



## **NIRB Uuktuutinga Ihivriughikhamut #125456**

### **Peat Expansion in Arctic Tundra (Baffin Island)--Pattern, Process, and the Implication for the Carbon Cycle**

**Uuktuutinga Qanurittuq:** New

**Havaap Qanurittunia:** Scientific Research

**Uuktuutinga Ublua:** 3/21/2019 3:13:56 PM

**Period of operation:** from 0001-01-01 to 0001-01-01

**Piumayaat Angirutinga:** from 0001-01-01 to 0001-01-01

**Havauhikhaq Ikayuqtinga:** Philip Camill  
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Hivayautit Nampanga:: 207-721-5149, Kayumiktukkut Nampanga::

# QANURITTUT

## Tukihinnaqtunik havaariyaumayumik uqauhiyun

**Qablunaatitut:** Peat Expansion in Arctic Tundra (Baffin Island) Pattern, Process, and the Implication for the Carbon Cycle (Non-technical summary) The following document has been submitted to the Nunavut Impact Review Board (NIRB) and is a nontechnical summary of a research proposal submitted previously to the Nunavut Planning Commission (NPC). Individual/institution proposing project: This project will be directed by Philip Camill, who is a professor at Bowdoin College (Brunswick, Maine, USA). Institutional support is provided by Bowdoin College, and funding for this project is through the (U.S.) National Science Foundation. Research objectives and need: Climate is warming worldwide and is most rapid in the polar arctic north. This warming is a result of the emissions of greenhouse gases to the atmosphere. The most important gas contributing to warming is carbon dioxide, which comes mainly from the burning of fossil fuels for energy. Because plants use carbon dioxide as they grow, and this carbon is stored in soils when plants die, there is interest in learning whether vegetation and soils might be able to take up some of the fossil fuel carbon dioxide released to the atmosphere. The plant uptake of carbon may increase in the future as climate warms and landscapes become more vegetated, as areas that are open tundra now become more like the spruce forests and bogs to the south. Scientists refer to this process as a greening of the arctic. Arctic greening may possibly help to slow the rise of greenhouse gases in the atmosphere and, therefore, climate warming. This proposed research is part of a project to understand how arctic ecosystems may respond to warming, including plant and soil uptake of carbon. If arctic greening is happening, this could possibly slow the rise in atmospheric greenhouse gases. The goal of this work is to improve our understanding of these processes. Proposed research study locations: The proposed research would be located on Baffin Island, Nunavut, Canada, in study sites located within approximately 400 km of Iqaluit (a map was included in the application to NPC). The NIRB indicates that the study sites are located in the South Baffin Region, including Inuktitut (Iqaluit, Kimmirut, Cape Dorset, and Pangnirtung) and French-speaking (City of Iqaluit) communities. Proposed transport: Our work will be based out of Iqaluit, and air travel will be by helicopter. We plan to fly to each of the proposed sites and carry out the field tasks below depending on the suitability of each site. Once on site at each field location, all travel will be by foot. We will only be using handheld equipment. Proposed field research tasks: The research team carrying out this work consists of 2-4 people. (1) Sampling soils to measure the amount of carbon stored: We are particularly interested in wetland soils, or peat patches, dominated by peatmosses because they store the most carbon in arctic landscapes. At each site, we will collect multiple soil cores (likely fewer than 10 per site). The cores would be approximately 5 cm in diameter and sampled to the depth of the soil (most likely 20-75 cm deep). (2) Collection of weather data: At each site, we will use a small weather station to measure air and soil temperatures and soil moisture. These will log data for several days, and we will return to the sites to retrieve the weather station. This information will help us assess the extent to which the peat patches are dependent on certain soil temperatures or moisture conditions. (3) Mapping of surface topography and vegetation: To assess the area of the peat patches and the potential environmental factors controlling them, such as local topography and drainage, we will use global positioning system (GPS) units to take multiple measurements of topography and peat patch areas. At each site, we will use small (1-x-1-m) sampling plots to identify different plant species and quantify their areal coverage. Specimens of different plant types would be collected and shipped back to the USA for identification. (4) Imaging surface vegetation: At each site, we will collect aerial imagery to help us map the peat patches and their potential environmental controls, like topography. We will deploy a drone over a ~20-hectare area to a height of ~250 m. This instrument produces a photo-like image of the vegetation. These images will be used alongside satellite-based remote sensing images of the region to help us determine the spatial scales of the peat patches and their potential environmental controls. Timeframe of proposed activities: The research would take place for a fixed period (2-3 weeks) during the summer of 2019. Long-term implications: Because the field work will involve limited collection of soil cores, topography, vegetation samples, and weather information over the span of a few days per site, there will be little environmental impact. No permanent structures will be constructed. A summary of the results of this work will be translated and made available to the local communities in Nunavut to help them understand the potential changes in their landscapes as climate warms.

