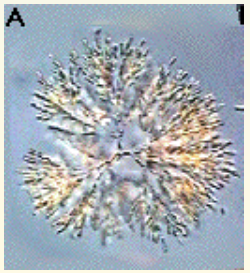
Beaufort Regional Environmental Assessment

2015 Research Results Forum

Species Oil Spill Vulnerability Profiles (VPs) For Net Environmental Benefit Analysis (NEBA) In the Beaufort Sea

Inuvik, NWT

February 24-28, 2015



Acknowledgements

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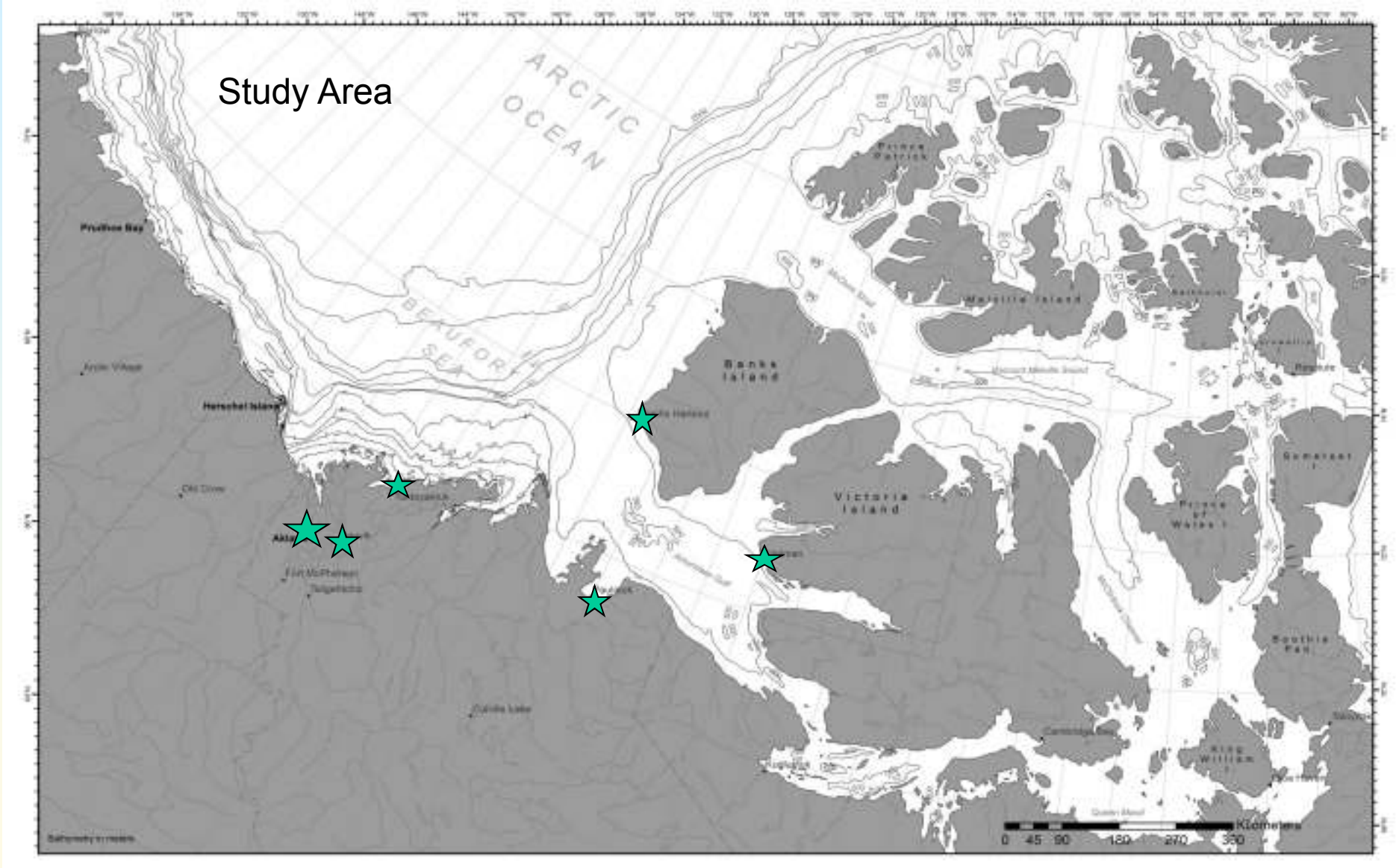
  - **Carl Brown (Env. Canada)**

Introduction

- Objectives
  - Prepare oil spill vulnerability profiles for selected KEY Beaufort Sea Species
  - Prepare Net Environmental Benefit Analysis (NEBA) for an Example Spill Scenario
  - Focus this project is NEBA for In-Situ Burning (ISB) and Dispersants in the Beaufort Sea
- Study Area
- Background and Approach
  - NEBA
  - Project
    - Select Key Species from Beaufort (Valued Ecosystem Components (VECs))
    - Assemble Spill Vulnerability Profiles
    - Prepare Example NEBA for Realistic Spill Scenario

Introduction



Introduction

Net Environmental Benefit (or Cost) Analysis (NEBA)

- **NEBA**
  - **Analyzes impacts from oil spills and countermeasures in the local environment**
  - **Identifies potential benefits and costs of using dispersants and ISB**
- **Method**
  - **Analyzes specific spill scenario(s)**
  - **Estimates impact of untreated spill (e.g., Subsea blowout 6360 m3 oil/day x 10 days)**
  - **Compares to impacts of spill treated with dispersants alone and In-situ burning (ISB) alone**
  - **Uses selected key species and socio-economic components**
- **Background**
  - **Analytical process developed in Canada in 1980s**
  - **First application was Southern Beaufort Sea (1987)**
  - **Applied various regions (Gulf of Mexico, all coastal regions of US, Nfld Grand Banks)**

NEBA Summary:
Subsea Blowout, Offshore , August 15, Impacts as % (Illustration only)

Valued Ecosystem Components (VECs)	Monitor Only	In-Situ Burning	Dispersants Surface	Dispersants Subsea
Phytoplankton	0.001%	0.001%	0.04%	0.04%
Arctic Cod	.02	.02	.5	.5
Dolly Varden/Char	0	0	0	0
Broad Whitefish	0	0	0	0
Snow Goose	0	0	0	0
Pacific Brant	5	2	1	1
King Eider	0	0	0	0
Long-tailed Duck	6	2	1	1
Beluga Whale	0.03	0.02	0.001	0.001
Bowhead Whale	0.06	0.02	0.01	0.01
Ringed Seal	2	1	0.5	0.5
Polar Bear (SBS) Polar Bear (NBS)	1 0.1	0.5 0.05	0 0	0.0 0.0
Caribou (Dolphin-Union)	0	0	0	0
Caribou Hunting	0	0	0	0
Goose Hunting	0	0	0	0
King Eider Hunting	0	0	0	0
Beluga hunting	0	0	0	0
Coastal Fishing	AK=40 IN=25	AK=40 IN=25	AK=20 IN=10	AK=20 IN=10

LEGEND

VH = 10%+,
H= 3-9%,
M= .3-2.9%,
L= .03-.29%,
VL= <.03%

LEGEND

AK= Aklavik
IN=Inuvik
TU=Tuktoyaktuk
PA=Paulatuk
UL=Ulukhaktuk
SH=Sachs Hb.

