

# Shoreline Mapping in the Arctic

July 2023 – by Valerie Wynja

Landscape Science and Technology Division  
Science and Technology Branch



Environment and  
Climate Change Canada

Environnement et  
Changement climatique Canada

Canada

# Who am I?

**My name:** Valerie Wynja

**I live in:** Ottawa Ontario on the unceded, unsundered Territory of the Anishinaabe Algonquin Nation.

**I work for:** Environment and Climate Change Canada's Science and Technology Branch at the National Wildlife Research Centre

**My job is:** Shoreline mapping for oil spill preparedness (on and off since 2011).



# Goal of our work

We collect baseline shoreline information to support oil spill planning and response in priority areas in Canada.



Shoreline Type



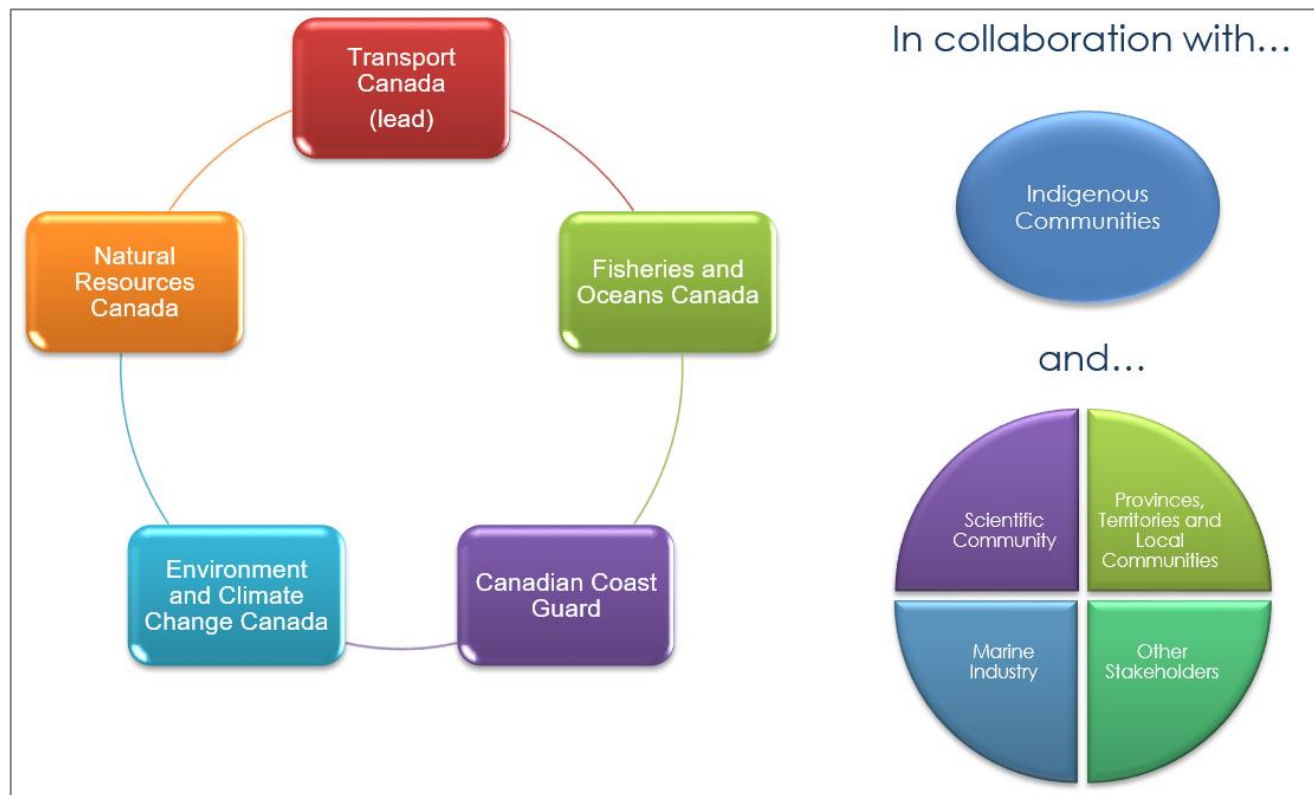
Biological Resources



Human-use Resources

# Oceans Protection Plan 2.0 Initiative

The Oceans Protection Plan 2.0 is an investment made to protect Canada's coasts and waterways.

