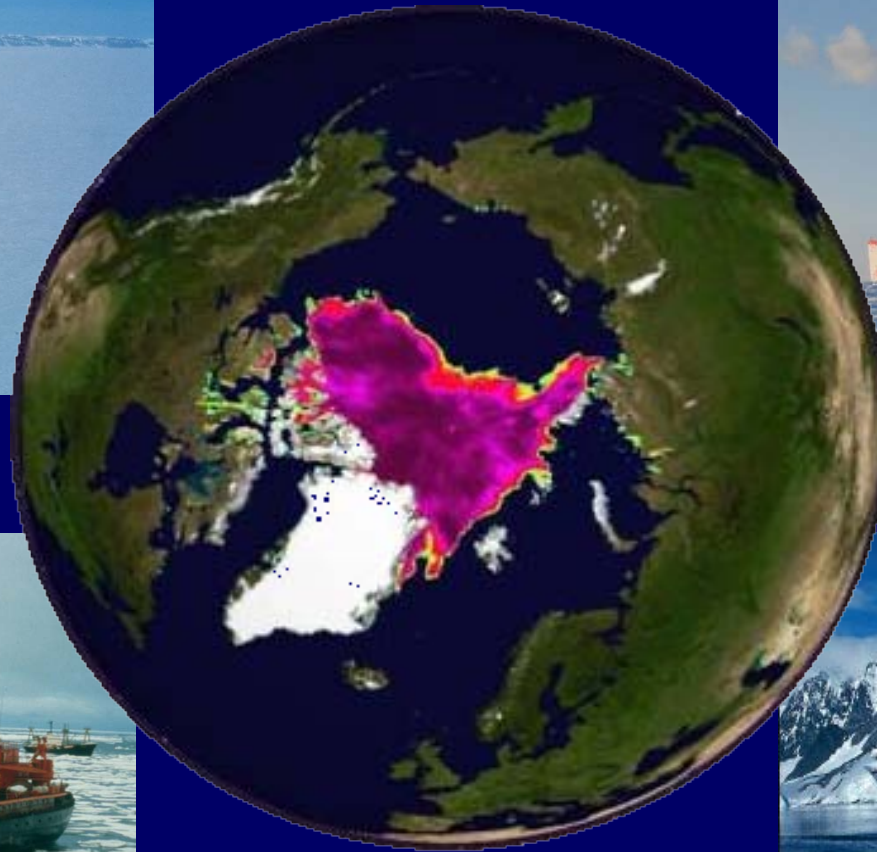


# Outcomes of the Arctic Council's Arctic Marine Shipping Assessment (AMSA)

*Alaska Center for Climate Assessment and Policy (ACCAP)*

**University of Alaska Fairbanks  
Fairbanks, Alaska ~ 24 June 2009**



**Lawson W. Brigham, PhD**

**Professor, University of Alaska Fairbanks  
Senior Fellow, Institute of the North & Chair, AMSA**

# **Topics ~ ACCAP Briefing:**

- **Current Arctic Marine Use**
- **Arctic Marine Shipping Assessment  
2009 Report**
  - **Ongoing Actions**

# Arctic Marine Geography

## CHALLENGES & RISKS

**Northwest Passage**

**Draft**

**Intra-Arctic Route**

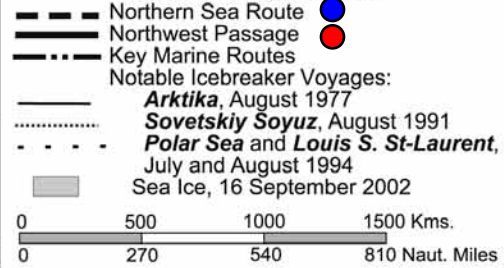
**Choke Point**

**Central Arctic Ocean Route (2100-nm)**

**Sea Ice**

**Cold Climate Ice-Free Ops**

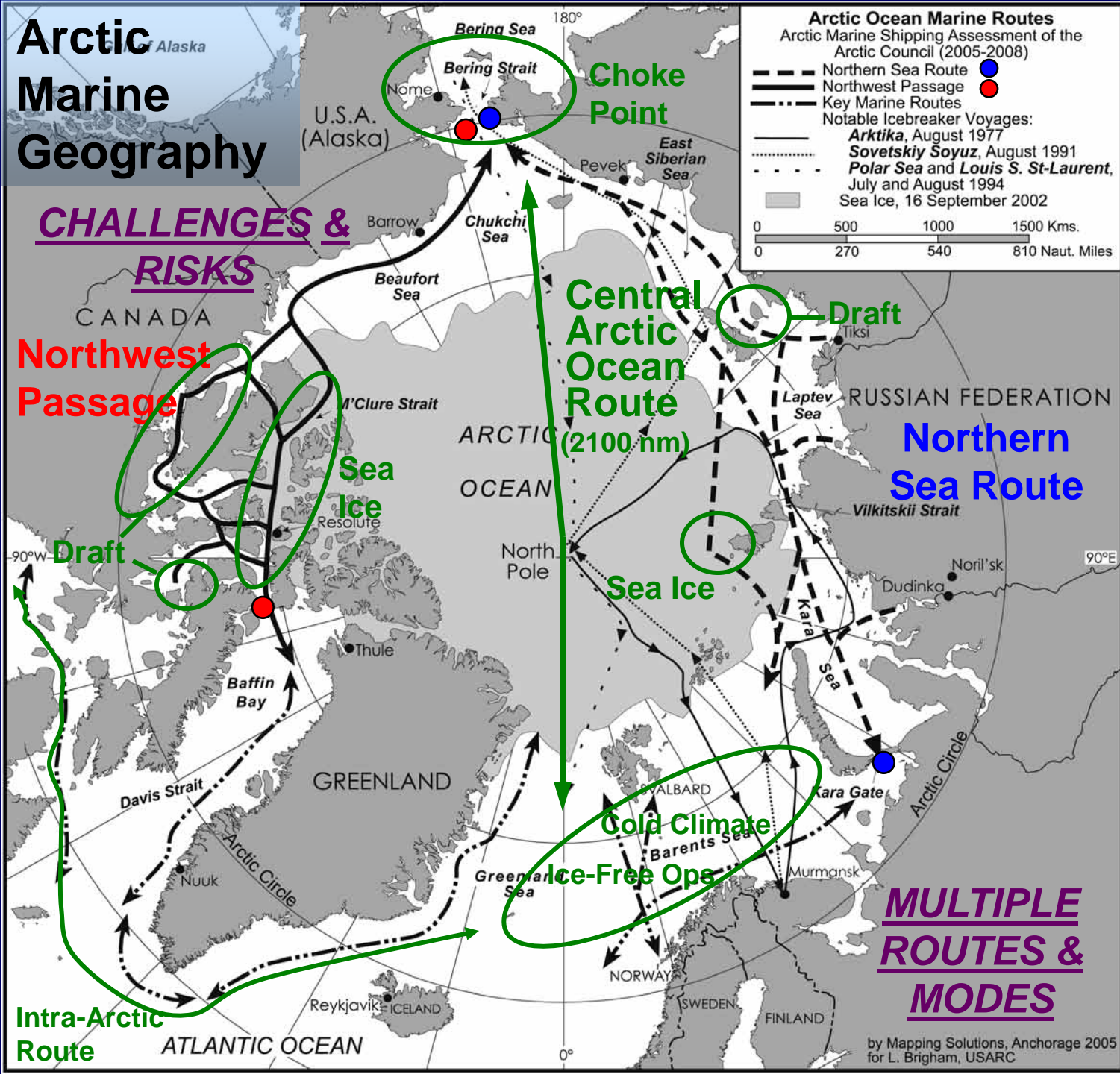
### Arctic Ocean Marine Routes Arctic Marine Shipping Assessment of the Arctic Council (2005-2008)