List of Species/Harvesting Activities Included

VEC List Criteria

1. **Groups included:**
    - **birds, mammals, fish/shellfish, other groups (e.g., phytoplankton)**
2. **Community harvest activities (e.g., caribou, beluga, geese, fish)**
3. **Populations of Main Species Harvested**
4. **Keystone Species – Beaufort Marine Ecosystem (e.g. phytoplankton)**
5. **Other Numerically Dominant Species of Types (e.g., Long-tailed Duck)**
6. **Species-At-Risk (e.g., bowhead whale)**

List of Species and Harvesting Activities Included

VEC	Population(s) (B)	Reason for Including
Beluga Whale	Eastern Beaufort Sea	Very important harvest species
Bowhead Whale	Bering-Chukchi-Beaufort Seas	Protected mammal species
Ringed Seal	Beaufort and Chukchi Seas	Very important harvest species, Keystone
Polar Bear	Northern Beaufort Sea Southern Beaufort Sea	Important harvest species Protected species populations Keystone
Caribou	E.G., Dolphin and Union Caribou (A) (one of several ppn)	Most important harvest species
Snow Goose	Western Canadian Arctic	Important harvest species, Example Mackenzie Flyway species
Brant Goose	Black (Pacific) Brant	Example marine goose species
King Eider	Western North America	Important harvest marine duck species, Example marine duck species
Long-tailed Duck	North America Western Arctic	Numerically abundant sea duck Highly vulnerable sea duck species,
Broad Whitefish	Mackenzie R. Anadromous	Important fish harvesting species
Dolly Varden	Beaufort Sea	Important harvesting salmon species
Arctic Char	Beaufort Sea	Important harvesting salmon species
Arctic Cod	Mackenzie Shelf	Keystone species
Phytoplankton (A)	Mackenzie Shelf Community	Keystone species

A.Suggested in Game Council Workshop
B. Reproductively isolated populations, where possible

Spill Vulnerability Profiles(VP): Introduction

- VP = Information Needed for Oil Spill Impact Assessment and NEBA

- Profile Components for Each VEC
  - Biological VECs (e.g. beluga whale, arctic cod)
    - Population(s) in Study Area
    - Seasonal Use of Beaufort Sea
    - Monthly distribution and aggregation
    - Habitat and Habits
    - Life History
  - Harvesting
    - Community-specific
    - Major species
    - Spatial distribution of harvesting
    - Seasonality of harvesting
- Oiling thresholds for impact analysis

Spill Vulnerability Profiles: Beluga

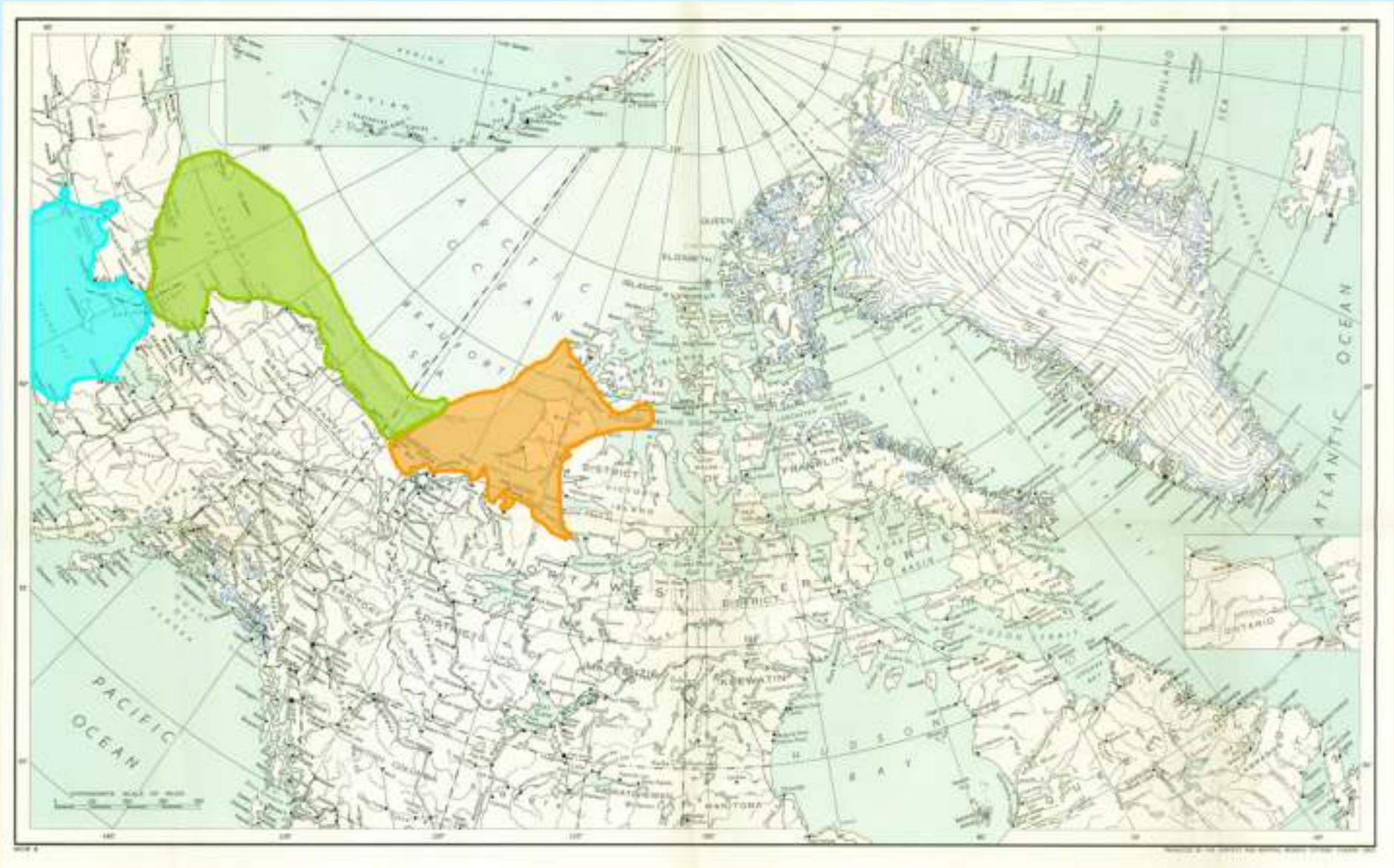
- **Beluga Whale**
  - **Eastern Beaufort Sea population (approx. 39,000 inds)**
  - **Summers in Beaufort Sea area – winters in Bering Sea**

