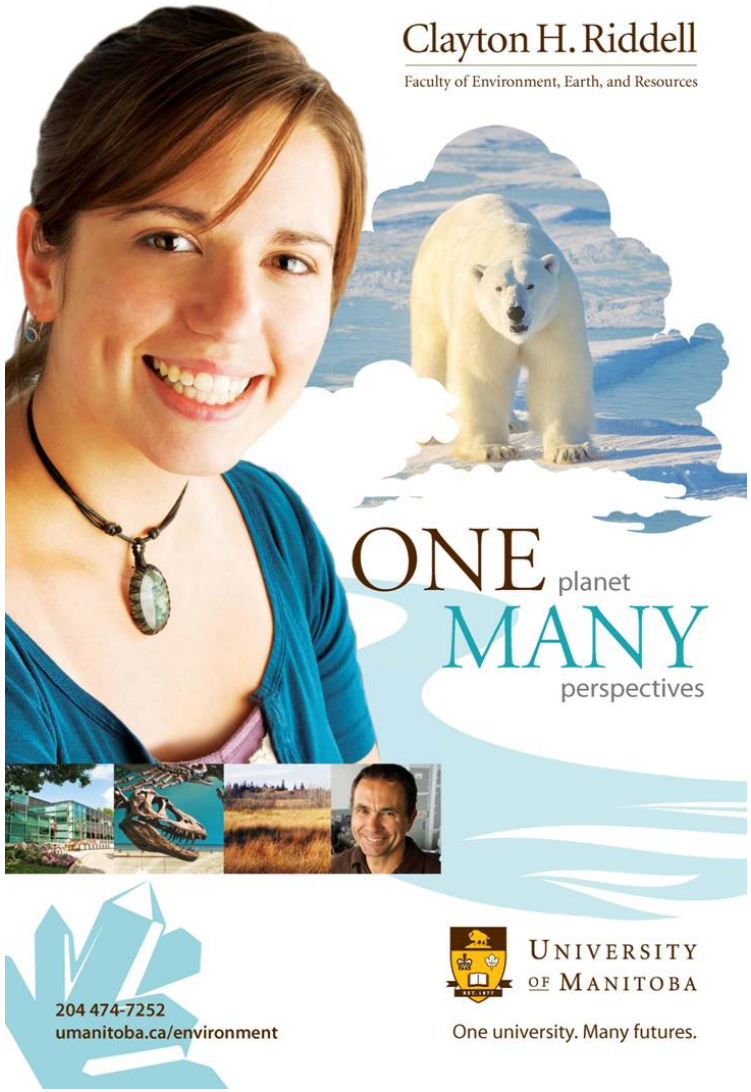


Overview of Projects and Facilities in Support of ASP Collaborations

The Centre for Earth Observation Science (CEOS)

University of Manitoba
Winnipeg, MB, Canada

Arctic Science Partnership
Science Meeting
3-4 Nov., 2020

Research Chairs

David Barber (CRC-1 Arctic System Science)
Eric Collins (CRC-2 Arctic Microbial Ecosystems)
Dorthe Dahl-Jensen (CERC Glacier-marine coupling)
Søren Rysgaard (CERC-L Arctic marine biogeochemistry)
Julienne Stroeve (C-150 Remote Sens. Sea Ice and Climate)
Nicole Wilson (CRC-2 Community resilience)
Wang, Feiyue (CRC-1 Arctic marine chemistry)
TDB (CRC-2 Arctic System Science)

Other Core Faculty

Karen Alley - Glacier-Marine Coupling
Igor Dmitrenko - Phys. Oceanography
Jens Ehn - Phys. Oceanography
Mostafa Fayek - Isotope Geochem
John Hanesiak - Meteorol. & Storms
Mark Hanson - Ecotoxicology
John Iacozza - Marine mammals
Dustin Isleifson - Remote sensing (sea ice)

Other Core Faculty Continued

Zou Zou Kuzyk – Carbon biogeochem.
Lisa Loseto – Beluga Co-Mngmt & Ecosys. health
CJ Mundy – Ecosystem Dynamics (lower troph.)
Juliana Marsden – Phys. Oceanog. (modelling)
Jill Oaks – Inuit TEK
Tim Papakyriakou - Carbon Biogeochem & Flux
Gary Stern – Contaminants and Ecosys. Health

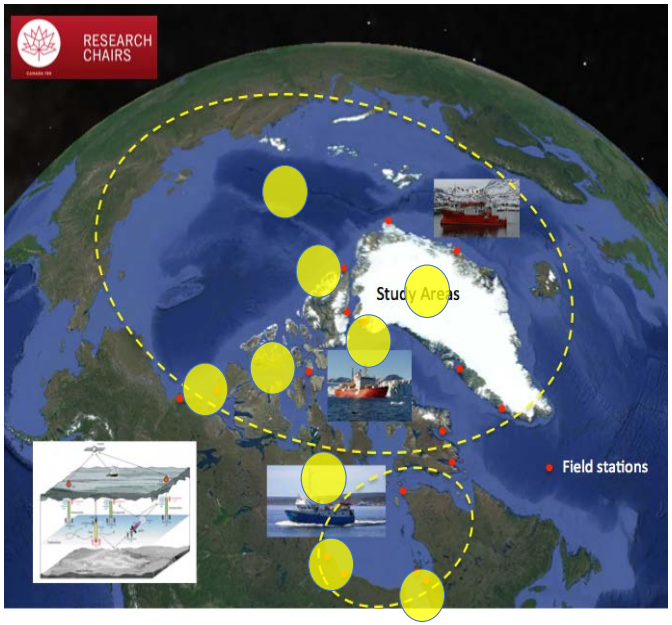
Totals
23 Faculty
19 MSc, 22 PhD, 20 RA,
6 PDF, 9 Techs, 4 Office staff

