Pre-ABoVE: Arctic Vegetation Plots, Oumalik, Alaska, 1983-1985

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Documentation Revision Date: 2017-06-21

Data Set Version: 1

Summary

This data set provides environmental, soil, and vegetation data collected between 1983 and 1985 from 87 study plots near an abandoned test oil well in Oumalik, Alaska. Specific attributes include dominant vegetation, species, and cover, soil chemistry, physical characteristics, moisture, and organic matter, as well as site disturbance from various sources. The vegetation sampling sites were chosen to represent the full range of vegetation in the area with replication, and for uniformity in floristic composition and environmental conditions.

The well construction activities caused a great deal of damage to the tundra, and many barrels and other debris were left after the well was abandoned. Eighty-four recovery plots were established in July of 1979 by removing debris and three additional plots were established after the cleanup.

There are three data files in comma-separated (.csv) format with this data set.

Figure 1. Photo from the Oumalik study area showing vegetation and some of the barrels left from the oil well test site when it was abandoned in 1950 (from Ebersole, 1985).

Citation

Ebersole, J.J., and D.A. Walker. 2017. Pre-ABoVE: Arctic Vegetation Plots, Oumalik, Alaska, 1983-1985. ORNL DAAC, Oak Ridge, Tennessee, USA. https://doi.org/10.3334/ORNLDAAC/1506

Table of Contents

1. Data Set Overview

This study addressed the environment, ecosystems, and disturbances to the vegetation around a test oil well at Oumalik, Alaska, erected during 1949-1950 and abandoned in 1950. The data includes environmental, soil, and vegetation data collected between 1983 and 1985 from 87 study plots near the abandoned oil well. Specific attributes include dominant vegetation, species, and cover, soil chemistry, physical characteristics, moisture, and organic matter, as well as site disturbance from various sources.

Eighty-four recovery plots were established in July of 1979 by removing debris leftover from the test well's abandonment in 1950. Three additional plots were established after the cleanup. A classification of the vegetation was done to provide communities for comparison to the natural vegetation, including disturbances, and an ordination of the disturbed vegetation showed the environmental factors that correlated most highly with the variation in vegetation (Ebersole, 1985).

Project: Arctic-Boreal Vulnerability Experiment (ABoVE)

The Arctic-Boreal Vulnerability Experiment (ABoVE) is a NASA Terrestrial Ecology Program field campaign based 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 were obtained from the Alaska Arctic Geoecological Atlas (http://agc.portal.gina.alaska.edu), which provides access to existing Arctic vegetation plot and map data in support of the ABoVE campaign.

2. Data Characteristics

Spatial Coverage: Oumalik, Alaska

ABoVE Grid Location: Ahh1Avv0

Spatial Resolution: Point resolution

Temporal Coverage: 1983-06-21 to 1985-08-05

Temporal Resolution: Each plot was sampled once

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

Site	Westernmost Longitude	Easternmost Longitude	Northernmost Latitude	Southernmost Latitude
Oumalik, Alaska	-156.02	-155.899	69.86229	69.83724

Data File Information

There are three data files with this data set in comma-separated (.csv) format. The files provide the vegetation species found at 87 plots as well as the percent ground cover occupied by the species, soil characterization, plot environmental data, and estimated disturbance by various sources. These data may also be found in the TURBOVEG database. There are also three companion files which provide plot photos and research information.

Table 1. Data files

Data File Name	Description
oumalik_environmental_data.csv	Environmental characterization data for Oumalik research plots
oumalik_soils_data.csv	Soil analysis data
oumalik_species_data.csv	The estimated percent land cover by species per plot

Companion files	Description
Oumalik_Plot_Photos.pdf	Photos of the plots at Oumalik in .pdf format
Oumalik_Veg_Plots_Report.pdf	Report which provides details of the research (Ebersole, 1985)
Ordinal_Scales_Oumalik_Env_data.pdf	A pdf with ordinal scale tables from the Ebersole 1985 document. The ordinal scales are used in the data file *oumalik_environmental_data.csv*
Oumalik_Veg_Plots.pdf	A pdf of this guide document

Table 2. Variables in the file **oumalik_environmental_data.csv**

Refer to the companion file **Ordinal_Scales_Oumalik_Env_data.pdf** for the ordinal scale descriptions and associated codes. Data not provided are represented as -9999.

