

Mapping Sea Ice Overflow on the Alaskan Beaufort Sea Coast Using Remote Sensing

2010 Alaska Marine Science Symposium
Anchorage, AK

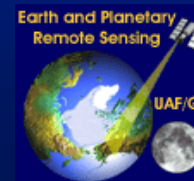
Minerals Management Service , Alaska OCS Region

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Overview

- Objectives
- Background
- Methods
- Results
- Conclusions

Project Objectives

- Compare Mapping Methods
- Map River Overflow Limits
- Identify Facilities Siting Hazards
- Investigate Causative Factors
- Compile GIS Database

Background

Sea Ice Overflood

- Annual event
- Duration 5-15 days
- Late May to mid June
- On-ice water depth 1 m +
- Distance 10 km +
- Flood area to 1000 km²
- Energetic drainage
- Strudel scour

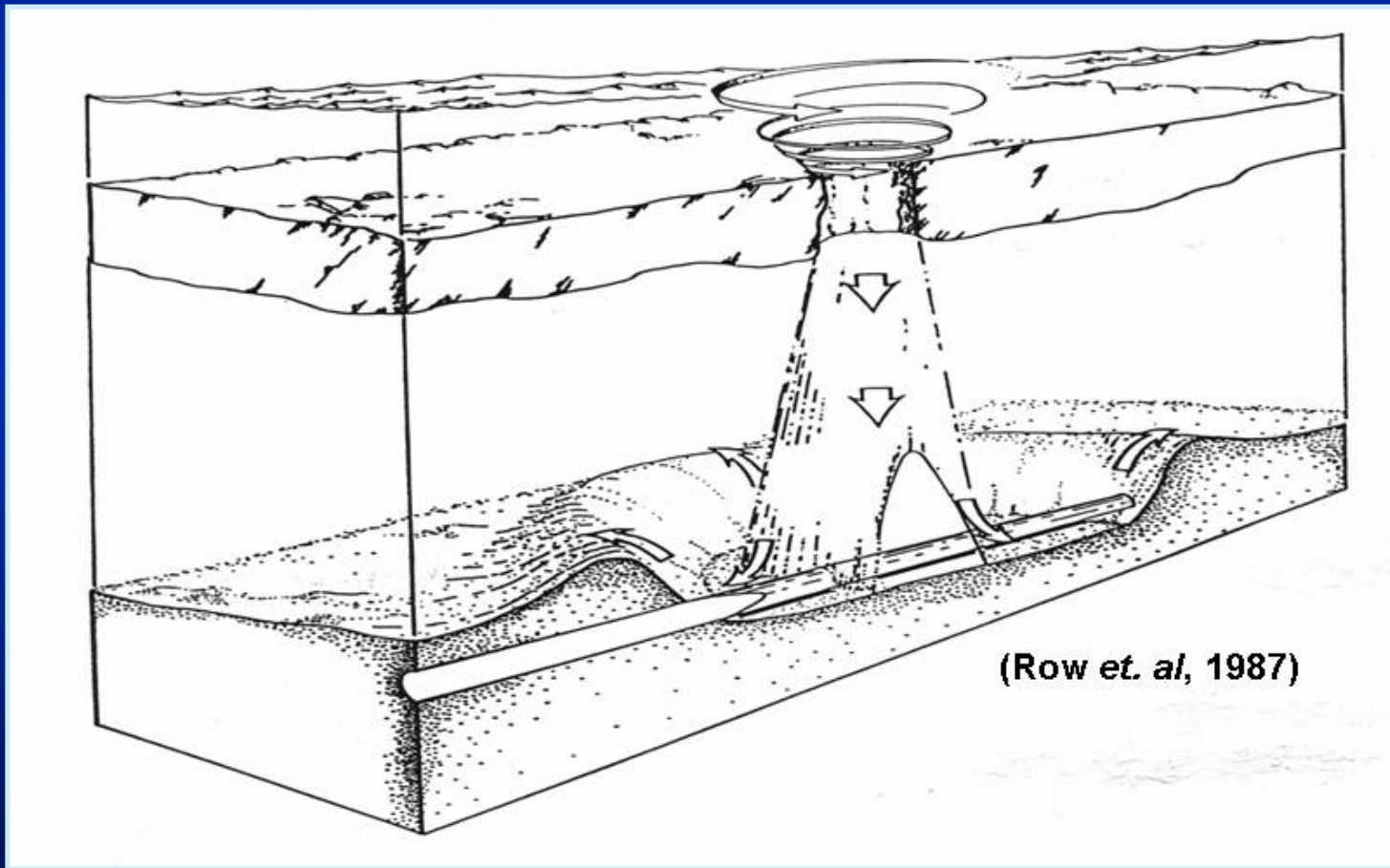


Importance of Overflow

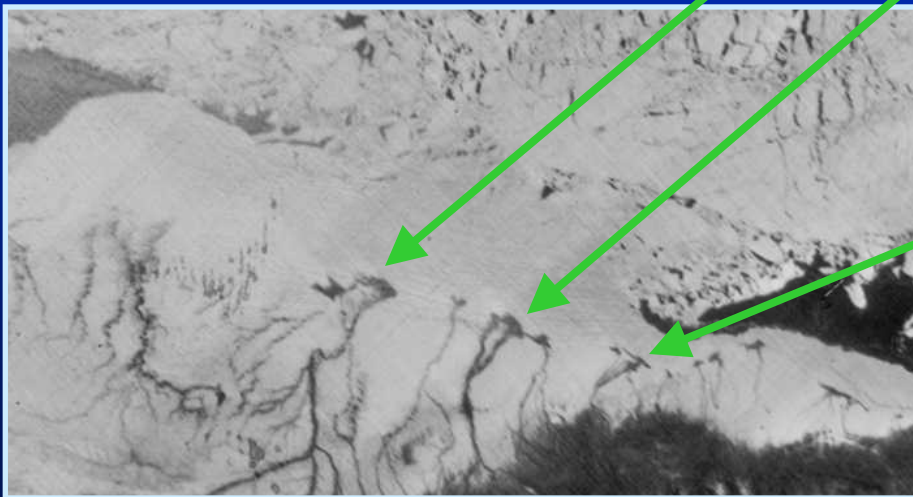
- Strudel Scouring
- Oil Spill Dispersal
- Ice Road Access
- Spill Response



Strudel Scour Formation



Overflood Mapping



Rivers

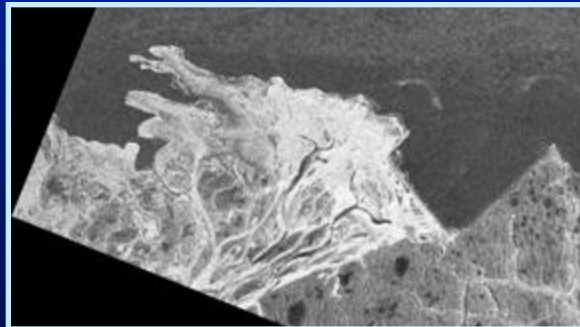
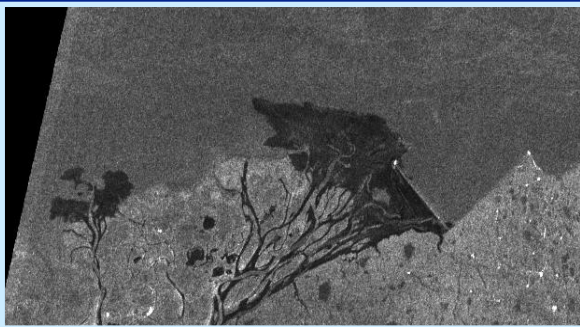
- *Topagoruk*
- *Ikpikpuk*
- *Colville*
- *Kuparuk*
- *Sagvanirktok*
- *Kadleroshilik*
- *Shaviovik*
- *Staines*
- *Canning*
- *Katakturuk*
- *Sadlerochit*
- *Hulahula*
- *Okpiluk*

