Regional Synthesis of Coastal Geoscience for the Beaufort Sea

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 (regional compilations)***

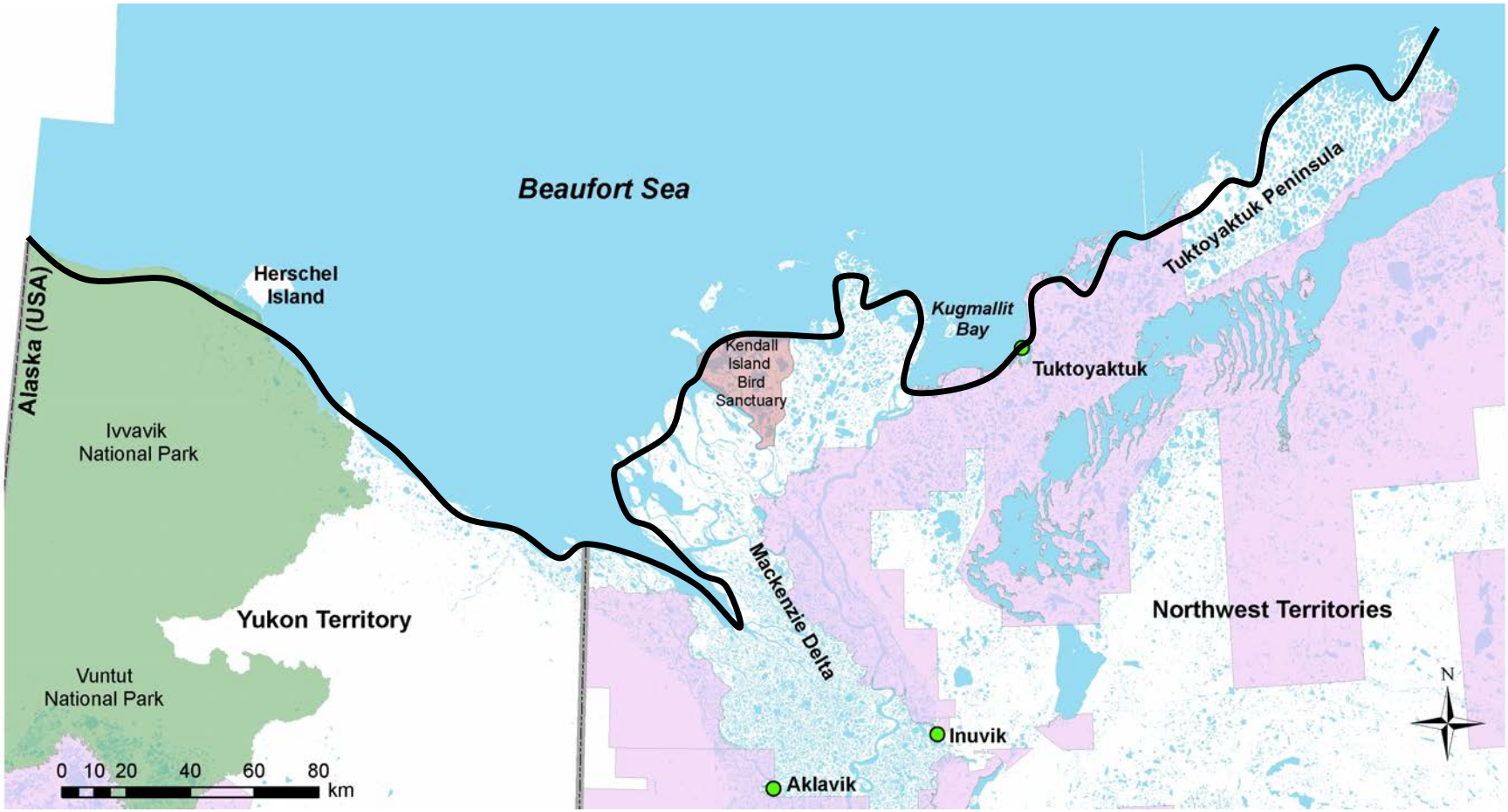
  coastal monitoring, nearshore and onshore digital elevation models, database of historical photos, historical shoreline vectors from air photos, retreat rates, coastal formation, landforms, and classification.

- ***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***.