Outline:

- Update on CERC and C150 Chairs
- BaySYS Wrap-up
- New Faculty
- Other Projects
- On the horizon – Proposals in Review

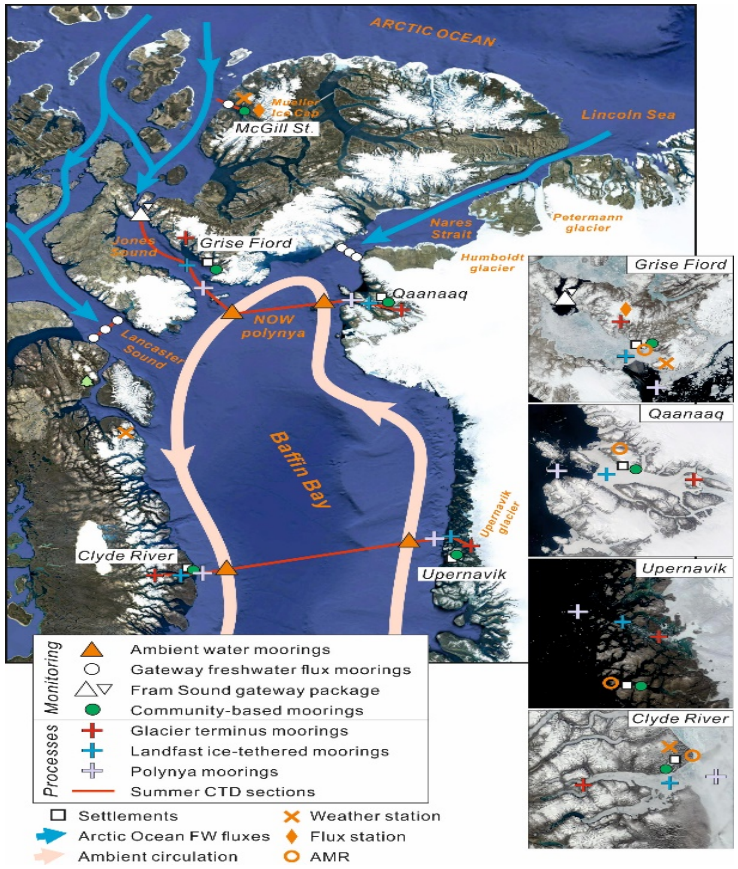
CEOS Major Science Themes and locations:

- Glacier-, freshwater- and marine-coupling
- OSA coupled systems
- Oil spills, contaminants and ecosystem health
- Physical-biological coupling & ecosystem dynamics
- Biogeochemical cycles
- Climate connections, meteorology & extreme weather
- Remote sensing of ocean and ice
- Arctic governance, co-management and indigenous peoples



Canada Excellence Research Chair (CERC) in *Arctic Ice, Freshwater-Marine Coupling and Climate Change*.

- Muellers Ice Cap and Marine Program
- CFI Baffin Bay Observing System
- UM/Canada member of the EGRIP program
- Ice and Climate group being established



CFI: Infrastructure Request for a Baffin Bay Observing System (BBOS)

Baffin Bay is one of the most productive marine systems in the Northern Hemisphere and represents an important connection between the Arctic Ocean and the North Atlantic. Baffin Bay is also an Inuit homeland and an important site for cultural resources and coastal interactions. Pikialasorsuaq (refers to the North Water Polynya region in the Greenlandic language)[6] in the northern Baffin Bay has just been acknowledged as a co-management area and is the focus of the BBOS program.

STATUS – waiting for verdict ☺

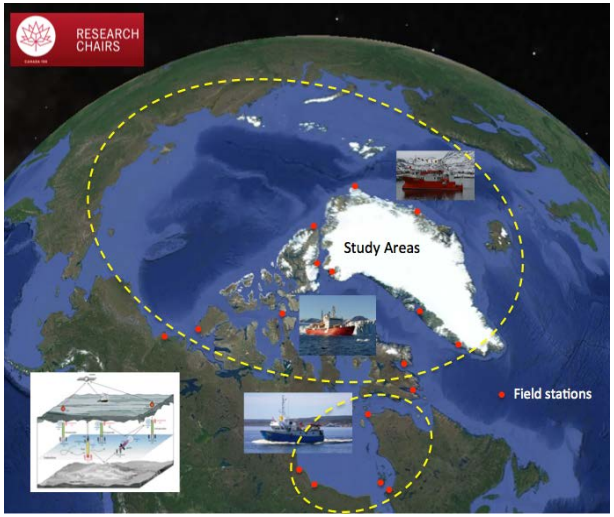
Müllers Ice Cap & Glacier Marine Coupling

Müeller's Marine and Community Exchange Program

Try again for Spring & Summer 2021

Working with ICC and Oceans North along with Grise Fiord to plan a Grise Fiord and Qaanaaq Exchange May or Fall 2021. During the exchange there will be a research and monitoring workshop.

