



Climate Change and the Erosion of Archaeological Sites on the Beaufort Sea Coast

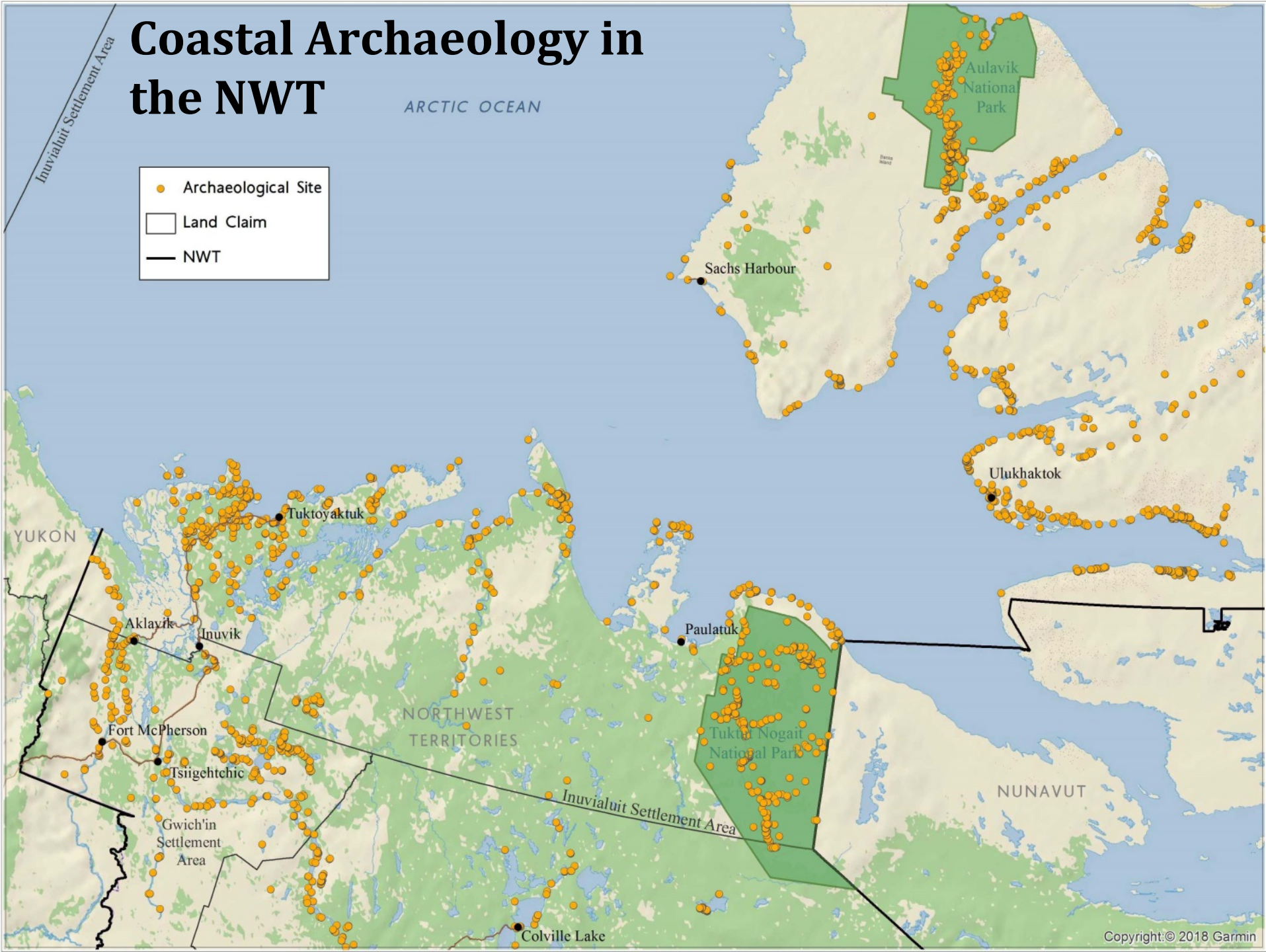
Glen MacKay, Culture and Heritage Division, Government of the Northwest Territories

APVE III Workshop

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Government of
Northwest Territories

Coastal Archaeology in the NWT



Inuvialuit History at Kuukpak



Kuukpak Sod and Driftwood Houses



Photo courtesy of Max Friesen, University of Toronto





Image courtesy of Max Friesen, University of Toronto

Permafrost and Preservation



Government of
Northwest Territories

Permafrost and Preservation



Permafrost and Preservation



Arctic Wildlife

- Coastal archaeological sites are repositories of well-preserved ancient animal bones.
- Ancient animal bones are useful for understanding current wildlife populations.



