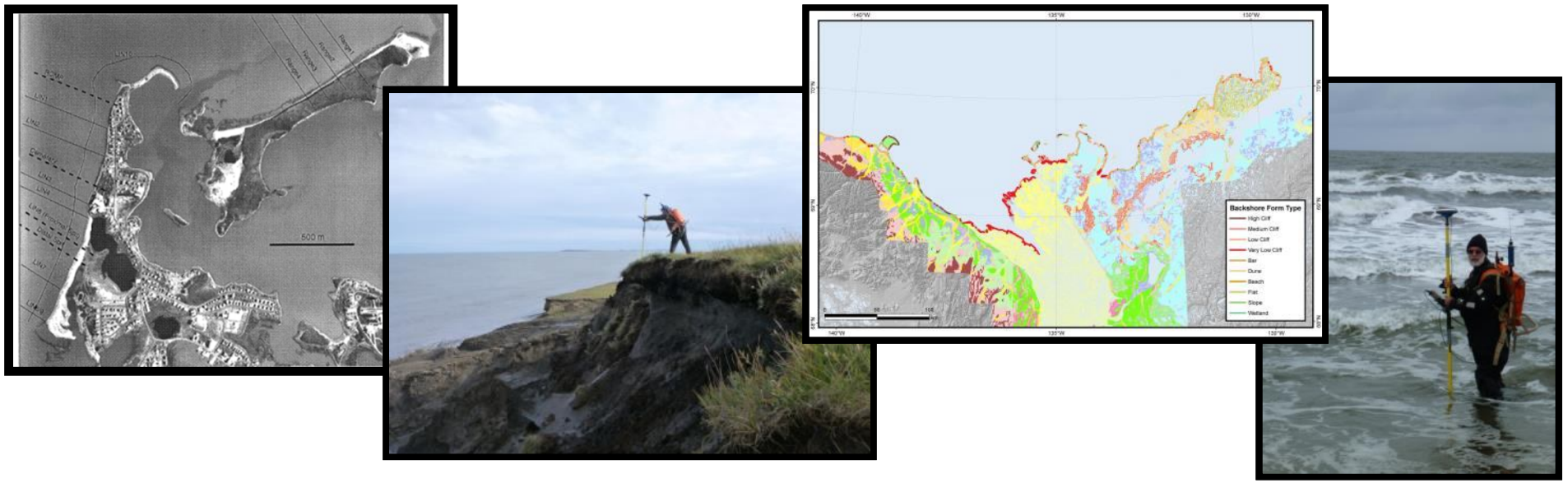
Regional Synthesis of Coastal Geoscience Data

- **findings and observations based on the synthesis of data to support the BREA**



Dustin Whalen, Don Forbes, Paul Fraser, Sheila Hynes, Nicole Couture, Kimberley Jenner, Gavin Manson, Tom James, and Barb Szlavko

Project Focus and Main Drivers

General lack of knowledge of coastal processes on regional scale

General lack of access to coastal knowledge

Oil and Gas Exploration and Development

Dependence on the coastal zone region

Need for ports and safe harbours

Information to support disaster mitigation

Community and other Coastal Infrastructure

Knowledge to support adaption

"Changing climate - - - changing coasts"

Project Deliverables

- ***Spatial Data Inventory (data compilation)***

  coastal monitoring, nearshore and onshore digital elevation models, database of historical photos, historical shoreline vectors from air photos, retreat rates, coastal formation, landforms, and classification.

- ***Update of coastal change assessment (2012 to 2014 field work)***

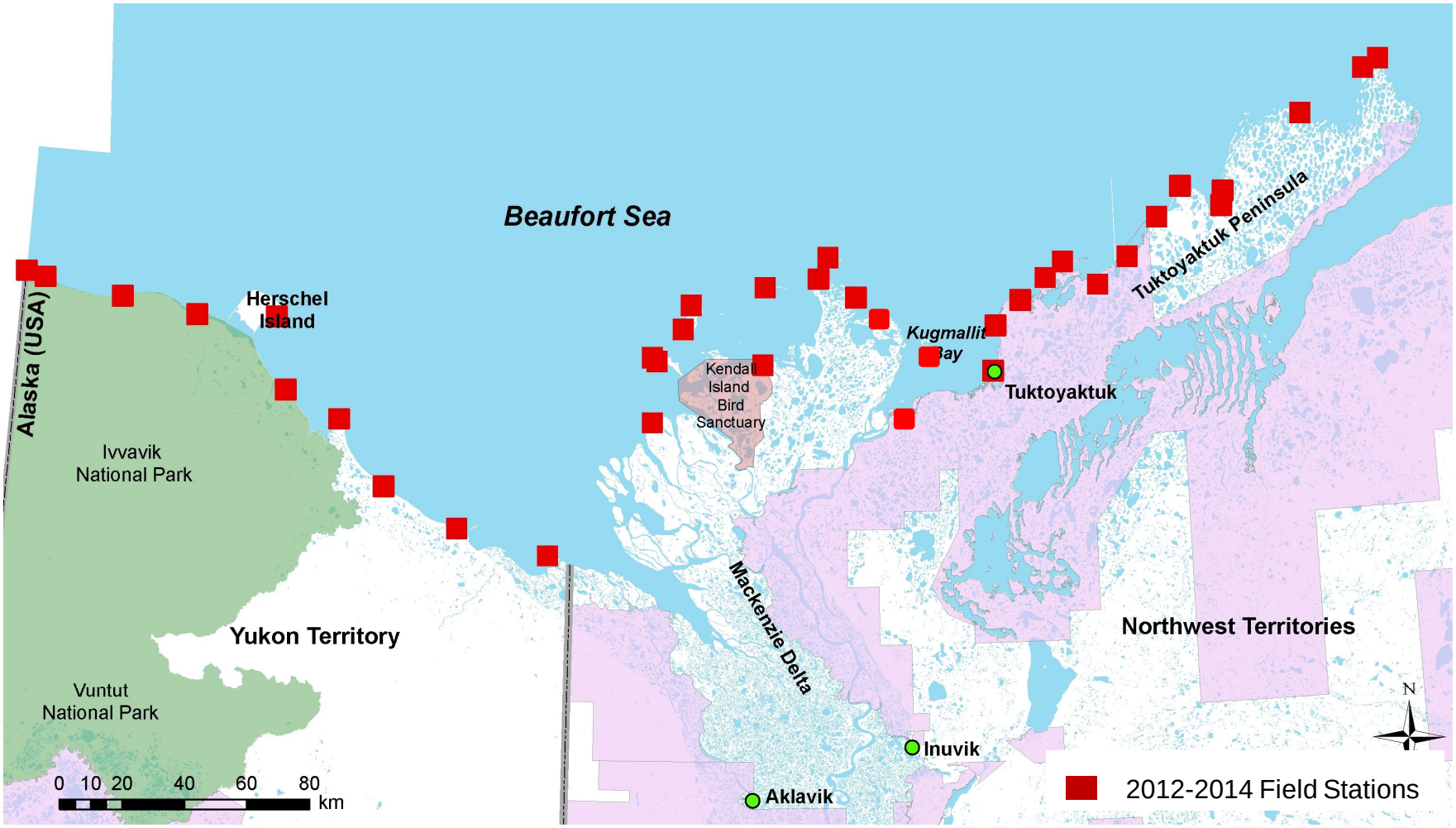
  on the ground observations of the coastal monitoring network

- ***Accessibility of data to stakeholders and community groups***

  enable proponents, decision-makers and communities to plan for project-specific EA requirements for the Beaufort Sea coastal zone and potential Harbour development.

