

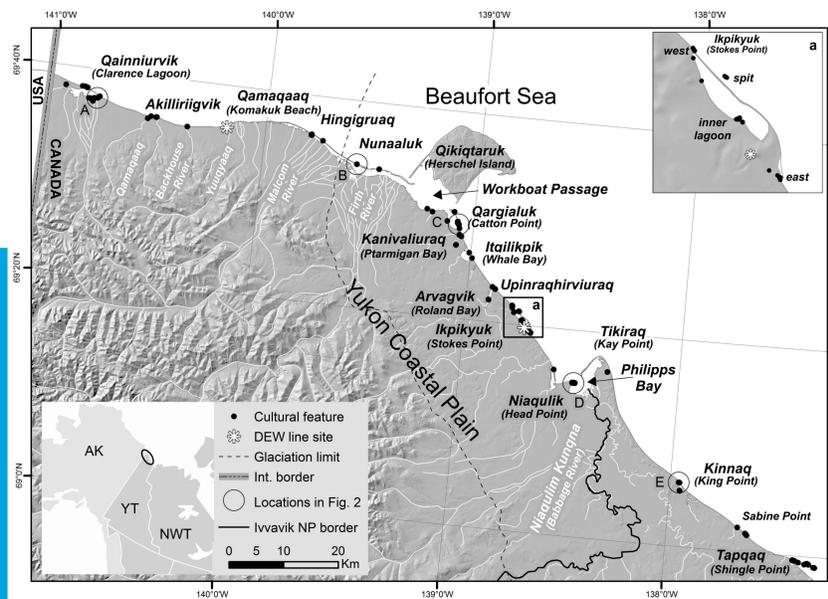
# Present and future impacts of coastal dynamics on the human environment of the Yukon coast

## Rationale

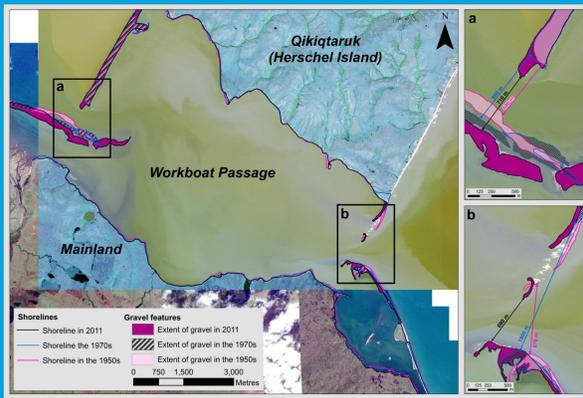
The Beaufort coast is extensively used by the Inuvialuit and other indigenous and non-indigenous peoples<sup>1,2</sup>. Cultural sites and features which give insights into the Inuvialuit way of life prior to contact with western cultures<sup>3,4,5</sup>, as well as of the early explorers<sup>6,7</sup>, the whaling era<sup>8</sup> and the missionaries<sup>9</sup> are valuable documents from the past (Figures A to E). In the last decades, the Yukon coast also became strategically<sup>10,11</sup> and economically<sup>12</sup> important.

The un-lithified and ice-bonded Yukon coast is very prone to rapid coastal erosion, which can reach as high as  $-9 \text{ m/a}^{13}$ . Coastal erosion and flooding have the potential to damage cultural heritage and infrastructure and modify travel routes<sup>14,15,16,17</sup>. Investigations show, that many of these processes can already be seen along the Yukon mainland coast and Qikiqtaruk<sup>14,16,18,19</sup>.

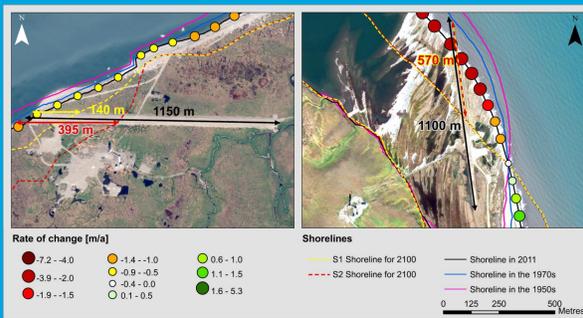
To understand how coastal changes influence the human environment of the Yukon mainland coast, the impacts of former and future coastal changes on cultural sites, infrastructure and travel routes were assessed. Therefore, past movements of barrier spits and barrier islands in the area of Workboat Passage and at Shingle Point were analyzed. Further, on the basis of past shoreline change rates, a linear (S1) and a dynamic (S2) shoreline projection for the year 2100 was done.