Photo courtesy of Max Friesen, University of Toronto

Long-term Erosion of Shorelines in the Beaufort Sea



Image courtesy of Charles Arnold



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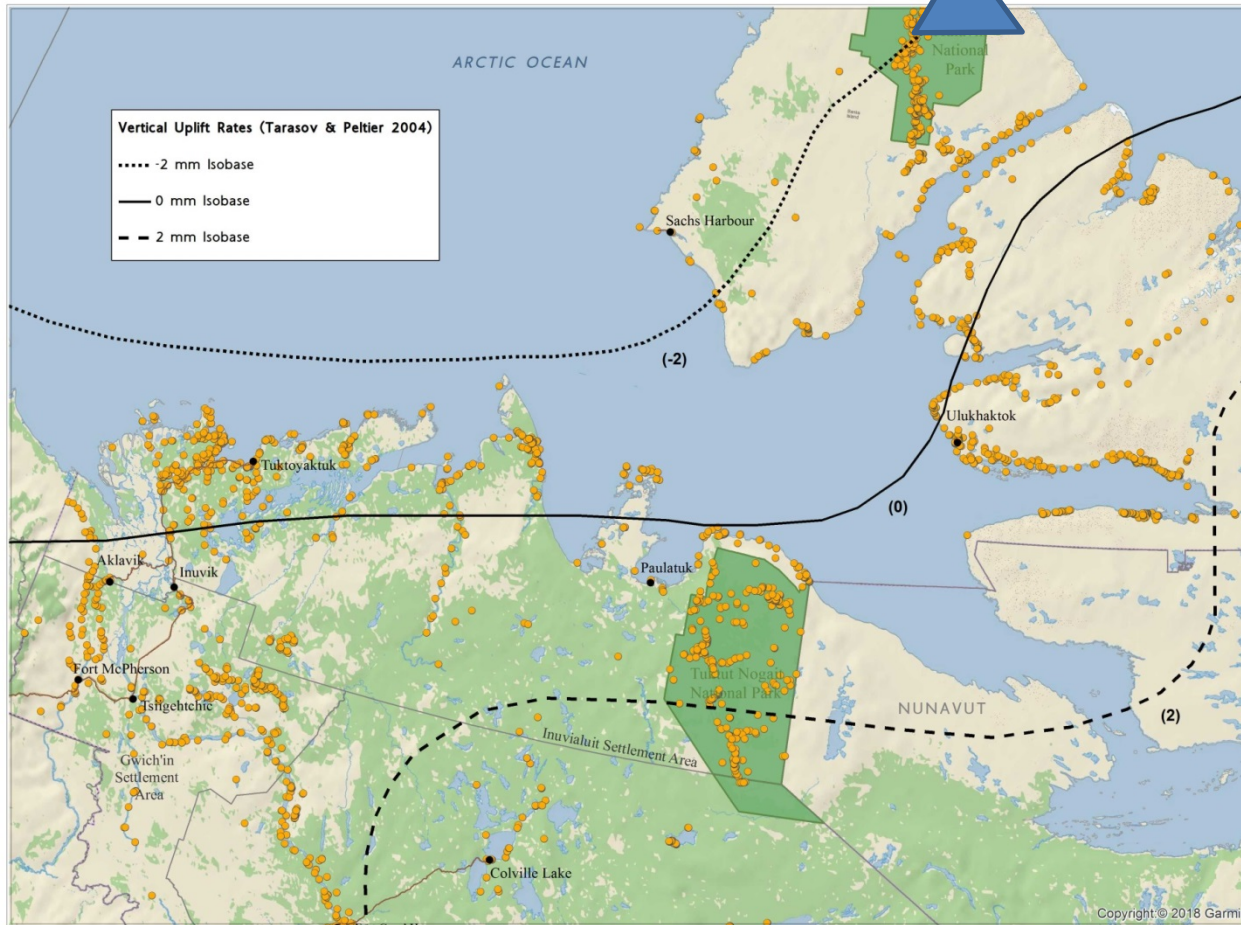
McKinley Bay

- Inuvialuit village site on the Tuktoyaktuk Peninsula
- Eroding at approximately 1 m per year
- Two house features that were 8 m inland in 2004 are now totally gone



