

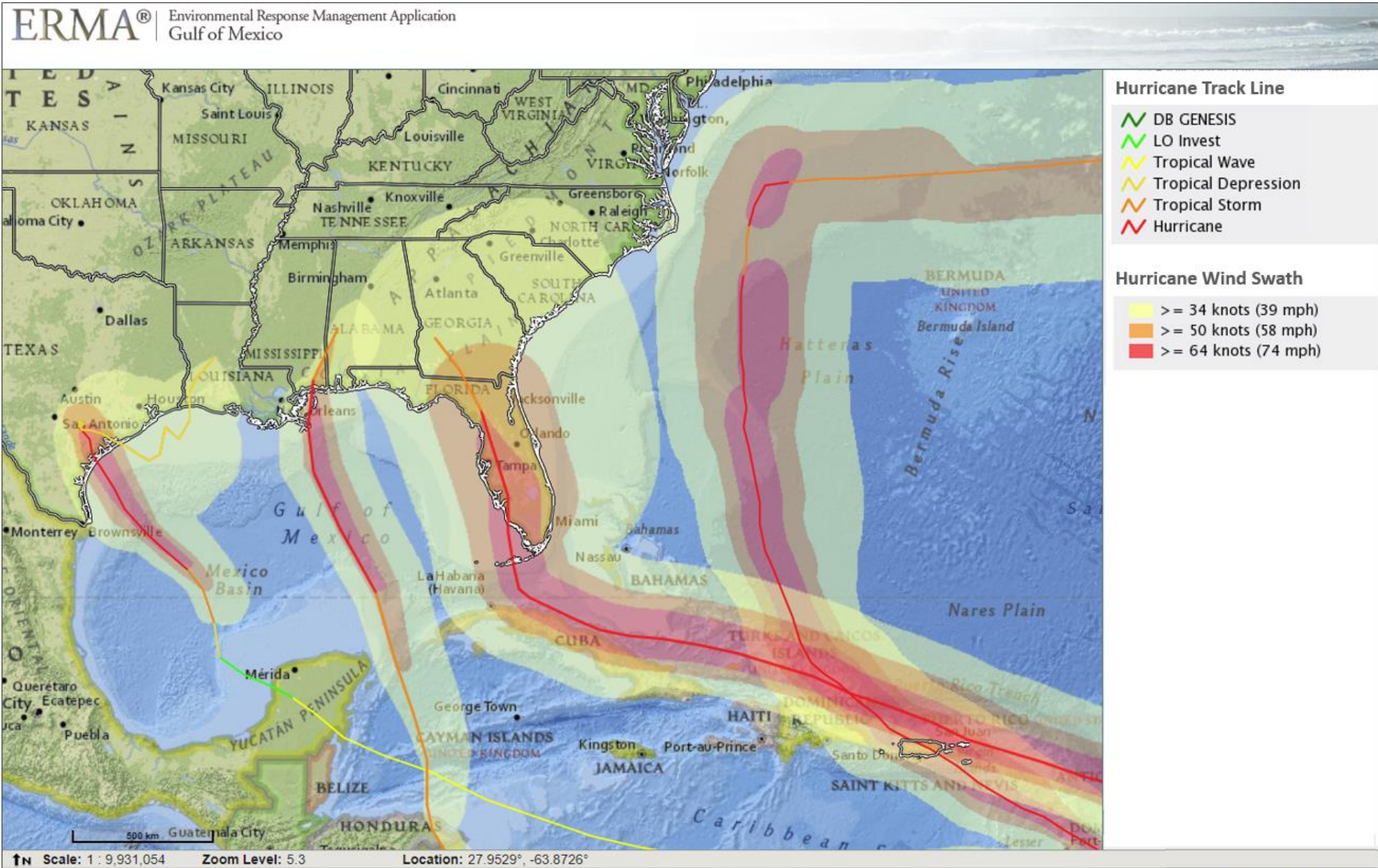


# International Oil Spill Response Tool: Arctic Environmental Response Management Application (ERMA<sup>®</sup>)

Merten<sup>1</sup>, A. A., Wright<sup>2</sup>, R.K., Bruns<sup>3</sup>, P, and, Holst-Andersen<sup>4</sup>, J.P.

1. NOAA's Office of Response and Restorations, Seattle, WA; 2. NOAA's Office of Response and Restoration, Silver Spring, MD; 3. Arctic Council Secretariat, Tromsø, Norway. 4. Danish Ministry of Defense, Copenhagen, Denmark.

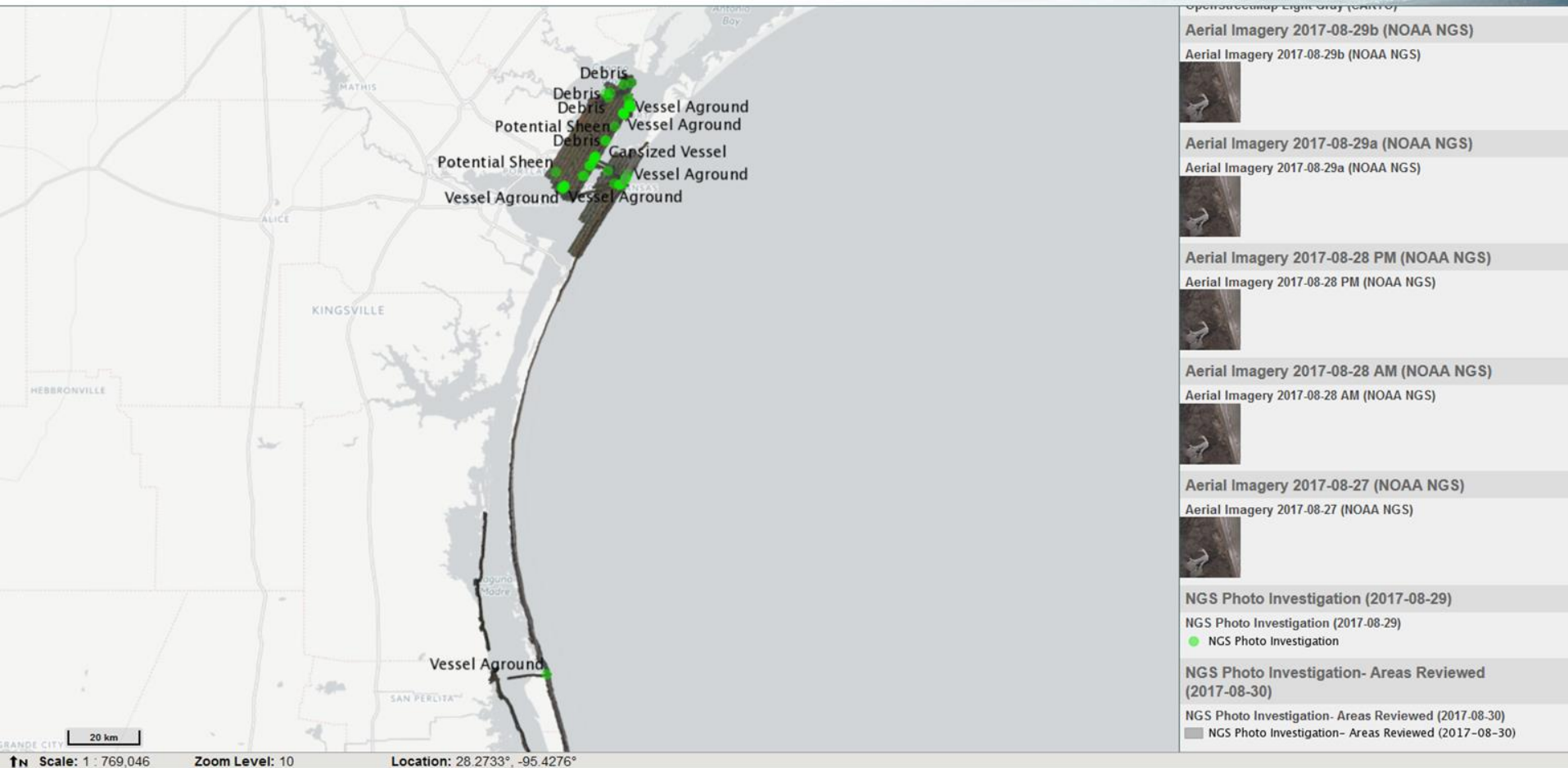
# Track and Wind Swaths for the Four '17 storms





# NGS Imagery and ERMA Draw Tool used to find pollution targets and navigational hazards

ERMA® Environmental Response Management Application  
Gulf of Mexico



Scale: 1 : 769,046 Zoom Level: 10 Location: 28.2733°, -95.4276°



**ERMA**® | Environmental Response Management Application  
Gulf of Mexico




Blank Base Layer

Blank Base Layer

Aerial Imagery 2017-08-30 (NOAA NGS)

Aerial Imagery 2017-08-30 (NOAA NGS)