Column number	Variable	Units/format	Description
1	plot_number	numeric	Plot number as provided by the author
2	date	yyyymmdd	Date plot was investigated
3	latitude	decimal degrees	Plot latitude
4	longitude	decimal degrees	Plot longitude
5	community	code	Plant community
6	plant_community_name	text	Plant community name
7	microrelief_type	code	Microrelief type: 1=featureless, flat 2=tussocks 3=reticulate-patterned ground 4=low-centered polygon center 5= low-centered polygon rim 6= low-centered polygon trough 7=high-centered polygon center 8= high-centered polygon trough 9=palsa 10=irregular 11=mounds of bladed material 12=ruts of multi-pass trail 13=thermokarst 14=irregularly rough, caused by moderate surface disturbance leaving surface changed but not removed 15=bladed and smothed 16=area bladed below original surface 17=graveled area
8	microrelief_ht	cm	Microrelief height
9	releve_area	m2	Releve area
10	releve_shape	text	Releve shape
11	cover_tree_layer	%	Percent of trees in the plant community
12	cover_shrub_layer	%	Percent of shrubs in the plant community
13	cover_tall_shrubs	%	Percent of tall shrubs in the plant community
14	cover_low_shrubs	%	Percent of low shrubs in the plant community
15	cover_erect_dwarf_shrubs	%	Percent of erect dwarf shrubs in the plant community
16	cover_prostrate_dwarf_shrubs	%	Percent of prostrate dwarf shrubs in the plant community
17	cover_graminoids	%	Percent of graminoids in the plant community

18	cover_tussock_graminoids	%	Percent of tussock graminoids in the plant community
19	cover_forbs	%	Percent of forbs in the plant community
20	cover_seedless_vascular_plants	%	Percent of seedless vascular plants in the plant community
21	cover_mosses_liverworts	%	Percent of mosses and liverworts in the plant community
22	cover_lichen_layer	%	Percent of plot that was lichen
23	cover_crust	%	Percent of plot that was crust
24	cover_algae_layer	%	Percent of plot that was algae
25	cover_bare_soil	%	Percent of plot that was bare soil
26	cover_bare_rock	%	Percent of plot that was bare rock
27	cover_water	%	Percent of plot that was open water
28	cover_litter_layer	%	Percent of plot that was litter
29	cover_total	%	Percent of plot that had cover
30	canopy_ht	cm	Mean canopy height
31	tree_layer_ht	m	Mean tree height
32	shrub_layer_ht	cm	Mean shrub height
33	herb_layer_ht	cm	Mean herb height
34	moss_layer_ht	cm	Mean moss height
35	aspect	degrees	Aspect
36	slope	degrees	Plot slope
37	thaw_depth	cm	Thaw depth
38	water_depth	cm	Water depth
39	site_moisture	ordinal scale	Site moisture observations noted using an ordinal scale of 1-10
40	summer_air_temp	ordinal scale	Site air temperature observations noted using an ordinal scale of 1-10
41	duration_snow	ordinal scale	Snow cover and duration recorded using an ordinal scale of 1-10
42	wind_regime	ordinal scale	Wind conditions noted using an ordinal scale of 1-10
43	age_surface	ordinal scale	Age of surface and time since the surface was disturbed noted using an ordinal scale of 1-10
44	surface_stability	ordinal scale	Surface stability with regard to avalanches, surface movements due to floods, etc. noted using an ordinal scale of 1-10
45	cryoturbation	ordinal scale	Cryoturbation (0-100%) noted using an ordinal scale of 1-10
46	disturbance_type	code	Disturbance of site: 1=undisturbed, 2=naturally disturbed, and 3=anthropogenically disturbed
47	disturbance_intensity	ordinal scale	Physical disturbance intensity of the site surface by animals, people, or equipment, noted using an ordinal scale of 1-7
48	disturbance_score	ordinal scale	Disturbance score at site noted using an ordinal scale of 1-10
49	disturbance_caribou	ordinal scale	Site disturbance by Caribou noted using an ordinal scale of 1-10
50	disturbance_microtine	ordinal scale	Signs of site disturbance by microtine noted using an ordinal scale of 1-10
			Signs of site disturbance (ground disturbance) by squirrels

