



$${}^{\epsilon}\mathfrak{b} \Delta^{\zeta} \dot{\mathfrak{N}} \sigma^{\flat} \quad \wedge \text{c} \text{ n} \nabla {}^{\epsilon}\mathfrak{b} {}^{\epsilon}\sigma \nabla \text{ n} \nabla {}^{\alpha}\mathfrak{L}^{\alpha} \sigma^{\flat}$$

Who: Jules Blais, University of Ottawa, 30 Marie Curie Road, Ottawa, Ontario, K1N 6N5; Email: Jules.Blais@uottawa.ca; Phone: (613) 562-5800 Ext. 6650  
What: Our field collections will involve collecting lake sediment cores near bird colonies. We do this by removing a 3 inch diameter core of sediment from the bottom of a lake, typically about 3 feet in length. We then place samples in containers, and collect small samples of soil, water, and filtered particles in one liter of lake water. Our work is not invasive and has a minimal impact on the environment. We will have a maximum of 4 (four) people on site for these sample collections. We will not need to build any facilities because we will use either the Canadian High Arctic Research Station at Cambridge Bay or the Karrak Lake research station in the Ahiak Migratory Bird Sanctuary for lodging. We will use commercial aircraft to reach Cambridge Bay, and all other transport to field sites will be either by helicopter or twin otter, or by ATV for sites closer to Cambridge Bay.  
Why: Our objective is to show how bird populations around Cambridge Bay and the Ahiak Migratory Bird Sanctuary have changed over time using lake sediments as a natural archive. Long term, we will integrate bird population histories with recent research and indigenous knowledge to investigate the stability of migratory bird populations and their reliability as a food source in the North. Sediment is a natural archive because it slowly accumulates at the bottom of lakes and it contains animal and plant material from the time it was deposited. Thus sediment is a record of environmental changes. When birds colonize the area, they fertilize the water, and these changes are recorded in the chemical and biological composition of the lake sediment layers, which can be used to show the long term history of bird populations. We can also learn more about how bird species have changed over the past several thousand years by analyzing bird and other wildlife DNA in sediment. This study can provide new information on the stability of these populations over time and how they were affected by past changes in climate.  
Where: We propose to track long-term changes in several geese populations (snow geese and Ross's geese) in the Ahiak Migratory Bird sanctuary, the Anderson Bay colony, and the Icebreaker colony. Our main base will be the Canadian High Arctic Research Station in Cambridge Bay. Our field sites are all within a 300 km radius of Cambridge Bay and include the Anderson Colony, the Icebreaker Colony, and the Karrak Lake Research Station in the Ahiak Migratory Bird Sanctuary. The Karrak Lake Research Station is located at the main field site at Karrak Lake (67° 14' N, 100° 15' W). It consists of six plywood buildings ranging in size from 8x12' to 20x20'.  
When: We plan to do our field work over a 2 week period in June/July of each year under this permit. We will spend about a week at the Ahiak Migratory Bird Sanctuary (Environment Canada research base at Karrak Lake) each summer. Our work at the Anderson Colony and Icebreaker colony will consist of day trips to each location, where we will conduct our field work for a period of 4-8 hours on site.

