

# Survey of Arctic relevé data and a Northern Alaska IAVD prototype

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Breen

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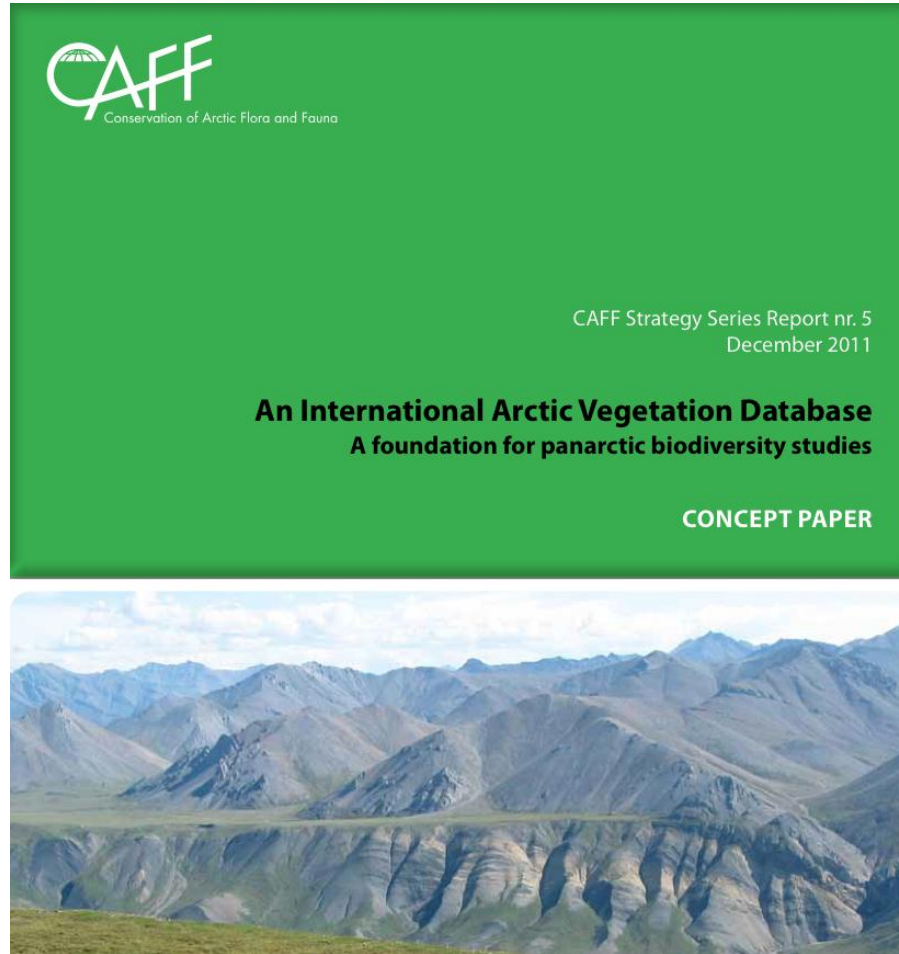
IAVD-CBIONET Workshop, Roskilde, Denmark, 29-31 May 2012

## **Overview of talk**

- **Table of available data from the CAFF Strategy Report No. 5.**
- **Northern Alaska IAVD prototype**



# Appendix from CAFF Strategy Report No. 5



# Canada relevés

Country	Source (author, date, location, journal)	Published Relevés	Other
Canada	Babb & Bliss 1974, QE Islands, J. Applied Ecology	8	
	Barrett 1972, Devon I., UBC PhD		72
	Bergeron 1988, Sverdrup Pass, Ellesmere I., U Toronto MSc		65
	Bliss 1977, Truelove Lowlands, Devon I, U Alberta Press	2	
	Bliss & Svoboda 1984, QE Islands, Holarctic Ecology	41	
	Bliss et al. 1994, Devon & Ellesmere I. , Arctic & Alpine Research	19	
	Breen & Levesque 2006, Sverdrup Pass, Ellesmere I., Can J Botany	20	
	Brigland 1986, Cape Herschell, Ellesmere I., UNStJ MSc		70
	Cordes et al. 1984, Mackenzie Delta, report for BC Hydro		48
	Duclos et al. 2006, Bylot and Baffin I., Parks Canada		541
	Forbes 1993, mostly disturbed sites	246	
	Forbes 1994, mostly disturbed sites	180	
	Gill 1971, Mackenzie Delta, UBC PhD		64
	Gonzalez et al. 2000, CAVM Canada expedition AGC data report		108
	Gould, A.J., 1985, Lake Hazen, Ellesmere I., U Toronto MSc		50
	Hastings 1983, Mackenzie Delta, U. Alberta MSc		34
	Hernandez 1972, Tuktoyuktuk Peninsual, U. Alberta MSc		38
	Levesque 1997, Ellesmere I, U. Toronto PhD		41
	MacHutchon 2000, Vuntut Park, Parks Canada		89
	Nams & Freedman 1987, Alexandra Fiord, Ellesmere, Holarctic Ecology	8	
	Rowe et al. 1977, Rankin Inlet, Muskox	13	
	Smith et al. 1989, Herschel I., Ag. Canada		538
	Vonlanthen et al. 2008, Isachsen, Mould B., Green Cab., Phytocoenologia	75	
	<b>Canada approx. total</b>	<b>612</b>	<b>1758</b>

