



# *North Slope Science Initiative* 2009 Report to Congress



North Slope Science Initiative  
ALASKA

<http://www.northslope.org>



## Scope, Mission and Vision

The North Slope Science Initiative (NSSI) was developed by local, state and federal governments with trust responsibilities for land and ocean management, to facilitate and improve collection and dissemination of ecosystem information pertaining to Alaska’s North Slope region, including coastal and offshore regions. The *mission* of the NSSI is to improve scientific and regulatory understanding of terrestrial, aquatic and marine ecosystems for consideration in the context of resource development activities and climate change. The *vision* of the NSSI is to identify those data and information needs management agencies and governments will need in the future to develop management scenarios using the best information and mitigation to conserve the environments of the North Slope. The NSSI adopts a strategic framework to provide resource managers with the data and analyses they need to help evaluate multiple simultaneous goals and objectives related to each agency’s mission on the North Slope. The NSSI uses and complements the information produced under other North Slope science programs, both internal and external. The NSSI also facilitates information sharing among agencies, non-governmental organizations, industry, academia, international programs and members of the public to increase communication and reduce redundancy among science programs.

## 2005 Legal Mandate

Under the provisions of the Energy Policy Act of 2005 (PL 109-58), the annual report is due to the Secretary of the Interior each August. This is the second such report and describes NSSI’s background, scope, mission and vision, objectives, administrative structure, and accomplishments, and outlines future directions based on identified issues on the North Slope and in the adjacent marine environment.

## Credits

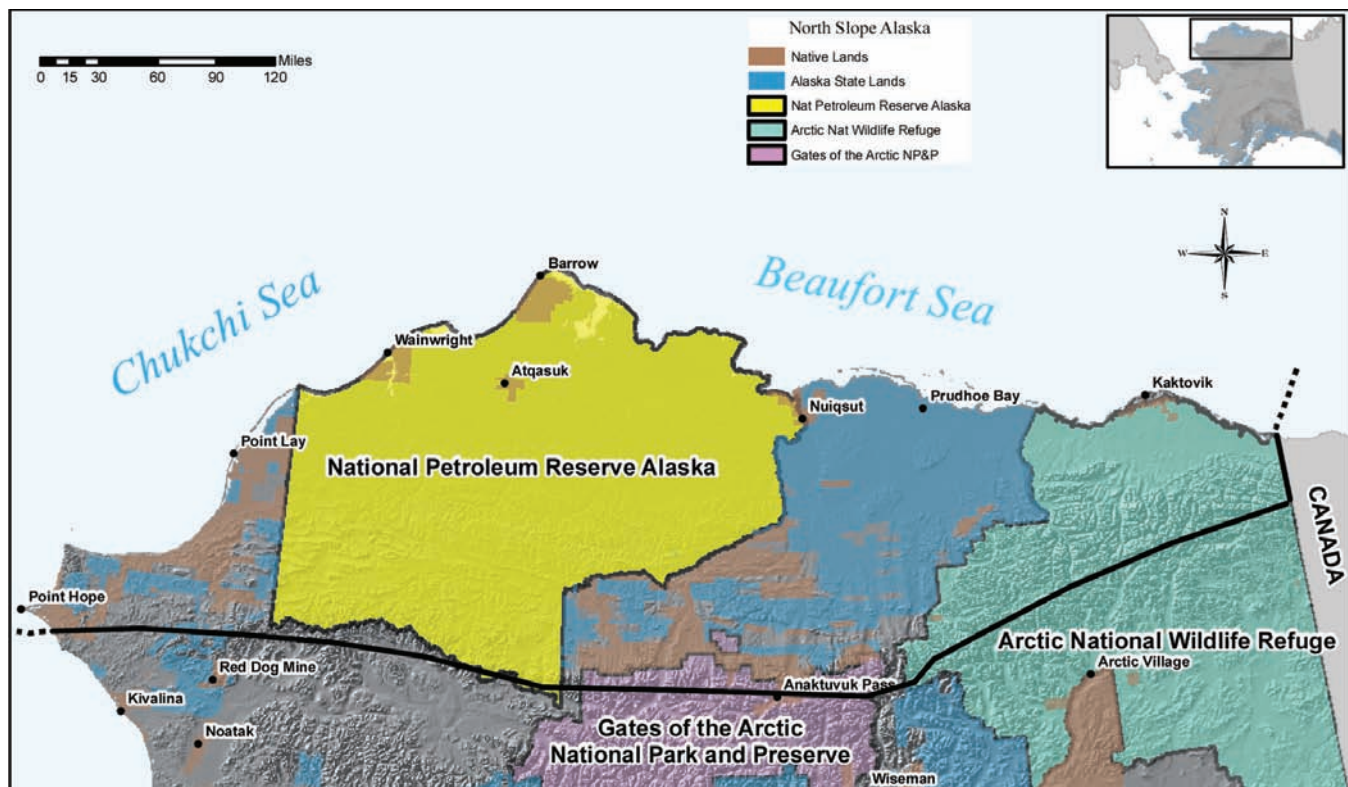
John F. Payne, Ph.D., NSSI Executive Director, Denny Lassuy, Ph.D., NSSI Deputy Director, and the NSSI Oversight Group are the principal authors of this report, with input and review from the NSSI Senior Staff Committee.

# North Slope Science Initiative

## 2009 Report to Congress

### Executive Summary

The North Slope of Alaska is America's Arctic. It is a vast area encompassing 231,000 km<sup>2</sup> (89,000 mi<sup>2</sup>), and has what may be some of the largest oil, gas and coal potential remaining in the United States. The North Slope and adjoining seas are home to a diverse array of fish, wildlife, and plant resources that support a vibrant subsistence culture. While sustaining these resources and planning for safe energy exploration and development, North Slope managers are also facing the challenges of a rapidly changing climate. As the unparalleled challenges and opportunities of a changing arctic climate are recognized, there is a growing need in both the public and private sectors for information and more effective ways to support climate-related and development decisions. In fact, changes now being experienced are of such magnitude that there is federal, state and local consensus that enhanced, coordinated, and sustained observation, research and monitoring is vital.



North Slope Land Status. (Information on this map should be used for graphic display only.) (BLM)

## Executive Summary (Continued)

To that end, federal, state, and local governments collectively formed the North Slope Science Initiative (NSSI); formally authorized under the Energy Policy Act of 2005 (Section 348). The NSSI's broad legislative mandate is integrated across federal, state and local governments with both partnered research and service. Collectively, through NSSI, the membership believes it can increase collaboration and coordination, among its membership and with industry, academia, non-governmental organizations, the public, and the pan-Arctic community that will lead to better informed management decisions in the future. This second Report to Congress outlines again the formation and organization of the NSSI and highlights the NSSI's 2009 and cumulative accomplishments.

In 2009, with the full engagement of its member agencies, the NSSI and its Science Technical Advisory Panel made major progress in several areas:

- Served as an effective forum for coordination and integration of the shared concerns and science needs of North Slope resource managers;

- Made significant progress in assessing a series of "emerging issues" and the science needed to meet the challenges these issues pose;

- Extensively updated and improved the NSSI website to serve as a gateway for public information and access to North Slope science projects;

- Implemented the NSSI Catalog for access to imagery and scientific data and made over 120 geographic information system data layers available through the NSSI website;

- Further developed cost effective means of remotely collecting water quality and bathymetry data and adapted this work to evaluate yellow-billed loon habitat;

- Developed and tested protocols for a North Slope-wide digital land cover map; and,

- Facilitated extensive coordination among member agencies, academic institutions, National Science Foundation, U.S. Arctic Research Commission, non-governmental organizations, industry, Interagency Arctic Research Policy Committee, and the greater pan-Arctic community.

Adequate funding is essential for the NSSI to continue its success as a forum for coordinating research and monitoring activities that support shared local, state and federal management needs in America's Arctic. Funds support core data and information sharing tools and implementation of priority needs among emerging concerns such as permafrost, hydrology, erosion, fire regime, social and economic challenges, increasing marine activities, and an array of species of shared interest. Each of these broad categories of information raises important management questions and challenges that require both short- and long-term budget planning. Consistent base funding would also support a stable staff and include the position of Executive Director and three staff positions. Since its inception, the NSSI has continued to evolve in terms of organizational effectiveness, interagency interaction and coordination on federal, state and local levels. This growth in cooperation is increasingly reflected as the benefits of the initiative are realized.

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## Legislative Purpose and Objectives of the North Slope Science Initiative

The NSSI was formally authorized in Section 348, Energy Policy Act of 2005 (Public Law 109-58). The legislative purpose and objectives are stated below:

§(a)(2) The **purpose** of the Initiative shall be to implement efforts to coordinate collection of scientific data that will provide a better understanding of the terrestrial, aquatic, and marine ecosystems of the North Slope of Alaska.

§(b) **Objectives:** To ensure that the Initiative is conducted through a comprehensive science strategy and implementation plan, the Initiative shall, at a minimum—

1. identify and prioritize information needs for inventory, monitoring, and research activities to address the individual and cumulative effects of past, ongoing, and anticipated development activities and environmental change on the North Slope;
2. develop an understanding of information needs for regulatory and land management agencies, local governments, and the public;
3. focus on prioritization of pressing natural resource management and ecosystem information needs, coordination, and cooperation among agencies and organizations;
4. coordinate ongoing and future inventory, monitoring, and research activities to minimize duplication of effort, share financial resources and expertise, and assure the collection of quality information;
5. identify priority needs not addressed by agency science programs in effect on the date of enactment of this Act and develop a funding strategy to meet those needs;
6. provide a consistent approach to high caliber science, including inventory, monitoring, and research;
7. maintain and improve public and agency access to—
  - a. accumulated and ongoing research; and
  - b. contemporary and traditional local knowledge; and
8. ensure through appropriate peer review that the science conducted by participating agencies and organizations is of the highest technical quality.

*Note: Objectives will be referenced here after by (Obj.#).*

## Background and Need for the North Slope Science Initiative

The North Slope of Alaska is a vast area of the polar arctic encompassing 231,000 km<sup>2</sup> (89,000 mi<sup>2</sup>). The offshore areas of the Chukchi and Beaufort Seas have an additional 295,000 km<sup>2</sup> (114,000 mi<sup>2</sup>). The natural resources of the North Slope are considerable. The area may have some of the largest oil, gas and coal potential remaining in the United States. The North Slope is also home to an abundant and diverse array of native fish, wildlife, and plant resources that support the vibrant subsistence culture of the Iñupiat people who reside in the area. Balanced and scientifically informed management of fish, wildlife, subsistence, and energy resources continues to be the goal of agencies, Alaska residents, and industry.

The coal resources of the North Slope are estimated to be a minimum of 2.7 trillion tons, or approximately 40 percent of America's reserves. 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. A number of onshore areas in Canada, Russia and Alaska have already had substantial exploration for petroleum, resulting in the discovery of more than 400 oil and gas fields north of the Arctic Circle. This makes up almost 10 percent of the world's known conventional petroleum resources. The extensive Arctic continental shelves may constitute the geographically largest unexplored prospective area for petroleum remaining on earth. A USGS report released in 2008 suggests that more than 70 percent of the undiscovered oil resources may occur in five provinces: Arctic Alaska, Amerasia Basin, East Greenland Rift Basins, East Barents Basins, and West Greenland-East Canada. In addition, the report estimates 84 percent of the undiscovered oil and gas occurs offshore in the Arctic. In Alaska, the 2008 USGS report estimates there are 30 billion

barrels of undiscovered oil, 221 billion cubic feet of natural gas, and six billion barrels of natural gas liquids. This places Arctic Alaska second in the world behind only the West Siberian Basin.

The central North Slope contains most of the commercial oil fields and virtually all of the petroleum-producing infrastructure and pipelines in northern Alaska, including the Trans-Alaska Pipeline System (Figure 1).

Through 2004, 15 billion barrels of oil have been produced from this area, and remaining reserves are estimated to include between 6 and 7 billion barrels of oil and 35 trillion cubic feet of discovered recoverable natural gas (DOE/NETL 2007). The Prudhoe Bay

and Kuparuk oilfields are the two largest oilfields in the United States. Four other adjacent oilfields, Point McIntyre, Endicott, Alpine, and North Star, also are among the top ten U.S. oilfields. Together they have contributed about 20 percent of U.S. domestic production annually since North Slope oil production began in 1977. For comparison, a 2008 USGS report estimated undiscovered oil in adjacent areas include 10.6 billion barrels in the National Petroleum Reserve in Alaska (NPRO) and 10.4 billion barrels in the Arctic National Wildlife Refuge (ANWR) 1002 area.

The Minerals Management Service (MMS) divides the North Slope offshore into two planning areas, the Beaufort Sea and Chukchi Sea. In 2006, MMS estimated a mean total of 104 trillion cubic feet of undiscovered technically recoverable natural gas and 24 billion barrels of undiscovered technically recoverable oil in these two areas combined (Sherwood 2006). This represents about 79 percent of the gas and 89 percent of the oil in all of the outer continental shelf of Alaska.

The wetland, coastal and off-shore habitats of the North Slope also support a wide variety of important fish and wildlife populations. Over 200 species of birds migrate to the North Slope each summer to nest and raise their young, including hundreds of thousands of waterfowl (including the threatened spectacled and Steller's eiders), shorebirds and many others. These summer visitors migrate to the North Slope from nearly every U.S. state and as far away as South America, Africa, Asia, and Antarctica (Figure 2). Four caribou herds numbering about 400,000 animals, currently more than half of Alaska's caribou, make their home on the North Slope of Alaska and provide a significant portion of the wild native foods harvested by North Slope residents. Offshore areas provide habitat for a variety of marine mammals, including the polar bear, four species of ice seals, walrus and several species of whale. Marine mammals comprise over 60 percent of the annual subsistence harvest. Freshwater fishes, particularly several whitefish species (e.g., Aanaakliq, Pikuktuuq, and Qaaktaq) and Dolly Varden (Iqalukpik), are also important subsistence food sources. The North Slope is the largest contiguous region of wetlands within the Arctic (CAVM Team 2003), in large part due to the continuous presence of permafrost beneath the surface.