Esri World Imagery

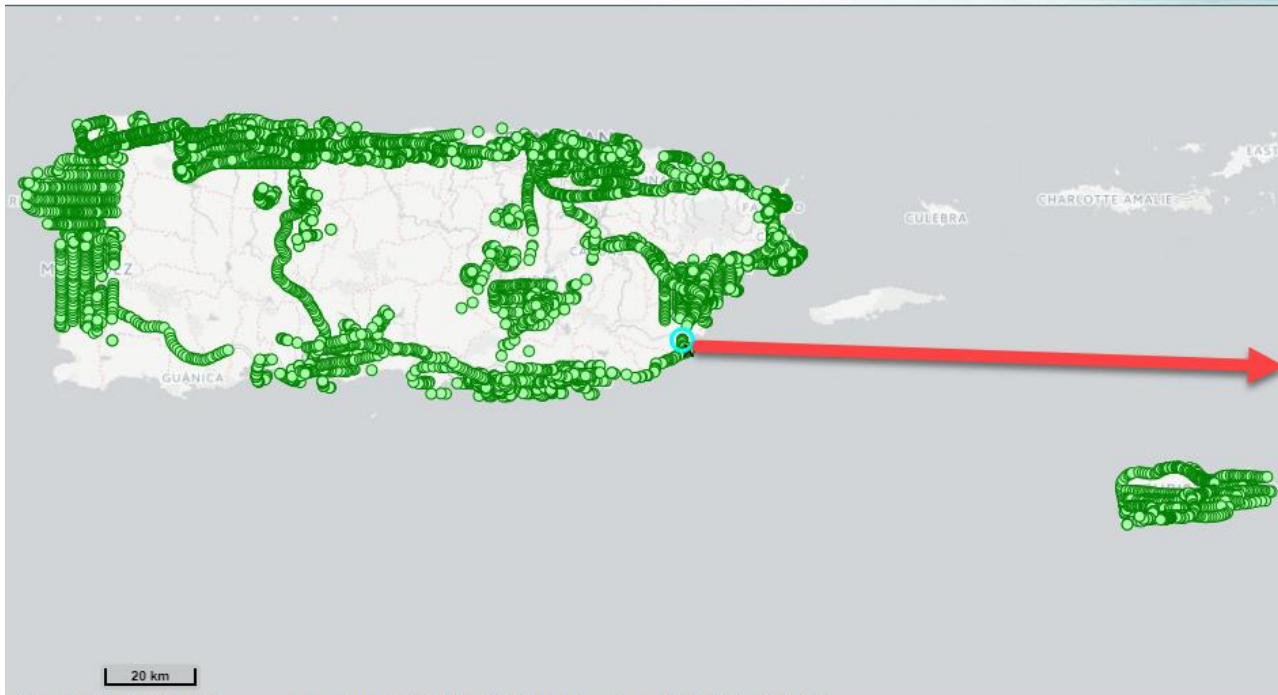
Esri World Imagery

↑N Scale: 1 : 5,870    Zoom Level: 16    Location: 29.7949°, -95.6088°



# Current Civil Air Patrol Coverage as of 09-29-17

ERMA® | Environmental Response Management Application  
Caribbean



Civil Air Patrol Photos for Hurricane Maria (CAP)

Civil Air Patrol Photos for Hurricane Maria (CAP)

● Civil Air Patrol Photos for Hurricane Maria (CAP)

OpenStreetMap Light Gray (CARTO)

OpenStreetMap Light Gray (CARTO)



20 km

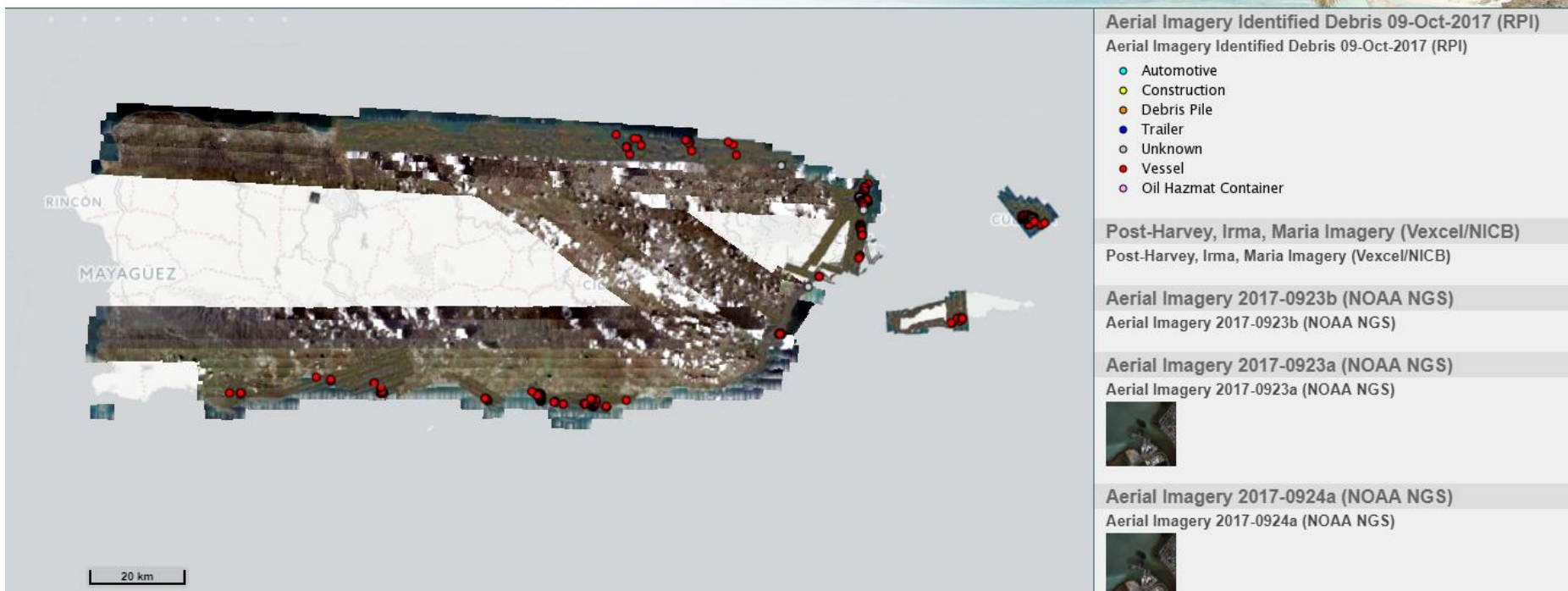
↑N Scale: 1 : 882,296 Zoom Level: 8.9000000000000000 Location: 18.2965°, -64.5829°





# Debris report for Irma and Maria 10-10-18

ERMA® | Environmental Response Management Application  
Caribbean



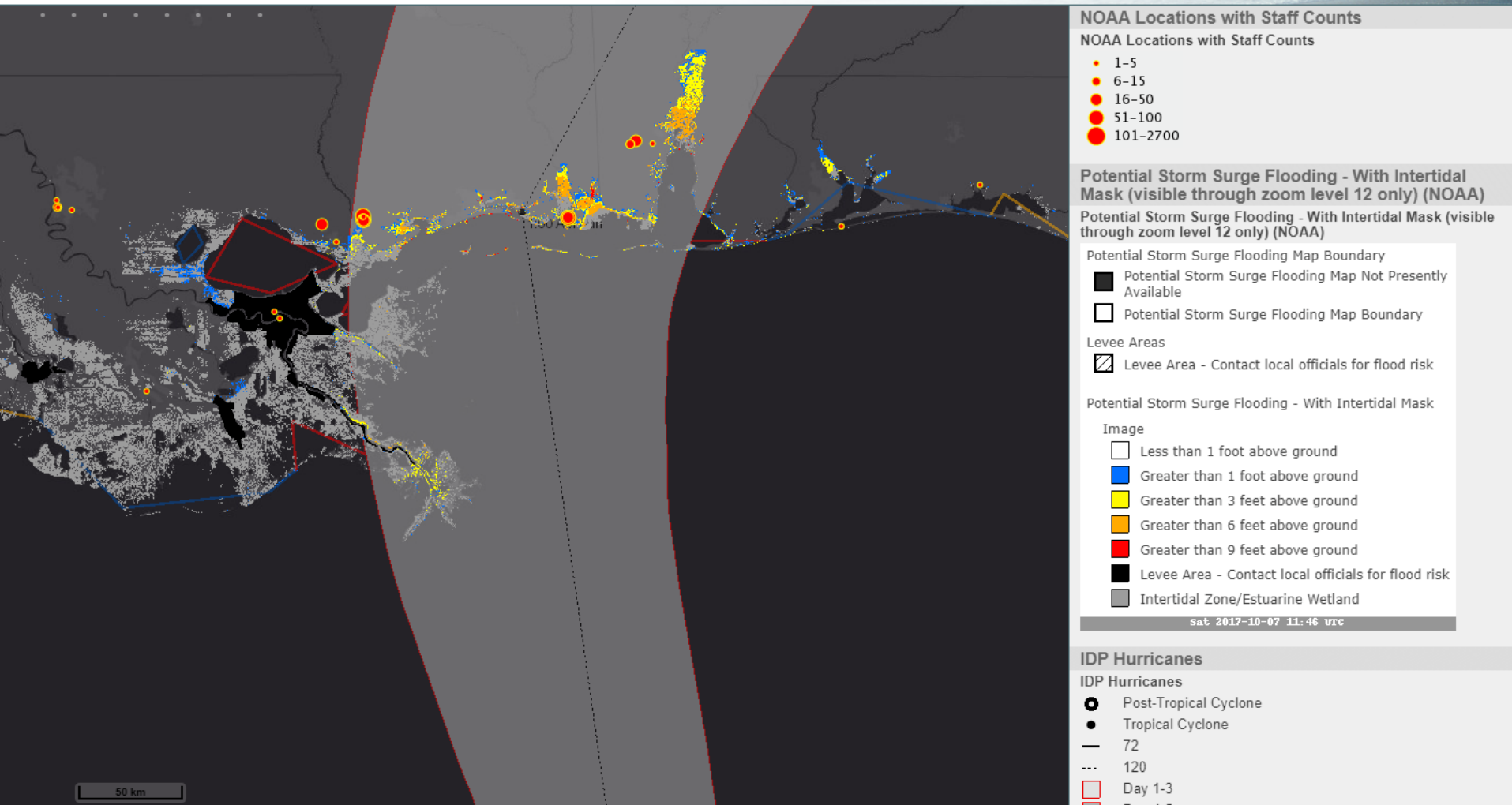
Scale: 1 : 707,213    Zoom Level: 9.21815928421628    Location: 18.6690°, -65.1655°





# Nate, Potential Storm Surge Flooding, NOAA Locations 10/7 @8am

ERMA® | Environmental Response Management Application  
Gulf of Mexico



50 km

Scale: 1 : 1,506,486    Zoom Level: 8

Location: 30.9253°, -86.0800°



# Polar vs. Mercator

ERMA® Environmental Response Management Application  
Arctic

Information Help Recent Data Admin Upload

Search Layers, Folders, and Bookmarks

Geographic Search

Change Password Logout



Layers Legend Draw Query Tools Zoom Download

## Pump (BSEE, EPPR)

Pump (BSEE, EPPR)