# Alaska relevés

Alaska	<i>Alaska Geobotany Center</i>		
	Breen 2012?, North Slope poplars, Phytocoenologia	25	
	Edwards et al. 2002, North Slope	15	
	Jorgenson 2009, NPS, Arctic Network relevés	763	
	Kade et al. 2005, North Slope Frost boils, Phytocoenologia	117	
	Schikhoff et al. 2001, N. AK, Willow comm., Phytocoenologia	85	
	Walker 1981, 1985, Prudhoe Bay, Ph.D. thesis and CRREL report	93	
	Walker et al. 1984, Imnavait Crk. data report, M.D. Walker et al. 1994 (JVS),	81	
	Walker and Barrv 1991. Toolik Lake data report. M.D. Walker et	72	
Alaska cont'd	Walker M.D., 1990, Pingos of N. Alaska, published thesis	293	
	Edwards et al., 2000,, ATLAS data report		12
	Elias et al. 1996, Barrow, Barter I. Legacy data report		61
	Walker et al. 1997, Happy Valley Data report		55
	<i>AGC Subtotal</i>	756	181
	Churchill 1955, Umiat, Ecology	51	
	Cooper 1986, Arrigetch Mtns, Phytocoenologia	372	
	Ebersole 1985, Oumalik, unpublished thesis		85
	<i>S. Talbot:</i>		
	Talbot et al. 2005, alders of SW AK, Phytocoenologia	128	
	Talbot & Talbot 2008, Chisik I., (Daniëls Festschrift vol.)	38	
	Talbot et al. 2010, Unalaska (Botany)	65	
	Talbot & Talbot 1994, Attu Island	79	
	Webber, IBP studies at Barrow, summary table in Tieszen 1978		33
	<b><i>Alaska approx. total</i></b>	<b>2274</b>	<b>299</b>

# Greenland relevés

Greenland	De Molenaar 1974, MoG	61	
	De Molenaar 1976, MoG	305	
	Daniels 1982, MoGBiosci	269	
	Sieg et al 2006, Phytocoenologia	394	
	Sieg & Daniels 2005, Phytocoenologia	49	
	Lünterbusch & Daniels 2004, Phytocoenologia	49	
	Sieg et al 2009, Phytocoenologia	55	
	Drees & Daniels 2009, Phytocoenologia	149	
	Lepping & Daniels 2007, Polarforschung	57	
	Lünterbusch et al 1997, Polarforschung	50	
	Böcher 1963, MoG	450	
	Div MoG Danish researchers, MoG	200	
	Dierssen div.	50	
	Stumbock 1993, Diss. Bot	214	
	Lünterbusch Dissertation Münster		236
	Ferwerda, MSc Thesis Utrecht		150
	GBU-Berichte Copenhagen		150
	Herk and Knaapen, MSc Thesis, Utrecht		70
	Daniels 1992 Disko, still to be published		105
	Daniels NW Greenland 1993, still to be published		100
	Daniels 1998 NW Greenland, still to be published		100
	Daniels North Greenland 1995, still to be published		75
	Daniels West Greenland 2001-2003, still to be published		72
	Daniels SE Greenland 1995, still to be published		13
	Daniels 2009 S Greenland, still to be published		15
	Lepping 1998 NW Greenland, still to be published		60
	Dierssen & Dierssen W Greenland 1981, still to be published		500
	<b>Greenland approx. total</b>	<b>2352</b>	<b>1646</b>

# Svalbard relevés

Svalbard (Arve Elvebakk)	Syntaxa are reviewed in Elvebakk (1994, JVS) without association tables.		
	19 habitat types in 17 alliances, Several hundred relevés are in unpublished theses. eg. I. Möller 2000, NW Svalbard (479), Current total for Svalbard 479		

# Russia relevés

Russia	V.D. Alexandrova, 1983, Franz Jozef Land	61	
	Forbes (1995, 1996, 1997, Forbes & Sumina 1999) Yamal mostly disturbed	419	
	<i>O. and I. Lavrinenko:</i>		
	2010, marshes in Malozemelskaya tundra	100	
	2010 in prep, Dryas comm. in European Russia Arctic		60
	2010 in prep, Barents Sea coastal communities		50
	Others already in Excel		380
	<i>subtotal</i>	100	490
	S. Kholod 2007, Wrangel Island	691	400
	N. Koroleva 1994, Kola Peninsula, JVS	250	
	N. Koroleva, unpublished from Barents Sea coast		400
	E.E. Kylygina, 2008, Pechora R. sandy outcrops	121	
	<i>N. Matveyeva:</i>		
	1979, Taimyr, Cape Cheluskin	5	
	1979, Maria Pronchitscheva Bay	4	
	1994, Taimyr Peninsula, 5 Ass.	180	
	1998, Taimyr Pen., 4 Ass.	90	
	2003, Plato Putorana alpine belt	31	
	2006, Bolshevik I.	250	
	Unpublished in field books		500
	<i>Matveyeva subtotal</i>	560	500
	Raynolds 2004, Kolyma R., ATLAS study		25
	Razzhivin 1994, Chukotka snowbeds, summary Table in JVS		261
	Sekretareva (1991, 1992, 1995, 1999, 2001,2003), Willows of E. Russ. Arctic,	235	164
	O. Sumina 1994, Disturbed sites, Chukotka	181	
	Walker et al. 2009, Yamal data report		66
	L.L. Zanokha (1993, 1995, 2001, 2003, 5 ass. From Taimyr (?) region	182	
	LL Zanokha, unpublished from Taimyr, Labytnangi, Plateau Putorana		600
	<b><i>Russia approx. total</i></b>	<b>2381</b>	<b>2906</b>



