	##	Field plot number
GEOREFERENCE	Y/N	Indicates whether site coordinates were recorded
GEOREFERENCE_SOURCE		Georeferencing method
GEOREFERENCE_ACCURACY	M	Georeferencing horizontal accuracy
LATITUDE_WGS_84	DD	Latitude of the plot
LONGITUDE_WGS_84	DD	Longitude of the plot
ALTITUDE	M	Altitude of the plot
SLOPE	DEGREES	Slope of the plot
TOPOGRAPHIC_POSITION		Topographic position description
SITE_MOISTURE		Moisture of the plot --- *WET*, *MST*, or *DRY*
DISTURBANCE		Indicates source of disturbance of the plot
ORGANIC_LAYER_DEPTH	CM	Depth of soil organic layer
SOIL_PH_AT_10_CM		Soil pH
MOSSES_IDENTIFIED	Y/N	Indicates whether mosses were identified in the plot
LIVERWORTS_IDENTIFIED	Y/N	Indicates whether liverworts were identified in the plot
LICHENS_IDENTIFIED	Y/N	Indicates whether lichens were identified in the plot
COVER_SHRUB_LAYER	%	Percent cover of the shrub layer in the plot
COVER_GRAMINOIDS	%	Percent cover of graminoids in the plot
COVER_FORBS	%	Percent cover of forbs in the plot

COVER_MOSSES_&_LIVERWORTS	%	Percent cover of mosses and liverworts in the plot
COVER_LICHEN_LAYER	%	Percent cover of the lichen layer in the plot
COVER_TOTAL	%	Total percent vegetative cover in the plot
REMARKS		Field notes

Table 3. Atqasuk_*_Species_Data.csv --- Species data recorded in 2000 and 2010 are split into two separate files

Column Numbers	Column Name	Units	Description
1	PASL_TAXON_SCIENTIFIC_NAME_NO_AUTHORS		Current Taxonomy according to the Panarctic Species List (PASL)
2	PASL_TAXON_SCIENTIFIC_NAME_WITH_AUTHOR(S)		Current Taxonomy according to the Panarctic Species List (PASL) includng authors names
3	DATASET_TAXON		Dataset taxonomy
2000: 11624-11654 2010: 11655-11685	TURBOVEG_NUMBER		Column headings correspond to the 31 sites that were resampled in 2000 and 2010. Species cover estimates are given as averages of the percent cover in the 10 sub-plots for each site.

Table 4. Atqasuk_Species_Index_Data.csv

Column Name	Units	Description
SITE		Site number
SPECIES_CODE		Species code *
SPECIES_INDEX_VALUE		Species index value **

* See companion file *Atqasuk_Species_Codes.csv* to determine species name from species code.

** See section 5 for explanation of species index value.

3. Application and Derivation

These data bring together for easy reference all the available information collected from the plots and that has been used for the classification, mapping, and analysis of the geo-botanical factors for the Atqasuk research plots. Derived regional maps of these data will be used in regional models of fluxes of trace gases, water, and energy from tundra surfaces. In addition, a circumpolar vegetation classification resulting from these data sets would be highly desirable to extend the results to the entire arctic region.

Re-sampling of the Atqasuk research sites in 2000 and 2010 was performed as part of the International Polar Year: Back to the Future project funded by the NSF with the stated goals of helping to elucidate decadal scale ecosystem changes in multiple land cover types across the Arctic; validate and improve models of environmental change based on remote sensing; assess the impact of global change on ecosystem structure and function, including arctic plant biodiversity; and improve our knowledge of feedback mechanisms between land and atmospheric subsystems in the Arctic.

Comparison of the species abundance data from 1975 and the data from 2000 and 2010 indicated that species richness and diversity did not change, but evenness increased significantly. Vegetation community change was also found to be accelerating over the decade between 2000 and 2010 for sites near Atqasuk, and that the rate of change in diversity is accelerating (Villarreal 2013).