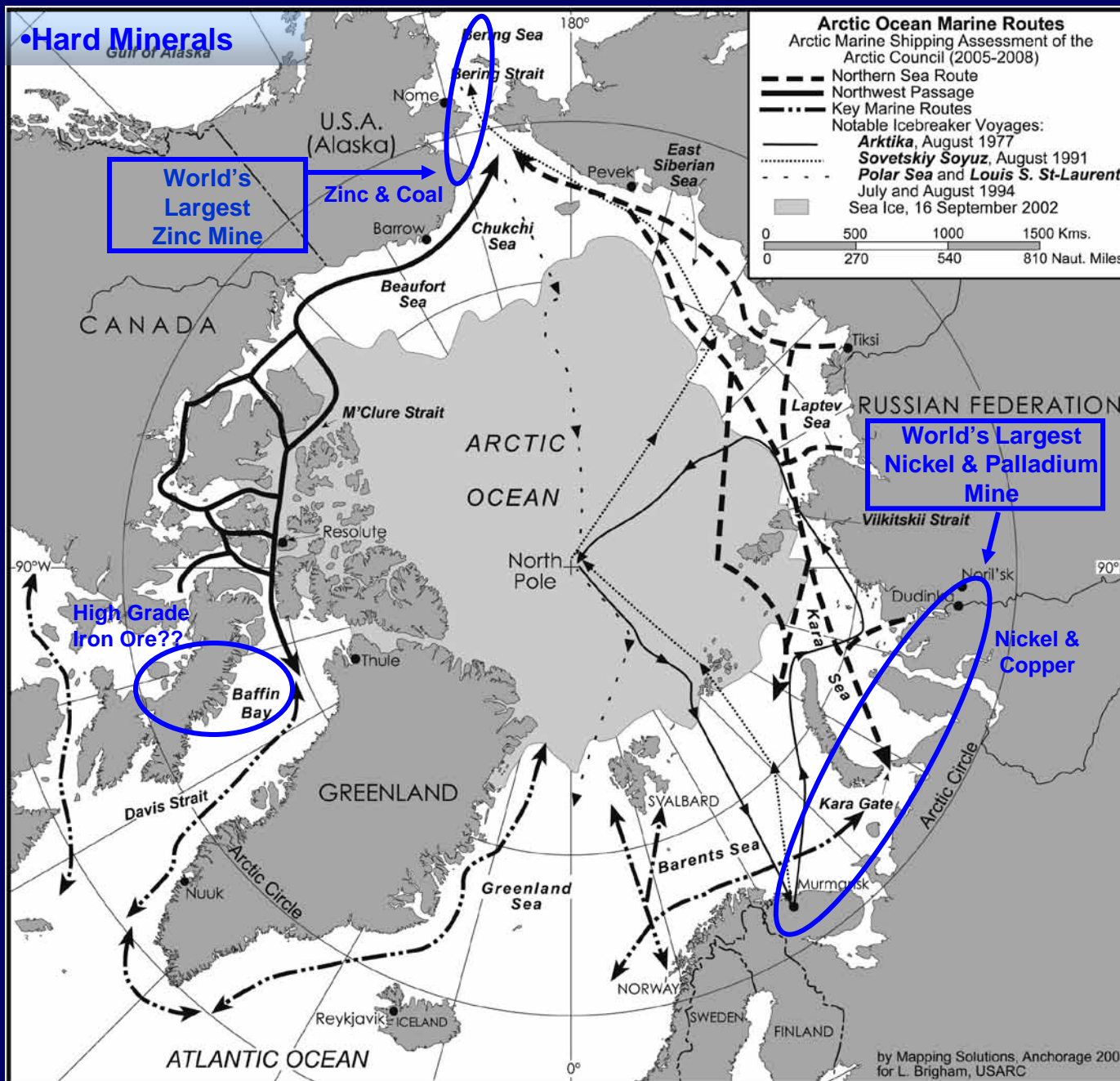
**Draft**

**Northern Sea Route**

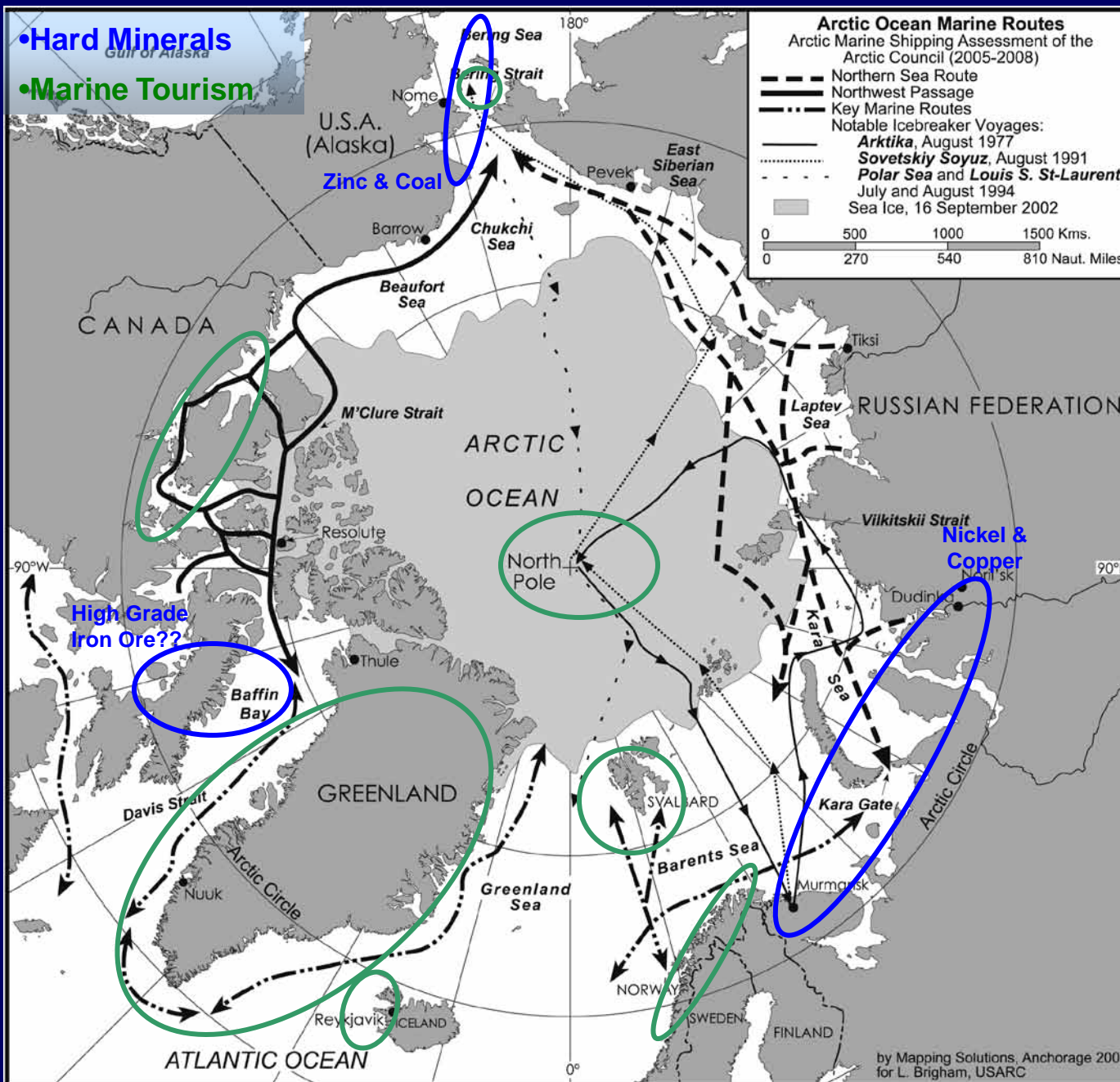
**MULTIPLE ROUTES & MODES**



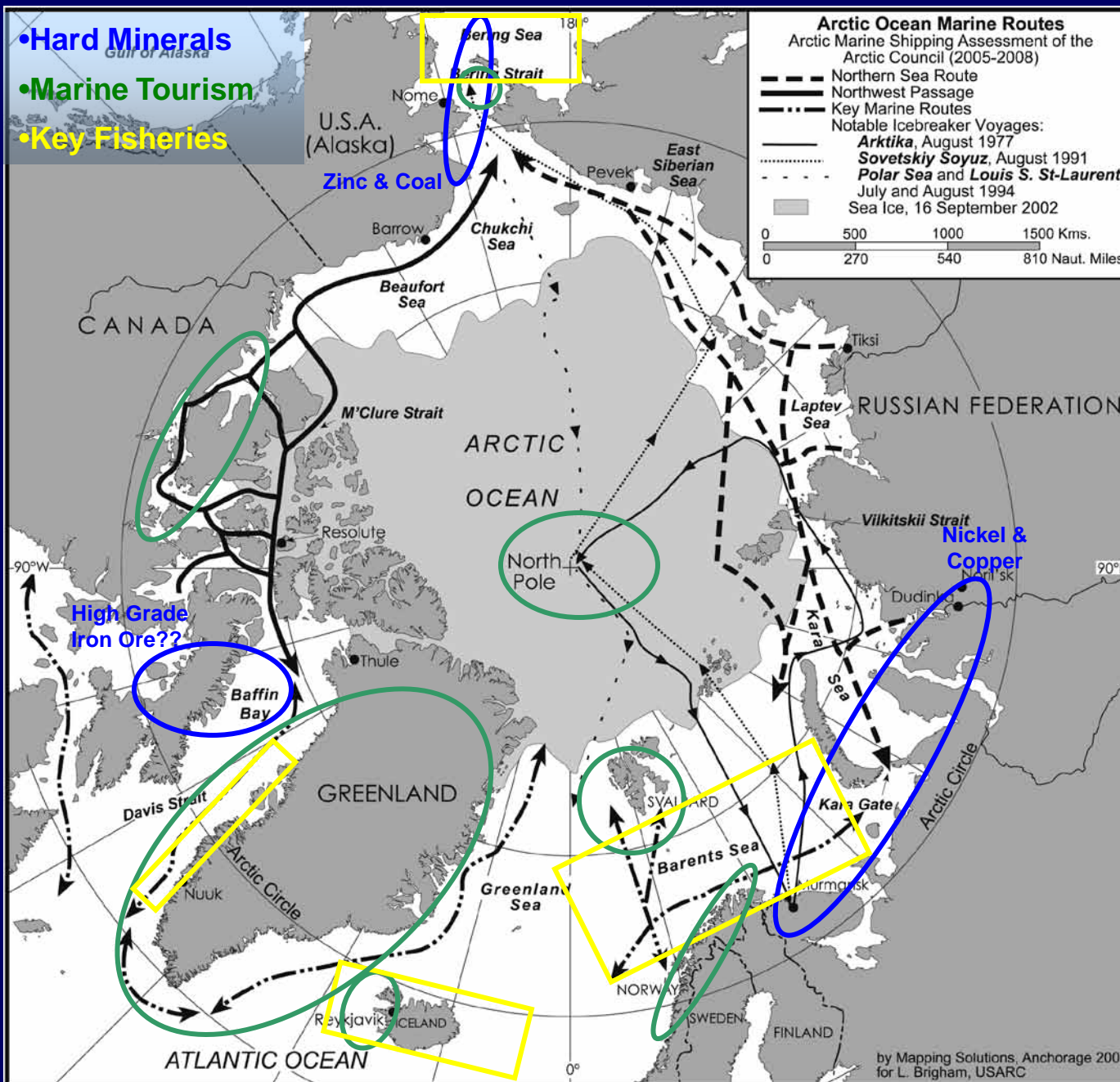
# Today's Arctic Marine Use



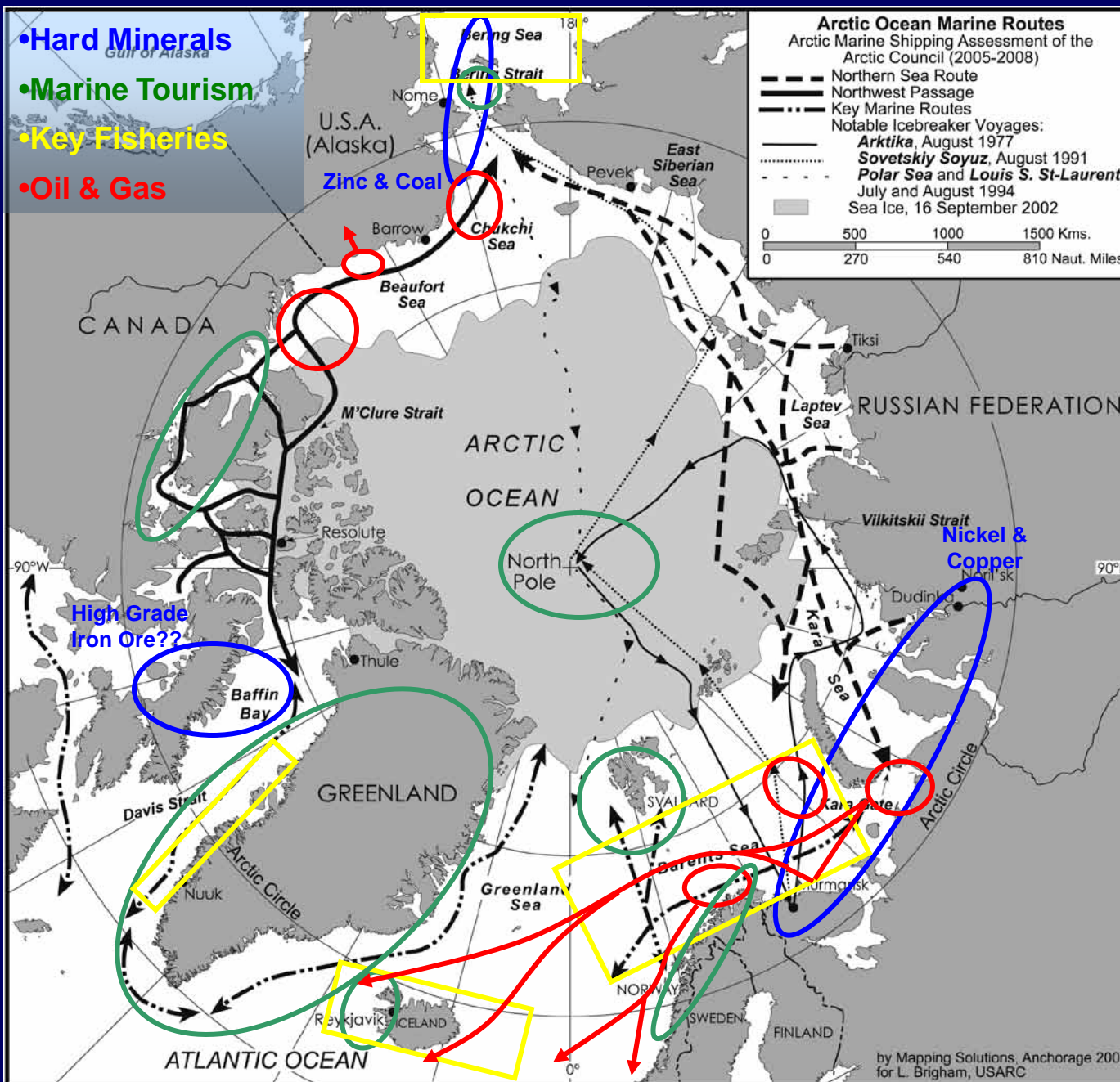
# Today's Arctic Marine Use



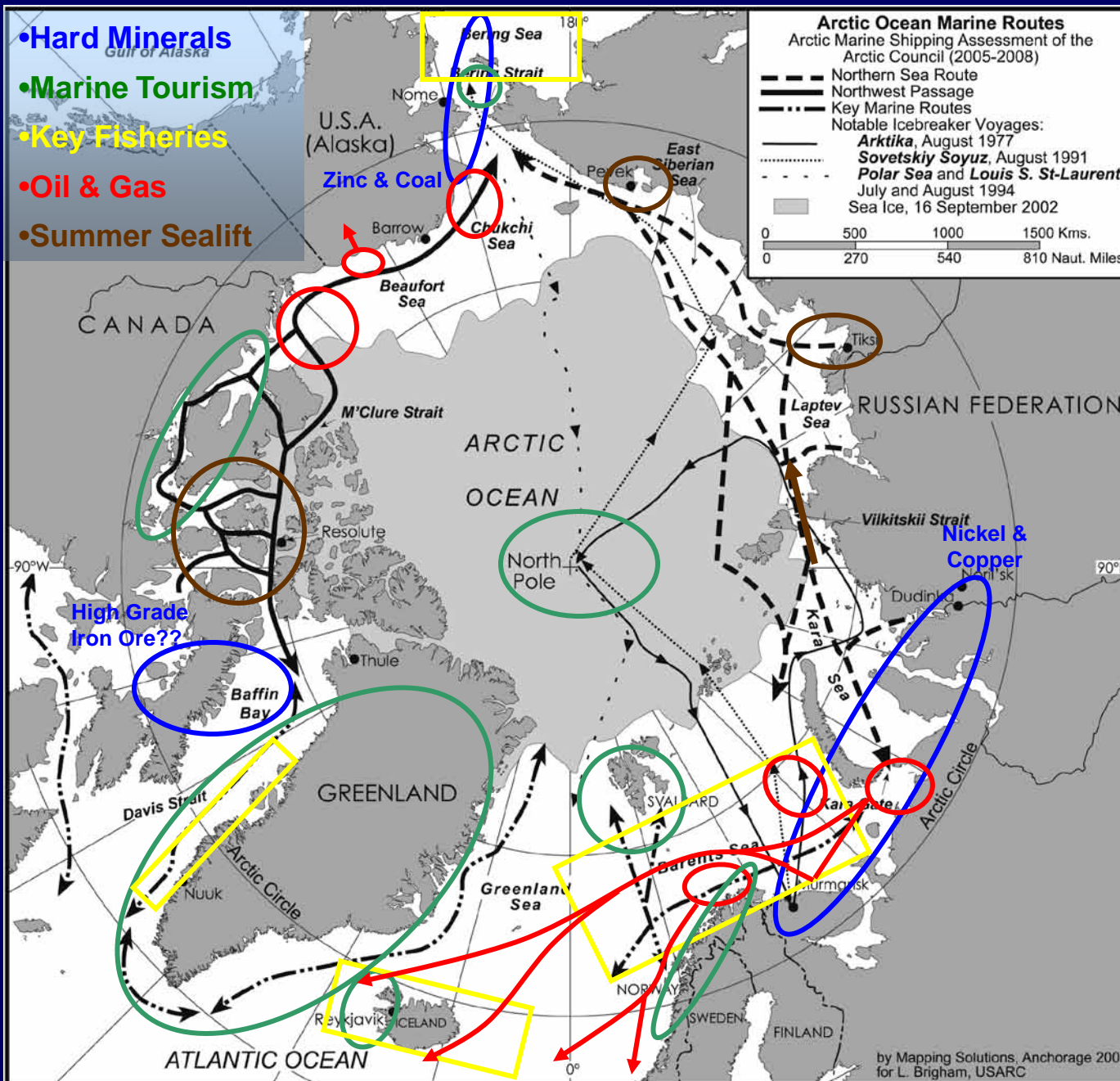
# Today's Arctic Marine Use



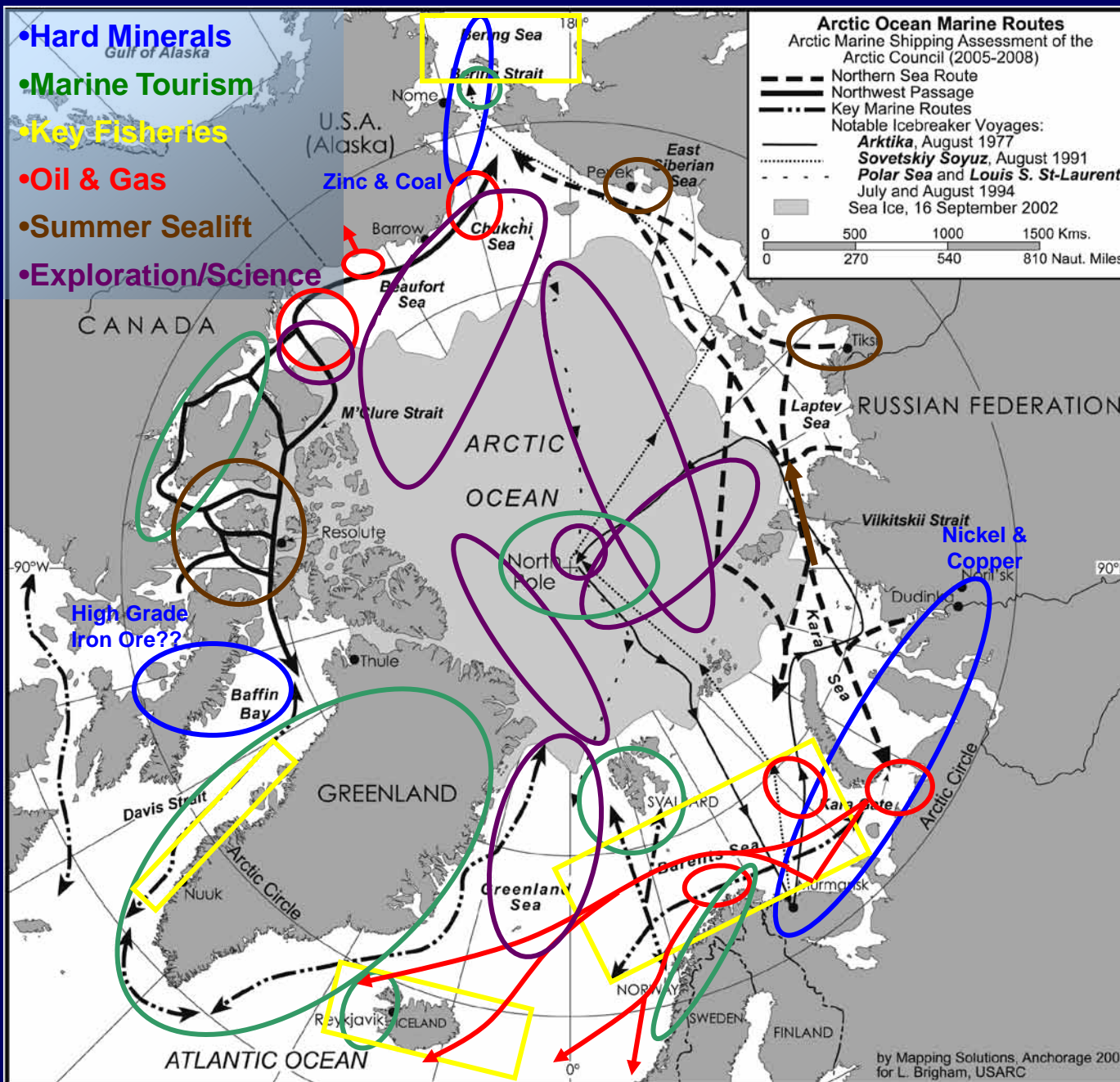
# Today's Arctic Marine Use



# Today's Arctic Marine Use



# Today's Arctic Marine Use





**2004 – 2009**

**Arctic Council ~ Intergovernmental Forum**

**AMSA Lead Countries for PAME ~ Canada, Finland & USA**

**AMSA Focus ~ Marine Safety & Marine Environmental Protection**

**13 Major Workshops & 14 Town Hall Meetings**

**Key Challenge ~ Many Non-Arctic Stakeholders**

Arctic Ministers' Approval 29 April 2009 ~  
Negotiated Text

Arctic Council  
**Arctic Marine Shipping  
Assessment 2009 Report**



ARCTIC COUNCIL  
IN COOPERATION WITH THE ARCTIC STATES  
2010/2011

**PAME**  
Partnership for the Arctic Marine Environment

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**Executive Summary with Recommendations**

**Introduction**

**Arctic Marine Geography, Climate and Sea Ice**

**History of Arctic Marine Transport**

**Governance of Arctic Shipping**

**Current Marine Use & the AMSA Shipping Database**

**Scenarios, Futures and Regional Futures to 2020**

*Regional Futures: Bering Strait Region, Canadian Arctic and Northwest Passage, Northern Sea Route and Adjacent Areas*

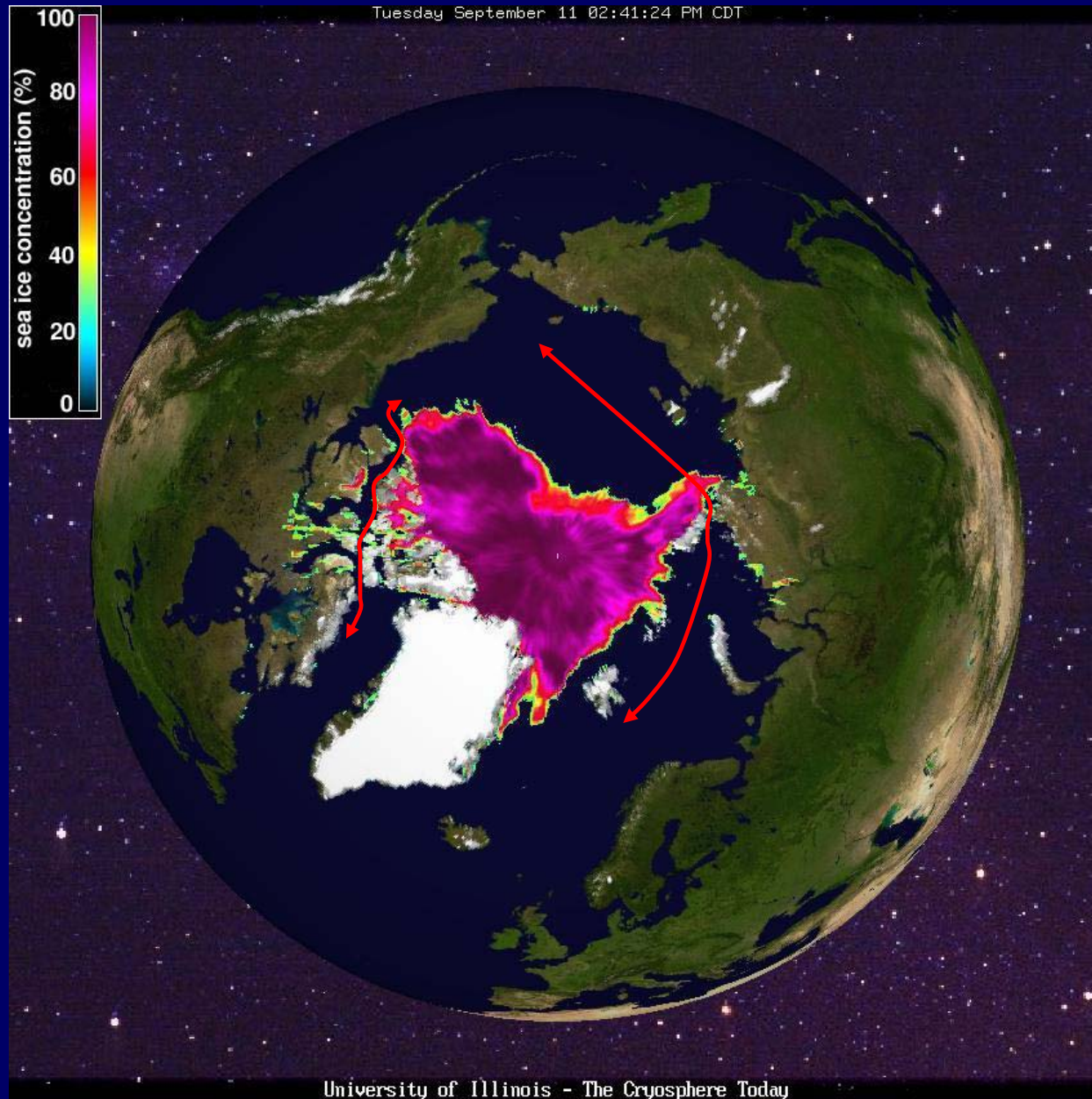
**Human Dimensions**

**Environmental Considerations and Impacts**

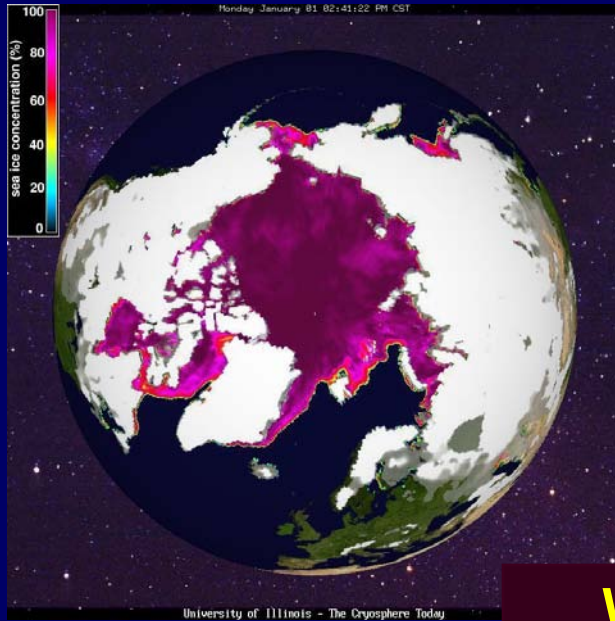
*Regional Environment Case Studies: Aleutian Islands/Great Circle Route, Barents and Kara Seas, Bering Strait, Canadian Arctic*