Beluga Whale (E. Beaufort Sea) - Seasonal Use

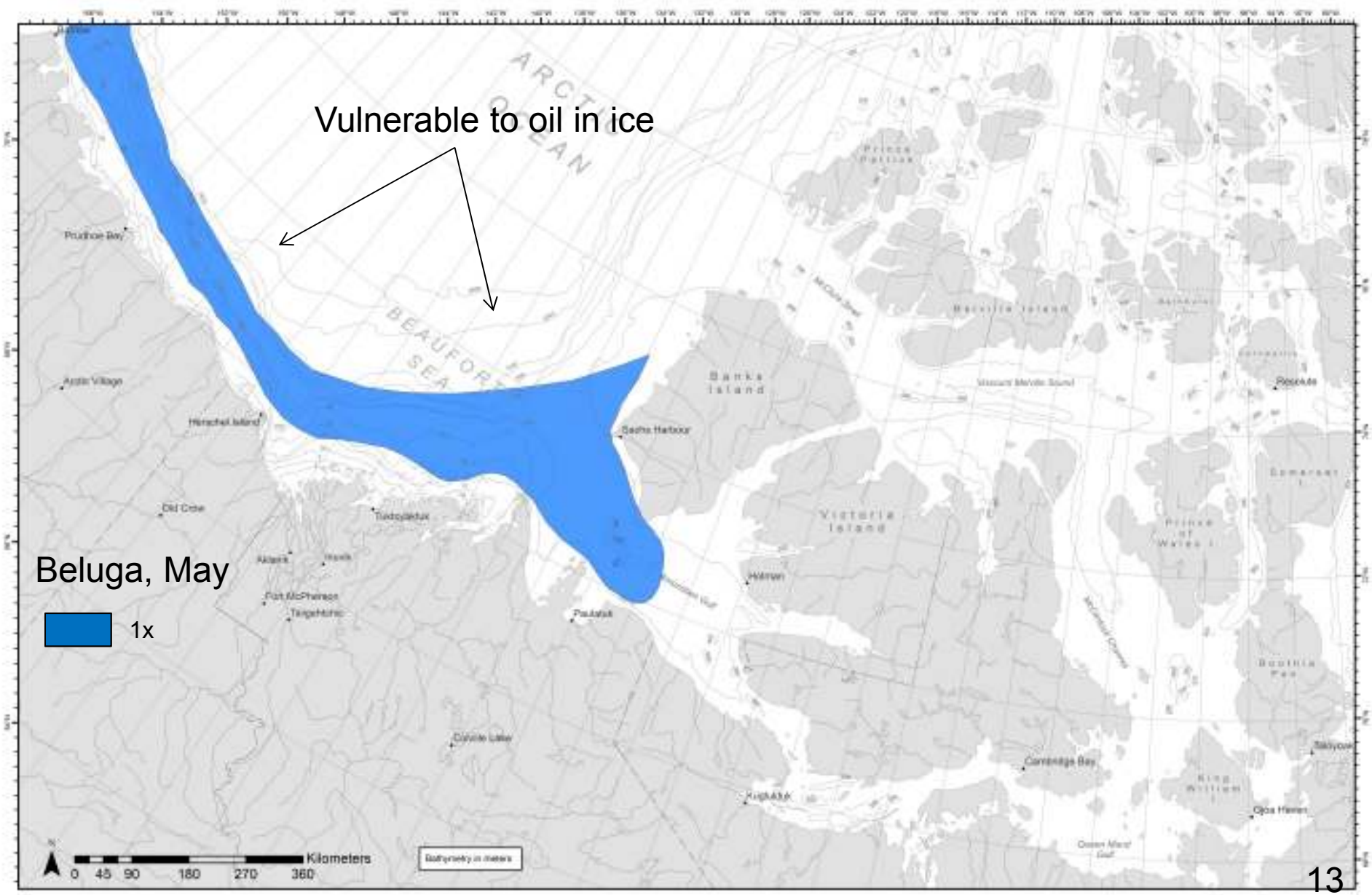
	J	F	M	A	M	J	J	A	S	O	N	D	Ref.
Winters in Bering Sea	xx	xx	xx							x	x	x	a
Migrates into E. Beaufort			xx	xx	xx								a
Arrive Amundsen G. and Banks Is.					xx	xx							a
Move to Mackenzie Estuary						xx	xx						a
Concentrate Mackenzie Estuary for Molting						xx	xx						a
Disperses through Beaufort and Amundsen Gulf							xx	xx					a
Depart Beaufort Sea for Bering Sea								xx	xx				a
Proportion of E. Beaufort ppn in Study Area, %	**0**	**0**	**0**	**50**	**100**	**100**	**100**	**100**	**50**	**0**	**0**	**0**	a

a.COSEWIC 2004.

