



Natural resource damage assessment (NRDA) in Arctic waters

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The Players

- Oil spill clean up
 - U.S. Environmental Protection Agency
 - U.S. Coast Guard
- Assessment of resource damage, restoration planning and implementation
 - “Trustees”
 - NOAA
 - Office of Restoration and Response
 - NMFS Restoration Center
 - General Counsel for Natural Resources
 - Other Federal agencies
 - State agencies, Tribes, Public
- Funds for assessment and restoration
 - “Responsible Party”

The NRDA Process

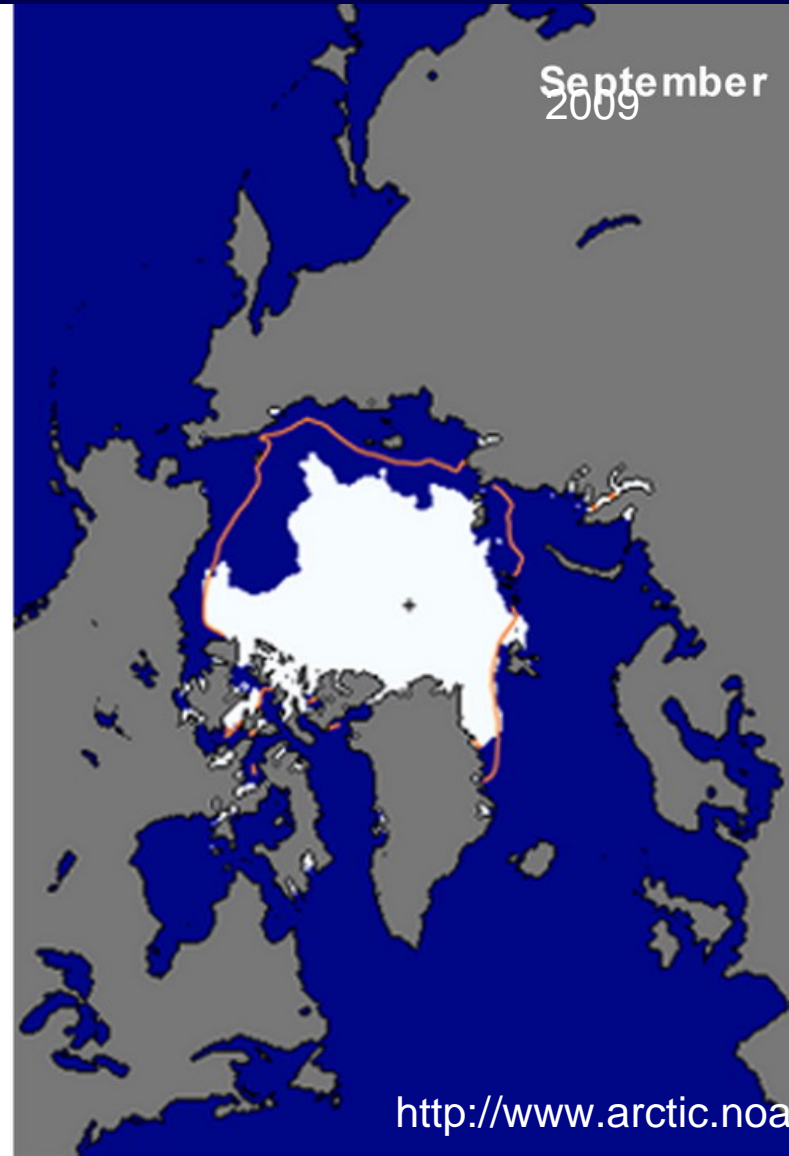
1. Preliminary assessment
2. Injury assessment and restoration planning
3. Restoration implementation

Requires an understanding of the condition of the natural resources in the absence of the spill (i.e., baseline conditions)

Arctic Challenges

- Polar weather and ice
- Remote
 - Fewer resources for response and damage assessment
- Sensitive habitats
 - Sea ice
 - Shallow benthic habitat

