WWF Arctic

Modelling Oil Spills in the Beaufort, Bering and Barents Sea

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Outline of Presentation

- Why and how WWF we did this modeling
- Oil Spill Modelling 101
- Case Studies
  1. Beaufort Sea – O&G and Shipping
  2. Bering Sea – Shipping
  3. Barents Sea - O&G
- Lessons Learnt
- Recommendations to Arctic Council Working Groups and National Governments

Modelling oil spills in the Arctic

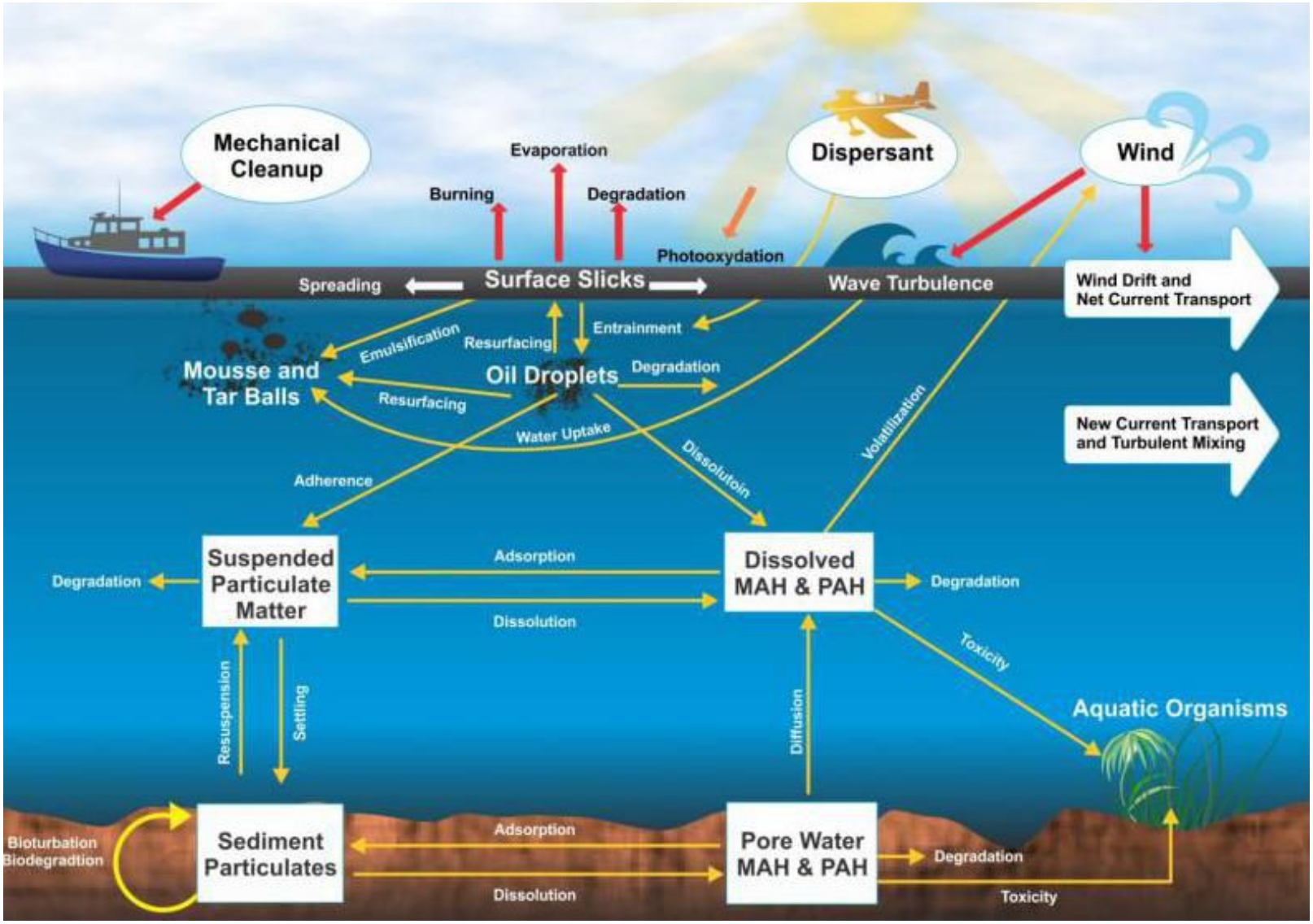
WHY?

- Understand risk of a range of activities
- Prepare for oil-spill response planning
- Inform oceans management and planning

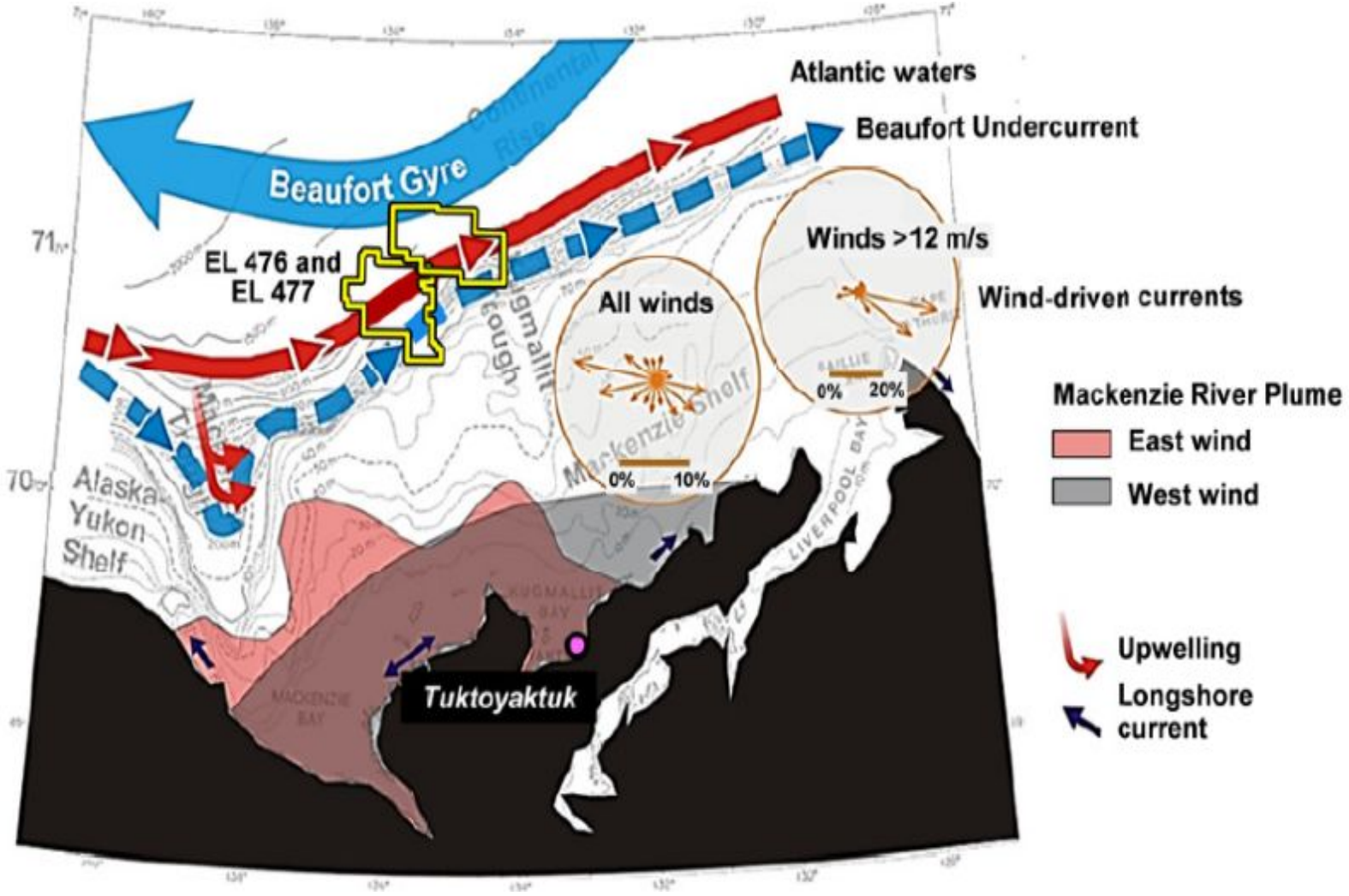
HOW?