51	disturbance_squirrel	ordinal scale	noted using an ordinal scale of 1-10
52	disturbance_ptarmigan	ordinal scale	Signs of site disturbance by ptarmigan noted using an ordinal scale of 1-10
53	disturbance_birds	ordinal scale	Signs of site disturbance by birds noted using an ordinal scale of 1-10
54	disturbance_insects	ordinal scale	Signs of site disturbance by insects noted using an ordinal scale of 1-10
55	disturbance_other_animals	ordinal scale	Signs of site disturbance from other animals noted using an ordinal scale of 1-10
56	disturbance_total_animals	ordinal scale	Site disturbance from all animal categories, noted using an ordinal scale of 1-10
57	comments	text	Comments

Table 3. Variables in the file **oumalik_soil_data.csv**

Soil samples were collected at 10-cm depth. Data not provided are represented as -9999.

Column number	Variable	Units/format	Description
1	plot_number		Plot number as provided by the author
2	date	yyyymmdd	Date sampled
3	latitude	decimal degrees	Plot latitude
4	longitude	decimal degrees	Plot longitude
5	community	code	Plant community
6	plant_community_name	text	Plant community name
7	sand	%	Percentage of sand in the soil
8	silt	%	Percentage of silt in the soil
9	clay	%	Percentage of clay in the soil
10	soil_moisture	ordinal scale	Estimated soil moisture
11	hygroscopic_moisture	%	Hygroscopic moisture in soil provided as a percent. The weight loss of soil from air to dry weight (105 degrees C) relative to oven dry weight
12	organic_matter	%	Organic matter in soil provided as percent
13	water_absorption	%	Water absorption provided as percent. Defined as the weight of water absorbed upward into soil relative to oven dry weight
14	field_capacity	%	Field capacity provided as percent. Defined as the weight of water retained by soil in pressure membrane apparatus with pressure differential of 1/3 bar, relative to oven dry weight
15	wilting_point	%	Wilting point provided as percent. Determined using a pressure membrane apparatus, 15 bars
16	available_water	%	Available water in soil provided as percent. Defined as the difference between field capacity and the wilting point
17	carbonates	%	Carbonates in soil provided as percent
18	pH		Soil PH
19	NH4	PPM	Total available soil ammonium content provided in parts per million (PPM)
20	NO3	PPM	Total available soil nitrate content provided in parts per million (PPM)

21	N	PPM	Total available soil nitrogen content provided in parts per million (PPM), defined as the sum of N-NO3 and N-NH4
22	P	PPM	Total available soil phosphorus content provided in parts per million (PPM)
23	K	PPM	Total available soil potassium content provided in parts per million (PPM)
24	Ca	PPM	Total available soil calcium provided in parts per million (PPM)
25	Mg	PPM	Total available soil magnesium provided in parts per million (PPM)
26	cation_ex_capacity	MEQ/100 G	Cation exchange capacity