Pump (BSEE, EPPR)

## Boom (BSEE, EPPR)

Boom (BSEE, EPPR)

Boom (BSEE, EPPR)

## Vessel Skimming (BSEE, EPPR)

Vessel Skimming (BSEE, EPPR)

Vessel Skimming (BSEE, EPPR)

2000 km

Scale: 1 : 56,151,056 Zoom Level: 3

Location: 41.9269°, 33.6386°

Projection: 3995: Arctic Polar

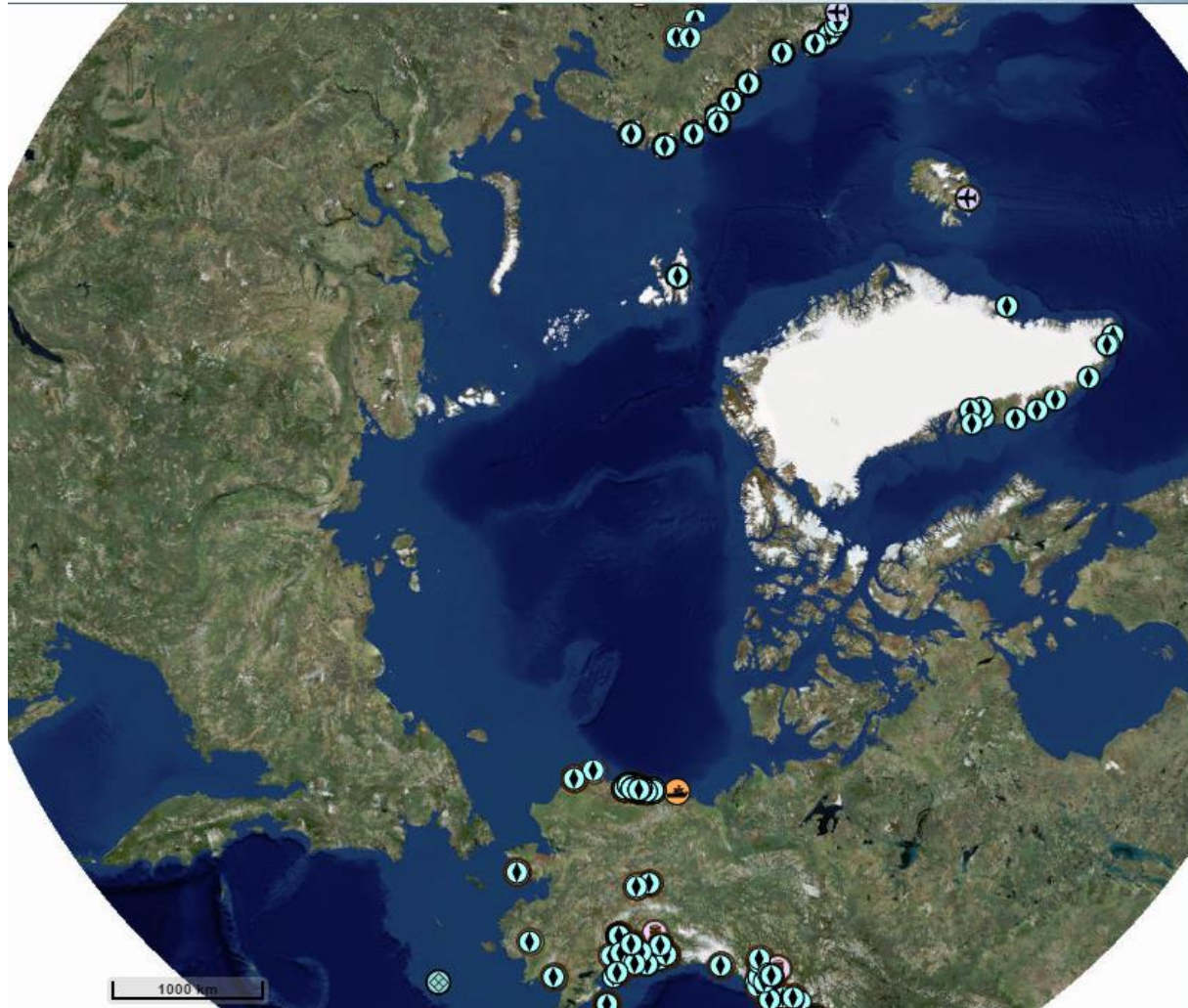
clean >





# Polar Vs Mercator

ERMA® | Environmental Response Management Application  
Arctic




Pump (BSEE, EPPR)

Pump (BSEE, EPPR)

 Pump (BSEE, EPPR)


Vessel Skimming (BSEE, EPPR)

Vessel Skimming (BSEE, EPPR)

 Vessel Skimming (BSEE, EPPR)


Skimmer (BSEE, EPPR)

Skimmer (BSEE, EPPR)

 Skimmer (BSEE, EPPR)


Vessel Non-Skimming (BSEE, EPPR)

Vessel Non-Skimming (BSEE, EPPR)

 Vessel Non-Skimming (BSEE, EPPR)


Shoreline Cleaner (BSEE, EPPR)

Shoreline Cleaner (BSEE, EPPR)

 Shoreline Cleaner (BSEE, EPPR)


Sorbent (BSEE, EPPR)

Sorbent (BSEE, EPPR)

 Sorbent Type (BSEE, EPPR)


Temporary Storage (BSEE, EPPR)

Temporary Storage (BSEE, EPPR)

 Temporary Storage (BSEE, EPPR)


Specialist Vehicle (BSEE, EPPR)

Specialist Vehicle (BSEE, EPPR)

 Specialist Vehicle (BSEE, EPPR)

Dispersant (BSEE, EPPR)

Dispersant (BSEE, EPPR)

 Dispersant (BSEE, EPPR)

Scale: 1 : 27,727,083    Zoom Level: 4

Location: 72.3377°, -74.3866°

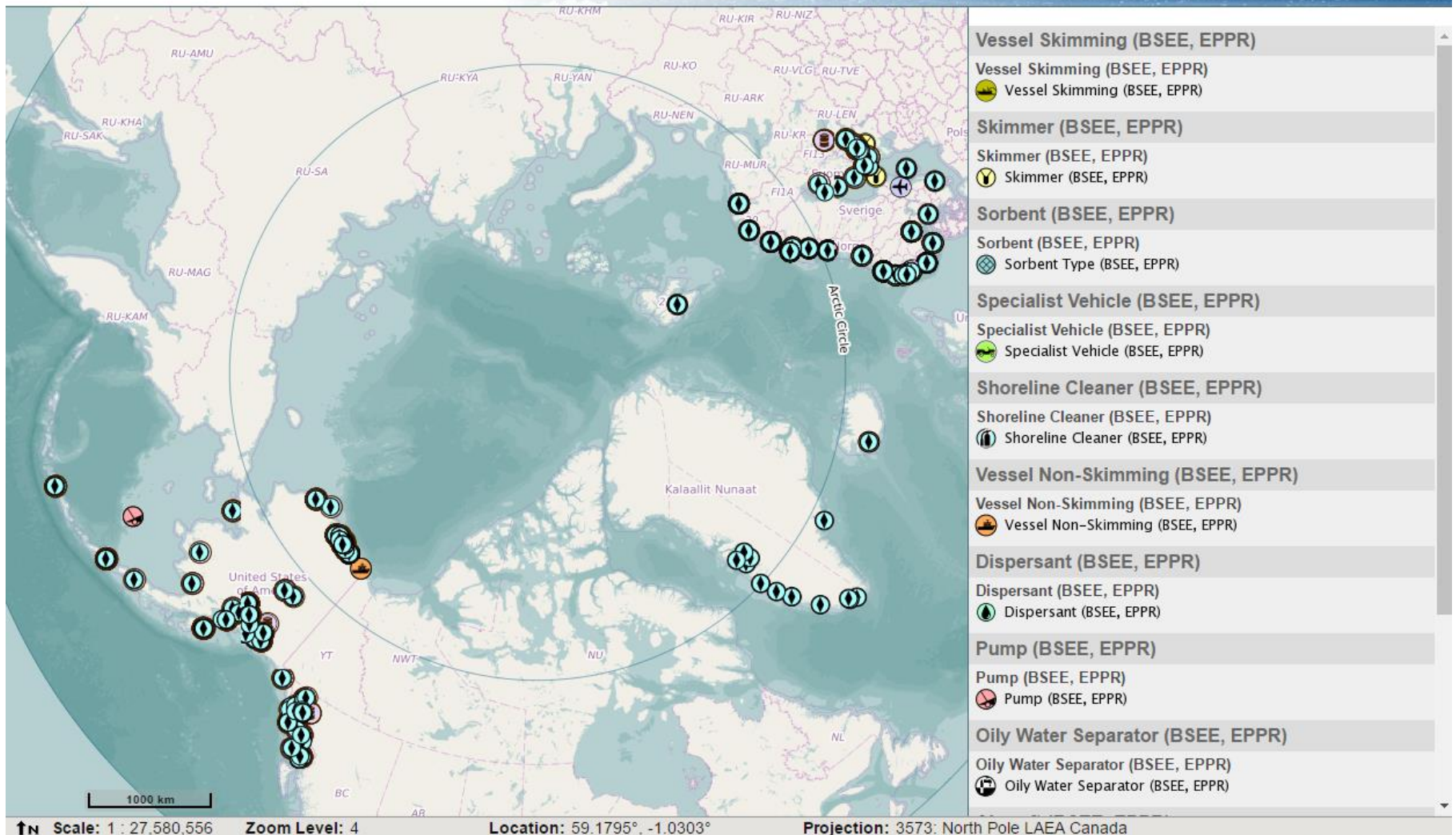
Projection: 5936: Alaska Polar





# Polar Vs Mercator

ERMA® | Environmental Response Management Application  
Arctic



## Vessel Skimming (BSEE, EPPR)

Vessel Skimming (BSEE, EPPR)  
 Vessel Skimming (BSEE, EPPR)