- Investigate ***variety of oil spills*** associated with increased activity across Arctic using:
  - Best environmental data (e.g. currents, winds)
  - Cutting edge science and modelling practices
  - Input from experts and communities

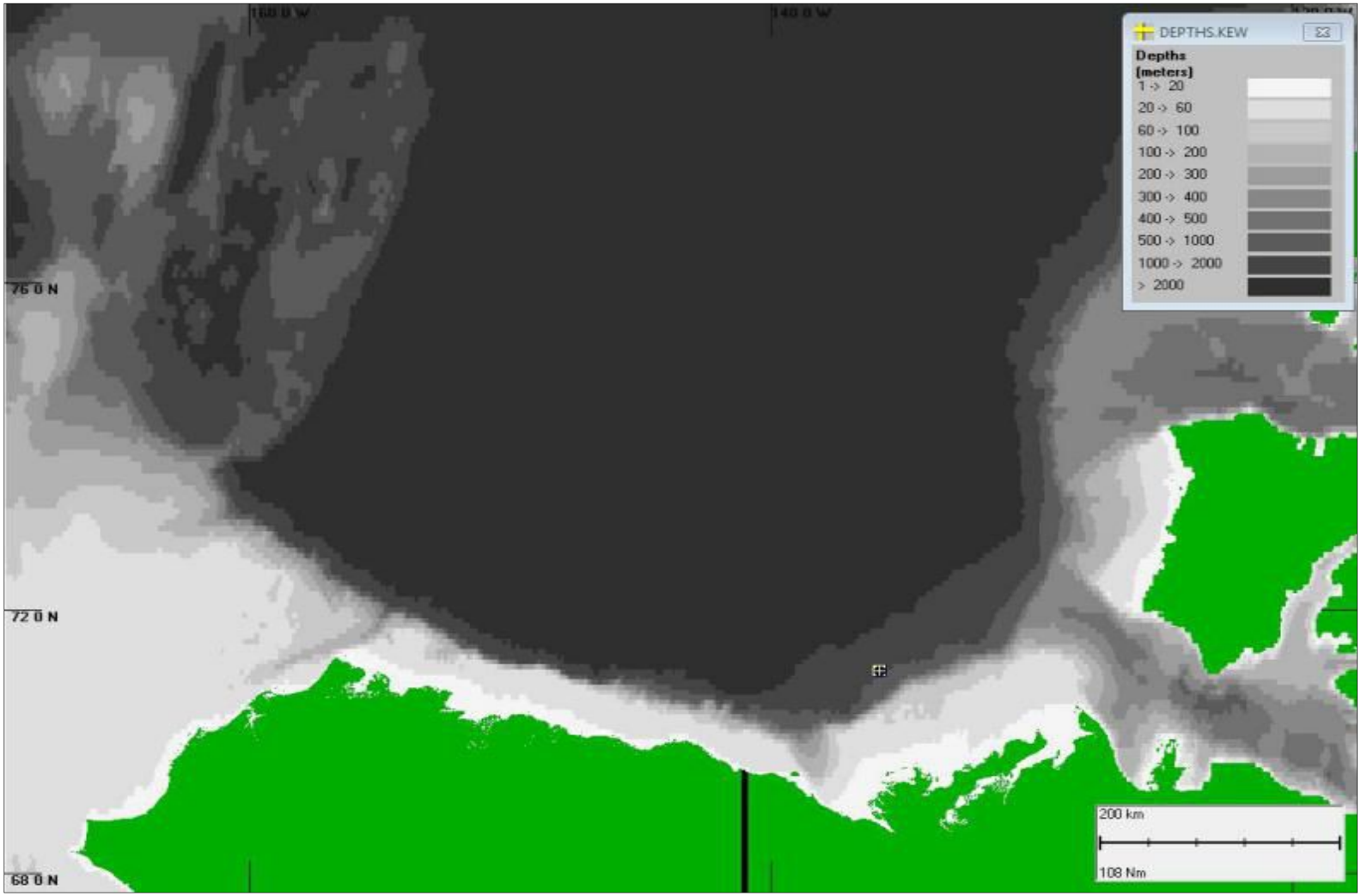
Oil Spills in Open Water



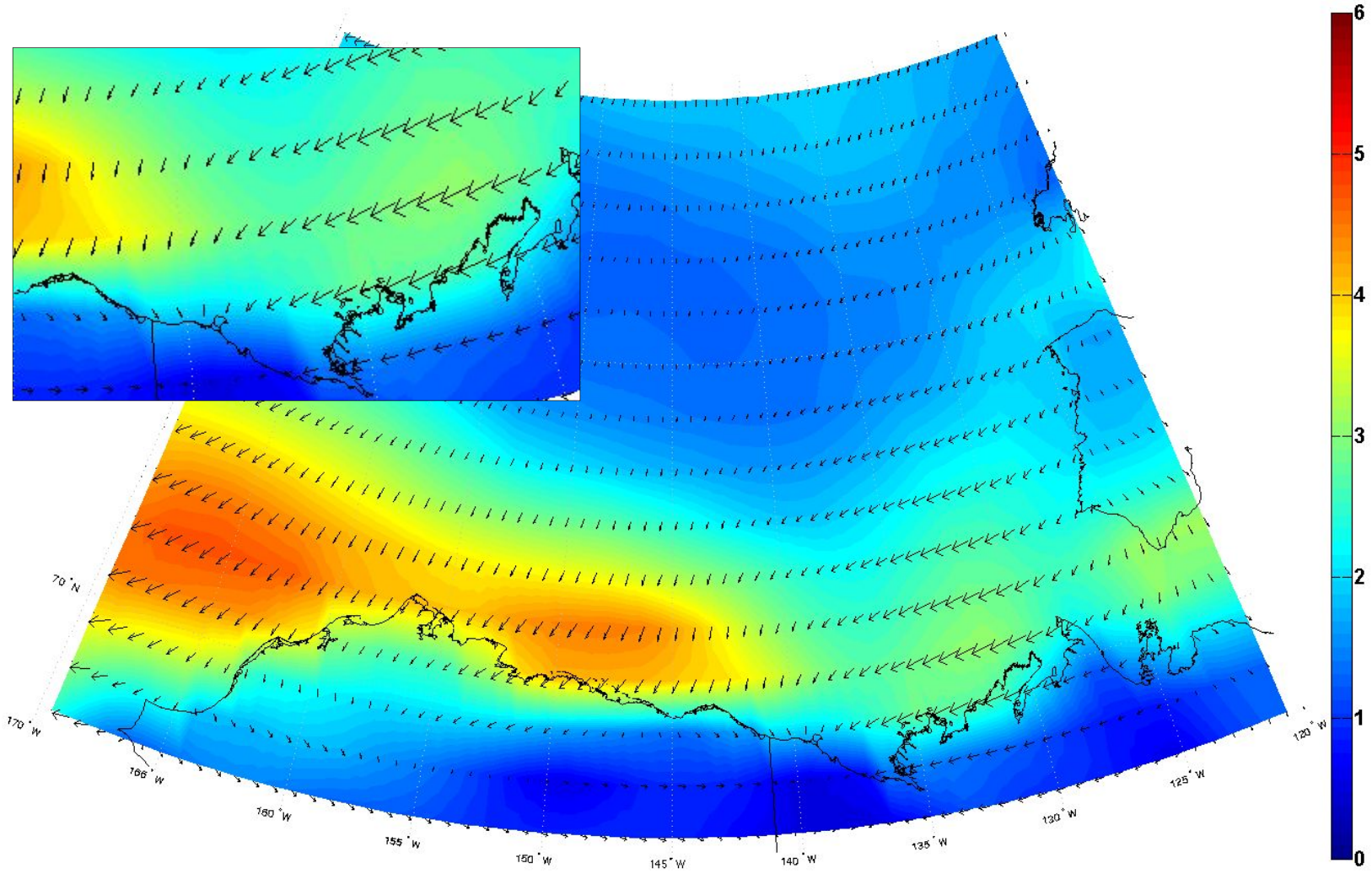
Unique and Complex Combination of Regional Variables