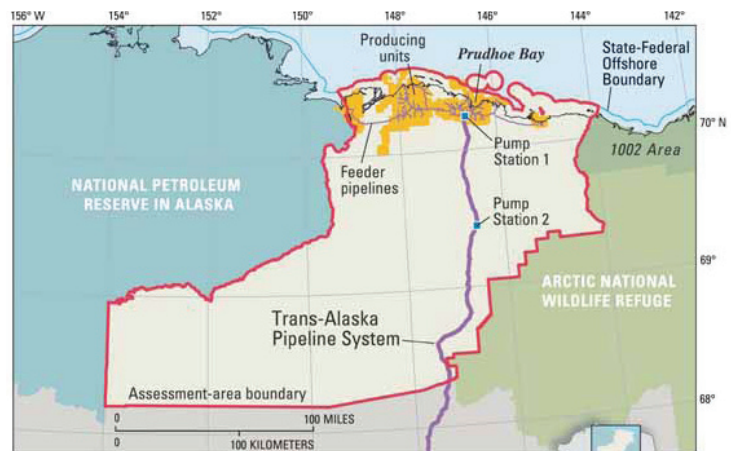
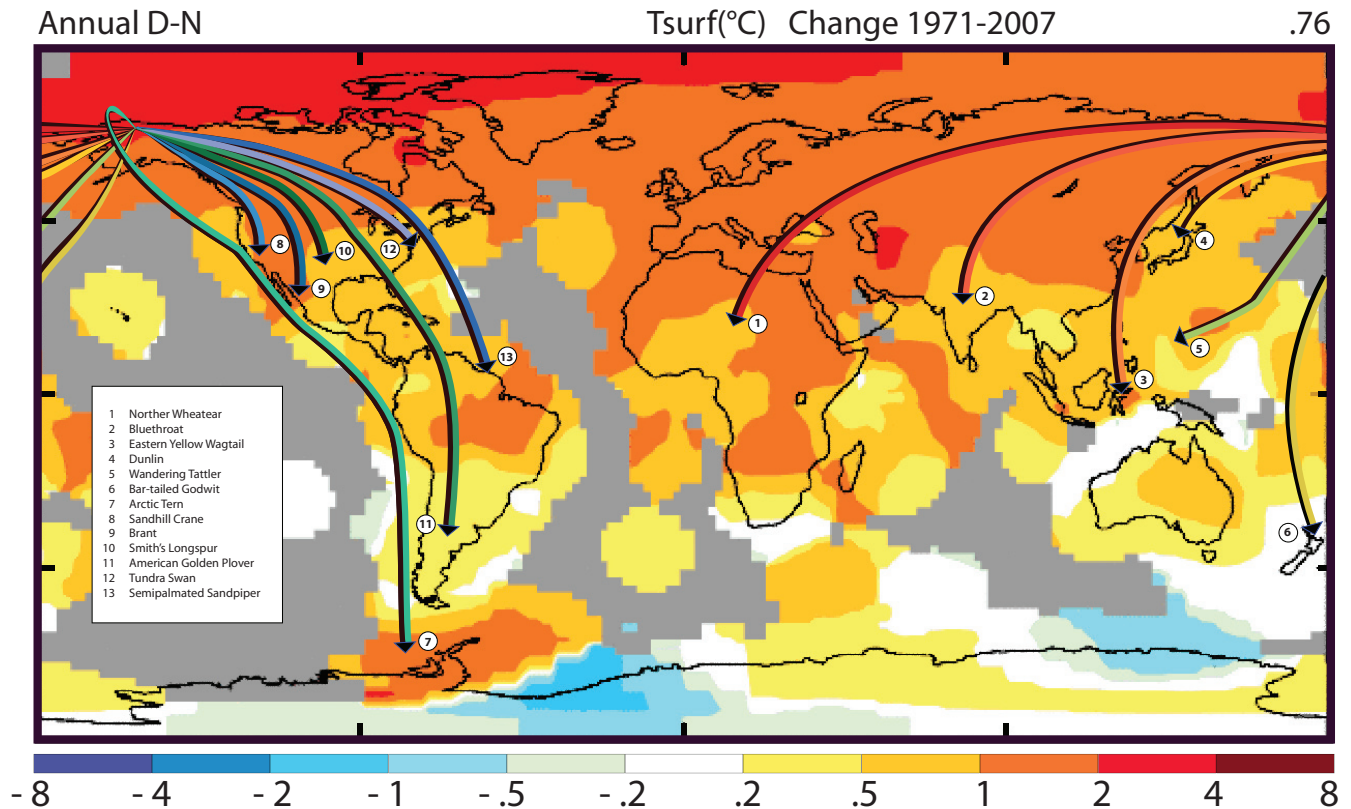





Figure 1. Central North Slope area in USGS economic analysis of undiscovered oil and gas resources (2005).



**Figure 2. Climate change and migratory bird patterns converge on the North Slope of Alaska. This area provides globally important migratory bird nesting and rearing habitat, but is also the place that has seen the greatest rise in average annual temperature of any location in the nation. (NASA-GISS & USFWS)**

## Endangered, Threatened, and Candidate Species of the North Slope and Adjacent Seas

	Species	Status	Lead Agency
	Bowhead whale ( <i>Balaena mysticetus</i> )	Endangered	NMFS
	Fin whale ( <i>Balaenoptera physalus</i> )	Endangered	NMFS
	Humpback whale ( <i>Megaptera novaeangliae</i> )	Endangered	NMFS

—Table continues on next page.



	<b>Species</b>	<b>Status</b>	<b>Lead Agency</b>
	Polar bear ( <i>Ursus maritimus</i> )	Threatened	USFWS
	Steller's eider ( <i>Polysticta stelleri</i> )	Threatened	USFWS
	Spectacled eider ( <i>Somateria fischeri</i> )	Threatened	USFWS
	Ringed seal ( <i>Phoca fasciata</i> )	Candidate	NMFS
	Spotted seal ( <i>Phoca largha</i> )	Candidate	NMFS
	Bearded seal ( <i>Erignathus barbatus</i> )	Candidate	NMFS
	Yellow-billed loon ( <i>Gavia adamsii</i> )	Candidate	USFWS
	Kittlitz's murrelet ( <i>Brachyramphus brevirostris</i> )	Candidate	USFWS

The North Slope is also a place where global forces have long been converging. First, it was a pathway for the spread of the Iñuit culture eastward across arctic North America. In modern times, whalers followed the bowhead whales into the pack ice; military contractors constructed the network of Distant Early Warning radar stations bringing the first large-scale development to the region; and oil companies developed a large industrial complex. Today the North Slope is a focal point of growing global awareness and is used for observation and assessment of the near- and long-term impacts of climate change.

All of these resources and their patterns of development are of vital importance nationally and internationally, and especially to the residents of the North Slope who depend on the resources for subsistence and economic well-being. The resources are managed by federal, state and local agencies to maintain healthy fish and wildlife populations and their habitats in a productive environment. The laws and regulations that govern oil and gas development and protect the environment are among the most stringent in the United States, and Alaska is proud of its track record. Through continued technological improvements, industry has succeeded in reducing the footprint of development while expanding into new areas with directional drilling that targets oil reservoirs several thousand feet from the main drill site (Figure 3). Mud pits for holding drilling wastes have been replaced by grind and inject facilities that return these materials to the formation underground. Ice roads have replaced gravel roads for exploration activities. Alaska has a strong record in incorporating new technologies for exploration and development activities to reduce impacts to the environment.

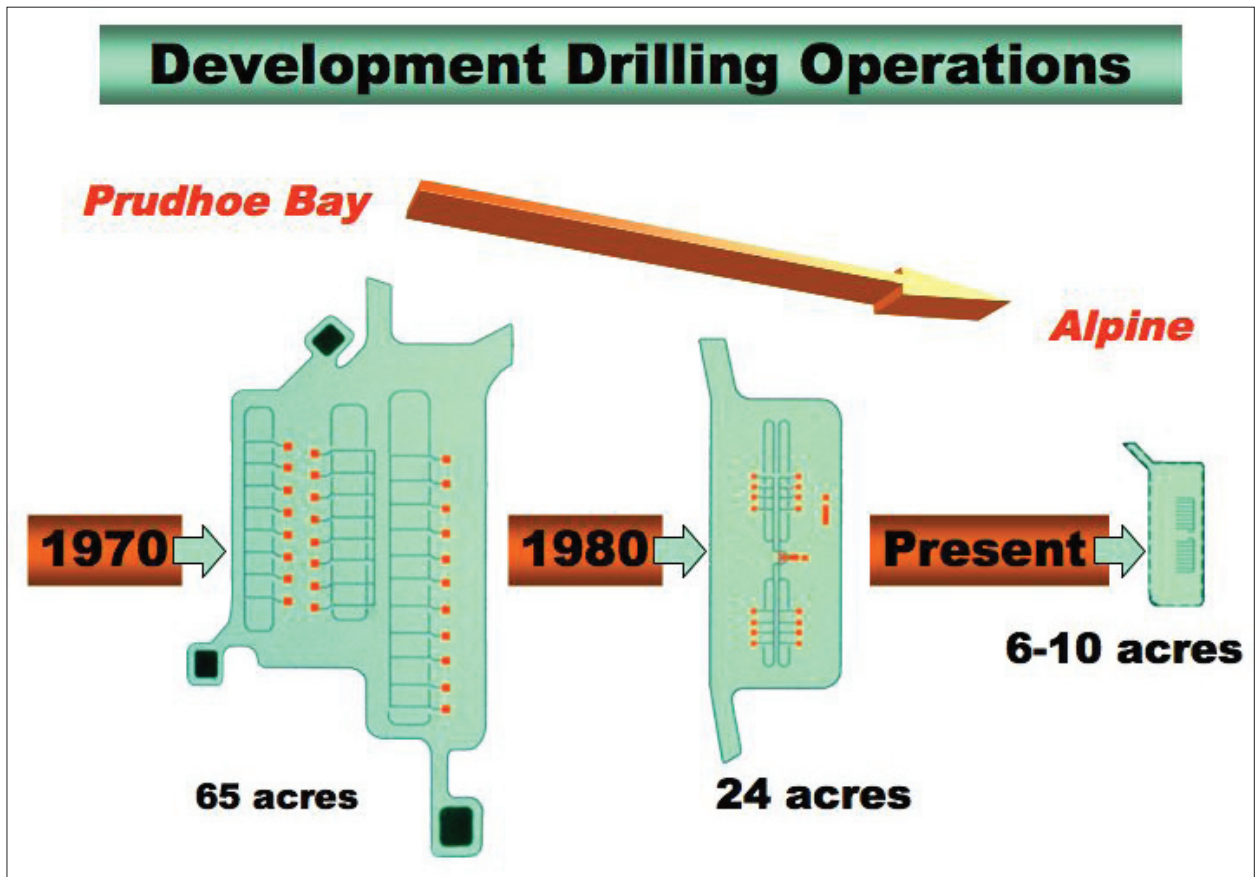


Figure 3. Reducing the size of the industry footprint. (BLM)

Resource managers are also adapting to a rapidly changing Arctic environment. Climate change impacts to the Arctic have both regional and global implications, and likely will have increasingly significant Arctic and worldwide environmental and societal consequences (IPCC). These Arctic-wide changes are of such magnitude and rate that there is broad consensus that enhanced, coordinated and sustained observation, research and monitoring is vital. Additional well-planned and coordinated inventory, monitoring and research will be required to:

1. Document the magnitude, variation and rate of changes that are currently occurring, and place them in the context of past environmental change.
2. Understand the regional and global causes and consequences of current changes.
3. Predict the magnitude, variation and rate and consequences of future Arctic and global change.
4. Identify effective adaptive management practices appropriate to Arctic change.

The National Academies, in response to a request from Congress, prepared the Cumulative Environmental Effects of Oil and Gas Activities on Alaska's North



Trans-Alaska Pipeline (Doug Kane, UAF)



Caribou are an important subsistence resource on the North Slope. (ADFG)

### **National Security Presidential Directive (NSPD-66) and Homeland Security Presidential Directive (HSPD-25):**

#### **Relationship to the North Slope Science Initiative**

On January 9, 2009, the President issued two directives related to the U.S. Arctic. While these directives are not specifically related to the administration and operation of the NSSI, they do contain components which help set direction related to the NSSI. Section III (A)(2) states the policy of the United States is to "Protect the Arctic environment and conserve its biological resources"; Section III (A)(3) states the United States will "ensure that natural resource management and economic development in the region are environmentally sustainable"; and Section III (A)(6) states the United States will "enhance scientific monitoring and research into local, regional, and global environmental issues."

The Directives further state that the United States will actively promote access to Arctic research, establish effective Arctic observing networks, work with the Interagency Arctic Research Policy Committee and Arctic Research Commission and strengthen partnerships with academic and research institutions. The NSSI through its Science Technical Advisory Panel and the Oversight Group, with the assistance of the Senior Staff Committee, are addressing or coordinating many of the Directives that are now the policy of the United States as a member of the pan-Arctic community.

Slope (NRC 2003). The purpose for the report was to review information on oil and gas activities, and assess the known and possible cumulative impacts of those activities. The report considered impacts on the physical, biotic, human and marine environments from past and present development activities. Several findings and recommendations were developed, including:

**Climate Change:** Additional research and modeling is required to understand the impacts to the Arctic, and more importantly, to the North Slope region.

**Need for Comprehensive Planning:** Currently, decisions on industrial activities are made by multiple agencies on a case-by-case basis, without a comprehensive plan to guide the process. A comprehensive plan is needed to ensure that decisions are made that match the overall goals for the region, in all phases of development.

**Ecosystem Research:** There is currently a lack of ecosystem-level research on the North Slope. Research activities need to increase, and focus on ecological processes.

**Offshore Oil Spills:** The potential for a large offshore oil spill in the Arctic requires additional research directed at the effects of such a spill, how marine life could be protected, and the effectiveness of various cleanup activities, especially in broken sea ice.

**Human Communities:** Traditional and local knowledge could be of great benefit to researchers. More research is needed that examines the benefits and threats from industrial activities and climate change to the way of life of North Slope communities.

As the unparalleled challenges and opportunities of a changing climate have been recognized, there is a growing need among leaders in both the public and private sectors for information and more effective ways to support climate-related decisions. The NSSI, with its broad legislative mandate, is an initiative that is integrated across federal, state and local governments with both partnered research and service. Collectively, through the NSSI, the membership believes it can increase collaboration and coordination, both internally among membership and externally with industry, academia, non-governmental organizations, the public and the greater pan-Arctic community, which will lead to better informed management decisions in the future.