Canada 150 Research Chair in Climate-Sea Ice Coupling



To improve our understanding of how changes in sea ice contribute to the large-scale coupling of freshwater and the Arctic Ocean, and in turn how these changes influence large-scale weather and ocean circulation patterns, polar ecosystems, marine biogeochemistry, the livelihoods of coastal communities, marine activity, and resource extraction

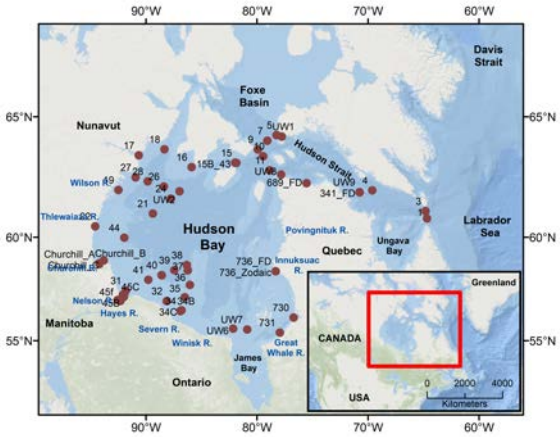
Dr. Julienne Stroeve 

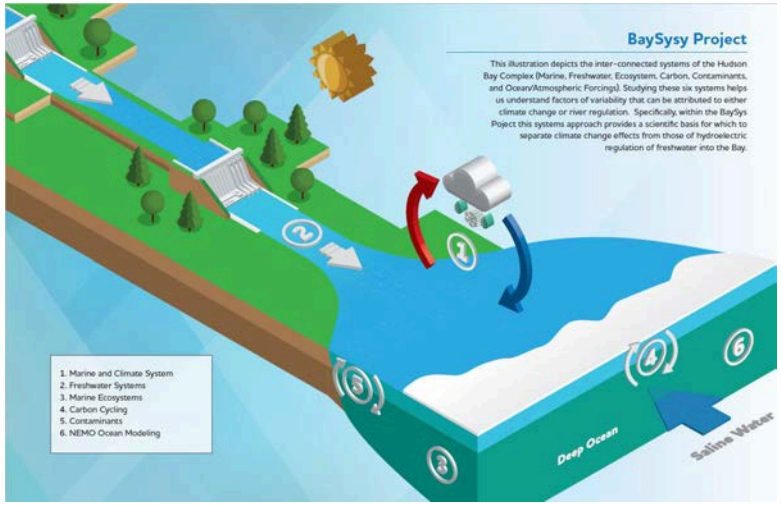
Main Projects

- MW remote sensing of sea ice and snow depth (MOSAIC)
- Rain on snow
- Storms and Storm tracking in the Arctic
- Storm impacts on sea ice and sea ice dynamics
- Mixed layer processes
- Landfast ice
- 2 RAs, 4-post docs, 2 PhDs

NSERC CRD BaySys: Hudson Bay System Study

What are the relative contributions of regulation versus that of climate change on FW-marine coupling in Hudson Bay?





BaySys to wrap up in 2021:

- 138 researchers, including HQP, Faculty and Central Members
- 76 days at sea (Summer 2018 – Amundsen; 2016-2018 Des Gros./Henry Larsen/William Kennedy
- 75 days ice campaign
- 37 publications with 70 others submitted or in-prep

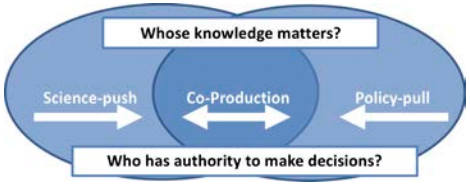
New Faculty:

Nicole Wilson

Projects:

Arctic governance, climate change & Indigenous peoples

- Developing approaches to knowledge co-production that support Indigenous self-determination in the context of environmental change and governance.



https://umanitoba.ca/faculties/environment/departments/geography/staff/1585.html

Juliana Marson

Research interests: Ocean modelling; ocean-cryosphere interactions; polar oceans and climate change

Specifics

- Dispersion, fate, and impacts of **freshwater** on Polar oceans' dynamics, water properties, sea ice condition, and biogeochemical cycles
- **Iceberg modelling**: trajectories, role as freshwater and nutrient sources, forecasting

New Faculty:

Eric Collins

Arctic Marine Microbial Ecosystem Services

- understand the origin, evolution, distribution, and function of microorganisms in the cryosphere, including bacteria, archaea, algae, protists, fungi, and viruses.

https://umanitoba.ca/faculties/environment/departments/ceos/people/1558.html

Lisa Loseto (DFO)

Cumulative impacts of multiple stressors – species to ecosystem

Specifics

- **Knowledge co-production research**
- **Beluga health research**
- **Beluga habitat**
- **Marine protected areas**

https://umanitoba.ca/faculties/environment/departments/ceos/people/lloseto.html
https://profils-profiles.science.gc.ca/en/profile/lisa-l-loseto

of Manitoba

Relatively New to CEOS:

Mark Hanson

Response of organisms (aquatic plants and invertebrates) to various stressors – ecosystem-level risk prediction in response to toxicant exposure or change in water quality

Specifics

- Characterizing Wastewater Contaminants and their Effects - Ongoing work in Iqaluit and Baker Lake, NU
- Monitoring for pharmaceuticals and microbial pathogens in wastewater influenced surface waters (fresh and marine).
- Delineating effects along wastewater streams in fish and macrobenthos

http://umanitoba.ca/faculties/environment/departments/geography/staff/Hanson.html

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Other Projects: MPRI (2018–2022)