Study Area – Beaufort Sea Coastline
Alaska/Yukon border to Cape Dalhousie



Digital 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*

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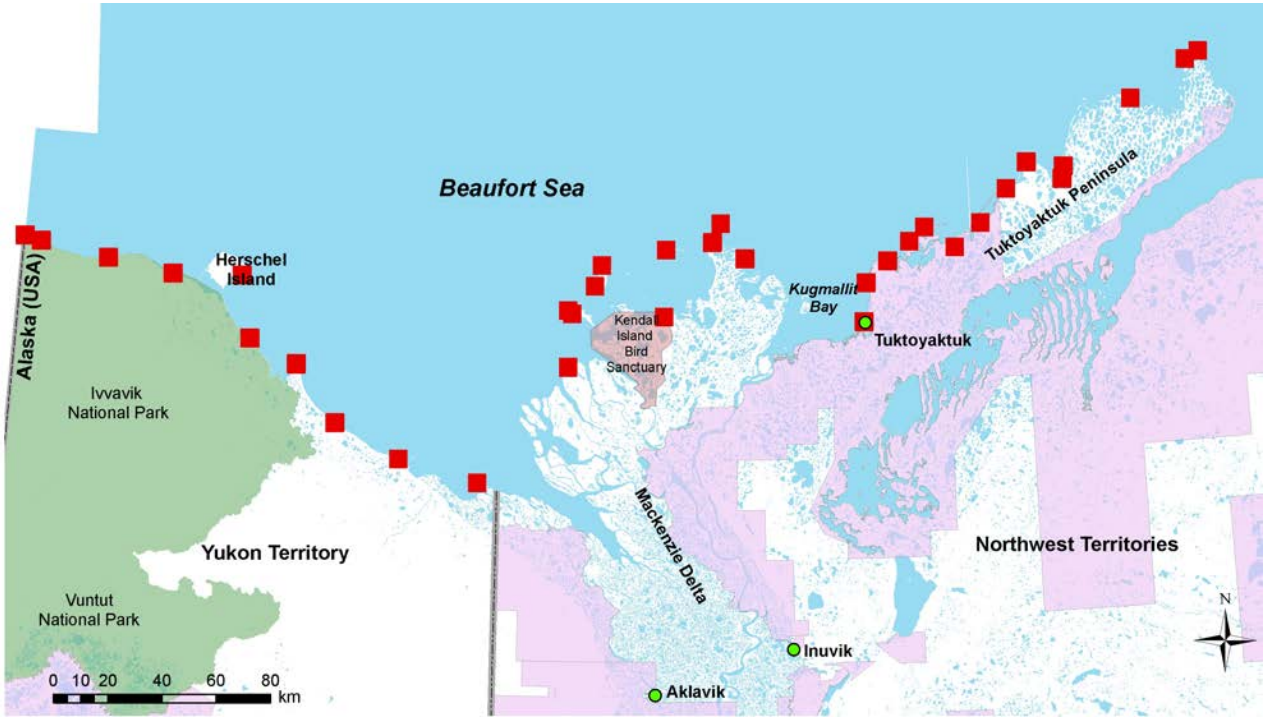
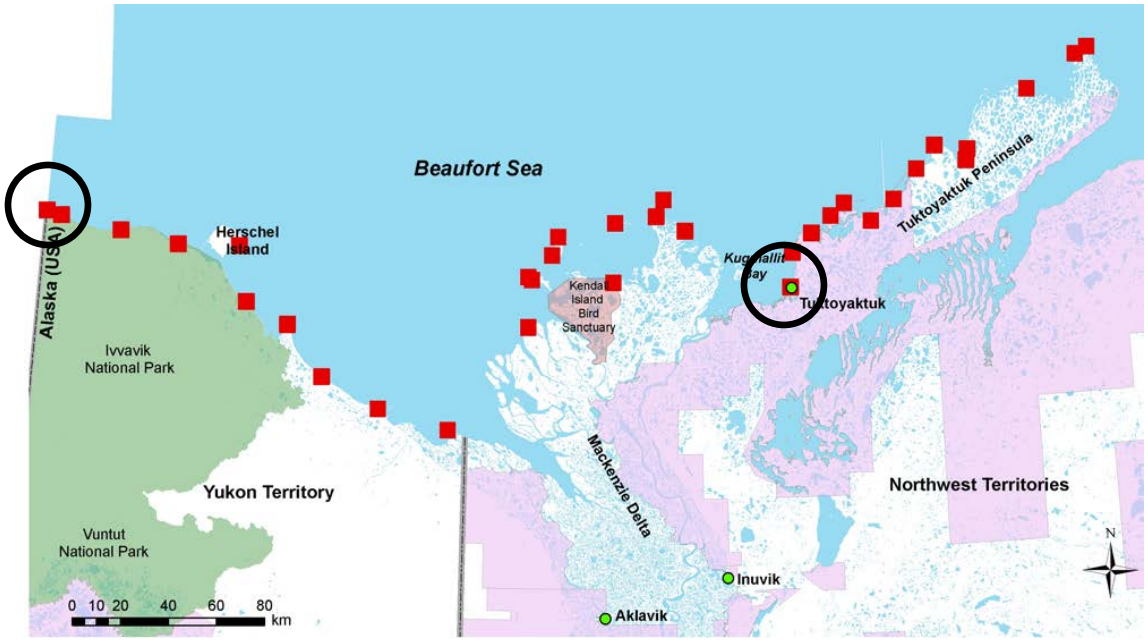
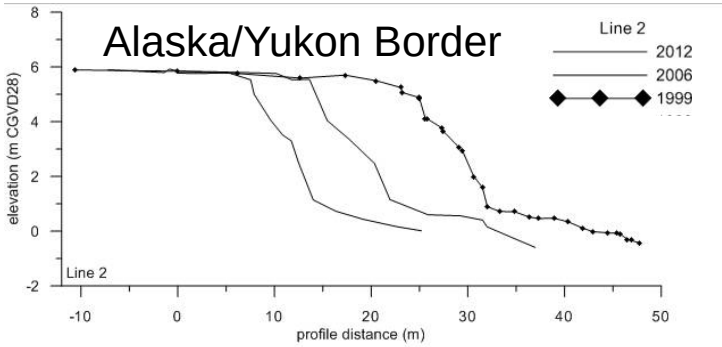
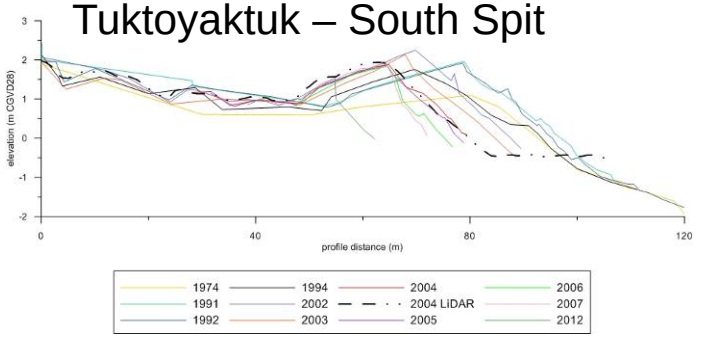


Digital Database of Coastal Monitoring sites







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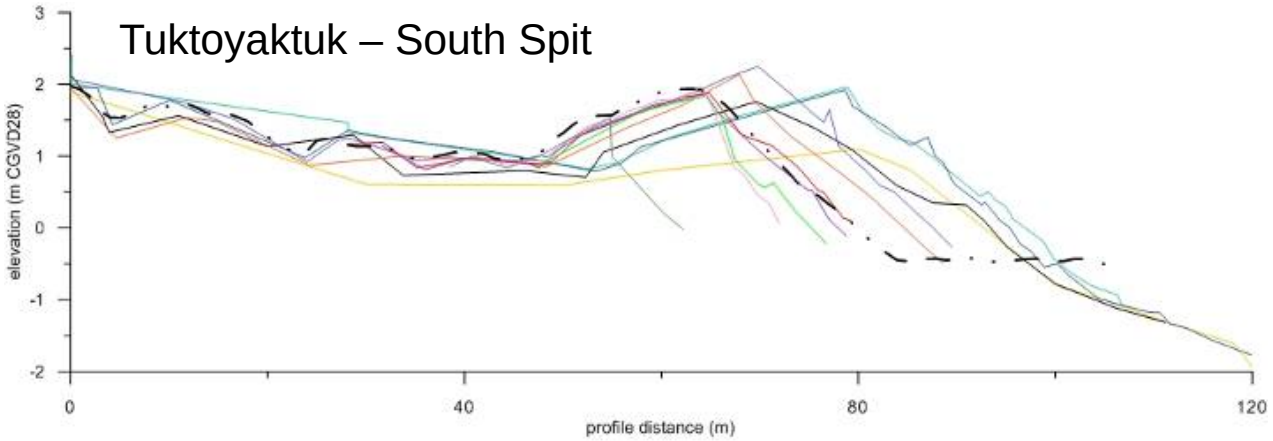

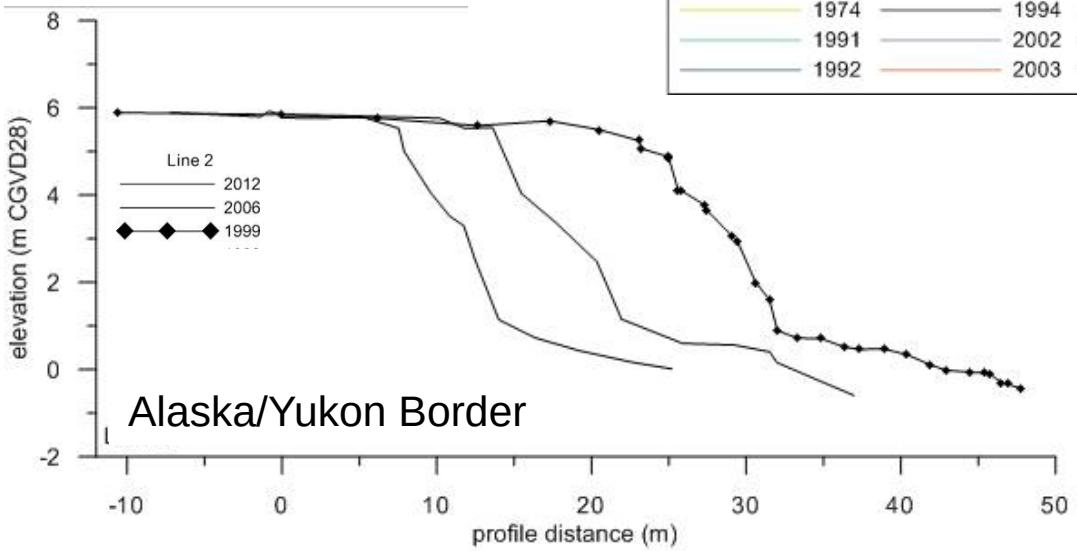

Coastal Landform Topography and Nearshore Bathymetry

- *Numerous high resolution multibeam and LiDAR datasets*
- *Varying levels of access from restricted to public availability*
- *Datasets are critical to determine landscape and seabed morphology*
- *Identification of potential geohazards on the seabed and flooding limits on land.*