**Uiviititut:** Expansion tourbière dans la toundra arctique (Terre de Baffin). Modèle, processus, et implication pour le cycle de carbone (Résumé non-technique) Le document ci-dessous a été soumis au Nunavut Impact Review Board (NIRB). C'est un résumé non-technique d'une proposition de recherche soumise précédemment au Nunavut Planning Commission (NPC). Individu/Institution responsable du projet: Ce projet sera dirigé par Philip Camill, professeur à Bowdoin College (Brunswick, Maine, États-Unis). Le soutien institutionnel est fourni par Bowdoin College, et le projet est financé par (U.S.) National Science Foundation. Besoin et objectifs de recherche: Le réchauffement climatique de la planète est global et se produit le plus rapidement dans l'arctique polaire du nord. Ce réchauffement est dû aux émissions de gaz à effet de serre dans l'atmosphère. Le dioxyde de carbone est le gaz le plus important contribuant à ce réchauffement, et provient principalement de la combustion d'énergie fossile. Vu que les plantes utilisent

[illegible]

[illegible]

**Personnel**

Personnel on site: 3

Days on site: 10

Total Person days: 30

Operations Phase: from 2019-07-07 to 2019-07-27

# Hulilukaarutit

Inigiya	Hulilukaarut Qanurittuq	Nunannga Qanurittaakhaanik	Initurlinga qanuritpa	Initurlinga utuqqarnitat unaluuniit Ingilraaqnitat Uyarannguqtut akhuurninnga	Qanitqiyauyuq qanitqiamut nunallaat kitulluuniit ahiruqtaliyainnit nuna
proposed study sites	Scientific/International Polar Year Research	Crown	NA	NA	NA

## Nunaliin Ilauyun, Aviktuqhimayuniitunullu Ikayuuhiarunguyun

Nunauyuq	Atia	Timiuyuq	Upluani Uqaqatigiyaungmata
Information is not available			

# Angiuttauvaktunik

Naunaiqlugu nunanga talvani havauhikhaq ittuq:

South Baffin

## Angiuttauvaktunik

Munariniqmut Ayuittiaqtuq	Angirutinga Qanurittuq	Tadja Qanurittaakhaanik	Ublua Tuniyauyuq/Uuktuqtuq	Umikvikhaa Ublua
Nunavunmi Ihivriuqniqmut Timiqutigiyanga	Research license application	Applied, Decision Pending		
Tingmiliqiyiitkut Kaanatami	We are awaiting information about he drone equipment to be able to apply for an exemption through Transport Canada. As described below, we may not need a SFOC. My research colleague who will be flying the drone provided this information: a) I was in communication with Transport Canada in January about applying for SFOC or getting an Exemption; b) Exemption might be possible if we fly more than 6 miles outside of Iqaluit. c) I am a Canadian Citizen and have passed Unmanned Vehicle Certification.	Not Yet Applied		

## Project transportation types

Transportation Type	Qanuq Atuqtauniarmangaa	Length of Use
Air	helicopter	

## Project accomodation types

Alaanut,

# Ihuaqutivaluin Atuqtauyukhan

Hanalrutit atuqtaunahuat (ukuallu ikuutat, pampiutainnik, tingmitinik, akhaluutunik, hunaluuniit)

Hanalrutit Qanurittuq	Qaffiuyut	Aktikkulaanga – Qanurittullu	Qanuq Atuqtauniarmangaa
hand-held soil coring devices	2	150 x 10 cm	to collect soils as described in the project description
drone	1	50 x 50 cm	aerial imagery of landscape vegetation as described in the project description
helicopter	1	unknown	round trip transport to sites from Iqaluit
GPS unit	1	100 cm x 20 cm	to map peat patches and topography as described in project description
meteroligcal station	1	200 cm x 100 cm	measuring air and soil temperatures and soil moisture