Table 4. Variables in the file **oumalik_species_data.csv**

Column number	Column header	Description
1	PASL_taxon_scientific_name	Current nomenclature according to the Panarctic Species List (PASL)
2	PASL_taxon_scientific_name_author	Current nomenclature according to the Panarctic Species List (PASL) with the data authors name
3	dataset_taxon	Data set taxonomy
4-90	TURBOVEG_plot_accession_number and dataset_plot_number_author	Two rows of 87 column headers which are plot numbers/accession numbers. The first row is TURBOVEG accession numbers. Column headers= 10545-10631. The 2nd row is dataset_plot_number_author, the plot numbers as named in the original data set; column headers= numbers 24 – 269 (nonsequential #s). The data values are the estimated percent land cover by species per plot according to the the Ordinal cover-abundance scale 1-9 (modified from Westhoff and Maarel 1978) where: 0= (none present) 1 (covers less than 1%) 2 (covers 1 %) 3 (covers 2 to 3%) 4 (covers 4-5%) 5 (covers 6 to 12%) 6 (covers 13 to 24%) 7 (covers 25 to 49%) 8 (covers 50 to 74%) 9 (covers 75 to 100%)

Taxa are listed in alphabetical order according to the accepted PASL name. In three instances, taxa were lumped into a single taxon in the PASL:

1) Campylium hispidulum (Campylium hispidulum and Campylium sommerfeltii)

2) Dicranum spadiceum (Dicranum angustum and Dicranum spadiceum)

3) Peltigera canina (Peltigera canina and Peltigera canina f. sorediata).

Refer also to the companion file **Oumalik_Veg_Plots_Report.pdf (**Ebersole, 1985), Appendix: Tables B1 and B3.

Table 5. Example data from the file **oumalik_species_data.csv**

		TURBOVEG_plot_accession_number	10545	10546	10547	10548
		dataset_plot_number_author	24	44	70	71

PASL_taxon_scientific_name	PASL_taxon_scientific_name_author	dataset_taxon				
Alectoria ochroleuca	Alectoria ochroleuca (Hoffm.) Massal.	Alectoria ochroleuca	0	0	0	0
Amblystegium serpens	Amblystegium serpens (Hedw.) B. S. G.	Amblystegium serpens	0	0	0	0
Andromeda polifolia	Andromeda polifolia L.	Andromeda polifolia	0	0	0	0

3. Application and Derivation

These data are useful to policies regarding energy development in the northern Alaska region and the resulting environmental impacts. They could also be useful to climate change studies.

4. Quality Assessment

Refer to the companion file **Oumalik_Veg_Plots_Report.pdf**

5. Data Acquisition, Materials, and Methods

Site Description

This study was conducted to address the environment, ecosystems, and disturbances to the vegetation around a test oil well at Oumalik, Alaska, erected during 1949 and abandoned in 1950. The well construction activities caused a great deal of damage to the tundra from construction of an airport, heavy vehicles, equipment hauling, bulldozing, and operations. Many barrels and other debris were left after the well was abandoned.

Oumalik is in the continuous zone of permafrost with frost boils and frost scars. Vegetation cover on the frost scars ranges from none to nearly complete. Soils are generally poorly developed with little variation. Vegetation classification defined 23 natural and 13 disturbed vegetation communities (Ebersole,1985). Permafrost on the Arctic Coastal Plain frequently has a lot of ground ice. Ice lenses are horizontal layers of ice 1 mm to tens of meters thick and several mm to hundreds of mm in extent, and ice wedges are important component of the ground ice at Oumalik (Ebersole, 1985).