- ***Gaps analysis study of critical science and information both at a regional and local (port specific) scale***.

Regional Synthesis of Coastal Geoscience Data

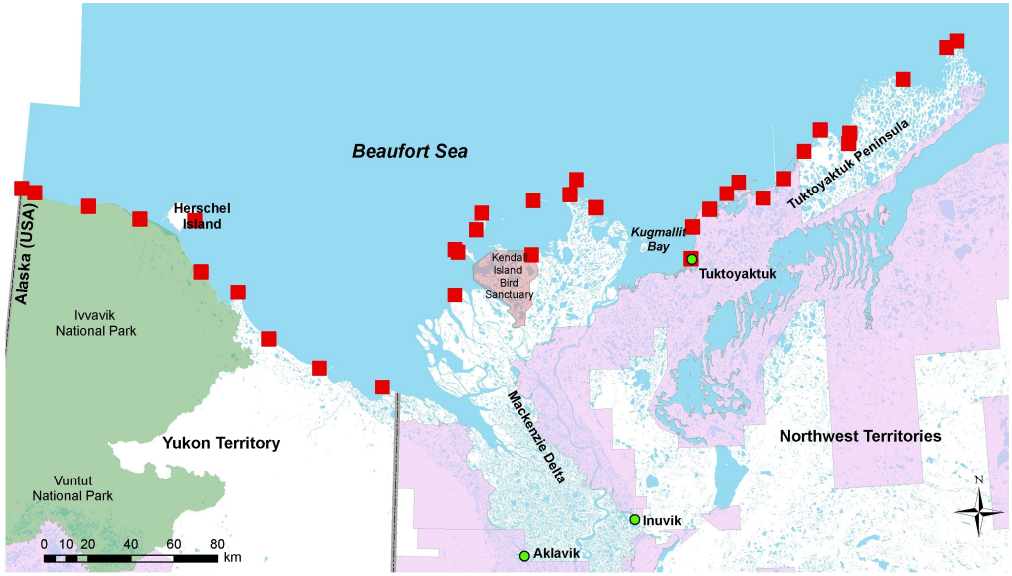


Regional Diversity of Coastal Zone Region

69.36257 N, 138.80432 W

69.30546 N, 135.81944 W

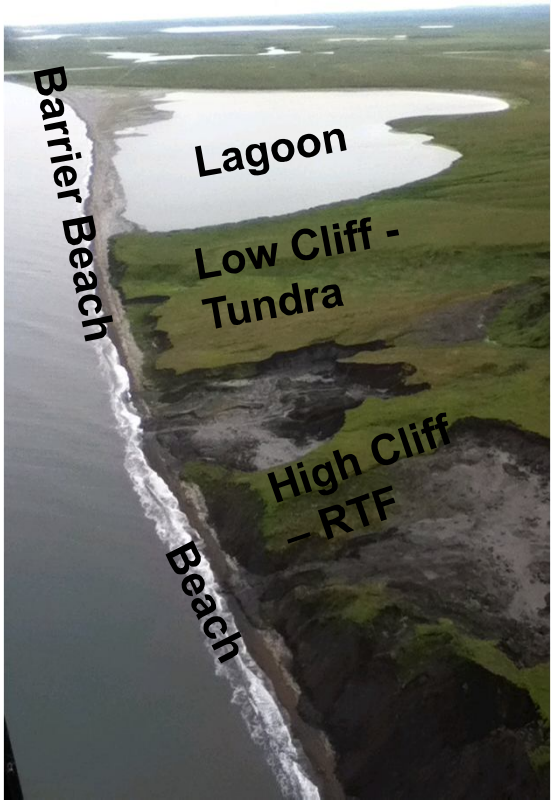
69.447 N, 133.03848W



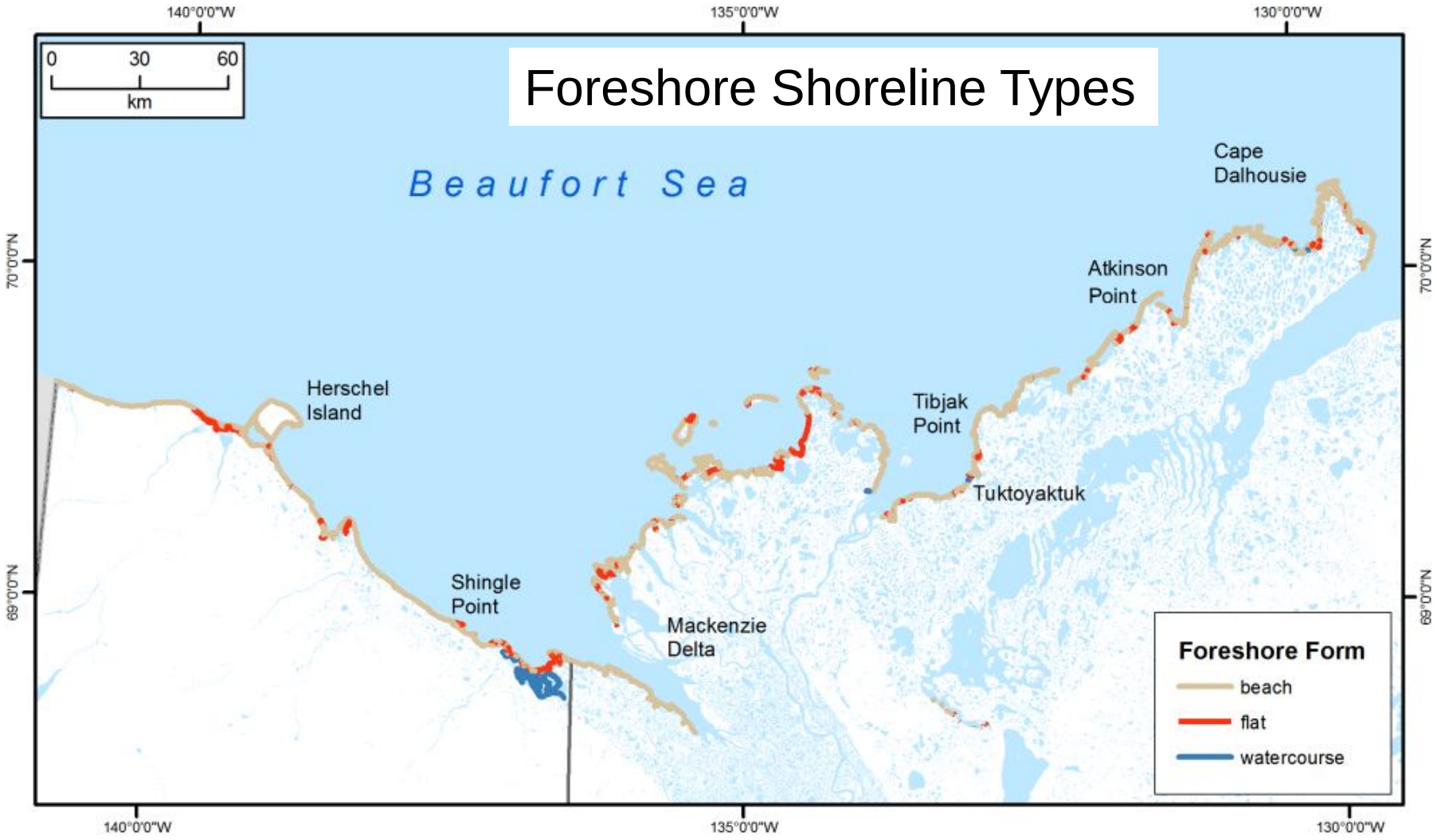
69.95169 N, 131.42921 W

Spatial Data Inventory – Coastal Classification Database

- *Observations from coastal video (1970, 1999, 2000)*
- *Separated into nearshore, foreshore and backshore*
- *Type, material, ice content and cliff height identified*