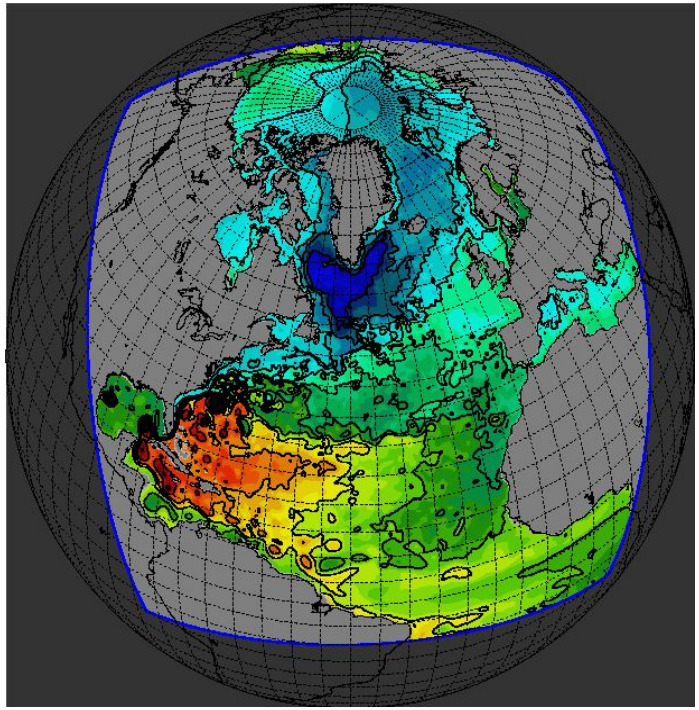
Depth, Bathymetry & Water Column

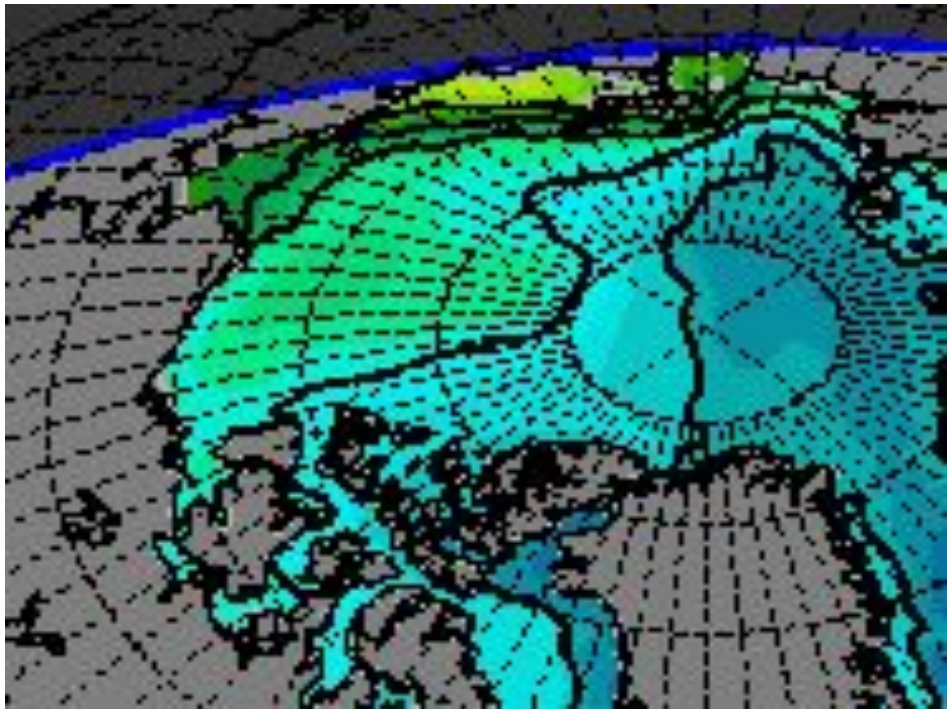


Wind Velocity & Direction

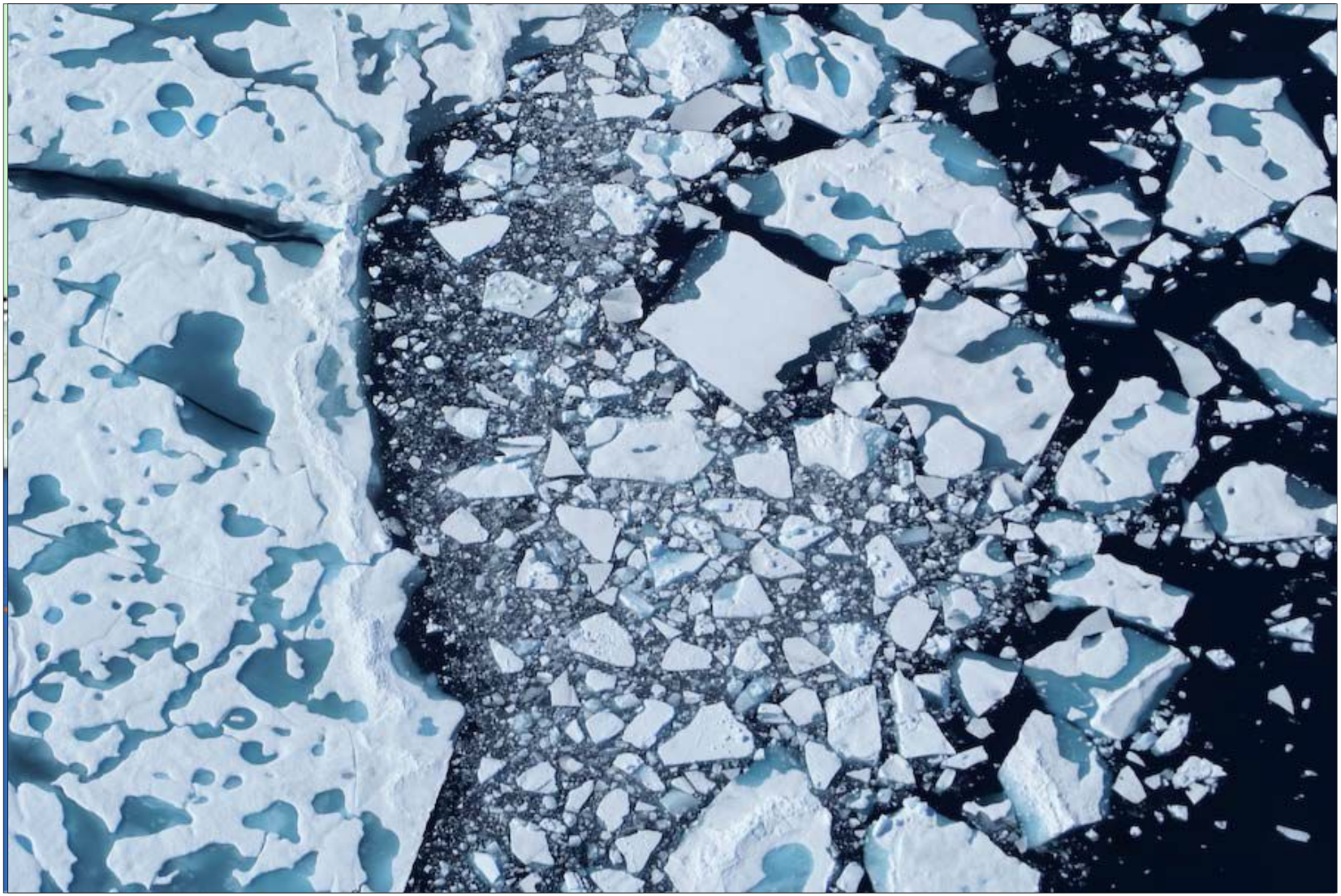


Ocean Currents, Speed & Direction

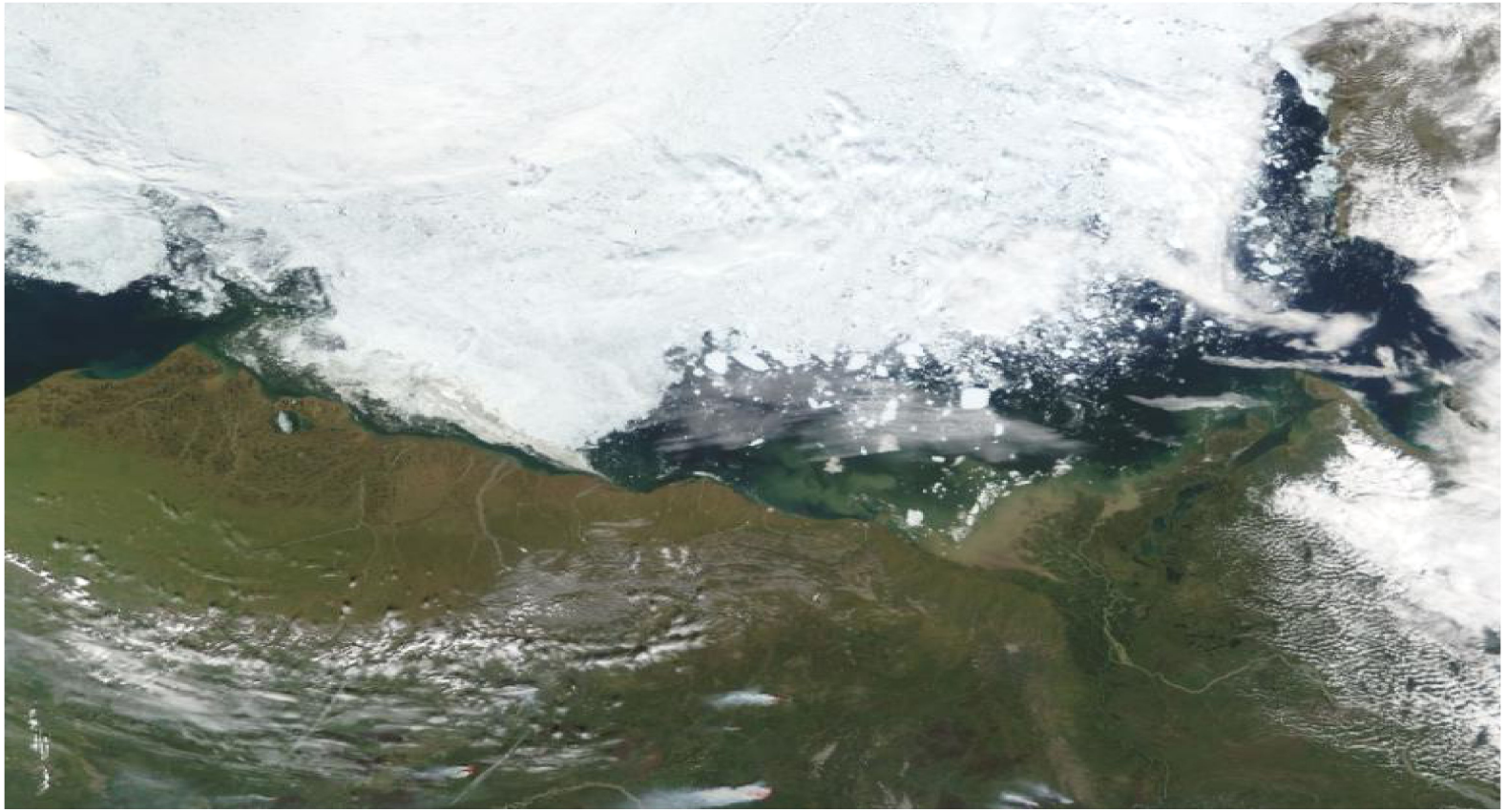




Oil in Ice Interactions and Behaviour



Oil Spill Trajectory Modeling in the Beaufort Sea- Oil & Gas and Shipping



OIL SPILL SCENARIOS

(1) EASTERN SHIPPING SPILLS

(2) TRANSBOUNDARY SPILLS

(3) SHALLOW BLOWOUT SPILLS

(4) DEEP BLOWOUT SPILLS

Scenarios: Criteria

(1) **TYPE OF SPILL**
e.g. shipping, pipeline leaks, blowouts

(2) **FLOW RATE OR VOLUME**
e.g. most probable, worst-case

(3) **LOCATION, TIMING, DURATION**
e.g. how long to cap well? freeze-up conditions?

