



NIRB Application for Screening #125806

Rapid assessment of tundra plant diversity using small bits of genetic code found in the soil

Application Type: New

Project Type: Scientific Research

Application Date: 5/2/2023 1:20:21 PM

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

Proposed Authorization: from 0001-01-01 to 0001-01-01

Project Proponent: Jakob Assmann
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DETAILS

Non-technical project proposal description

English: Rapid assessment of tundra plant diversity using small bits of genetic code found in the soil. Lead researcher: Jakob J. Assmann, University of Zurich, Switzerland. Climate change and industrial activity are changing the Arctic tundra. Since tundra plants are small and hard to identify, it is often difficult to know which different kinds are found in an area of tundra. Not knowing which plants are present makes it difficult to support nature conservation efforts and measure changes in plants over time. The main objective of our study is to test a new protocol that could make finding the different kinds of plants in the tundra a lot easier. The protocol uses small fragments of the plants' genetic code found in soil that can tell us which plants are found close by. To test the protocol, we will collect soil samples from three 300 m x 300 m tundra locations around Cambridge Bay and extract the plants' genetic code in the laboratory of the Canadian High Arctic Research Station. We will also survey the plants by eye and use drones to create maps of each location. The plant surveys will help us test the quality of the protocol and the maps will show us how the samples fit into the landscape. The collected soil also holds information about nutrients and which microbes are present. In addition to testing the protocol, we will examine how soil nutrients and microbes influence the kinds of plant that can be found in an area of tundra. We plan to complete the field research between July 1st and August 12th, 2023. The scientific analysis and evaluation of the protocol will be carried out at the University of Zurich in Switzerland. We aim to conclude the project by summer 2024. All data and results will be made available to everyone through an online database and in a scientific publication. In addition, we will share all data and observations of interest to community members, local authorities, and researchers at Polar Knowledge Canada in advance. We will give a public talk to introduce the project during Polar Knowledge Canada's "Speaker Series" in Cambridge Bay this summer and hope to return later in 2023/24 to share the findings. To make it easier to engage with our research, we will introduce our team on the appropriate Facebook groups prior to arrival in Cambridge Bay. We are also coordinating with Polar Knowledge Canada to plan a potential workshop for a school holiday club if this is of interest to the community. The impact on the environment, wildlife, and people will be small. We will collect only small amounts of soil (estimated 162 samples of 50 ml each) and around five leaves for about 150 plants to create a library of the local plant's genetic code. We will prioritize respect for the community when we fly drones. As such, we will not fly within 150 m of people, camps, and houses. We will obtain all required permits.

French: Not applicable

[illegible]

Personnel

Personnel on site: 2

Days on site: 43

Total Person days: 86

Operations Phase: from 2023-07-01 to 2023-08-12

Activities

Location	Activity Type	Land Status	Site history	Site archaeological or paleontological value	Proximity to the nearest communities and any protected areas
Canadian High Arctic Research Station - Laboratory and Lodging.	Scientific/International Polar Year Research	Crown	Recently established research station run by Polar Knowledge Canada.	Not applicable.	The research station is in the community of Cambridge Bay.
Target area for the establishment of three temporary research sites (each 300 m x 300 m) in summer 2023.	Scientific/International Polar Year Research	Crown	The target area for the establishment of the three research sites (300 m x 300 m each), contains different areas with various histories, ranging from currently settled areas to open tundra.	The area contains various sites of archaeological / paleontological value. We will coordinate closely with our collaborators in the team at the Canadian High Arctic Research Station, to ensure that our choice of site locations will not interfere with these.	The area of interest contains parts of the community of Cambridge Bay and the Ovayok Territorial Park. We will coordinate closely with the team at CHARS and all relevant organisations to ensure that our research will cause as little impact on the cultural and natural environment as possible. (See also environmental impacts section). Note: The area contains a mixture of land ownership types, including Inuit owned land.