Multi-Partner Research Initiative on Marine Oil Spill Research & Response

- **Program:** Government of Canada, 2018–2022, $45M
- **Objectives:** To support collaboration among leading national and international experts on oil spill research and response to support science-based decisions and develop new technologies and protocols to minimize the environmental impacts of oil spills in offshore waters and enhance habitat recovery
- **ASP involvement:**
  - Program Area Lead: CEOS (Wang)
  - Participants: CEOS (Stern), AU (Rysgaard, Vergeynst)

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Other Projects: MOBE (2020–2022)
(MPRI Offshore Burn Experiment)

- **Program:** MPRI (Canada), 2020–2022, $4.5M cash + $5.5M in-kind
- **Objectives:** To carry out a full-scale, field experiment on novel in situ burning (ISB) technologies to 1) bring these technologies closer to commercial readiness and public acceptability; and, 2) train first responders and the next generation of highly qualified personnel in carrying out ISB operations in response to oil spills in offshore waters.
- **ASP involvement:**
  - Led by CEOS (Wang)
  - Participants: AU (Fritt-Rasmussen)
- **Field trials:** ~July/August, 2021

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Other Projects: Characterizing the light climate of various coastscapes in the Arctic and its impact on kelp distribution

- Collaboration of M. Sejr, C.J. Mundy and the members of the ACCES biodiversity project (lead PI: J. Soreide)

https://www.acces-arctic.com

- *Objective*: Characterize key processes influencing PAR availability across varying coastscapes, including fjords, estuaries, rocky coasts, and barrier island lagoon systems
  - Datasets will be derived from interannual datasets of moored PAR sensors across different coasts, including data from Young Sound and Hudson Bay
  - Plan to host a small focused writing meeting in Fall 2021 (TBD) – partially sponsored by UM CERC and individual research grants, information to follow

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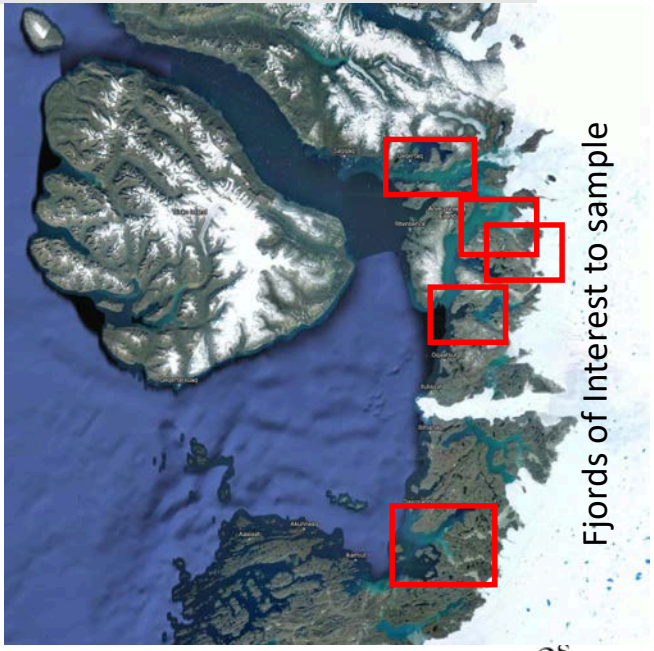
Other Projects: Disko Bay case study of kelp as integrators of light and nutrient availability

- Collaboration of C. Mundy and M. Sejr – sponsored by UM CERC and individual research grants
- *Objective*: Contrast kelp depth distribution, photophysiology, and biochemical composition between marine- and land-terminating glacial fjords as a function of PAR and nutrient availability

- **Problem** - plan is to rent *RV Polarsid* for 10 days summer 2021, but not guaranteed (2020 bookings moved to 2021). If booking is possible, 2-3 berths would be open for others to join cruise.
- Question - is there interest of others to join and perhaps look to use the *RV Sanna*?



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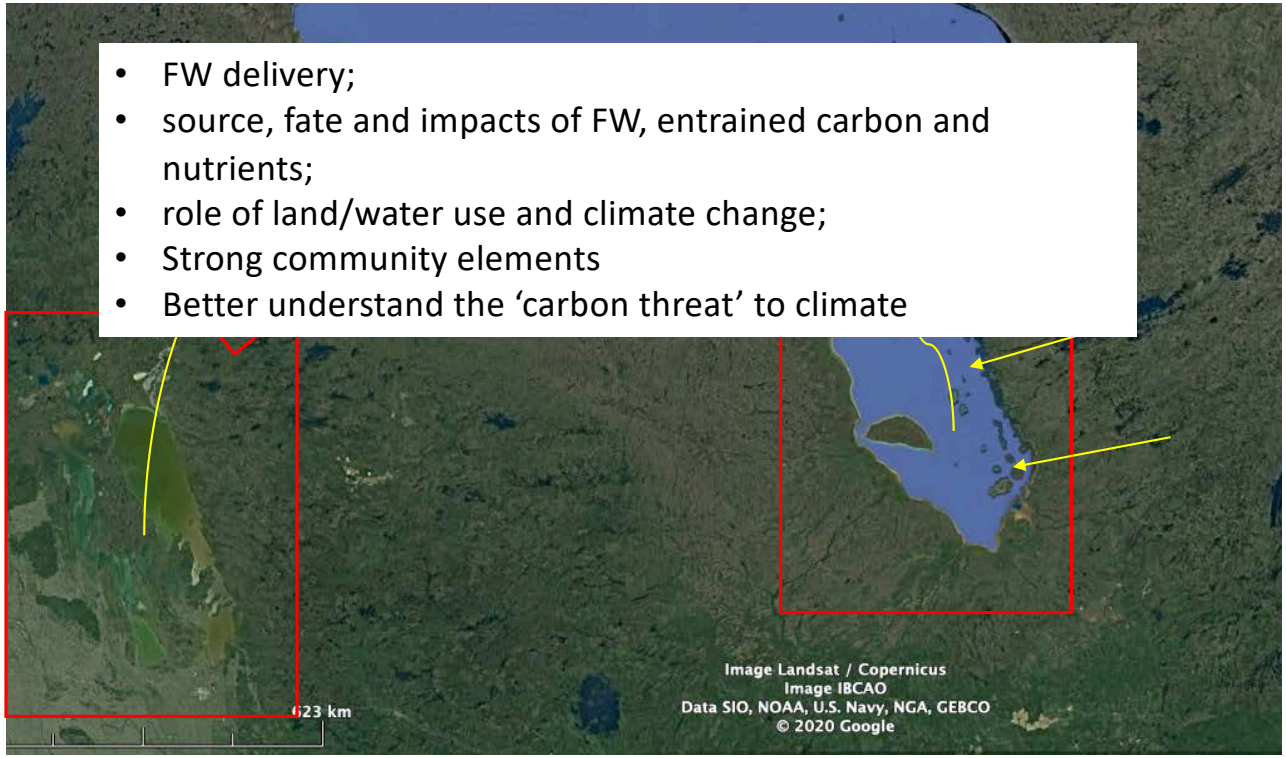
Other Projects: Aquatic Continuum – Land, Rivers and Coastal Ocean