## Skimmer (BSEE, EPPR)

Skimmer (BSEE, EPPR)  
 Skimmer (BSEE, EPPR)

## Sorbent (BSEE, EPPR)

Sorbent (BSEE, EPPR)  
 Sorbent Type (BSEE, EPPR)

## Specialist Vehicle (BSEE, EPPR)

Specialist Vehicle (BSEE, EPPR)  
 Specialist Vehicle (BSEE, EPPR)

## Shoreline Cleaner (BSEE, EPPR)

Shoreline Cleaner (BSEE, EPPR)  
 Shoreline Cleaner (BSEE, EPPR)

## Vessel Non-Skimming (BSEE, EPPR)

Vessel Non-Skimming (BSEE, EPPR)  
 Vessel Non-Skimming (BSEE, EPPR)

## Dispersant (BSEE, EPPR)

Dispersant (BSEE, EPPR)  
 Dispersant (BSEE, EPPR)

## Pump (BSEE, EPPR)

Pump (BSEE, EPPR)  
 Pump (BSEE, EPPR)

## Oily Water Separator (BSEE, EPPR)

Oily Water Separator (BSEE, EPPR)  
 Oily Water Separator (BSEE, EPPR)

Scale: 1 : 27,580,556

Zoom Level: 4

Location: 59.1795°, -1.0303°

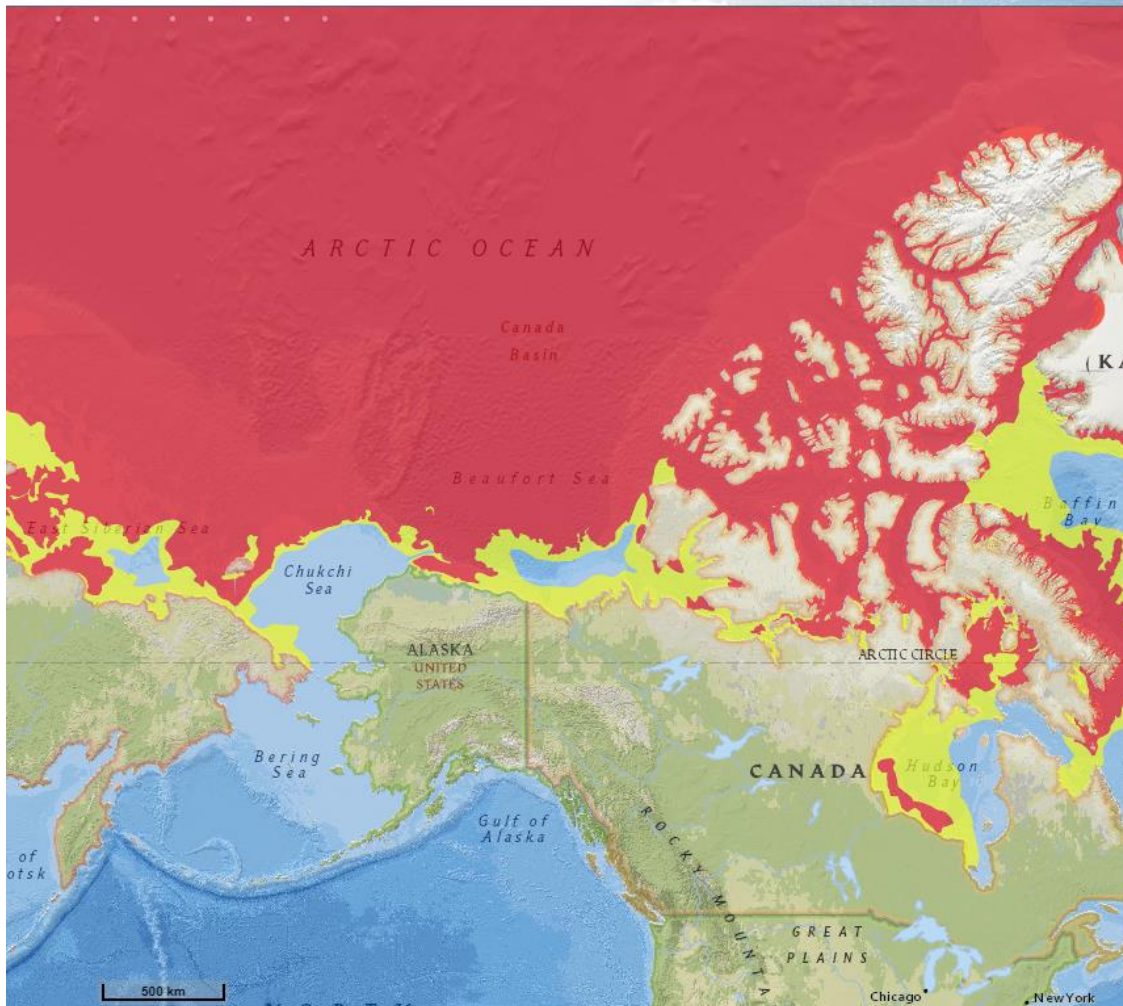
Projection: 3573: North Pole LAEA Canada





# Sea Ice (National Ice Center)

ERMA® Environmental Response Management Application  
Arctic



Esri National Geographic

Esri National Geographic

Daily Ice Edge and Marginal Ice Zone - Latest (NIC)

Daily Ice Edge and Marginal Ice Zone - Latest (NIC)

■ Marginal Ice Zone

■ > 8/10ths

Valid Date: 2017-07-10

↑N Scale: 1 : 15,714,046 Zoom Level: 3

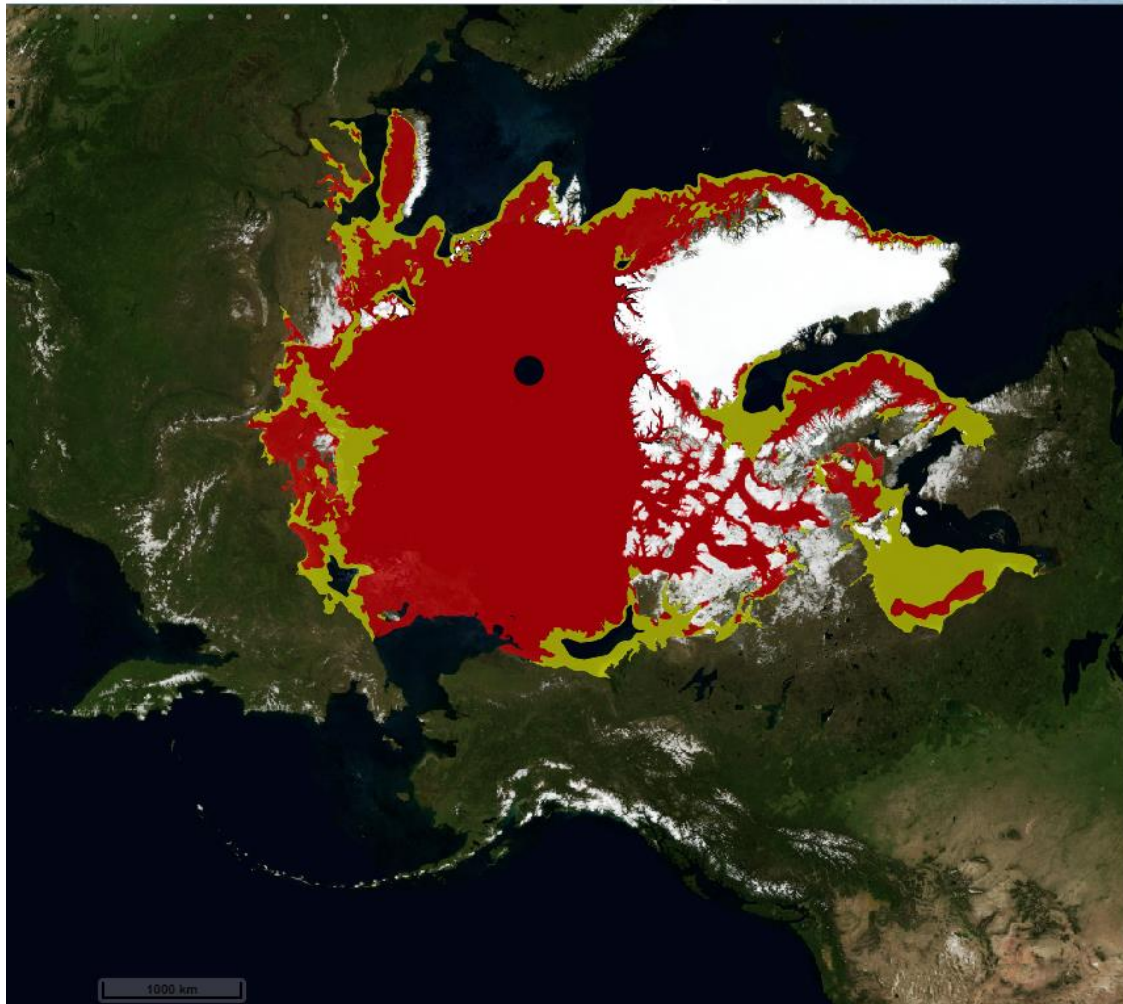
Location: 62.2604°, -60.7338°

Projection: 3857: WGS84 Web Mercator



# Sea Ice (National Ice Center)

ERMA® Environmental Response Management Application  
Arctic



GINA Imagery Polar Basemap

GINA Imagery Polar Basemap



Daily Ice Edge and Marginal Ice Zone - Latest (NIC)

Daily Ice Edge and Marginal Ice Zone - Latest (NIC)