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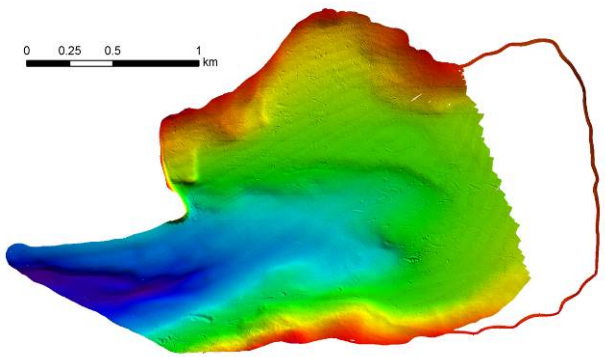
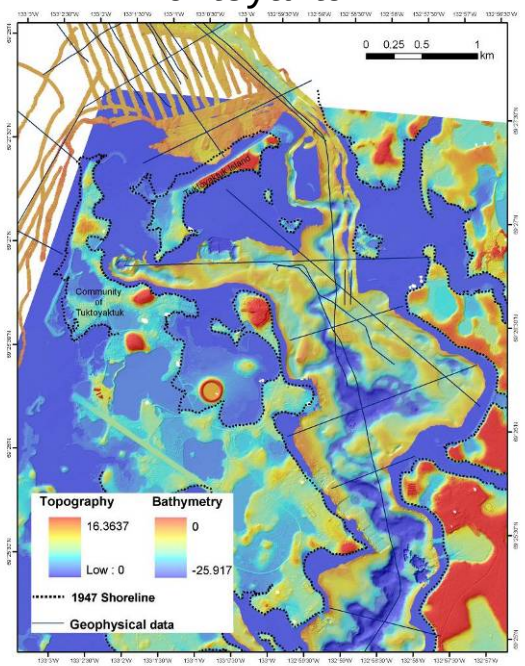
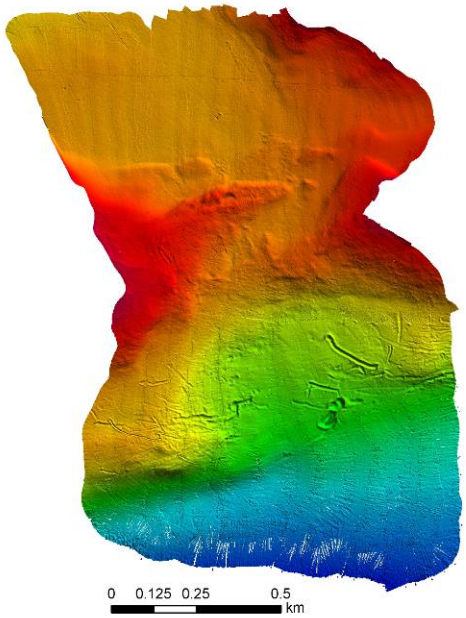
Wise Bay



Tuktoyaktuk



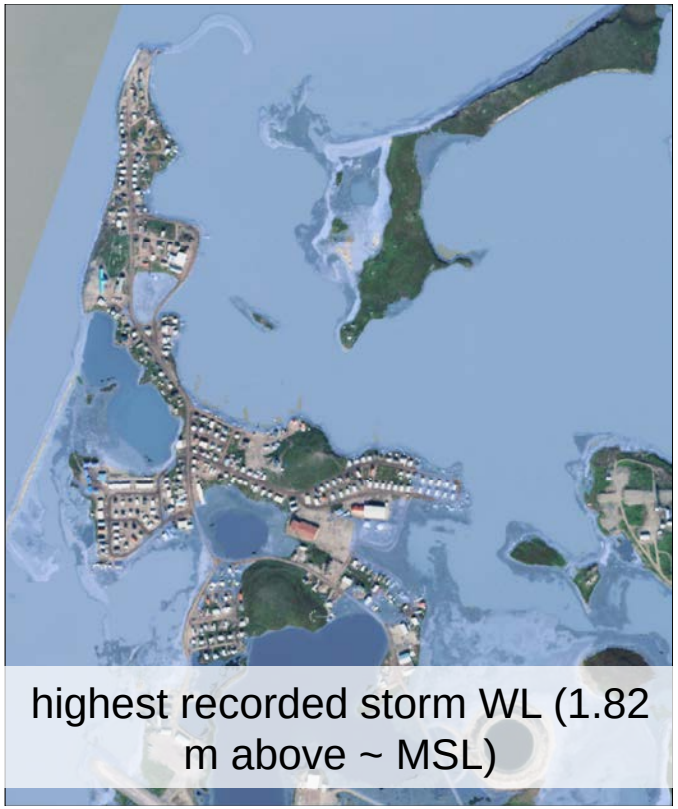
Summer’s Harbour



Coastal Landform Topography and Nearshore Bathymetry

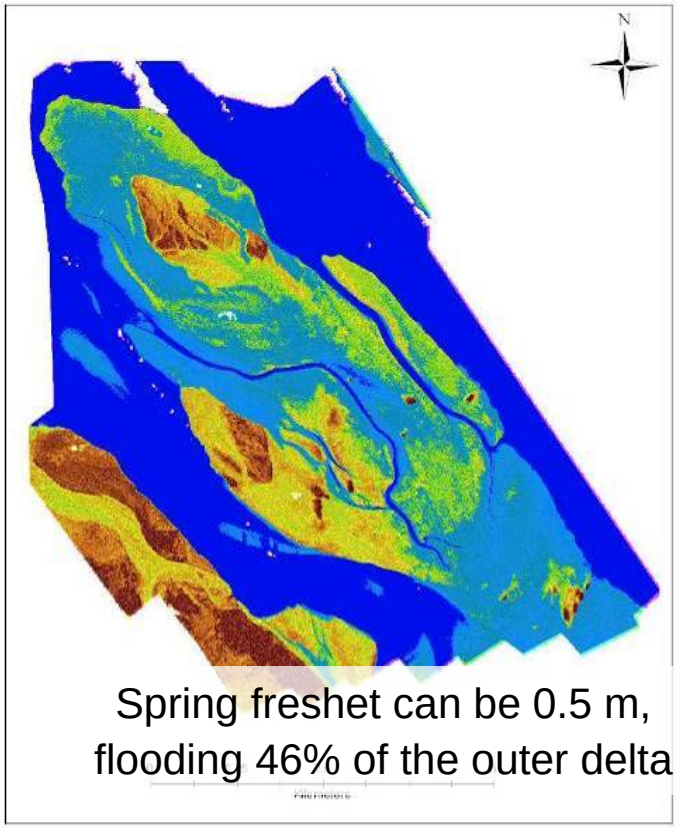
- *Using LiDAR to model storm surge flooding and Spring freshet*

Tuktoyaktuk 1999 storm surge



highest recorded storm WL (1.82 m above ~ MSL)