Images courtesy of Max Friesen,
University of Toronto

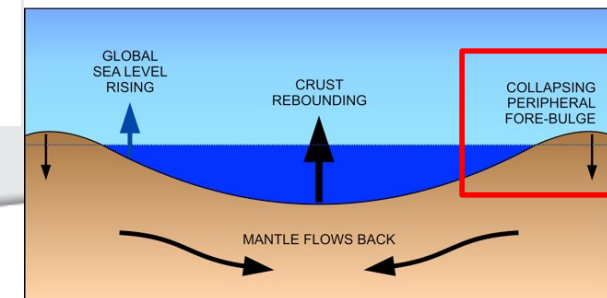
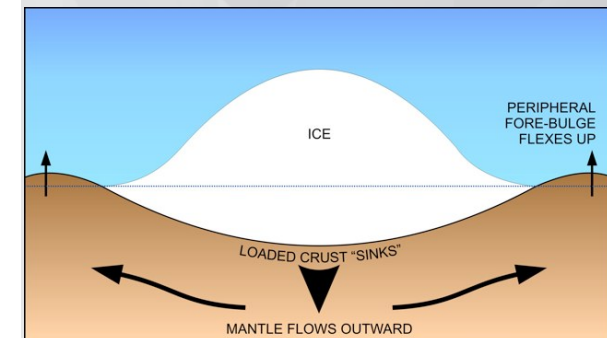
Glacial Isostatic Adjustment



-2mm
ISOBASE

0mm
ISOBASE

2mm
ISOBASE



Long-term Coastal Erosion Rates

- Long-term rates of coastal retreat calculated from historic air photos.
- Erosion rates of 1 m/year are commonplace along the Beaufort Sea Coast.
- But erosion rates of >10 m/year (and higher) occur along some stretches of the coast.