Spill Vulnerability Profiles: Population



Spill Vulnerability Profile: Beluga- Seasonal Distribution



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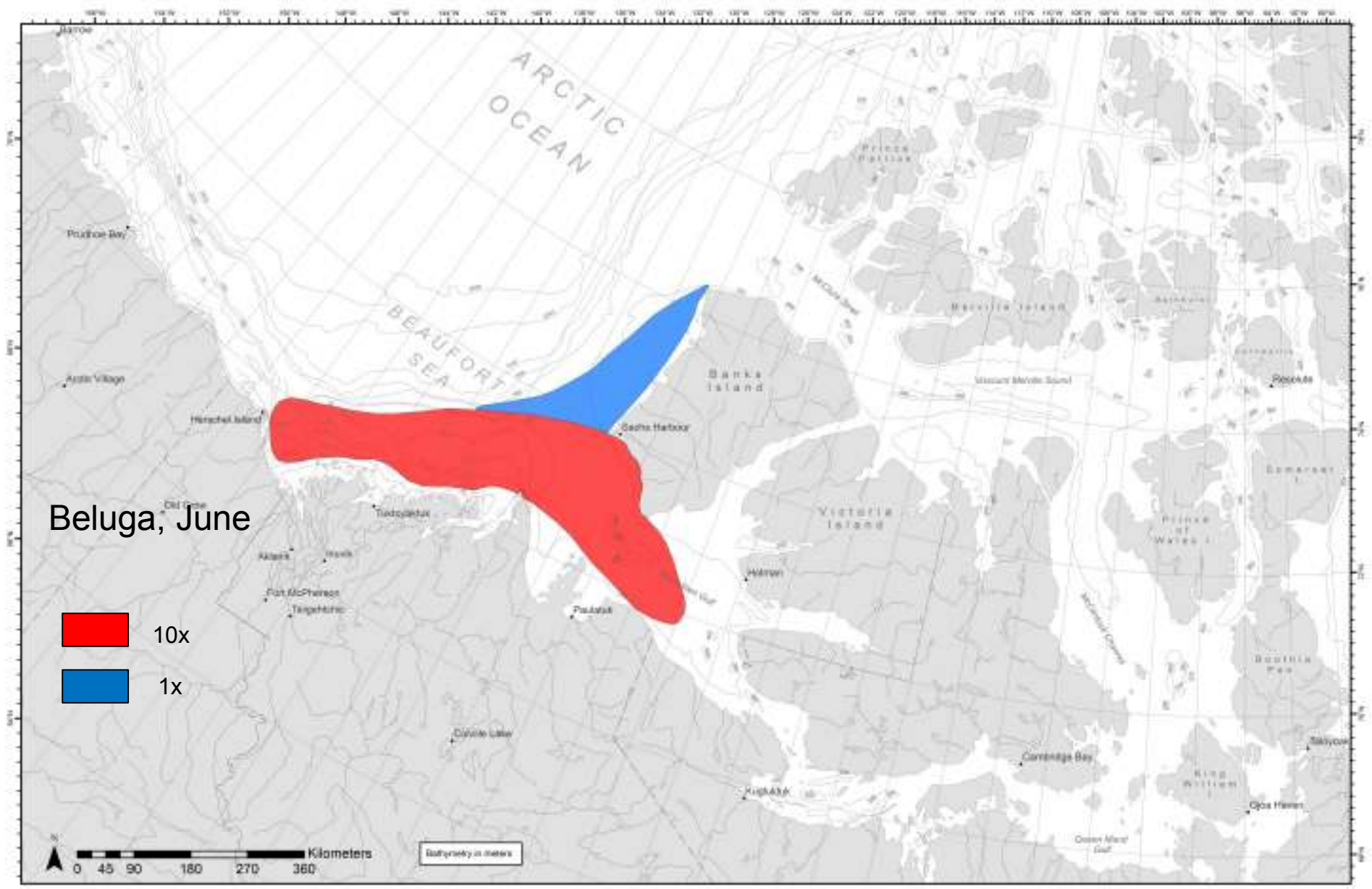

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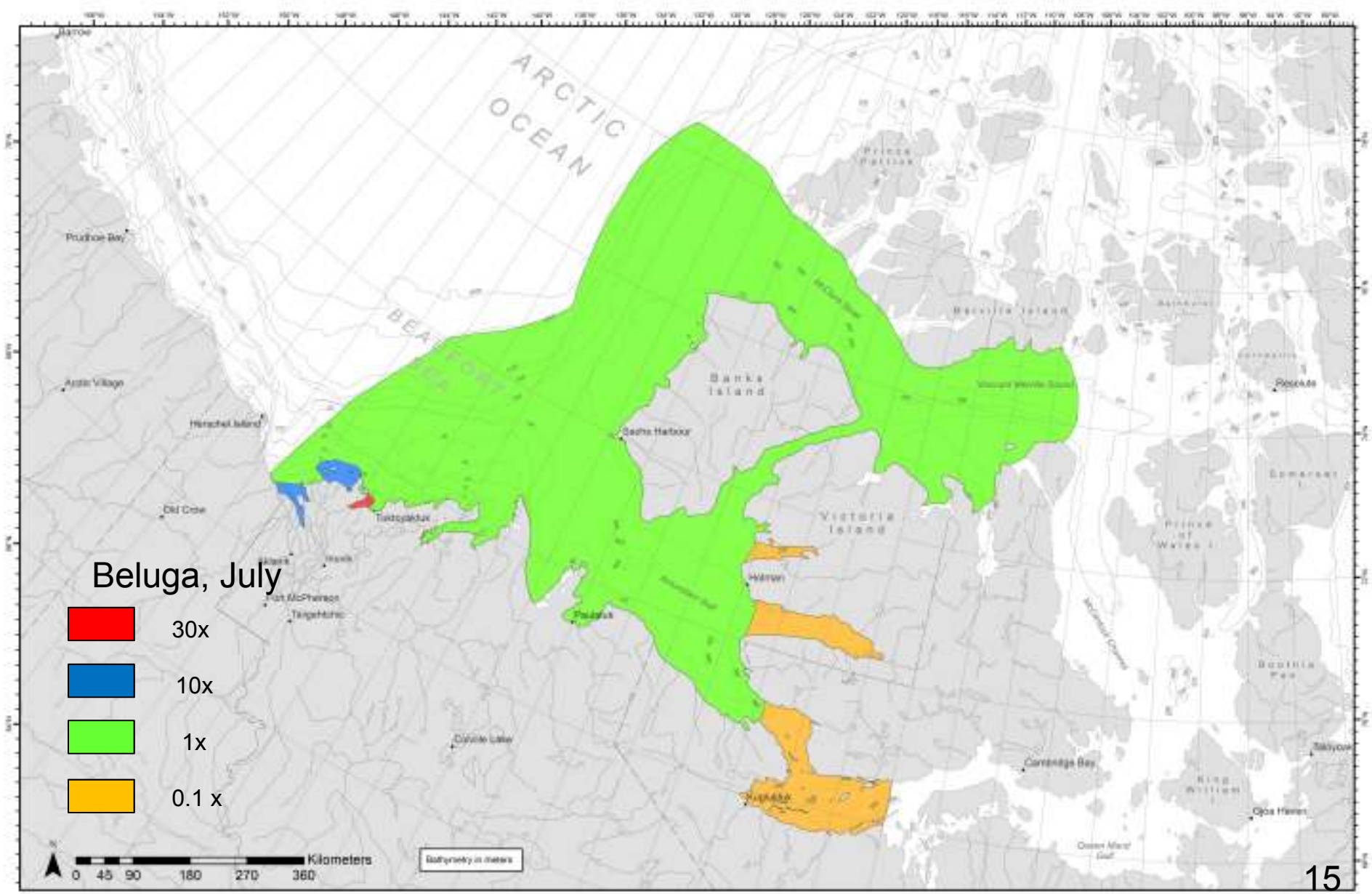