(4) **RESPONSE**
e.g. burning, surface dispersants

(5) **OIL TYPE**
e.g. heavy fuel oil, Alaskan crude, diesel


RESULTS

Results: Shallow Well Blowout

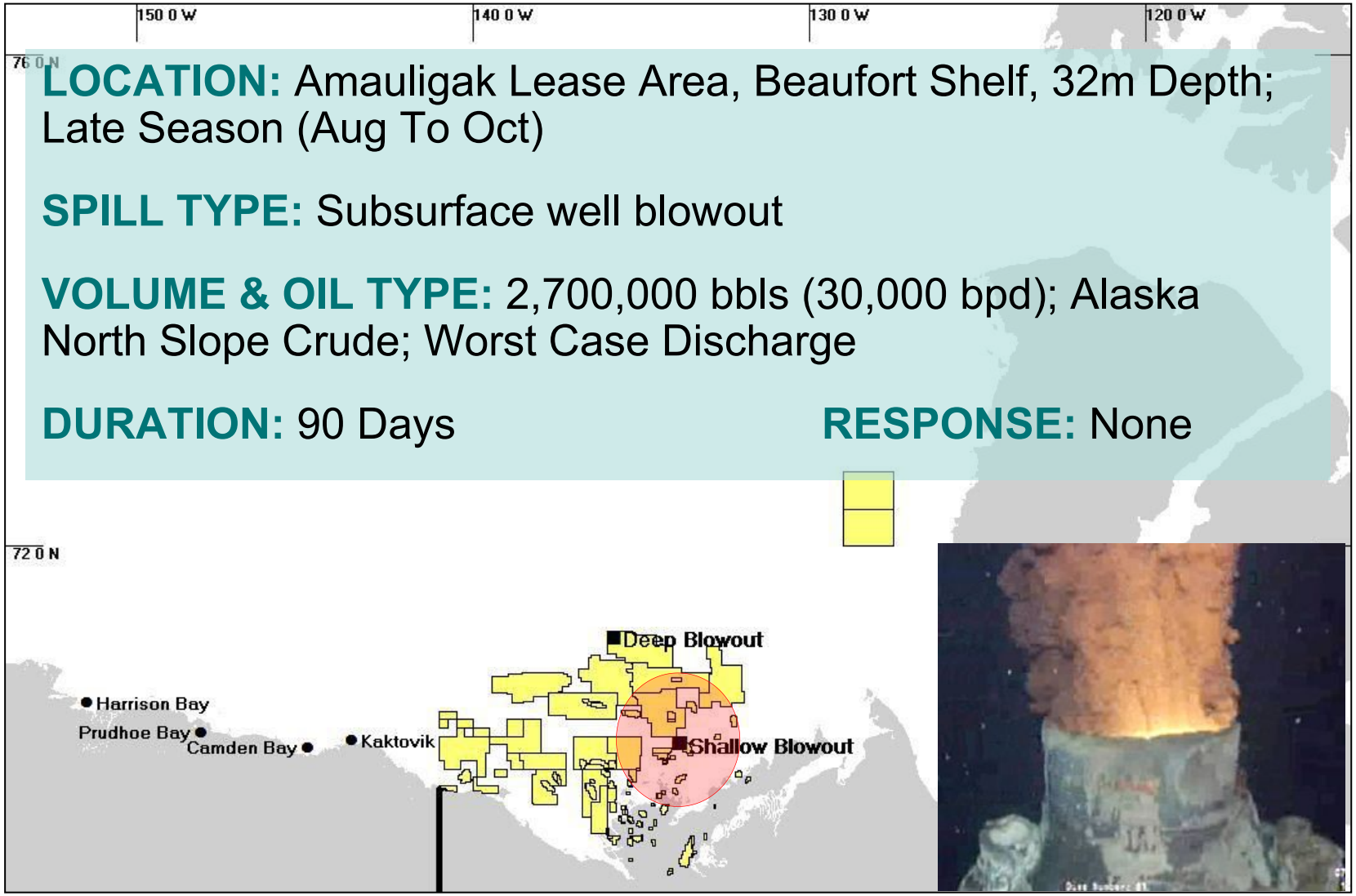
LOCATION: Amauligak Lease Area, Beaufort Shelf, 32m Depth; Late Season (Aug To Oct)

SPILL TYPE: Subsurface well blowout

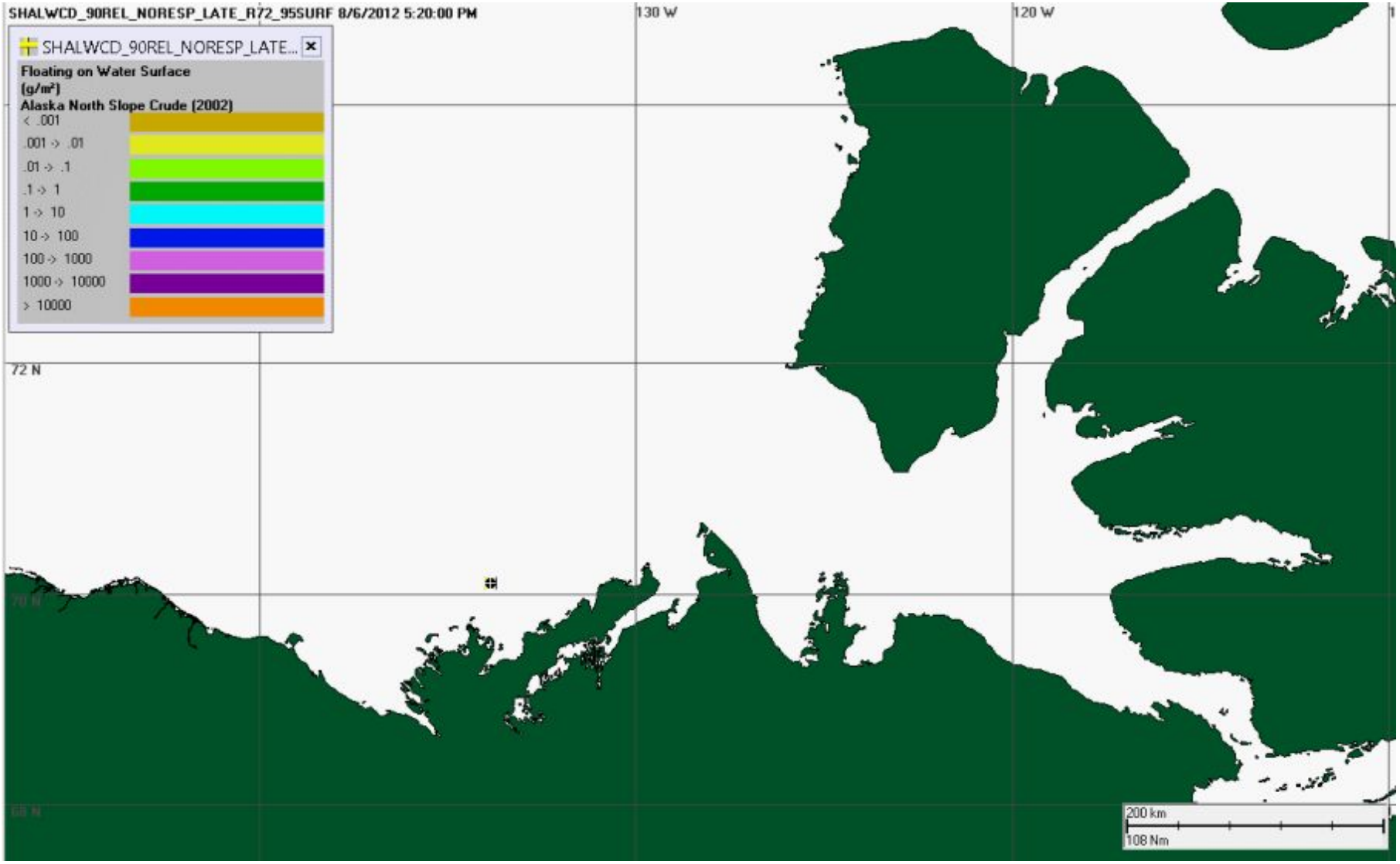
VOLUME & OIL TYPE: 2,700,000 bbls (30,000 bpd); Alaska North Slope Crude; Worst Case Discharge