**Arctic Marine Infrastructure**

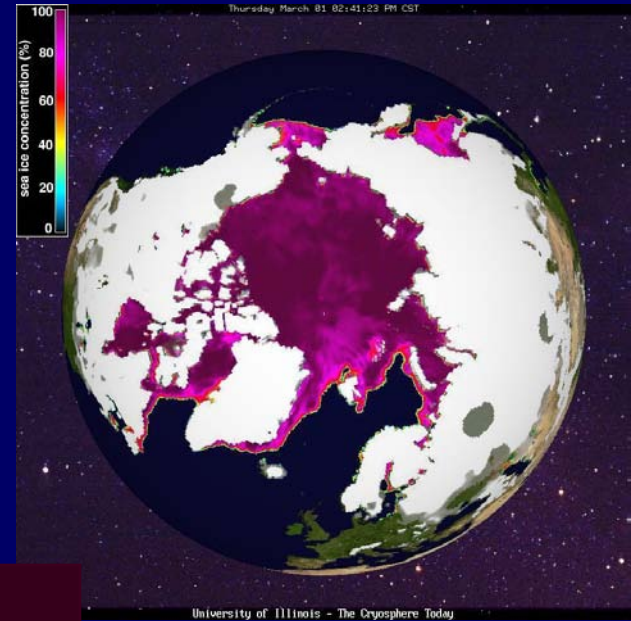
# 11 September 2007



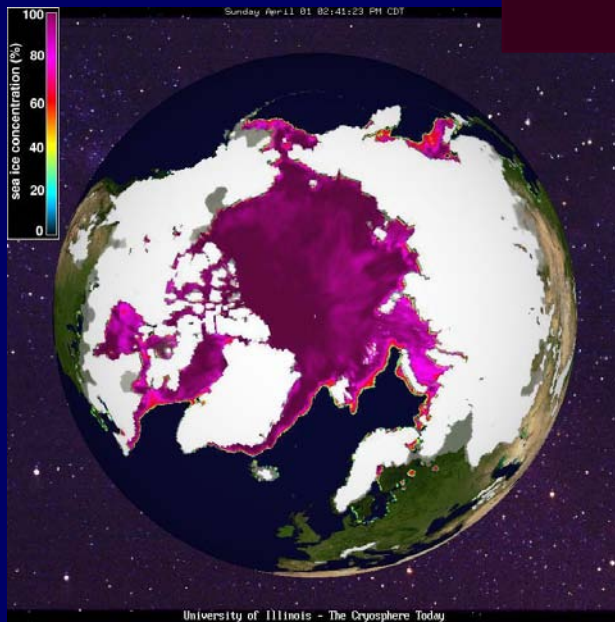
**1 January 2007**



**1 March 2007**

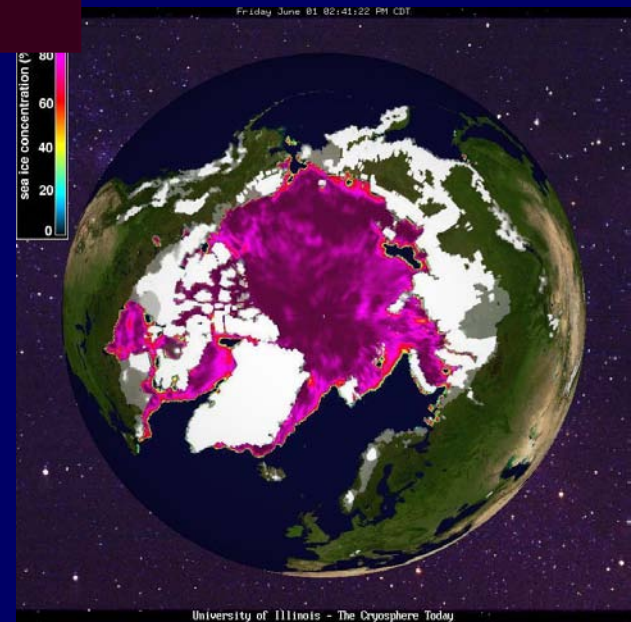


**1 April 2007**



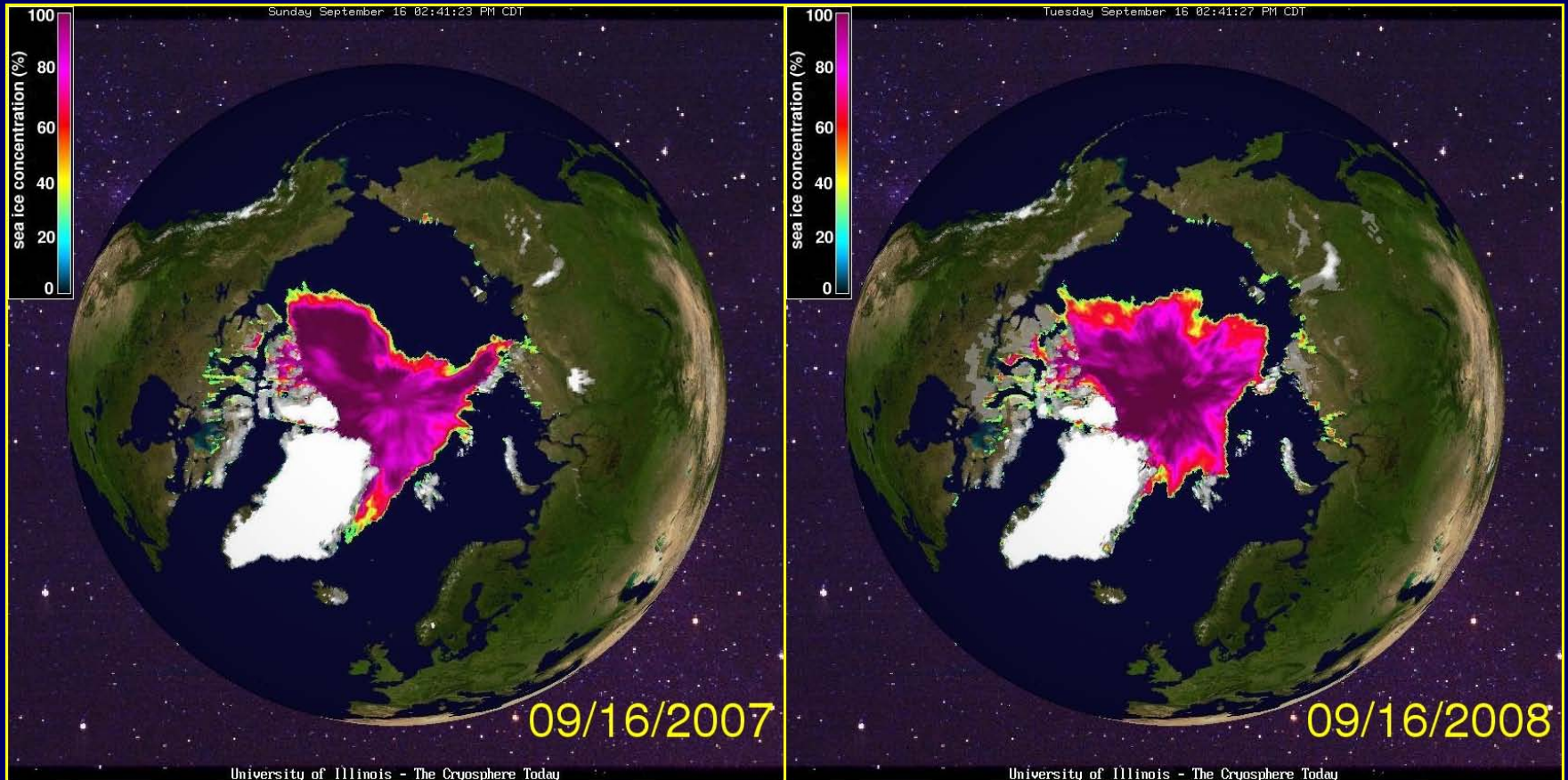
**Winter &  
Spring Months  
2007**

**1 June 2007**



16 September 2007

16 September 2008



Source: University of Illinois – *The Cryosphere Today*

# *Icebreaker Transits to the North Pole & Trans-Arctic Voyages (1977-2008):*

- 77 Transits to the North Pole (65 Russia, 5 Sweden, 3 USA, 2 Germany, 1 Canada, 1 Norway)
- 33 Ship Transits to the NP in 2004-2008
- 7 Trans-Arctic Voyages (1991, 1994, 1996, 2005)
- Single Non-summer NP Voyage (*Sibir* Voyage May-June 1987)