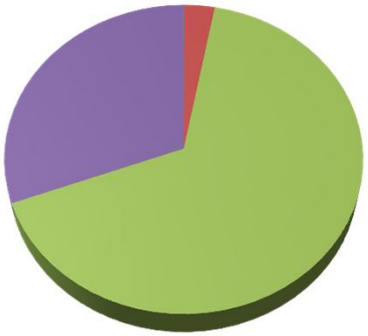


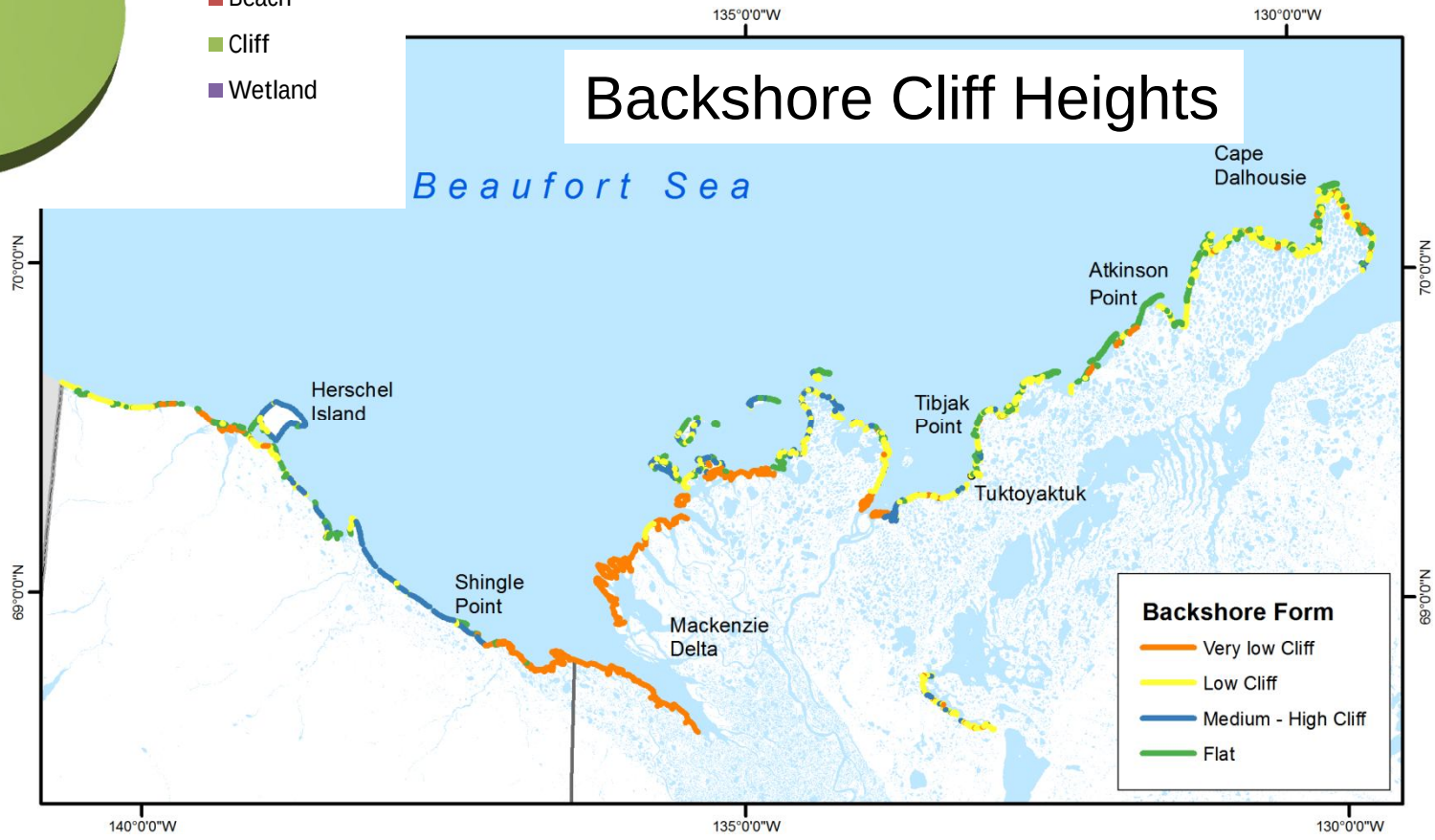
Data Products – Coastal Classification Database