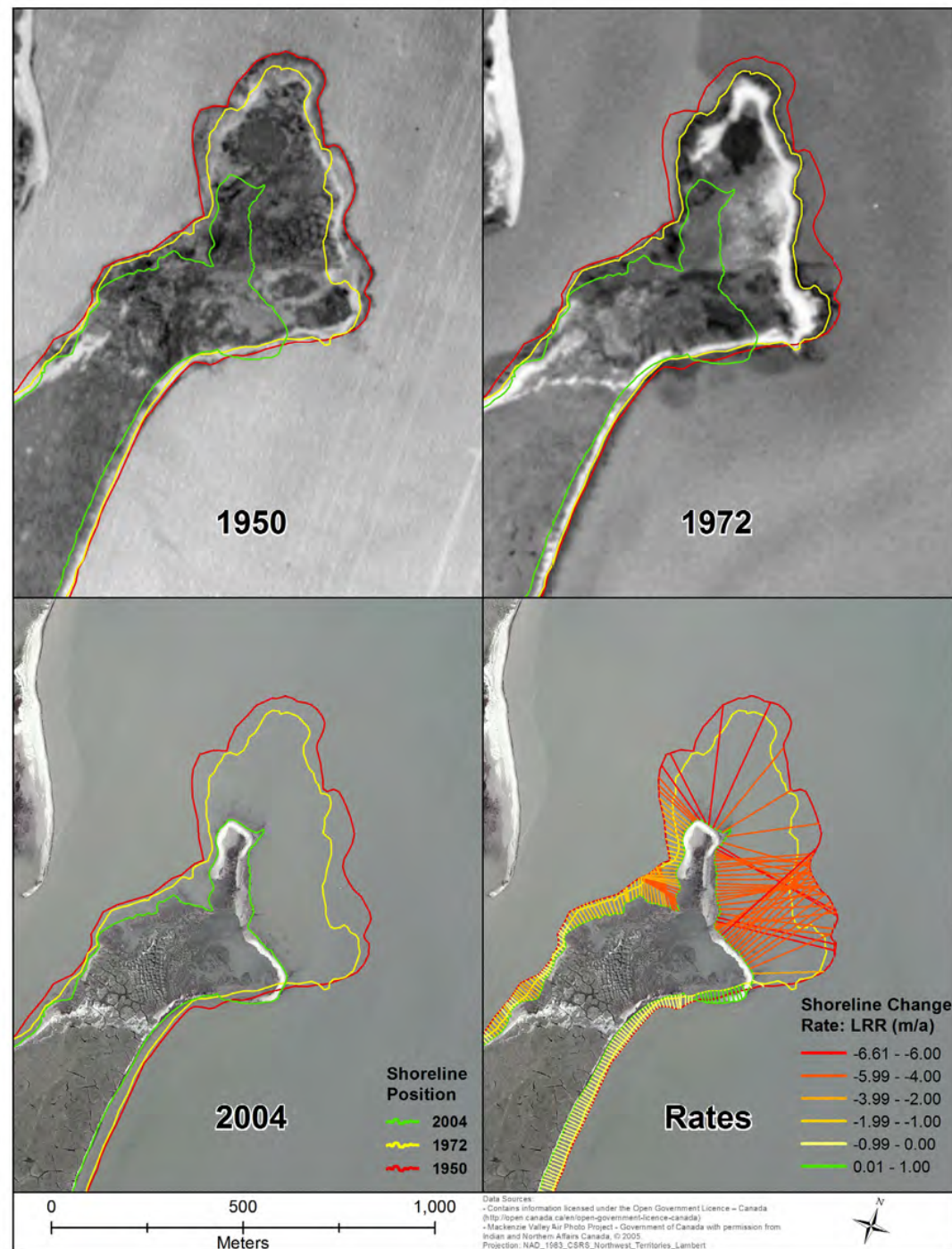
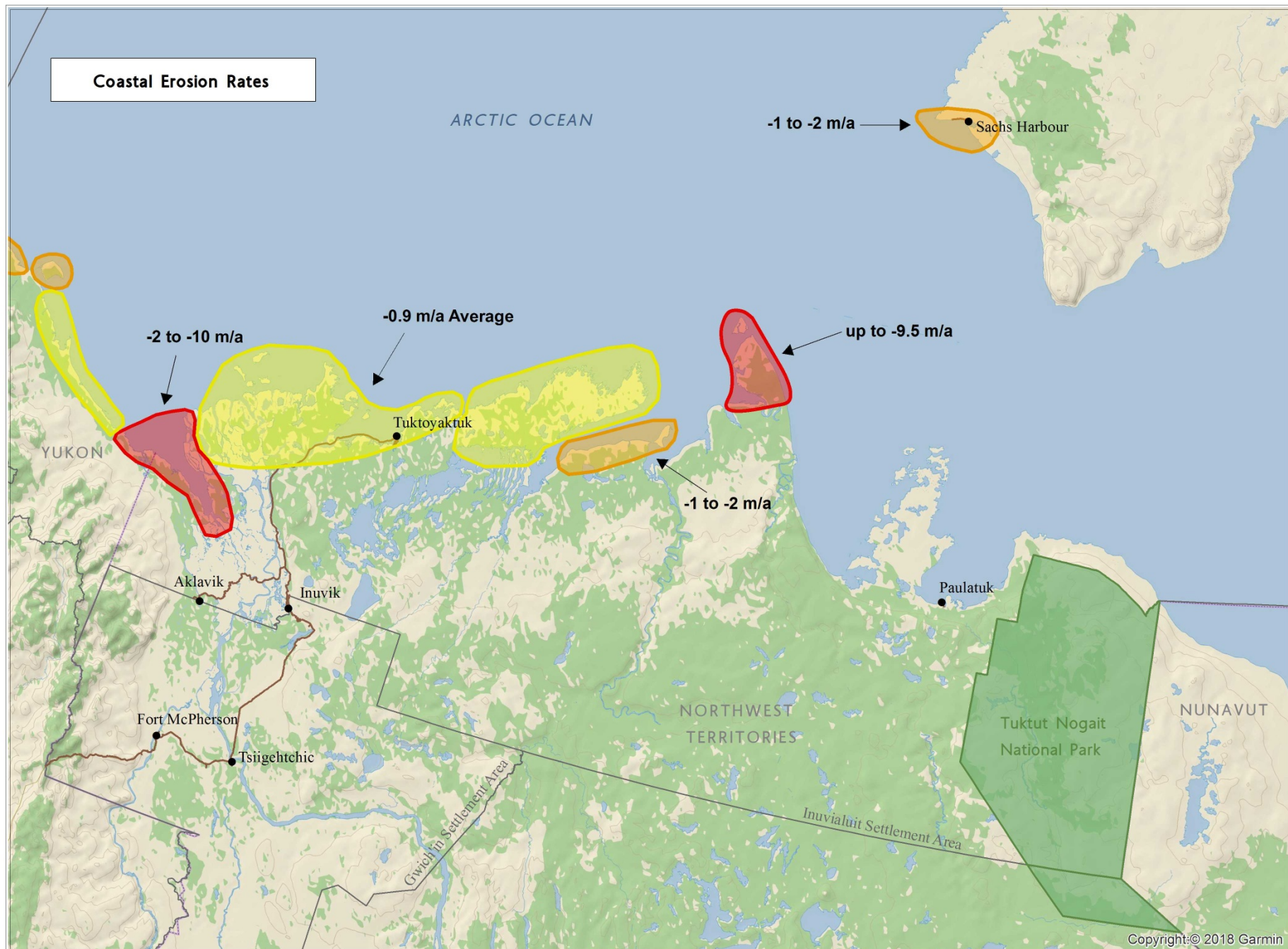