Publications produced as a result of this research are listed at NSF PLR Award No. 0732885.

4. Quality Assessment

No specific quality assessment information provided.

5. Data Acquisition, Materials, and Methods

The Atqasuk vegetation plots were originally described and mapped by Drs. Vera Komarkova and Patrick J. Webber in 1975 as part of the Research on Arctic Tundra Environments (RATE) project. These sites were re-sampled in 2000 and 2010 and assessed for community change as part of the "International Polar Year (IPY) Back to the Future: Resampling old research sites to assess changes in high latitude terrestrial ecosystem structure and function project" (Tweedie 2013; NSF Award No. 0732885). Atqasuk is located near the Meade River within the Arctic Coastal Plain and the landscape is characterized by polygons, drained lake basins, ponds, lakes, meandering streams.

60 sites (600 sub-plots) were originally established in 1975 and 31 sites (310 sub-plots) were re-sampled in 2000 and 2010. The Back to the Future project characterized 9 plant communities including: Arctophila wetland (1 site), Carex wetland (7 sites), Sphagnum moist tundra (13 sites), Carex-Salix moist tundra (15 sites), Moss moist tundra (3 sites), Dry ridge tundra (8 sites) and Dune shrub tundra (4 sites), Snowpatch tundra (2 sites), and Dry Dryas tundra (7 sites). Each 1x10-m site divides into ten sub-plots for which species presence and percent cover were visually estimated. The vegetation plot data are mean summaries of the ten 1x1-m sub-plots. The 1975 data and the corresponding re-sampling data from 2000 and 2010 were assessed for change and published in Villarreal (2013). Site locations are depicted in Figure 2.