Data Products – Coastal Classification Database

% of Backshore Types

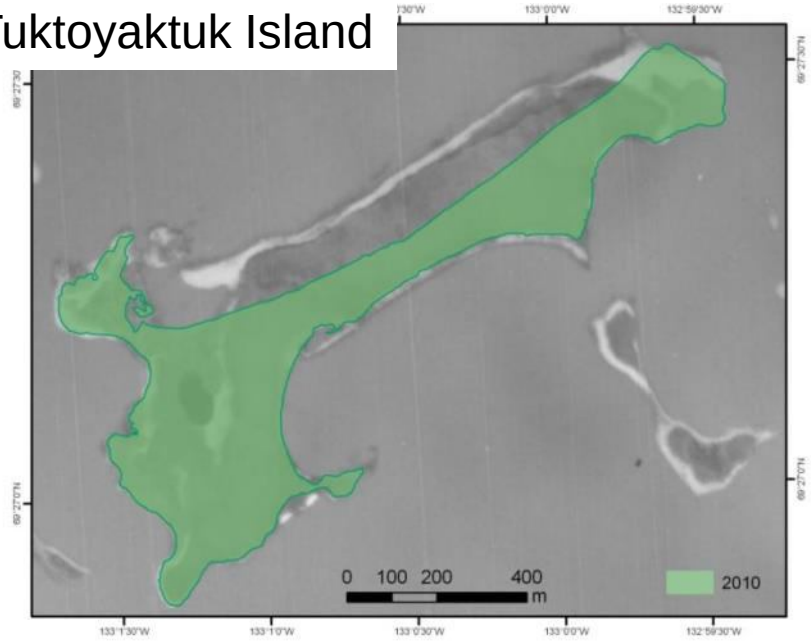




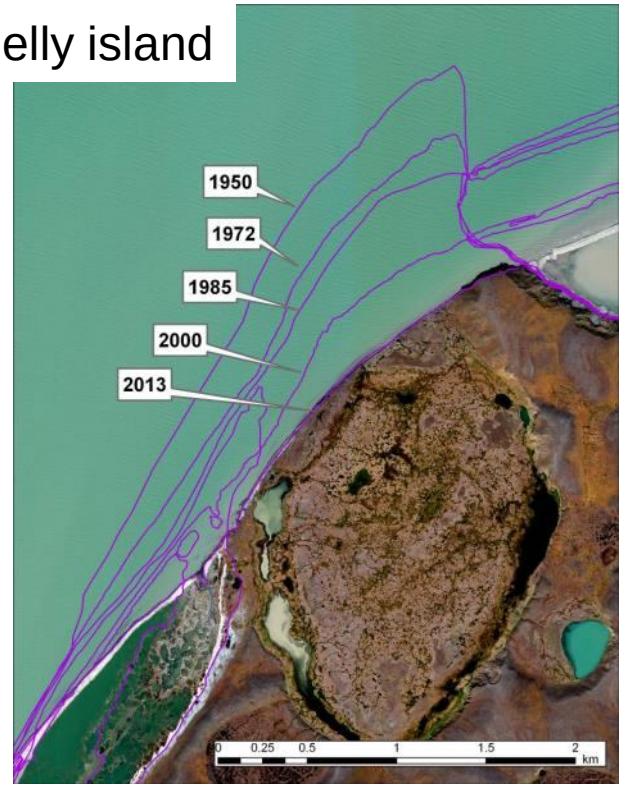
Spatial Data Inventory – Coastline Vectors (position of shoreline through time)

- *Identification of land/water interface from 1947-present*
- *Accurate representation of coastline verified with survey ground control points and high resolution satellite imagery*

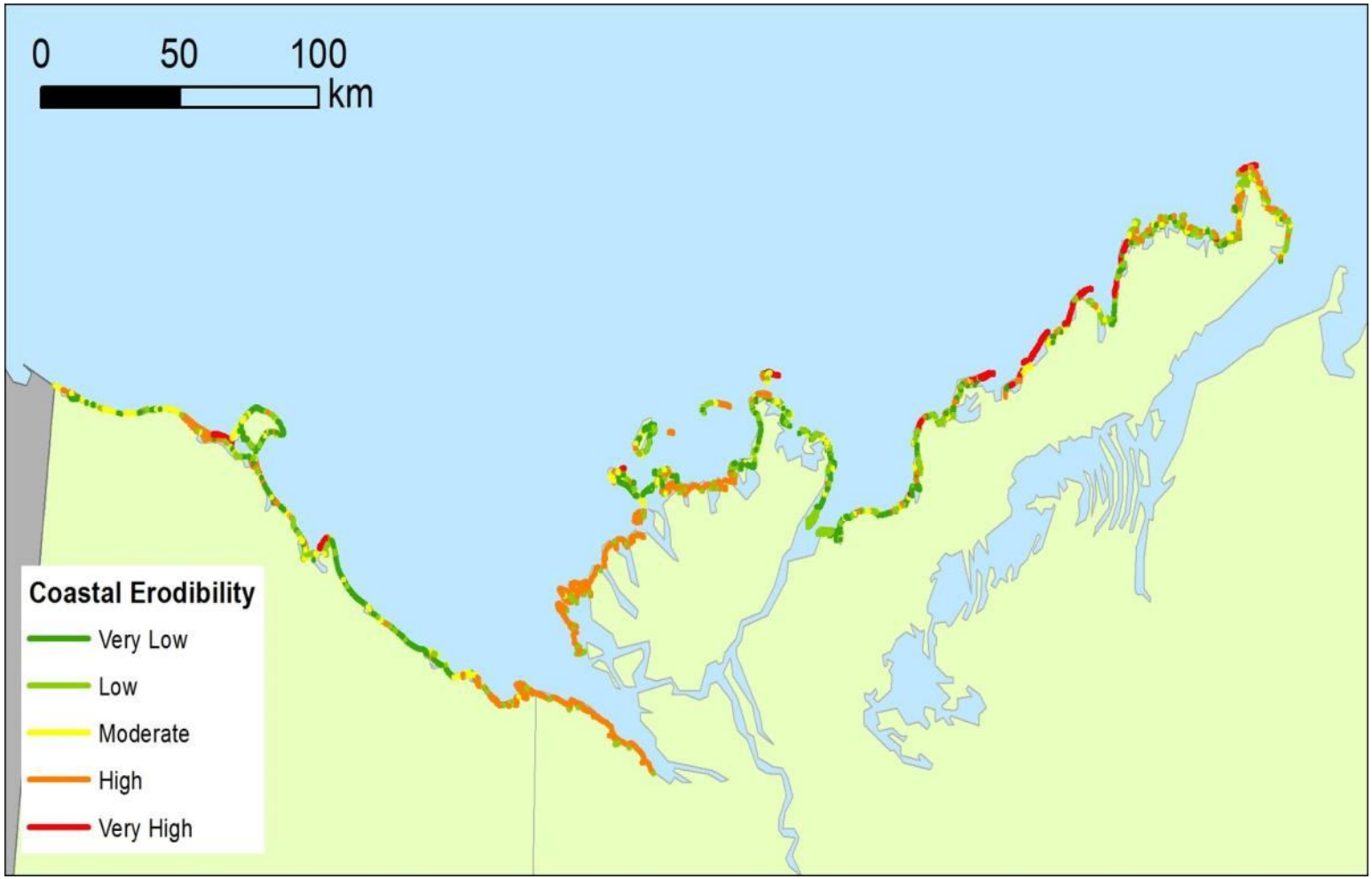
Tuktoyaktuk Island



Pelly island



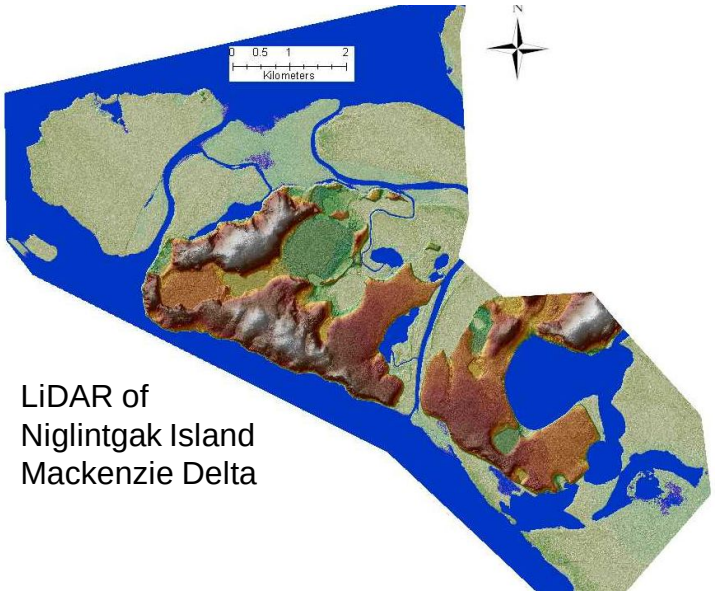
Data Products – Coastline Vectors - Coastal Change