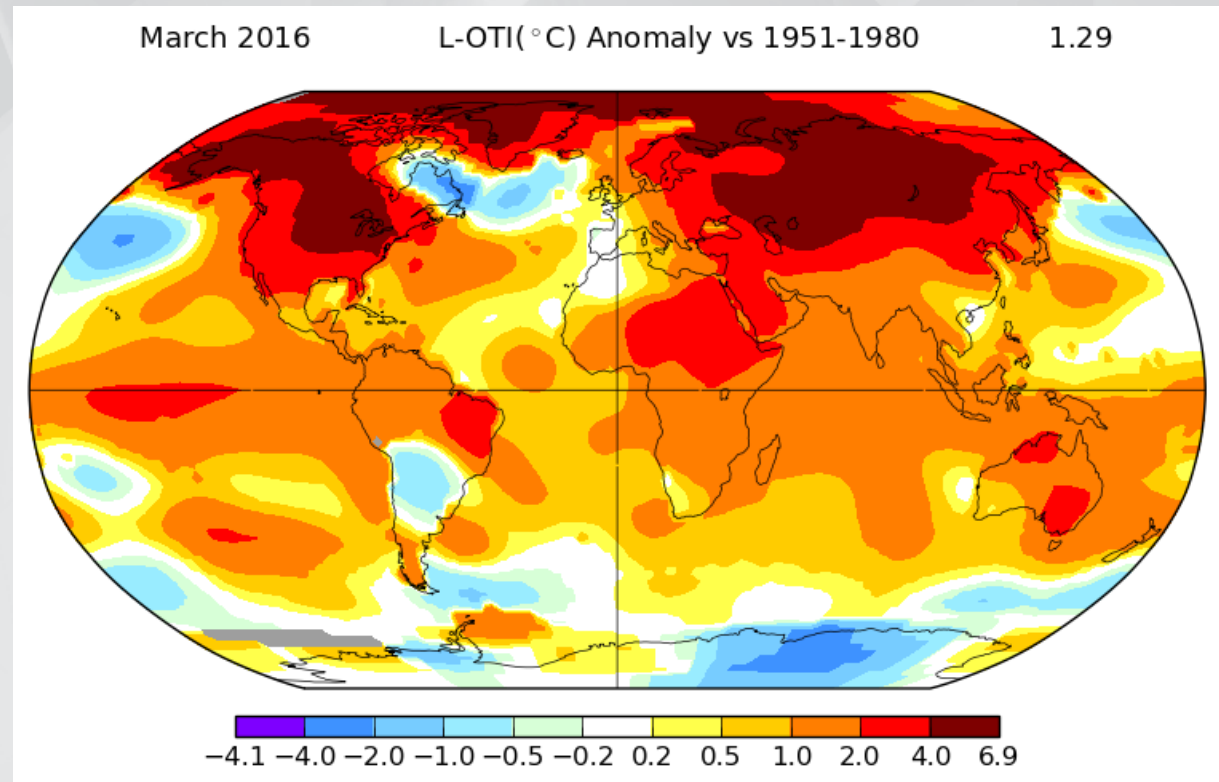
Image courtesy of Mike O'Rourke,
University of Toronto (O'Rourke 2017.
Open Archaeology 3:1-16).

Coastal Erosion Rates

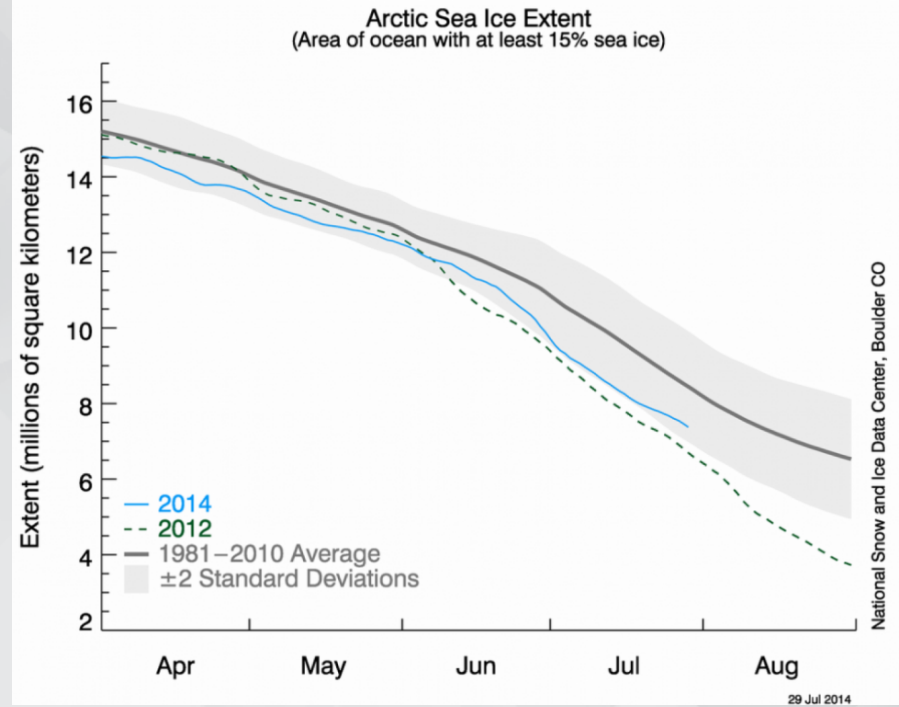
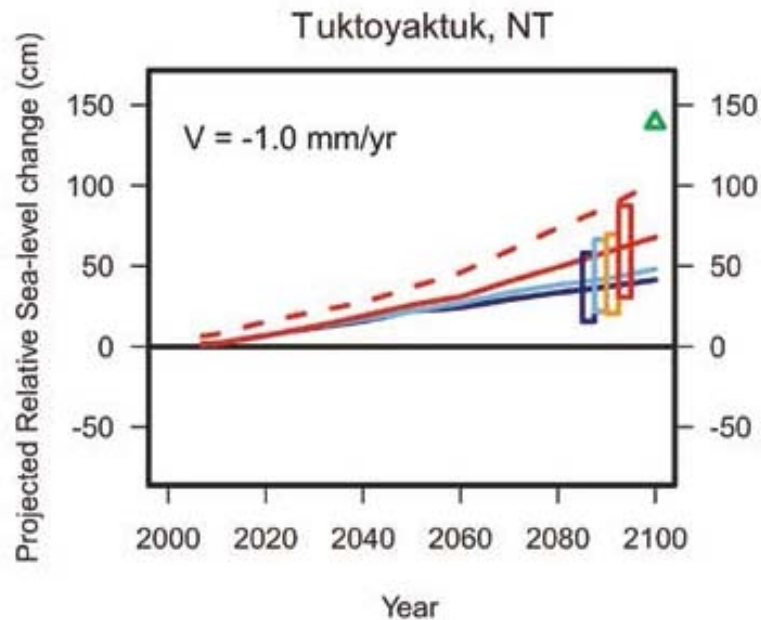


