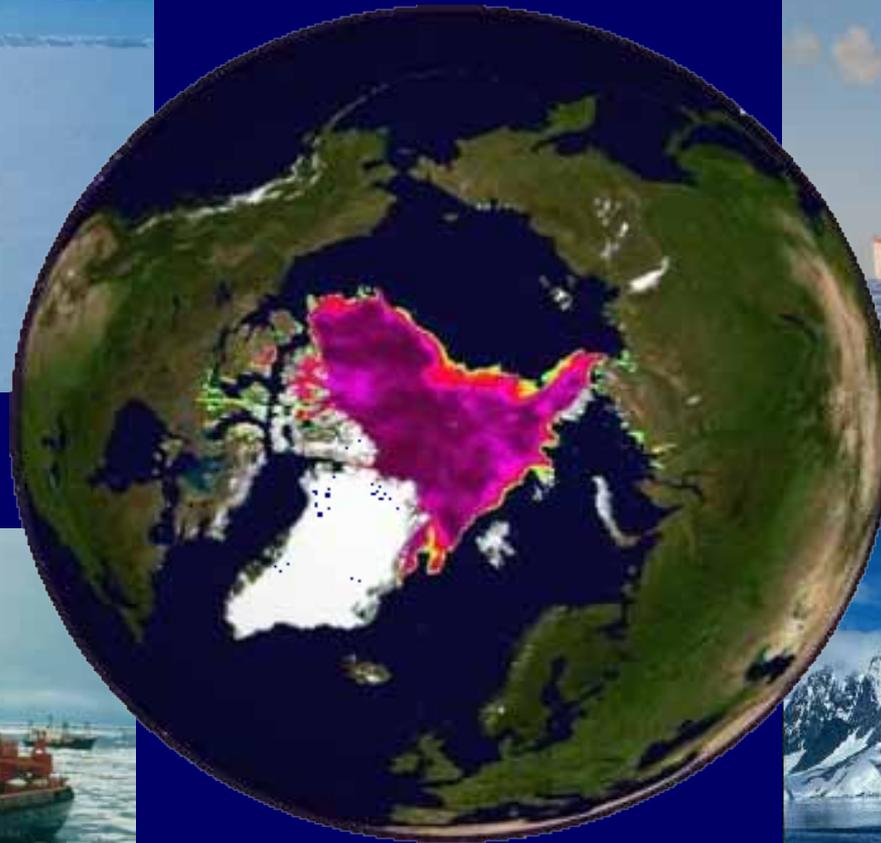


Outcomes of the Arctic Council's Arctic Marine Shipping Assessment (AMSA)

Alaska Department of Environmental Conservation

Anchorage ~ 17 September 2009



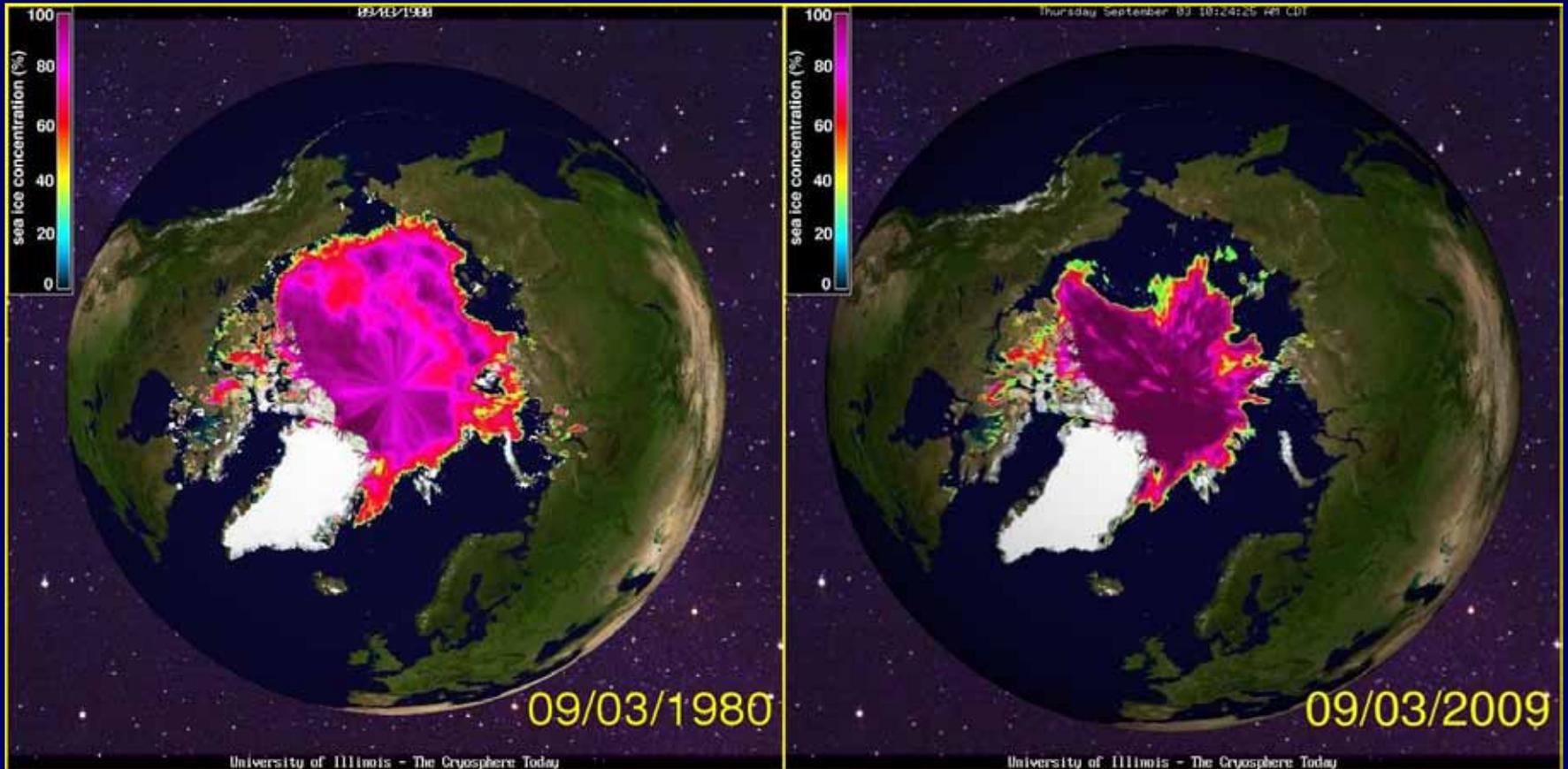
Lawson W. Brigham, PhD

Professor, University of Alaska Fairbanks

Senior Fellow, Institute of the North & Chair, AMSA

3 September 1980

3 September 2009



Source: University of Illinois – *The Cryosphere Today*

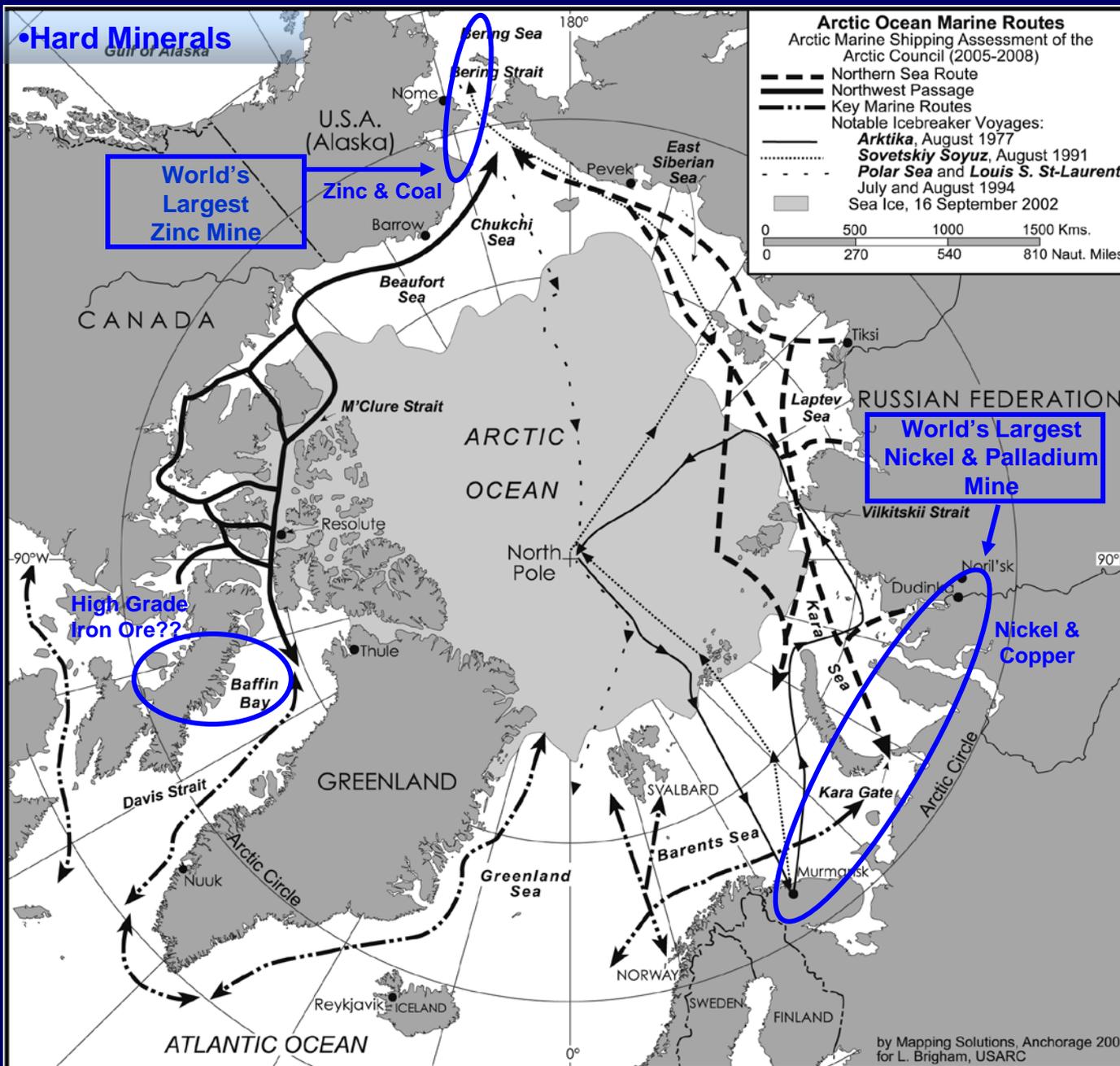
Topics ~ Alaska Department of Environmental Conservation Briefing:

§ Current Arctic Marine Use

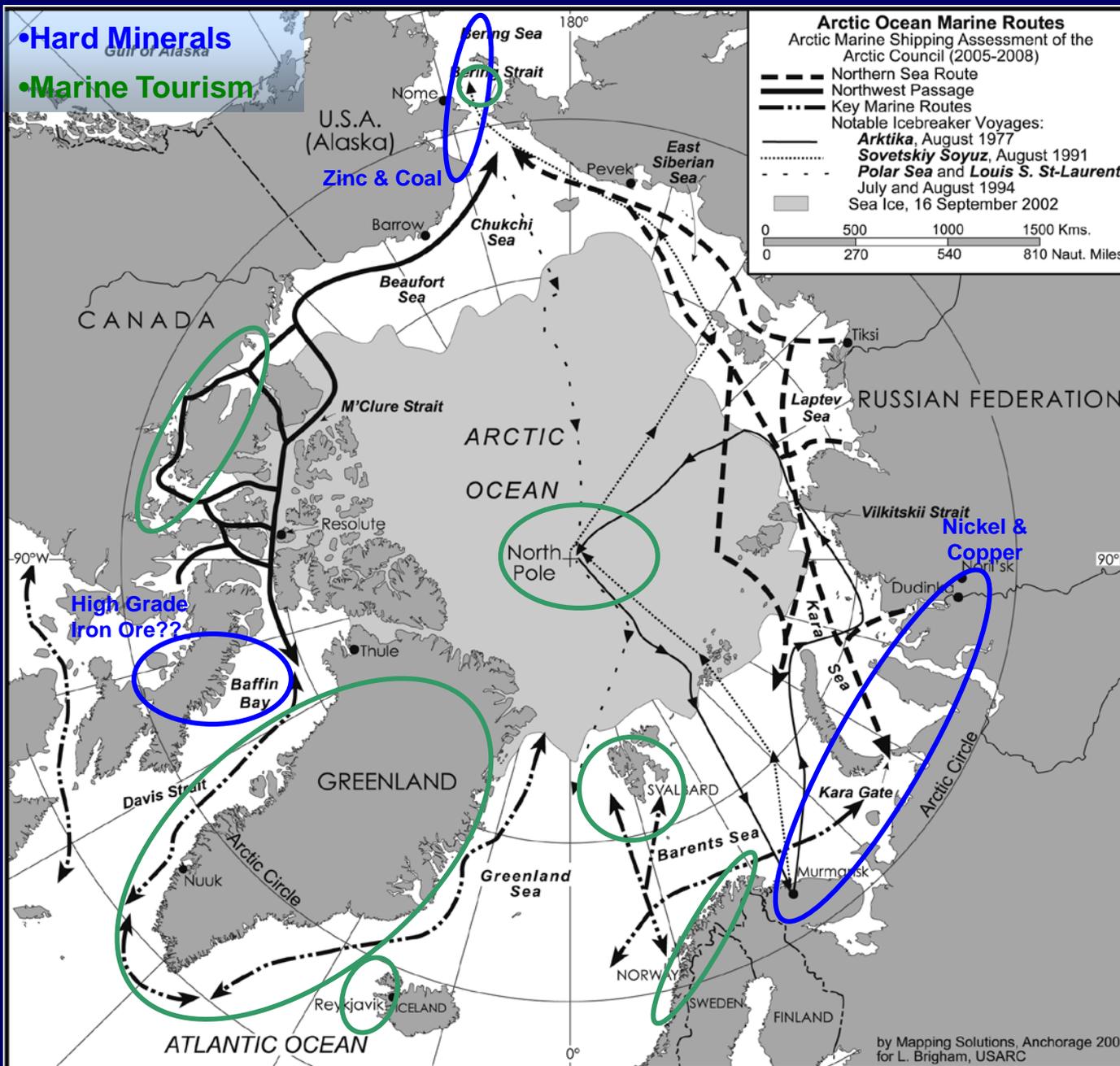
**§ Arctic Marine Shipping Assessment
2009 Report**