# Missing relevés

- Ermokina 2012. Yamal peninsula Russia
- Many other Russian relevés
- Details of Svalbard relevés
- Probably others in Greenland
- Iceland (?)
- Should we include the subarctic islands (e.g., Aleutians, Talbot has many relevés). This is problematic because it will require addition of many species not in the Panarctic Flora.
- Status of Canada IPY database is uncertain, but Greg Henry assures us that he will send it as soon as he receives it.

# Relevés for Northern Alaska Prototype

Initial focus will be on data sets with which we have strong familiarity and are readily accessible:

Location (author)	No. relevés
Barrow (Webber 1978)	33
Kaktovik and Barrow (Elias et al. 1994)	85
Prudhoe Bay (Walker 1981, 1985; Walker & Everett 1990)	93
Happy Valley (Walker et al. 1991)	55
Imnavait Creek (Walker et al. 1984, M.D. Walker 1994)	72
Toolik Lake (Walker et al. 1991, M.D. Walker 1994)	81
Westerm Arctic Transect (Edwards et al)	12
Seward Peninsula (Raynolds et al. 2002)	53
Pingos (M.D. Walker 1990), in VegBank	293
Bicomplexity study along Dalton Highway (Kade et al. 2005)	117
Riparian communities along Dalton Highway (Schikhoff et al. 2001)	85
Arctic poplar communities (Breen et al. in review )	25