Climate Change in the NWT

- The NWT is warming at a faster rate than the global average
- This trend will continue

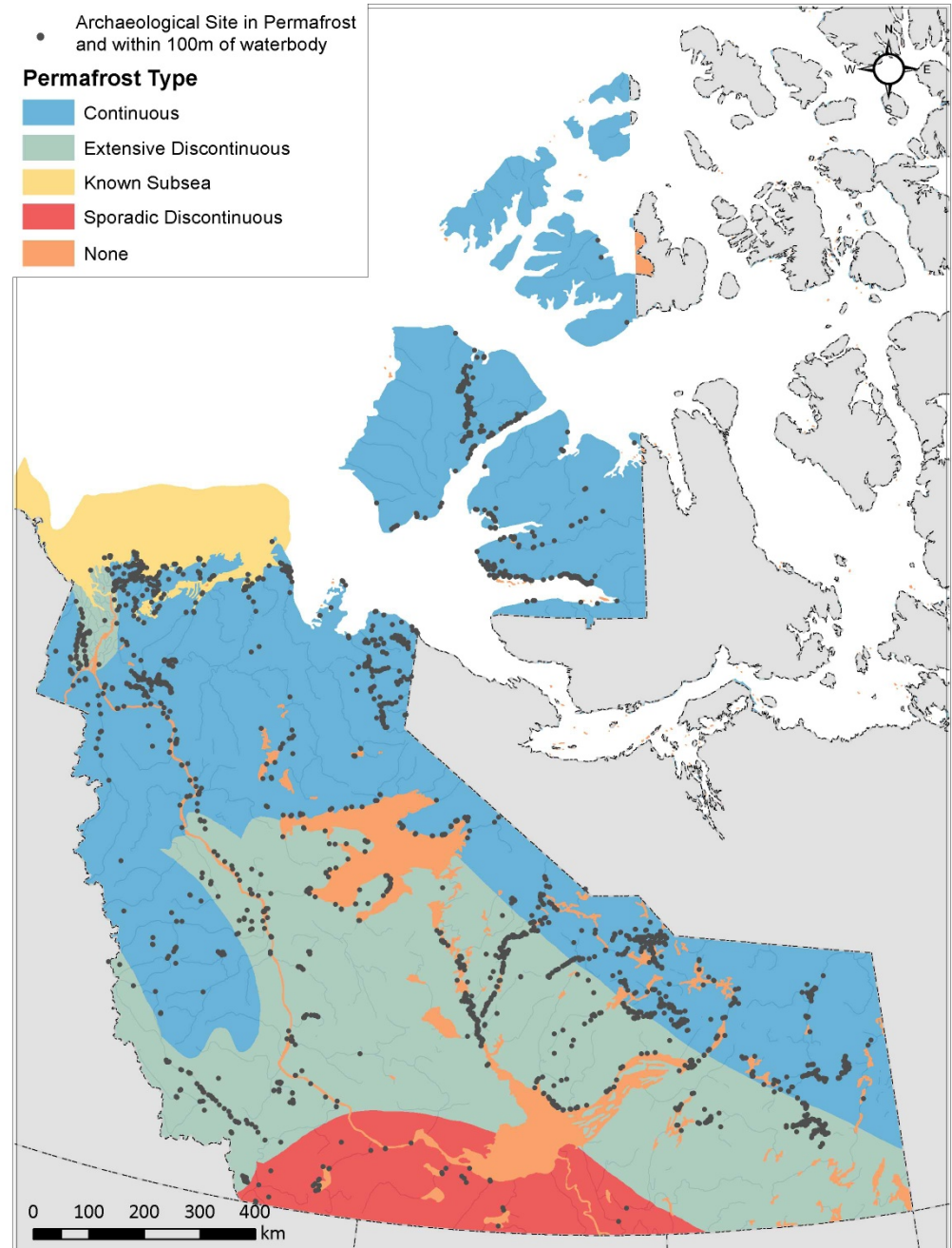


Climate Change and Coastal Erosion



Thawing Permafrost

- Continuous permafrost underlies the entire NWT coast
- Permafrost temperatures are warming
- Active layer thickness is increasing



Massive Ground Ice and Landscape Disturbance