▷ΔΑΠΝΩ: N/A

$\Delta \mathcal{L}^b \cap \mathcal{D}^c$ : N/A

Inuinnaqtun: KinnaJules Blais, Illahakvirjua Ottawami, 30 Marie Curie Apkutta, Ottawami, Ontariop Illuanni, Titikikivip Naunnaitkutta K1N 6N5 Karitaujakkut Naunaitkkutta: Jules.Blais@uottawa.ca ; Hivvajauta Naunaitkutta: (613)562-5800 Nanminnia: 6650 Hunna Havvangnahuaktakkut imma, katitiikataklutta tahiup makluannik, hannianni tingmiat nunanni. Immatut 3 inch takitjutta makluk ammuluru imman attaniin, 3 feet takitjutta. Ummakaraluttik illirivaktaqut puqhivingmun, katihimaqhutta mikkiunik nunamik, immangmik tahapkuatlu kuhuiktaktauji mayut, illiriqataqhutta one litre ukkumaitjutta immang. Havvavut hivvurannaituk hillarjuangmut. Hittamainnangnik havvatikangniakturut havvakvippingnii. Iglukpangnik nappaktiilmaiturut, Canadami Ihivriutiitiaruktut havakviit, iglukpainlu attuktinniangmatta, Ikaluktuiammi, hamannilunin Karrak Tahia, ihivriukrvik, Ahiangmii, Tingmiat Nunani. Tingmikuuklutta Ikaluktutiamun tikinniakturut, Angutikaktutlu tingmijutit attuklurit, Mikaitlu akhaluaktut atturlugit, kannitkijaujut Ikaluktutiammi. Huuk Naunapkanqhiinahuarlutta kannuklii Tingmiat ammigaikcutait naunaijattiarluru, Ikaluktutiap hannaini, Ahaikmilu. Kannukli allangurumik ihivriutirlurit tahiit Tingmiat attukattakutait, titirakqharlurit tutkumannahuaqtut

tairuaqtqhait. Hivuptaa ihumariluru, katinniakaqut titkikihimajut havvavut. Tahapkuanlu Inuit pitkuhiit attahimalurit ihivriutiarlurit qannuk nammatjutta Tingmiat, immalu nikkautjutaulutiik Inuinnun. Makluk attani tahiup, itkumatiqhamik, immak lu, maklulu attarammik atanni immap tahingmi, huratjaat, tingmiatlu tahik attuktat naunaittuk. Makluk tamna naunaitjuturaammi,, kannukli immak, nunalunnin allangulirangami. Tingmiat mihimragamik tahingmi, immangmik allangutilangmatta, hapkuat itkumajut maklungmi, immangmilu. Hapkuat naunaitkutiriikpaktakkut kannuilitaruttait tingmiat, Taima naunaijatiakpakpakkut allanguraanngamiik nuna, immaklu, taima uingaijakpakpakkut tingmiat amiraikattaqhutik, ikkilikataqhutiklu. Ihivriutirangapta naunaittut kangarallukimmangmii itkumarammik maklungmii, imma kangaraaluk tingmiat huratjaat kannukliallanguvjakpan. Una ihhiriungnik tittikkatlu, uingaipgallaqtuk tingmiat kannuritqhait, kannuklu hilla allangungman itpan. Hummi Havvaraiumajakkut, Uingaijakluru allatkiik Tingmiat ammirairumik, ikkilirumiklunin( Kannguit, Tahapkuat lu-Ross Tingmiat) Ahiak Tingmiat nunarijaat, Anderson milu Tingmiat, tahapkuatlu umiaryuat inniainnik inglirajuktut. Canadami Ihirviurvik Havakvia Ikaluktutiammi. Nuna Havarvirinahuaktakkut 300 miles nik takkitjutta, Ikaluktutiap hanniani, Anderson tingmiat illarija, hapkuatlu ummiat innit, tamnalu Karrak ihivriurvik havvakvia, Ahiangmittuk. Karrak Tahia naunaitkuta (6714° Kanangnaq, 100° 15 Uatta) Tallimat attauhingmik iglukpkaktuk, aktirutait allatkingujut. Kangalhumajurut havvaqhavut Junemi, Julymilu havvarumayakkut ummunga titikkat angitutta. Tallimat malrungnik Ahiangmi illutta aulangurangat. Havvavut Andersonmi, Ummi Innanilu, uppakatrlurit malgunnik ublunik, tamaitta havvarvikput nunami. Hitamanik-tallimat pingahuut ubluqhiumni iggangniit tahamanni havvarlutta.