**Total: 1004 relevés**

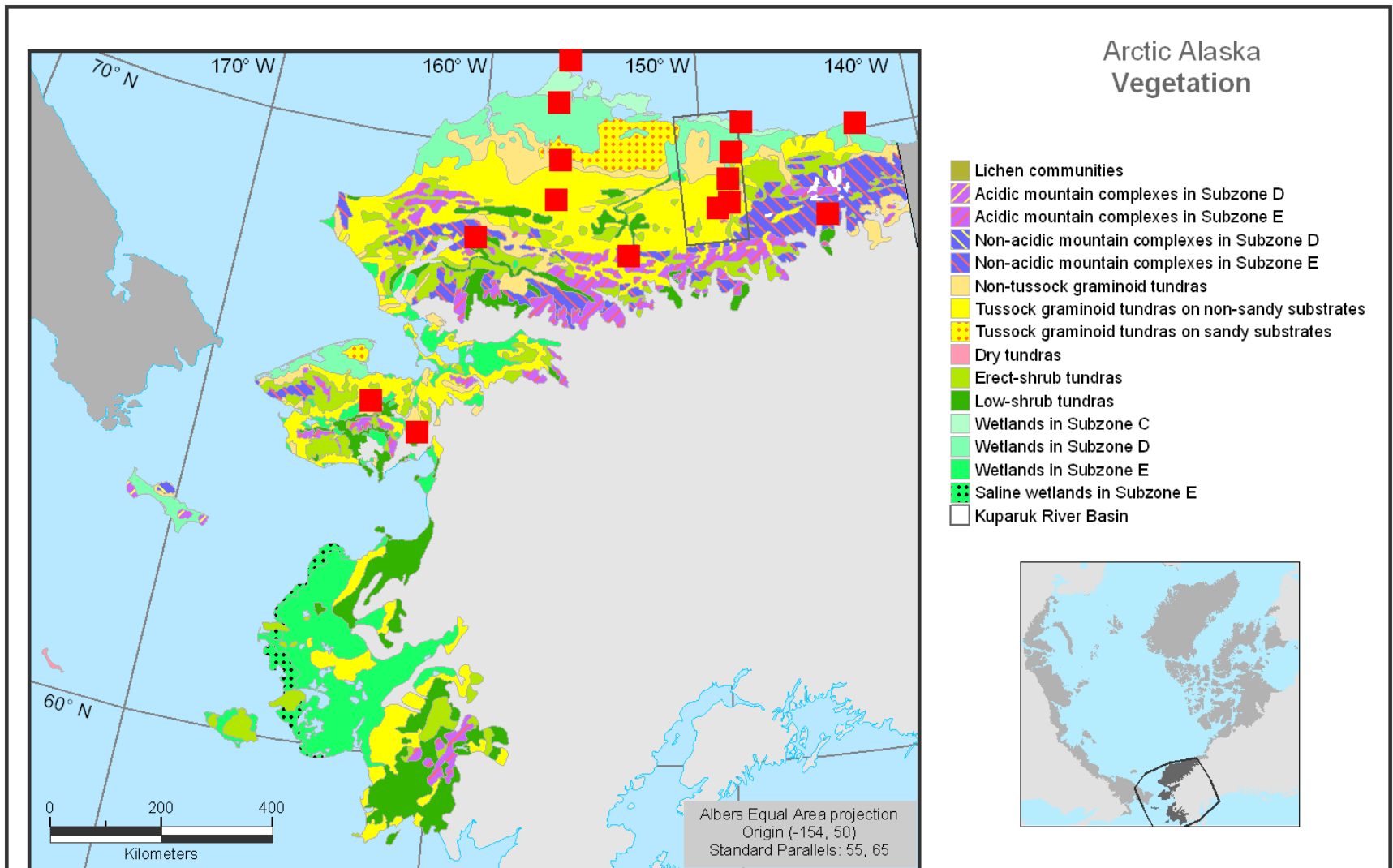
# Other Northern Alaska Relevés

Data sets that will require communication with author or recovery of data sheets:

Location (author)	No. relevés
Northern Alaska Parks (Jorgenson et al. 2009)	263
Arrigetch Peaks (Cooper 1986)	372
Oumakik (Ebersole 1985)	85
Sand region of NPR-A (Komarkova)	Over 400

Total: 720+ relevés

# Locations of Northern Alaska data sets



Raynolds MA, Walker DA and Maier HA. 2006. Alaska Arctic Tundra Vegetation Map. Scale 1:4,000,000. Conservation of Arctic Flora and Fauna (CAFF) Map No. 2. U.S. Fish and

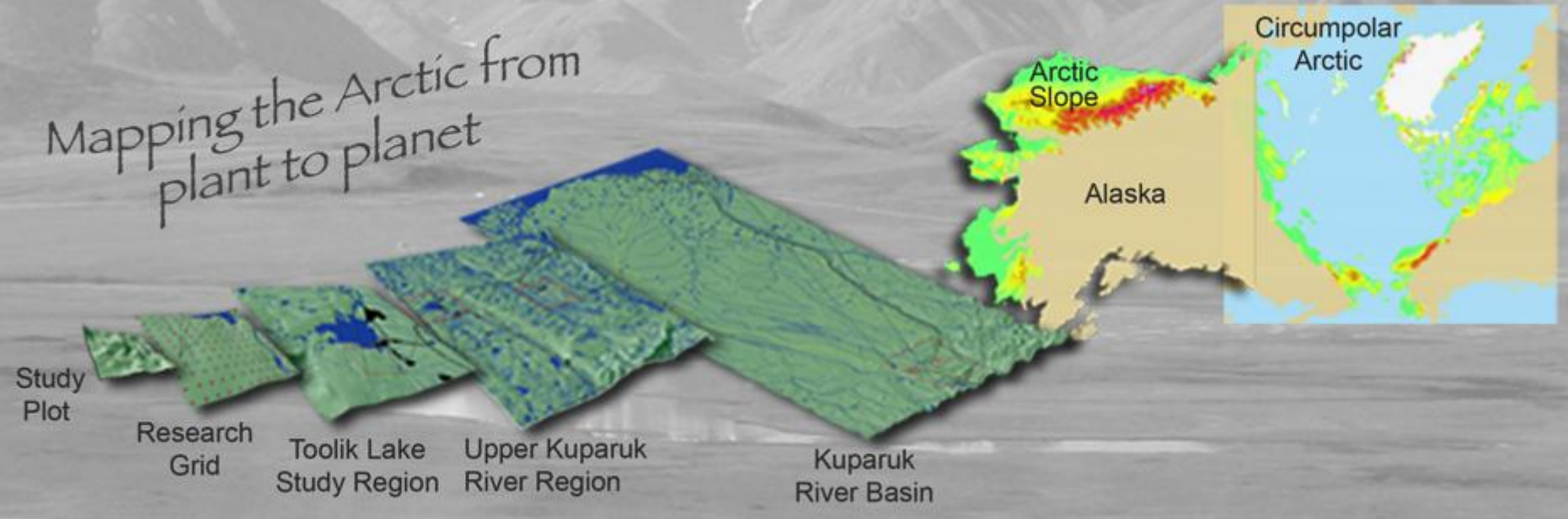


# Northern Alaska hierarchical spatial information: From plants to the circumpolar Arctic

## Toolik-Arctic

## Geobotanical Atlas

Mapping the Arctic from  
plant to planet



- An example of possibilities for Arctic observatories with deep map, vegetation, and species data sets.
- Useful for extrapolation of plot-level surveys and research to broader regions and the circumpolar Arctic.

# Hierarchical map browser by area and theme



[Circumpolar Arctic Vegetation Map](#) » [Map Browser](#) » [TAGA Home](#) » [Maps](#) » [Map Browser](#)

## Map Browser

This section lists the maps that can be accessed by area or theme. You can also [download the GIS data](#).

Choose a map area or a theme from the list below, or select a map area from the image to the right. Not sure which map to look at? See [all the maps](#).