- FW delivery;
- source, fate and impacts of FW, entrained carbon and nutrients;
- role of land/water use and climate change;
- Strong community elements
- Better understand the 'carbon threat' to climate

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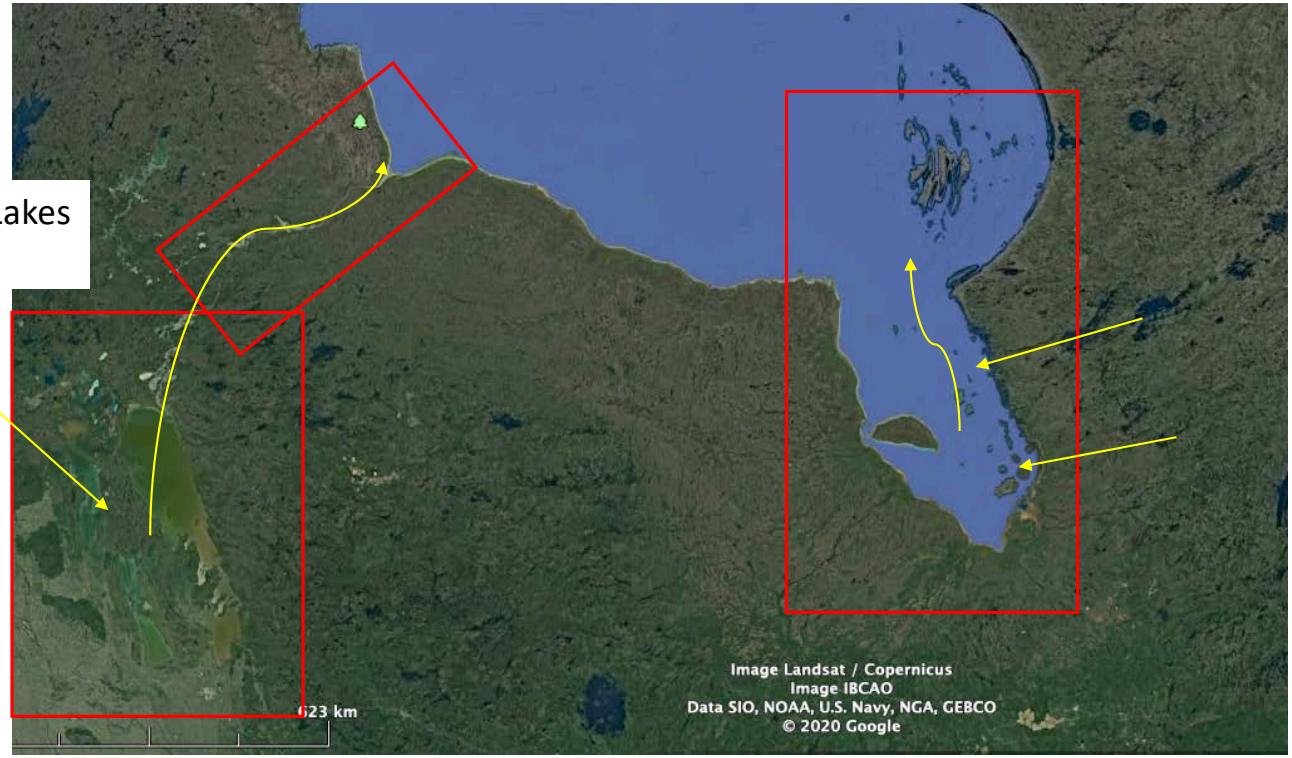
Other Projects: Aquatic Continuum – Land, Rivers and Coastal Ocean

Manitoba Great Lakes
Barber P.I.