§ Ongoing Actions

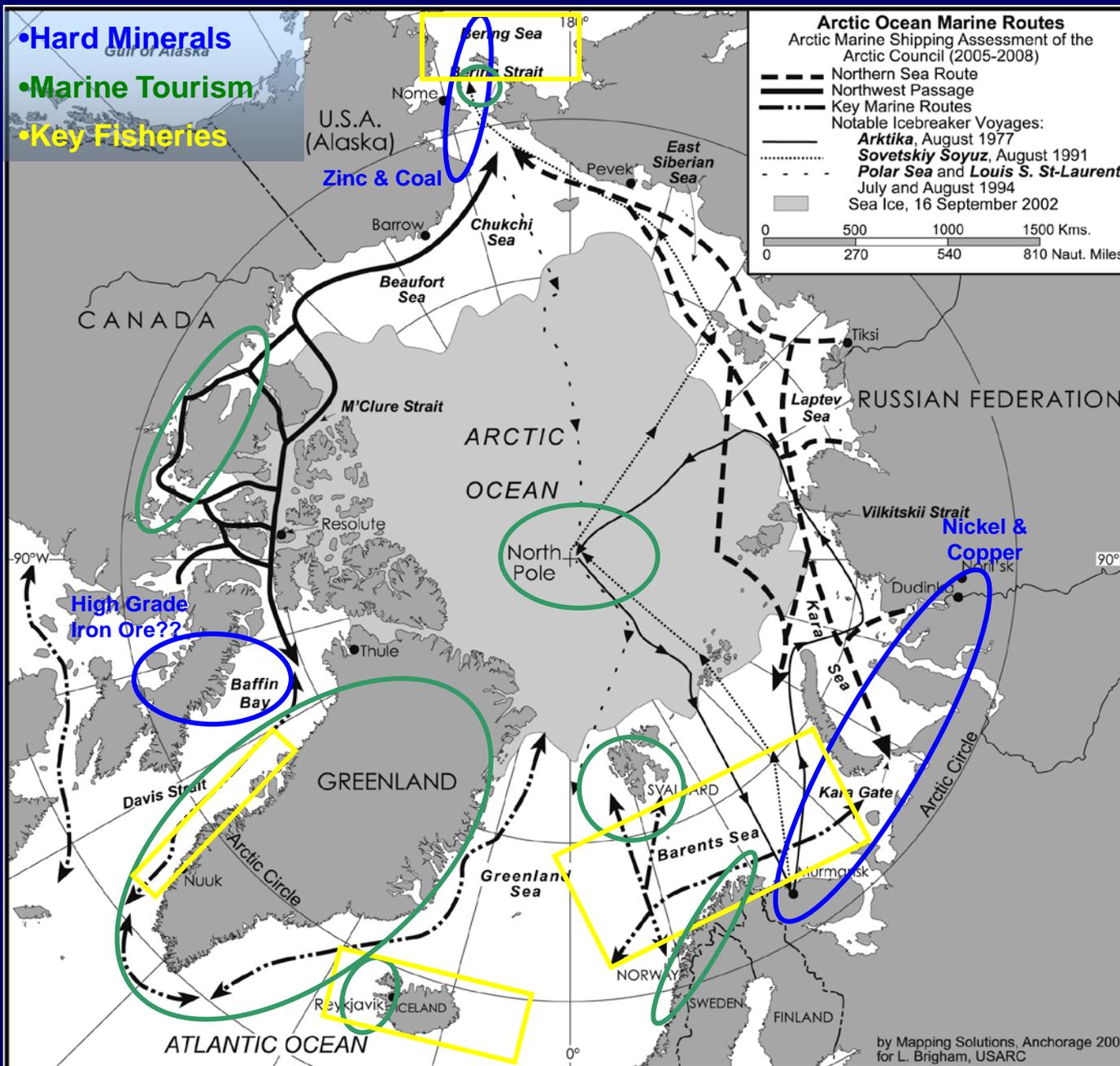
Today's Arctic Marine Use



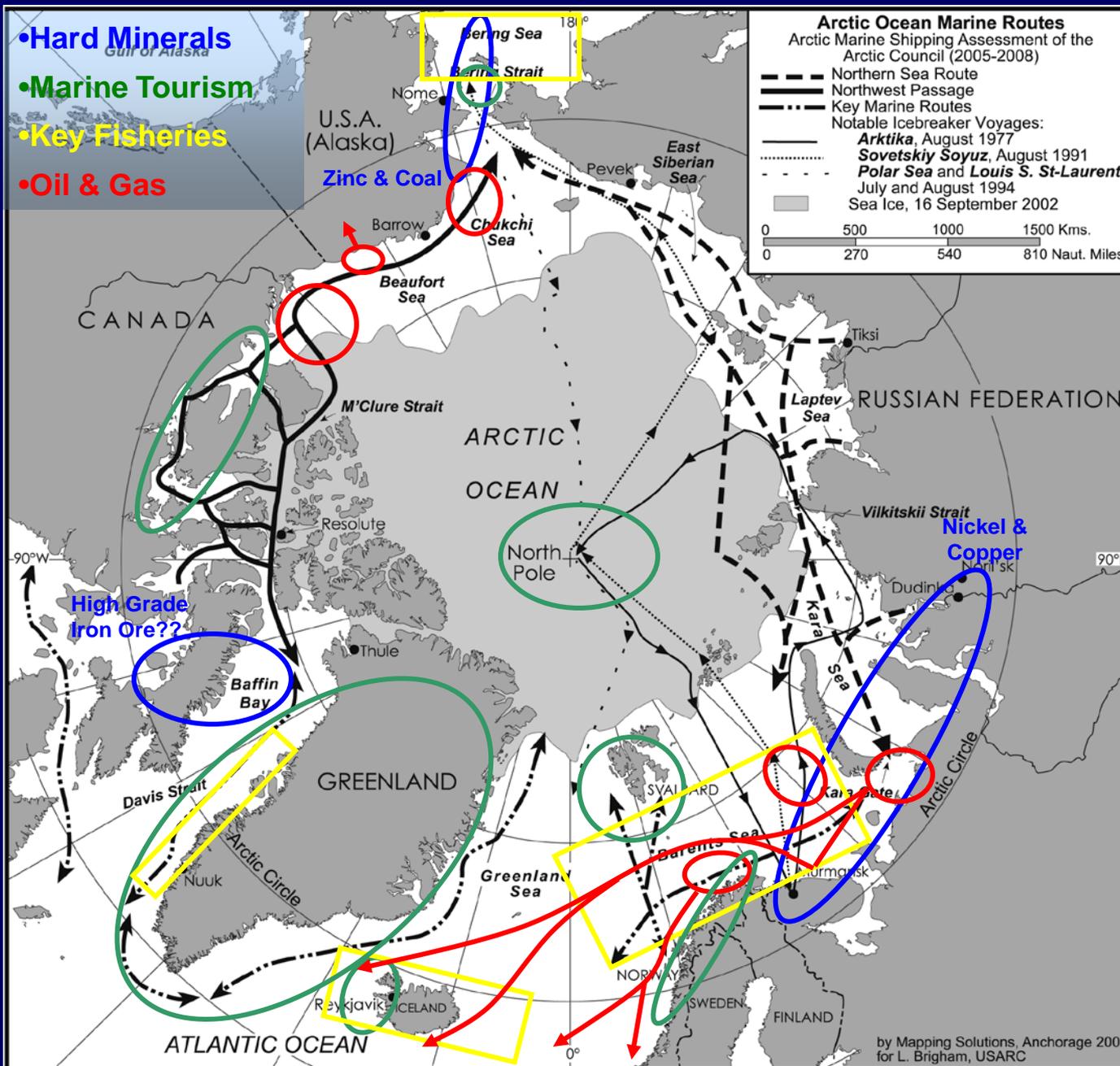
Today's Arctic Marine Use



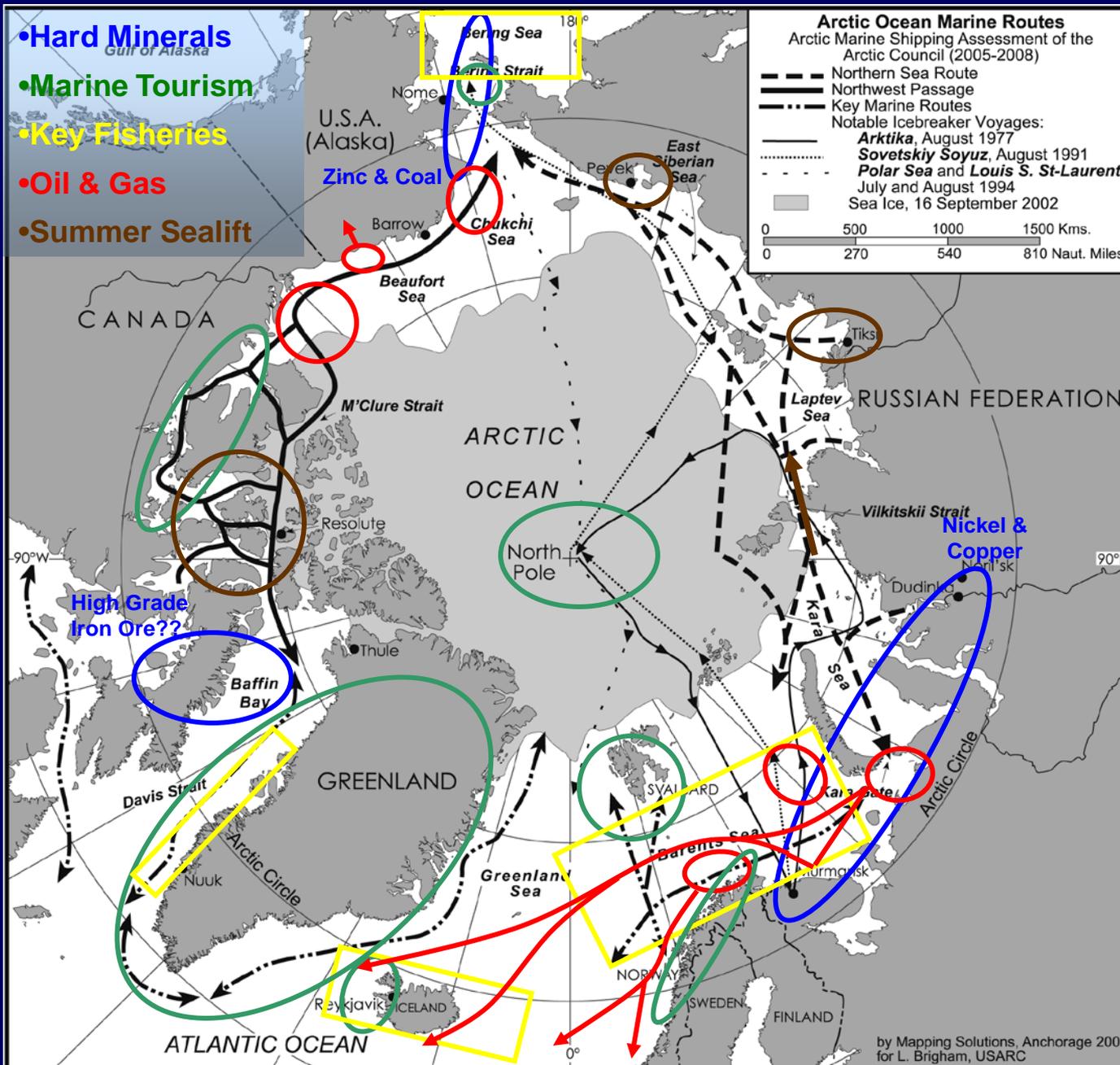
Today's Arctic Marine Use



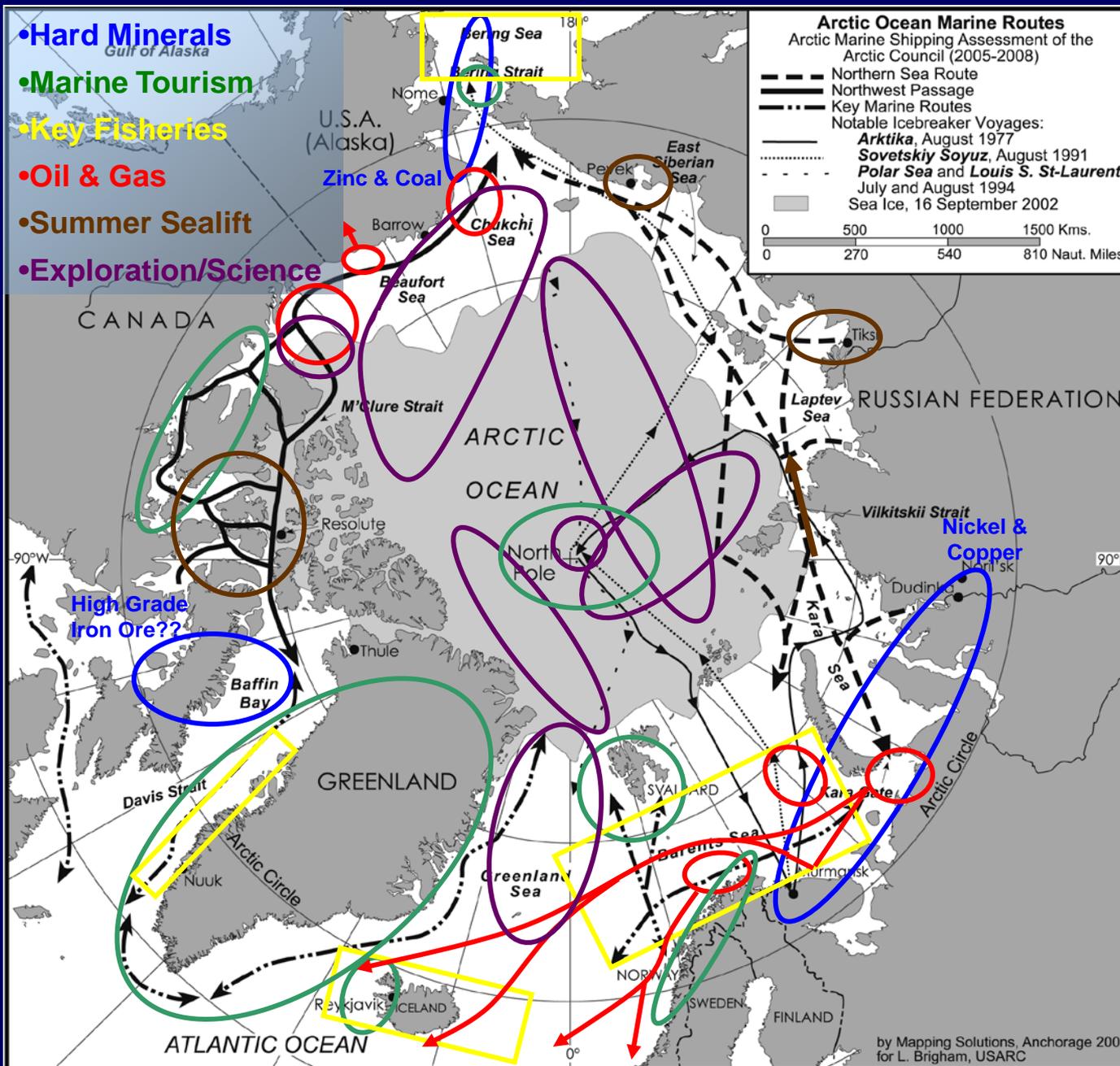
Today's Arctic Marine Use



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
INDEPENDENT CHARTERED REPORT
2010/2011

PAME
Partnership for Arctic Marine Environmental