DURATION: 90 Days

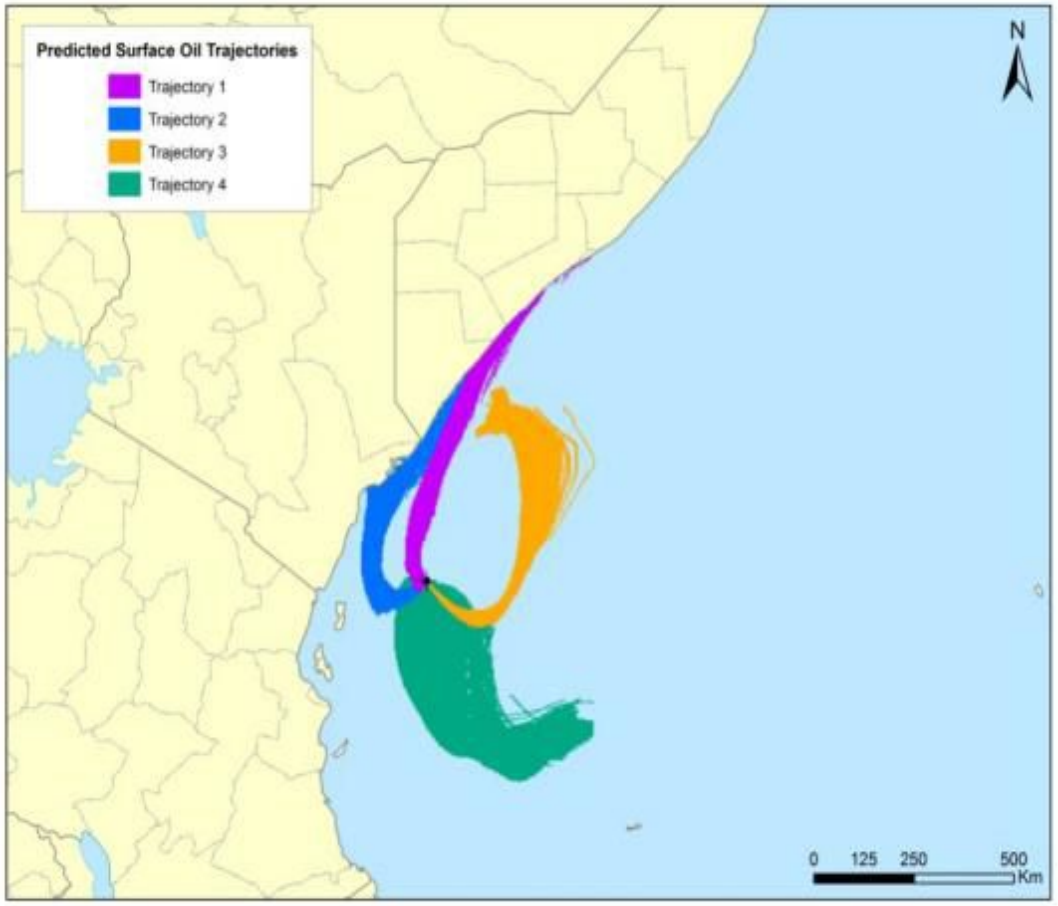
RESPONSE: None

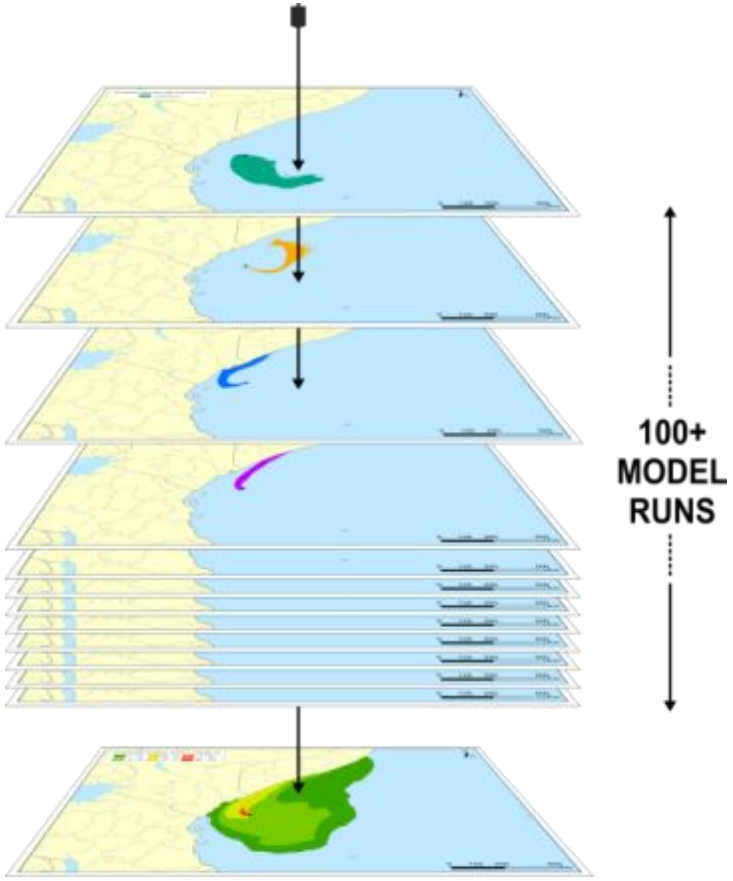


Results: Shallow Well Blowout

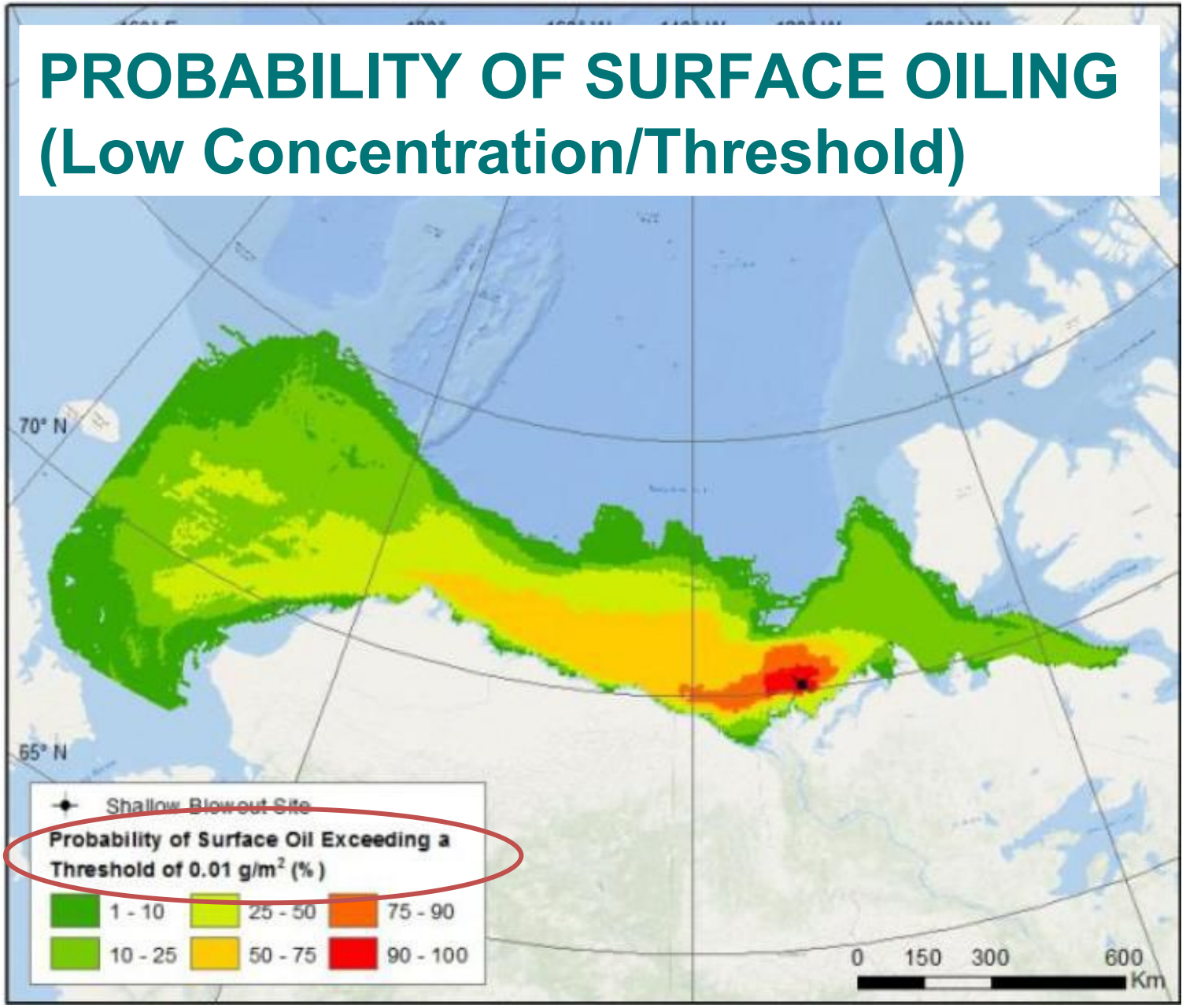


Determining Probability Maps…