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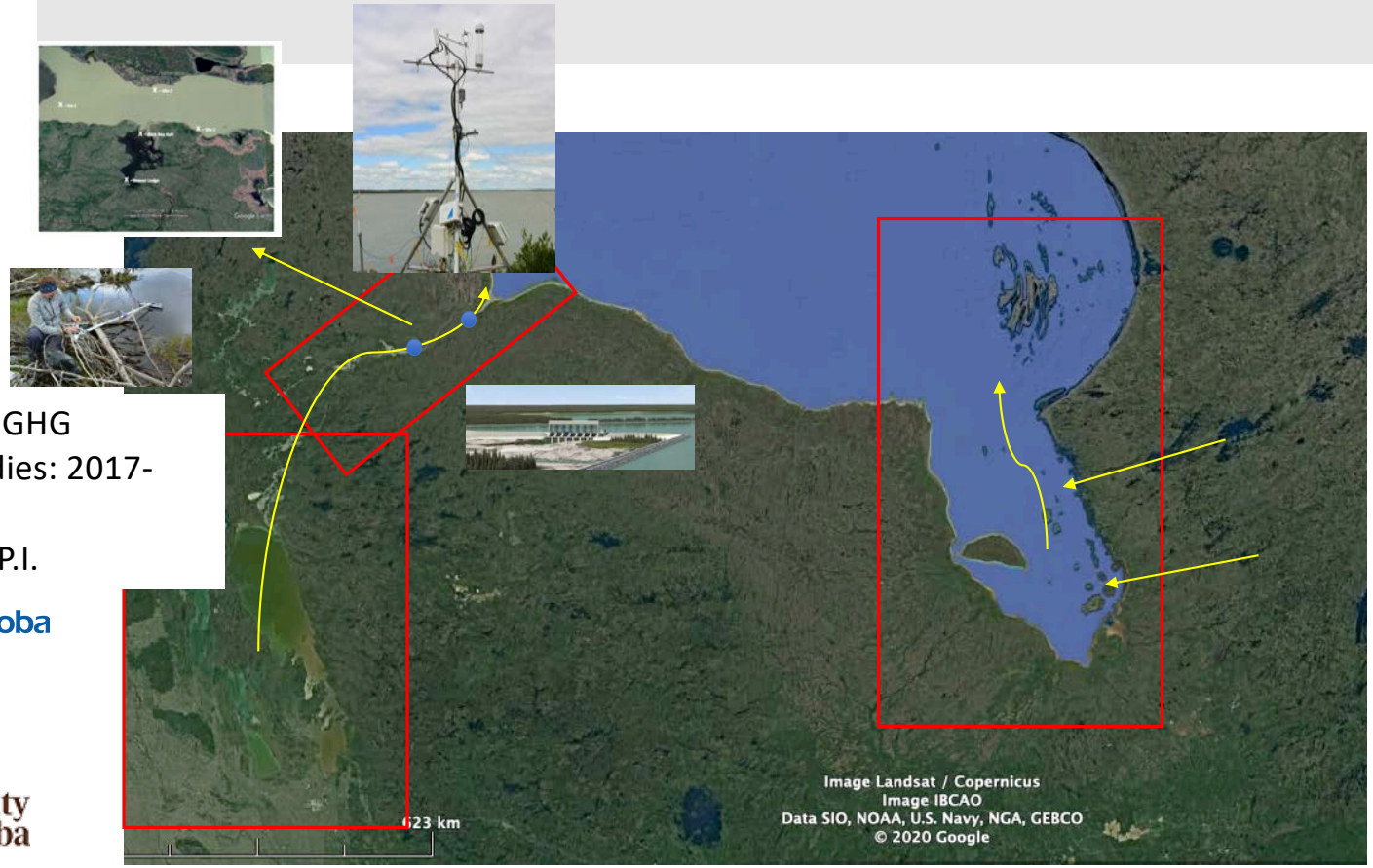

Lower Nelson GHG Reservoir Studies: 2017-2022

Papakyriakou P.I.

Manitoba Hydro

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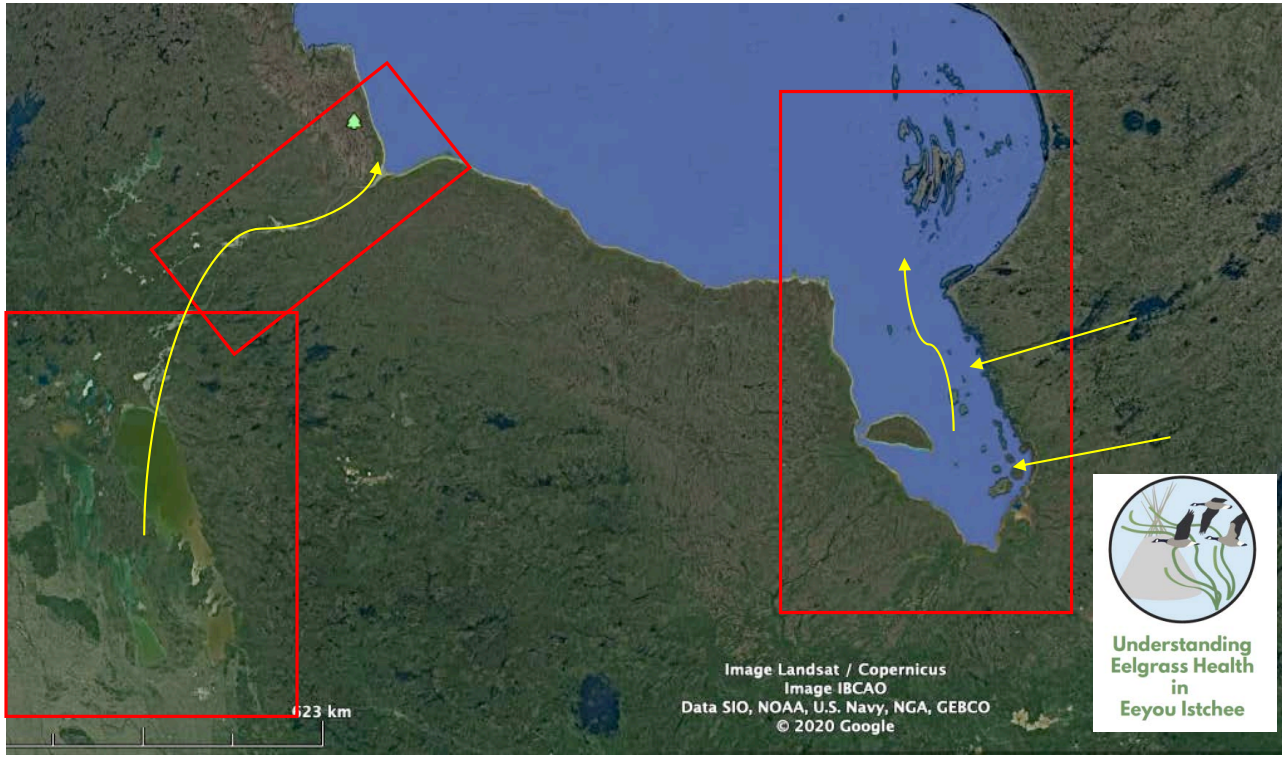