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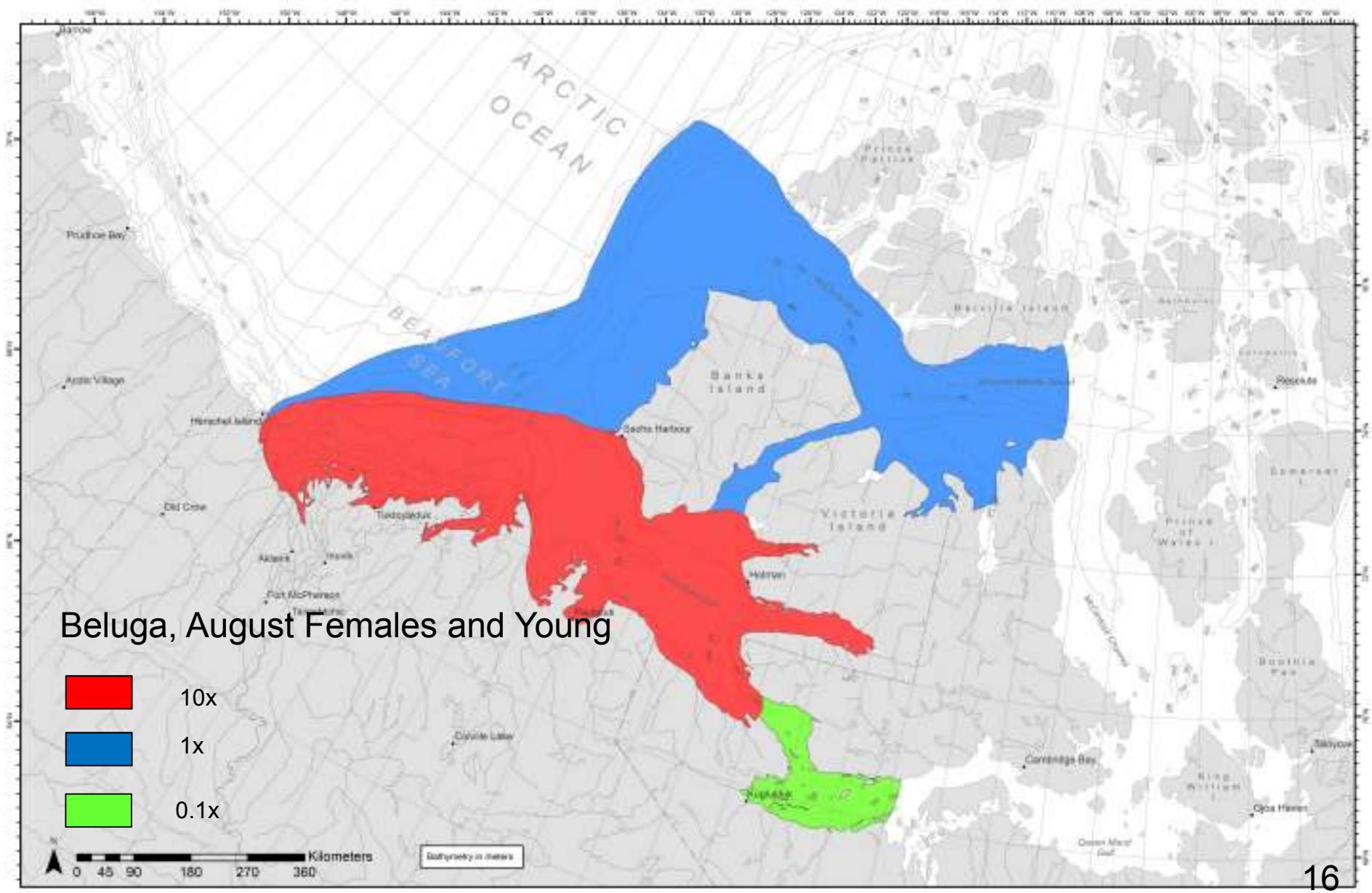

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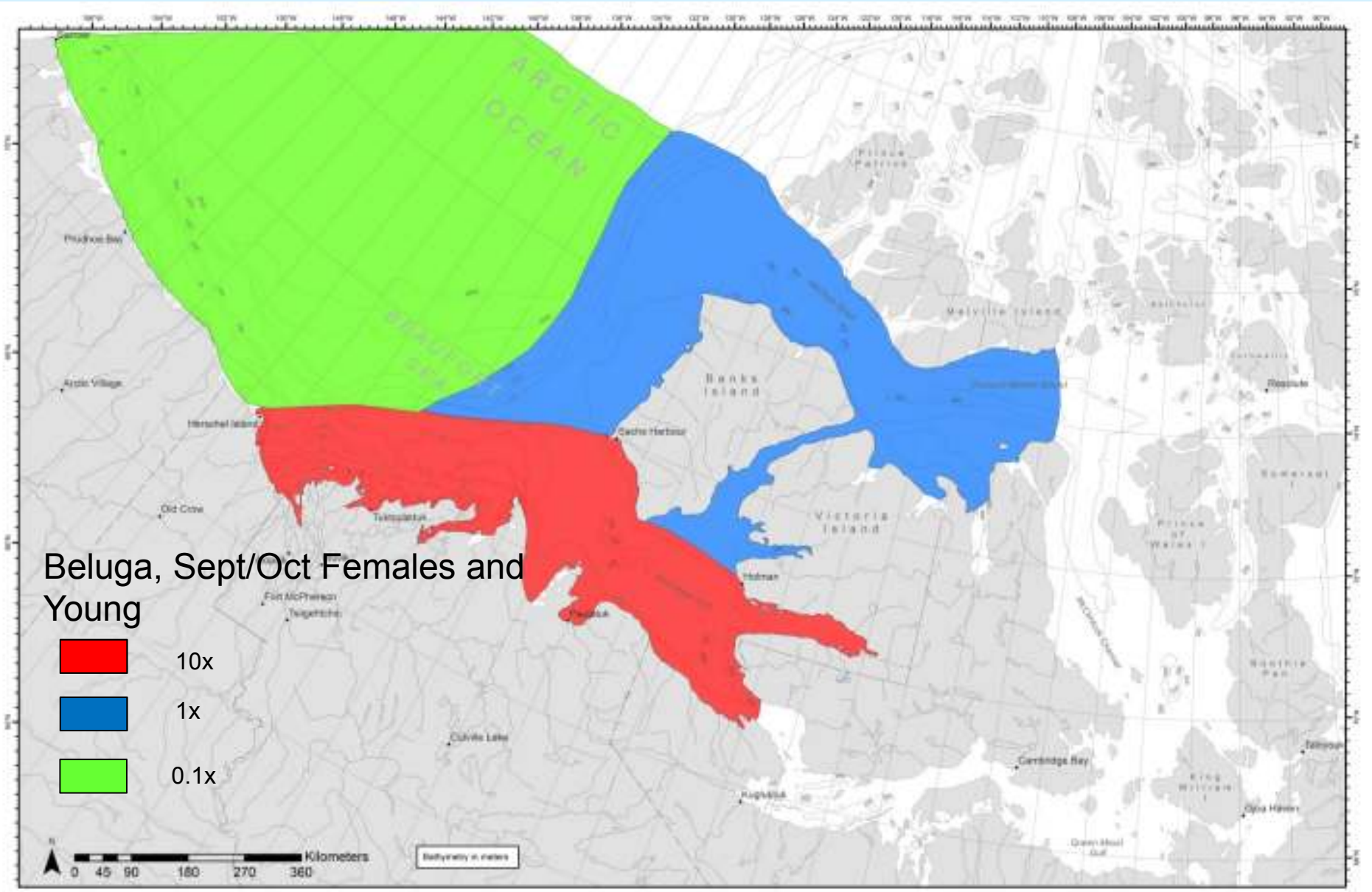