Mapping Methods

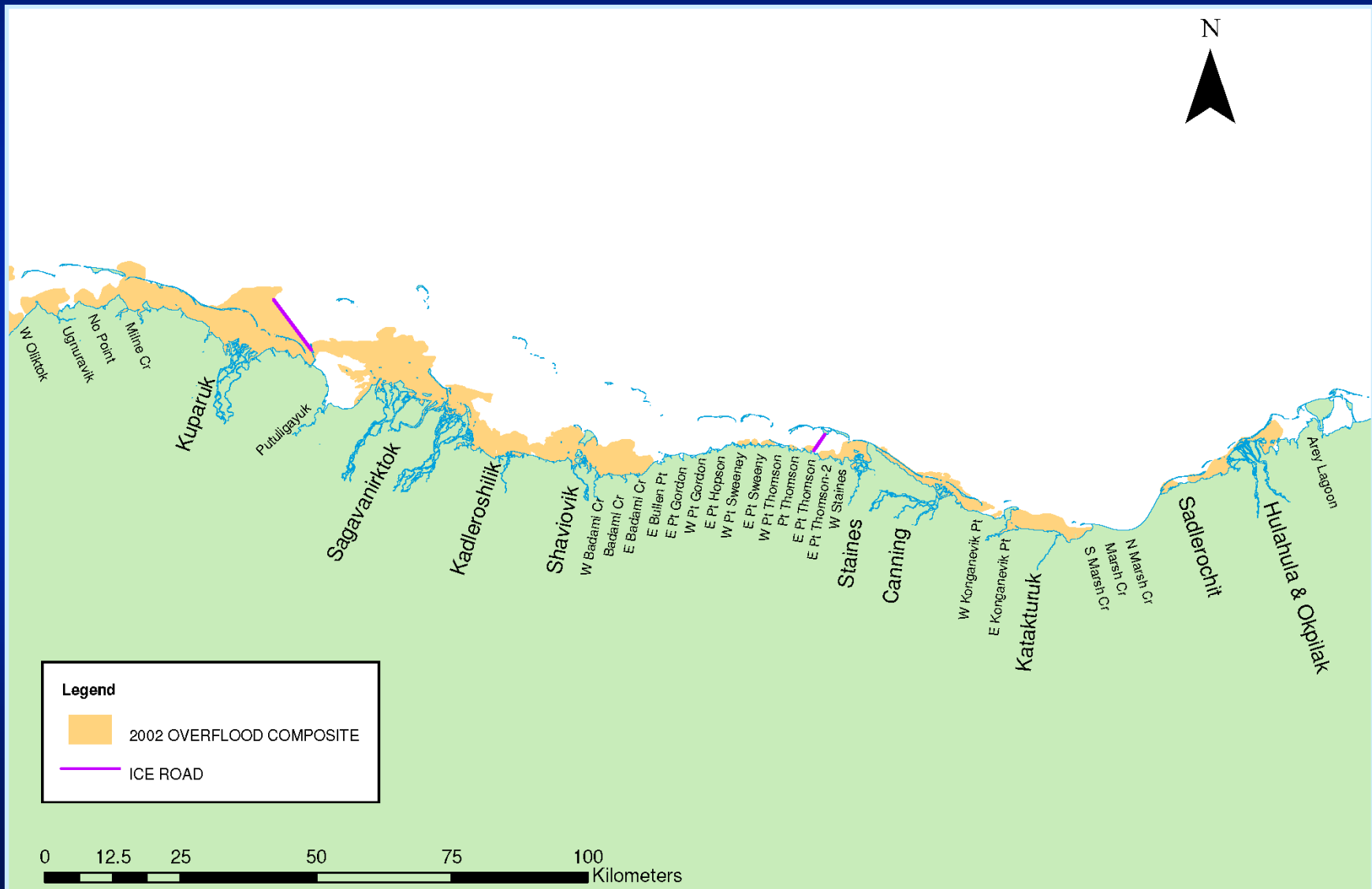
- Helicopter GPS Surveys
- Visual Satellite Imagery
 - Landsat
 - Spot
 - Modis
- Radar Satellite Imagery
 - RadarSat
 - ERS 1 & 2

Mapping Procedure

- Employ all Platforms
- Interpret and Map Limits in CAD/GIS
- Develop Composite Limit
- Quantify Flood Properties