Arctic Challenges – Climate Change

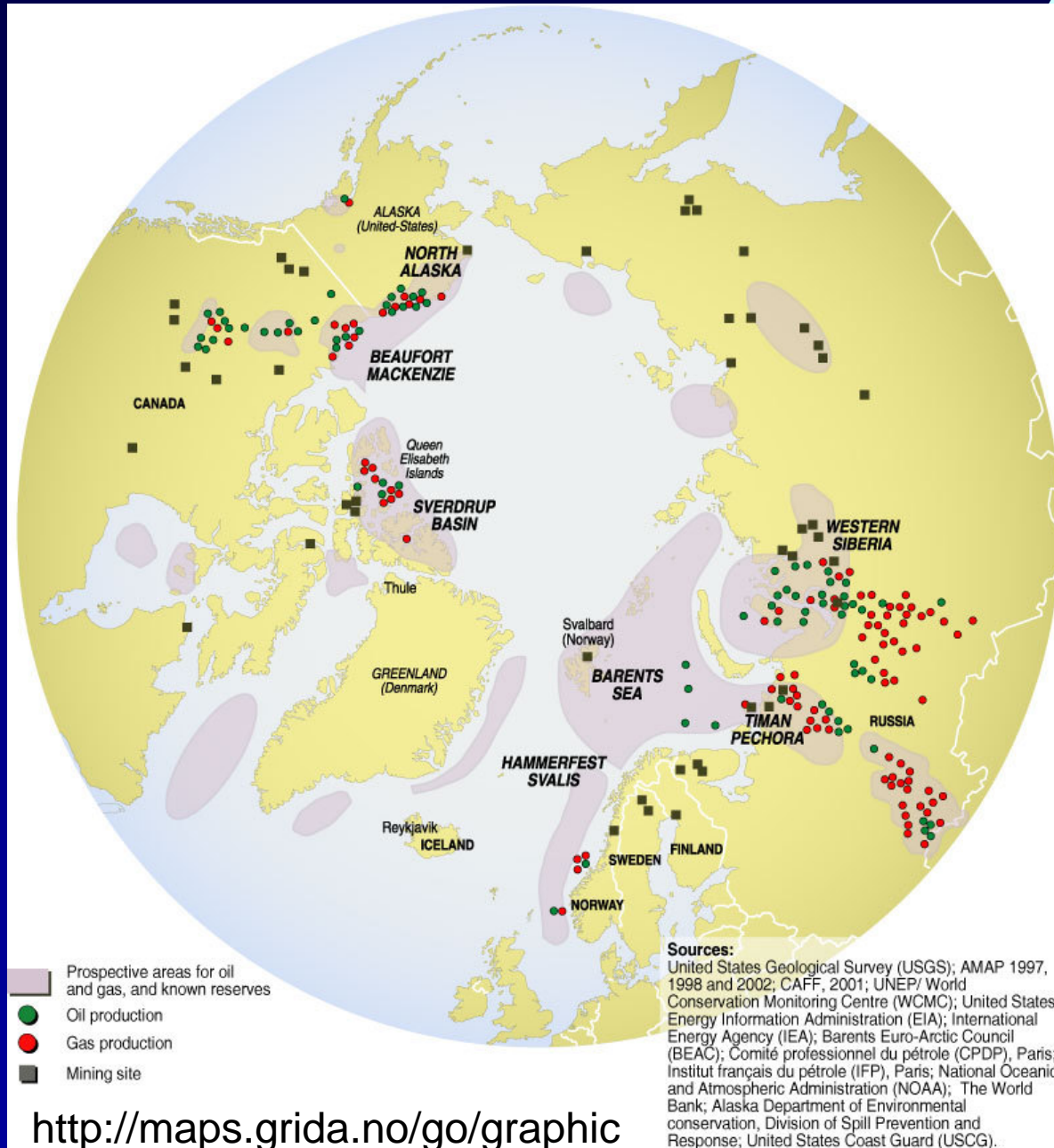


Increased Human Activity in the Arctic

- Shipping, fishing, tourism and oil, gas, and mineral exploration.
- Arctic contains a potential 90 billion barrels of oil and 1,700 trillion cubic feet of natural gas
- 84% of the undiscovered oil and gas occurs offshore

<http://geology.com/usgs/arctic-oil-and-gas-report.shtml>

Current Oil/Gas Activity



<http://maps.grida.no/go/graphic>

History of Oil Spills in the Arctic

- Oil spills in the Arctic or sub-Arctic have been infrequent
- T/V Exxon Valdez
 - Gulf of Alaska
 - 1989
 - 11 million gallons crude oil
- M/V Selendang Ayu
 - Aleutian Islands
 - 2004
 - 336,000 gallons of heavy fuel oil and diesel
- 20 years of data on response to oil spills in the Aleutian Islands shows that almost no oil has been recovered



Deepwater Horizon Spill



Response



Assessment



Natural Resource Damage Assessment in Arctic Waters: The Dialogue Begins

- April 20 – 22, 2010 in Anchorage, Alaska
- Organizers
 - Coastal Response Research Center, Univ. New Hampshire
 - NOAA Office of Response and Restoration
- Participants
 - Natural resource trustees, industry, non-governmental organizations, academic scientists, and members of Arctic communities
- Topics
 - Extent of baseline information available
 - Gaps in the current knowledge
 - Efforts needed to close these gaps



Breakout Groups

- Marine Birds
- Mammals
- Fish and Invertebrates
- Ice and Under Ice Habitats
- Lagoons and Near Shore Environments
- Freshwater Habitats and Coastal Tundra

Birds



- Red Phalarope
- Red-Necked Phalarope
- Long-Tailed Duck
- Common Eider
- King Eider
- Spectacled Eider
- Steller's Eider
- Yellow-Billed Loon
- Red-Throated Loon
- Pigeon Guillemot
- Common Murres
- Thick-Billed Murres
- Gyrfalcons
- Snowy Owls
- Ivory Gulls
- Ross's Gulls
- Brant Eider
- Kittlitz's Murrelet
- Barrow Geese
- Wainwright Geese
- Kittiwakes