This cooperative, stakeholder-based, and deliberative approach to implementing the NSSI is also consistent with the 2009 National Research Council report. The report recommends that government agencies, other organizations and the scientific community should organize their decision support efforts around these six principles:

- Begin with the users' needs;
- Give priority to process over products;
- Link to information producers and users;
- Build connections across disciplines and organizations;
- Seek institutional stability; and,
- Design processes for learning.

## Organizational Structure and Administration of the North Slope Science Initiative

### *Why is the North Slope Science Initiative Unique in its Organization?*

The uniqueness of the NSSI as an organization begins with its membership, which includes the senior leaders of those agencies, governments and organizations that have management responsibilities for the resources on the North Slope and its off-shore environments. Also unique to the NSSI is an advisory group of principals who are either science or resource based. The principal members of the NSSI include:

<b>U.S. Department of the Interior</b>	
Bureau of Land Management (designated administrative agency)	State Director
Minerals Management Service	Regional Director
National Park Service	Regional Director
U.S. Fish and Wildlife Service	Regional Director
<b>U.S. Department of Commerce</b>	
National Marine Fisheries Service	Regional Administrator
<b>State of Alaska</b>	
Department of Fish and Game	Commissioner
Department of Natural Resources	Commissioner
<b>Local Government / Resource Manager</b>	
Arctic Slope Regional Corporation	President
North Slope Borough	Mayor
<b>Advisory to the NSSI</b>	
National Weather Service	Regional Director
U.S. Arctic Research Commission	Chair
U.S. Department of Energy	Director, NETL
U.S. Geological Survey	Regional Executive

Consistent with its mission and vision, the NSSI is a highly interactive organization, drawing advice from a variety of discipline expertise and knowledge. This functional structure is designed to assist federal, state and local governments, academia and industry in making strategic decisions based on short- and long-term ecosystem management needs. This structure, with the assistance of a small core of NSSI staff and a science advisory panel, will provide independent expert review and advice; facilitate energetic liaison among member programs and their resources; provide effective coordination and communication; and, develop a common infrastructure for data management, proposals, publications and information processing.

Functionally, the organizational structure includes the following four components: Oversight Group, Executive Director and staff, Science Technical Advisory Panel (STAP), and Senior Staff Committee. These components of NSSI are highly interactive and bring a variety of expertise and knowledge to the organization.

### *Oversight Group*

As described in its charter (Appendix 1, and posted at <http://www.northslope.org>), the Oversight Group is composed of senior-level management from member and advisory agencies of the NSSI. The Oversight Group provides management direction to the other three components of the NSSI, oversees the quality and quantity of the scientific information available for aquatic, terrestrial and marine environments on the North Slope, and makes this information available to decision-makers, governmental agencies, industry and the public. The Chair of the Oversight Group rotates annually between federal and non-federal membership.

### *Executive Director*

The Executive Director is responsible for providing managerial guidance and executive oversight on the day-to-day activities of NSSI. The Executive Director provides advice and consultation to governmental agencies, scientific and academic institutions, and other interested parties to further the Congressional objectives of NSSI. The Executive Director coordinates and develops integration of science-based activities for the North Slope region. Responsibilities of the Executive Director include formulating annual operating and strategic plans, program administration, budget planning, task tracking, staff assignments, contract and agreement oversight and travel according to mission requirements. The Executive Director provides support to the Oversight Group and is the Federal Advisory Committee Act designated federal officer for the Science Technical Advisory Panel. The Executive Director reports to the Chair of the Oversight Group, and is supported by an NSSI staff that includes a deputy, technical specialist and a staff assistant. All NSSI staff and the Chair of the Science Technical Advisory Panel report to the Executive Director.

### *Science Technical Advisory Panel*

The Science Technical Advisory Panel (STAP) is a legislatively mandated Federal Advisory Committee Act advisory group consisting of not more than 15 scientists and technical experts from diverse professions and interests, including the oil and gas industry, subsistence users, Native Alaskan entities, conservation organizations, wildlife management organizations, and academia, as determined by the Secretary of the Interior. The members are selected from among, but not limited to, the following disciplines: expertise in North Slope traditional and local



**Science Technical Advisory Panel and staff focus on emerging issues in Deadhorse. (NSSI)**

knowledge, landscape ecology, petroleum engineering, civil engineering, geology, botany, hydrology, limnology, ecology, wildlife biology, biometrics, sociology, cultural anthropology, economics, ornithology, oceanography, fisheries biology and climatology (Appendix 2). The duties of the STAP are solely advisory to the Oversight Group and Executive Director, as described in the STAP charter (Appendix 3, and posted at <http://www.northslope.org>).

### Senior Staff Committee

The Senior Staff Committee is comprised of representatives from member agencies with experience in North Slope management and science. Committee members are the primary liaison between the NSSI organization and their individual Oversight Group member and are responsible for informing their Oversight Group member of NSSI activities, providing summaries of their agency's research activities to the NSSI, and providing recommendations on projects or proposals.

## Funding of the North Slope Science Initiative

Section 348(f) of the Energy Policy Act of 2005 authorized the appropriation of funds necessary for the Secretary of the Interior to carry out the functions of the NSSI. The first appropriation request for the NSSI was in the President's Budget for fiscal year 2007, allocating \$2.0 million as base funding for the NSSI. For fiscal years 2008 and 2009, the annual base funding allocation was \$1.0 million each year.

While individual member agencies have research programs that address many of their mandated science needs, the NSSI is positioned to enhance coordination efforts and fill information gaps that no single member agency can accomplish as well on their own. This coordination and collaboration are among the major value-added benefits of the NSSI. Funding to date has allowed significant progress on early NSSI priorities including data systems, project tracking, water quality, hydrology, and perhaps most importantly, interagency coordination (see "**Progress and Accomplishments**"). In addition to these early directions, the NSSI is identifying science and information needs for the future (see "**Future Directions and Emerging Issues**"). These collaborative analyses involve resource managers, agency staff, science



Wetlands provide quality migratory bird habitat. (USFWS)



Aerial photo of Teshekpuk Lake area of North Slope. (BLM)

advisors (within or outside of the NSSI), industry, academic institutions and non-governmental entities. They identify science or information needs to address emerging issues such as:

Permafrost	Hydrology and lake drying
Coastal and riverine erosion	Saltwater intrusion
Sea ice and ocean conditions	Changing fire regime
Increasing marine activities	Weather and climate
Species of interest such as caribou, marine mammals and migratory birds	Arctic contaminants
Vegetation change	Social and economic structure

Information products, research directions and specific studies can then be formulated around these management issues and funded by the NSSI, its member agencies, or external sources depending on priorities and availability of funds.

## Initial Directions for the North Slope Science Initiative

Before the passage of the NSSI's implementing legislation, several workshops were held in Anchorage, Fairbanks and Barrow, to gauge the status of North Slope knowledge from the perspective of information availability, information needs, and the setting of priorities should the NSSI become a reality (Krummel et al. 2004). Nearly 500 people from federal, state, and local agencies and governments, industry, non-governmental organizations, academic institutions, and the public attended these workshops. These workshops helped the Oversight Group set the initial direction for the NSSI. The workshops made it clear that, the substantial body of resource-oriented activity and knowledge on and about the North Slope and its off-shore environments, is not readily available, lacks coordination between and within agencies, and often is not in formats that can be effectively used. Several recommendations were developed from the workshops to guide the formative years of the NSSI. These recommendations include:



Arctic sun reflects off North Slope wetland. (USFWS)

The NSSI must support resource management decision-making. A coordinated program that effectively integrates the needs of a number of agencies would add value by increasing cooperative efforts and providing long-term focus and direction. The NSSI should implement an administrative structure that brings together its membership in a forum conducive to information and project sharing.



NSSI should develop a data management and information sharing system as a very early priority program area. This could be accomplished through an integrated and distributed approach, such as using functionality available through the University of Alaska, Geographic Information Network of Alaska (GINA).

Since the North Slope has extremely limited access by land, there is a need to increase the type and availability of multi-resolution imagery from satellite and airborne systems to aid in the evaluation of energy exploration and development initiatives, and in

determining the effects of climate change. Additionally, the NSSI should work with the State and USGS to develop better digital elevation models in a resolution appropriate to more effectively define hydrologic and terrestrial needs.

In many cases, baseline information is non-existent in usable formats (vegetation, land cover, hydrology, shoreline definition, transportation, etc.), has limited availability, or is not compatible with similar data across the North Slope.

The NSSI should use a conceptual scientific framework to address ecosystem changes. This framework should articulate the status of knowledge of resources on the North Slope and show how those resources may be at risk from development activities and climate change. This approach aids resource managers in their decision-making roles using the best scientific information available. It would also illustrate how the NSSI is integrated into other science programs both internal to NSSI membership and external science from other sources, nationally and internationally.

Species-specific information should be considered in an ecosystem or landscape context to ensure that results of inventory, monitoring, and research projects could be shared, merged and linked to other projects. Context provides the foundation for effective development of cause-effect relationships.

Those projects in which NSSI is a partner should be conducted at all scales, defined by user requirements and be of benefit to a wide user base of agencies, governments, non-governmental entities, academia, public and the greater pan-Arctic community.

The NSSI should be at the forefront in the use of local and traditional knowledge. It will be important to develop a process for partnering with other groups (North Slope-wide and pan-Arctic) who are also using local and traditional knowledge in their programs.



Atigun Pass tundra plants. (USFWS)

## Progress and Accomplishments of the North Slope Science Initiative\*

Using the feedback from the early workshops, as well as information from the Senior Staff Committee, Science Technical Advisory Panel and the Oversight Group memberships, several preliminary directions were developed that the NSSI could begin implementing in its first few years. These included the following:

Develop a public website for the NSSI.

Initiate a database of ongoing North Slope projects.

Design a data management and information sharing system for North Slope science.

Address and monitor hydrologic processes on the North Slope.

Gather and coordinate a consistent and accurate vegetation baseline for the entire North Slope.

Design and deploy a water quality and bathymetry system to reduce logistical and laboratory costs while providing highly accurate information.

Partner with USGS, the State of Alaska, and others to create updated and higher resolution digital information layers to use for evaluating and planning future activities.

Implement efforts to coordinate and collaborate with academic institutions, National Science Foundation, U.S. Arctic Research Commission, non-governmental organizations, industry, Interagency Arctic Research Policy Committee and the greater pan-Arctic community, and other initiatives such as Alaska Oceans Observing Systems and the North Pacific Research Board to share information, address management issues, and collaborate on common issues.

Collaborate closely with other Initiatives, such as Alaska Oceans Observing Systems and the North Pacific Research Board, and within the greater pan-Arctic community.

Despite early funding challenges, the NSSI has made considerable progress and accomplishments to date in addressing these initial directions and major progress on analyzing the science needs of the NSSI to meet emerging challenges (see Future Direction and Emerging Issues section later in this report). The NSSI has developed a public website (<http://www.northslope.org>); designed a data management and information system; developed a U.S. Arctic Project Tracking System; collaborated and networked with many national and international entities; developed and tested protocols for the development of a North Slope-wide digital land cover map for land use and vegetation associations; and, focused on technology to efficiently collect water quality parameters. Each of these areas has gained substantial footing and is on the way to being fully implemented, but funding limitations for the NSSI are either delaying or extending the timeframes for full implementation of many identified projects. The NSSI has also partnered with the USGS to deploy traditional hydrologic gauging stations in two strategic locations within the Arctic National Wildlife Refuge. However, the breadth of coverage, and thus our ability to understand broad hydrological processes, is severely limited by a lack of long-term and consistent funding and the ability to pursue cost-effective alternative technologies.

\* *Summaries of these and other accomplishments are outlined in the next section. How they relate to the legislative objectives of the NSSI, listed and numbered in a sidebar on page 2, is noted in parentheses at the end of each entry.*

## North Slope Science Initiative Website (<http://www.northslope.org>)

The NSSI website was developed as an “.ORG” site to reflect the diverse membership of the NSSI and to provide greater flexibility in both content and operation. The site operates through an Assistance Agreement with Michigan Technological University and is linked to information sites throughout the world that are actively involved in arctic issues and research. The NSSI website has internet map server (IMS) capabilities with a number of physical and biological data layers. The site continues to receive considerable traffic (over 35,000 visits/month average). The website was extensively updated and improved in 2009. For example, it is now the gateway to the Project Tracking System and Data Catalog. Since this site is the public interface of the NSSI, it will continue to be updated on an ongoing basis. (Obj. 7)

## Geographic Information Network of Alaska, NSSI Data System (GINA)

The successful establishment of a functional multi-entity geographic information and decision support system is a high value added function of the NSSI. In partnership with the University of Alaska, Geographic Information Network of Alaska (GINA), the Senior Staff Committee, and the STAP, and in coordination with other data warehouse efforts like the Alaska Marine Information System, this effort has now identified over 230 potential data layers that could be used in evaluating the ecosystems on the North Slope and its off-shore environment.