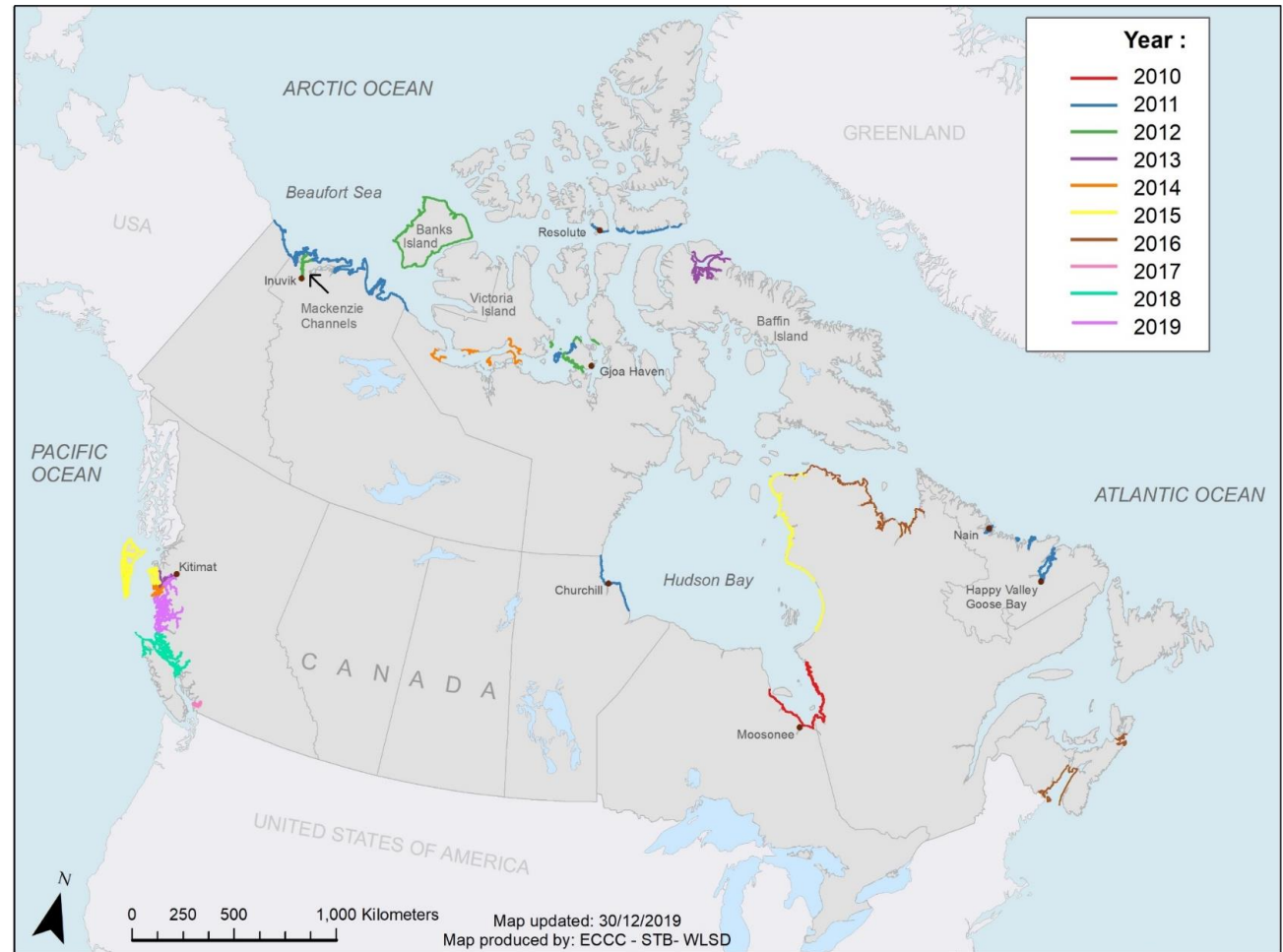




# Information gaps in the Arctic

There are large information gaps in baseline coastal mapping along Arctic shorelines.