**'Clear Evidence of  
Central Arctic Ocean  
Navigation'**

**25 May 1987 ~ North Pole  
Soviet Nuclear Icebreaker *Sibir*  
'A Walk Around the World!'**

**AMSA Scenarios:  
Plausible Futures for Arctic  
Navigation to 2050**

**~ Complexity ~**

# AMSA Key Uncertainties for Future Arctic Marine Transportation

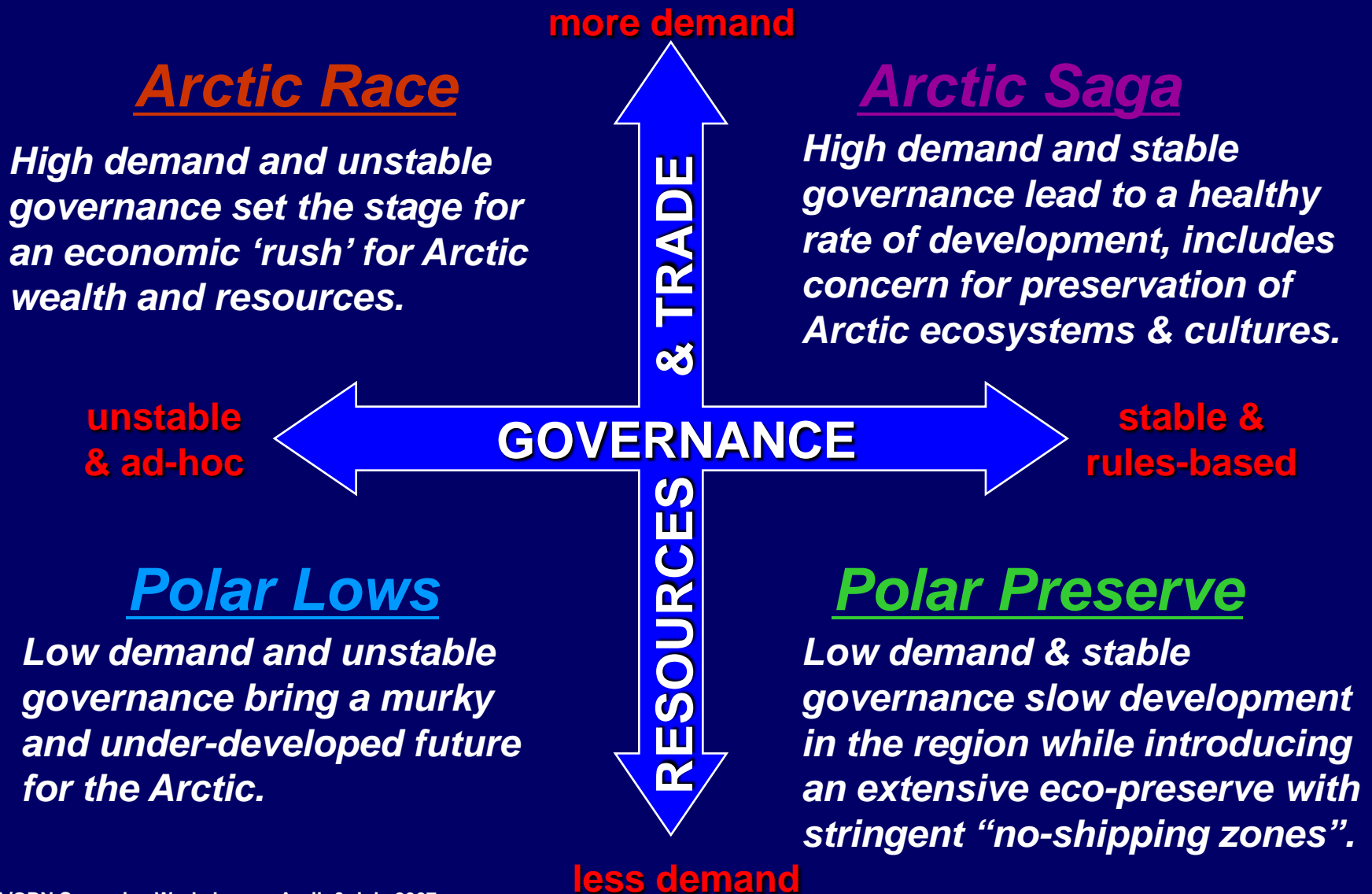
- Stable legal climate
- Radical change in global trade dynamics
- Climate change is more disruptive sooner
  - Safety of other routes
- Socio-economic impact of global weather changes
- Oil prices (55-60 to 100-150 USD?)
- Major Arctic shipping disasters\*\*\*
  - Limited windows of operation (economics)
    - Rapid climate change
  - Maritime insurance industry
- China, Japan & Korea become Arctic maritime nations
  - Transit fees
- Conflict between indigenous & commercial use
  - Arctic maritime enforcement
- Escalation of Arctic maritime disputes
  - Shift to nuclear energy
  - New resource discovery
    - World trade patterns
- Catastrophic loss of Suez or Panama Canals
  - Global agreements on construction rules and standards

# “Stricken cruise ship off Antarctic evacuated”

MSNBC- 11/23/07



# Scenarios on the Future of Arctic Marine Navigation in 2050



# U.S. Geological Survey Report ~ July 2008



## Circum-Arctic Resource Appraisal: Estimates of Undiscovered Oil and Gas North of the Arctic Circle

The U.S. Geological Survey (USGS) has completed an assessment of undiscovered conventional oil and gas resources in all areas north of the Arctic Circle. Using a geologic-based probabilistic methodology, the USGS estimated the occurrence of undiscovered oil and gas in 33 geologic provinces thought to be prospective for petroleum. The sum of the mean estimates for each province indicates that 50 billion barrels of oil, 1,669 billion cubic feet of natural gas, and 44 billion barrels of natural gas liquids may remain to be found in the Arctic, of which approximately 80 percent is expected to occur in a 600,000-acre area.



Structural and bathymetric maps of the Labrador Group under a midlight rainbow near Gaborath Lake, Alaska, summer 2007. USGS photo by David Swenson/USGS.

### Introduction

In May 2008 a team of U.S. Geological Survey (USGS) scientists completed an appraisal of possible future additions to world oil and gas reserves from new field discoveries in the Arctic. This Circum-Arctic Resource Appraisal (CARA) evaluated the petroleum potential of all areas north of the Arctic Circle (66.5° north latitude). Quantitative assessments were conducted in those geologic areas considered to have at least a 10-percent chance of one or more significant oil or gas accumulations. For the purposes of the study, a significant accumulation contains recoverable volumes of at least 50 million barrels of oil and/or oil-equivalent natural gas. The study included only those resources believed to be recoverable using existing technology but with the important assumption for offshore areas that the resources would be recoverable even in the presence of permanent sea ice and ocean water depth. No economic considerations are included in these initial estimates; results are presented without reference to costs of exploration and devel-

opment, which will be important in many of the assessed areas. So-called unconventional resources, such as coal bed methane, gas hydrates, oil shale, and tar sand, were explicitly excluded from the study. Full results of the CARA study will be published later.

A number of offshore areas in Canada, Russia, and Alaska already have been explored for petroleum, resulting in the discovery of more than 400 oil and gas fields north of the Arctic Circle. These fields account for approximately 240 billion barrels (BBOE) of oil and oil-equivalent natural gas, which is about 10 percent of the world's known conventional petroleum resources (conventional production and remaining proved reserves). Nevertheless, most of the Arctic, especially offshore, is essentially unexplored with respect to petroleum. The Arctic Circle encompasses about 6 percent of the Earth's surface, an area of more than 21 million km<sup>2</sup> (8.1 million mi<sup>2</sup>), of which about 8 million km<sup>2</sup> (3.1 million mi<sup>2</sup>) is onshore and more than 7 million km<sup>2</sup> (2.7 million mi<sup>2</sup>) is in continental shelves under less than 200 m of water. The entire Arctic continental shelves may constitute the

geographically largest unexplored prospective area for petroleum remaining on Earth.