Community Involvement & Regional Benefits

Community	Name	Organization	Date Contacted
Cambridge Bay	Tannis Bolt	Kitikmeot Inuit Association	2023-01-31
Cambridge Bay	David Hik	Polar Knowledge Canada	2022-10-11

Authorizations

Indicate the areas in which the project is located:

Kitikmeot

Authorizations

Regulatory Authority	Authorization Description	Current Status	Date Issued / Applied	Expiry Date
Nunavut Research Institute	Nunavut License (Physical / Natural Sciences)	Applied, Decision Pending		
Kitikmeot Inuit Association	Land Use – Certificate of Exemption	Applied, Decision Pending		
Government of Nunavut, Department of Environment	Wildlife Permit	Applied, Decision Pending		
Government of Nunavut, Department of Environment	Nunavut Territorial Parks Use Permit (for Owayok Territorial Park)	Applied, Decision Pending		
Transport Canada	Special Flight Operations Certificate (SFOC) for foreign drone operators (all operations in the basic category)	Applied, Decision Pending		

Project transportation types

Transportation Type	Proposed Use	Length of Use
Land	We will walk or use ATVs for transport between our accommodation in Cambridge Bay and the three field research sites. We will mainly operate the ATVs on roads and ATV tracks. We will avoid going off road as much as possible. Where possible the ATVs will be parked next to the track and the remaining distance from the ATV track to the study sites will be completed by foot. Transport across the field research sites will be by foot only.	

Project accommodation types

Other,

Material Use

Equipment to be used (including drills, pumps, aircraft, vehicles, etc)

Equipment Type	Quantity	Size - Dimensions	Proposed Use
All Terrain Vehicles (ATVs)	2	approx. 1.2 m x 2.1 m x 1.2 m (L x W x H)	We will use All Terrain Vehicles (ATVs) for transport from the Canadian High Arctic Research Station (CHARS) in Cambridge Bay to the field study sites. We will mainly operate the ATVs on roads and ATV tracks. We will avoid going off road as much as possible. Where possible the ATVs will be parked next to the track and the remaining distance from the ATV track to the study sites will be completed by foot. The locations of the field study sites will be chosen within approx. 20 km of CHARS.
Drone / Remotely Piloted Aircraft	2	max. takeoff weight equal to or less than 1.6 kg	We will use small, battery powered, survey drones to obtain maps of the field study sites. All operations will be done according to Transport Canada regulations ("basic operations" category). We will obtain pilot licenses and a Special Flight Operations Certificate as required for foreign operators. We will pay particular attention to safety and privacy when operating the drone, always keeping a minimum distance of 150 m to bystanders, infrastructure, or groups or large individuals of wildlife.

Detail Fuel and Hazardous Material Use

Detail fuel material use:	Fuel Type	Number of containers	Container Capacity	Total Amount	Units	Proposed Use
Gasoline	fuel	1	82	82	Liters	Fuel for ATVs used for transport between field sites and the Canadian High Arctic Research Station in Cambridge Bay. All fuel will be purchased at fuel stations in town. No fuel will be stashed at the field sites. We will only bring the amount of fuel fitting into the tanks

						of the ATVs. The figure provided is an estimate of fuel consumption based on an average travel distance of 20 km for 15 days of field work, using two ATV vehicles and an estimated fuel consumption rate of 13.5 L per 100 km.
Reagents for DNA extractions (flammable / harmful to environment)	hazardous	1	1	1	Liters	We require a small amount of hazardous substances to extract the genetic code (“DNA”) from soil and plant tissue. The extractions will be done in the laboratory at the Canadian High Arctic Research Station in Cambridge Bay. We will use commercial extraction kits. These kits contain a combined amount of 0.7 L of hazardous substances classified as “flammable / harmful to environment”: 350 ml ethanol solution; and 350 ml solution containing ethanol, isopropanol, and guanidine hydrochloride.
Reagents for DNA extractions (corrosive)	hazardous	1	1	1	Liters	We require a small amount of hazardous substances to extract the genetic code (“DNA”) from soil and plant tissue. The extractions will be done in the laboratory at the Canadian High Arctic Research Station in Cambridge Bay. We will use commercial extraction kits. These kits contain a combined amount of 0.47 L of hazardous substances classified as “corrosive”: 120 ml solution containing aluminum chloride hexahydrate; and 350 ml solution containing guanidine

						thiocynate.
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Water Consumption