The screenshot shows the NSSI Data Catalog interface in a Mozilla Firefox browser. The page title is "North Slope Science Initiative :: NSSI Catalog - Mozilla Firefox". The URL is "http://catalog.northslope.org/#catalog". The page features a search bar with the following fields:

- Contains text: [ ]
- Starts before: [ ]
- Ends after: [ ]

Below the search bar is a map of Alaska with a search bar and a "Search" button. The main content area is titled "Data Products" and contains a table with the following columns: Name, QCMD Theme, Begin Date, and End Date. The table lists 125 data products, including:

Name	QCMD Theme	Begin Date	End Date
ADFO Anadromous Streams	Salmons/Trouts	1997/06/29	2002/01/20
ADFO Habitat - Hump	Brown Algae	1997/06/29	1997/06/29
ADFO Habitat - Polar Bear	Bears	1995/1/20	1997/06/29
ADFO Habitat - Spotted Seal (Line)	Seals/Gee Lions/Walrus	1997/06/29	1997/06/29
ADFO Habitat - Winterowl	Birds	1997/06/29	1997/06/29
ADFO MESA - Spotted Seal Habitat	Seals/Gee Lions/Walrus	1997/06/29	1997/06/29
ADFO MESA-Seaard Colonies	Birds	1995/1/20	1995/1/20
ADNR Administrative Large Parcels	Administrative Divisions	2001/1/2/8	2007/1/2/0
ADNR Alaska State Boundary 1:250,000	Political Divisions	1949/1/2/0	1980/1/2/0
ADNR General Land Ownership Status	Administrative Divisions	2005/1/1/0	2007/1/2/0
ADNR Hypsography 1,000 Foot Interval	Contours	1990/1/2/0	2007/1/2/1
ADNR Lakes 1:1,000,000 (Poly)	Lakes	1990/1/2/0	1991/1/2/0
ADNR Rivers 1:1,000,000 (Line)	Rivers/Streams	1990/1/2/0	1991/1/2/0
ADNR Rivers 1:1,000,000 (Poly)	Rivers/Streams	1990/1/2/0	1991/1/2/0
ADNR Towns and Villages	Administrative Divisions	1997/06/20	2007/1/2/0
ANMIR Boundaries	Unknown		
BLM AFS Fire History	Fire Occurrence	1949/1/2/0	2002/1/2/0
BLM AFS Fire Mgmt Option Boundries	Fire Dynamics	2002/04/25	2003/04/29
BLM AFS Fire Mgmt Zones	Fire Dynamics	2003/07/14	2003/1/2/0
BLM AM Towers	Communications	2004/06/13	2004/06/13
BLM Airstrip Runway Centerlines	Transportation	2004/06/13	2004/06/13
BLM Antenna Towers (Point)	Communications	2004/06/13	2004/06/13
BLM Camps (Point)	Cultural Features	2004/06/13	2004/06/13
BLM Cellular Towers	Communications	2004/06/13	2004/06/13
BLM Coal Thickness Contours	Coal	2004/06/13	2004/06/13
BLM Colville River 5 Mile Buffer	Rivers/Streams	2004/06/13	2004/06/13
BLM Detailed Existing Pipelines	Pipelines	2004/06/13	2004/06/13
BLM Detailed Lakes of Alaska	Unknown	1995/1/0/1	1995/1/0/1
BLM Exploratory Oil Wells in Alaska	Unknown	2002/01/01	2002/01/01
BLM Game Mgmt Line 25AD	Animals/Vertebrates	2004/06/13	2004/06/13
BLM Game Mgmt Line 26BD	Animals/Vertebrates	2004/06/13	2004/06/13
BLM Habitat - Brant	Ducks/Geese/Swans	2004/06/13	2004/06/13

The page also shows a search bar at the bottom with "Clear" and "Search" buttons. The status bar at the bottom indicates "Logged in as Guest User" and "Done".

Screen shot, NSSI Data Projects. (GINA)

In 2009, GINA implemented the NSSI Data System, accessible through the NSSI website (<http://www.northslope.org>), or directly at <http://catalog.northslope.org>, for access to imagery, scientific data and project information relevant to the North Slope. The system made over 200 GIS data layers available through this public portal. This effort is well on its way to becoming the “one-stop shop” it was envisioned to be and will serve as a comprehensive distributed network that offers geographic information specialists, managers, staff, academia, and the general public the opportunity to search for credible information about the North Slope and a link to a site for download and local evaluation. To help insure this is always up-to-date, the NSSI has tasked a STAP standing subcommittee on GIS/Remote Sensing to provide recommendations on content and operation. (Obj. 1-8)

## Project Tracking System (PTS)

The purpose of the Project Tracking System (PTS) is to make information readily available about ongoing activities by various entities on the North Slope and its off-shore environments. The PTS provides information on who, what, where and when of activities. The database began with a spreadsheet of 571 ongoing projects, with the goal of periodically updating information on new project starts. In 2009, the PTS became operational and is now populated with some 1,200 project records representing the work of over 100 public and private institutions and over 800 individuals. These projects are searchable by subject, by agency or entity, and by research principal investigator. The National Science Foundation is among the agency and industry entities who have provided access to their current research records. Development of PTS’s format was based on similar project tracking

The screenshot displays the North Slope Science Initiative (NSSI) project database interface. The page is titled "North Slope Science Initiative" and "NSSI Data Products & Project Tracking". It features a search bar on the left, a map of the North Slope region, and a list of project records on the right. The project records are organized into a table with columns for Title, Status, Agency, PI, and Start Date.

Title	Status	Agency	PI	Start Date
"Sleazy" gray whale investigations	Ongoing	NOB, TBRO	Rosa, Cheryl	2008
146 and 150 deposition in the snow: year round measurements at Summit, Gror.	Complete		Wagnerbach, Dietmar	1997
2009/2010 Alpine Lakes Water Resources	Ongoing	CPAI, MELJ	Rothwell, Sally	2008
2009/2010 Ice Bridge Monitoring	Ongoing	CPAI, MELJ	Rothwell, Sally	1998
A Collaborative Proposal on Particle Dynamics in an Arctic Ecosystemic Role of Br	Complete	NSF	Deming, Jody	1997
A Collaborative Study of Prolonged Production and Trophic Transfer to Predator	Complete	NSF, UNE, UAW	Swanberg, Neil	1999
A Comparison of Metal Accumulation in Arctic and Temperate Marine Organisms	Complete	NSF	Fisher, Nicholas	2000
A Field Test of The Subsurface Ice Probe	Complete	NASA	Behar, Alberto	2006
A Survey of Living Conditions in the Arctic Inuit, Saami and the Indigenous Peop	Complete	NSF, UAA	Yrute, Jack	2000
A Watershed-Scale Hydrologic Process Study of Lake Et'gygytyn: A Pilot Project	Complete	NSF, UAF	Nolan, Matthew	2000
A half century of change in Arctic Alaskan stratus: a photographic based assess	Complete	NSF, CREEL	Sturm, Matthew	2001

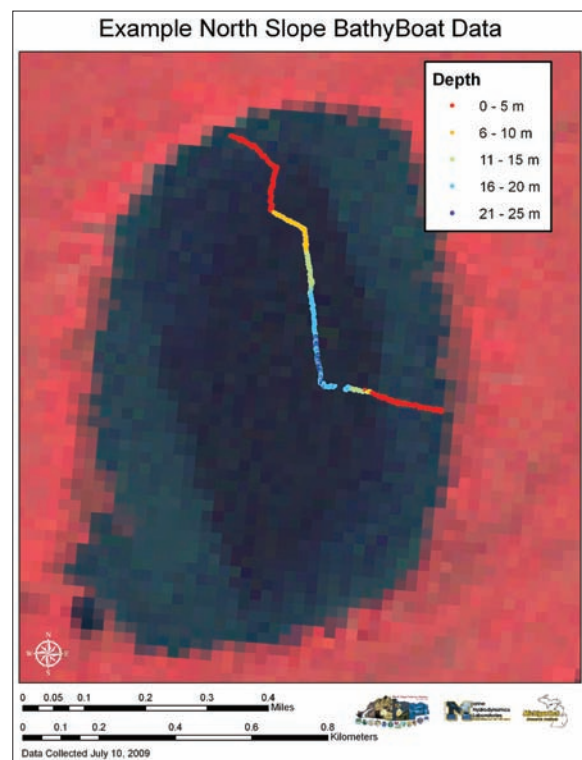
The interface also includes a "Simple Search" section with fields for "Contains text:", "Starts after:", "Ends before:", "Status:", "Agency:", "Contact:", and "Data source:". A "Region Map" section shows a map of the North Slope region. The bottom of the page indicates "Logged in as Guest User" and "Ver: 1.6d800".

Screen shot of NSSI project database. (GINA)

systems implemented by the North Pacific Research Board and Alaska Oceans Observing System. While these two systems focus on the statewide marine environment, the NSSI has developed an interoperability with PTS that tags their project records based on geographic location in the Arctic and displays the information to the end user. The PTS user interface continues to be refined with planned additions of terrestrial geographic locations of projects, sorted project information printing capabilities and links to project websites. Equally important, the PTS system design allows for inter-operability between existing and complimentary systems. The PTS may be accessed through the NSSI website or directly at <http://catalog.northslope.org>. (Obj. 4, 5, and 7)

## Automated Water Quality and Bathymetry Assessments (ALWAS)

As North Slope lakes shrink and salt water intrusion changes the chemistry and water quality, data collection continues to challenge industry and agencies responsible for land and water management, as does the establishment of baseline parameters for the detection of change in the future. Costs related to the traditional methods of water sampling and bathymetry are also enormous, running from a low of \$10,000 to over \$25,000 per lake (industry estimates). In partnership with Michigan Tech Research Institute and the University of Michigan, NSSI has supported development of efficient and accurate remote sensing technology to collect water quality and bathymetry parameters. The first generation device was so successful that deployment of a second generation device, a compact autonomous “Bathy-Boat” that can be pre-programmed to return to its deployment location, was deployed in the summer of 2008. Additional deployments are scheduled for 2009. Up to 20 water quality parameters, plus bathymetry, are transmitted to a ground station to provide information in near real-time (no additional expensive laboratory analysis is needed). This reduces the cost per water body by roughly tenfold to between \$1,000 and \$2,000, and greatly expands the number of locations that can be sampled in the brief sampling season on the North Slope. In 2009, this project has been adapted to compliment studies by the USFWS and USGS to evaluate yellow-billed loon habitat. The planned 2009 deployment will also re-evaluate several lakes that were tested for water quality in the early 1980’s within the Arctic National Wildlife Refuge. (Obj. 1-8)



Bathyboat track. (MTRI)



ALWAS “Bathyboat” ashore. (MTRI)

## Hydrologic Gauging Stations

A solid understanding of the current and future hydrology of the North Slope was identified in the public workshops as a high priority need, since water availability may be a limiting factor for both energy development and species survival, as well as a factor that could see significant alteration in the face of climate change. In addition, NSPD 66 and HSPD 25 (January 9, 2009), specifically require the United States to identify opportunities for international cooperation on North Slope hydrology and other issues [Section III (G)(4)(h)]. The initial design for increasing this understanding was to establish a network of traditional hydrologic gauging stations across the North Slope. While several agencies have individually planned or implemented some of these stations at key locations, many have not been maintained due to the lack of a consistent funding source. This hit or miss approach can leave the responsible agencies without the information necessary for permitting bridges, facilities and infrastructure, or to define the instream flow or wintering habitat needs of aquatic species.

USGS is the lead federal agency generating hydrologic information for the nation. However, the cost of deploying, operating and maintaining a network of hydrologic stations on the North Slope of Alaska is four to five times more costly than similar stations in the Lower 48 states. As a matter of practice, most gauging stations in the Lower 48 states can be accessed on a road system and equally as important, can be maintained on a year-round basis, even in winter months. The placement, operation and maintenance of the traditional hydrologic gauging stations on the North Slope means they are not accessible except by helicopter, or in some cases, fixed wing aircraft, and the stations must be removed and stored during the winter months to avoid irreparable damage to equipment caused by ice. These challenges are in addition to the challenges of defining riverine flow during “break-up.”



**Ublutuoch River Summer Flow.** (BLM)



**Ublutuoch River Spring Breakup.** (BLM)

USGS funds several gauges on the North Slope, but does not have funding to fully cover this need. In 2009, the NSSI continued a partnership with USGS by jointly funding two gauging stations on the Canning and Tamayariak rivers. These two stations were the first stream gauges in the Arctic National Wildlife Refuge, the furthest northeast gauges in Alaska, and the first hydrological data collection in this area since the early 1970s. With costs of maintaining each of the stations possibly as high as \$80,000 a year per station, this makes the placement and NSSI support of additional stations, questionable in the future. Pending appropriations, the NSSI will continue to support the deployed gauges in the near term

through an interagency cost-share agreement with USGS. In addition, the NSSI has tasked its STAP to investigate alternate technologies to gather information of sufficient quality to comply with engineering requirements. (Obj. 1-8)

## Digital Land Use/Land Cover and Change Detection

The NSSI is working to bring North Slope land cover maps into the digital age. Approximately 55 different land cover products have been completed across the North Slope. Many of these products support a localized research project, some are more regional in scope using field data for validation, and others are computer-generated maps with no field validation. All of these products have a common element: no products actually used a standardized protocol that could combine efforts into a single highly accurate map. Portions of the North Slope are also thought to have changed dramatically since the land cover products were initiated. This is why no common, up-to-date land cover protocol or database exists across the North Slope.

A consistent and accurate land cover database is needed to provide a strong baseline for any geographic information system (GIS). Dependable land cover information is critical to interpreting landscape integrity, current and future wildlife habitat availability, and even to help parameterize habitat-based models of carbon sequestration.