#### Personnel

Personnel on site: 3

Days on site: 14

Total Person days: 42

Operations Phase: from 2020-06-22 to 2022-07-10

$\Lambda \subset \mathbb{N} \triangleleft \mathbb{N} \hookrightarrow \mathbb{D}_\sigma \triangleleft {}^{\aleph_b} \mathbb{C}$

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Ahiak Migratory Bird Sanctuary	Scientific/International Polar Year Research	Crown	The research station where we will base operations in the Ahiak Migratory Bird Sanctuary is maintained by scientists from the Canadian Wildlife Service (led by Ray Alisauskas). This station has been in continuous operation for the past 30 years.	N/A	Within the Ahiak Migratory Bird Sanctuary, and about 300 km from Cambridge Bay
Icebreaker Colony	Scientific/International Polar Year Research	Crown	Established bird colony	N/A	100 km to Cambridge Bay
Cambridge Bay and region	Scientific/International Polar Year Research	Crown	Town of Cambridge Bay	N/A	N/A

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ᓄᓇᑦᑦᑭᑦ	ᐱᑦᑎᑦ	ᑲᐅᑦᑕᐱᑦᑎᑦᑭᑦ	ᑦᑲᑦᑭᑦ ᐅᐱᑦᑎᑕᐅᓚᐅᓴᐱᐱᑦᑦᑭᑦ
ᐃᑦᑲᐅᑦᑐᑦᑕᑦᐱᑦ	Jenny Rausch	Ahiak Area Co- Management Committee for the Ahiak (Queen Maud Gulf) Migratory Bird Sanctuary	2019-04-23
ᐃᑦᑲᐅᑦᑐᑦᑕᑦᐱᑦ	Beverley Maksagak	Ekaluktutiak Hunters & Trappers Organization	2019-04-15

[illegible]

$a^{\dagger}r d^{q_1} r^{a_{\sigma}} \Lambda_{C_n} d^{e_{\delta}} \Delta D_{\sigma} d^{q_b} J^c$   $\Pi \Pi q^f \omega^c:$

## Kitikmeot

[illegible][illegible]

## Project transportation types

Transportation Type	Access Route	Length of Use
Air	Commercial flights to Cambridge Bay, then PCSP flights (helicopter or twin otter) to field sites	
Land	ATV to sites near Cambridge Bay	

### Project accomodation types

## Temporary Camp

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$\triangleleft^b C d^c$ 
$$\Delta^b C d_{\sigma} \sim \Delta^q \sigma^q$$

ᐱᑕᓕᓴᓂᔭᐅᒻᒪᒻᑦ ᐱᑕᓕᓴᓂᔭᐅᑖᓄᓴᑦᑐᑦ	ᑭᑲᑖᐃᑦᑐᑦᑭ ᓴᑦᑕᓴᑦ	ᑭᑲᑖᐁᓯ ᓴᑦᑕᓴᑦ ᑭᑦᐁᓴᑖᓄᓴᑦᑐᓂᔭᐅᑦ	ᑭᑲᑖᑭ ᓴᑦᑕᑦᑕᐅᑖᓄᓴᑦᑐᑦ	ᑭᑲᒻᒪᑦᑭᓴᐅᐁᑦᑭᑦᑖᑦᑖᑦᑖᑦᑖᑦᑖᑦᑐᑦ
Scientific/International Polar Year Research	ΔLΔ <sup>c</sup> ᓴᑐᑦᑕᐅᔭᓂᑦᓯᒪᒻᑦ	10 L/day	Greywater is disposed of by soil leaching, at least 31 meters from the high water mark.	Most waste is incinerated in an incinerator. Sewage is buried in pits, at least 31 m from the nearest high water mark. Glass, metal, ash from incinerated waste, and other non-combustible waste is shipped to Cambridge Bay, Nunavut or Saskatoon, Saskatchewan for disposal or recycling.

$$A^{\alpha} B^{\beta} C^{\gamma} D^{\delta} E^{\epsilon} F^{\zeta} G^{\eta} H^{\theta} I^{\iota} J^{\kappa} K^{\lambda} L^{\mu} M^{\nu} N^{\xi} O^{\pi} P^{\rho} Q^{\sigma} R^{\tau} S^{\upsilon} T^{\omega} U^{\phi} V^{\chi} W^{\psi} X^{\eta} Y^{\theta} Z^{\iota}$$