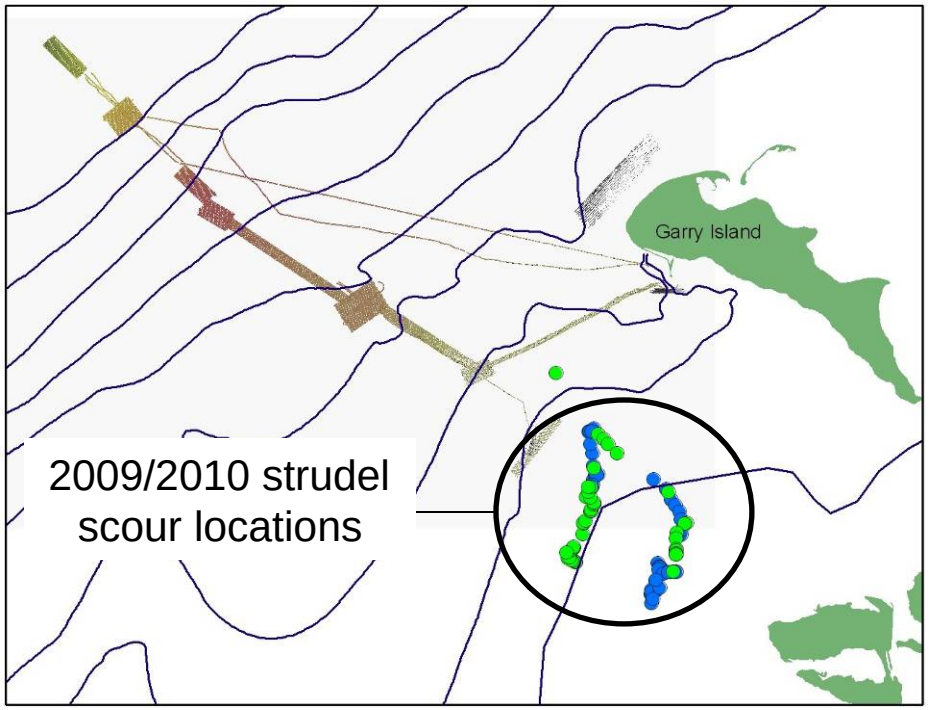
Mackenzie Delta Spring Freshet



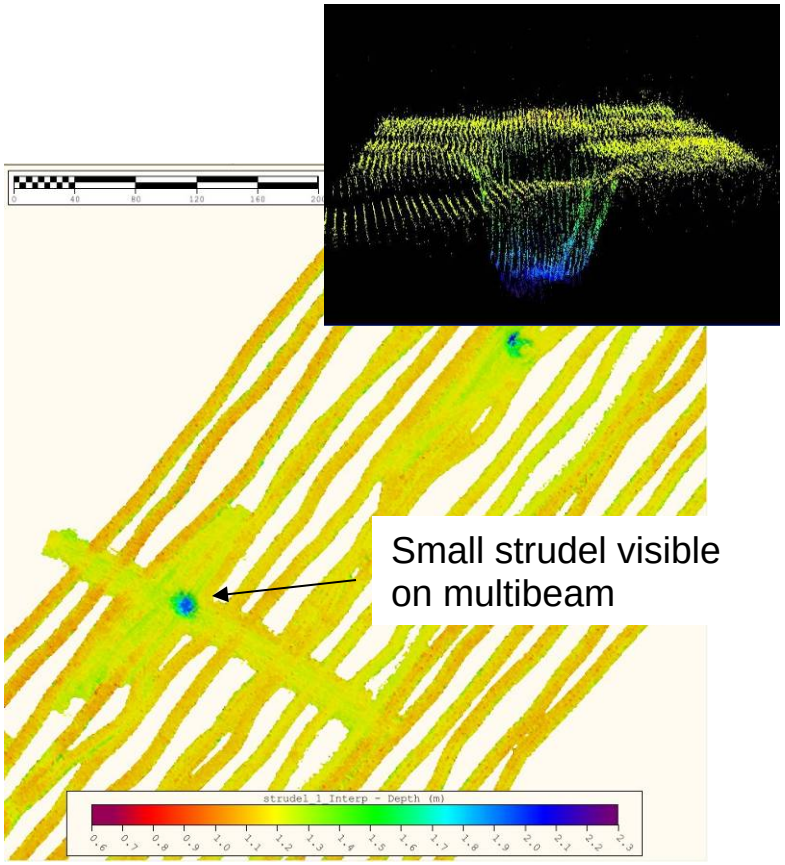
Spring freshet can be 0.5 m, flooding 46% of the outer delta

Coastal Landform Topography and Nearshore Bathymetry

- *Circular seabed scours occur during the initial Spring overflow*
- *Scours have been observed up to 6 m deep and 20 m wide*
- *Approximately 50 strudel scours identified between 2009 and 2010*



Nearshore region of Mackenzie Delta



Spatially Referenced Coastal Photography

- *Database contains 1000's of photographs of Beaufort coastline*
- *Data spans from the early 1970's to present*
- *Photographs have been spatially referenced (varying degrees of accuracy)*