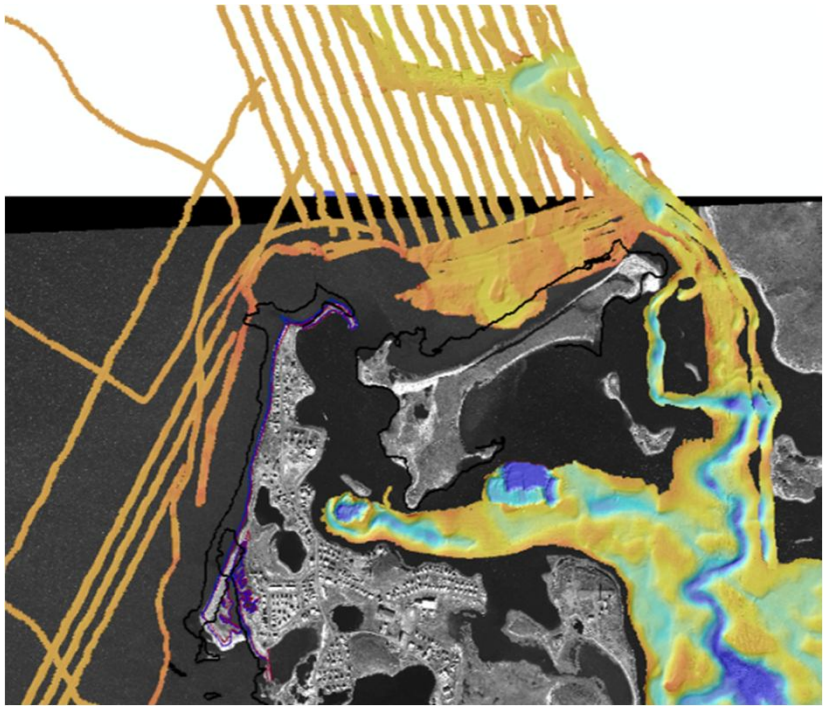
On average the region is retreating at a rate of 1.1 m/yr.

Spatial Data Inventory - Nearshore Bathymetry and LiDAR

- ***Numerous high resolution multibeam and LiDAR datasets***
- ***Datasets are critical to determine landscape and seabed morphology***
- ***Identification of potential hazards which on the seabed and flooding limits on land.***

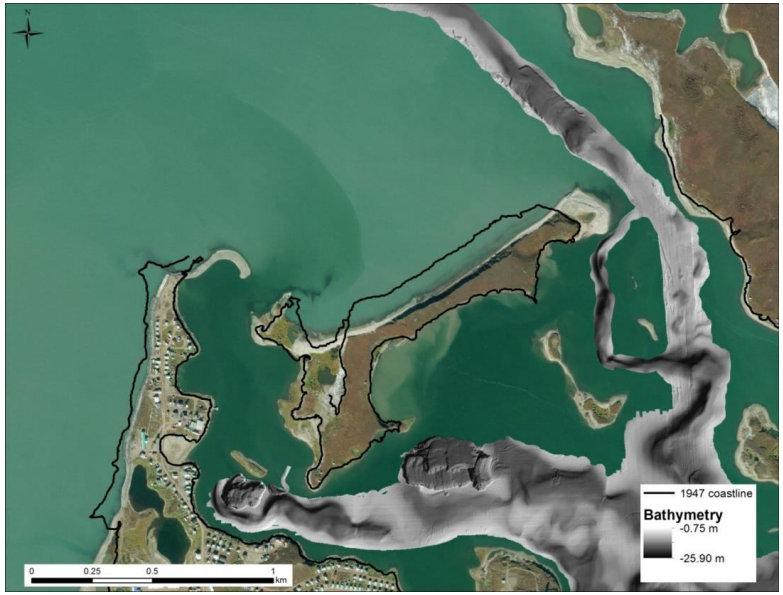


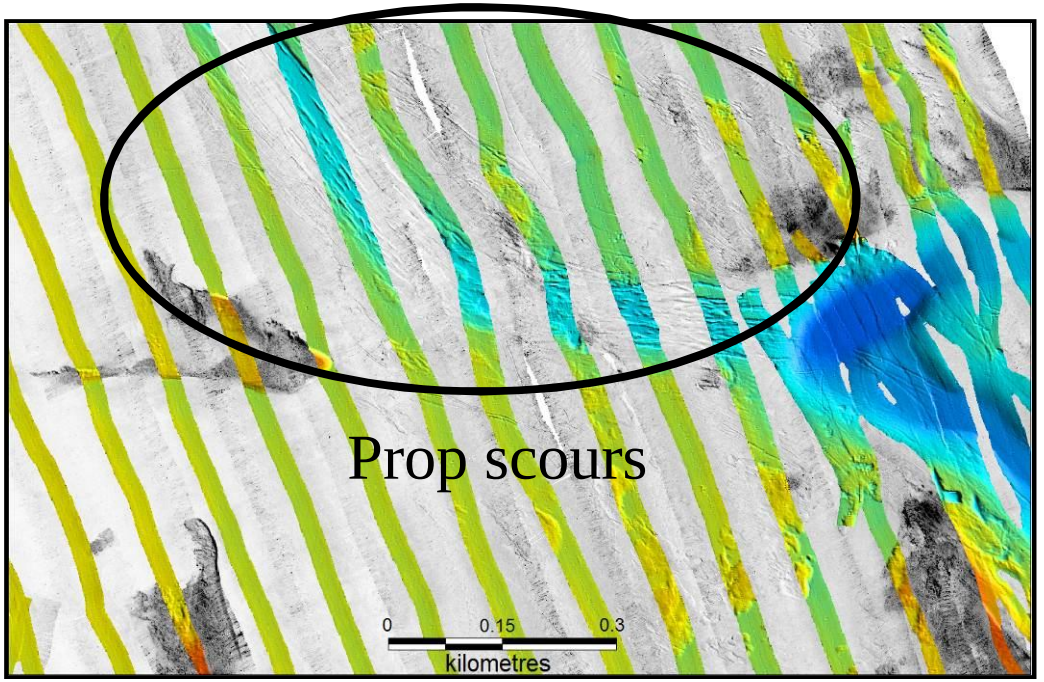
LiDAR of
Niglintgak Island
Mackenzie Delta