### Methodology

A newly compiled map of Arctic sedimentary basins (Arctic Crustal Provinces, unpublished work) was used to define geologic provinces, each containing more than 1 km<sup>3</sup> of sedimentary strata. Assessment units (AUs)—susceptible volumes of rock with common geologic traits—were identified within each province and quantitatively assessed for petroleum potential. Because of the sparse seismic and drilling data in much of the Arctic, the tools and techniques used in USGS resource assessments, such as discovery process modeling, prospect delineation, and deposit simulation, were not generally applicable. Therefore, the CARA relied on a probabilistic methodology of geological analysis and modeling. A world geologic database (Chapman and others, 2006) was developed using the AUs defined in the USGS World Petroleum Assessment 2000 (USGS World Assessment Team, 2000). (Continued on back page)

## “Circum-Arctic Resource Appraisal: Estimates of Undiscovered Oil and Gas North of the Arctic Circle”

–13% Undiscovered Oil

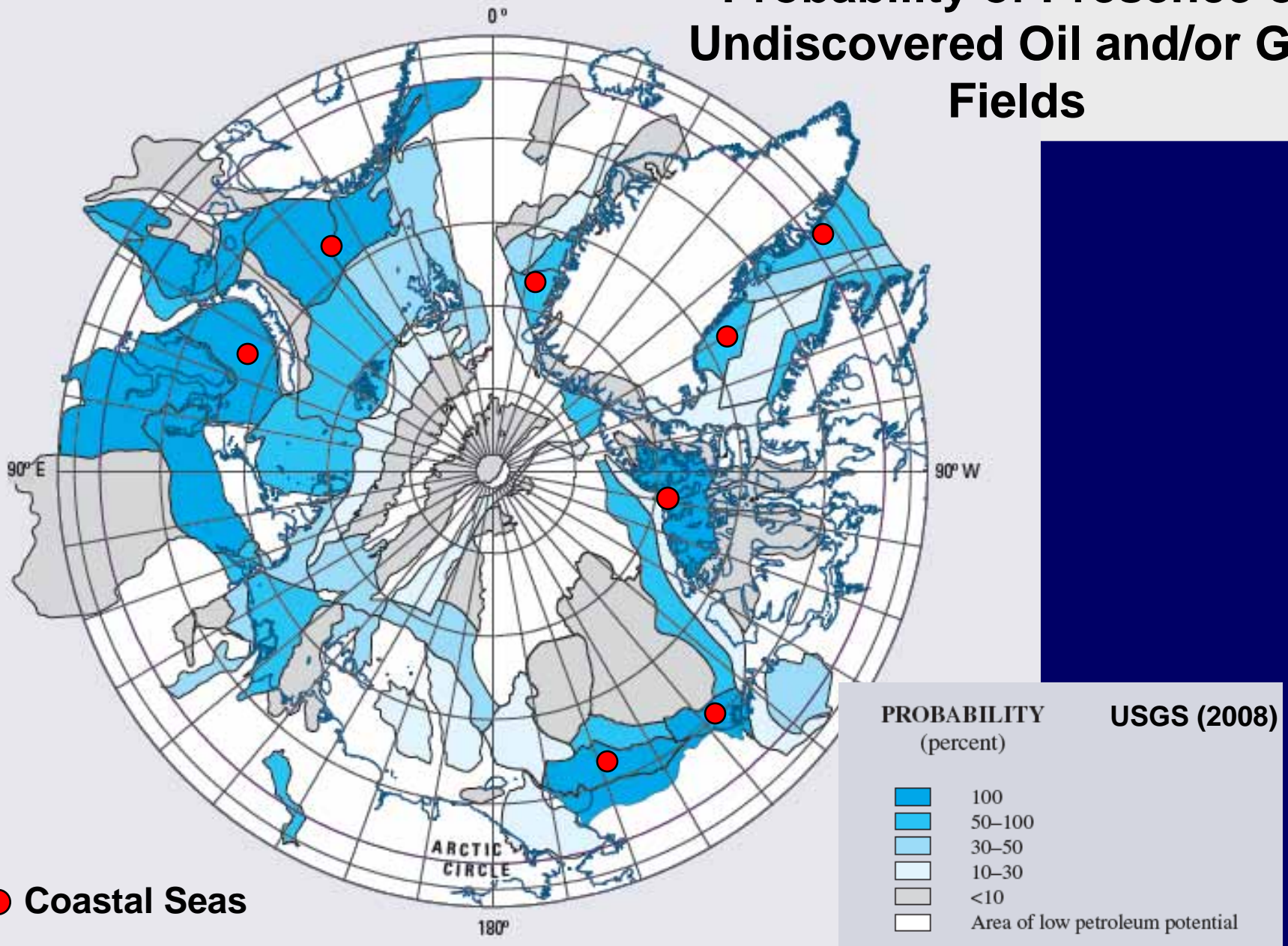
–30% Undiscovered Natural Gas

–20% Undiscovered Natural Gas Liquids

<http://pubs.usgs.gov/fs/2008/3049/>

## ‘Wild Card’ Issue ~ New Resource Discoveries

# Probability of Presence of Undiscovered Oil and/or Gas Fields



**'Wild Card' Issue ~ New Resource Discoveries**

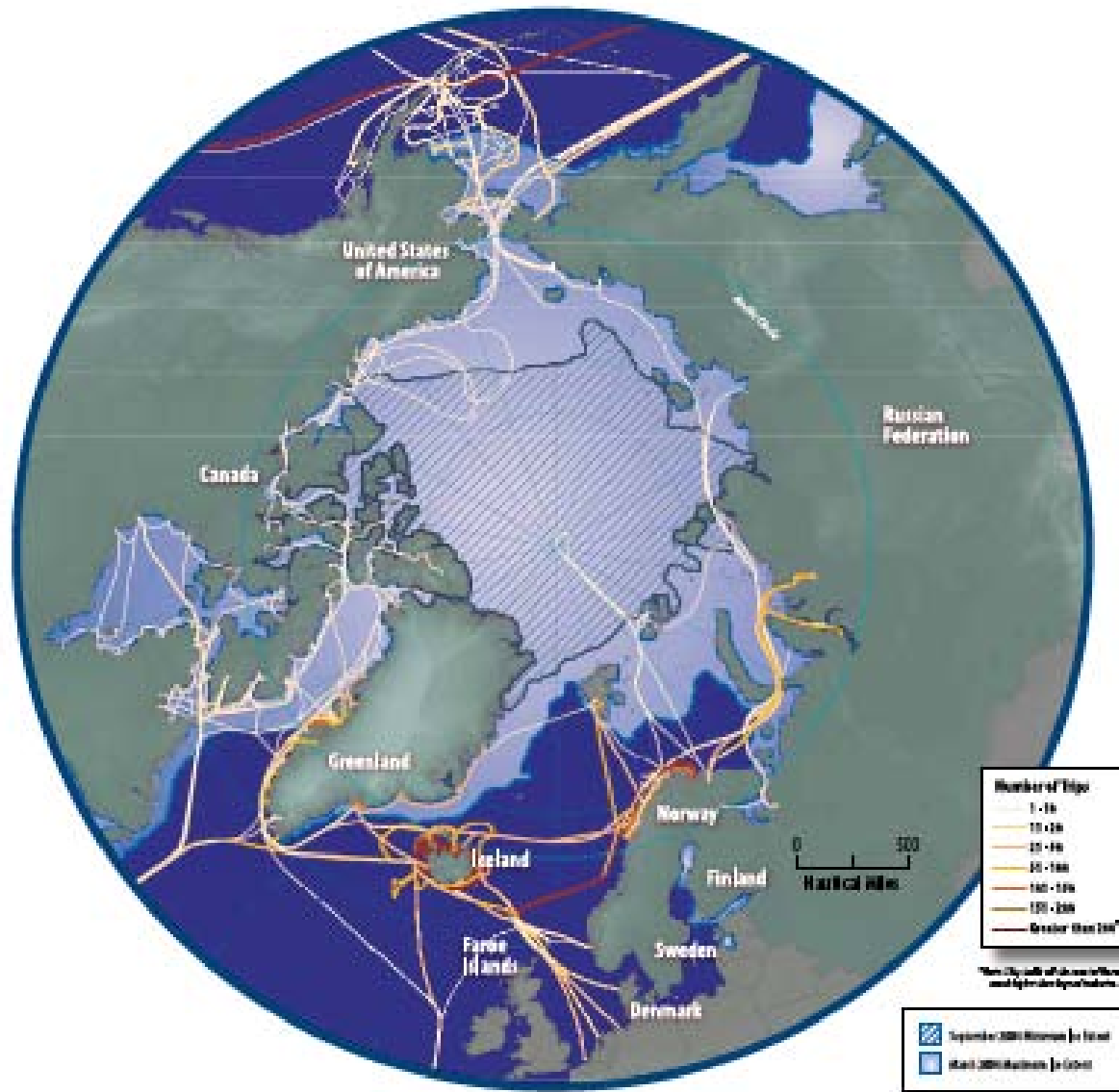


**'Wild Card' Issue ~ New Technology**

**Aker Arctic Technology**

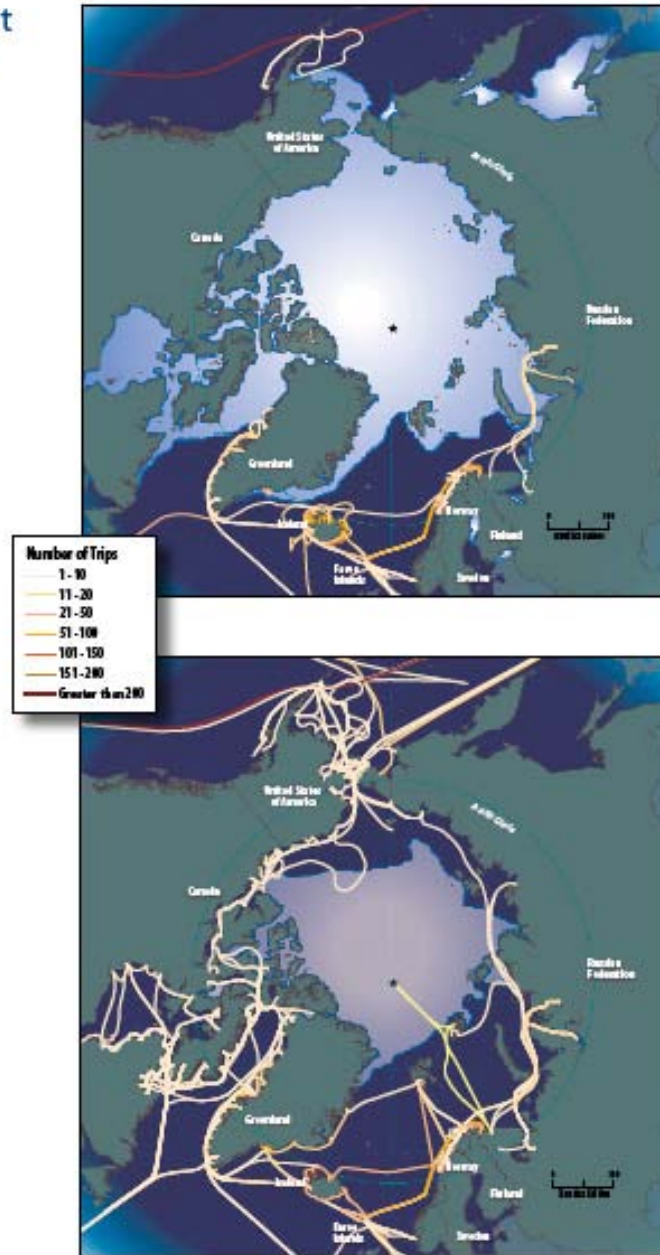
Long known as a storehouse of untapped natural resources, high commodity prices and a growing worldwide demand in recent years have the Arctic poised as a significant contributor to the global economy.





**Shipping traffic in the Arctic for the AMSA Survey Year 2004.**

## Sea Ice Extent Differences



**January 2004 Traffic**

**July 2004 Traffic**

# Russian Arctic Shipping 2004



## Future Convoy Requirements?



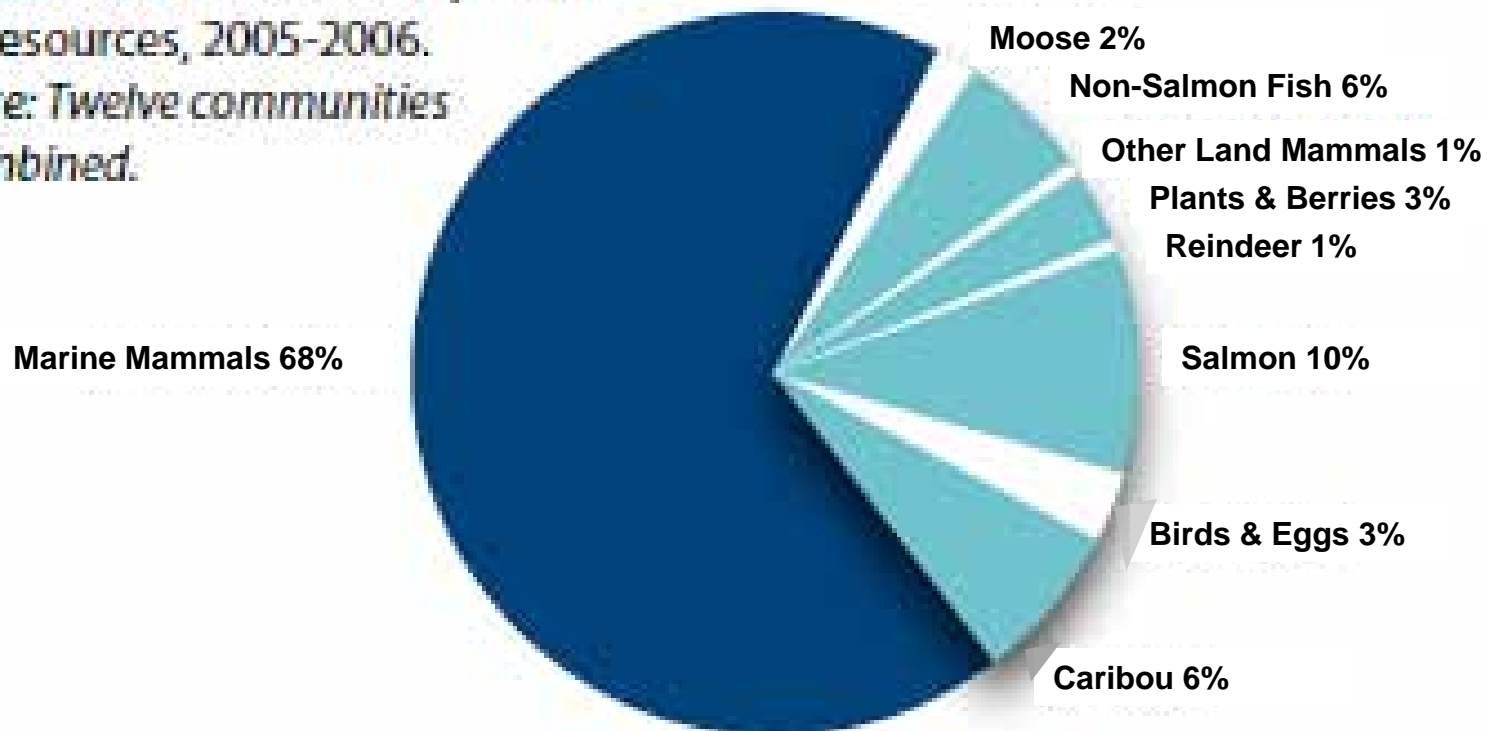
**Icebreaking (Double Acting) Container Ship  
*Norilskiy Nickel* in the Kara Sea  
March 2006**

Aker Arctic



**Bering Strait Region Traffic 2004**

**Table 6.3** Harvest composition of resources, 2005-2006.  
*Note: Twelve communities combined.*



Source: Kawerak, Inc., North Pacific Research Board, Alaska Department of Fish and Game, 2005-2006 Comprehensive Subsistence Harvest Survey, Bering Strait/Norton Sound Region

# **Findings ~ Bering Strait Region to 2020**

- 1) BSR ~ International strait for navigation; natural chokepoint for marine traffic.**
- 2) Seasonally ice-covered; highly productive area; ice-dependent species; migration corridor.**
- 3) Prolific location for seabird colonies.**
- 4) Indigenous communities ~ marine resources vital; hunting 60-80 nautical miles offshore.**
- 5) Marine activity: fishing; Red Dog Mine & hard minerals; science & exploration; tourism; offshore oil & gas development.**