### Available Map Areas: Available Themes:

[Circumpolar Arctic](#)  
[Arctic Alaska](#)  
[Kuparuk River Basin](#)  
[Upper Kuparuk River Region](#)  
[Imnavait Creek Area](#)  
[Toolik Lake Area](#)  
[Toolik Lake Grid](#)  
[Imnavait Creek Grid](#)  
[Imnavait Creek Grid Plots](#)  
[Toolik Lake Grid Plots](#)

[Alaska Arctic Tundra Vegetation Map](#)  
[AVHRR False-color Infrared Base Map](#)  
[Bioclimate Subzones](#)  
[Circumpolar Arctic Vegetation Map](#)  
[Elevation](#)  
[Floristic Provinces](#)  
[Hydrology and Watershed Boundary](#)  
[Lake Cover](#)  
[Landscape](#)  
[NDVI/Phytomass](#)  
[Spot False-Color Infrared Image](#)  
[Substrate Chemistry](#)  
[Toolik Lake Area Vegetation](#)  
[Toolik Lake Grid Vegetation](#)  
[Upper Kuparuk River Region Vegetation](#)

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August 20, 2009

Circumpolar Arctic

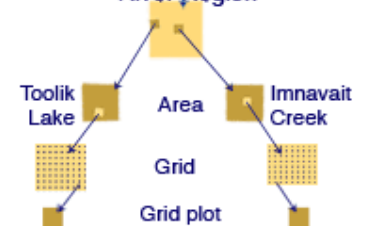


Arctic Alaska



Kuparuk River Basin

Upper Kuparuk River Region



# Map pages



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## Circumpolar Arctic Vegetation

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[Physiography](#) [NDVI and Phytomass](#) [Substrate Chemistry](#) [Coastline](#) [CAVM Sites](#) [Hierarchy of Geobotanical Vegetation Map Units](#)  
(Walker DA 2002)

### About the vegetation map units

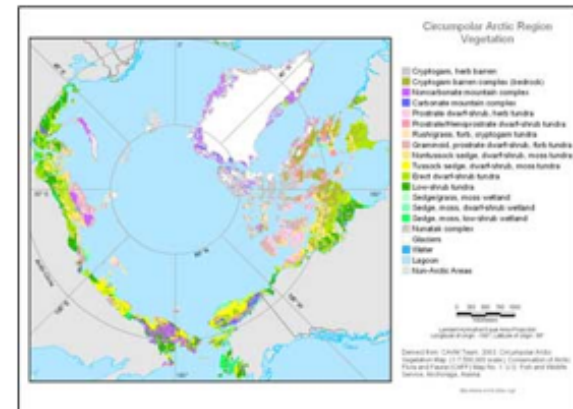
Mapped polygons at 1:7.5 million scale contain many vegetation types. The map often portrays the dominant zonal vegetation within each mapped polygon. Zonal sites are areas where the vegetation develops under the prevailing climate, uninfluenced by extremes of soil moisture, snow, soil chemistry, or disturbance, and are generally flat or gently sloping, moderately drained sites, with fine-grained soils (Vysotsky 1927). Large areas of azonal vegetation that are dependent on specific soil or hydrological conditions, such as mountain ranges and large wetlands, were also mapped.

The legend contains five broad physiognomic categories:

- B — barrens
- G — graminoid-dominated tundras
- P — prostrate-shrub-dominated tundras
- S — erect-shrub-dominated tundras
- W — wetlands

These are subdivided into 15 vegetation mapping units with numeric codes added to the alphabetic codes. The mapping units are named according to *dominant plant functional types* except in the mountains where complexes of vegetation are named according to the dominant bedrock (carbonate and noncarbonate mountain complexes). The coloring scheme of the map is suggestive of the physiognomy of the vegetation. The plant functional types are based on a variety of criteria including growth form (e.g., graminoids, shrubs), size (e.g., dwarf and low shrubs), and taxonomical status (e.g., sedges, rushes, grasses). The legend takes into special consideration the stature of woody shrubs, which is a major diagnostic feature of zonal vegetation in the Arctic (Edlund and Alt 1989, Walker et al. 2002, Yurtsev 1994).

Very steep bioclimate gradients occur in mountains, so these areas are mapped as complexes of [elevation belts](#). Mountainous areas of the map are shown with hachures; the background color indicates the nature of the bedrock, and the color of the hachures indicate the bioclimate subzone at the base of the mountains.



[Enlarge image](#)

Available data:



PDF



GE



Metadata GIS data

### Select a unit for more information and photos.

#### Barrens



[B1. Cryptogam, herb barren](#)



[B2. Cryptogam barren complex \(bedrock\)](#)



[B3. Noncarbonate mountain complex](#)



[B4. Carbonate mountain complex](#)

#### Graminoid tundras



[G1. Rush/grass, forb, cryptogam tundra](#)



# Map pages



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## Upper Kuparuk River Region