Daily amount (m3)	Proposed water retrieval methods	Proposed water retrieval location
0		

Waste

Waste Management

Project Activity	Type of Waste	Projected Amount Generated	Method of Disposal	Additional treatment procedures
Scientific/International Polar Year Research	Combustible wastes	120 litres	Disposal of all combustible waste (household waste, packaging, non-hazardous laboratory waste) will be coordinated with the team of the Canadian High Arctic Research Station (CHARS). We will use the local waste service providers in Cambridge Bay.	Not applicable.
Scientific/International Polar Year Research	Hazardous waste	1.17 liters (total)	<p>The extractions of the genetic code from the soil and plants that we will carry out in the laboratory at the Canadian High Arctic Research Station (CHARS) will generate the following projected quantities of hazardous waste.</p> <p>Flammable / harmful to the environment: 350 ml ethanol solution, 350 ml solution containing ethanol, isopropanol and guanidine hydrochloride.</p> <p>Corrosive: 120 ml solution containing aluminum chloride hexahydrate, 350 ml solution containing guanidine thiocyanate.</p> <p>We will bring all required containers, packaging and labels required for the safe disposal of the hazardous waste. We will coordinate disposal of these substances with the laboratory management at CHARS. Where safe disposal is not possible locally, we will arrange for shipment and disposal of the hazardous waste to the south of Canada according to</p>	Not applicable.

			the regulations with the help of a waste disposal company licensed for handling the types of waste listed above.	
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Environmental Impacts:

The predicted impact on the environment, people and wildlife from our research project is small. Nonetheless, we will take great care to reduce the impacts of our activities as much as possible. Impacts could arise from the selection of the research sites, the collection of soil and plant tissue samples, the marker placement for the study locations, the use of ATVs, the use of drones for mapping, the handling of hazardous substances for the extraction of genetic code (DNA). We will closely work with team at the Canadian High Arctic Research Station to ensure that our planned fieldwork and the choice of field research locations do not pose a threat to the natural and cultural environment, and do not interfere with people's privacy or livelihoods. We will collect only what is necessary to meet the objectives of our study (estimate: 162 soil samples of 50 ml each; five leaves each for 150 plants) to reduce the impact of the sample collection. We will only use temporarily placed markers (pin flags and pegs) to indicate the research sites and plots to mitigate the impact on the landscape. All markers will be removed at the end of our visit. We will limit the use of ATVs as much as possible (emissions, damage to tundra plants) and rely on transport by foot where we can. To mitigate the risk of disturbance of humans or wildlife by the drones, we will only operate small drones (less than 1.6 kg) and we will not fly within 150 m of groups or large individuals of wildlife, as well as people, camps, houses, infrastructure etc. All extractions of DNA and the handling of the hazardous substances will be done in the specifically designed genetics laboratory at CHARS. We will use commercial DNA extraction kits optimized for personal and environmental safety.