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Executive Summary with Recommendations

Introduction

Arctic Marine Geography, Climate and Sea Ice

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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

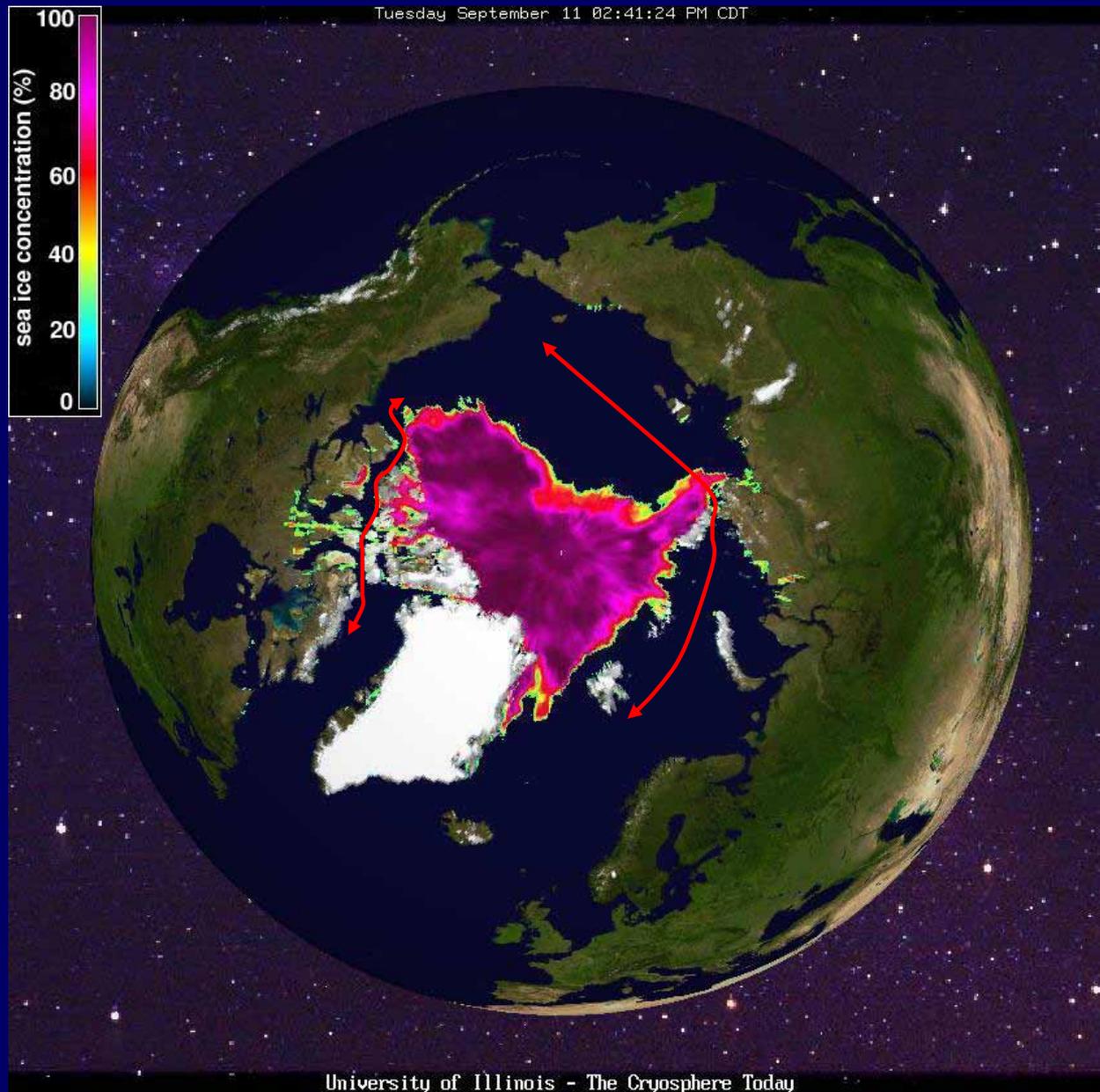
Human Dimensions

Environmental Considerations and Impacts

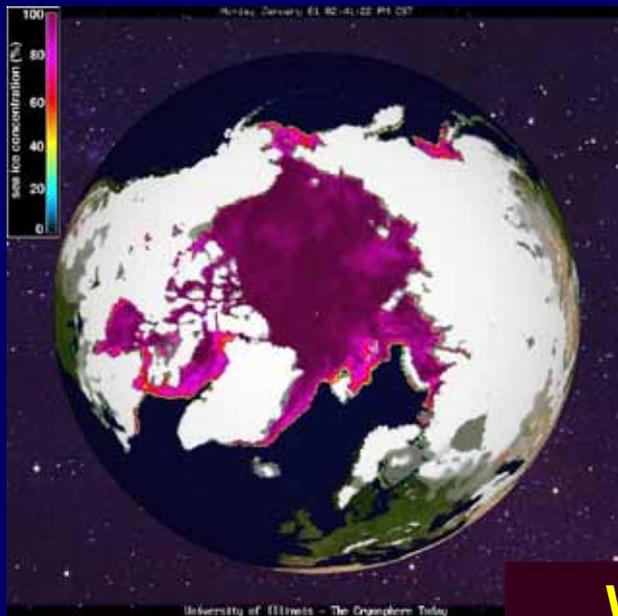
Regional Environment Case Studies: Aleutian Islands/Great Circle Route, Barents and Kara Seas, Bering Strait, Canadian Arctic