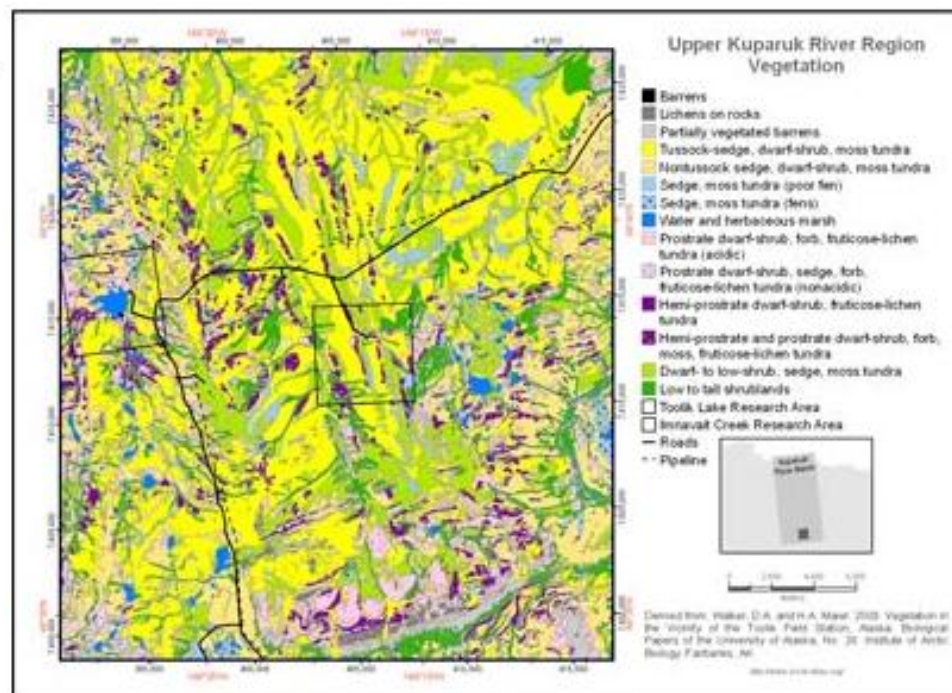
### About the map

The upper Kuparuk River region has terrain typical of the Southern Foothills of the Brooks Range, including landscapes affected by three major glacial events.

[Map A](#) shows the vegetation of the upper Kuparuk River region at 1:63,360-scale.

Other maps show a [false-color infrared satellite image](#), [glacial geology](#), [surficial geomorphology](#) and Normalized Difference Vegetation Index (NDVI/biomass) - all at 1:225,000-scale. Maps A ([Vegetation](#)) and C ([Glacial Geology](#)) were derived from a geobotanical map of the region. The base map for the geobotanical map was a 1:25,000-scale black-and-white orthophoto-topographic map that was prepared especially for this project by Vexcel Corp., Denver, CO in 1994 from stereo pairs of 1:60,000-scale, 9 x 9-inch color-infrared aerial photographs that were obtained by NASA in 1982. The base map was prepared without ground-control points, but was registered as closely as possible to the 1:63,360 USGS map of the region. Vegetation and other geobotanical features were mapped by photo-interpretation onto 1:25,000-scale enlargements of the 1982 NASA aerial photographs. The minimum mapping unit was approximately 0.6 ha (1/8" at 1:25,000-scale). No formal accuracy assessment was performed. See 2005

Map A shows the vegetation of the upper Kuparuk River region at 1:63,360-scale. Other maps show a false-color infrared satellite image, glacial geology, surficial geomorphology and Normalized Difference Vegetation Index (NDVI/biomass) - all at 1:225,000-scale. Maps A (Vegetation) and C (Glacial Geology) were derived from a geobotanical map of the region. The base map for the geobotanical map was a 1:25,000-scale black-and-white orthophoto-topographic map that was prepared especially for this project by Vexcel Corp., Denver, CO in 1994 from stereo pairs of 1:60,000-scale, 9 x 9-inch color-infrared aerial photographs that were obtained by NASA in 1982. The base map was prepared without ground-control points, but was registered as closely as possible to the 1:63,360 USGS map of the region. Vegetation and other geobotanical features were mapped by photo-interpretation onto 1:25,000-scale enlargements of the 1982 NASA aerial photographs. The minimum mapping unit was approximately 0.6 ha (1/8" at 1:25,000-scale). No formal accuracy assessment was performed. See 2005



[Enlarge image](#)



# Links to vegetation descriptions



## Circumpolar Arctic Vegetation Unit B1

[CAVM](#) [Vegetation](#) [About the Vegetation Map Units](#) [Bioclimate Subzones](#) [Floristic Provinces](#) [AVHRR](#) [Elevation](#) [Lake Cover](#) [Physiography](#) [NDVI and](#)  
[Phytomass](#) [Substrate Chemistry](#) [Coastline](#) [CAVM Cites](#)

Barrens: [B1](#) - [B2](#) - [B3](#) - [B4](#) || Graminoid Tundras: [G1](#) - [G2](#) - [G3](#) - [G4](#) || Prostrate-shrub Tundras: [P1](#) - [P2](#) || Erect-shrub Tundras: [S1](#) - [S2](#) || Wetlands: [W1](#) - [W2](#) - [W3](#)  
[Hierarchy of Geobotanical Vegetation Map Units](#) ([Walker DA 2002](#))

### B1. Cryptogam, herb barren

Dry to wet barren landscapes with very sparse, very low-growing plant cover. Scattered herbs, lichens, mosses, and liverworts. Subzone A and B, some C at higher elevations.