- 6) No formal vessel routing measures; future voluntary traffic routes ~ IMO proposal by US and Russia required.**
- 7) Offshore oil & gas development ~ increased marine traffic in the region.**

# **Selected AMSA Findings**

- (A)--UNCLOS ~ Fundamental framework & IMO ~ Competent UN agency**
- (B)--Winter Arctic sea ice cover remains & near or complete disappearance of multi-year ice**
- (C)--No specially-tailored, mandatory IMO environmental standards for vessels operating in the Arctic**
- (D)--AMSA data survey ~ nearly all destination traffic**
- (E)--Key drivers ~ Natural resource development & regional trade**

# **Selected AMSA Findings**

- (F)--Many factors of uncertainty influencing future Arctic marine activity**
- (G)--Arctic residents ~ concerns & recognition of benefits**
- (H)--Most significant threat ~ release of oil through accidental or illegal discharge**
- (I)--General lack of marine infrastructure (exceptions: Norwegian coast & northwest Russia)**

# AMSA Recommendations: Three Broad, Interrelated Themes



# Recommendation Highlights

- **Arctic States Decide** ~ Cooperatively support IMO efforts to strengthen, harmonize & regularly update international standards for vessels operating in the Arctic.
- **Arctic States Decide** ~ Support mandatory application of relevant parts of the IMO *Guidelines*.
- **Arctic States Decide** ~ Development & implementation of a comprehensive, multi-national SAR instrument.
- **Arctic States Recognize** ~ Explore the need for internationally designated areas for environmental protection (one tool: PSSA).
- **Arctic States Should Consider** ~ Ratification of the IMO 'Ballast Water Convention'.

# Recommendation Highlights

- ***Arctic States Decide*** ~
  - Enhance Cooperation in oil spill prevention
  - Engage organizations addressing the effects of ship noise, disturbance and ship strikes
  - Improved practices & technologies to reduce current/future air emissions
- ***Arctic States Recognize*** ~ Improvements to Arctic marine infrastructure to enhance safety & environment protection (Arctic marine traffic awareness system)
- ***Arctic States Decide*** ~ Develop circumpolar environmental response capabilities (circumpolar & regional agreements)



# **AMSA 2009:**

- **Baseline Assessment**
- **Arctic Council Policy Document**  
~ Negotiated Text Approved 29 April 2009 ~
- **Strategic Guide**

[www.pame.is](http://www.pame.is)

# Ongoing Actions

- **IMO ~ Denmark, Norway, & USA Submission (March 2009) on Mandatory Guidelines**
- **IMO ~ June 2009 Marine Safety Council ~ Move to Mandatory Guidelines**
- **Arctic Council ~ Task Force on Arctic Search & Rescue (SAR) Approved at the Tromso Ministerial**
- **House AMSA Implementation Bill**
- **Briefings: Arctic State Capitals, London, Alaska, & Other Locations**
- **AMSA Research Agenda to International Arctic Science Committee (IASC)**