Arctic Marine Infrastructure

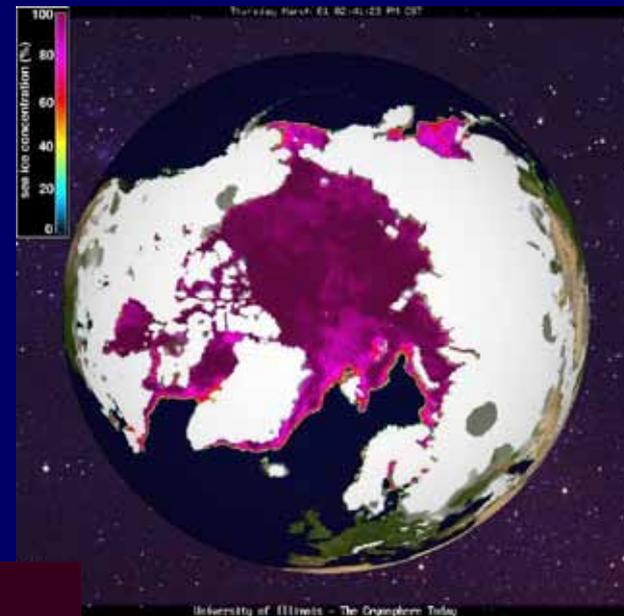
11 September 2007



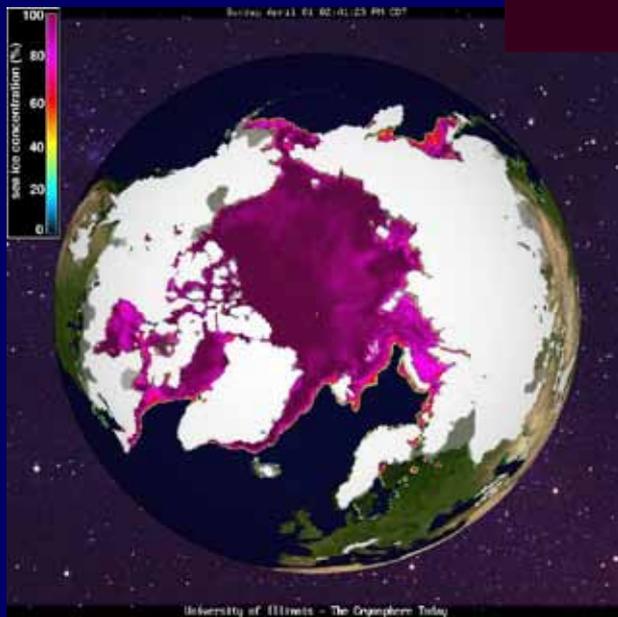
1 January 2007



1 March 2007

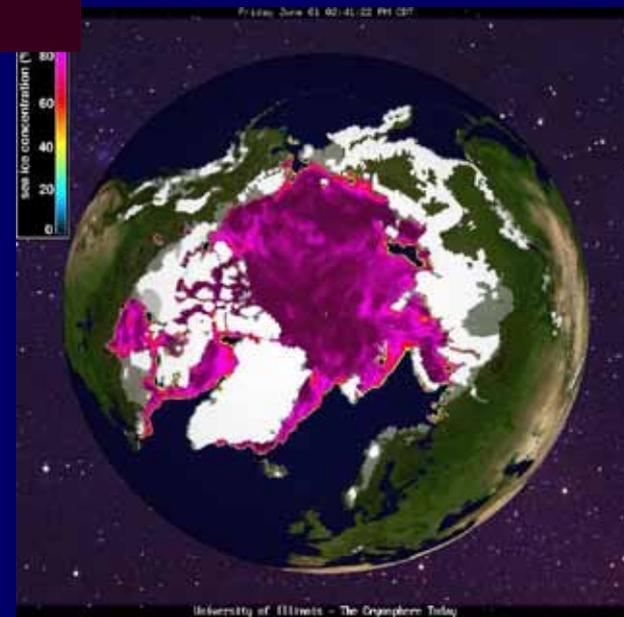


1 April 2007



**Winter &
Spring Months
2007**

1 June 2007



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

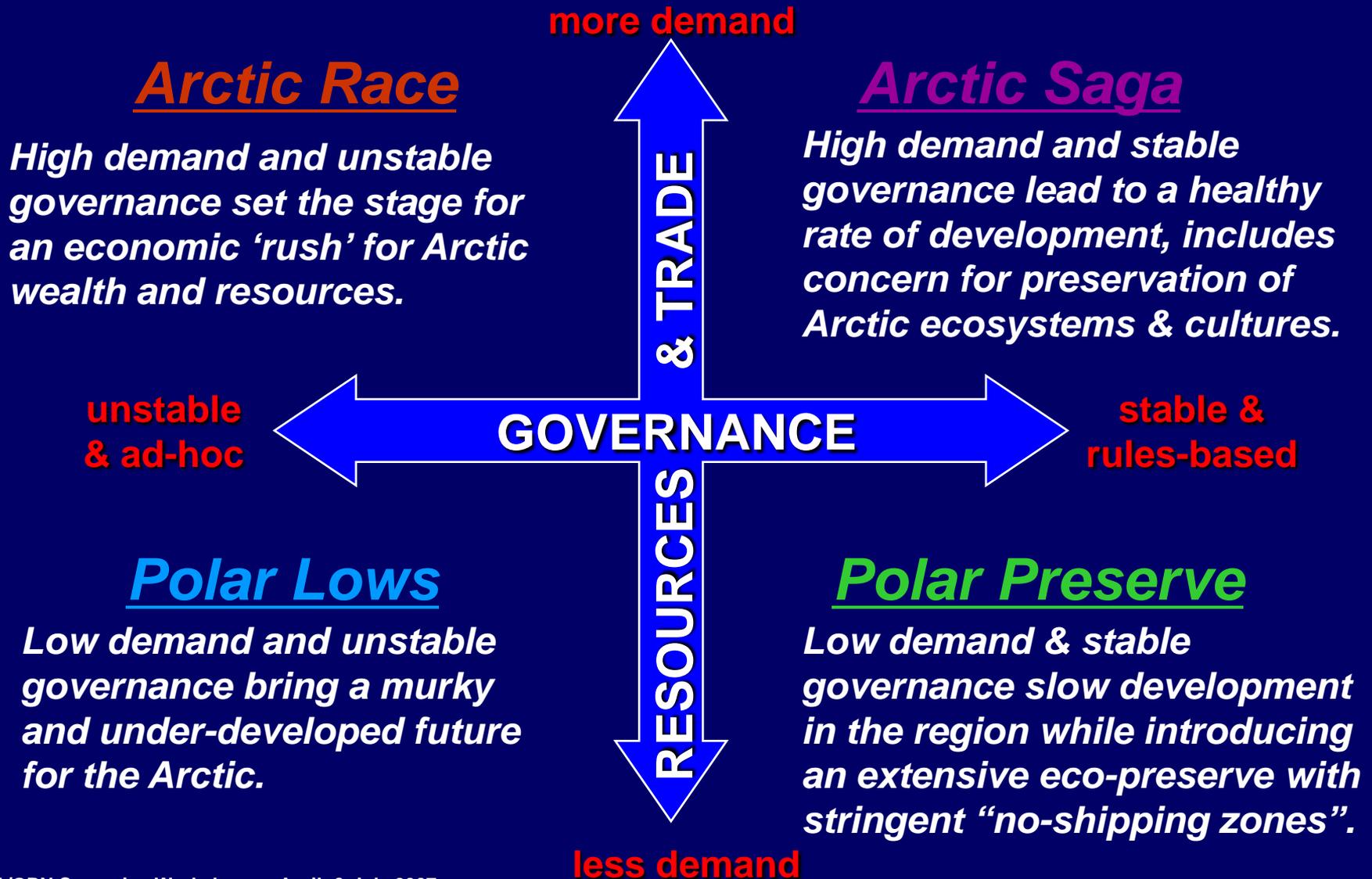
- Stable legal climate
- Radical change in global trade dynamics
- Climate change is more disruptive sooner
 - Safety of other routes
- Socio-economic impact of global weather changes
- Oil prices (55-60 to 100-150 USD?)
- Major Arctic shipping disasters***
 - Limited windows of operation (economics)
 - 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 oil and gas in 23 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 trillion cubic feet of natural gas, and 44 billion barrels of natural gas liquids may remain to be found in the Arctic, of which approximately 88 percent is expected to occur in offshore areas.



Overcasted mountains north of the Labyrinth Group under a midlight rainbow near Svalbard Lede, Alaska, summer 2007. USGS photo by David Brumbaugh.