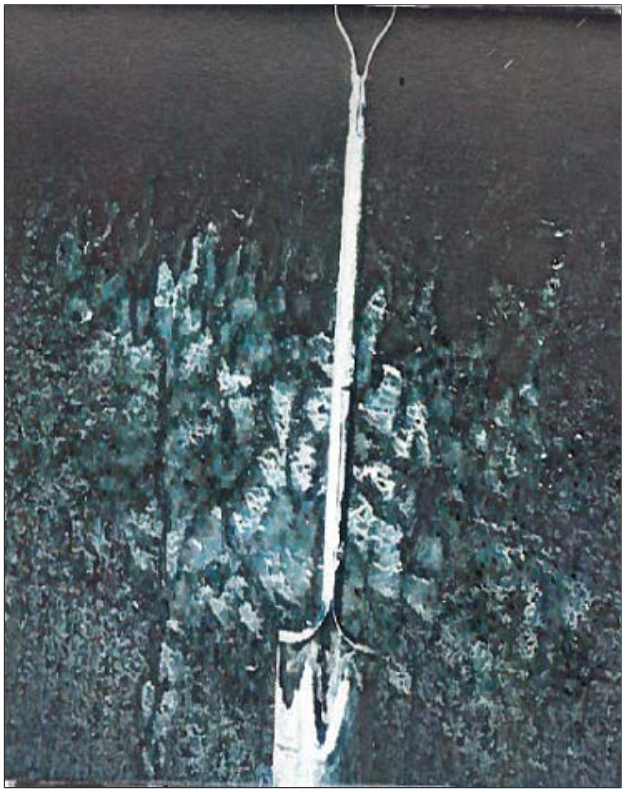

Figure 2. Ice lenses at the Oumalik study site. The ice lenses are several cm long (Ebersole, 1985).

Figure 3. Ice wedge at the Oumalik study site. The ice wedge is about 80 cm wide (Ebersole, 1985).

Methods

Vegetation Data

Eighty-four recovery plots were established in July of 1979 by removing debris from the places where they had been since 1950. Three larger plots were established in late July 1980, after the cleanup. Of the 87 plots, 54 were located in natural habitats and 33 in anthropogenically disturbed habitats. A classification of the vegetation was done to provide communities for comparison to the natural vegetation, including disturbances, and an ordination of the disturbed vegetation showed the environmental factors that correlated most highly with the variation in vegetation (Ebersole, 1985)..

The vegetation within about three km of the test well was sampled using the releve method (Westoff and Maarel 1978, Mueller-Dombois and Ellenberg 1974). Sample sites were chosen to represent the full range of vegetation in the area with replication. Sites were chosen for uniformity in floristic composition and environmental conditions. Plot sizes were about 25 m2. Plot locations were marked with a stake and on aerial photographs.

At each plot, plants that were identifiable were listed, and those uncertain were (mosses and lichens) were collected for identification in a laboratory or verified by experts. Estimated ground cover data (percent) are provided in the environmental data file. Species data are provided in the species data file (refer to Section 2, Table 2 of this document).

Figure 4. Figure 4. Vegetation plot photo at Oumalik, Alaska (Ebersole, 1985).

Site Environmental Data

At each site, environmental factors and disturbances at each plot (refer to Section 2, Table 2 of this document) were measured or estimated:

- Percent ground cover was noted using a slight modification of the method of Westhoff and Maarel (1978) as the ground cover was taken in percent rather than the Braun-Blanquet cover-abundance values. The Braun-Blanquet table method was used to determine the vegetation communities (Ebersole, 1985).
- Ordinal scales were used to note temperature, site moisture, wind, surface stability, and disturbances. These scales were taken from Walker et al., (1979), modified from Komarkova (1979).
- Aerial photographs and Google Earth were used to obtain latitude and longitude data in 2014.

Soil samples were collected at 10-cm depth for physical and chemical analysis performed at the INSTAAR Sedimentology Laboratory and the University of Alaska, respectively. Soil analysis data are provided in a separate data file (refer to Section 2, Table 2 of this document).

Refer to the companion **file Oumalik_Veg_Plots_Report.pdf** for detailed information regarding this study.

6. Data Access

These data are available through the Oak Ridge National Laboratory (ORNL) Distributed Active Archive Center (DAAC).

Pre-ABoVE: Arctic Vegetation Plots, Oumalik, Alaska, 1983-1985

Contact for Data Center Access Information:

- E-mail: uso@daac.ornl.gov
- Telephone: +1 (865) 241-3952

7. References

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