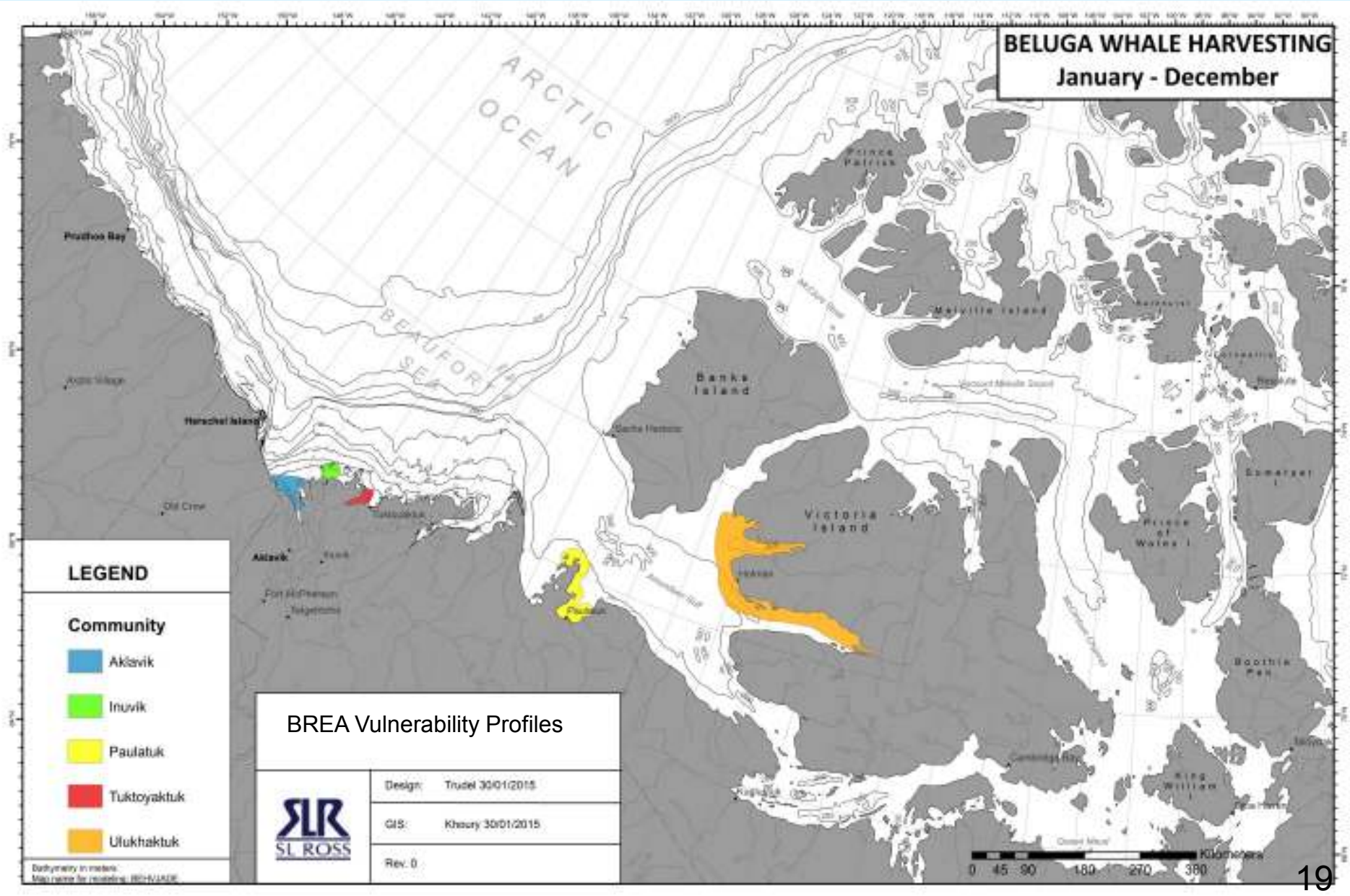
Spill Vulnerability Profiles: Harvesting

Beluga Harvest Importance By Community (a)

Community	Relative Importance to Community[b]	Annual Catch Weight kg	% Annual Total Harvest	Harvest Location[c]	Harvest Season[d]
Aklavik	3	6400	10%	See map	Jul, Aug, Sep
Inuvik	2	18000	22	See map	Jul, Aug
Paulatuk	2	3400	9	See map	Jul, Aug
Sachs Harbour	Lower than 10th	< 25 kg	<1%	See map	Aug-Sept[e]
Tuktoyaktuk	2	16,000	15	See map	Jul, Aug, Sep
Ulukhaktok	Lower than 10th	< 25 kg	<1%	See map	Mid-July to mid Sept[e]

a. Inuvialuit Harvesting Study (2003);
b. By weight;
c. Community Conservation Plans;
d. BP TK Study;
e. T. Smith pers. comm. 2013

Spill Vulnerability Profiles: Beluga - Harvesting



Oiling Thresholds for Impact Analysis

Wildlife Group	Exposure Medium	Exposure Threshold	Prob	Habitats Occupied
Molting/Staging Waterfowl	Oil Slick	10 g/m^2, surface oil	99%	Near-shore, bays lagoons, estuaries
Surface divers: seabirds	Oil Slick	10 g/m^2, surface oil	99%	All intertidal and waters
Aerial seabirds	Oil Slick	10 g/m^2, surface oil	5%	All intertidal and waters
Wetland birds (waders, shorebirds)	Oil Slick	10 g/m^2, surface oil	35%	All wetlands, shorelines, seagrass beds
Furbearing marine mammals	Oil Slick	10 g/m^2, surface oil	75%	All intertidal and marine waters
Pinnipeds	Oil Slick	10 g/m^2, surface oil	1%	All marine intertidal and waters
Cetaceans	Oil Slick	10 g/m^2, surface oil	0.1%	All subtidal marine waters
Terrestrial mammals, shorelines	Oil Slick	10 g/m^2, surface oil	0.1%	All wetlands, shorelines
Fish and Shellfish Adults	Phys/chem dispersed oil	1 ppm	99%	All marine areas
Eggs and Larvae	Phys/chem dispersed oil	1 ppm	99%	All marine areas
Benthic Species	Phys/chem dispersed oil	1 ppm	99%	All marine areas
Harvest disruption	Oil patches	1 g/m^2, surface oil	99%	All marine areas
a. From French-McCay 2011				