■ Marginal Ice Zone

■ > 8/10ths

Valid Date: 2017-07-10

1000 km

↑N Scale: 1 : 27,584,361 Zoom Level: 4

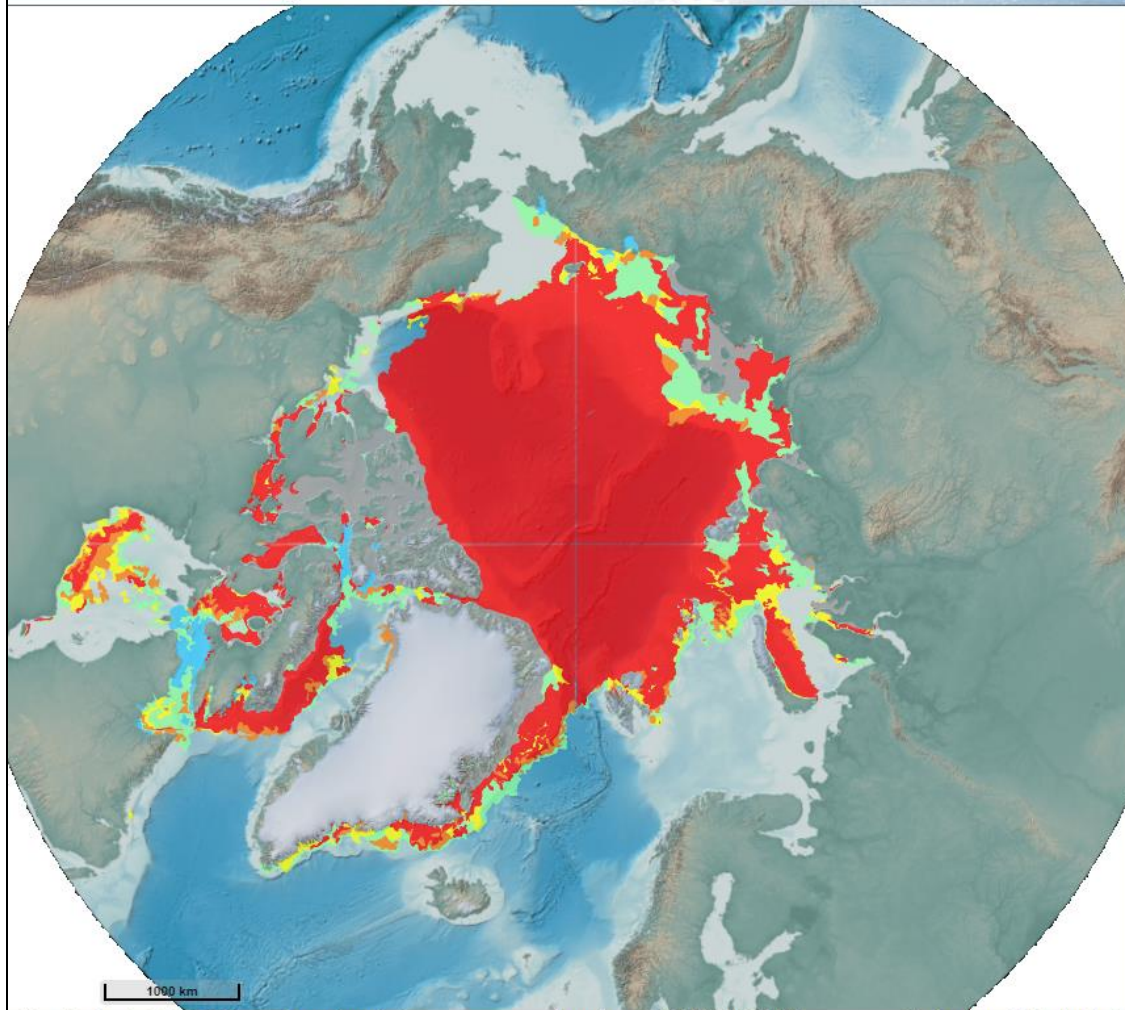
Location: 46.1845°, -39.7228°

Projection: 3572: North Pole LAEA Alaska



# Sea Ice (National Ice Center)

ERMA® Environmental Response Management Application  
Arctic



NGDC Arctic Basemap

NGDC Arctic Basemap

Sea Ice Concentration in Tenths - Latest (NIC)

Sea Ice Concentration in Tenths - Latest (NIC)

- Ice Free
- 1-3 Tenths
- 4-6 Tenths
- 7-8 Tenths
- 9-10 Tenths
- Fast Ice

Valid Date: 2017-07-06

↑N Scale: 1 : 28,337,993

Zoom Level: 4

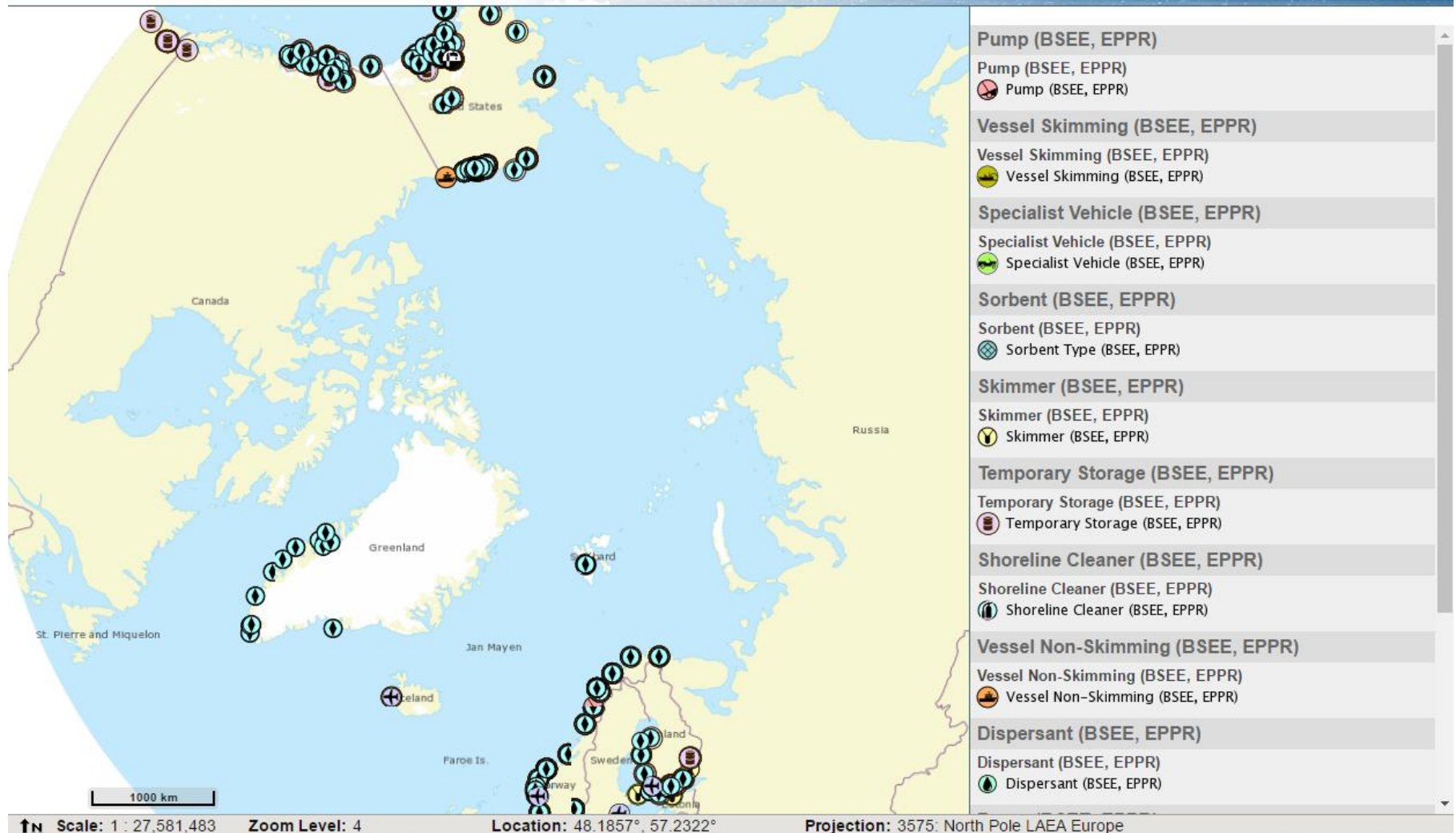
Location: 52.9098°, 92.7880°

Projection: 3995: Arctic Polar



# Arctic Response Database

ERMA® | Environmental Response Management Application  
Arctic



## Pump (BSEE, EPPR)

Pump (BSEE, EPPR)

Pump (BSEE, EPPR)

## Vessel Skimming (BSEE, EPPR)

Vessel Skimming (BSEE, EPPR)

Vessel Skimming (BSEE, EPPR)

## Specialist Vehicle (BSEE, EPPR)

Specialist Vehicle (BSEE, EPPR)

Specialist Vehicle (BSEE, EPPR)

## Sorbent (BSEE, EPPR)

Sorbent (BSEE, EPPR)

Sorbent Type (BSEE, EPPR)

## Skimmer (BSEE, EPPR)

Skimmer (BSEE, EPPR)

Skimmer (BSEE, EPPR)

## Temporary Storage (BSEE, EPPR)

Temporary Storage (BSEE, EPPR)

Temporary Storage (BSEE, EPPR)

## Shoreline Cleaner (BSEE, EPPR)

Shoreline Cleaner (BSEE, EPPR)

Shoreline Cleaner (BSEE, EPPR)

## Vessel Non-Skimming (BSEE, EPPR)

Vessel Non-Skimming (BSEE, EPPR)

Vessel Non-Skimming (BSEE, EPPR)

## Dispersant (BSEE, EPPR)

Dispersant (BSEE, EPPR)

Dispersant (BSEE, EPPR)

Scale: 1 : 27,581,483

Zoom Level: 4

Location: 48.1857°, 57.2322°

Projection: 3575: North Pole LAEA Europe





# Arctic Response Database

ERMA® Environmental Response Management Application Arctic

Information ERMA View Internal Data Administration Log Out

Gid	Equiptype	Owner	Manufac	Barrelhr	Man Url	Modelna
1					://www.lamor.co...	Minima
2					://www.lamor.co...	Minima
3					://www.lamor.co...	BS400
4					://www.lamor.co...	Minima
5					://www.lamor.co...	Minima
6					://www.lamor.co...	BS400
7					://www.lamor.co...	THOR
8					://www.lamor.co...	Lamor
9					://www.lamor.co...	Lamor
10					://www.lamor.co...	HK 2 L

Showing 416 of 416 Rows

Add Selected Features To O

Displaying 26 of 26 Fields

gid x equiptype x ov  
location x address x m  
poc\_email x response x

Click in the box to select additional fields to display, click on the x next to a displayed field to suppress its display. Once displayed, you may drag the table headings to reorder and/or resize them.