### Detailed Description

Dry to wet barren desert-like landscapes mainly in Subzone A and on some coarse-grained, often calcareous sediments in subzones B and C. Sparse (2-40%) horizontal plant cover, and very low vertical structure (generally <2 cm tall) with a single layer of plants where they occur. Dry herb barrens composed of few scattered vascular plants are present over much of the landscape. Snow-flush communities are often a conspicuous component, forming dark streaks on the otherwise barren lands, composed largely of bryophytes and cryptogamic crusts. In upland areas, vascular plant cover is generally very sparse (<2%), mainly scattered individual plants often in crevices between stones or small (<50 cm diameter) cryoturbated polygons. Sedges (Cyperaceae), dwarf shrubs, and peaty mires are normally absent.

Area: 225 x 1000 km<sup>2</sup>.

### Representative Syntaxa

Communities of the classes: *Thlaspietea rotundifolia* Br.-Bl. et al. 1947, (e.g., *Papaveretum dahliani* Hofm. 1968), *Salicetea herbaceae* Br.-Bl. et al. 1947, (e.g., *Phippsietum algidae-concinnae* Nordh. 1943).

### Dominant Plants

The most common vascular plants are cushion forbs, graminoids, lichens, mosses, liverworts, and cyanobacteria.

Cushion forbs: *Papaver dahlianum* ssp. *polare*; *Draba*; *Potentilla hyparctica*<sup>a</sup>; *Saxifraga oppositifolia*<sup>a</sup>;  
Graminoid: *Alopecurus alpinus*; *Deschampsia borealis/brevifolia*; *Poa abbreviata*; *Puccinellia angustata*; *Phippsia*; *Luzula nivalis*<sup>a</sup>; *Luzula confusa*<sup>a</sup>;  
Lichen: *Caloplaca*; *Lecanora*; *Ochrolechia*; *Pertusaria*; *Mycobilimbia*; *Collema*; *Thamnochloa*; *Cetraria*; *Flavocetraria*; *Cetrariella*; *Stereocaulon*;  
Moss: *Racomitrium*; *Schistidium*; *Orthothecium*<sup>a</sup>; *Ditrichum*<sup>a</sup>; *Distichium*<sup>a</sup>; *Encalypta*; *Pohlia*; *Bryum*; *Polytrichum*;  
Liverwort: *Gymnomitrium*; *Cephaloziella*;  
Cyanobacteria: *Cyanobacteria*<sup>a</sup>;

<sup>a</sup>=acidic, <sup>n</sup>=non-acidic



Eskimonaesset, North Greenland, C. Bay.  
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# Links to species descriptions



## Photo Library

Alphabetical list of plant species: [A](#)[B](#)[C](#)[D](#)[E](#)[F](#)[G](#)[H](#)[I](#)[J](#)[K](#)[L](#)[M](#)[N](#)[O](#)[P](#)[Q](#)[R](#)[S](#)[T](#)[U](#)[V](#)[W](#)[X](#)[Y](#)[Z](#)

## *Papaver dahlianum* subsp. *polare*

**Family name:** *Papaveraceae*

**Common name:** Svalbard poppy

**Growth form:** Forb

**Names used on the Toolik-Arctic Geobotanical Atlas maps:**

**Circumpolar Arctic Vegetation Map:** *Papaver dahlianum* ssp. *polare*

Select image to enlarge



Flowering plant

Båtsfjord: Austereiva, 1983.

Image author: **Kjell M. Sarre** ©

Website: [Norwegian Botanical Association](#)

[Source of original image](#)

**For more information about this plant:**

[Panarctic Flora](#)

[Flora of the Canadian Arctic Archipelago](#)

**Nomenclature:**

Vascular Plants:

Elven, R., Murray, D.F., Razzhivin, V.Y. & Yurtsev, B.A. (2006): Checklist of the Panarctic Flora (PAF). Vascular plants. University of Oslo, Oslo.

[Annotated Checklist of the Panarctic Flora \(PAF\) Vascular plants, version 1.0, 2011](#)

**Other possible sources for additional information and photos:**

[Botanika Fotogalerie](#)

[Cofrin Center for Biodiversity, Herbarium – University of Wisconsin](#)

[DELTA \(DEscription Language for TAXonomy\)](#)

[Den virtuella floran](#)

[Digital Natural History of Newfoundland and Labrador](#)

[Flora Danica Online](#)

[Flora of North America](#)

[Josef Hlasek - Photo Galleries](#)

[Leif & Anita Stridvall Plant Gallery](#)

[Lichen Herbarium – University of Oslo, Norway](#)

[Linnean Herbarium – Swedish Museum of Natural History](#)

[Michael Luth - Pictures of Bryophytes](#)

[Norwegian Botanical Society](#)

[Plants of Iceland](#)

[Robert W. Freckmann Herbarium – University of Wisconsin](#)

[The Plant List](#)

[USFS National Lichens & Air Quality Database and Clearinghouse](#)

[Wisconsin Bryophytes](#)

# Links to plot data



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## Supporting Data Data Reports

Supporting information includes the baseline plot information for vegetation, soils, and site factors for the study plots at Toolik Lake, Imnavait creek, Happy Valley, Prudhoe Bay, and elsewhere.