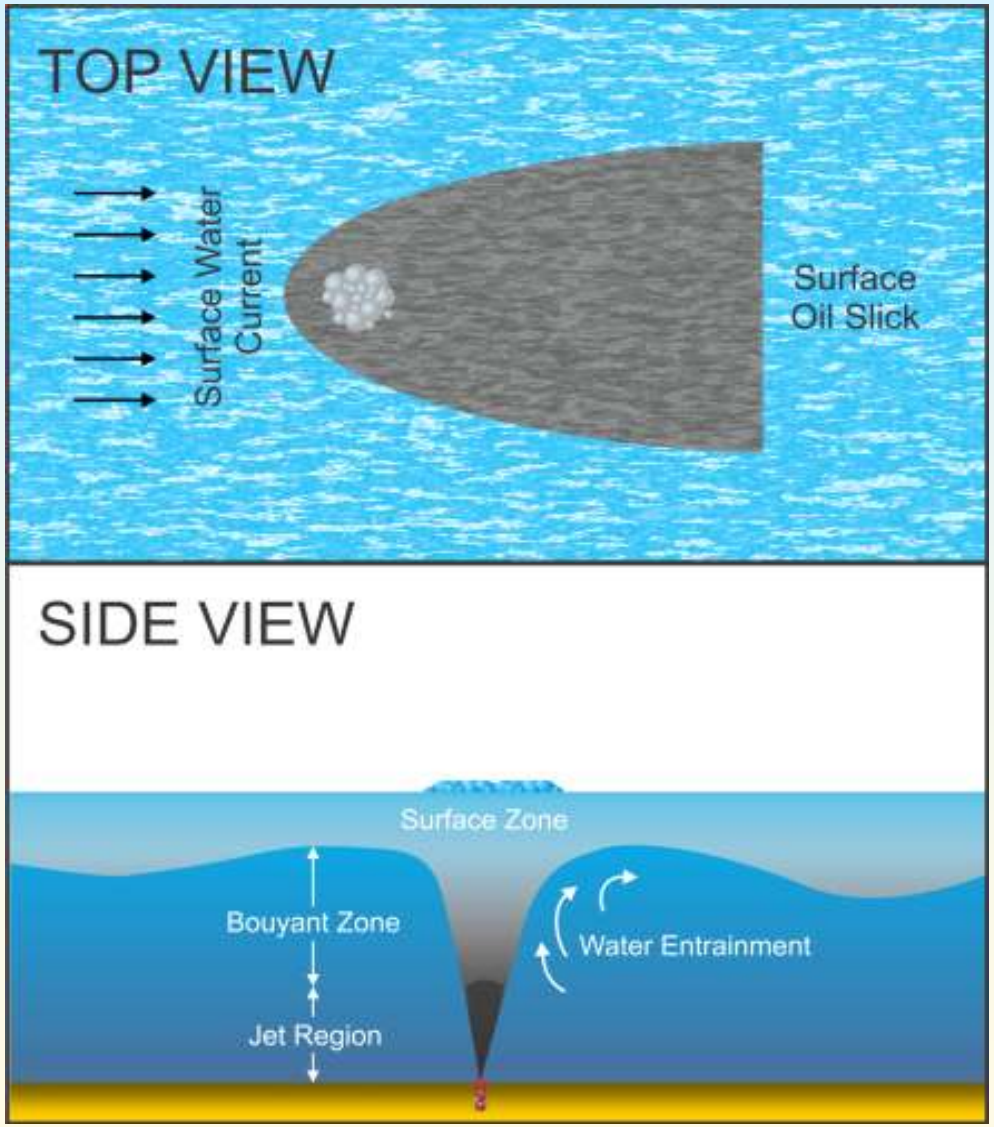
Example NEBA Scenario

- **Process:**
  1. For a given spill scenario
  2. Use models to estimate fate and trajectory of oil
  3. Use toxicity data to estimate areas of damage to species/harvesting
  4. Use resource distribution data to estimate damage to each population/harvesting
  5. Repeat steps 2-4 for each of ISB, surface dispersants and subsea dispersants countermeasures
  6. Summarize/analyze environmental damage predictions to aid planning

Example NEBA Scenario

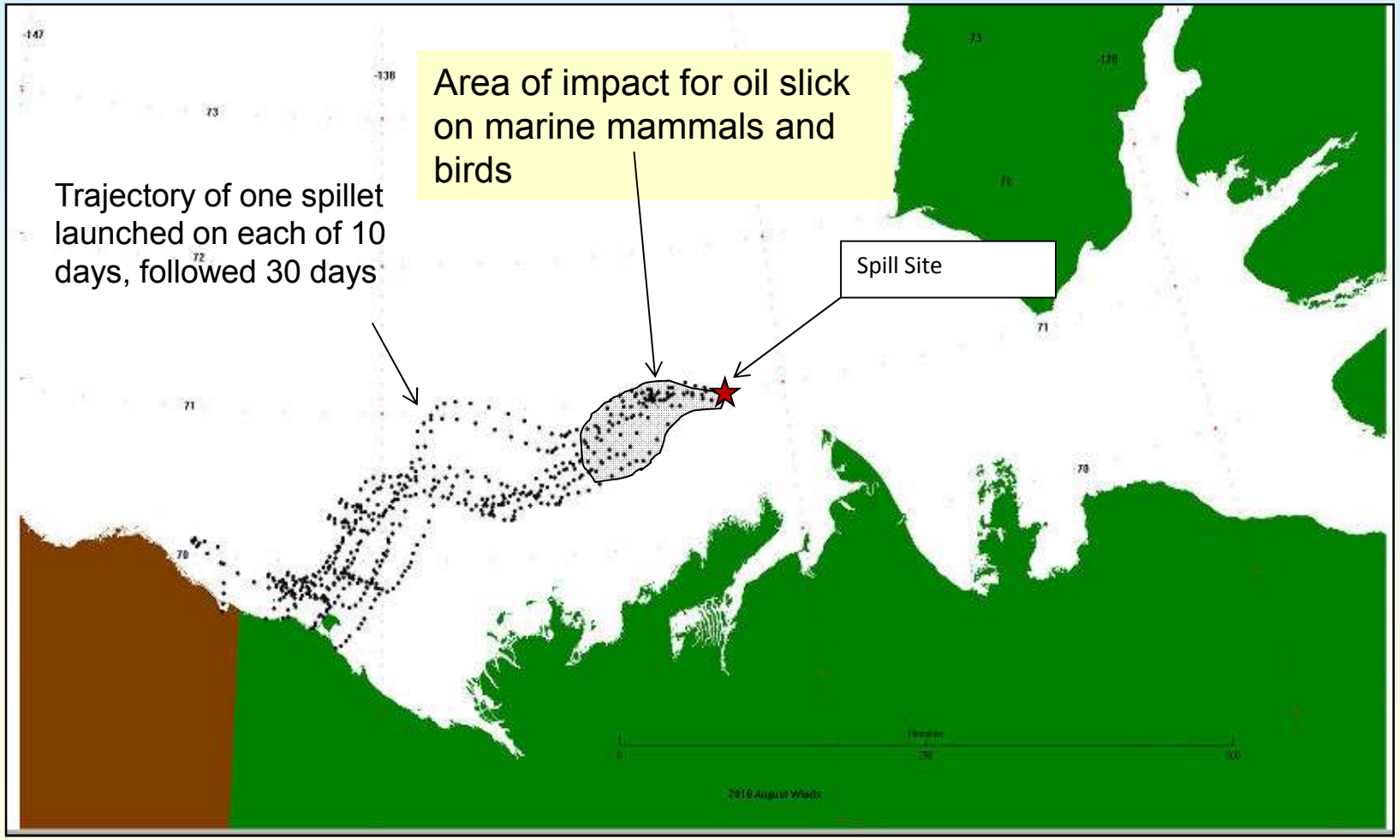
- **Spill Scenario:**
  - **Type:** **Subsea blowout; 6360 m^3 oil/day x 10 days; water depth 100 m**
  - **Date:** August 15
  - **Oil type:** Alaska North Slope Crude Oil (API Gravity 29.8^o)
  - **Winds:** historical winds for those dates (avg = 16 km/hr)
  - **Countermeasures:**
    - a) Monitor only (subsea plume rises to surface)
    - b) Subsea Dispersants (disperses 90% of oil discharged at depth, plume reaches surface)
    - c) Surface dispersants (70% effective due to logistics)
    - c) In-Situ Burning (50% of oil reaching surface is burned)