Scale

US DOC | NOAA | NOAA Office of Response & Restoration  
Disclaimer | Privacy policy | Official Citation | Contact

Coastal Response Research Center  
©2007 - 2017 University of New Hampshire



# Arctic Response Database

ERMA® Environmental Response Management Application  
Arctic

Information



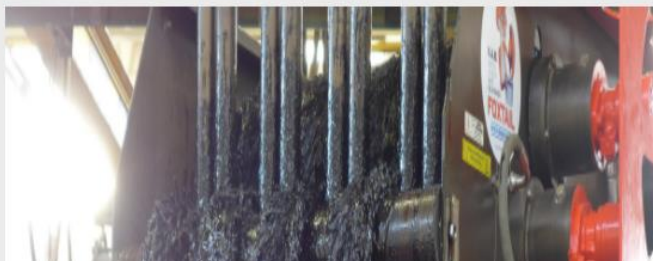
## Oil Skimmers



Oil skimmers are machines that separate a liquid from another liquid, or from particles floating on it. A common application is removing oil floating on water.

FoxTail FoxTailMini FoxDrum Hydraulic Power Pack

### FoxTail



#### Vertical Adhesion Band Oil Skimmer

The V.A.B. FOXTAIL OIL SKIMMER was developed and tested at the Norwegian Pollution Control Authority (NPCA) base in Horten, Norway. Since 1984 several units have been in service in the North Sea on board specialized oil recovery vessels operated by the Norwegian Pollution Control Authority. Not only is the V.A.B. FOXTAIL OIL SKIMMER capable of recovering large quantities of oil, but it performs equally well also in rough sea. This can be seen from the illustration on the following pages. Patent Pending.

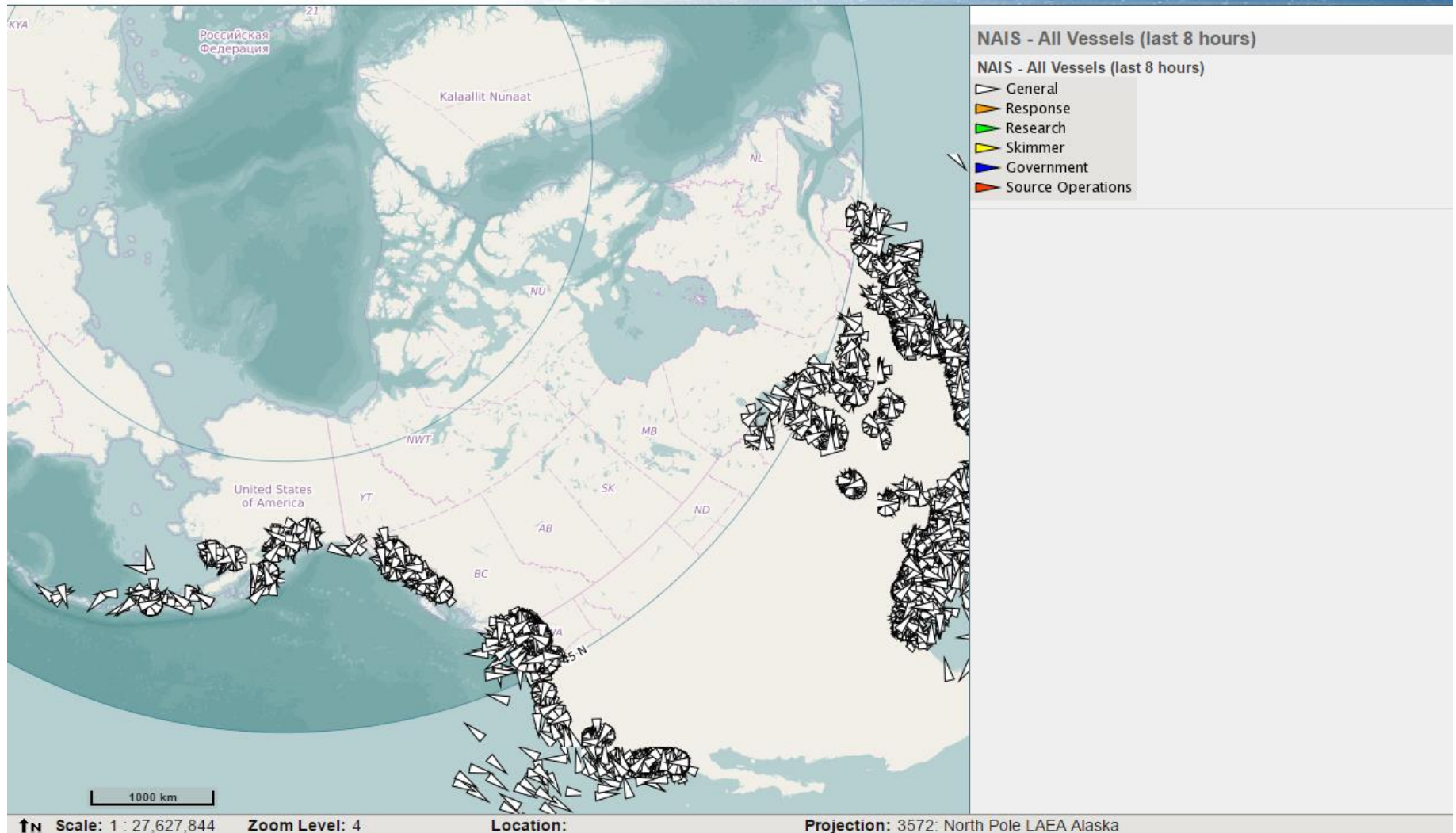
Scale:





# Re-project on the Fly

ERMA® | Environmental Response Management Application  
Arctic



# MOSPA EXERCISE

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AGREEMENT ON COOPERATION ON MARINE OIL POLLUTION PREPAREDNESS AND  
RESPONSE (MOSPA) AFTER ACTION REPORT

# SCENARIO

---

**Exercise Lead:** U.S. in coordination with Host Nation (Norway).

**Scenario:** Fully loaded tank vessel transporting crude oil and a bulk cargo vessel collide near the Traffic Separation Zone outside Vardø

**Target/ Product/ Volume:** Tanker/ Crude & Fuel Oil/ Partial loss; approximately 25,000 m<sup>3</sup> of cargo and 1,000 m<sup>3</sup> of fuel oil discharged.

**Location:** In vicinity of the Traffic Separation Zone.

Regulated vessel traffic scheme/ regulated waterway.

**Weather:** Heavy fog

**Key Impacts:** Shoreline impacts w/ environmentally and culturally sensitive locations.

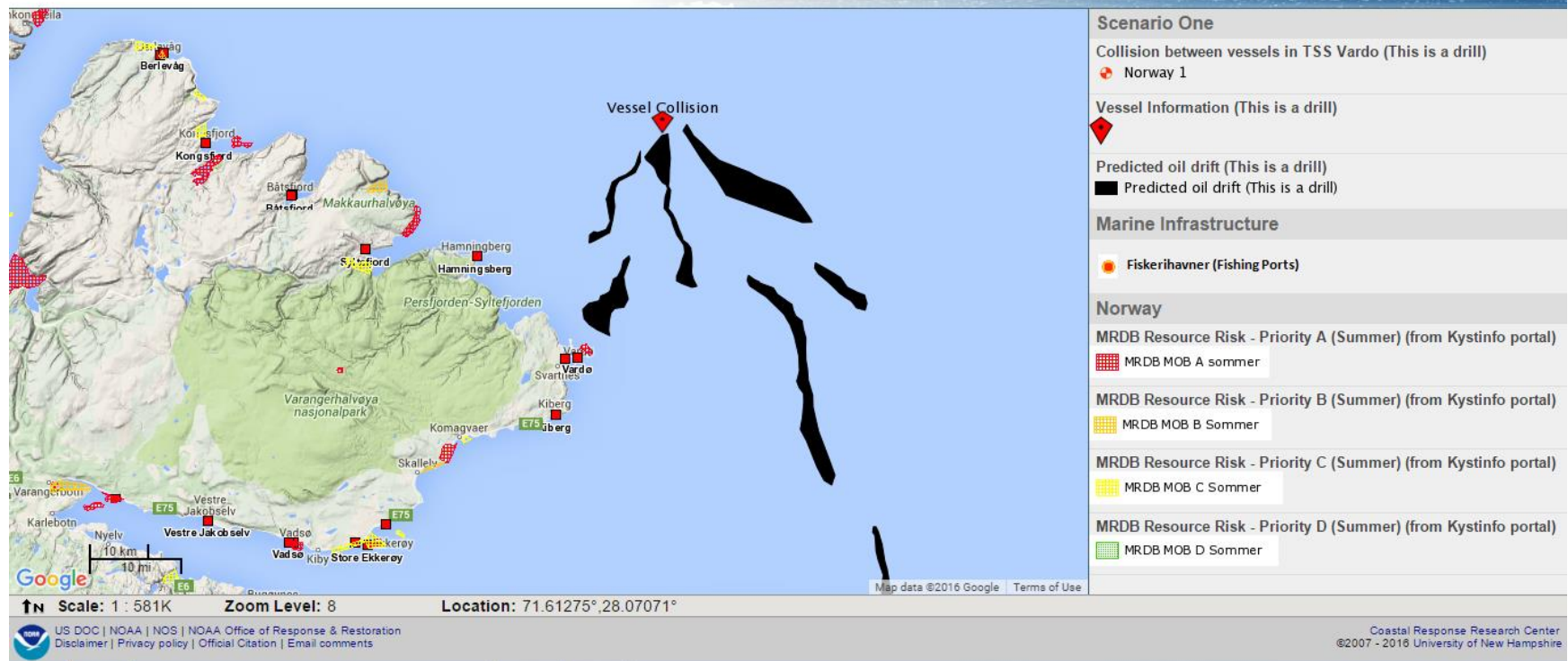
**Request for Assistance:** Desirable for at least one request.