Multibeam of Tuktoyaktuk Harbour

Data Products and Applications





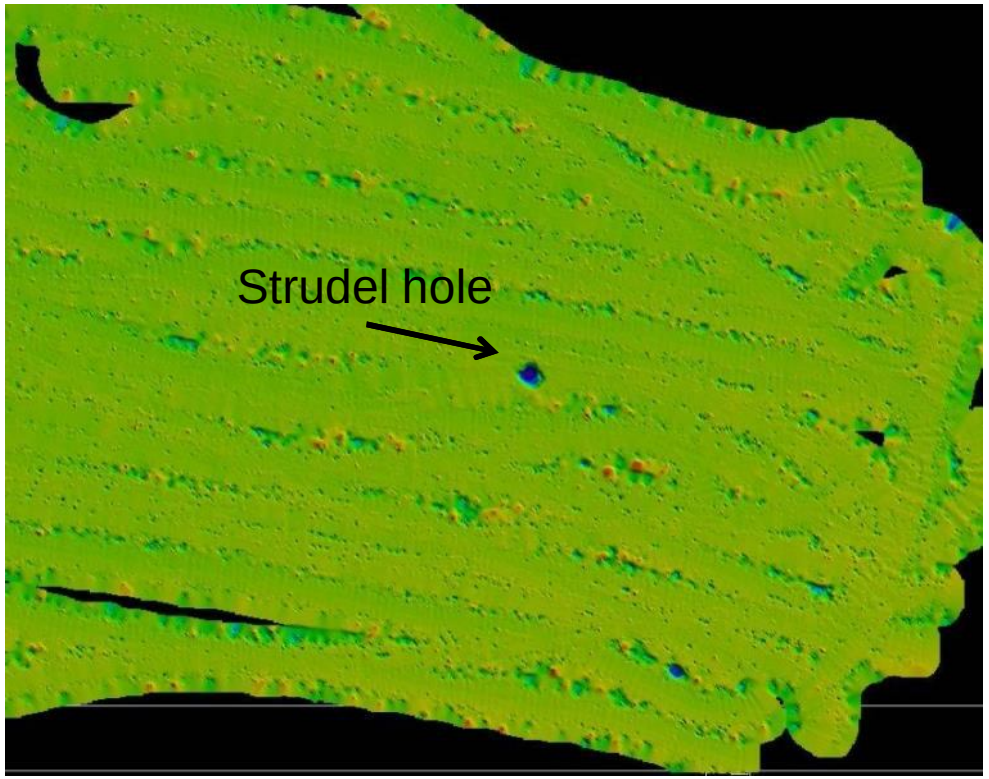
Tuktoyaktuk Harbour Approach

Is it becoming shallower?

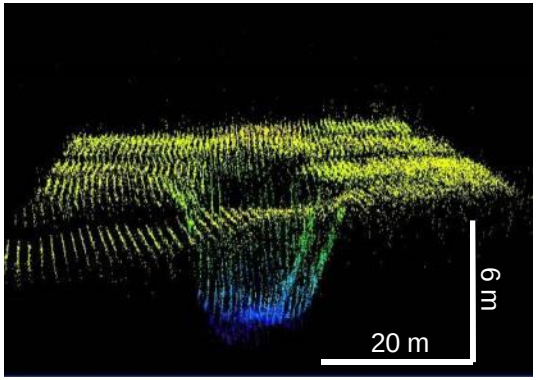
Data Products and Applications

Edge of Overflow Observation

Circular drainage

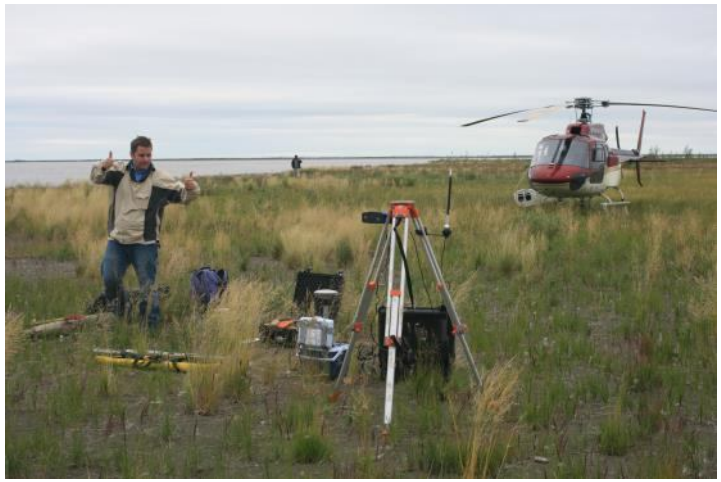


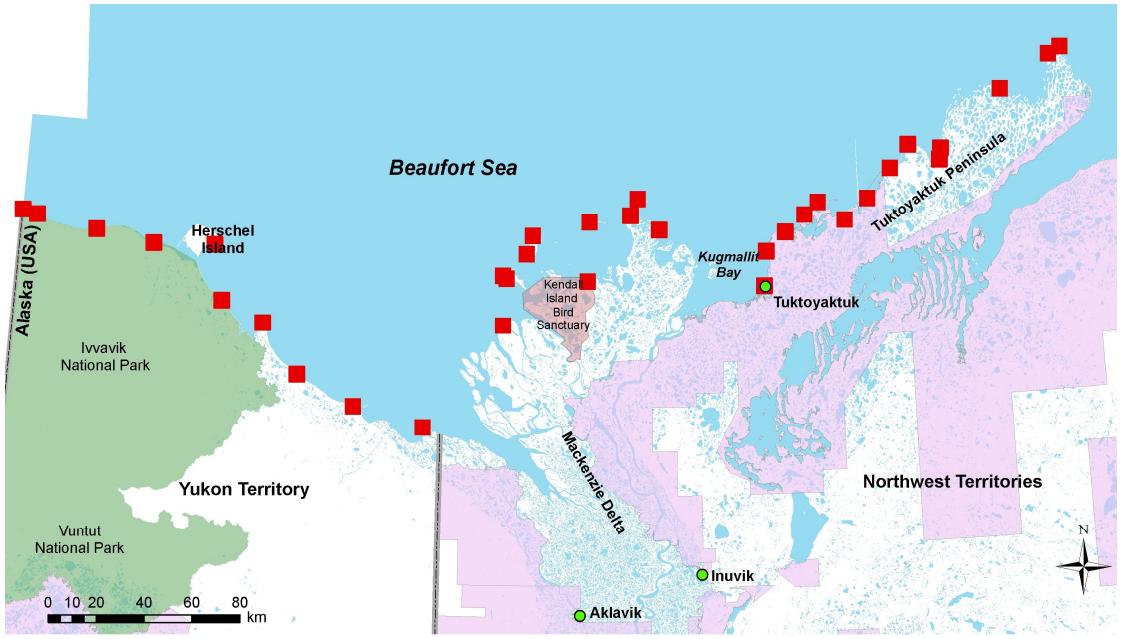
Formation of strudel scour depression



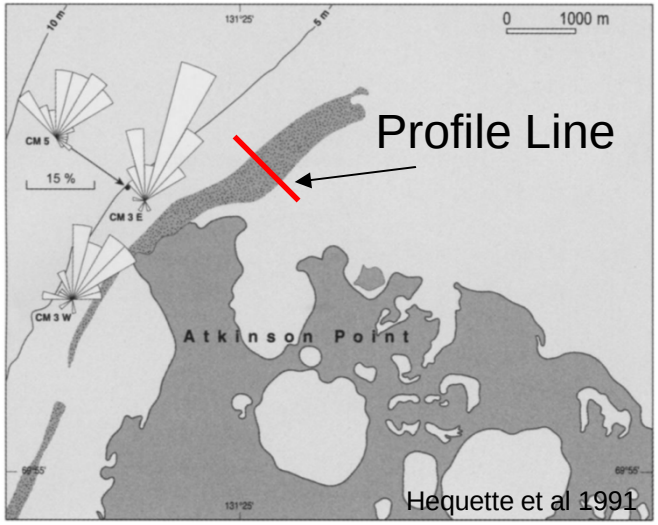
Update of Coastal Change Assessment
Database of Coastal Monitoring sites

