

ᐅᓃᓕᓚᐅᓃᑦ: 207-721-5149, ᓃᓕᓴᓃᓃᑦ:

ᐅᓂᕈᕋᕐ ᐱᕐᔪᕐ ᐅᓂᕈᕋᕐ (ᐅᓂᕈᕋᕐ ᐱᕐᔪᕐ) 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 storedWe 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**

ᐅᐃᐱᓂᑦ: 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 rechercheLe 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 fossileVu que les plantes utilisent le dioxyde de carbone pendant leur croissance, et qu'à leur mort ce carbone se stocke dans la terre, il y a tout intérêt à apprendre si la végétation et la terre peuvent absorber une partie des combustibles fossiles du dioxyde de carbone émis dans l'atmosphère. L'absorption de carbone par les plantes pourrait augmenter à l'avenir à mesure que le climat se réchauffe et que la végétation de paysage augmente, à mesure que les régions de la toundra claire ressemblent plus à des forêts d'épinettes et à des tourbières au sud. Les chercheurs parlent de "verdissement" arctique pour décrire ce processus. Le verdissement arctique pourrait éventuellement ralentir la montée dans l'atmosphère des gaz à effet de serre, et donc ralentir le réchauffement climatique.La recherche proposée fait partie d'un projet pour comprendre comment l'écosystème arctique, y compris l'absorption du carbone par les plantes et le sol, peut réagir à ce réchauffement. S'il y a un verdissement arctique, ceci pourrait éventuellement ralentir la montée dans l'atmosphère des gaz à effet de serre. Le but de ce travail est d'améliorer notre savoir sur ces processus.Sites de recherche proposésLa recherche proposée serait située à la Terre de Baffin, Nunavut, Canada, dans environ sites de recherche situés approximativement à 400 km d'Iqaluit (une carte a été remise dans l'inscription au NPC). Le NIRB indique que les sites de recherches sont situés dans la région du sud de Baffin, y compris Inuktitut (Iqaluit, Kimmirut, Cape Dorset, et Pangnirtung) et des communautés francophones (la ville d'Iqaluit).Transport ProposéNotre travail sera basé à Iqaluit, et le transport aérien sera effectué par hélicoptère. Nous envisageons de voyager à chacun des sites proposés et de réaliser les tâches sur le terrain mentionnés ci-dessous selon les convenances de chaque site. Une fois sur le terrain à chaque site, tout déplacement sera effectué à pied. Nous utiliserons seulement du matériel portable.Tâches sur le terrain proposéesL'équipe de recherche est constituée de 2 à 4 personnes.(1) Échantillonnage de sol pour mesurer la quantité de carbone stockéNous sommes particulièrement intéressés par les sols de zones humides, ou par des zones de tourbes dominés par la mousse parce qu'elles stockent le plus de carbone dans les paysages arctique. A chaque site, nous prélèverons des carottes de sol multiples (probablement moins de 10 par site). Les carottes seraient approximativement 5 cm de diamètre et les échantillons seraient pris à la profondeur du sol (probablement de 20 à 75 cm de profondeur).(2) Collecte de données météorologiquesA chaque site, nous utiliserons une petite station météorologique pour mesurer les températures de l'air et du sol, et l'humidité du sol. Ces stations enregistreront des données sur plusieurs jours, et nous retournerons à chaque site pour récupérer les stations. Ces informations nous aideront à évaluer dans quelle mesure les zones de tourbes dépendent d'une certaine température du sol ou de conditions d'humidité.(3) Cartographie de la topographie de surface et de la végétationPour évaluer la région des zones de tourbes et les facteurs environnementaux potentiels qui les contrôlent, tels que la topographie locale et le drainage, nous utiliserons des appareils GPS (Global Positioning System) pour prendre des mesures multiples de la topographie et des régions de tourbières. A chaque site, nous

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

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შეცდომები	დანი	საქართველოს იუსტიციის	საგარეო საგარეო ურთიერთობების
Information is not available			

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South Baffin

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Project transportation types

Transportation Type	Transportation Mode	Length of Use
Air	helicopter	

Project accomodation types

476,

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Λ⁹d^c d^abΓ²Δ⁶ ΔD⁶C DσD⁴Δ⁵ Δc⁹bΓDΠ³Γ^c ΔjCΔ^c, Γ^c₃D PÑ^c, Δ⁶bLCΓ^jΔ⁶, ΔeΓD^c ΔΓ^aΓ^c₃

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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
meterological station	1	200 cm x 100 cm	measuring air and soil temperatures and soil moisture

$\Pi \cap \nabla D^{\perp} \Gamma_{\Delta} = \emptyset$, $D^{\perp} \Gamma_{\Delta} \subset \nabla C_{\Delta}^{\perp}$, $\nabla C_{\Delta}^{\perp} \subset D^{\perp} \Gamma_{\Delta}$.

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$\Delta L^{\epsilon_b} \quad \triangleleft \triangleright^{\epsilon_b} \subset \triangleright \triangleleft \dot{L}^{\epsilon_b} \triangleright^{\epsilon_b}$

$\Delta^c \rightarrow C\dot{L}^{fb} \rightarrow \Delta^{fb} C \rightarrow \sigma \Delta^{fb} \rightarrow^{fb}$	$^{fb} \rightarrow^{fb} \Delta \Gamma^{fb} C^{fb} C^i \sigma \Delta^{fb} <^c$	$a P^c \Delta \Gamma^{fb} C^{fb} C^i \sigma \Delta^{fb} <^c$
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.

$\triangleleft^b C d^c$
$$\Delta^b C d_c n_\sigma \Delta^q \sigma^q$$

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Sampling sites	ᖃᐃᖃᑕᑕᓚᑦᖃ ^a	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

4907DC⁵ 4⁶5⁶CD⁷LD⁸

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 11: Municipal Development

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Miscellaneous Project Information

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Cumulative Effects

Impacts

$\mathbb{C} \rightarrow \mathbb{C} \Delta^{\mathfrak{b}} \mathbb{C} \rightarrow \sigma^{\mathfrak{a}} \mathfrak{r}^{\mathfrak{c}} \quad \mathbb{A} \mathbb{C} \cap \Gamma \rightarrow \mathbb{C} \mathfrak{z}^{\mathfrak{c}} \mathbb{D}^{\mathfrak{c}} \quad \mathbb{A}^{\mathfrak{b}} \mathbb{D}^{\mathfrak{b}} \mathbb{C} \rightarrow \mathfrak{r}^{\mathfrak{c}} \mathbb{L} \mathfrak{r}^{\mathfrak{c}}$

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$$(P = \langle b \rangle \Delta \langle P \cap \langle a \rangle \langle b \rangle \rangle^C, N = \langle b \rangle \langle P \rangle \langle \langle D \rangle \langle a \rangle \langle b \rangle \rangle^C \langle \langle D \rangle \langle P \rangle \rangle \langle \langle D \rangle \langle a \rangle \langle P \rangle \rangle^C \rightarrow, M = \langle b \rangle \langle P \rangle \langle \langle D \rangle \langle a \rangle \langle b \rangle \rangle^C \langle \langle D \rangle \langle P \rangle \rangle \langle \langle P \rangle \langle D \rangle \langle a \rangle \langle b \rangle \rangle^C \rightarrow, U = \langle b \rangle \langle P \rangle \langle \langle a \rangle \langle P \rangle \rangle \langle \langle b \rangle \rangle)$$

1	polygon	proposed study sites
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