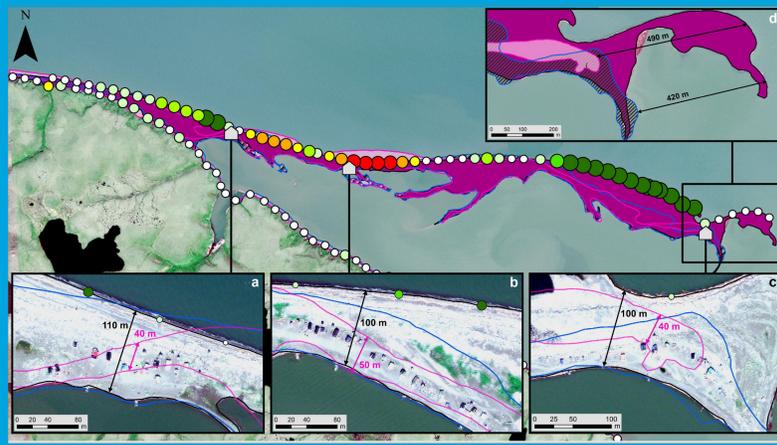
## Results



WBP is expected to remain open in the future. Increasing sediment input due to faster erosion is expected to result in shallowing of the lagoon.



Both landing strips will be shortened by future shoreline retreat. At Stokes Point, there is an additional risk of periodical or permanent flooding.



At Tapqaq, all three main camp sites are not directly threatened by present coastal erosion. However, projected sea level rise of up to 1 m by 2100<sup>20</sup> will increase the risk of all camps to erosion and floods, as well as breaching of the spit. Additional topography and bathymetry data would allow better estimates of these risks. (For legend please see figure to the left.)

## KEY FINDINGS

- Between 2011 and 2100, approx. **850 ha (S1) to 2240 ha (S2)** of the Yukon mainland are expected to erode
- **46% (S1) to 52% (S2)** of all cultural features are expected to get lost
- The three main Tapqaq camps are not directly threatened by erosion today, but **may become endangered** in the future due to sea level rise and storms surges
- **Navigation** through the Workboat Passage will be **more challenging** due to expected shallowing
- The Komakuk and Stokes Point **landing strips will be substantially shortened** and their usage will be very limited

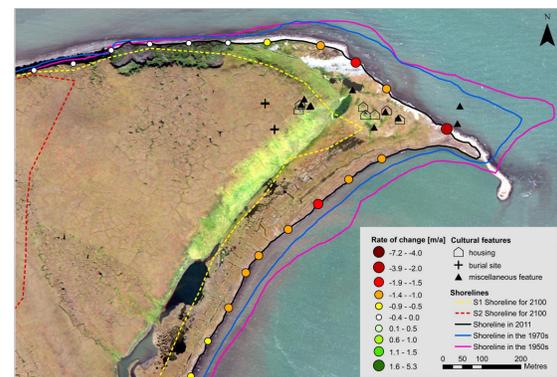
## Methods

### Cultural data

Information from a Parks Canada database<sup>22</sup> and the Yukon Archaeological Program database<sup>23</sup> were combined and extended by information from literature, site visits and overflights. The position of most features was enhanced or obtained by using satellite imagery from 2011 and aerial photos from the 1950s and 1970s.

### Shoreline projections S1 and S2 for 2100

End point rates (EPR), for several time periods which were calculated using the Digital Shoreline Analysis System (DSAS) for Esri ArcGIS<sup>22</sup> were used for both shoreline projections. **S1** is a linear projection based on EPRs for the 1950s – 2011 time period. **S2** is a dynamic projection which additionally uses information about the change in the EPRs for the 1970s – 1990s and 1990s – 2011 and thus accounts for acceleration and deceleration in shoreline change. The position of the S1 and S2 shorelines with respect to the mapped cultural features was then analyzed in ArcMap to see, which cultural features will be destroyed (Figure to the right).



The content of this poster including all figures is in review in Arctic Science.

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