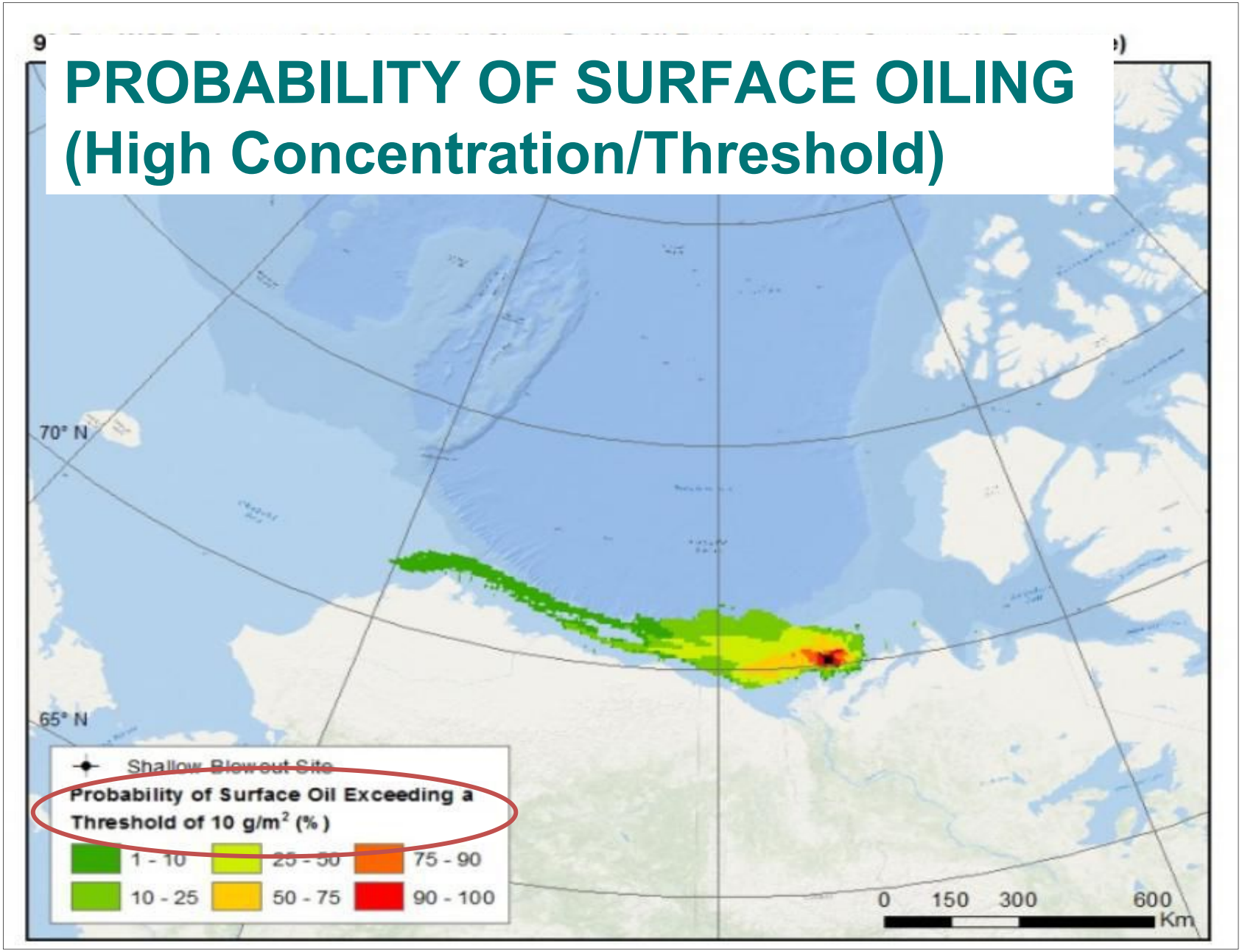


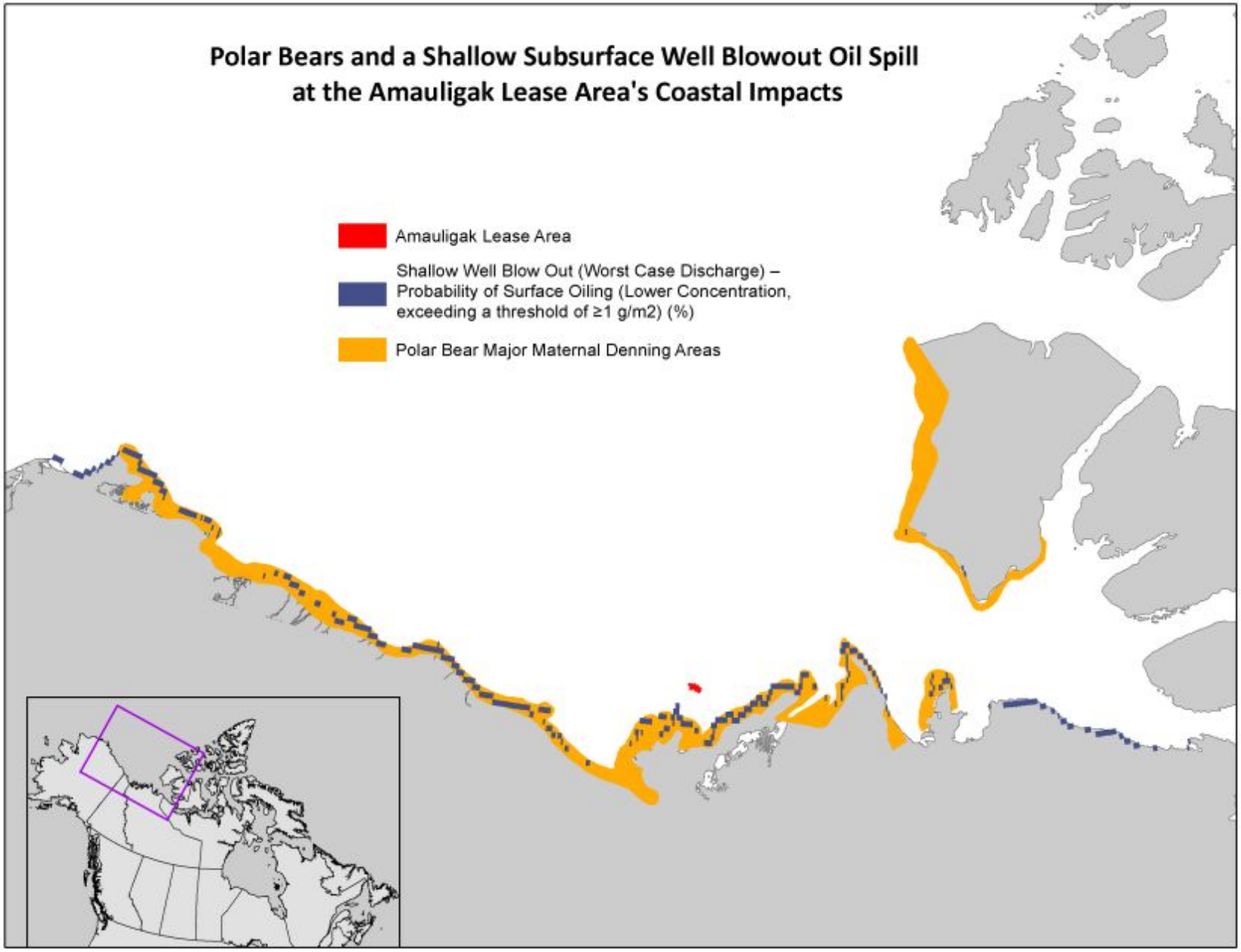


PROBABILITY OF SURFACE OILING (Low Concentration/Threshold)

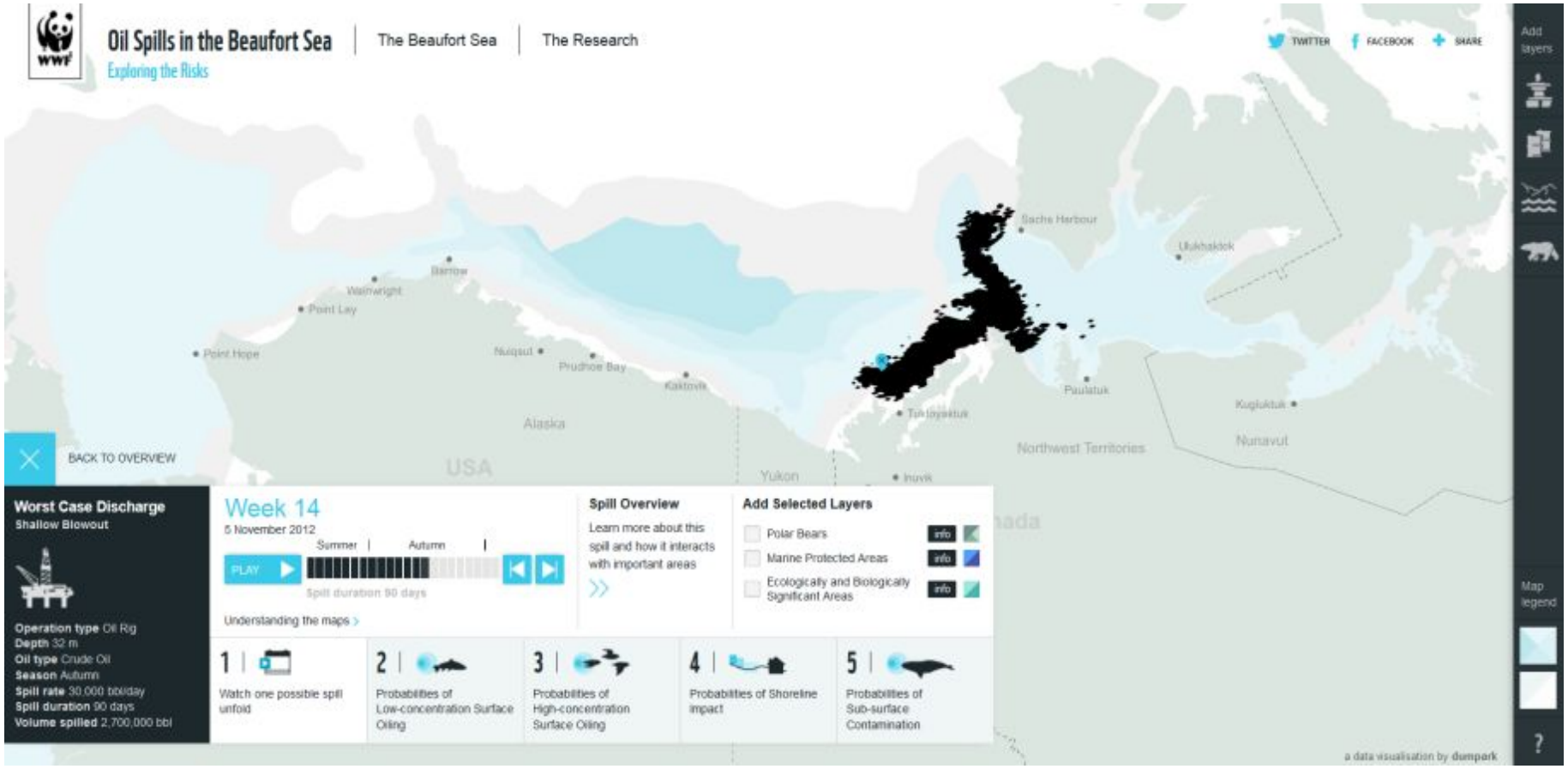


PROBABILITY OF SURFACE OILING (High Concentration/Threshold)