Subsea Blowout Behaviour

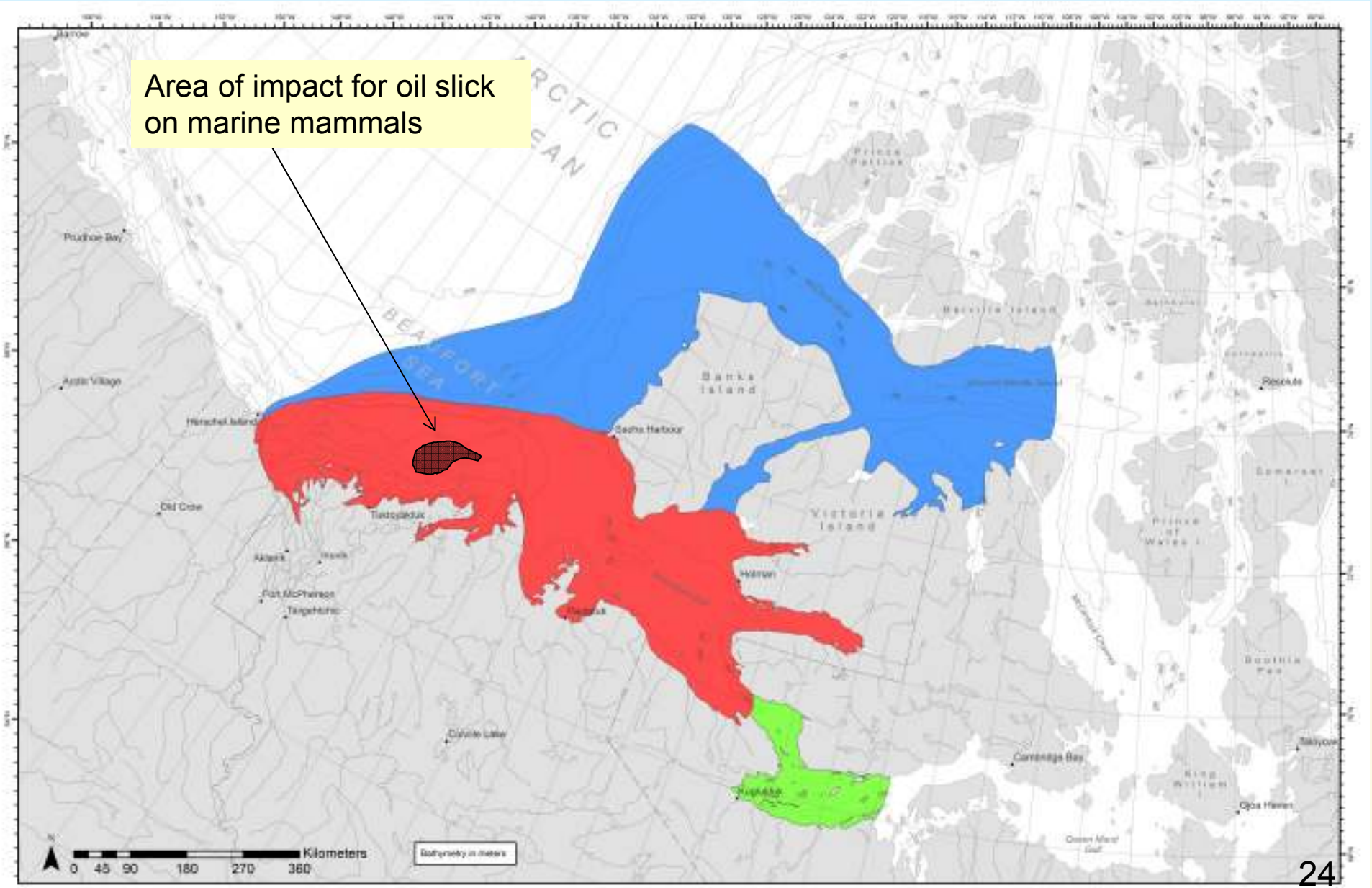


Example NEBA Scenario

Spill Scenario Description & Trajectory: 6360 m^3/day, August 15



Overlay Area of Damage on Resource Map



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Summary

1. List of Species and Harvesting Included
2. Structure of Resource Oil Spill Vulnerability Profiles
3. Example NEBA

- What are the Findings
  - As above
  - This is based on EXISTING PUBLISHED TK and Science
- Meaning
  - NEBA can be done now
  - More data useful
- Where to from Here
  - Add additional harvesting activities and biological species
  - Communities review / improve database
  - Update harvesting data and maps
  - Researchers/experts update and input new knowledge to fill gaps
  - Update based on current sea ice conditions

Beaufort Regional Environmental Assessment
Wrap-Up Meeting

Thank you!

Inuvik, NWT
February 24-28, 2015