## Qanurittuq Urhuqyuaq unalu Qayangnaqtut Hunavaluit Aturninnga

Qanurittuq urhuqyuaq hunavaluit aturninnga:	Urhuqyuaq Qanurittuq	Qaffiuyut qattaryut	Qattaryuk Aktikkulaanga	Atauttimut Qaffiuyut	Ilanga	Qanuq Atuqtauniarmangaa
Information is not available						

## Imaqmik Aturninnga

Ubluq qanuraaluk (m3)	Aturumayain imavaluin utiqtittagaani qanuq	Atulirumayain imavaluin utiqtittagani humi
0	We will not use any field water. All drinking water will be brought in from Iqaluit.	We will not use any field water. All drinking water will be brought in from Iqaluit.



# Iqqakuq

## Ikkakunik Munakgiyauyunik

Havauhikhaq Hulilukaarut	Qanurittuq Iqqakut	Ihumagiyauyuq Qanuraaluktut Atuqtait	Qanuq Iqqakuurniarmangaa	Halummaqtirarnirutikhan piyutin
Sampling sites	Anaagun (inuin anaaguin)	approximately 15-30 L (0.5-1 L/person/day)	Human urine would be disposed of in remote, vegetated locations in the field at least 100 m away from water bodies. if this is an unacceptable disposal method, we could carry 1-L bottles with us and pack out human waste.	NA

### Avatiliriniqmut Ayurhauingit:

We do not anticipate environmental impacts. Surface and bedrock geology and sediment and soil quality--A few soil cores will be sampled and soil temperature probes installed. All of the holes associated with these activities will be backfilled, so these potential impacts are minor and should not be noticeable. Noise--for brief periods of time from the use of a helicopter. Wildlife, including habitat and migration-- the helicopter may cause some animals to move temporarily.