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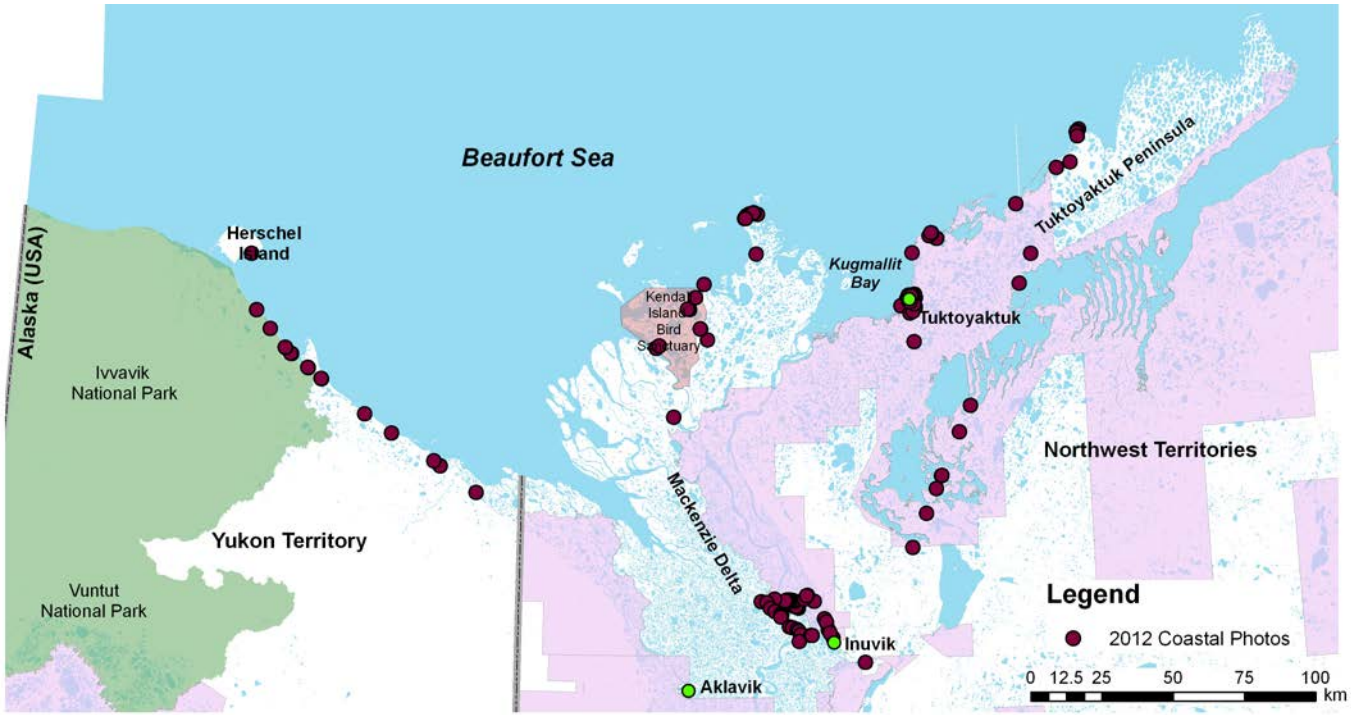
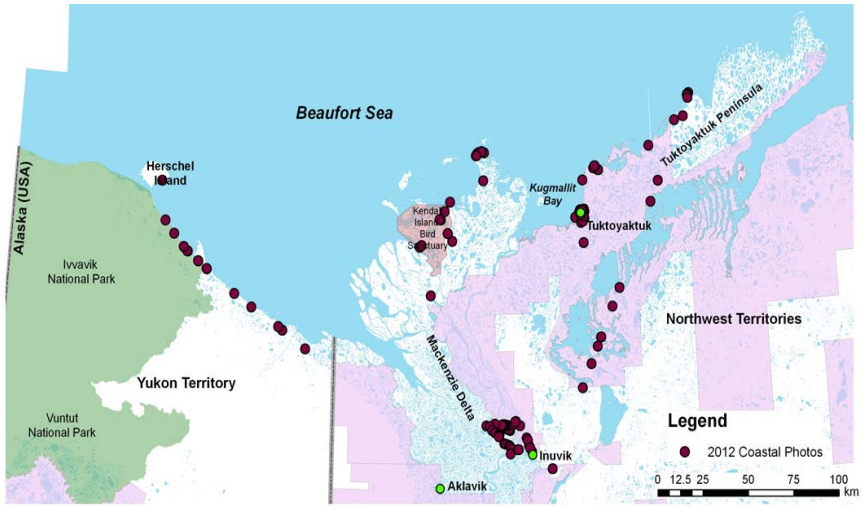


Spatially Referenced Coastal Photography

69.36257 N, 138.80432 W

69.30546 N, 135.81944 W

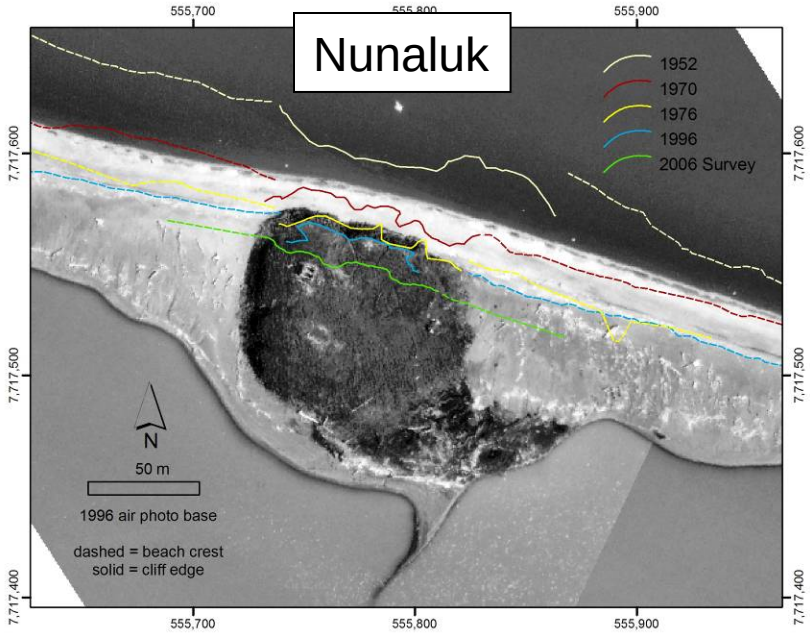
69.447 N, 133.03848W

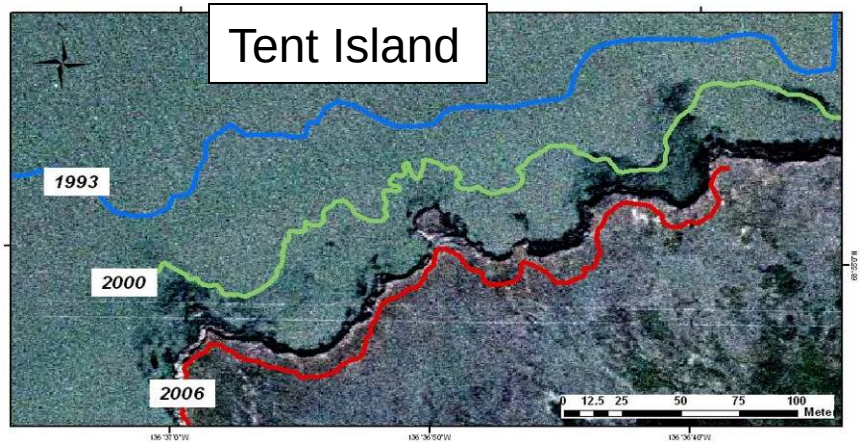


69.95169 N, 131.42921 W

50 years of digital coastlines

- *Identification of land/water interface on airphoto and satellite imagery*
- *Dataset contains coastlines digitized from 1947 and 1950 air photos*
- *Accurate representation of coastline – georeferenced to survey ground control points and high resolution satellite imagery*
- *Can be used for coastal change assessment across a broader regional scale*