Polar Bears and a Shallow Subsurface Well Blowout Oil Spill
at the Amauligak Lease Area's Coastal Impacts
Amauligak Lease Area
Shallow Well Blow Out (Worst Case Discharge) –
Probability of Surface Oiling (Lower Concentration,
exceeding a threshold of ≥1 g/m2) (%)
Polar Bear Major Maternal Denning Areas

Web Demo: Surface Oiling and Ice



Source: http://arcticspills.wwf.ca

Lessons Learnt - Beaufort

Oil and ice don't mix: oil is difficult to contain, especially in icy conditions

•Spilled oil may travel considerable distances to the west and north of the spill site when trapped and drifting within sea ice, affecting habitat for a wide range of marine species. As a result of this spread of oil, coastal oiling could be international issue.

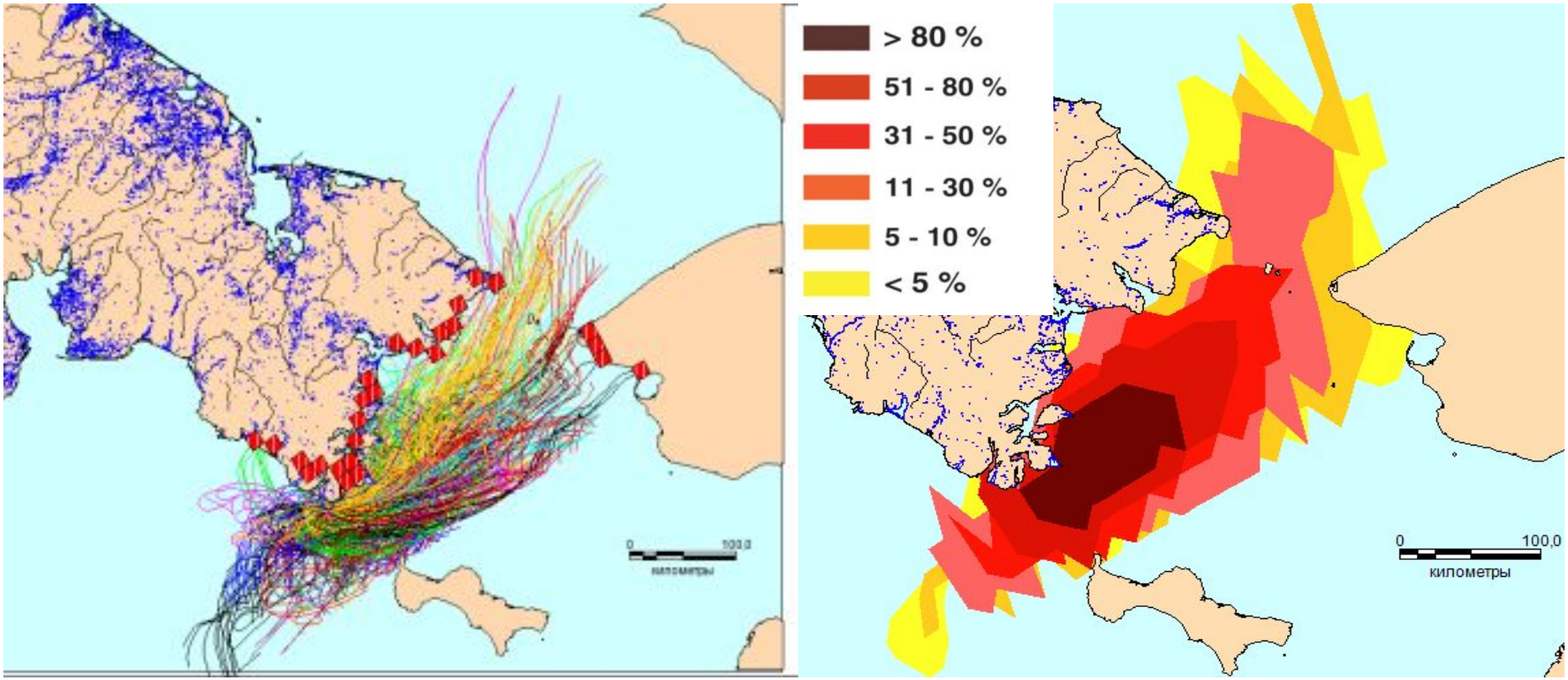
When clean isn't clean: spill response measures come with their own risks

•Use of chemical dispersants at deep water blowout sites may create 'toxic plumes' of chemical residue to concentrate along the Beaufort shelf, an area that is home to a diverse range of species and essential to the health and productivity of Beaufort Sea ecosystem.

Local indigenous knowledge provides valuable insight into local and historical environmental and oceanographic conditions

•Opportunities to include this in modeling and spill response planning should be explored.

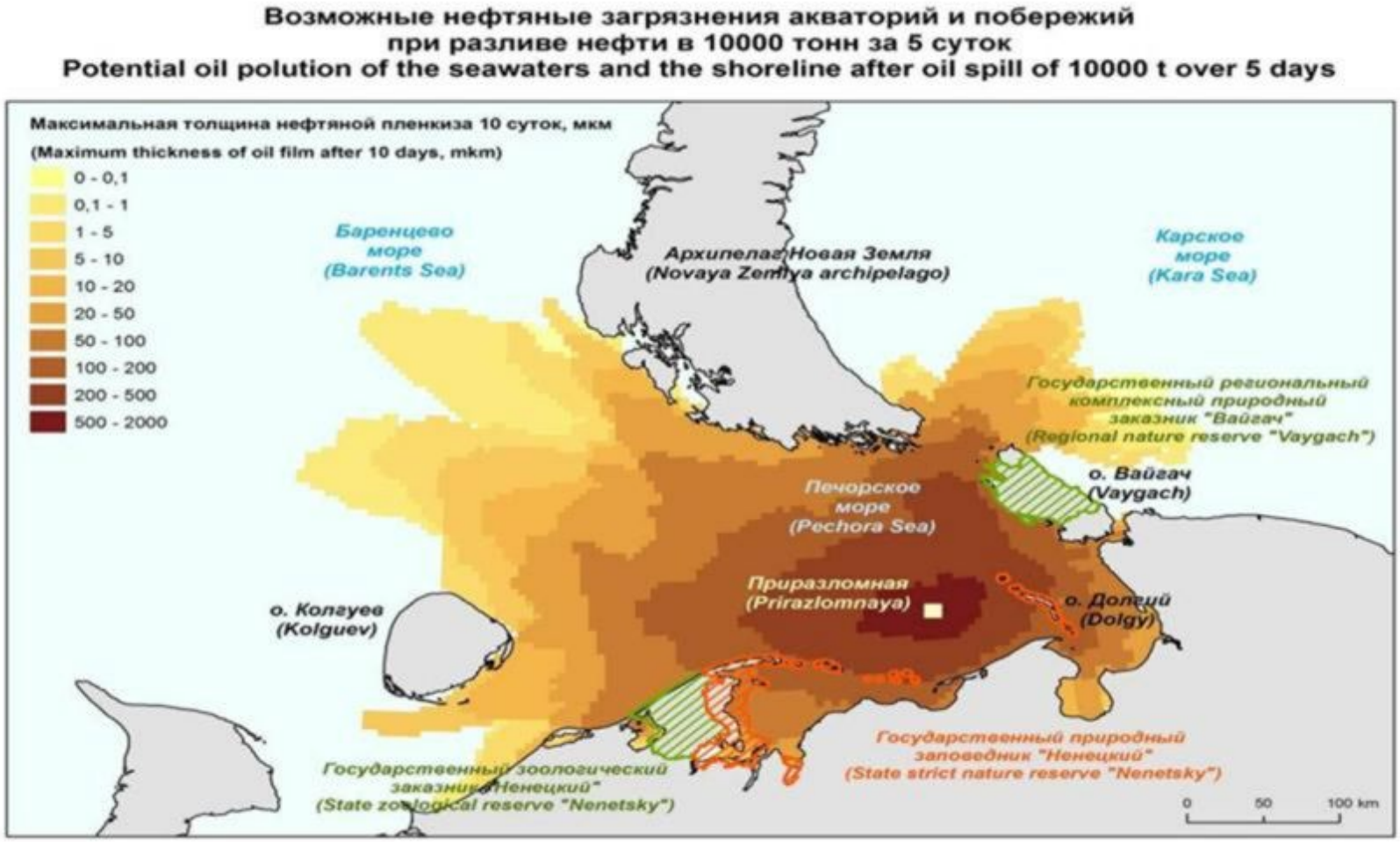
Oil Spill Trajectory Modeling in the Bering Sea – Tanker Shipping Spills



Lessons Learnt - Bering

- Increasing transport of oil and gas through the Bering Strait threatens protected territory of the Beringia National Park;
- An oil spill on the Russian side of the Bering Strait has a high probability of crossing to the US waters, affecting the entire ecosystem;
- Prevention and response systems in the Bering Strait are either missing or are inadequate;
- US-Russia transboundary collaboration and knowledge sharing is needed to support planning, preparedness, risk reduction, and incident response;
- Navigational safety measures are necessary to minimize risks of vessel accidents.