The expense and potential redundancy involved in starting a quality land cover mapping system for the North Slope has prompted the STAP through its public workshops, to recommend the NSSI work with

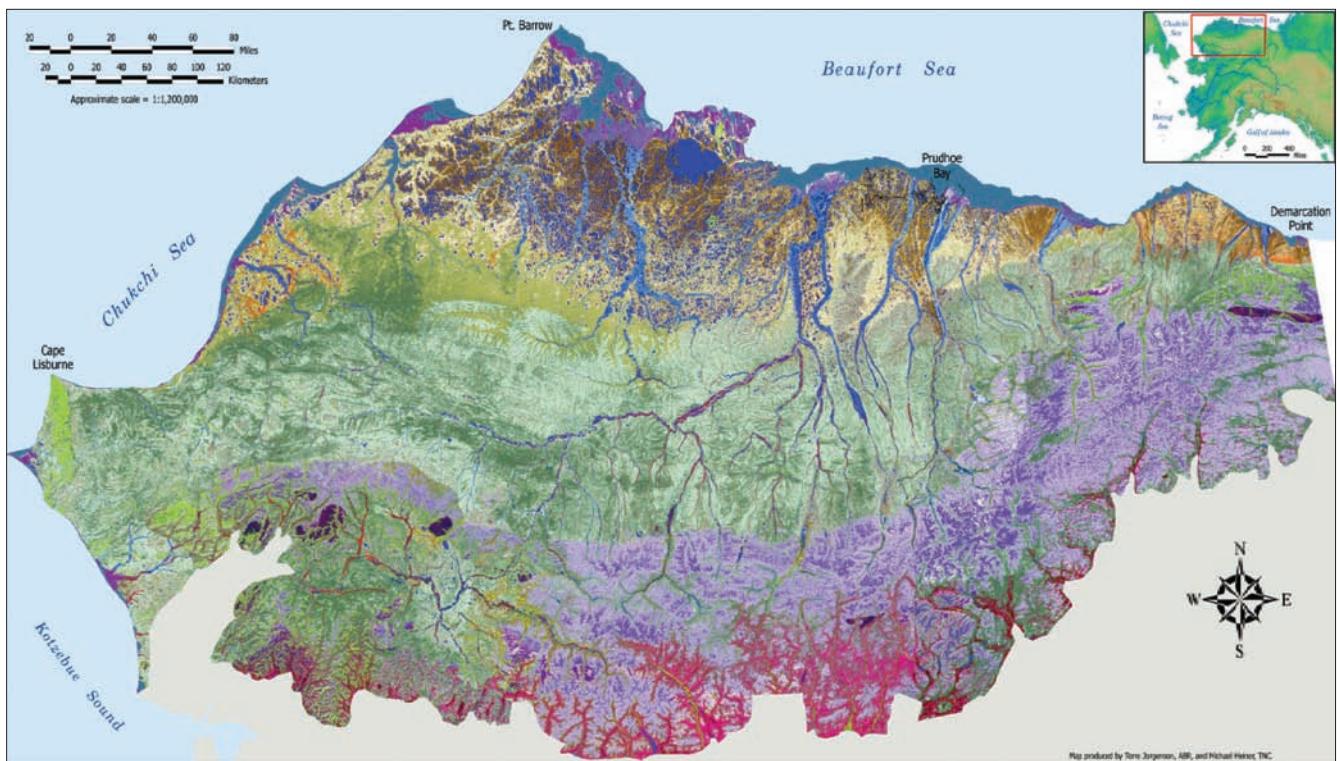


Figure 4: Land coverage map of North Slope. (Torre Jorgenson, ABR, Inc. and Michael Henier)

the National Landfire Program (<http://landfire.gov>). Landfire products are primarily aimed at assessing fire potential and are not robust enough by themselves to use for future assessments of change on the North Slope. However, the STAP determined that the confidence level of Landfire products can be reached through greater field validation (particularly of wetland complexes). In the spring of 2008, the NSSI established a partnership with Landfire, with independently developed protocols and a proof of concept field validation component. The protocols are now used for planning a greater, North Slope-wide field data collection during the summers of 2010 and 2011. The combined NSSI and Landfire capacities will be a far better product for the North Slope, with a revised land cover map due in late 2011. (Obj. 1-7)

## Workshops

A significant added value to the NSSI is the ability to hold independent (or partnered) workshops to address the status of knowledge and information needs for issues that cross administrative and political boundaries. Since the 2008 NSSI Report to Congress, five additional workshops have been completed and another is scheduled for the fall of 2009. (See workshop summaries below) In addition, the NSSI is working toward a comprehensive “status of our knowledge” workshop to bring agencies, academia, industry, non-governmental organizations, and the public together to share knowledge and increase understanding of the North Slope and its offshore environments, threats, and directions. The NSSI Oversight Group also frequently hosts guest presenters at its meetings for internal and external cross-jurisdictional information sharing. A summary of some of these presentations is presented in Appendix 4, and other forms of internal and external communications are expanded upon in later sections of this report.

(Obj. 1-7)

### *North by 2020 — A Forum for Local and Global Perspectives on the North: Reducing Environmental Impacts of Arctic Coastal and Offshore Oil and Gas Exploration (November 12-14, 2008, in Barrow):*

The NSSI co-sponsored the forum with the University of Alaska Fairbanks, U.S. Department of State, Alaska Oceans Observing System and the North Slope Borough. This local workshop addressed key questions centering on how technological advances, local knowledge, science, and adaptive management can together minimize the environmental risks and impacts of offshore oil and gas development, particularly in the exploration phase. Ninety participants from the North Slope, industry, government, academia, Canada, and Norway, with expertise in Iñupiat environmental knowledge, Arctic technology, spill prevention and response, management regimes, stakeholder involvement, and natural and social sciences, came together to exchange information and address challenging questions in an open “classroom” setting. Sessions on reducing discharges and noise, and spill response featured presentations on local concerns, state-of-the-art technologies, and integrating science and local knowledge. These sessions were followed by constructive discussion of key questions requiring further clarification or research. Such an approach may not always be possible in the types of consultations that are part of the regulatory process. The forum concluded with small groups identifying shared values and the next steps in research and information exchange.





U.S./Canada Oil and Gas Research Forum. (NSSI)

*United States and Canada, Northern Oil and Gas Research Forum—Current Status and Future Directions for the Beaufort Sea, North Slope, and Mackenzie Delta (October 28-30, 2008, in Anchorage) (future forums planned):*

The U.S. and Canada share a history of oil and gas exploration and development in the Beaufort Sea and adjoining coastal areas. Currently, both countries are considering proposals for the transmission of natural gas

resources to southern markets, as well as ongoing exploration and development of oil and gas resources. Both countries have also undertaken significant research in support of the environmental assessment and regulatory processes associated with oil and gas development. This research is important because it enables governments and industry to fulfill their responsibilities to the public and ensures that oil and gas development minimizes environmental and social impacts and supports economic development. This NSSI co-sponsored joint forum provided opportunities for United States and Canada scientists, industry and regulators, to: (1) share information about research programs; (2) discuss future directions for northern oil and gas exploration and development; (3) become better informed about existing research and how information is used in decision-making; and, (4) discuss future opportunities for international collaboration. The forum was attended by over 300 individuals representing six countries. The two nations are planning such research forums as a bi-annual event for the future.

*Lessons from Continuity and Change in the Fourth International Polar Year (March 4-7, 2009, in Fairbanks):*

The NSSI partnered with the University of Alaska Fairbanks and the Inland Northwest Research Alliance to organize a symposium focused on the lessons learned from polar research and elsewhere that can inform studies of the Arctic. While rapid change has been amplified in the Arctic, the entire Pacific Northwest is also undergoing rapid changes to its social and ecological systems due to similar economic, climatic, demographic and other forces. The responses to such external forcing have occurred across levels of governance, but rarely in a comprehensive or long-range fashion. Thematic sessions included:

- Coastal and Rural Communities
- Vulnerabilities and Adaptations
- Oil and Gas Development
- Balancing Interests and Sustainability
- The Future of Marine Ecosystems
- Freshwater Systems: Hydrological
- Security in the Face of Rapid Change
- Local, Traditional and Indigenous Knowledge

The symposium had nearly 300 participants, with representation from all eight Arctic nations, and numerous government entities and academic institutions throughout the world. The keynote speaker was Dr. Murray Gell-Mann, a Nobel Prize recipient for his work in physics.

*Fish and Fisheries of Alaska's Arctic (Alaska Chapter, American Fisheries Society, October 2008, in Anchorage) and the International Arctic Fisheries Symposium (planned for October 2009, in Anchorage):*

Observed and expected changes in ocean conditions and North Slope hydrology, potential new demands on North Slope water supplies, and predicted shifts in species composition all add up to a major concern for the fish and fisheries of the North Slope and its offshore waters. In October of 2008, the NSSI sponsored a session



**Arnold Brower, Sr. (deceased), former STAP member, subsistence fishing.** (Gordon Brower, NSB)

at the Alaska Chapter American Fisheries Society meeting to focus on these concerns. The session highlighted ongoing work and emerging information on fish in America's Arctic. Speakers from federal, state, borough and private organizations discussed how aerial surveys and genetic analysis are helping us understand stock origins, movements and overwintering patterns; what salmon are feeding on and how they are growing in the Chukchi Sea; how traditional local knowledge can inform fish research and add focus to our questions; new data on the distributions of fish and invertebrates (like arctic cod, Bering flounder, opilio crabs, and an amazing abundance of brittle stars); new knowledge about range extensions; and, even new discoveries of previously undescribed species. Evidence was presented on how climate change shifts in nearshore ocean currents may affect the movement of important subsistence species across international boundaries. Perhaps the strongest conclusion of the session was that we know far less than we need to know if we are to manage the fish and fisheries of America's Arctic in a sustainable way. This precarious state was fully reflected in the session's plenary talk that outlined the newly released "Arctic Fishery Management Plan." The plan largely prohibits commercial fishing in the Arctic Management Area until information improves. This precautionary and scientifically-informed approach retains options for addressing future management issues in light of climate change and the potential long-term effects from these changes on arctic ecosystems. The session's outcomes made it obvious that fish and fisheries management concerns in America's Arctic must be understood and engaged in within the broader circumpolar context. To that end, the NSSI will be co-sponsoring the International Arctic Fisheries Symposium in Anchorage in October 2009, with participants from around the Arctic and with both legal and scientific experts to help frame the discussion.

**Data Integration:** With the advent of modern data storage capacities and distribution of network technology, combined with the renewed and diverse interest in Alaska’s energy development and climate change, multiple parties have created a variety of databases for specific purposes (Figure 5). For decision makers, commonality in data and the translation into visual information is often its most useful form. Data integration workshops help facilitate links between GINA and other databases, enhance data sharing partnerships and protocols, and improve data integration and visualization. A second important part of data integration is to know what types of research (or other information gathering activities) currently occur on the North Slope and its marine environments. The NSSI’s Project Tracking System facilitates communication and coordination between entities interested in studies in the Arctic.

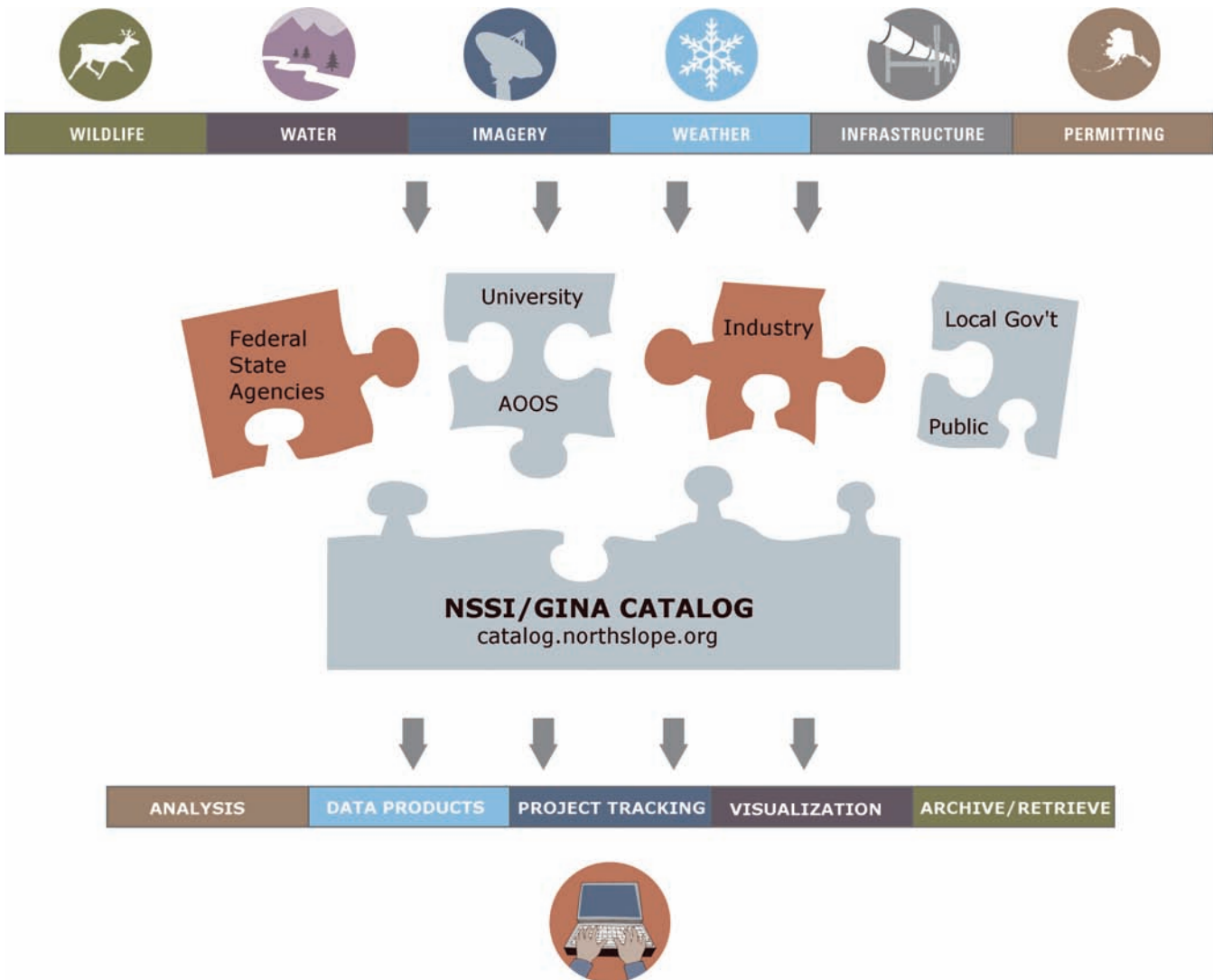


Figure 5. Using GINA to improve data integration and visualization. (GINA)

## Coordination and Cooperation

One of the primary goals of the local, state, and federal partners in forming the North Slope Science Initiative was to improve upon their awareness and collective understanding of each others' missions, management concerns, and science needs. This purpose was solidified under the enabling legislation that emphasized coordination of ongoing and future inventory, monitoring and research activities and cooperation among NSSI parties and the broader scientific community. The structure and organization of the NSSI was designed to enable, and NSSI leadership has promoted, the communications needed to accomplish this purpose.