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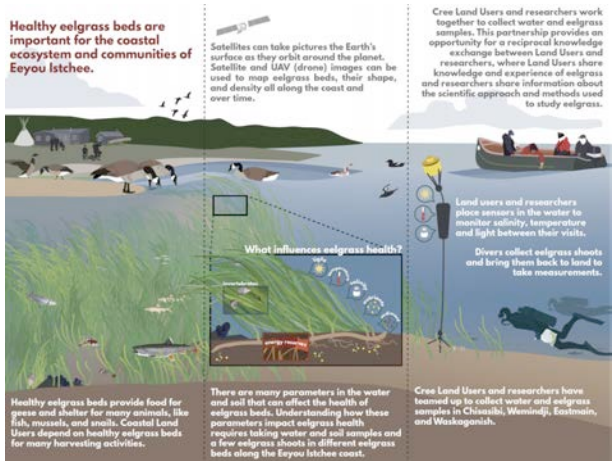
Comprehensive Research Program on Coastal Habitat of Eeyou Istchee (eastern James Bay)

- Multi-university consortium addressing two questions
  - What are the main factors affecting eelgrass health along the east coast of James Bay?
  - What is the impact of the current state of eelgrass on waterfowl presence and thus Cree hunting?
- PIs Ehn and Kuzyk
  - Moorings, water sampling
  - AUV side-scan sonar
    - collaboration with Rysgaard/W. Boone



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North

Cree partners keep large-scale eelgrass research on track during pandemic

All-Cree team retrieves 'priceless' data from the bottom of James Bay

Susan Bell · CBC News · Posted: Sep 23, 2020 4:00 AM CT | Last Updated: September 23

Wemindji diver Henry Stewart was a key member of an all-Cree team that stepped in when COVID-19 travel restrictions kept southern researchers away. (Submitted by Henry Stewart)

An all-Cree team of partners has stepped in to salvage a key year of data collection in a large, multi-year research project looking at changes in the coastal habitat of James Bay.

The Coastal Habitat Comprehensive Research Program began in 2017 and aims to combine traditional knowledge with science, to better understand environmental changes happening in the bay. Cree hunters have for decades been reporting a dramatic decline in eelgrass beds in the area and dwindling numbers of Canada geese that feed on the grasses. The geese are also a staple in the Cree diet.

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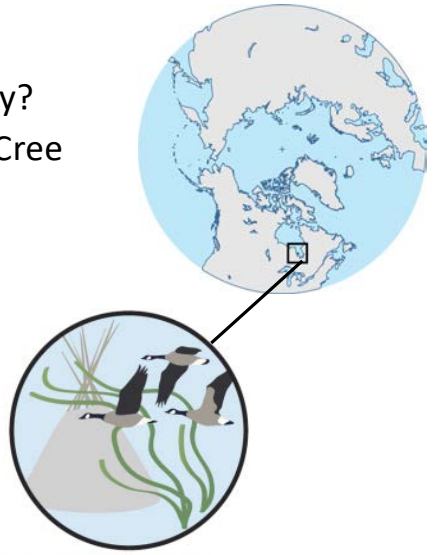

Understanding Eelgrass Health in Eeyou Istchee

https://www.cbc.ca/news/canada/north/cree-eelgrass-ocean-research-geese-traditional-knowledge-1.5734572

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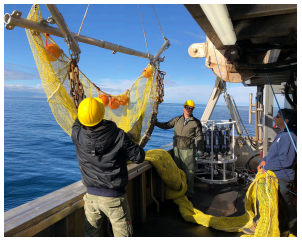
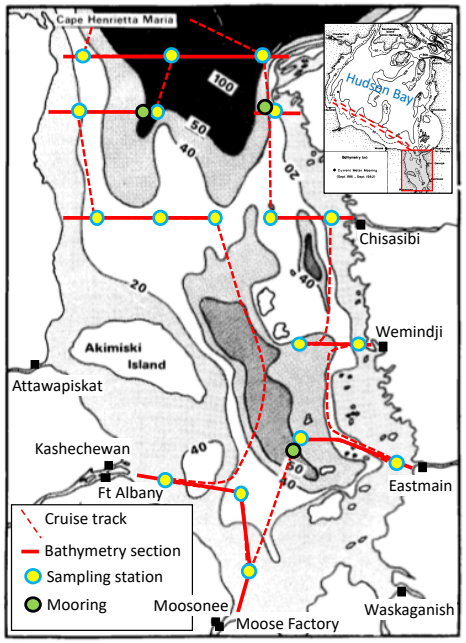
On the Horizon: James Bay Expedition – summer/fall 2021, summer 2022