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

Description of Existing Environment: Physical Environment

Description of Existing Environment: Biological Environment

Description of Existing Environment: Socio-economic Environment

Miscellaneous Project Information

Identification of Impacts and Proposed Mitigation Measures

Cumulative Effects

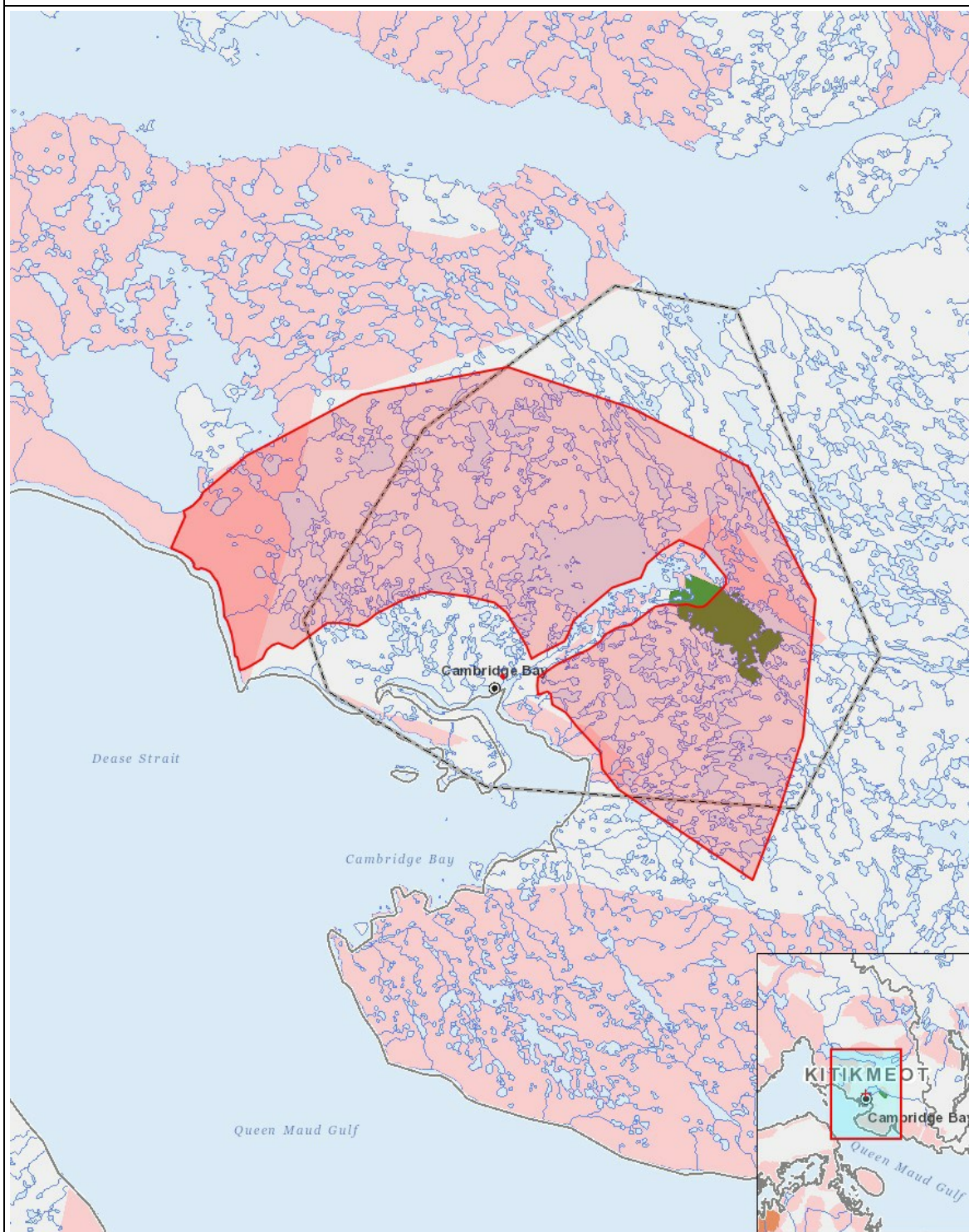
Impacts

Identification of Environmental Impacts

		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
Construction																										
-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Operation																										
Scientific/International Polar Year Research		M	-	-	-	-	-	-	-	-	-	M	-	-	-	M	M	N	-	-	-	-	P	-	-	-
Decommissioning																										
-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

(P = Positive, N = Negative and non-mitigatable, M = Negative and mitigatable, U = Unknown)

Project Location



List of Project Geometries

- | | |
|-----------|--|
| 1 polygon | Target area for the establishment of three temporary research sites (each 300 m x 300 m) in summer 2023. |
| 2 polygon | Canadian High Arctic Research Station - Laboratory and Lodging. |