Retreat rates of 6m/yr since 1993

50 years of digital coastlines

Community of Tuktoyaktuk Coastal Change 1947-present

<u>Tuktoyaktuk Island</u>

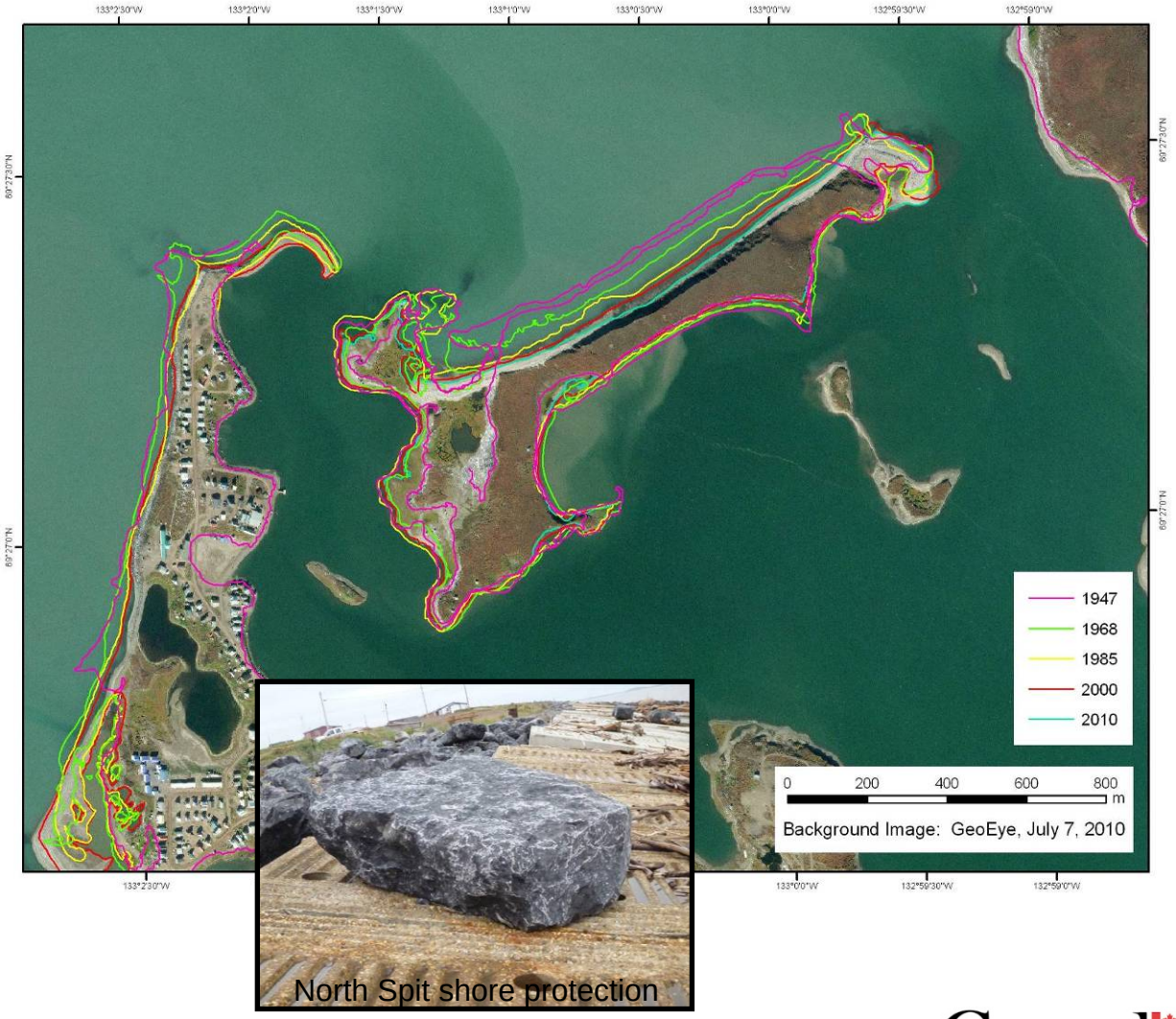
•~2 m/yr loss

•~140 m in the last 60 years

<u>Tuktoyaktuk Mainland</u>

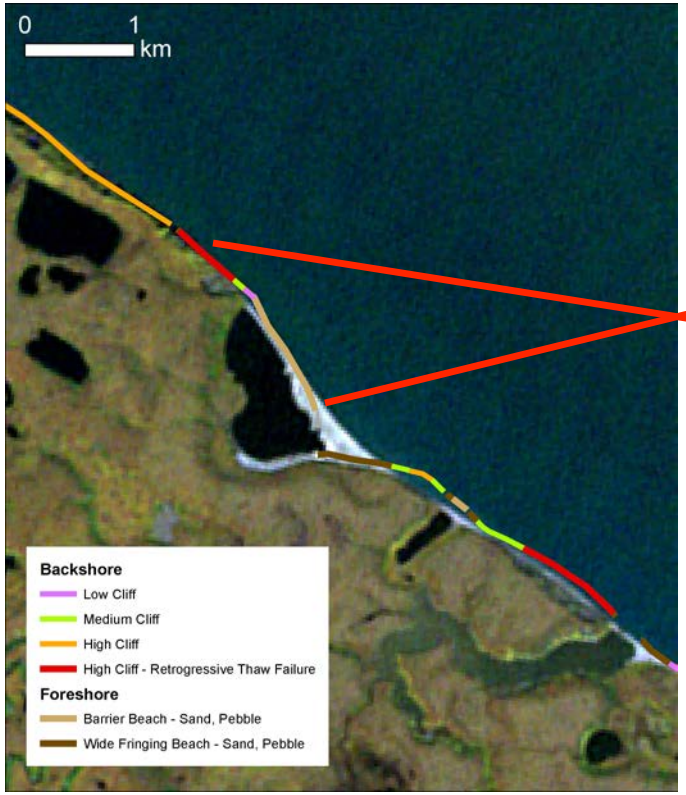
•~1.3 m/yr loss

•shore protection installed



Coastal Classification Database (CIS)

- *Formation, material, ice content and cliff height identified*
- *Separated into Backshore, foreshore and nearshore*
- *Dataset characterizes change between 1994 and 1999 video surveys*.



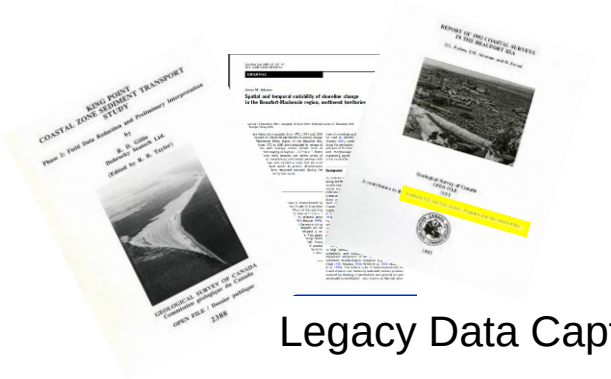
Barrier Beach

High Cliff - RTF

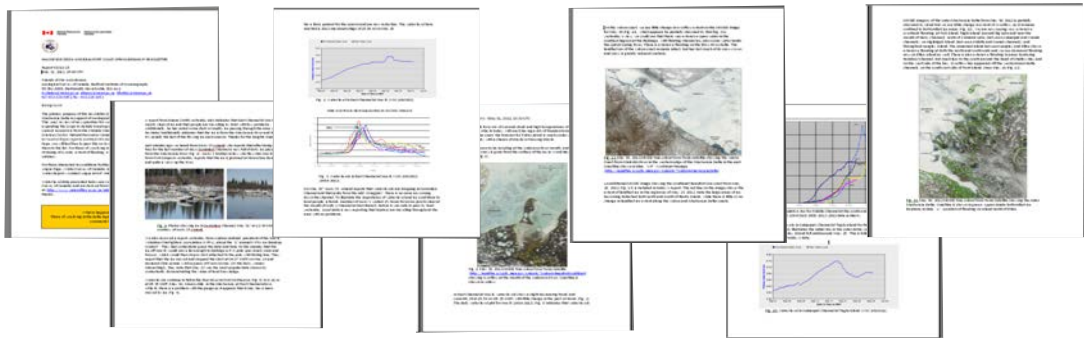
Knowledge Transfer and Legacy non-digital data