### *NSSI Internal Communication*

Even prior to the formation of the NSSI, the various member organizations had each been supporting a range of inventory, monitoring and research activities. That level of ongoing activity continues, but the substantial benefit of the organizational structure of the NSSI is that both the principals (Oversight Group) and their senior staff now regularly communicate and coordinate with each other on new and ongoing projects. The Oversight Group meets a minimum of four times a year and the Senior Staff Committee meets a minimum six times a year to discuss North Slope agency specific issues and the use of science for better decision-making. In addition to the normal agenda for each of these meetings, there is an annual meeting of the Senior Staff Committee to introduce new agency initiatives and report on the progress of ongoing projects. These meetings provide an opportunity for each member organization to understand what others are planning and to identify and benefit from the efficiencies afforded through collaboration and coordination in both gaining knowledge and sharing resources (monetary and human capital). All of the 2009 accomplishments detailed in the previous section benefited from NSSI-assisted coordination. Such interface also helps determine future information needs by using these forums to raise and mutually discuss emerging management questions (see the Future Directions section). (Obj. 1-7)

### *NSSI Member Agency Cooperative Science on the North Slope*

The NSSI has also provided a forum for its members to build on their own agency's study or research programs. Each year, senior staff from the member agencies gather to present their individual agency projects planned for the upcoming fiscal year. This forum provides a basis for additional cooperation or collaboration that is focused on the work each agency is planning within their mandates. Some of the coordinated science efforts of each NSSI agency that has an operational component on the North Slope are summarized below:



***Bureau of Land Management (BLM):*** The BLM's Arctic Field Office manages the National Petroleum Reserve-Alaska (NPR-A) on the western North Slope. The BLM's mission in the NPR-A is to contribute to the nation's domestic production of oil and gas resources, while protecting the surface resources and their traditional uses by the local Native communities. The NPR-A is large, 9.3 million ha (23 million acres) and remote, making studies of those surface resources both expensive and logistically difficult. The



**Ice roads and pads are used for winter exploration to minimize permanent effects on the tundra. The BLM studies impacts to tundra vegetation from these activities. Above images are of the same location in March 2008 (left) and August 2008 (right). (BLM)**

BLM enhances its efforts to gain information about the NPR-A's surface resources and their use by cooperating with many other entities, thereby increasing the available knowledge, expertise and finances for research and monitoring. The BLM's partners this year (2009) include the North Slope Borough (NSB), the Alaska Department of Fish and Game (ADFG), the Minerals Management Service (MMS), the U.S. Fish and Wildlife Service (USFWS), the U.S. Geological Survey (USGS), the Alaska Natural Heritage Program, the University of Alaska, and ConocoPhillips Alaska, Inc. The BLM is the administrative agency for the NSSI and provides funding, contracting, agreements and procurement support, as well as office space. The BLM participates in identifying management needs through the interaction with the NSSI'S Oversight Group, Senior Staff Committee and Science Technical Advisory Panel.

This year's cooperative projects are diverse and include studies of caribou, an important subsistence resource; threatened (Endangered Species Act) spectacled eiders, Steller's eiders and polar bears; yellow-billed loons (Endangered Species Act candidate species); and several species of fish that are important to the Native subsistence culture. Additional biological studies investigate the distribution of rare plant species and the impacts to tundra vegetation of oil and gas exploration activities conducted during winter. A hydrological study is gathering multi-year data on stream flow of several rivers and recharge of lakes following winter water withdrawal by the oil/gas industry. A paleoecological study is addressing the effects of climate warming on the landscape, fauna and ecology of the North Slope over the last 15,000 years.

The caribou and fish studies will improve the BLM's, NSB's and State of Alaska's abilities to manage development of oil/gas infrastructure to minimize effects on caribou range use and movements and on fish movements through streams and lakes. Similarly, studies of species protected, or proposed for protection, under the Endangered Species Act will better enable the BLM and USFWS to permit oil/gas activities and other land uses without further jeopardy to those

species. Information on rare plants will allow the BLM to avoid management decisions that could lead to the need for protection under the Endangered Species Act, whereas monitoring the effects of winter exploration on common species of tundra vegetation informs the BLM, State of Alaska and oil industry on potential technology improvements and mitigation efforts for this off-road activity. Hydrological data are needed to engineer adequate stream-crossing infrastructure and gravel pads for oil field development (such as culverts, bridges and drilling pads), to protect both the infrastructure and the fisheries habitat. Important wintering habitat for fish is protected by determining how lakes recover after water withdrawal. The study of past climate change will inform all management agencies and the oil industry as to what situations might develop during future climate change. In summary, many valuable surface (biological and physical) resources may be affected by oil and gas exploration and development, but with sufficient knowledge, the managing agencies and the oil industry can minimize those impacts.



**Minerals Management Service (MMS):** The MMS manages and regulates oil, gas, and renewable energy projects on the nation's Outer Continental Shelf. The Beaufort and Chukchi Sea planning areas off the North Slope cover about 73 million acres, but only about five percent of this area is currently leased. The MMS Alaska Environmental Studies Program currently manages and funds more than 50 ongoing study projects across the disciplines of physical oceanography, biology, endangered species, and social sciences.

In the Beaufort Sea, MMS continues to fund research to monitor ocean circulation, sedimentation, ice dynamics, whale migration, fish distribution, and potential effects on social systems and subsistence activities across the Beaufort Sea and in the vicinity of operations at the Northstar and Liberty oil fields. In the Chukchi Sea, MMS is funding a new suite of studies to research and monitor marine mammals, fish, birds, benthic fauna and sedimentation, ice dynamics and oceanographic conditions, offshore subsistence hunting, and community resilience through sharing networks.

The MMS Alaska 2009 research budget exceeded \$12 million, with well over half of current projects conducted with partners from other federal, state, and local government or science-oriented institutions. Some of these partners include the National Oceanographic Partnership Program, the USGS Biological Resources Division, the National Marine Mammal Laboratory of the Alaska Fisheries Science Center (NOAA-NMFS), the University of Alaska Fairbanks Coastal Marine Institute, ADFG, and the North Slope Borough Department of Wildlife. A list of MMS fiscal year 2009 new and ongoing projects is available at [http://www.mms.gov/alaska/ess/ongoing\\_](http://www.mms.gov/alaska/ess/ongoing_)



**Oceanographic sampling during MMS/NMFS BOWFEST project.** (Carin Ashjian, WHOI)

[studies/09\\_ong.pdf](http://www.mms.gov/alaska/ess/essp/sp2009.pdf) and more detail can be seen in the Annual Studies Plan, available at <http://www.mms.gov/alaska/ess/essp/sp2009.pdf>.

Two excellent examples of broad coordination efforts include whale feeding and environmental monitoring projects.

1. MMS is funding a multi-disciplinary effort in arctic research through the current \$7 million study entitled “Bowhead Feeding Variability in the Western Alaska Beaufort Sea.” This study combines targeted oceanographic sampling with biological sampling and satellite tracking of individual whales (involving Alaska Native whalers and traditional knowledge). It will expand understanding of whale behavior and improve predictions about where and when aggregations of feeding whales are likely to occur.
2. Beginning in fiscal year 2009, an important multi-lateral project coordinated within the NSSI is a social science project, “Aggregate Effects Research and Environmental Mitigation Monitoring of Oil Operations in the Vicinity of Nuiqsut.” This MMS-funded study will benefit from a steering committee comprised of representation from MMS, BLM, USFWS, and ADFG. The study involves cumulative impact research across federal and state oil development projects, both onshore and offshore. Likewise, through NSSI coordination, BLM joined with MMS, USGS, and USFWS in a new multi-lateral polar bear project (fiscal year 2009) that includes the oil and gas prospects of the NPR-A.

Collaboration continues on new research projects proposed for fiscal year 2010. At least five of the anticipated new or extended MMS projects will be conducted as Interagency Agreements with various departments of NOAA. Also, several more new projects are anticipated through collaboration with the Coastal Marine Institute at the University of Alaska Fairbanks.



**National Park Service (NPS):** Highlights of some of the coordination and collaboration on National Park Service-northern Alaska projects include:

**Moose movement in Game Management Unit 24 (includes Gates of the Arctic National Park):** The objective of this project is to capture and track moose for a multi-year study investigating seasonal moose movement. The information will be used to make informed decisions on sport and subsistence hunting seasons and regulations. Partners include ADFG, BLM, and USFWS.

**Caribou range conditions:** The Western Arctic Caribou Herd (WACH) is Alaska’s largest caribou herd and is heavily used for both subsistence harvest and sport hunting. It summers on the North Slope, but there are management concerns on its critical winter range as well. This WACH winter range study that has three objectives: 1) quantify the amount of wildfire that is present on the landscape for the past 55 years; 2) determine factors that correlate with caribou distribution; 3) model the effects of difference climate scenarios on the quantity and quality of available winter range. The information will be used to determine when management actions should

be triggered regarding management of the herd, fire suppression strategies, and seasonal migration changes due to changing conditions. Partners include ADFG, BLM, and USFWS.

**Western Arctic Caribou Herd (WACH) Working Group Support:** A Challenge Cost-Share Agreement has been executed to support the WACH Working Group annual meeting, publication of the 2009 edition of “Caribou Trails,” and aircraft charter for participants with the Onion Portage project. Partners include ADFG, BLM, USFWS, and the Northwest Arctic Borough School District.

**Ecology of Smith’s Longspurs in Northern Alaska:** This study focuses on population abundance and distribution, demographic parameters, habitat requirements, and basic biology. Information gained will help in developing effective conservation measures. Partners include USGS and USFWS.

**Snowshoe Hare Ecology Project and Contaminant Analysis:** This traditional knowledge project has been ongoing for several years. Partners include residents of Wiseman and UAF-IAB.

**Cadastral Survey at Anaktuvuk Pass:** Cadastral surveys create, mark, define, retrace, or reestablish the boundaries and subdivisions of the public lands. In this project, the NPS is working with several interests so that the impact to subsistence caribou hunters and wilderness resources will be minimized. Partners include BLM, Arctic Slope Regional Corporation, Nunamiut Corporation, Village of Anaktuvuk Pass, and City of Anaktuvuk Pass.

Additional proposed collaborative projects include:

**Chandler Lake Clean-Up:** This is a proposed clean-up effort to remove over 100 55-gallon fuel drums and nearly 1000 5-gallon fuel cans. Partners will include the Arctic Slope Regional Corporation, Nunamiut Corporation, Village of Anaktuvuk Pass, and a DoD contractor.

**Tundra Fire Climate Modeling:** Objectives include quantification of the links between climate and fire within key tundra vegetation types and application of statistical models linking climate and tundra area burned to the future. Partners include BLM, University of Alaska Fairbanks, and Montana State University. The proposed study has benefited from an ongoing project looking at the paleo tundra fire regime (lake coring) that continues in partnership with the BLM.



Smith's Longspur. (NPS)

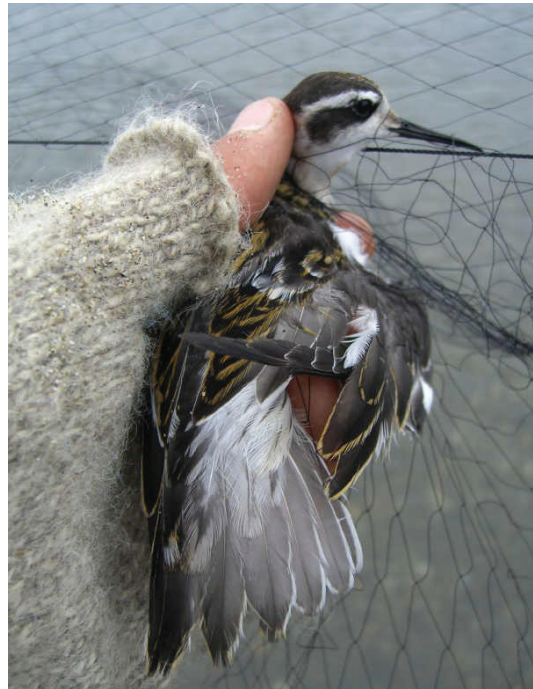




### *U.S. Fish and Wildlife Service*

**(USFWS):** The USFWS mission is to work with others to conserve, protect and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people. The Service's mission is thus cooperative in nature.

In 2009 on the North Slope, the USFWS will collaborate with other federal and state agencies (BLM, USGS, MMS, NPS, U.S. Department of Agriculture, and ADFG), local governments (North Slope Borough, Native Village of Barrow, and Native Village of Kaktovik), non-governmental organizations (BP, ConocoPhillips, ABR, Wildlife Conservation Society, Manomet) and universities (University of Alaska Fairbanks, University of Wyoming, and University of Texas) to conserve trust resources.



**Red-necked phalarope in mist net.** (Brad Winn)

On the Arctic National Wildlife Refuge in the northeast corner of Alaska, the USFWS will work with others to document distribution and abundance of pre-migratory shorebirds staging in coastal areas; investigate breeding ecology, abundance, distribution, and habitat associations of Smith's Longspurs; abundance, distribution, population structure, reproductive success, and survival of muskoxen in northeastern Alaska; continue data collection on the Porcupine Caribou Herd; and climate change studies including permafrost, vegetation, weather, and coastal erosion studies. Off-refuge studies include a long-term shorebird phenology study across the North Slope.

The majority of other cooperative studies on the North Slope concern species listed under the Endangered Species Act (ESA) as threatened or candidate species for listing. The USFWS is working very closely with multiple partners to conserve Steller's eiders (threatened under the ESA). Activities range from the biological (breeding pair surveys, nest surveys) to the social (myriad outreach activities with Native partners). The USFWS is working cooperatively with the NSSI, BLM, and USGS to determine the parameters (hydrological characteristics, prey species, disturbance) that make lakes suitable for nesting by yellow-billed loon (an ESA candidate species). The USFWS is also working with collaborators (USGS, ADFG, universities) to determine polar bear survival, distribution, and migration.

The USFWS continues to work with a variety of partners to identify areas of common interest and to promote collaborative efforts to improve the quality of information available to support management decisions. As climate change continues to impact northern latitudes disproportionately, the USFWS and other managers will increasingly depend on collaborative partnerships with specialists from other disciplines to conserve trust resources for future generations.



**National Marine Fisheries Service (NMFS):** NOAA Fisheries' Alaska Region and Alaska Fisheries Science Center (AFSC) are responsible for management of and research on living marine resources in the coastal oceans off Alaska. Because resources for arctic research are typically scarce and there is critical expertise in many different agencies, organizations, and universities, collaboration has been a key component of many of NMFS' Arctic studies.

Until recently, the AFSC supported only a modest level of arctic research.

Some examples include:

The National Marine Mammal Laboratory participated in assessments of the bowhead whale population dynamics and stock structure in cooperation with the NSB.

The Bering-Aleutian Salmon International Survey has been studying the effects of climate change on oceanography and fish communities for many years, and has recently extended survey effort to the Chukchi Sea. Collaborators include the University of Alaska, North Pacific Anadromous Fish Commission, Woods Hole Oceanographic Institution, Russian-American Long-term Census of the Arctic, USFWS, and the Evergreen State College.

Several collaborative studies of the four species of ice-associated seals have been implemented in recent years. Surveys were conducted with the Army Corps of Engineers to better understand local population densities in areas of proposed development near Red Dog Mine. Ice Seal Committee staff participated as part of the field team on recent ice seal surveys from both U.S. Coast Guard icebreakers and NOAA ships.