Lack of information impacts the ability to respond during an environmental emergency.



# What is the potential impact of an oil spill?

In general, oil spills can affect the ecosystem in two ways: **from the oil itself** and **from the response or cleanup operations**.

## Wildlife

### Direct

- Internal ingestion or inhalation
- External skin and eye irritation
- Smother fish or invertebrates
- Temperature regulation (coats feathers and fur)

### Indirect

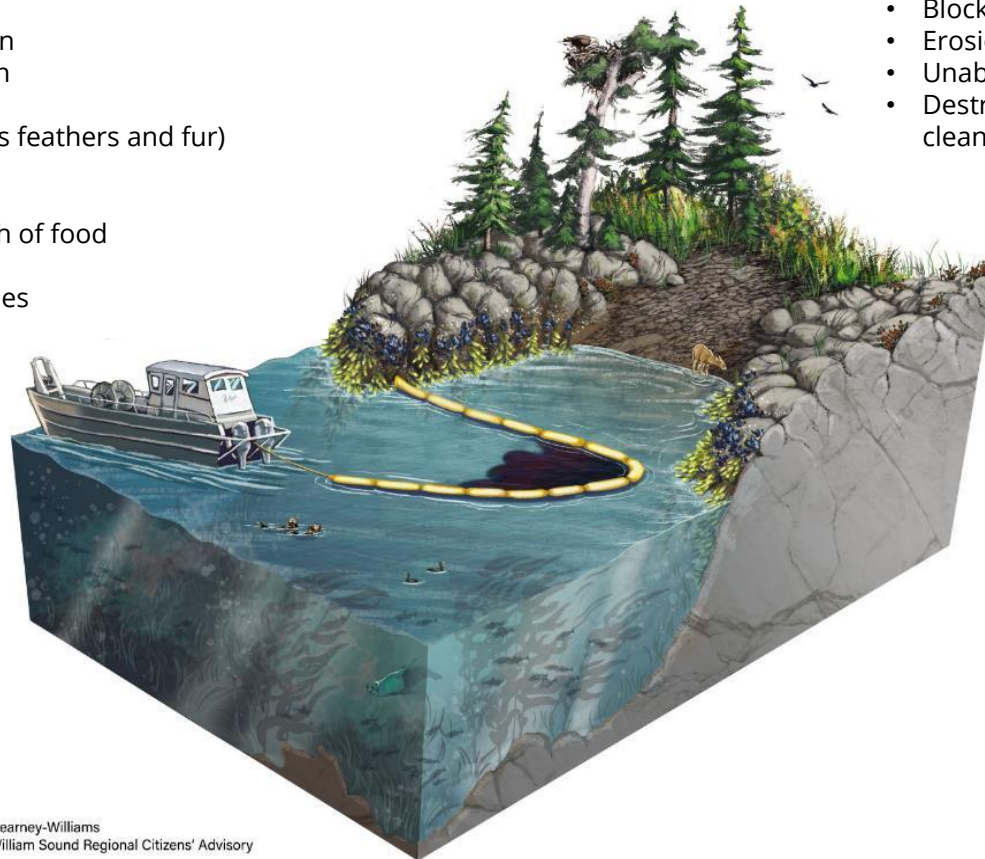
- Relocation of species in search of food
- Increased foraging time
- Disruptions to natural life cycles

## Human

- Impact to food sources
- Decreased air quality
- Impacted cultural sites
- Recreational use

## Environment

- Blocks out the sun's rays
- Erosion and contamination
- Unable to support normal vegetation
- Destruction of environment through cleanup activities



# Effects of oil on coastal habitats

Coastal areas are particularly susceptible to oil pollution. When a large spill drifts ashore, some of the oil may become trapped and can remain for years.