Land: Impact is minimal, and almost entirely restricted to 1-2 hectares at each Research Station. Restoration plans are to remove all evidence of habitation once research projects are complete. Aircraft landing strips at Karrak Lake are on ice only and therefore land is not damaged; at Perry River the airstrip (mud flat) is marred with tire tracks (and not all are ours), but little vegetation exists in this habitat. Water: Water is used for domestic purposes only, and grey water is disposed by soil leaching. Minimal gas/oil from boating activities is deposited into Karrak Lake and nearby Adventure Lake, as fuel tanks are filled on shore. Spill kits are located at each fuel cache. Flora: Some disturbance to flora is limited to 1-2 hectares at each Research Station, as pits are dug for disposal of sewage. Pits are backfilled with soil, and vegetation colonizes these areas within 5 years. Minimal impact. Vegetation sampling for research activities is largely observational (non-destructive). Wildlife: Geese avoid nesting within 100 m of Research Stations. Garbage is incinerated regularly, to avoid attracting bears. Travel by boats and snowmobiles likely disturbs wildlife, but temporarily. Air: Incineration of domestic garbage at Research Stations expels minimal pollutants.

# **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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We propose to be within the Ahiak Migratory Bird Sanctuary staying at an established research station with wildlife biologists present at all times. We will do all we can to avoid wildlife, and our work will not involve wildlife in any way.

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We will be working in a ross's goose colony, and will take care to minimize disturbance. Among the species listed on Species at Risk include wolverines, buff-breasted sandpiper, grizzly bears - we will take care to avoid these species. We will avoid caribou herds.

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There are documented archeological sites in the Ahiak Migratory Bird Sanctuary, but we will avoid these sites.

### Miscellaneous Project Information

[illegible]

We are working in a migratory bird sanctuary with many geese - our work is non-invasive and we will avoid wildlife. We will not be present during their breeding season which should minimize our impact. We anticipate having a positive impact on the community by hiring an assistant from the local community as a guide. We have indicated a positive impact on human health because we are studying the long term stability of bird populations that can inform questions regarding food security in northern communities.

## Cumulative Effects

Personnel conducting research activities may disturb wildlife, including species at risk, but care is taken to disturb all wildlife as little as possible. Researchers avoid working in the bird colonies during the light goose hatching period to avoid disrupting dispersing goslings and their parents. Research Stations can act as attractants for grizzly bears, so areas are kept tidy and garbage is incinerated regularly (and stored in closed buildings until incinerated, if required).



## Impacts

$\mathcal{L}(\mathcal{A}) \cap \mathcal{L}(\mathcal{B}) = \mathcal{L}(\mathcal{A} \cap \mathcal{B})$

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																

$$(P = \langle b \rangle \Delta_P \cap \langle a \rangle^c)^c, N = \langle b \rangle \Delta_P' \setminus \langle D \rangle \langle a \rangle^c \setminus \langle \langle D \rangle' \setminus P \rangle^c \langle D \rangle \langle a \rangle^c, M = \langle b \rangle \Delta_P' \setminus \langle D \rangle \langle a \rangle^c \setminus \langle \langle D \rangle' \setminus P \rangle^c \langle D \rangle \langle a \rangle^c, U = \langle b \rangle \Delta_P' \setminus \langle D \rangle \langle a \rangle^c \setminus \langle \langle D \rangle' \setminus P \rangle^c \langle D \rangle \langle a \rangle^c)$$

1	polygon	Ahiak Migratory Bird Sanctuary
2	polygon	Icebreaker Colony
3	polygon	Cambridge Bay and region

- |   |         |                                |
|---|---------|--------------------------------|
| 1 | polygon | Ahiak Migratory Bird Sanctuary |
| 2 | polygon | Icebreaker Colony              |
| 3 | polygon | Cambridge Bay and region       |