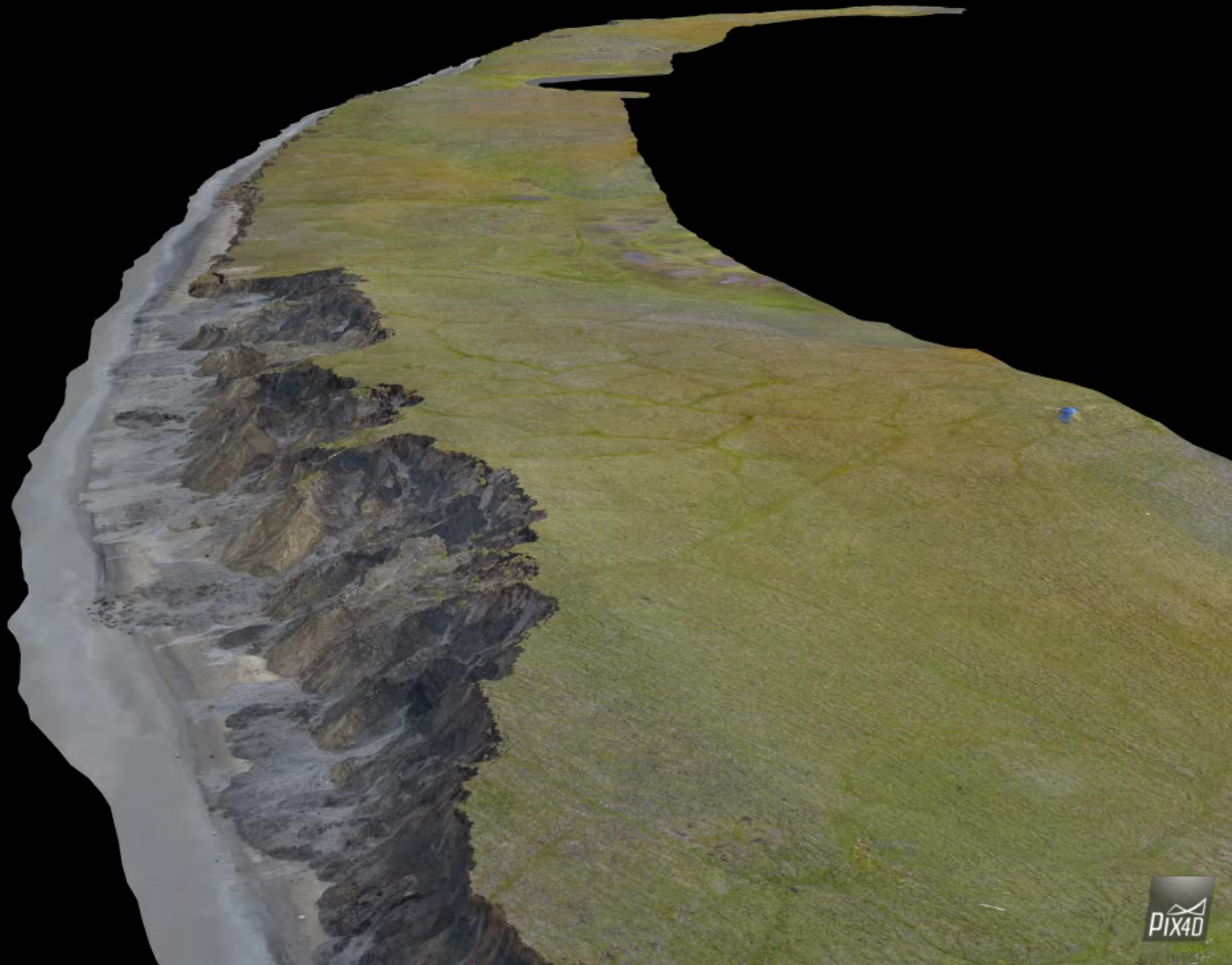
Block Failure

(Image from Ford et. al. 2016)



Thaw Slump

(Image from Ford et. al. 2016)



Remote Sensing for Monitoring Coastal Archaeological Sites

- Generalized , long-term erosion rates do not predict extreme erosion events (i.e. extreme storms, thaw slumps).
- Annual or semi-annual high-resolution satellite imagery needed to monitor erosion of significant archaeological sites.