Shoreline impacts are very situation-specific:

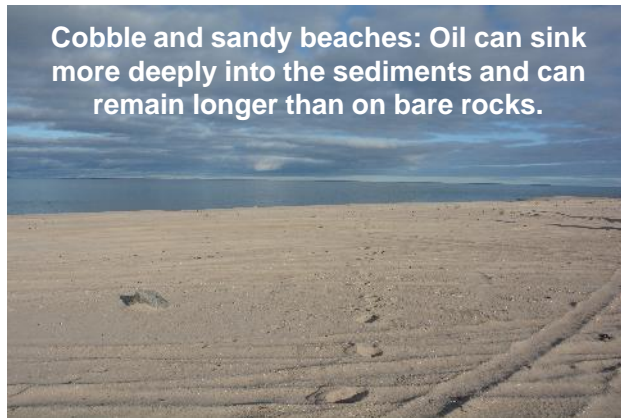
**Rocky shores:** Stranded oil may coat the rocks and gradually harden by weathering into a tough tarry “skin.”



**Tidal flats:** Oil may seep into the muddy bottoms and have long term impacts.



**Cobble and sandy beaches:** Oil can sink more deeply into the sediments and can remain longer than on bare rocks.



**Salt Marshes:** Oil may reduce the population and growth rate of the marsh plants and dependent species.





# We need baseline shoreline information

- To be **prepared** through proactive identification of environmentally sensitive areas
- To support a rapid and efficient **response** to oil spill events
- To perform **effective cleanup** efforts



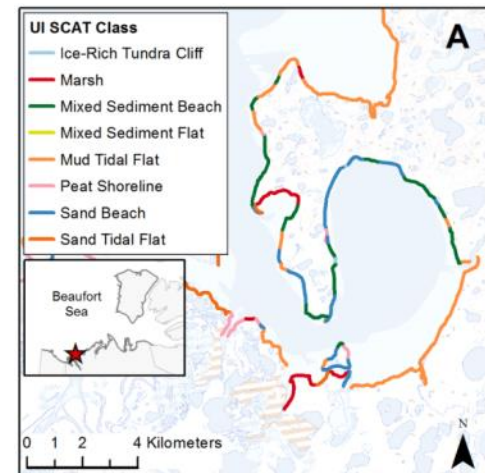
<http://skyshippings.com/images/slides/road.jpg?141264009834>





# What can be done pre-spill?

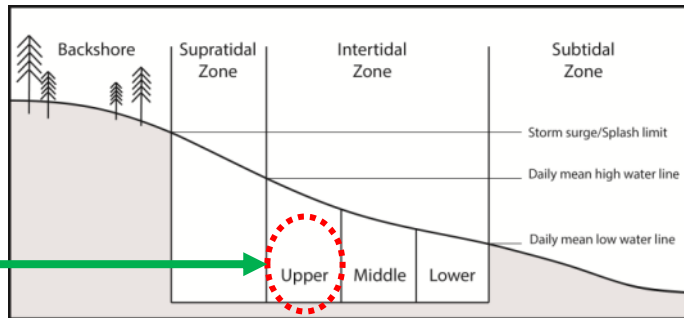
- Pre-spill data collection can be done prior to a spill
  - Provides a detailed shoreline characteristic profile before a spill and enables the identification of sensitive or priority areas
  - Supports effective cleanup efforts by providing a major head-start to cleanup teams
  - Provides baseline information for long-term recovery planning



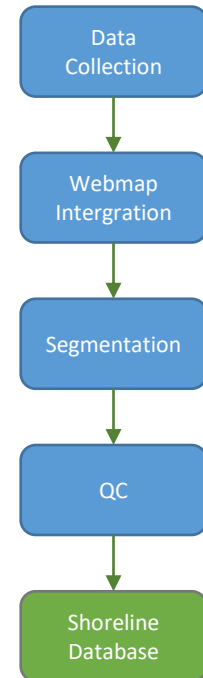
# Low-altitude helicopter surveys

Mapping is based on geotagged-videos and photos from low-altitude helicopter flights

- Spatially referenced: video with x,y coordinates
- Oblique video and photos: 45°



# Shoreline segmentation



Collect baseline information to provide a synthesis of environmental information relevant to the planning and implementation of oil-spill in coastal areas in Canada.