The Alaska Region has conducted inventories of nearshore schooling fish in shallow marine waters of the Arctic in collaboration with the Army Corps of Engineers and the North Slope Borough.

In 2009, the National Marine Mammal Laboratory evaluated the use of an unmanned aircraft system in surveying for ice seals in the Bering Sea. This project was conducted by NMFS and the University of Alaska Fairbanks, with additional support from the Navy.

Since 2006, the AFSC's Arctic research program increased dramatically with the receipt of funds from the Minerals Management Service for a variety of collaborative studies on marine mammals and fish in the Chukchi and Beaufort Seas. Some key collaborative projects between NMFS and the MMS are described in the MMS Alaska Environmental Studies Program section of this report. A final notable collaboration supported by MMS funds is



Spotted seal at ice edge. (NMFS)

the Beaufort Sea marine fish survey, which used bottom trawl and acoustic surveys to assess the distribution and abundance of benthic and pelagic fish. This study was led by the Resource Ecology and Fisheries Management program of the AFSC; collaborators included the University of Alaska Fairbanks and the University of Washington.

NMFS anticipates that the importance of collaborations is likely to increase in the future, as many of the most important questions that must be addressed are interdisciplinary in nature (such as, effects of climate change on animal distribution) and require expertise in topics such as climate, weather, and physical oceanography, which are not NMFS' strengths. The NMFS/AFSC anticipates that the past productive collaborations with local, state and federal agencies, non-governmental organizations, Alaska Native organizations and universities will continue to be an important component of most of our research in the Arctic.



**Alaska Department of Natural Resources (ADNR):** ADNR manages state-owned lands on the North Slope. These lands are largely between the Canning and Colville Rivers and the tidelands across the slope within three miles of the coast. These lands consist of almost 9 million acres of uplands and 2 million acres of tidelands. ADNR's mission is to develop, conserve, and enhance natural resources for present and future Alaskans. On the North Slope this largely involves managing lands for oil and gas development while minimizing impacts on other resources and users.

Information on fish, wildlife, subsistence uses, geology, and other resources are important when preparing oil and gas lease sales. Information on weather and climate is used when making day to day decisions on managing access to remote exploration areas.

This year the ADNR Division of Geological and Geophysical Surveys will continue conducting petroleum related geological studies on the North Slope of Alaska. This work is being done in coordination and collaboration with the ADNR Division of Oil and Gas, University of Alaska Fairbanks, and the USGS. This research will focus on economically significant strata and topics relevant to oil and gas exploration in the Brooks Range foothills and east-central North Slope of Alaska.



**Evaluating changes to vegetation after winter tundra travel. (ADNR)**

The ADNR Division of Mining, Land and Water is coordinating with the Alaska Department of Transportation and Public Facilities and the University of Alaska Fairbanks in the collection of hydrologic and meteorological data needed for road engineering design. This data is also useful for determining when off-road travel may be conducted without impacting tundra resources. In the past this work focused on the eastern Brooks Range foothills. This year the area will include the foothills west of the Dalton Highway.



*Alaska Department of Fish and Game (ADFG):* ADFG has responsibility to assure the sustainability of all fish and wildlife on all lands and waters in Alaska, including all lands of the North Slope. The State of Alaska's management authority over all fish and wildlife is only diminished by specific acts of Congress, such as the Marine Mammal Protection Act. Under Alaska law, subsistence use of fish and wildlife by Alaska residents is a priority over other consumptive uses on all lands except where subsistence use is not allowed. Under the Alaska National Interest Lands

Conservation Act, federal agencies are responsible for assuring that subsistence uses by federally qualified rural residents on federal public lands are granted a priority over other consumptive uses of fish and wildlife. In exercising that responsibility, federal lands may be closed to harvests by non-federally qualified users. The State of Alaska and the Federal Subsistence Board (USFWS, NPS, BLM, BIA, and USFS) maintain a Memorandum of Understanding to coordinate management of subsistence use on federal lands. ADFG also coordinates with federal agencies and international organizations that share responsibilities for marine mammals and migratory waterfowl.

The primary focus of ADFG research and management on the North Slope are species subject to subsistence harvests (caribou, moose, bear, wolf, musk ox, walrus, seals, whales, whitefish, Dolly Varden, lake trout, and salmon) and the subsistence uses of these species. ADFG is currently working on a number of cooperative projects that relate to energy development, primarily through the linkage of the effects on subsistence users and uses, including:

Resident fish studies (abundance and harvest monitoring) with various agencies.

Assessments of climate impacts on salmon distribution along the North Slope streams with various partners.

Caribou studies (abundance, health indices, and harvest assessment) with BLM and NSB.

Musk ox studies (abundance, distribution, and calving success) with USFWS.

Moose and caribou (abundance, browse, and health indices) with the NPS.

Whale studies (TEK) with the NSB, the Alaska Eskimo Whaling Commission, several village Whaling Captain's Associations, and NMFS.

Walrus studies (TEK) with the USGS, NSB, and USFWS.

Polar bear (human-bear interaction, movement, abundance, and research methods) with the USGS and USFWS.

Grizzly bear (movement and research methods) with BP Exploration and ConocoPhillips.

Studies of subsistence sharing networks and use of fish, caribou, and furbearers with the NSB, BLM, NPS, and MMS.



**ADFG biologist Tony Hollis prepares to collar tranquilized moose in a movement study partnered with NPS. (NPS)**



**North Slope Borough (NSB):** The NSB is the municipality that serves the Arctic coastal region and manages and permits land use through Title 19 of the NSB Code of Ordinances and the NSB Coastal Management Program. The Borough strives to balance the economic needs of its eight North Slope communities with the traditional subsistence practices of the Iñupiat who depend on these lands for their spiritual, cultural and nutritional needs. The NSB Department of Planning and Community Services and Department of Wildlife Management play active roles in documenting the traditional land and wildlife practices of the region's residents.

For more than 20 years, NSB has actively monitored and studied the ecology of wildlife species that are of particular importance to subsistence users. Research and monitoring conducted by NSB has largely been supported through grants and collaborative relationships with numerous federal and state agencies, non-governmental organizations, and universities. These include MMS, NOAA, NMFS, BLM and USFWS; the Alaska Department of Commerce, Community, and Economic Development and Alaska Department of Fish and Game (ADFG); the oil and gas industry; and the Alaska Eskimo Whaling Commission and other non-governmental organizations. Much of the research conducted by NSB has focused on building collaborative relationships with the aforementioned partners, and NSSI represents the most extensive of these collaborations. The Borough's research has also incorporated a local perspective that improves the quality of data collected and its interpretation. In particular, NSB has served as a community-based group of subsistence users and scientists who live on the North Slope and facilitate relationships between NSB residents, land use and wildlife managers, and developers.

It is important to note that NSB residents have a sophisticated understanding of fish, wildlife and marine mammals that has been acquired through generations of dependence on these species for survival. As a result, the Borough's primary responsibility is to address the concerns and interests of NSB residents through a coupling of western and traditional knowledge. To address local concerns over industrial development, changes in climate, and land use practices, NSB has built several long-term monitoring programs focusing on the bowhead whale, caribou, subsistence practices, waterfowl species, fisheries, and the health assessment of subsistence resources.

Many of these programs could not have been accomplished without collaboration involving numerous agencies and universities; nor would they have been developed without input from local NSB residents.

One of the core NSB-supported projects is the ongoing study of bowhead whale population dynamics, the hunt, life history characteristics and behavior. Information derived from this program



Whale harvest in Barrow. (Gordon Brower, NSB)

has withstood the scrutiny of the international community for the past 25+ years and has allowed the continued sustainable harvest of the bowhead. Despite this knowledge base, numerous important questions remain unanswered and it is NSB's goal to gain a more complete understanding of this important resource, thus ensuring its protection and availability as a resource to the Iñupiat.

The NSB has monitored the subsistence practices and use of all resources in each community on the North Slope since the early 1990s. Through interviews, NSB has documented the use of plants, birds, fish, and terrestrial and marine mammals. This work has been accomplished through collaborative relationships with BLM, USFWS, and ADFG and has served to document a baseline of community needs and land use practices.

Together with ADFG and BLM, the NSB developed a satellite monitoring program to document and monitor the distribution and land use of the Teshekpuk caribou herd. Prior to this program's initiation in 1990, western scientists did not know the seasonal distribution of this herd or its importance to the communities of the North Slope. This project has allowed a better understanding of the life history of barren ground caribou. Additionally, the NSB has responded to large winter die-offs of the Western Arctic Caribou Herd and has helped to monitor the land use and distribution of the Central Arctic Herd.

NSB has monitored the distribution and abundance of nesting and brood rearing Pacific black brant and lesser snow geese along the coast of the North Slope since the 1990s. This program has documented the exponential growth of lesser snow goose colonies and has begun to understand wintering distribution and use of this population by sport and subsistence hunters. NSB has also begun to monitor the breeding and brood rearing habitat of this species, and has studied the breeding ecology of Steller's and king eiders on the North Slope for the past decade. Under the guidance of the local Fish and Game Management Committee, NSB sought and gained approval to ban all lead shot use for hunting on the North Slope.

The NSB has sought to better understand the distribution, life history and ecology of the beluga whale through satellite monitoring and health assessment programs. Much of this work has been accomplished under the guidance of the Beluga Whale Commission and with the cooperation of subsistence hunters and collaboration with ADFG and various universities.

Fish are a vitally important resource to subsistence on the North Slope. Among species used for subsistence are broad whitefish, burbot, arctic grayling, Dolly Varden, rainbow smelt and arctic cisco. With cooperation from local fishers, and in combination with the studies of our partners, NSB has begun to more completely understand fisheries that are important to subsistence on the North Slope. This work has included documenting the movements and distribution of key fish species using satellite telemetry technologies, inventory of fish in lake and river systems used by subsistence fishers, and measuring water quality, deposition composition and productivity to describe important fish habitats. As a result, important spawning and over-wintering areas have been identified, as well as areas important to subsistence fishing.



**Arctic Slope Regional Corporation (ASRC):** Arctic Slope Regional Corporation (ASRC): ASRC is an Alaska Native-owned regional corporation representing more than 9,000 Inupiat Eskimos of Alaska's North Slope. The shareholders of ASRC own surface and subsurface title to more than five million acres of North Slope lands. ASRC has participated on several levels with government agencies and researchers. A partial summary follows:

**Wainwright Coalbed Gas:** ASRC, the USGS, the North Slope Borough and the State of Alaska have worked for several years to research and test the potential for shallow natural gas in the coal seams underlying the village of Wainwright as part of the U.S. Department of the Interior's Rural Energy Program. After initial field studies and interpretation of vintage seismic data, the USGS-led team began a multi season drill test program directly under the village of Wainwright. The drilling project is in its third season, has encountered gas-bearing coal beds and has produced the gas in limited tests. Future plans include further drilling to prove up lateral continuity and research related to production methodologies.



**ASRC provides support services for the oil and gas industry. (ADNR)**

**Participation in the BLM RAC:** ASRC has had a seat on the Resource Advisory Council (RAC), a fifteen-member group formed to provide advice to the BLM on resource and land management issues.

**Alaska DOT West Foothills Transportation Access Project:** ASRC has agreed to cooperate with the State of Alaska Department of Transportation and Public Facilities in their field and feasibility studies of a road extending from the Dalton Highway to the Colville River. The road would access state, federal and Native-owned lands, if constructed.

**Cooperation with Alaska Department of Fish and Game and NSB on Caribou and Moose Tracking:** ASRC has assisted and provide access to its lands for monitoring and tracking of caribou and moose on the North Slope. Explorers who have evaluated mineral and other potential on and near ASRC lands have conducted caribou monitoring programs during and after exploration phases in cooperation with local village organizations. These programs provide baseline information on caribou and moose movement

**Intern Placement with Science Support Organizations:** ASRC has provided shareholder interns to local science support organizations such as the Barrow Arctic Science Consortium (BASC). The internships foster educational opportunities for the shareholders and increase the two-way communication between visiting researchers and local residents.

**Liaison and Background Information for Various Research Projects:** ASRC staff have provide connections to local communities, technical on-the-ground information and letters of support for numerous and diverse research studies on diverse topics such as: methane seeps, river delta hydraulics, dinosaur expeditions, coastal studies, and other projects.

ASRC is involved with a number of North Slope resource development activities, and has a variety of subsidiary companies that are active in North Slope resource development and other sectors. The ASRC is a member of the NSSI and supports the science goals and objectives of the initiative to help utilize the collective scientific knowledge to better understand, mitigate and adapt to development activities and climate change.



**U.S. Geological Survey (USGS):** In 2009 USGS continues to conduct a broad range of collaborative

research in cooperation with other federal (BLM, MMS, USFWS, NPS), state (ADFG, ADNR), local government (NSB), Native corporations (Arctic Slope Regional Corporation), and universities (University of Alaska Fairbanks and Anchorage) that address energy, mineral, water resources, geographic analysis, and biological assessments. A more comprehensive view of USGS activities on the North Slope can be found at the USGS Alaska portal: <http://alaska.usgs.gov/portal/>

Some representative examples include:

**Species and Habitat Modeling:** The USGS is continuing to conduct research on sea ice, polar bears, and walrus to understand variability in population size, distribution, habitat use, and demography; and to understand the effects of climate change and diminishing sea ice on these species. USGS research increasingly is emphasizing development of new modeling approaches to forecast future status of sea ice habitat, and polar bear and Pacific walrus populations. Scientific findings that USGS generates are used by the USFWS, MMS, and BLM relative to their management responsibilities within the Department of the Interior.

**Permafrost and Climate-Monitoring Network:** The USGS is participating in a Global Terrestrial Network for Permafrost (GTN-P) and the Global Climate Observing System (GCOS) project that consists of two sub-networks on the North Slope: 1) a network of 15 automated surface stations, and 2) a 20-element deep borehole array. The surface stations continuously monitor changes in permafrost active-layer as well as a number of other climate parameters, including: permafrost temperature, soil moisture, snow depth, air temperature, wind speed and direction, up- and downwelling shortwave radiation, albedo, and cloudiness. Cooperators: BLM and USFWS.