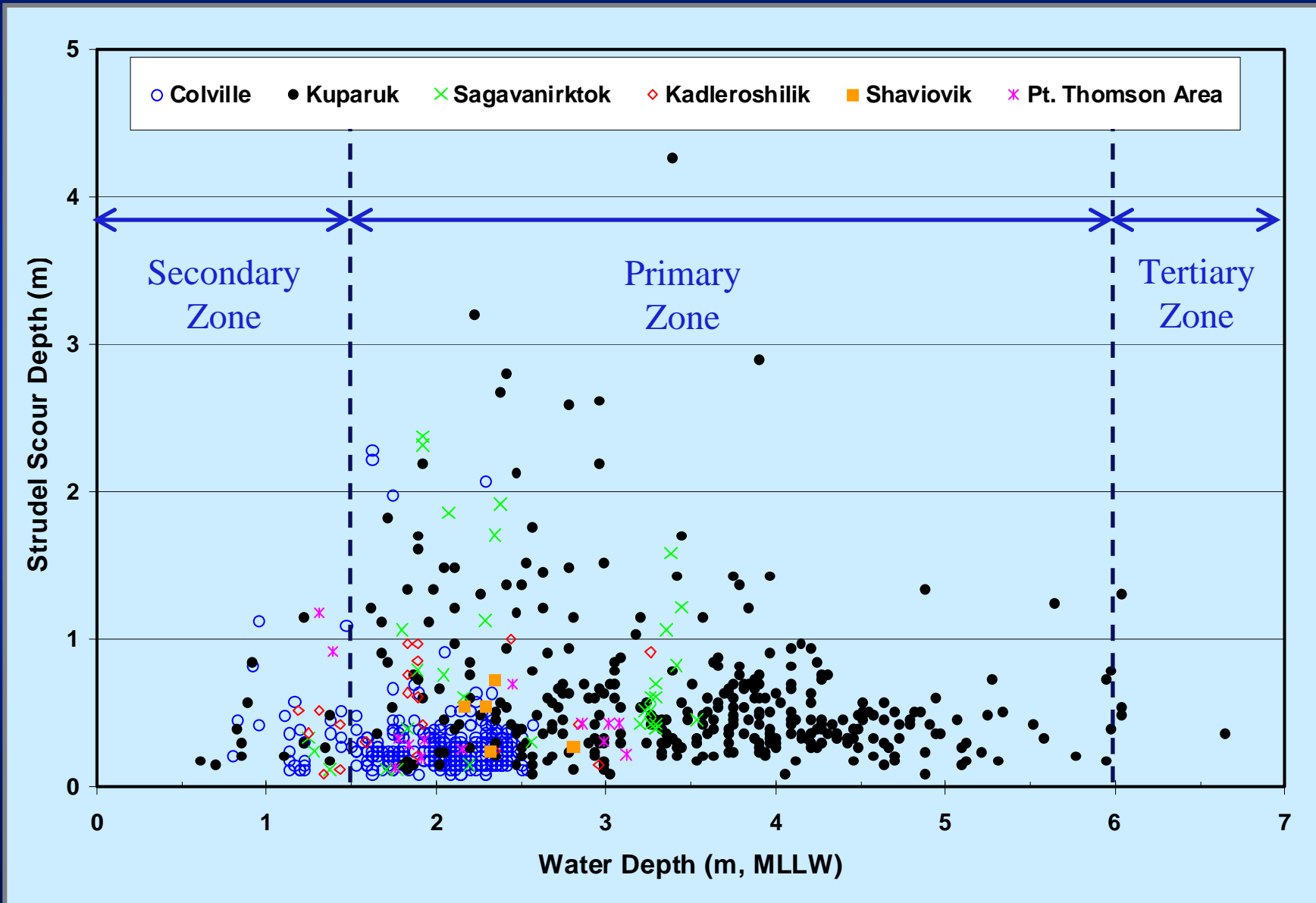
2002 Overflood Limits



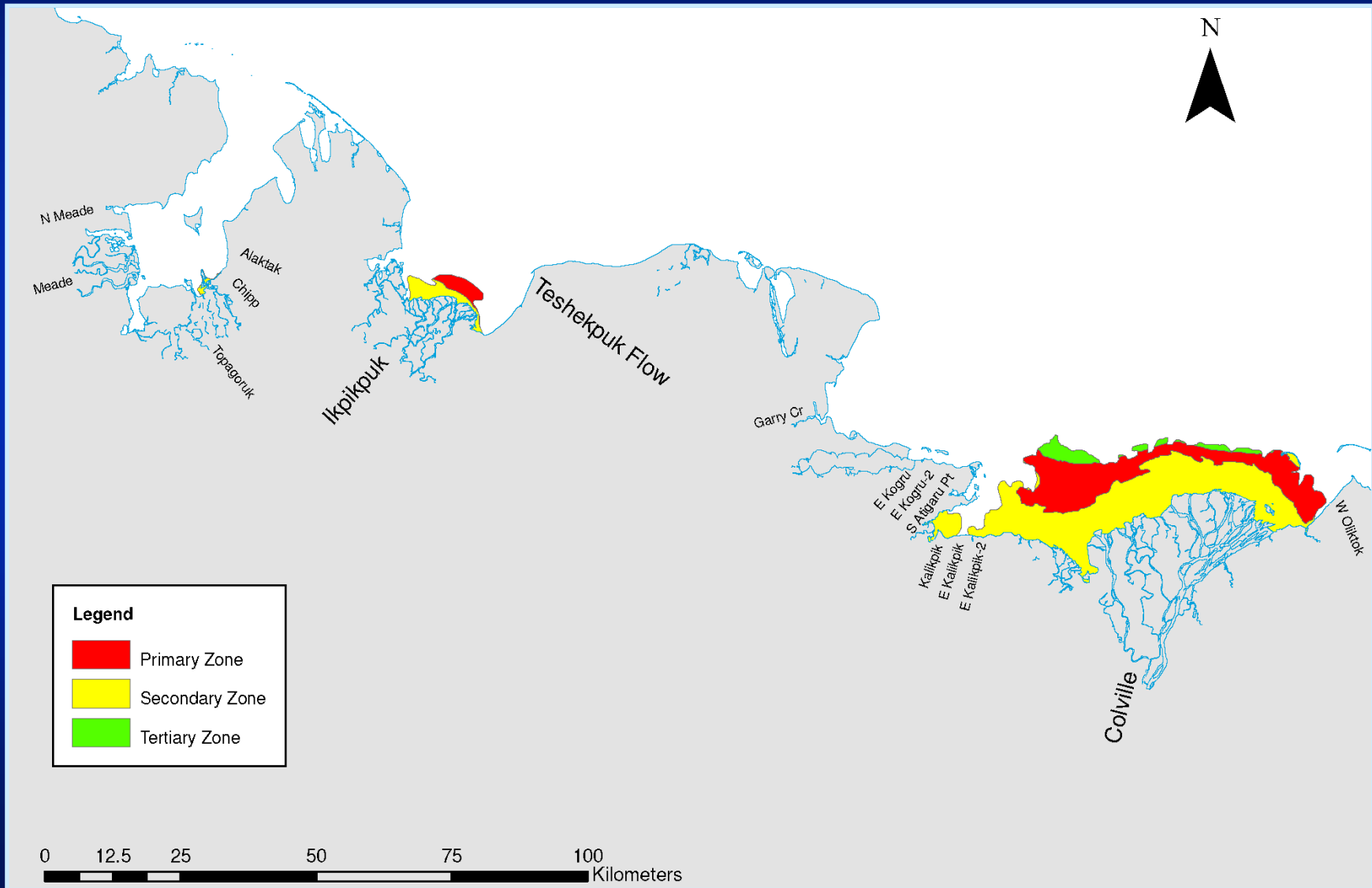
Strudel Scour Zonation

- Secondary Strudel Zone
 - *Bottomfast Ice ~ 0 to 1.5 m Depth*
 - *Scouring – low frequency and severity*
- Primary Strudel Zone
 - *Floating Fast Ice ~ 1.5 to 6 m Depth*
 - *Scouring – high frequency and severity*
- Tertiary Strudel Zone
 - *Floating Fast Ice ~ 6+ m Depth*
 - *Scouring - low frequency and severity*