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°50' north latitude). Quantitative assessments were conducted in three 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 oceanic 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 details 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 km² (8.1 million mi²) of which about 4 million km² (1.5 million mi²) is onshore and more than 7 million km² (2.7 million mi²) is an continental shelf 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 Circle and other, unpublished work) was used to define geologic provinces, each containing more than 1 km³ 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 methods 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 analog modeling. A world analog database (Charpentier and others, 2006) was developed using the AUs defined in the USGS World Petroleum Assessment 2000 (USGS World Petroleum 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

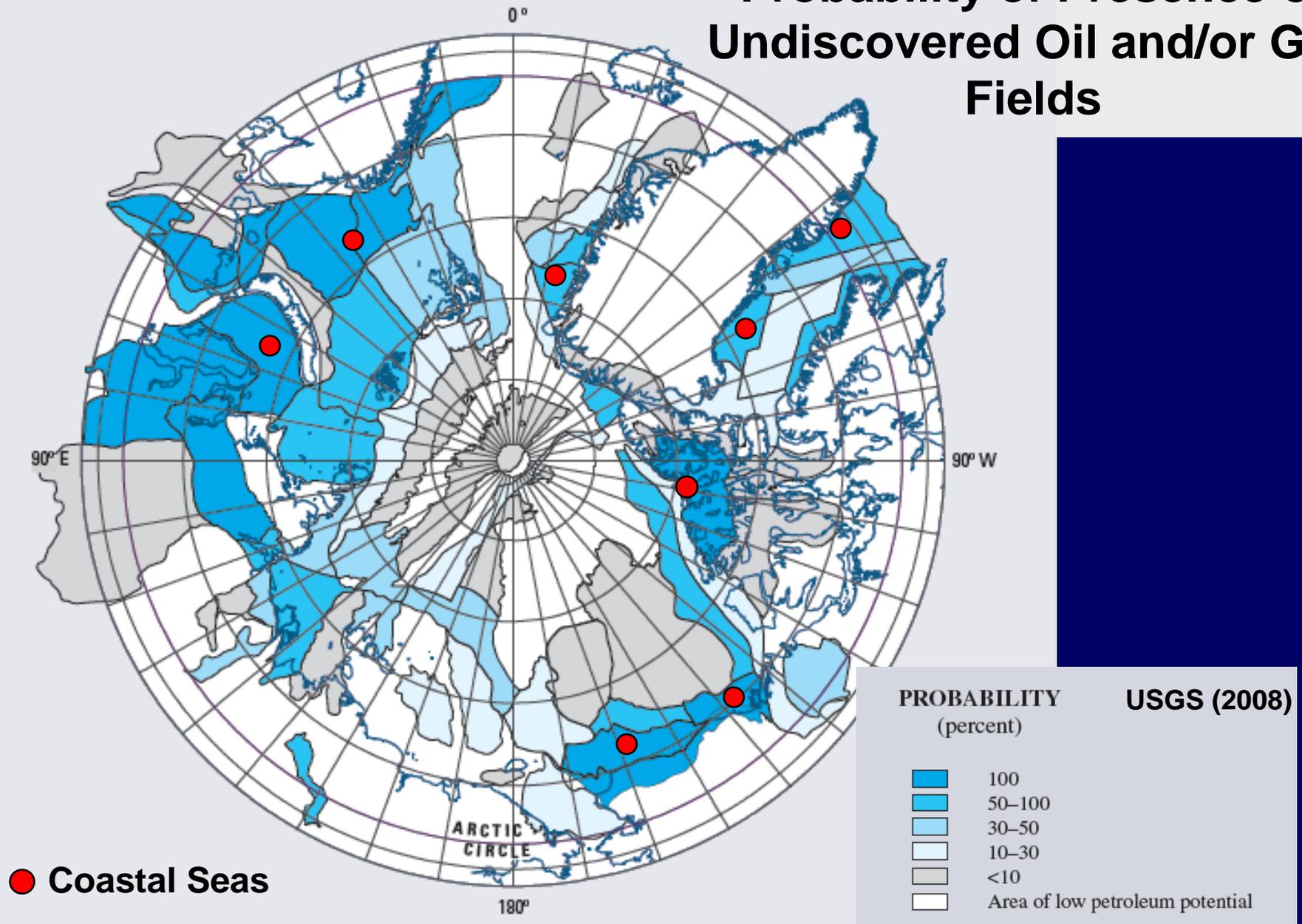
–30% Undiscovered Natural Gas

–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

Future Convoy Requirements?