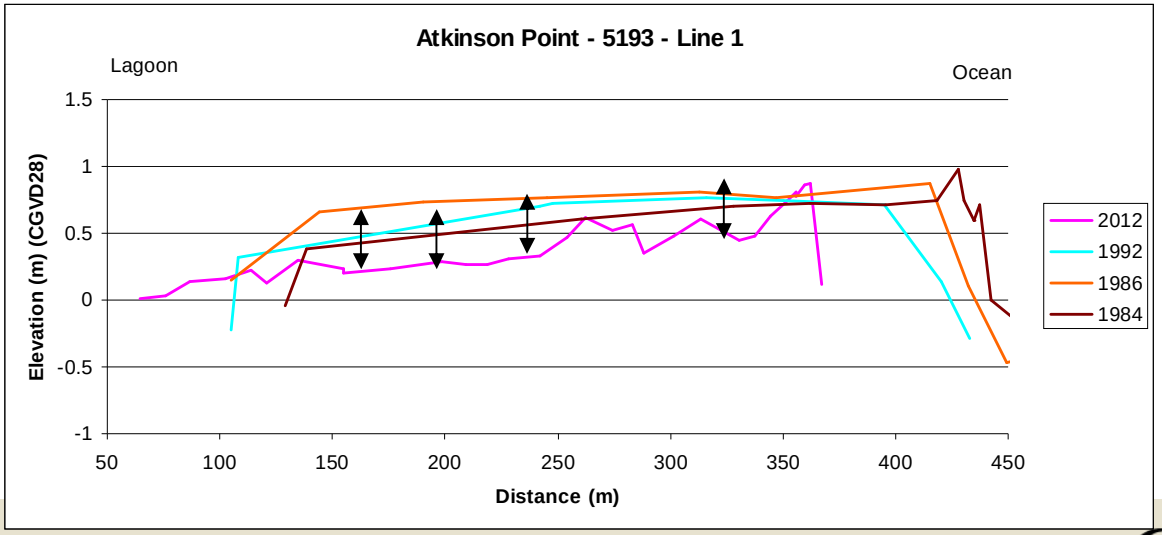
- *On the ground measurements at over 50 locations within study area*
- *Data spans from the early 1970's to present*
- *Challenges of combining various survey techniques (emery pole to GPS)*
- *Dataset highlight morphological change of coastline at specific locations*



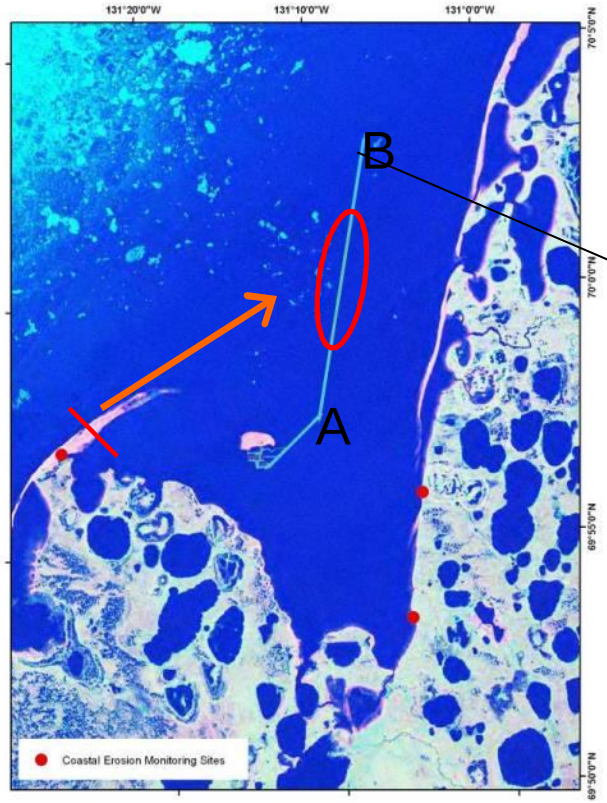


Update of Coastal Change Assessment - Atkinson Point



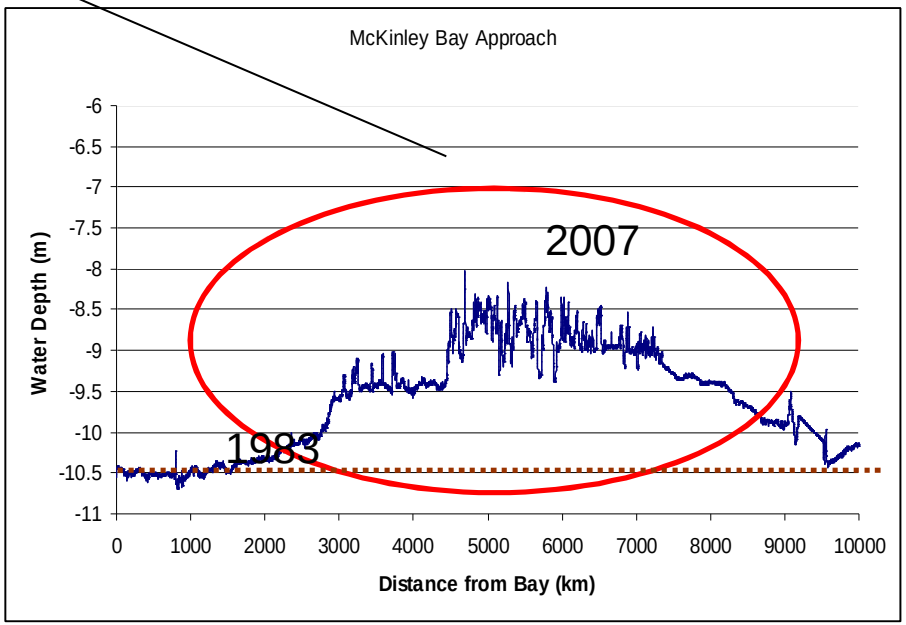


Update of Coastal Change Assessment - Atkinson Point



Northwesterly storms generate strong net sediment transport to the northeast, toward the mouth of McKinley Bay.

A



B

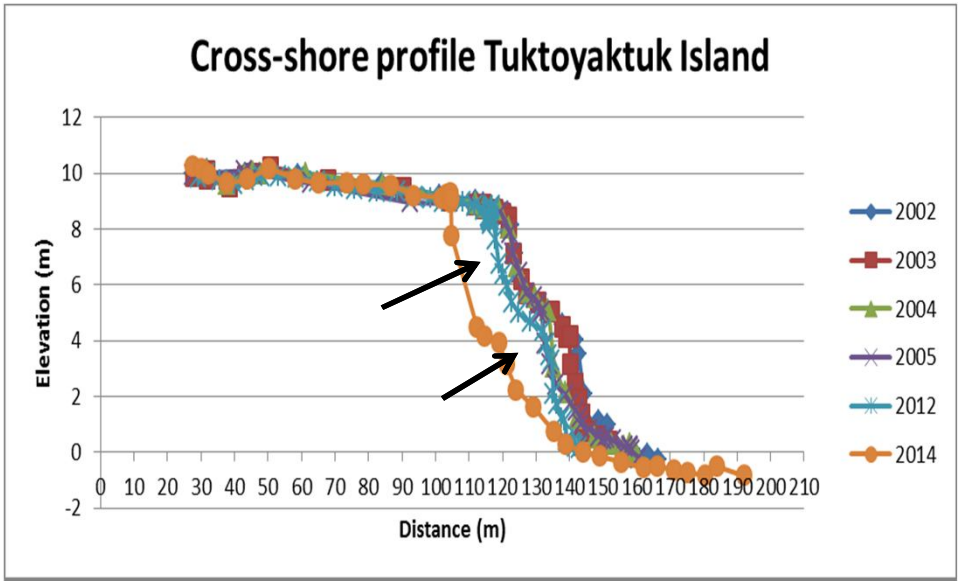
Long shore drift leads to channel infill at McKinley Bay