- *Lead PIs*: C. Mundy, Z. Kuzyk, J. Ehn, C. Gueguen, P. Archambault, T. Papakyriakou
- *Funding*: NSERC Ship Time (Applied), Oceans North (NGO), ArcticNet, individual research grants
- *Objective*: Update our knowledge of the oceanography of James Bay with emphasis on circulation and riverine freshwater distribution, biogeochemistry/carbon cycling, benthic biodiversity, and productivity at the base of the food web
- *Plan*: Aboard *MV William Kennedy,* 24 days in 2021 and 9 days in 2022 for mooring recovery





On the Horizon:TransARCTIC (proposal under review)

(Co-developing knowledge and technologies to detect, reduce, and mitigate marine transportation-related hazards in a rapidly opening Arctic)

- **Program:** New Frontiers in Research Fund – Transformation (Canada). 2021–2027, $24 M in total
- **Objectives:** To co-develop new knowledge to inform policy and to co-develop new technologies that are appropriate and accessible to Indigenous peoples, ship operators, and other decision-makers in order to detect, reduce, and mitigate marine transportation-related hazards in the Eastern Canadian Arctic (including Hudson Bay) and in the Arctic Ocean in general.
- **ASP involvement:**
  - Led by CEOS (Wang)
  - Participants: GINR, AU, AWI, …

On the Horizon: GENICE II: Reimagining Monitored Natural Attenuation as an Oil Spill Response Strategy in the Arctic

2020 LARGE-SCALE APPLIED RESEARCH PROJECT COMPETITION:
GENOMIC SOLUTIONS FOR NATURAL RESOURCES AND THE ENVIRONMENT
Lead - Gary Stern and Eric Collins – Co-lead

- Propose to use metagenomics, metabarcoding, mass spectrometry, and high-sensitivity remote sensing techniques to develop a mechanistic understanding of natural attenuation in the Arctic, and social, policy, and economic research to further develop an understanding of Monitored Natural Attenuation (MNA) as a rational response strategy for oil spills.
- One of 18 pre-proposals requested to move to the full proposal stage (Due to Genome Canada early January 2021)
- $6M over 4 years (October 2021-September 2025).
- 9 of 18 will be funded so 50% chance of success.

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On the Horizon: Arctic coastal community-based prediction of oil biodegradation potential using real-time DNA sequencing and machine learning

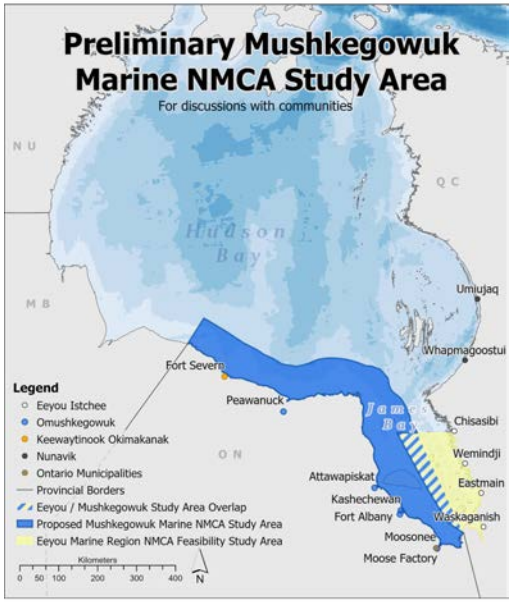
- NSERC New Frontiers Research Foundation -- Exploration -- $200k -- 2020--2022
- Goal is to conduct microbial genomics work at CMO using portable handheld DNA sequencers
- Funds for Community-Based Monitoring program to train local communities to use the technology to assess impact of oil spills
- Lead PI: Eric Collins, Co-lead: Gary Stern

On the Horizon: Air-Sea Ice-Ocean Interaction in Polar Systems (ASIOPolar)

- NSERC New Frontiers Research Foundation – Global 2020 -- $125k -- 2021-2023
- Canadian contribution for Horizon 2020 ASIOPolar
  - Better understand process feedbacks between the Arctic coastal seas, sea ice and the atmosphere as they affect and are affected by climate
- Lead PI: Papakyriakou, Co-lead: Wang

On the Horizon: Mushkegowuk Cree Community-Based Climate Action

- **Federal Climate Action and Awareness Fund**
- **Community-led** proposal
  - 5-year study partnering with CEOS (Kuzyk, Ehn, Mundy, Papakyriakou)
  - Engage 8 communities (~10,000 Crees)
  - Traditional territories include a large proportion of the HBL (2nd largest contiguous peatland)
  - Marine Environment covers 8,000,000 ha in James and Hudson Bays
  - Premise: *Canada and the world cannot meet its goals for climate action such as net zero greenhouse gas emissions by 2050 in the absence of a plan to maintain the globally significant carbon stores of the peatlands and blue carbon in our Mushkegowuk Territory*
  - Multiple Objectives to develop a Carbon Guardians Program



Questions?

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