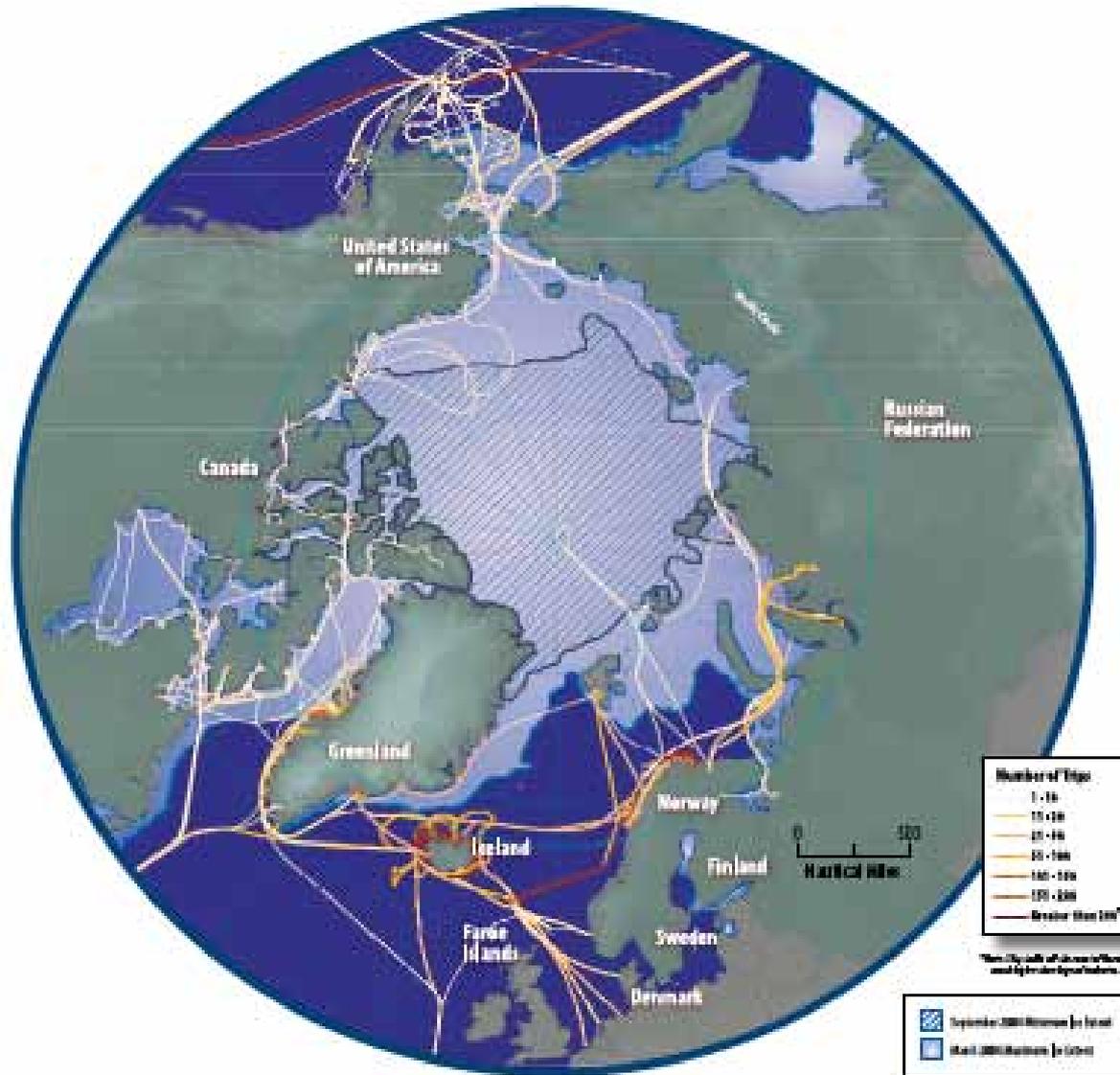


Icebreaking (Double Acting) Container Ship

***Norilskiy Nickel* in the Kara Sea**

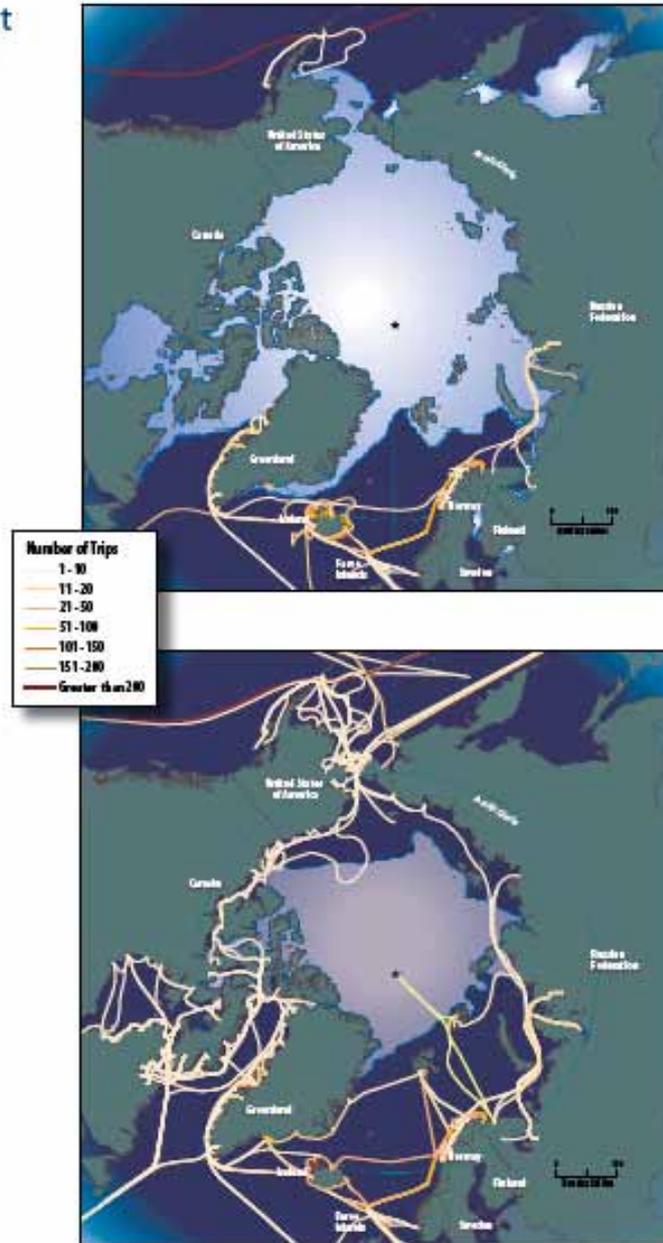
March 2006

Aker Arctic



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

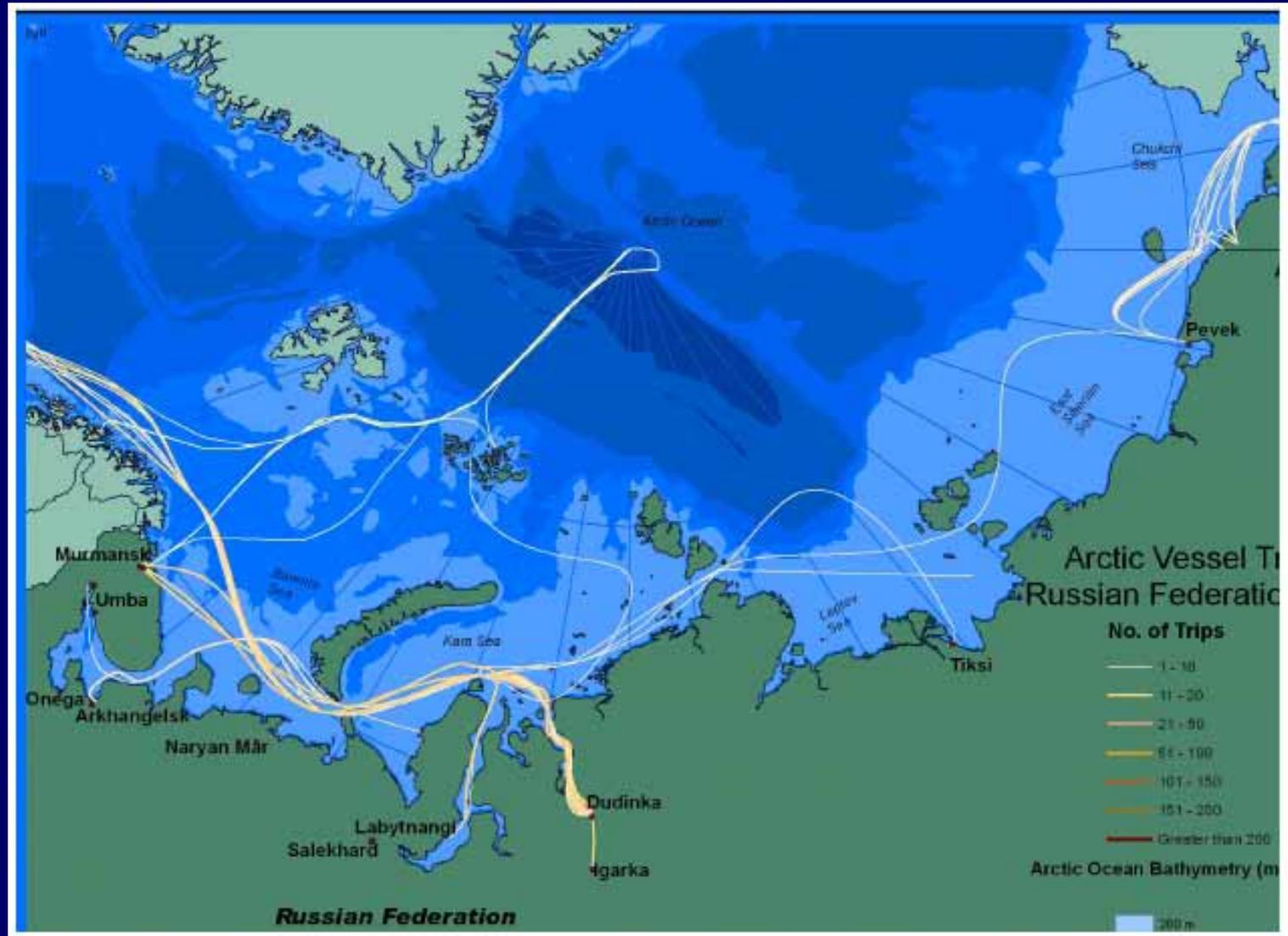
Sea Ice Extent Differences



January 2004 Traffic

July 2004 Traffic

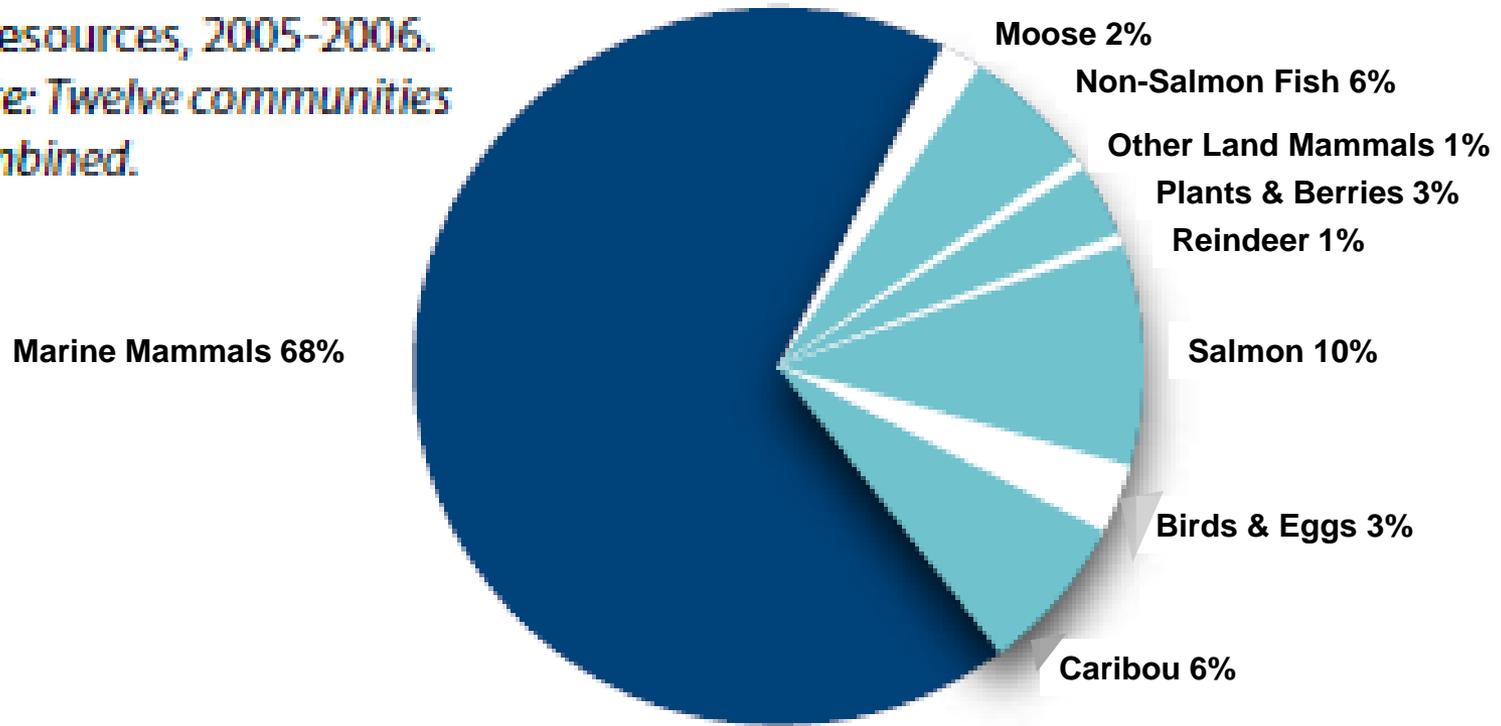
Russian Arctic Shipping 2004





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.