The spill exceeds national or regional response capabilities warranting a request for assistance.

Each nation should review their internal protocols to effectively evaluate challenges and to test their process for getting approval to send assistance.

# MOSPA SCENARIO

ERMA | Environmental Response Management Application  
Arctic



# HIGHLIGHTS

---

- 2nd MOSPA exercise took place in June 2016
- After Action Report (AAR) includes observations, recommendations and best practices.
- Provides recommendations for updating the Operational Guidelines.
- Marine Environmental Response Expert Group, mandated to address AAR recommendations and lessons learned. Will lead preparations for 2018 exercise.



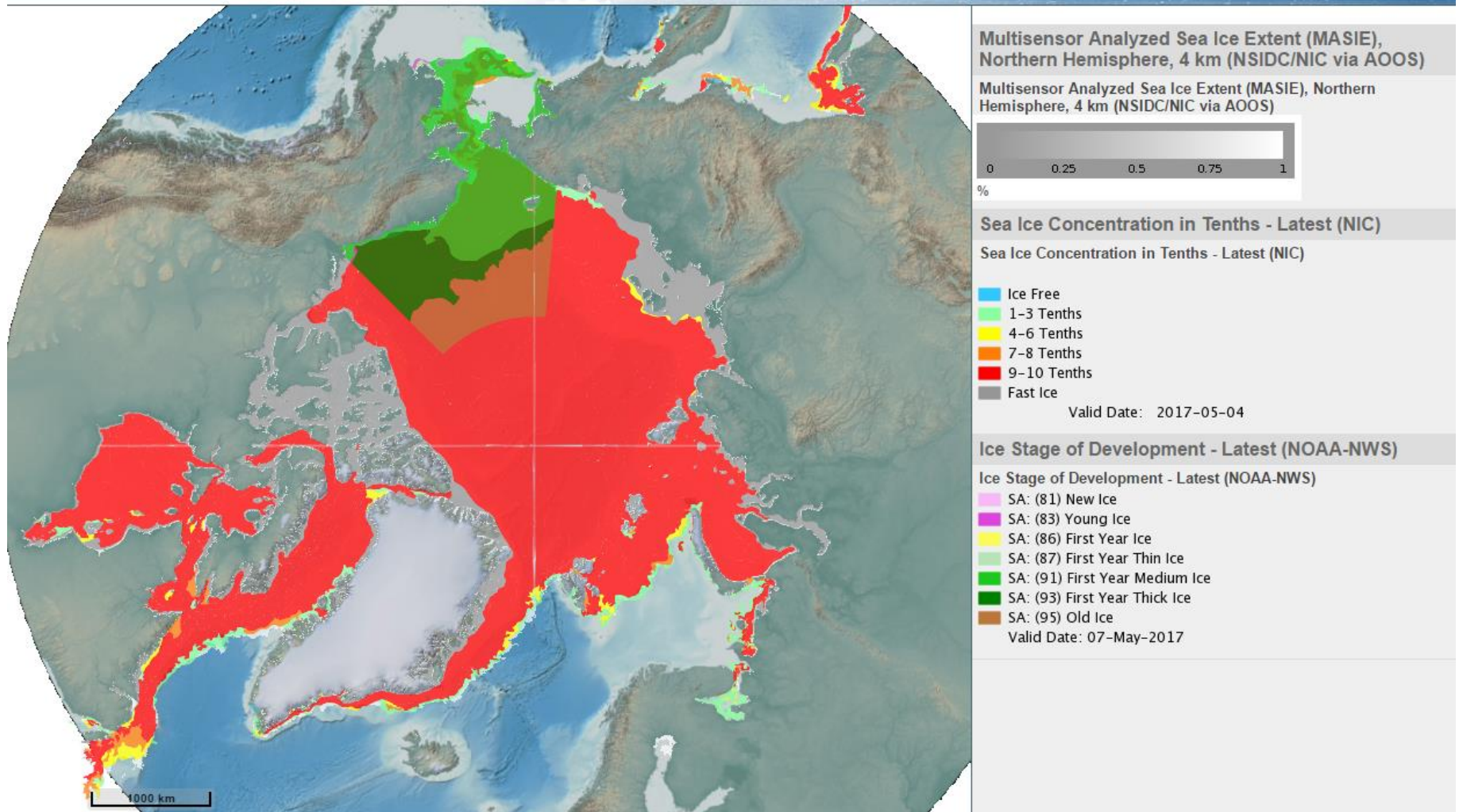
## Examples of Partnerships and Uses

- EPPR International Planning and Response
- Alaska Ocean Observing Systems (AOOS)
- UAF – Eiken – Local observations
- UAF – RiverWatch – UAS data assimilation
- UAF – Windsor – High resolution dye concentrations
- UAA – Arctic Domain Awareness Center
- WWF Russia
- USCG – Arctic Shield efforts
- Multiple drills and events



# Sea Ice

ERMA® | Environmental Response Management Application  
Arctic



↑N Scale: 1 : 55,396,736

Zoom Level: 3

Location: 55.3580°, 69.5365°

Projection: 3995: Arctic Polar





# River Watch 2017 – National Weather Service & University of AK - Fairbanks

ERMA® Environmental Response Management Application Arctic

Information Help Recent Data Admin Upload Search Layers, Folders, and Bookmarks

ID Location: 65.82508, -144.00567 - Google Chrome

Secure | <https://erma.noaa.gov/ident.html>

ID Location: 65.82508, -144.00567

Add Selected Features

Alaska River Watch

gid	oid_	name
2	0	Circle Prior

UAS Photo Location

gid	sourcefile
8	EX_1fDSC00221

Scale: 1 : 11,079 Zoom Level: 14 Location: 65.8251°, -143.9663° Projection: 3857: WGS84 Web Mercator

US DOC | NOAA | NOS | NOAA Office of Response & Restoration  
Disclaimer | Privacy policy | Official Citation | Contact

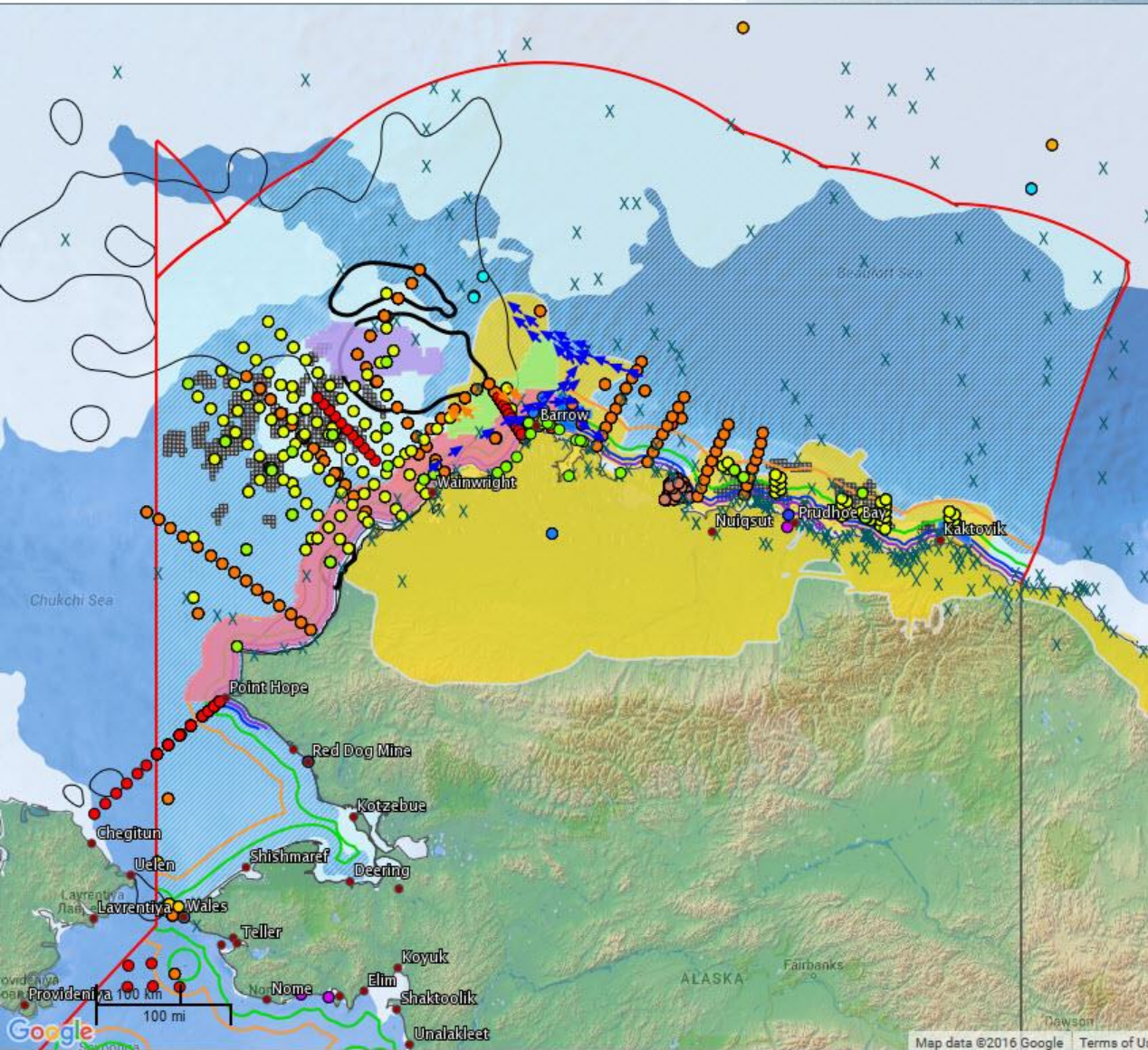
Coastal Response Research Center  
©2007 - 2017 University of New Hampshire