Don Forbes

Steve Solomon

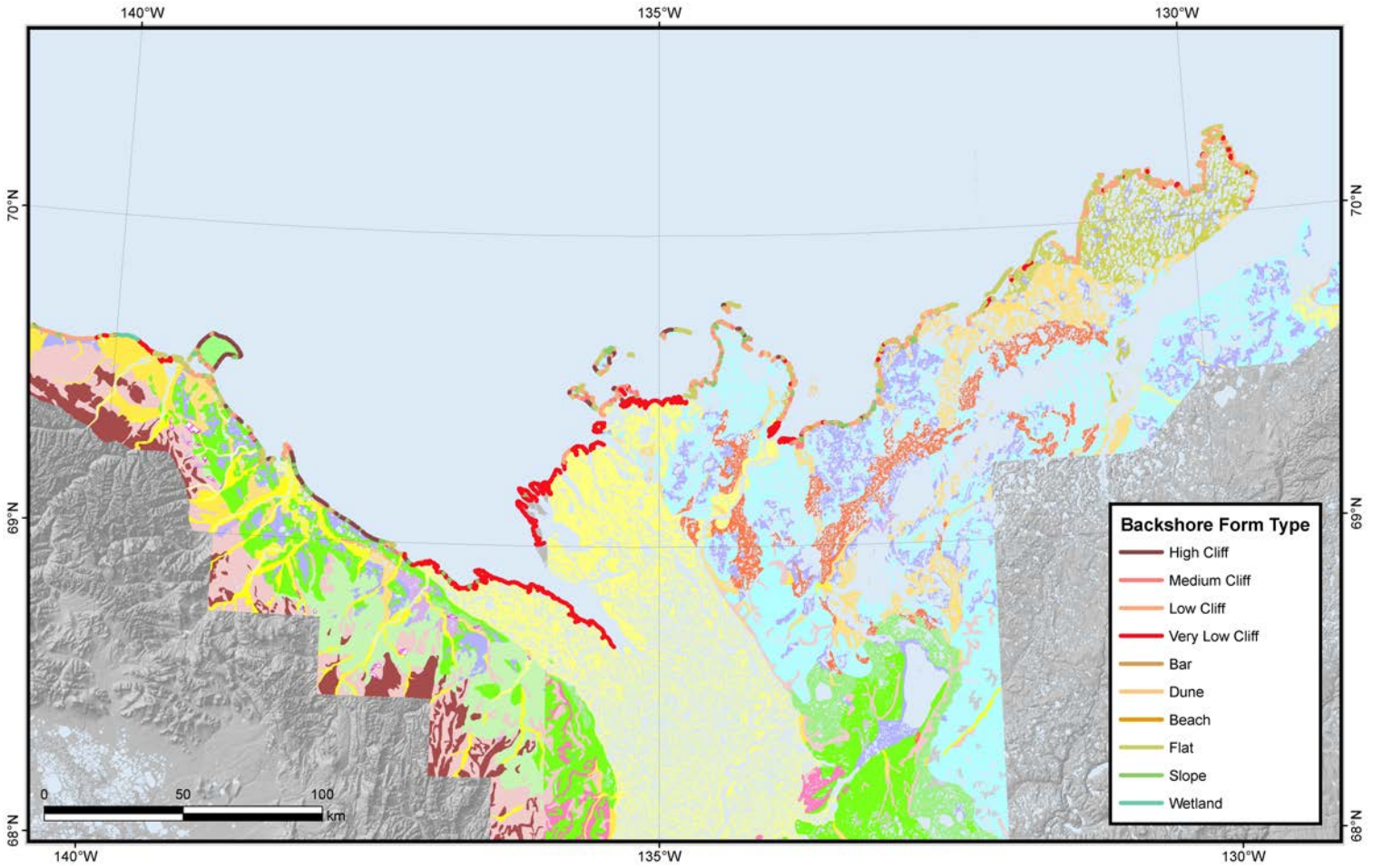


Legacy Data Capture



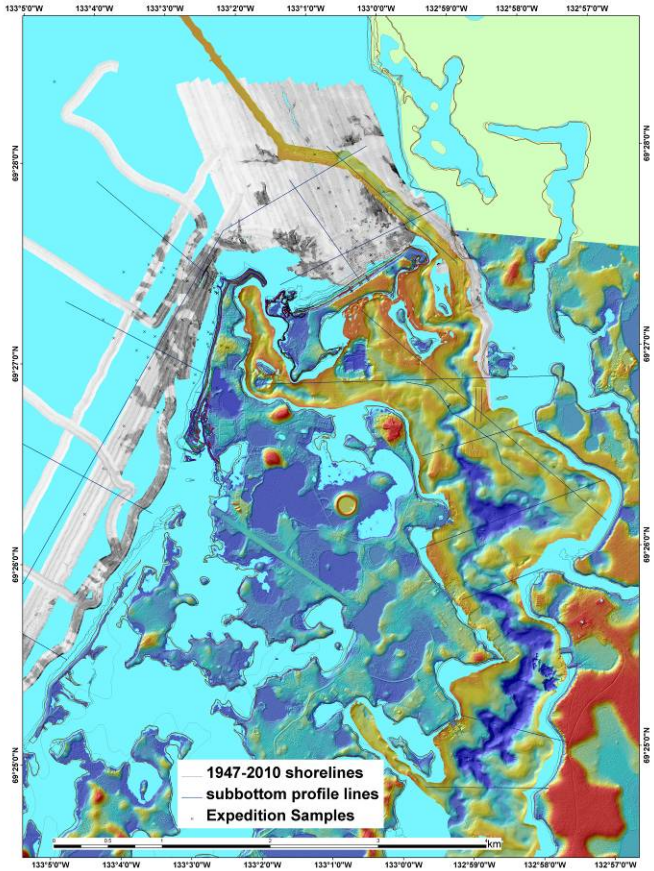
Spring Break-up Reports

Regional Data Synthesis – Surficial Geology with Backshore form Coastal Classification