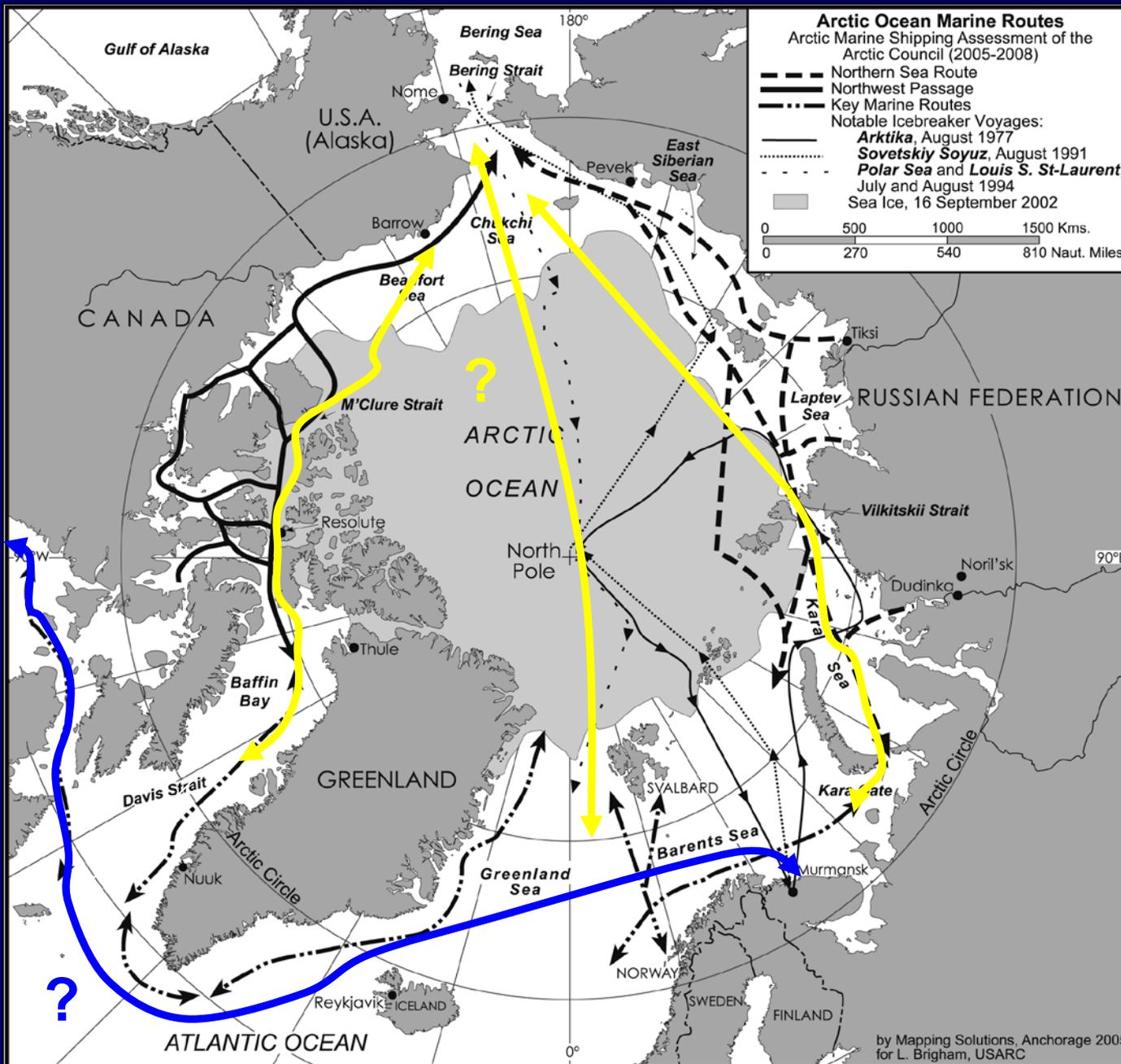
Selected AMSA Key Findings

- A~ UNCLOS: Fundamental framework & IMO ~ Competent UN agency**
- B~ Winter Arctic sea ice cover remains**
- C~ No special, mandatory IMO environmental standards**
- D~ Today ~ nearly all destination traffic**
- E~ Key drivers: Natural resource development & regional trade plus governance**
- F~ Future Arctic transport: many factors of uncertainty**
- G~ Arctic residents: concerns & recognition of benefits**
- H~ Most significant threat: release of oil**
- I~ General lack of marine infrastructure (exceptions: coast of Norway & northwest Russia)**

Future Arctic Marine Transport Modes

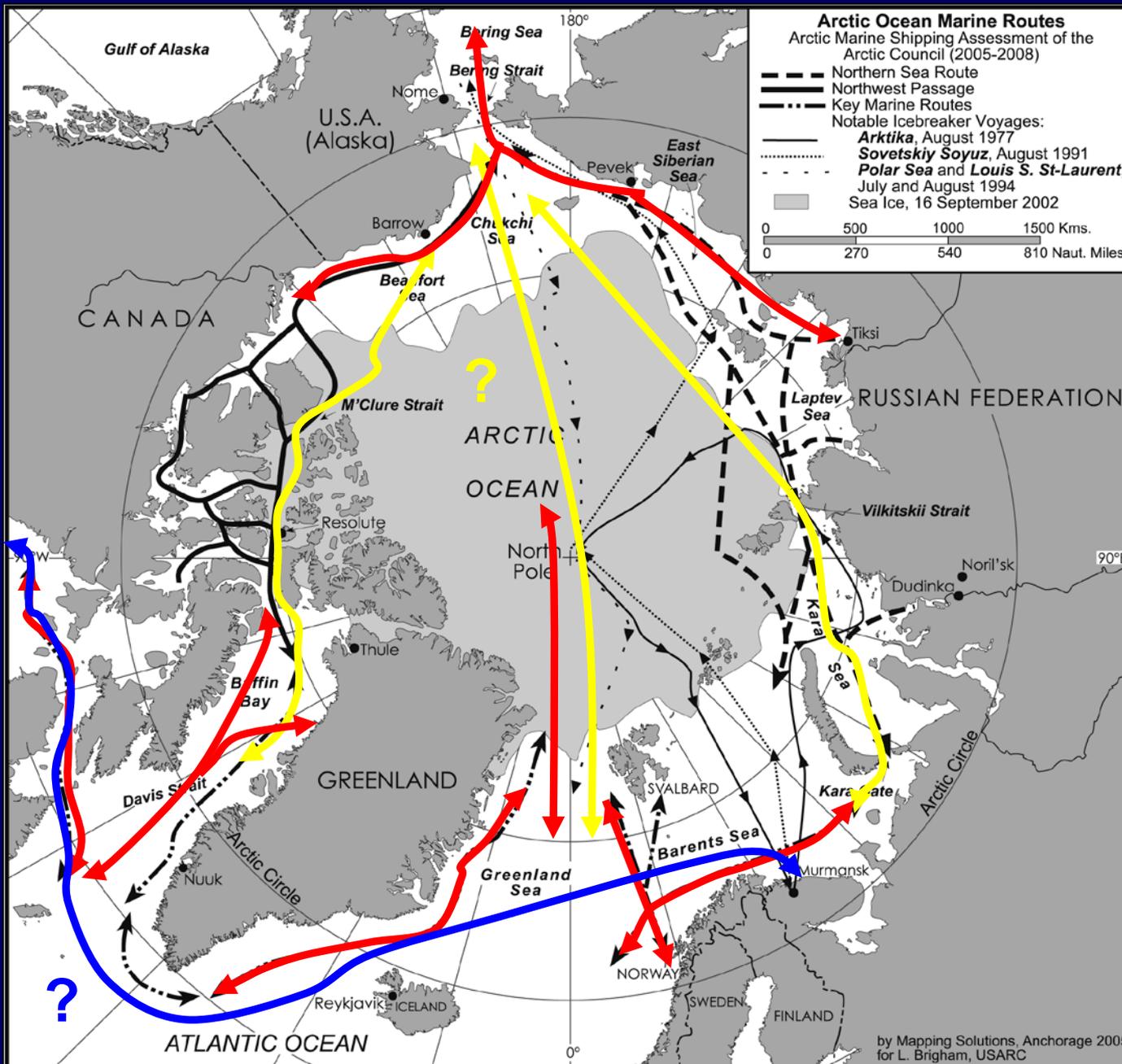


Future Arctic Marine Transport Modes



Churchill
to
Murmansk
Route

Future Arctic Marine Transport Modes



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**
- **Senate & House AMSA Implementation Bills**
- **Briefings: Arctic State Capitals, London, Alaska, & Other Locations**
- **AMSA Research Agenda to International Arctic Science Committee (IASC)**