# **Additional Information**

**SECTION A1: Project Info**

**SECTION A2: Allweather Road**

**SECTION A3: Winter Road**

**SECTION B1: Project Info**

**SECTION B2: Exploration Activity**

**SECTION B3: Geosciences**

**SECTION B4: Drilling**

**SECTION B5: Stripping**

**SECTION B6: Underground Activity**

**SECTION B7: Waste Rock**

**SECTION B8: Stockpiles**

**SECTION B9: Mine Development**

**SECTION B10: Geology**

**SECTION B11: Mine**

**SECTION B12: Mill**

**SECTION C1: Pits**

**SECTION D1: Facility**

**SECTION D2: Facility Construction**

**SECTION D3: Facility Operation**

**SECTION D4: Vessel Use**

**SECTION E1: Offshore Survey**

**SECTION E2: Nearshore Survey**

**SECTION E3: Vessel Use**

**SECTION F1: Site Cleanup**

**SECTION G1: Well Authorization**

**SECTION G2: Onland Exploration**

**SECTION G3: Offshore Exploration**

**SECTION G4: Rig**

**SECTION H1: Vessel Use**

**SECTION H2: Disposal At Sea**

**SECTION I1: Municipal Development**

**Qanurittuq Ittunik Avatinga: Avatingalluanga**

**Qanurittuq Ittunik Avatinga: Inuuhimayunut Avatinga**

**Qanurittuq Ittunik Avatinga: Inungit-maniliurutingit Avatinga**

**Miscellaneous Project Information**

**Naunaiyainiq ukuninnga Ayurhautingit unalu Piumayaat Ikikliyuumiutinahuarutit**

**Tamatkiumayunik Ihuikgutivaktunik**

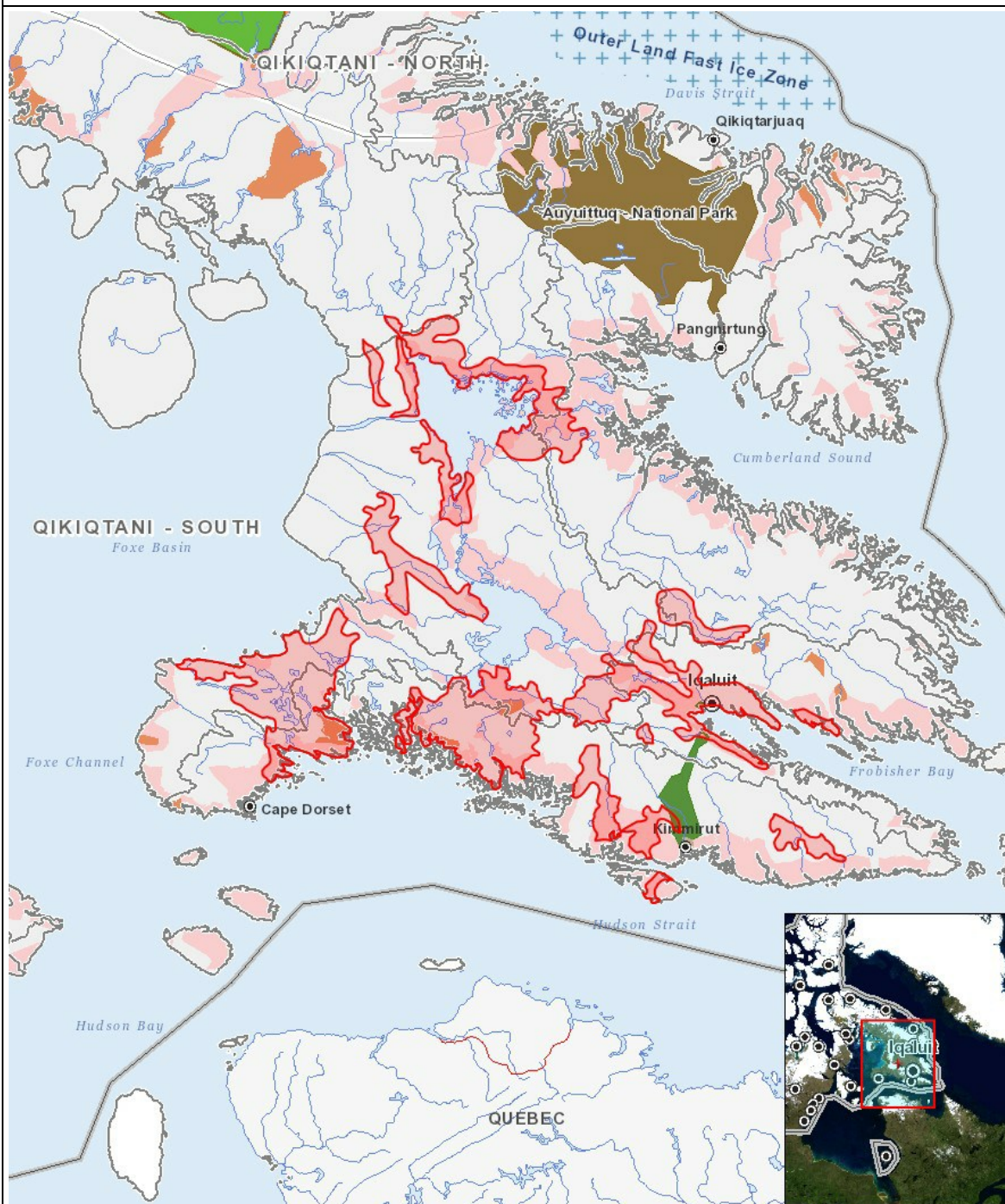
# Impacts

## Ilitariyauniq Avatiliriniqmut Ayurhautingit

		PHYSICAL	Designated environmental areas	Ground stability	Permafrost	Hydrology / Limnology	Water quality	Climate conditions	Eskers and other unique or fragile landscapes	Surface and bedrock geology	Sediment and soil quality	Tidal processes and bathymetry	Air quality	Noise levels	BIOLOGICAL	Vegetation	Wildlife, including habitat and migration patterns	Birds, including habitat and migration patterns	Aquatic species, incl. habitat and migration/spawning	Wildlife protected areas	SOCIO-ECONOMIC	Archaeological and cultural historic sites	Employment	Community wellness	Community infrastructure	Human health
Havakvinga																										
-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-
Aulapkaininnga																										
Scientific/International Polar Year Research		-	-	-	-	-	-	-	-	-	N	N	-	-	N	-	N	-	-	-		-	-	-	-	-
Piiqtauniq																										
-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-

(P = Nakuuyuq, N = Nakuungittut unalu mikhilimaittuq, M = Nakuungittut unalu mikhittaaqtuq, U = Naluyauyuq)

# Havaariyauyukhamut Nayugaa



## List of Project Geometries

1	polygon	proposed study sites
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