# Shoreline types in Canada

Bedrock Ramp



Bedrock Cliff



Bedrock Platform



Manmade Impermeable



Vegetated Bank



Mud Flat



Boulder Beach



Sand Beach



Glacier Ice



Manmade Permeable



Mixed Sediment Beach



Mixed Sed. Flat



Sand Flat



Pebble Cobble Beach



Peat Shoreline



Sediment Cliff



Wetlands



Mud/Clay Bank



Snow Covered



Tundra Cliff (Ice Rich)



Tundra Cliff (Ice Poor)

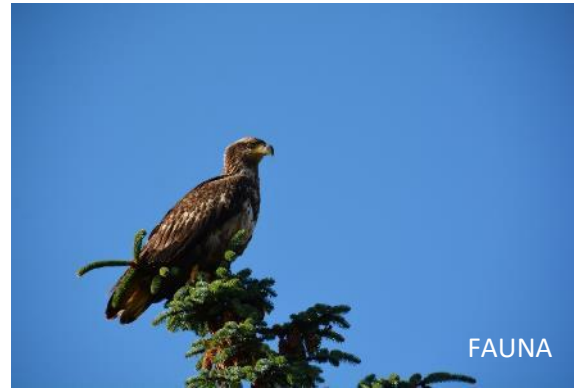
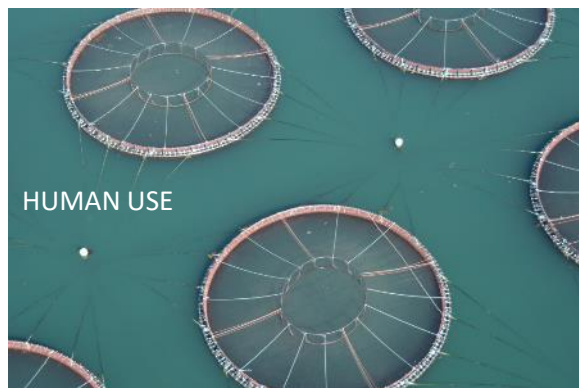
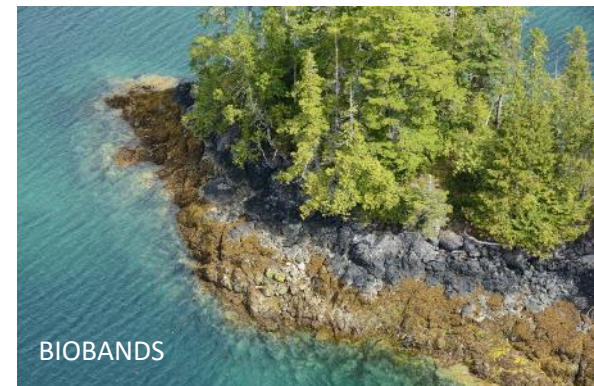