Birds

- Oil spill impacts
 - Damage to food supply
 - Disruption of breeding grounds
- Information needs
 - Off-shore foraging activities
 - Seasonal foraging requirements
 - Human use
 - Climate change impacts
- Steps to address needs
 - Expand baseline data
 - Reference areas for post-spill monitoring
 - Oiled birds, unattended eggs, oiled habitats and age-class studies





Marine Mammals



- Bearded Seal
- Spotted Seal
- Ringed Seal
- Ribbon Seal
- Polar Bear
- Pacific Walrus
- Beluga Whale
- Bowhead Whale
- Gray Whale
- Killer Whale
- Harbor Porpoise
- Humpback Whale
- Narwhal
- Minke Whale
- Sei Whale
- Fin Whale
- North Pacific Right Whale

Marine Mammals

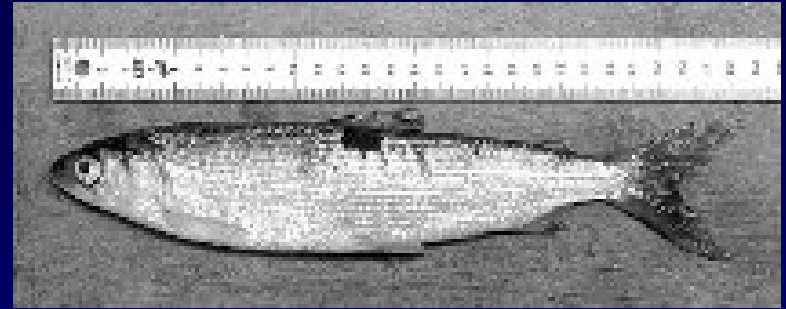
- Oil spill impacts
 - High human value: subsistence, tourism, culture
 - Food web impacts
 - Low reproductive rate, slow recovery
- Information needs
 - Population estimates
 - Climate change impacts on distribution
- Steps to address needs
 - Investigate metrics other than population size to monitor impacts
 - Reference sites for post-spill monitoring



Fish and Invertebrates



- Arctic cod
- Saffron cod
- Shee fish
- Herring
- Rainbow smelt
- Capelin
- Eulachon
- Halibut
- Flounder



- Cisco
- Salmon
- Freshwater trout
- Freshwater pike
- Shrimp
- Snails
- Sea urchin
- Tunicate
- Clams
- Starfish

Fish and Invertebrates

- Oil spill impacts
 - Coastal, ice, lagoons, and river deltas are most sensitive habitats
 - Near-shore spawning areas
 - Subsistence value
- Information needs
 - Tide, current, bathymetry, seafloor characteristics
 - Winter season data
 - Role in food web
 - Variation in growth, reproduction and distribution
- Steps to address needs
 - Reference areas for baseline data
 - Incorporate local knowledge



Ice and Under-Ice Habitats

- Multi-year ice
- First year ice
- Land fast ice
- Bottom fast ice
- Ridges
- Smooth ice
- Melt ponds
- Below ice
- Snow
- Fall freeze ice
- Columnar ice
- Spring break ice
- Summer melt
- Break out ice
- Brine channels
- Pack ice

Ice and Under-Ice Habitats

- Oil spill impacts
 - Ice-associated algae, amphipods, Arctic cod and meiofauna
 - Foraging seals and birds
 - Ice-related human activities
- Information needs
 - How oil behaves in Arctic environments
 - Uptake and release of oil in ice
 - Ice movement
- Steps to address needs
 - Background contaminant levels (e.g., in Arctic cod)
 - Biomass of ice-associated flora and fauna
 - Reference sites in un-oiled areas where baseline data is lacking

Workshop Conclusions

- A clearinghouse for baseline data is needed
- Historical studies in the Arctic exist, but they cover local areas and short time scales
- Information needed:
 - Baseline data
 - Seasonal variation
 - Food web impacts
 - Expanded environmental data (tides, currents, river flows, winds, ice movement; and habitat and seafloor mapping)

Workshop Conclusions

- Sampling and assessment logistics are challenging and funding is minimal
- Local and indigenous knowledge will be a valuable resource

Recommendations for assessments

- Reference sites in un-oiled areas to augment baseline data
- Standardized sites for monitoring recovery
- Modify on-going studies to include parameters appropriate for injury assessment
 - Condition, growth, reproduction
 - Distribution and habitat use
 - Food web structure and productivity
- Gather local knowledge of resources
- Develop protocols and tools for Arctic NRDA, conduct drills, integrate response and NRDA

For more information

- Coastal Response Research Center at Univ. New Hampshire
<http://www.crrc.unh.edu/>
- NOAA Office of Response and Restoration
<http://response.restoration.noaa.gov/>