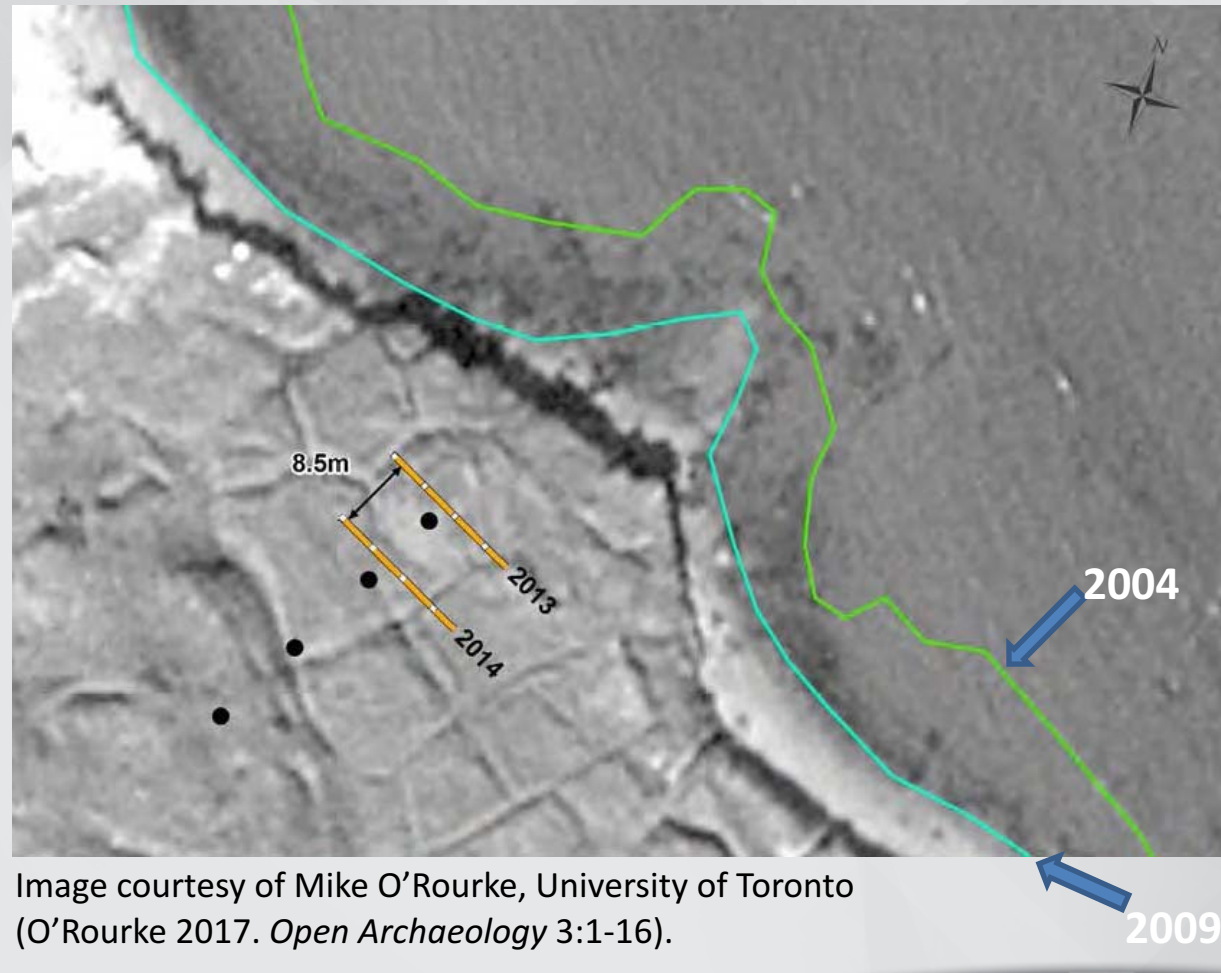


Image courtesy of Mike O'Rourke, University of Toronto (O'Rourke 2017. *Open Archaeology* 3:1-16).



**Mahsi | Masi | Mársı | Həı' |
Quana | ʻdɫ°ɔɫɫ° | Quyanainni
| Kinanāskomitin | Merci |
Thank you**