67% loss of land since 1947

Up to 15 m in one storm

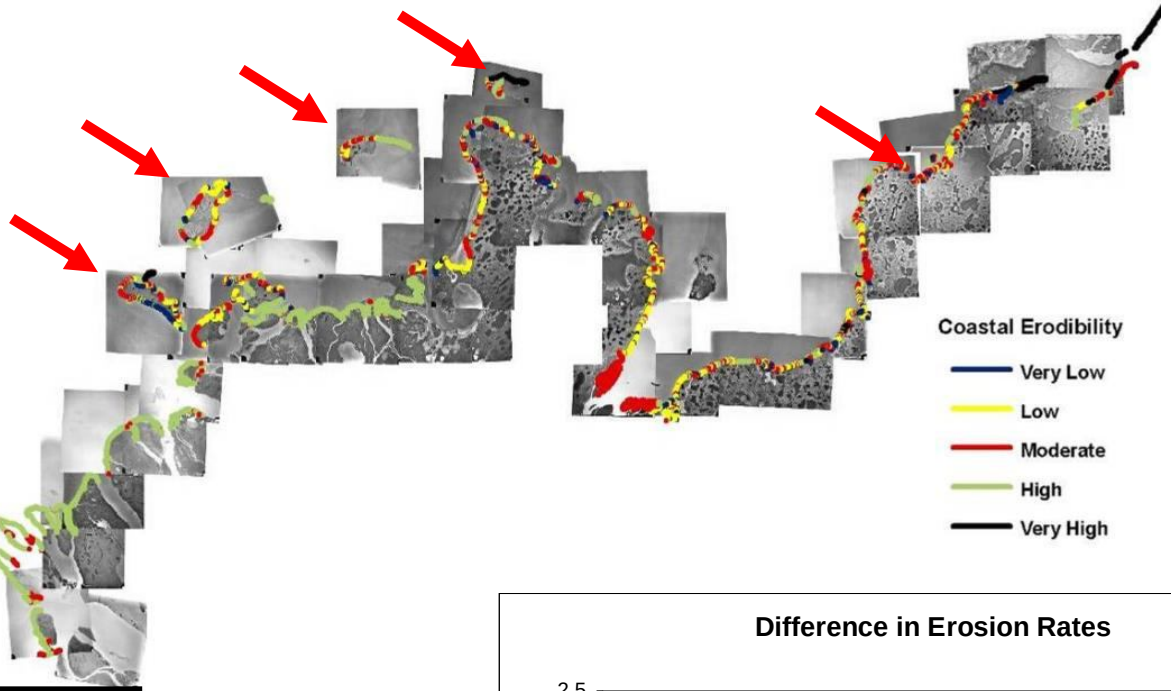
17,000 m^3 of material removed since 2012*

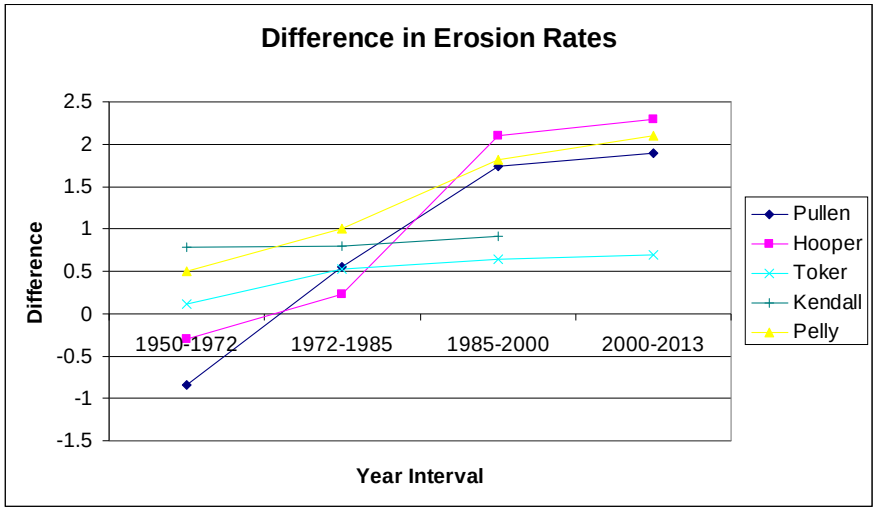
“27,000 tons (@ 19% ice)”



Update of Coastal Change Assessment – Preliminary Results

Acceleration of erosion in Northwest facing ice-rich cliffs





Conclusions – Completion of Project

- ***Spatial Data Inventory (data compilation)***

  Integration of data sources and types is important to provides both regional and localized perspective.

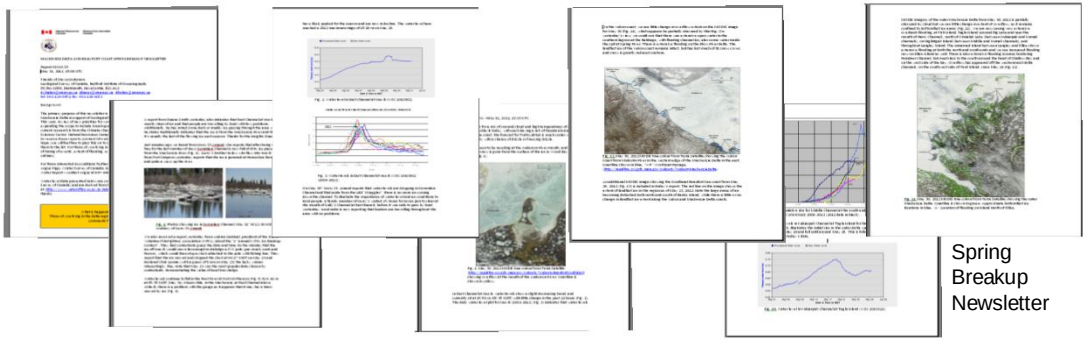
  Update of coastal change assessment (2012 to 2014 field work)

  Evidence for acceleration of coastal erosion along ice rich cliffs

- ***Accessibility of data to stakeholders and community groups***

  GSC Open File data releases, Polar Data Catalogue, data sharing with GNWT and ILA. Production of hard copy products and a community based Spring Break Up Newsletter

POLAR DATA CATALOGUE



Spring Breakup Newsletter

Knowledge Gaps – Looking Forward

1. *Assessment of all coastal infrastructure (industrial, communities, archeological)*
   What critical infrastructure is at risk or already gone?

2. *Data availability for all potential safe harbours and port sites*
   Does sufficient data exist to support EA assessments of existing potential port sites?
   What are the critical datasets that contribute to new shore based selections?

3. *Current assessment of coastal erosion*
   More data required to verify a recent acceleration of coastal erosion?

4. *Nearshore and channel sedimentation*
   What is the sediment infill potential at the approaches to Tuktoyaktuk Harbour?
   What are the key influences on seabed morphology (oceanographic or fluvial)?

Knowledge Gaps – Looking Forward

– Current GSC Projects (BREA Spin Off)

Braya pilosa

Tuktoyaktuk Harbour Sedimentation

Coastal Assessment at Cape Bathurst

Past knowledge of the coast is the key to understanding the future