[Toolik Lake Permanent Vegetation Plots](#)  
[Imnavait Creek Permanent Vegetation Plots](#)  
[Happy Valley data report](#)  
[Prudhoe Bay data](#)



Illustration by John Adams, 1991 ©



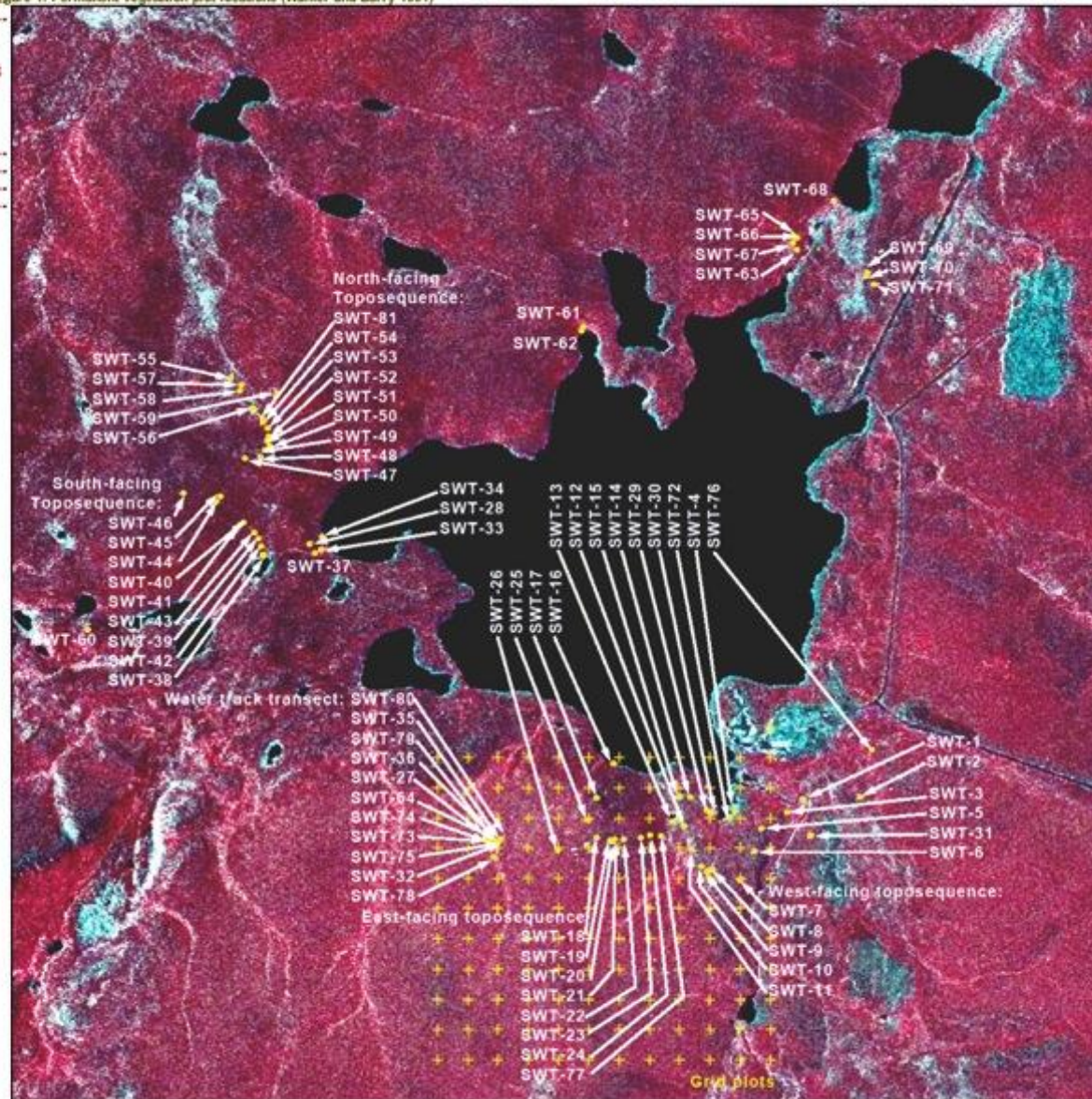
## Toolik Lake Area

Graphics || Map Images || Vegetation Map Unit Photos || Plant Community Photos || Circumpolar Arctic Bioclimate Subzone Photos || Photos-Vegetation TFS || Toolik Lake Permanent Vegetation Plot Photos || Innavik Creek Permanent Vegetation Plot Photos

Select the link below for more information (blue link returns you to the Maps section of the TAGA; tan link returns you to the Supporting Data section).

# Plot locations

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Toolik Lake Area Relevé Locations  
Figure 1. Permanent vegetation plot locations (Walker and Barry 1991)





Walker D.A. and Barry N. 1991. Toolik Lake permanent vegetation plots: site factors, soil physical and chemical properties, plant species cover, photographs, and soil descriptions. Data Report 48, Department of Energy R4D Program, Institute of /

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