Inundated Low-Lying Tundra



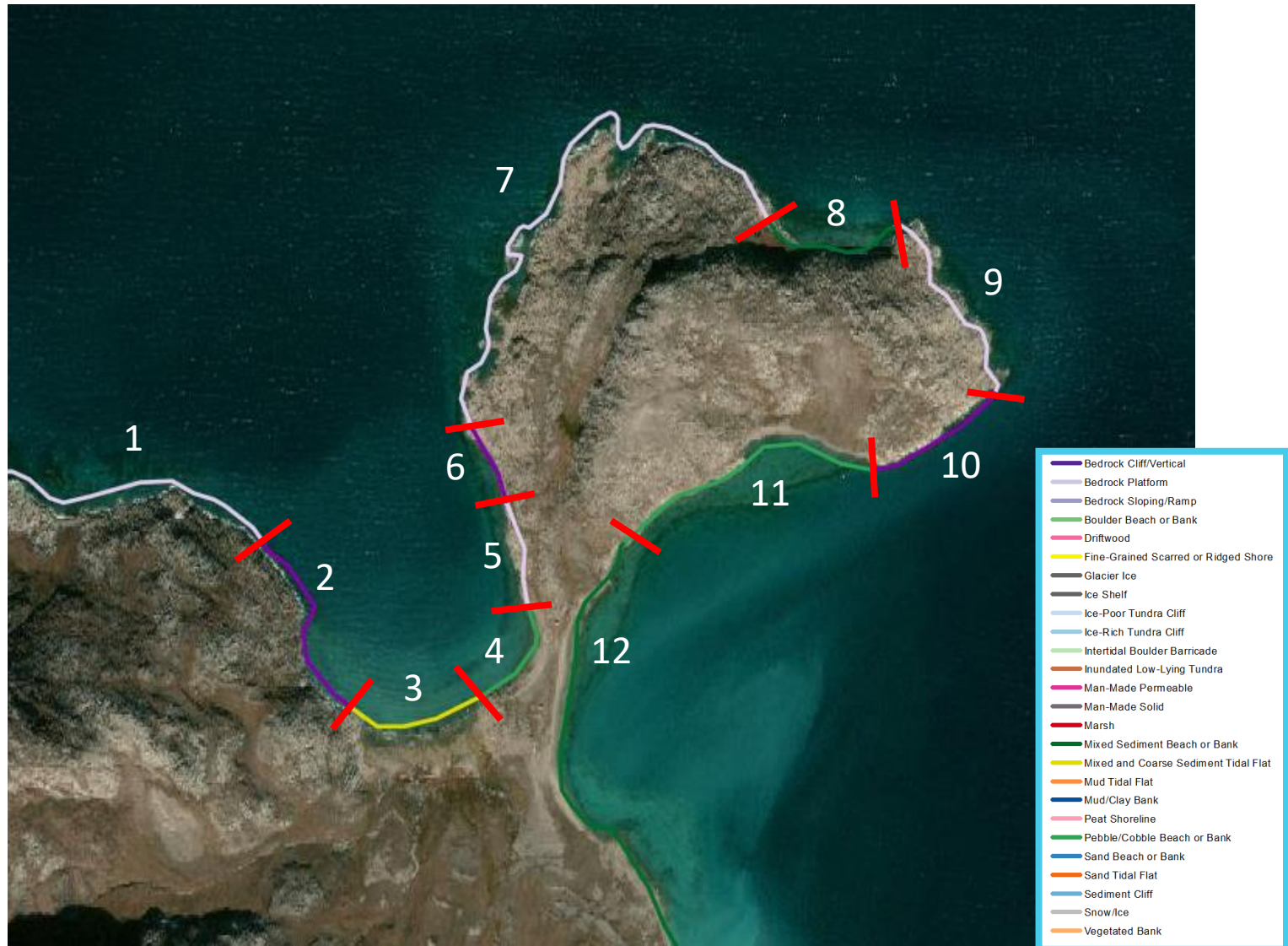


# Baseline Coastal Data





# Shoreline segmentation example



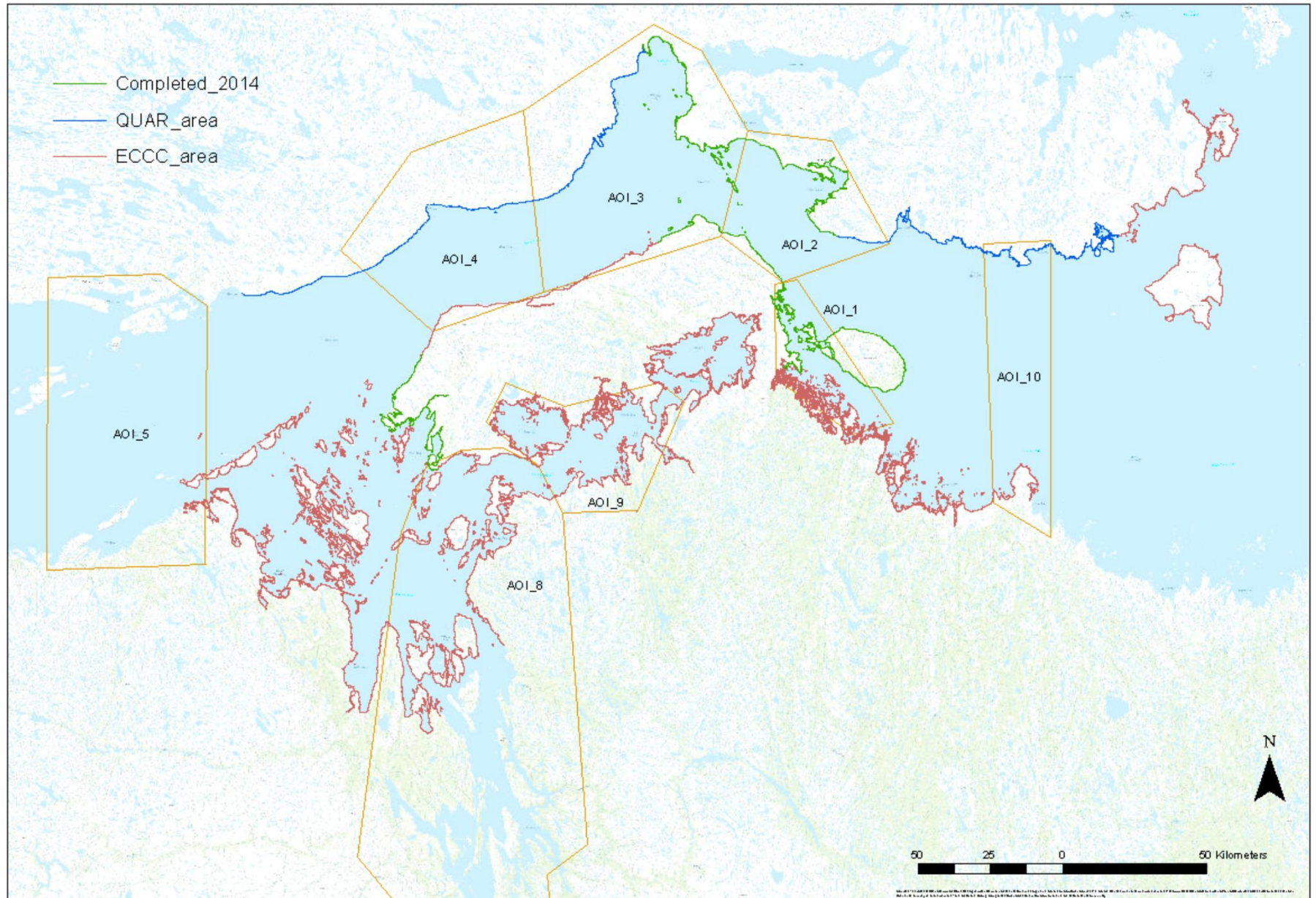
# Summer 2023 Study Areas

- Area around Cambridge Bay:  
August 15-23, 2023
- Area around southern coast of  
Lancaster Sound/Parry Channel:  
September 11-19, 2023





# Priority Areas





# Identifying special areas

- Are there special areas that you would like to see prioritized?
- Are there areas that we should avoid flying due to wildlife or traditional activities taking place on the land during August 15-23<sup>rd</sup>?
- Are there areas that should be analyzed/segmented first?



# What types of data products would be useful for you?

- Shoreline photos
- Shoreline videos
- Classified Vector shoreline layer
- Access to the shoreline viewer
- Other?

# Multiple uses for shoreline dataset

- Assist responders during an incident
  - Identify priority protection and clean-up sites
  - Pre-SCAT knowledge for planning purposes
  - Responsible hydrocarbon development
- Local shoreline planning
  - Coastal development
  - Coastal erosion
  - Species at risk
  - Habitat management
  - Environmental assessments
  - Identification of rare and invasive species
  - Baseline set of information for monitoring change in shoreline features
  - Research site selection



# Thank You!



## Contact Info...

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