UAS Rapid Response 2017

- 17 0504
- 17 0505 Evening
- 17 0506 Evening
- 17 0507 Evening
- 17 0508 Evening
- evening
- evening
- UAS Mosaic 2017-05-06 evening
- UAS Mosaic 2017-05-07 evening
- ADAC - AIFC - Test
- Bering Strait Incident (THIS IS A DRILL)
- ERMA Drawings
- Temporary Layers

Bookmark Views:





**Sea Ice Extent**  
 Daily Ice Edge and Marginal Ice Zone - 01-Nov-2012 (NIC)

**Essential Fish Habitat (EFH)**  
 AK Essential Fish Habitat - Arctic Cod (2009)

**Cultural Resources & Human Use**  
 North Slope Subsistence Use Areas (BOEM, 2009)  
 Subsistence Use Areas (BOEM, 2009)

**Oil & Gas Leases**  
 BOEM Planned Oil and Gas Leases (BOEM, 2010)

**Presidential Withdrawal Areas - 27-Jan-2015 (BOEM)**  
 Whaling Deferral Area  
 Hanna Shoal  
 Subsistence Deferral Area  
 Chukchi Sea Coastal 25 Mile Buffer

**Geopolitical Boundaries**  
 Alaska Border  
 Canadian Provinces/Territories (NRCAN, 2007)  
 Russia Border

**Pinnipeds**  
 Pacific Walrus - August Occupancy, Chukchi Sea (USGS, 2012)  
 95th Percentile  
 50th Percentile

**Marine Jurisdictions**  
 U.S. Marine Jurisdictions (NOAA, 2009)  
 Contiguous Zone  
 Exclusive Economic Zone  
 Revenue Sharing Boundary  
 State Seaward Boundary  
 Territorial Sea

Similar to Figure 1: Lovecraft *et al.*, AOS 2016



**Geopolitical Boundaries**

- Alaska Border
- U.S. States and Provinces Boundaries
- Canadian Provinces/Territories (NRCAN, 2007)
- Russia Border

**Marine Infrastructure**

- Ports and Communities (PAME, 2009)

**September 09 2015**

ARCTREX2015 20150909T082023

ARCTREX2015 20150909T082023

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ARCTREX2015 20150909T082023



September 09 2015

ARCTREX2015 20150909T082023

ARCTREX2015 20150909T082023

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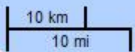
ARCTREX2015 20150909T090450

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Study Area

Wainwright





September 09 2015

ARCTREX2015 20150909T082023

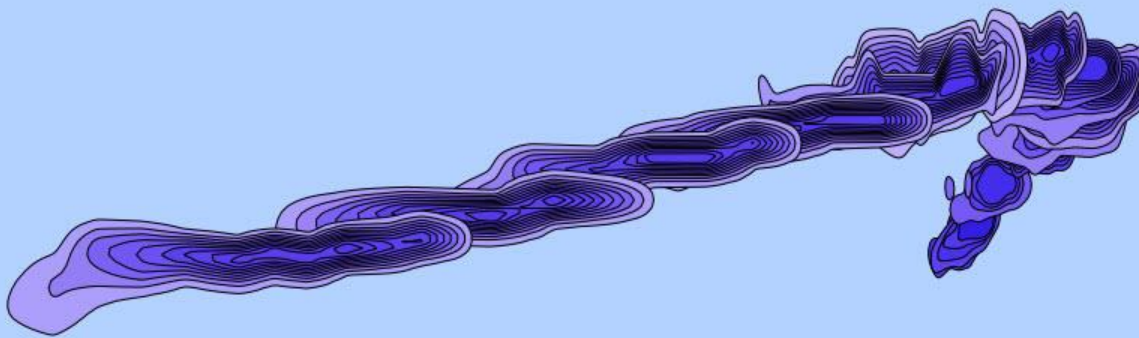
ARCTREX2015 20150909T082023

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ARCTREX2015 20150909T090450

ARCTREX2015 20150909T090450

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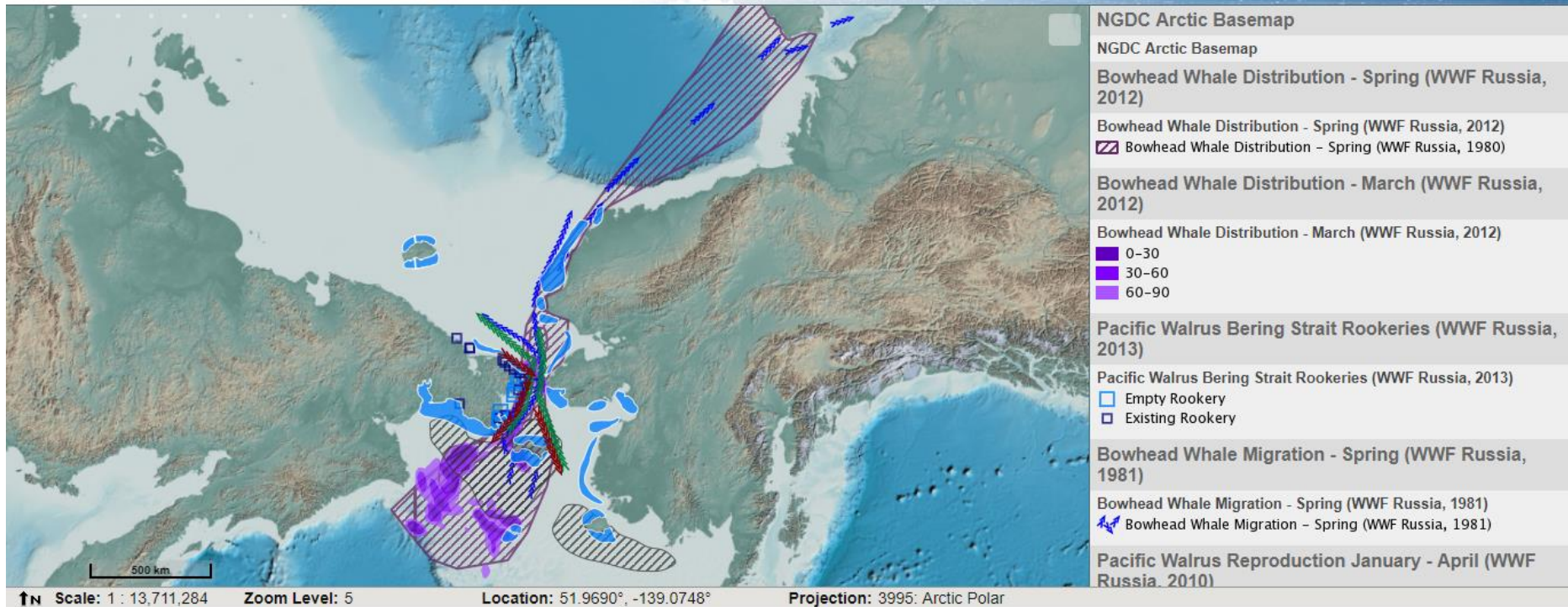
1000 m  
5000 ft



Map data ©2016 Terms of Use

# Example: WWF-Russian Data

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Arctic





# Areas of Collaboration

- Incorporating scientific/observing networks into exercise planning and response
- Identify priority data and products; develop work flows
- Identify research projects/assets to reorient for disaster response
- Optimize and automate electronic data capture, data volumes, and data management
- Optimize interoperability among systems; federated systems
- Link to broader disaster mitigation frameworks

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  - Michael Greer
  - JB Huyett
  - Zach Winters-Staszak
  - Rachel Fox
- I.M. Systems Group/Freestone:
  - Jay Coady
  - Nicolas Eckhardt
  - Matt Dorsey
- Development Team:
  - Aaron Racicot, Z-Pulley
  - Chander Ganesan, OTG
  - Robert St. Lawrence, UNH
  - Martin Ledoux, UNH

**Funding Sources:** Coastal Response Research Center, **US EPA Region II, Bureau of Safety and Environmental Enforcement**, U.S. Coast Guard, NOAA's Office of Response and Restoration and Coastal Storms Program, Oil Spill Recovery Institute,

# Please Visit Our ERMA Regional Sites

## [Response.restoration.noaa.gov/ERMA](http://Response.restoration.noaa.gov/ERMA)

U.S. Department of Commerce | National Oceanic and Atmospheric Administration | National Ocean Service

Search



## Office of Response and Restoration

Home Oil and Chemical Spills Environmental Restoration Marine Debris Training and Education Multimedia About

### Environmental Response Management Application (ERMA)

ERMA<sup>®</sup> is an online mapping tool that integrates both static and real-time data, such as [Environmental Sensitivity Index \(ESI\) maps](#), ship locations, weather, and ocean currents, in a centralized, easy-to-use format for environmental responders and decision makers.

ERMA enables a user to quickly and securely upload, manipulate, export, and display spatial data in a Geographic Information System (GIS) map.

Developed by NOAA and the [University of New Hampshire](#) with the U.S. Environmental Protection Agency, U.S. Coast Guard, and the Department of Interior, ERMA provides environmental resource managers with the data necessary to make informed decisions for environmental response.



ERMA Environmental Response Management Application  
Gulf of Mexico

Here, ERMA displays sampling locations in the Gulf of Mexico for the NOAA Mussel Watch Program, which monitored contaminant levels from mussels before and after the Macondo well blow-out in 2010 (well site shown in yellow). Source: NOAA.

### Arctic ERMA

Find out how NOAA is helping the Arctic region prepare for climate change and possible oil spills using ERMA

### Atlantic ERMA

In the fall of 2012, Atlantic ERMA was employed as the Common Operational Picture for the U.S. Coast Guard's pollution response to Post-Tropical Cyclone

### On Our Radar

#### Oiled Oregon Streams Get Fish-Friendly Makeover



#### Watching Chemical Dispersants at Work