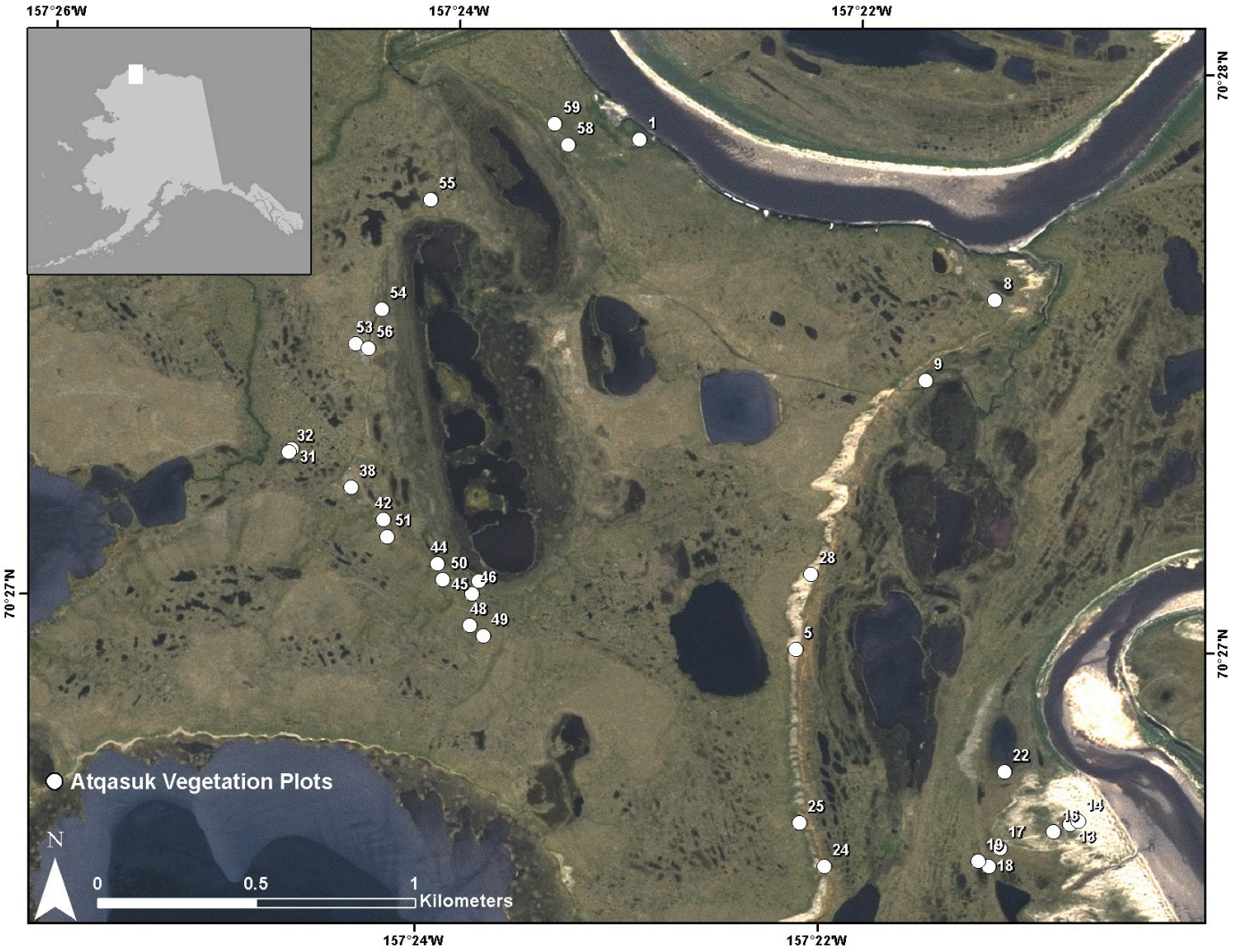

Figure 2. Locations for the 31 sites resampled in 2000 and 2010. Site numbers correspond to FIELD_RELEVE_NUMBER in *Atqasuk_Environmental_Data.csv.*

1975

Original data from 1975 were classified and a map of the region was published along with descriptions of plant communities (Komarkova and Webber 1980). The 1975 plot data were subsequently lost. Only Species Index Values (SIV) were recovered from punch cards. SIVs were determined by:

SIV = (Relative Cover + Relative Presence)/2

2000 & 2010

Species cover data for 2000 and 2010 are given as percents. For each sub-plot, the presence of all land cover types and all vascular, bryophyte, and lichen species were recorded. Some species were lumped if investigators were unsure of their taxonomy, e.g., Draga spp. The following texts were used to standardize nomenclature between the 1975 and 2000 plot samplings:

- Vascular plants

Hulten, E. 1968. Flora of Alaska and Neighboring Territories A Manual of the Vascular Plants. Stand University Press. Stanford, California pp. 1008.

- Lichens

Esslinger, T.L. and R.S. Egan. 1995. A sixth checklist of the lichen-forming, lichenicolus, and allied fungi of the continental United States and Canada. The Bryologist 98: 467-549.

- Liverworts

Stotler, R. and B. Crandall-Stotler. 1977. A checklist of the Liverworts and Hornworts of North America. The Bryologist 80(3): 406-428.

- Mosses

Anderson, L.E., H.A Crum, and W.R. Buck. 1990. List of the Mosses of North America north of Mexico. The Bryologist 93(4): 448-499.

- Sphagnum

Anderson, L.E. 1990. A checklist of Sphagnum in North America North of Mexico. The Bryologist 93(4):500-501.

6. References

Komarkova, V., and P. J. Webber. 1980. Two Low arctic vegetation maps near Atkasook, Alaska. Arctic, Antarctic, and Alpine Research 12:447-472.

Tweedie, Craig (2013): IPY Back to the Future (BTF): Re-sampling old research sites to assess change in high latitude terrestrial ecosystem structure and function. UCAR/NCAR - CISL - ACADIS. Dataset. Updated August 12, 2014. http://dx.doi.org/10.5065/D6XS5SD1

Villarreal, S. 2013. International Polar Year (IPY) Back to the Future (BTF): Changes in arctic ecosystem structure over decadal time scales. Doctoral Dissertation. The University of Texas at El Paso.