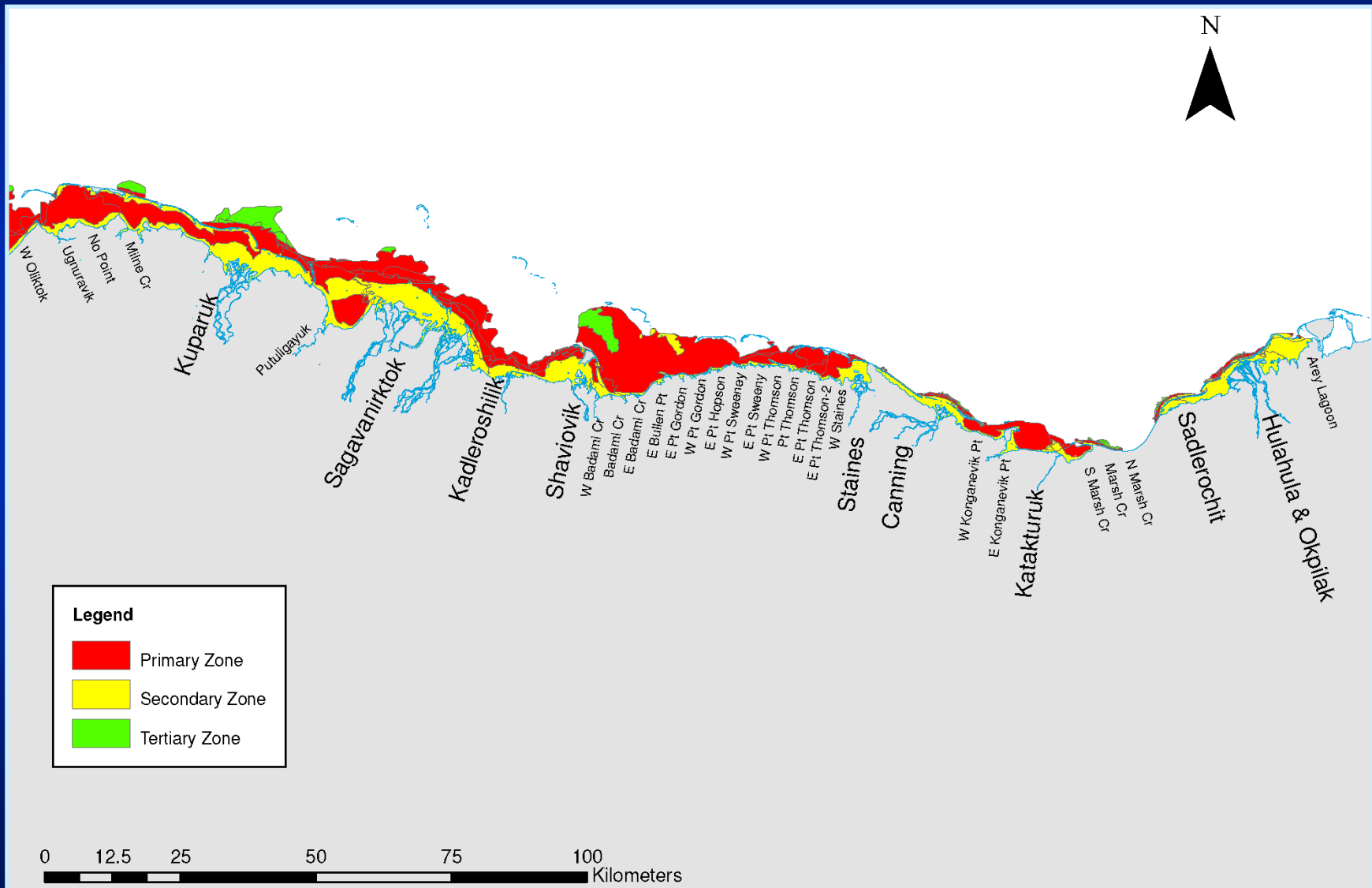
Strudel Scour Zonation



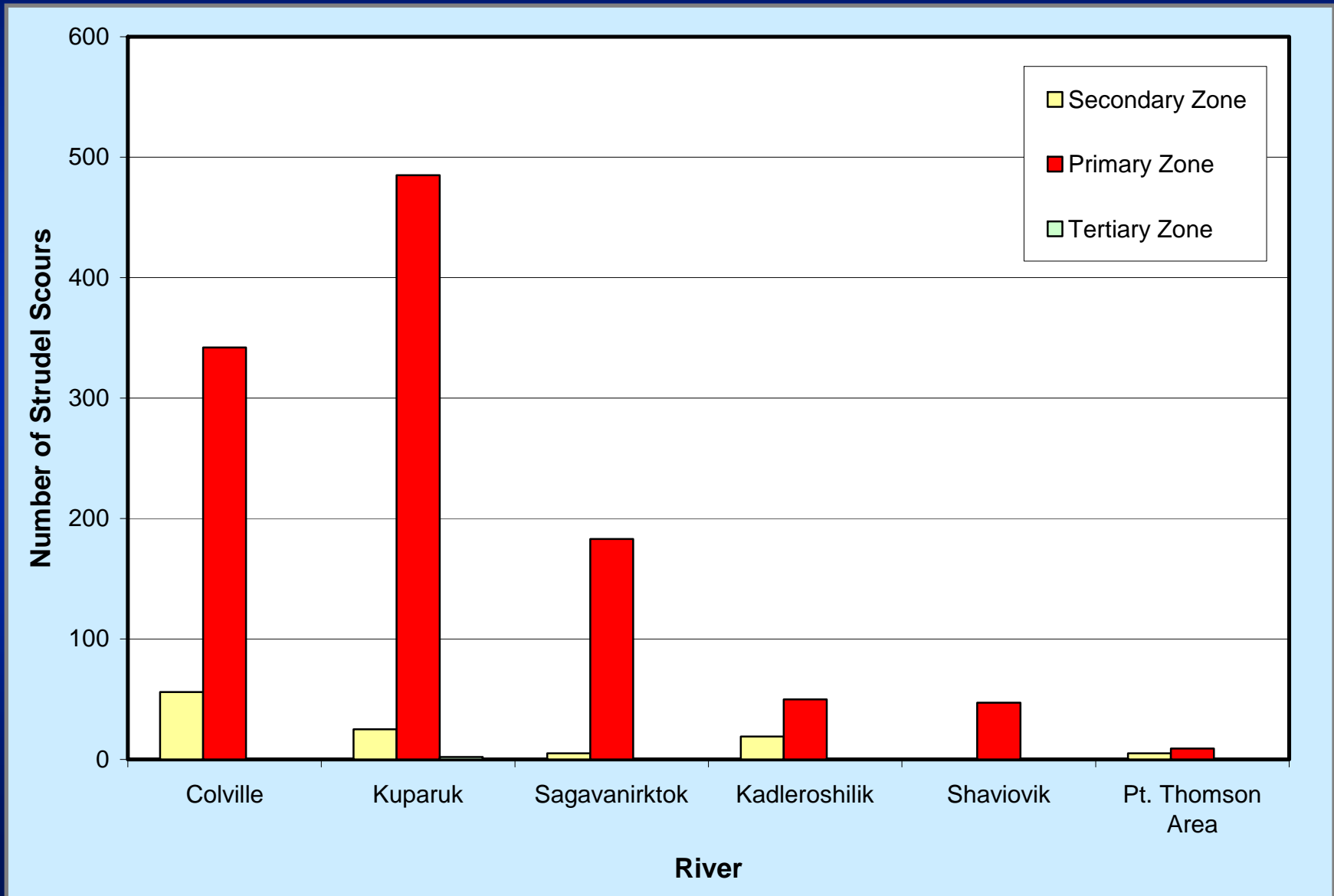
2001 Strudel Scour Zonation



1995-2007 Strudel Scour Zonation



Strudel Scour Occurrence by Zone



Conclusions

1. Satellite imagery is accurate overflood mapping tool
2. Helicopter surveys needed to map strudel drainage features
3. Strudel Zonation should be considered when siting pipelines and ice roads