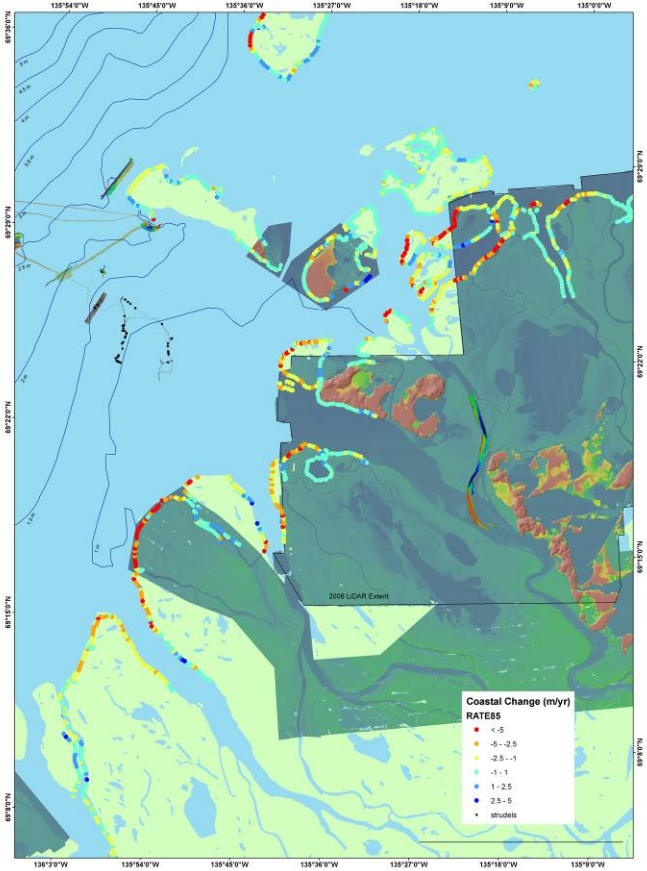


Localized Data Synthesis

Tuktoyaktuk



Mackenzie Delta



Summary of Coastal Geoscience Data

Spatial Data Inventory

1. Licensed and owned LiDAR datasets

2. Shallow Multibeam

3. Public availability of the Coastal Information System (CIS)

4. Compilation of coastal shoreline vectors – coastal change rates

5. Digital database of coastal monitoring sites (still in progress)

6. Coastal Photo Database

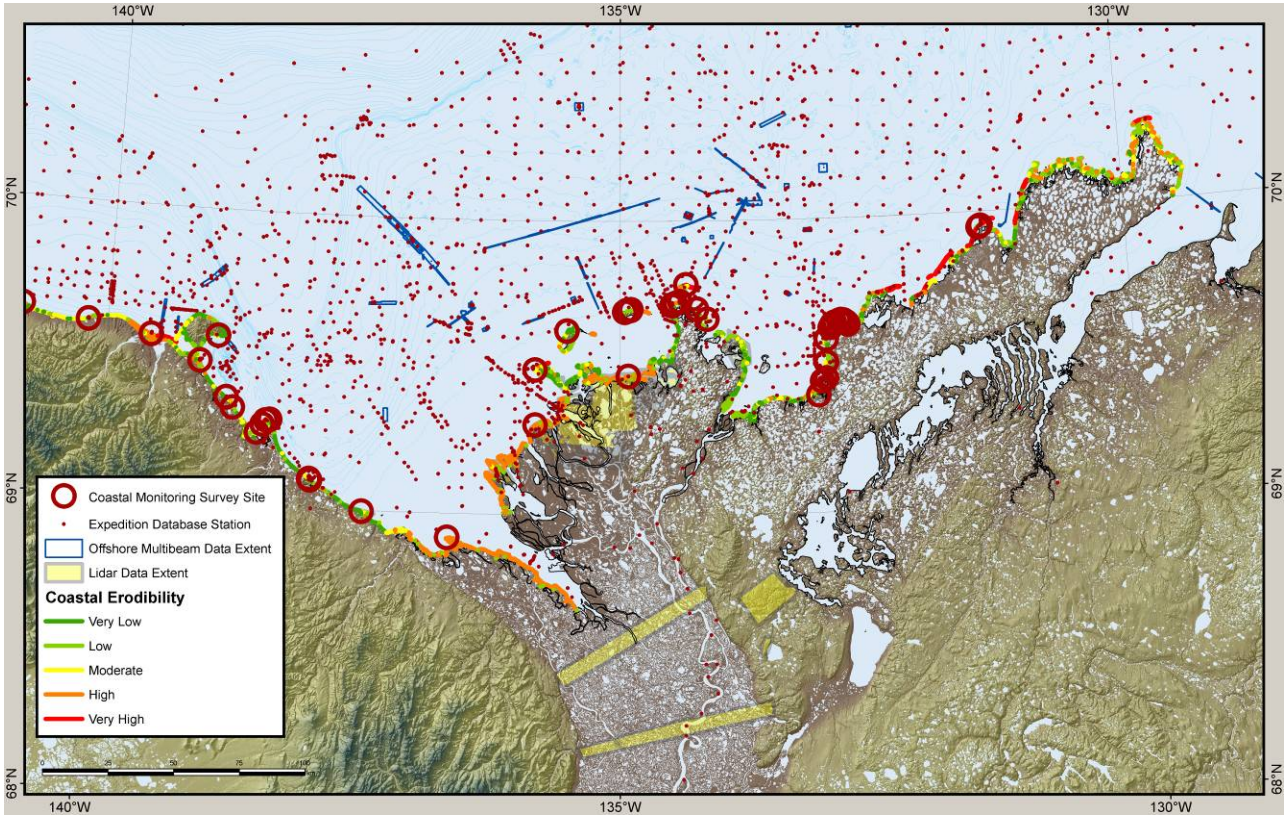
7. Surficial Geology layer (shape files) for the Beaufort Sea coastal region.

8. Bibliography of unpublished material, internal reports, field notes and works in progress
- conversion of legacy data to digital format – (ongoing)

9. Compilation of Spring Break-up Newsletters (2006-2012) - still planning for 2013

Accessibility of data to stakeholders and communities

- *Detailed baseline data allows for proponents to plan for EA requirements.*
- *Public data access allows for community groups to understand current environmental conditions to prepare for oil and gas activities*



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Data will be discoverable as web mapping services

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Knowledge Gaps – Preliminary Assessment

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*
   Is there any evidence for a recent acceleration of coastal erosion?

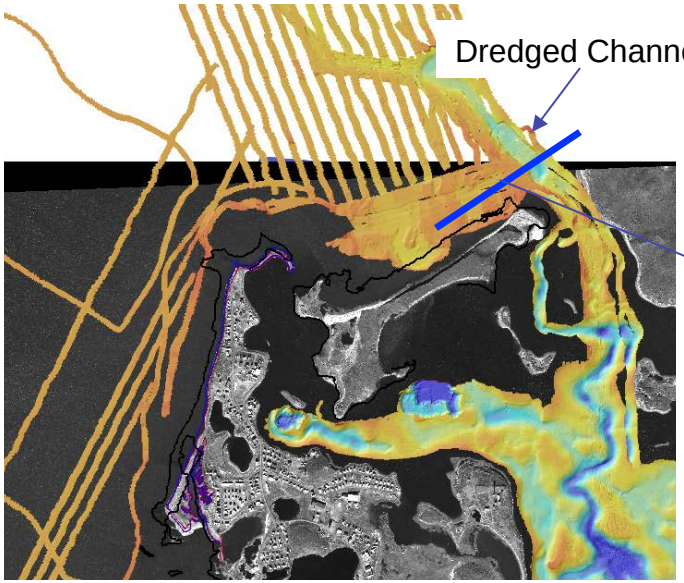
Tuktoyaktuk Island

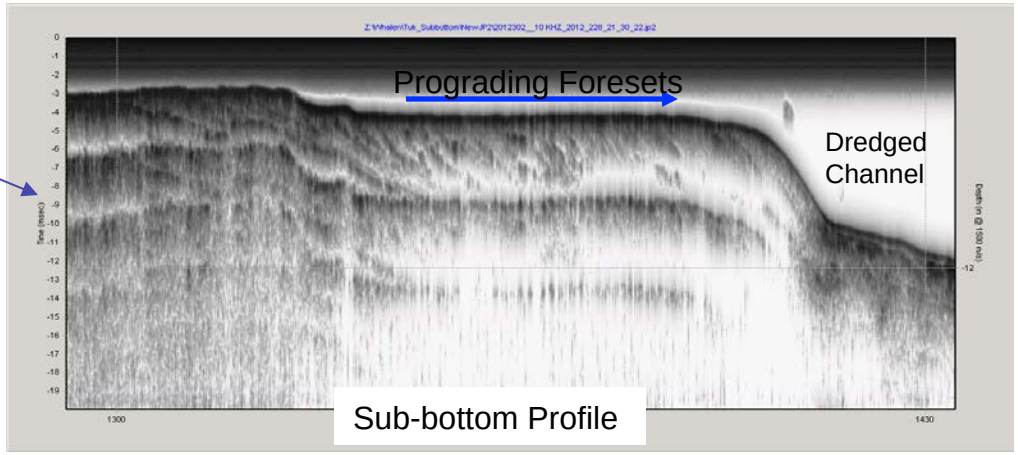
Navigation Marker
Tuktoyaktuk Island

Knowledge Gaps – Preliminary Assessment

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)?

5. ****Additional knowledge gaps are expected to be identified after year two of data synthesis and compilation*****





Thank You

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