Oil Spill Trajectory Modeling in the Barents Sea Shallow Water Wells



Lessons Learnt - Barents

- Gazprom Neft, operator of the oil platform Prirazlomnaya, needs to strengthen its oil spill response capability in the Arctic;
- In case of response failure due to harsh environmental conditions, an oil spill could lead to serious pollution of this fragile region;
- Potential impacts of oil spills in the southeastern Barents Sea will negatively affect endangered species habitat (Atlantic walrus) and important protected areas including shores of the Nenets zapovednik.

WWF Recommendations arising from this work….

1. Increased investment in knowledge generation and monitoring;

2.Implementing an Ecosystem Approach at National and Eco-region Scales;

3. Mandatory oil spill modelling;

4. Environmental Risk Assessments;

5. Implementing appropriate spatial and temporal measures to reduce disturbance to significant areas;

6. Improving oil spill response capacity and coordination.

2. Implementing an Ecosystem Approach at National and Eco-region Scales:

•Transboundary collaboration and knowledge sharing is essential to support planning, preparedness, and risk reduction prior to increased development.

•As one step to advance an ecosystem approach, WWF recommends that Arctic countries establish and enhance eco-region specific databases to actively share relevant data on environmental, ecological and human activity, and prioritize and fund research to further collect and compile such data at an ecosystem scale. **(i.e. AOOS-BSP example)**

3. Mandatory oil spill modelling:

•WWF recommends that all applications for oil and gas exploratory drilling and proposed shipping corridors be accompanied by 3rd party oil spill trajectory modelling in a range of scenarios (most probable spills, worst case spills and other important scenarios). Models should include spill scenarios that may occur both during and beyond operating seasons.

•These scenarios should also include vulnerability analyses, and identification of critical habitats and subsistence use areas.

5. Implementing appropriate spatial and temporal measures to reduce disturbance to significant areas

•Arctic States should continue the on-going identification and mapping of ecologically and culturally significant areas and pursue further work to determine the vulnerability of areas to oil spills under different scenarios.

•Ecosystem features, habitats, and subsistence use areas that are deemed too valuable and vulnerable to oil spills should be identified and agreed upon by national agencies, industry and regional communities.

•Special measures for response (i.e. response infrastructure nearby, seasonal considerations in response options), and development limitations (such as safeguarding, zoning, shipping lane designations, or deferral areas) should be implemented in oceans planning and leasing decisions at a national and ecosystem scale.

WWF-Russia - Policy on oil spill issue

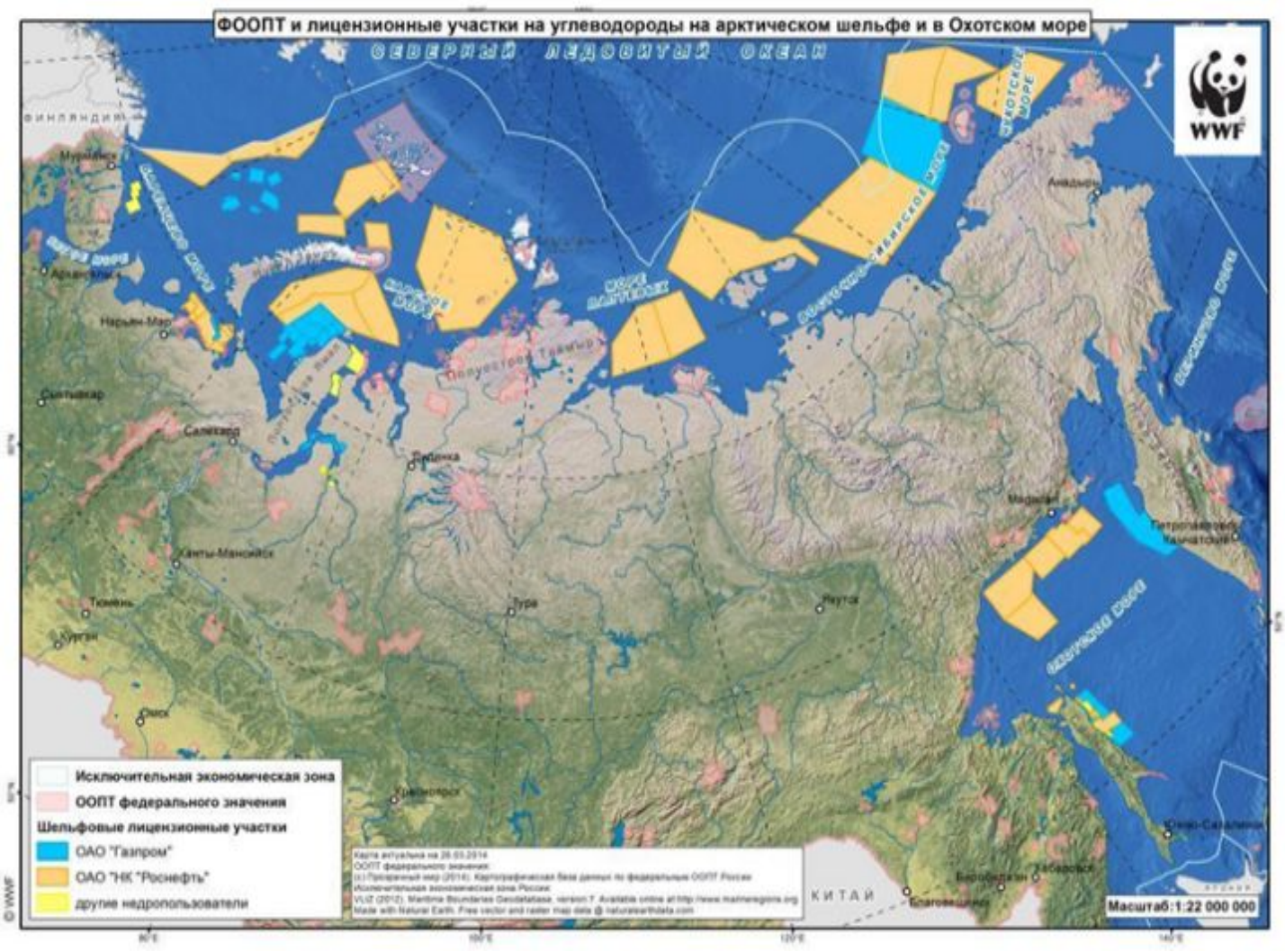
- Advocating for Federal Law #287 on oil spill response (OSR)

- Establishing legal basis for improving capacity to protect wildlife (including rescue/volunteers activities)

- Improving corporate/industry policy and standards (voluntary, Gazprom neft and Lukoil).

Oil spill - state and corporation policy

About 25% of Russian EEZ are leased.



WWF Russia campaign to improve legislation on OSR issue (2013)

Federal Law No. 287-FZ On amendments to Federal Law *'On Continental Shelf of the Russian Federation' and Federal Law 'On Internal Sea Areas, Territorial Sea, and Adjacent Zone of the Russian Federation'* was adopted by President of RF on December 30, 2012 and came in force on July 1, 2013

Federal Law No. 287 means that:

- **For the first time**, at the level of Federal law, exploration and production of hydrocarbon as well as its transportation and storage are only allowed with an approved **Oil Spill Prevention and Response Plan (OSRP).**
- **For the first time,** the Law stipulates the possibility to engage **volunteers for oil spill cleanup.**
- The Law requires a company to demonstrate **it has technologies and methods** to contain oil spilled into the marine environment **in ice conditions.**

Federal Law No. 287 not included:

- The request to conduct **Risk Assessment** before the project will get approval for implementation
- Establishment of a special **national compensation fund** for prompt oil spill response.
- Possibilities to determine **zones closed for exploration, production, and transportation** (“no go” zones) of oil and oil products if such activities pose a threat to rare and endangered animal species and valuable ecosystems

Gazprom neft corporation policy and practice

- In 2013 Gazprom neft and Lukoil sign an agreement on joint program on oil spill response in Pechora sea.
- In 2013 Gazprom neft spend additional $2 mln to increase capacity on oil spill response on Prirazlomnoe.
- In 2014 Gazprom neft as first Russian oil company joined JIP (Oil spill issue in Arctic).
- In 2014 Gazprom neft signed a Protocol to develop OWR component in OSR Plan for Prirazlomnoe.

Questions?

wwf.ca/arctic