**Male walrus hauled out on land, an increasingly common site as sea ice retreats.** (Wendy Loya, TWS)



**North Slope Shoreline Change Project:** The USGS is currently engaged in three separate and independent studies examining historical shoreline change along segments of Alaska's Arctic Ocean coast (North Slope) that have all documented extremely high rates of shoreline retreat. Ongoing work will make use of new acquisitions of lidar and near coastal bathymetry data to document past and ongoing change, as well as to build models that will provide predictions of future erosion rates based on beach geomorphology and ocean wave and current intensity. Cooperators include the BLM, NOAA, and USFWS.

**Movements and Distribution of Yellow-billed Loons:** In Alaska, breeding yellow-billed loons are restricted to coastal tundra areas north of the Brooks Range, with highest densities occurring just west of Teshekpuk Lake along the Ikpikpuk River drainage in the National Petroleum Reserve-Alaska, and also in the Colville River Delta. The USGS is currently conducting studies that will: 1) develop tools such as predictive models, decision support, and expert systems for science-based management of populations and habitats; and 2) evaluate the status of plant and animal species at risk and provide scientific guidance for their conservation and management. Satellite telemetry will document use of coastal marine habitats and identify migration pathways and wintering areas of yellow-billed loons. Cooperators: USFWS and BLM.



**U.S. Department of Energy (USDOE):** The U.S. Department of Energy's Arctic Energy Office (AEO), managed by the National Energy Technology Laboratory, was established in 2001. The AEO's research activities are broad, but can generally be described as concerning the development of technical solutions and economic analysis of potential fossil energy recovery activities, research concerning alternative environmental practices associated with tundra access in support of oil exploration, and facilitating communications with key stakeholders. The AEO's work has been carried out through extensive collaboration with the University of Alaska, the energy industry and state agencies. AEO is an active advisory member of the NSSI Oversight Group. AEO's current North Slope projects emphasize heavy oil recovery and development of methane hydrate resources. Other environmental projects include:

**North Slope Decision Support for Water Resources Planning and Management:**

Ice roads and ice pads provide a cost-effective means of oil and gas exploration on Alaska's North Slope, with minimal impact to the sensitive underlying tundra. Key components include information system technology, arctic hydrology and climatology, water resources management and decision support through modeling. The University of Alaska Fairbanks, Texas



Prudhoe Bay oil distribution system. (NSSI)

A&M University, and PBS&J Consulting are performers and partners for this important project.

**Using Artificial Barriers (Snow Fences) to Augment Fresh Water Supply:** Current arctic energy production is situated in a “Polar Desert.” Total annual precipitation averages a mere six to ten inches. With water available only 12 weeks, difficulties with storing and distributing water in arctic conditions, and high operation cost, water is a precious resource. Research will optimize retention of source water and discover means of retaining the existing supply for facility use and ice road/pad building. The University of Alaska Fairbanks, Colorado State University, and the Cold Regions Research & Engineering Laboratory are performers and partners for this project.

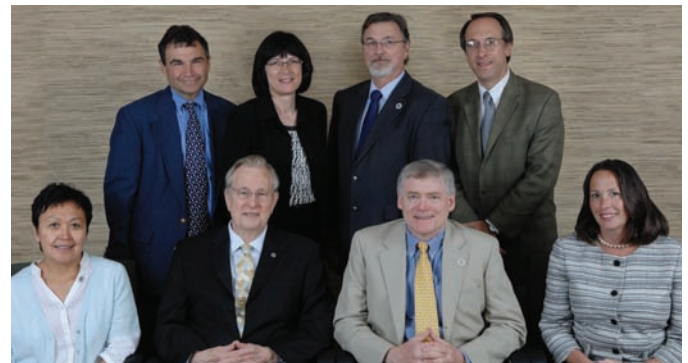


**U.S. Arctic Research Commission (USARC):** The USARC has been involved in activities and efforts to promote their five priority research themes reported in their 2009 goals and objectives report.

- Environmental change of the Arctic and Bering Seas
- Arctic human health
- Civil infrastructure
- Natural resource assessment and earth science
- Indigenous languages, cultures, and identities

These themes, originally released in 2007, have been adopted by the Interagency Arctic Research and Policy Committee, which is chaired by the National Science Foundation. Specific actions towards these goals have recently been achieved.

For example, in an attempt to develop a research agenda on certain aspects of arctic human health, the National Institutes of Health and the USARC cosponsored a “Behavioral and Mental Health Research” workshop at the University of Alaska in Anchorage, on June 2-3, 2009, which was attended by nearly 70 participants. The National Institutes of Health will soon release the workshop report. The USARC is also seeking support for a National Academy of Sciences, Institute of Medicine study on this topic.



**Commissioners, U.S. Arctic Research Commission.**  
*Front row from left: Vera Metcalf, Arden Bement (Director, NSF), Mead Treadwell (Chair), Michele Longo Eder, (Vice Chair) Back row from left: Warren Zapol, Helvi Sandvik, Buck Sharpton, and Charles Vorosmarty. (USARC)*

The USARC was pleased to see the President release the new national Arctic Region Policy (National Security Presidential Directive 66/Homeland Security Presidential Directive 25) on January 9, 2009 (see sidebar on page 7). The policy release was the culmination of nearly two years of interagency efforts, including considerable effort by the USARC, to revise the previous version of this policy released in 1994. The USARC’s efforts have now shifted to implementing specific aspects in the new policy.

The USARC was heavily involved in drafting the Arctic Council's *Arctic Marine Shipping Assessment 2009 Report*, which was approved at the Arctic Council Ministerial meeting in Tromsø, Norway, on April 29, 2009. This report is available online (<http://arcticportal.org/en/pame/amsa-2009-report>). The report's recommendations are now being implemented through actions taken by various federal agencies and through legislation introduced by all members of Alaska's congressional delegation.

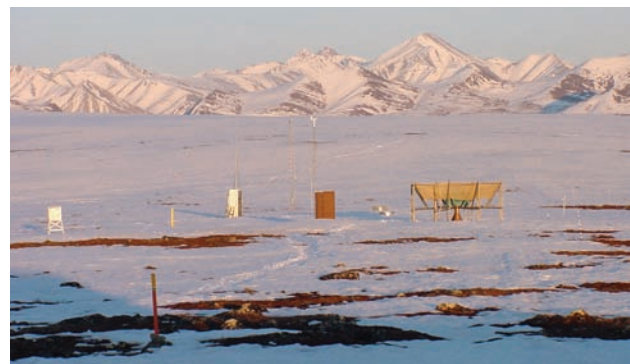
The Chair of the USARC, the Honorable Mead Treadwell, promoted arctic research through his testimony before the House Foreign Affairs and Senate Foreign Relations committees. Treadwell also held meetings with representatives from the Alaska congressional delegation; Senate committees on Commerce and Environment & Public Works; White House Council on Environmental Quality and Office of Science & Technology Policy; federal agencies (including USCG, DOI, NOAA, NSF, NASA, DOE, NGA); State of Alaska entities; industry (Shell, ConocoPhillips); and many others.

USARC is an active advisor to the NSSI and is working to promote the NSSI's goals and objectives through the Senate and its committees.



**National Weather Service (NWS):** The National Oceanic and Atmospheric Administration's (NOAA) National Weather Service (NWS) Alaska Region provides weather, hydrologic, climate forecasts and volcanic ash and tsunami warnings for the state of Alaska and its surrounding waters. Strategic priorities for NOAA include establishing a National Climate Service; supporting comprehensive marine spatial planning; ensuring the sustainability of marine fisheries; strengthening arctic science and stewardship; and sustaining satellite-based earth

observation. As a component of the focus on arctic strengthening, the NOAA NWS and Climate Program are continuing the deployment of the U.S. Climate Reference Network (USCRN) within Alaska. The USCRN's primary goal is to provide future long-term observations of temperature and precipitation, coupled to historical observations, for the detection and characterization of present and future climate change. USCRN data will be used in operational climate monitoring activities and for placing current climate anomalies into an historical perspective. The USCRN will also provide the United States with a reference network that meets the requirements of the Global Climate Observing System. There are currently four USCRN sites within Alaska, in Barrow, Sitka, Fairbanks and St. Paul. Over the next five years, USCRN expects to deploy an additional 29 sites throughout Alaska, including five sites on the North Slope. NOAA's NWS and National Environmental Satellite and Data Information Service (NESDIS) are also establishing a satellite product proving ground in collaboration with the University of Alaska to test and evaluate remote sensing algorithms for weather, water and climate applications.



**Meteorological station.** (Doug Kane, UAF)

## External Communication

The mission and administrative structure of NSSI requires a viable network of external contacts with academia, non-governmental entities, industry and other science organizations. These contacts bring together potential partners, add a broader knowledge of North Slope endeavors, and assure scientific excellence in NSSI products. Networking for NSSI is accomplished in three major categories:

1) through internal communications with member agencies to gain knowledge into projects or programs occurring or planned for the North Slope; 2) through Science Technical Advisory Panel expertise; and, 3) through academia, workshops, seminars, and interaction with the National Science Foundation Office of Polar Programs, and other external networks having knowledge of Arctic and pan-Arctic environments (Appendix 4). (Obj. 1-8)

## Collaboration with Arctic Research and Policy

The Arctic Research and Policy Act of 1984 (Public Law 98-373), amended as Public Law 101-609 on November 16, 1990, provides for a comprehensive national policy dealing with national research needs and objectives in the Arctic. This legislation was followed on January 9, 2009 by two Presidential Directives (NSPD-66 and HSPD-25, referenced previously) that brought dated U.S. Arctic policy to the forefront of security and climate change.

The Arctic Research and Policy Act established the Arctic Research Commission and an Interagency Arctic Research Policy Committee to help implement the Act. The NSSI is a formal member of the interagency committee as an independent organization. NSSI membership and participation in the committee's programs is important and mutually beneficial to both entities because of their difference in reach, but similarity in mission. The mission of the Interagency Arctic Research Policy Committee:

Helps set priorities for future Arctic research.

Works with the Arctic Research Commission to develop and establish an integrated national Arctic research policy to guide federal agencies in developing and implementing their research programs in the Arctic.

Consults with the Commission on matters related to Arctic research policy, programs and funding support.

Develops a five-year plan to implement the national policy, and updates the plan biennially.

Coordinates preparation of multi-agency budget documents for Arctic research;

Facilitates cooperation between the federal government and state and local governments in Arctic Research.



**The U.S. Coast Guard cutter Healy in the Arctic Ocean. (USCG)**

Coordinates and promotes cooperative Arctic scientific research programs with other nations.

Promotes federal interagency coordination of Arctic research activities, including logistical planning and data sharing.

Submits a biennial report to the Congress through the President containing a statement of the activities and accomplishments since the Interagency Arctic Research Policy Committee's last report.

Having principle investigator status in the development of the Arctic Observing Network and the larger Sustained Arctic Observing Network furthers the goals of the NSSI and expands networking capabilities and future partnership opportunities for Arctic activities outside the NSSI organization. There is strategic value to the NSSI in developing information sharing tools for the long-term sustainability of Arctic data. To this end, the NSSI has positioned itself as key player and significant contributor in the design and development of both the U.S. and the international observing systems. (Obj. 1,3,4,5,6,7)

## Emerging Issues and Future Directions

With the continued help of the Senior Staff Committee and the full engagement of the Oversight Group, the NSSI and its STAP made major progress in 2009 in assessing Emerging Issues (**Table 1**). This deliberative process has: 1) taken a targeted list of potentially emerging issues on the North Slope and in its offshore waters (Table 1, first column, identified by the Oversight Group); 2) clarified the specific management concerns associated with these issues (Table 1, second



**Warming permafrost and coastal erosion along the North Slope shoreline.**  
(Ken Dunton, University of Texas)

column, led by the Senior Staff Committee); and 3) matched these up with the scientific approaches that will be needed to credibly address them (Table 1, third column, led by the STAP). At each step, the draft products are shared among the three groups (executives, staff, and scientists) and reshaped as necessary to assure that the final products are both credible and serve the management needs.

Based on these deliberations, the STAP is developing a series of summary papers. Each summary will include a brief discussion of the status of relevant science and information needs, set forth some preliminary findings on management concerns, provide a shortlist of STAP recommendations as potential next steps for the NSSI, its member agencies and partners to address the science behind these critical and shared needs. The value of this approach has been noticeable. Other forums, such as the Alaska Climate Change Executive Roundtable, Alaska Governor's Subcabinet on Climate Change, and Interagency Arctic Research Policy Committee have expressed interest in building on these NSSI products as they shape their respective science programs.



**STAP member Dr. Matt Sturm and assistant sampling snow pack.** (Doug Kane, UAF)

abbreviated summary of the general issues, examples of the related management concerns, and some of the preliminary results of the STAP's assessment of the science needs is presented in Table 1.

When completed, this compilation of management concerns and related science recommendations will provide federal, state, and local resource managers of the North Slope and its offshore waters with a ground-truthed set of science priorities. The vision then is for these advisory documents to assist the NSSI and its member agencies and partners well into the future as they make critical decisions on the allocation of their respective and collective resources towards meeting these challenges. For example, where science needs are identified that can contribute to a shared understanding of the impacts of development activities and environmental change and support the missions of multiple agencies, those needs will become candidates for further collaboration. Where the identified information needs closely align with a single agency, the STAP recommendations may be taken as advisory to their own internal deliberations on how to meet those needs. Where the results of the deliberations call for more focused analyses or highlight the need for greater input, these will become opportunities for the NSSI to facilitate targeted workshops or promote greater coordination and cooperation. The extent to which this vision can be achieved will, of course, depend upon the level and stability of NSSI funding.

It is anticipated that all "Emerging Issue Summary" papers will be completed early in fiscal year 2010. The papers might be incorporated into the next Report to Congress as appendices, or compiled separately and posted to the NSSI website. In addition, because the preliminary STAP deliberations made it apparent that there are common themes among the findings and recommendations, it is anticipated that an additional paper will be developed to highlight and address these "connectivities."

The initial Oversight Group listing included a dozen general issues of emerging concern and three specific animal groups of shared interest. Fisheries were also raised as a potential emerging issue, but are being handled via a different track (as noted in the "Workshop" section above). Because two of the general issues (hydrology and lake drying) were combined for further consideration by the STAP during the deliberative process, there are a total of 14 emerging issues now being addressed through this process. The STAP has engaged in assessments of all 14 of these issues, and thus far in 2009 has produced draft issue papers on 13 of the 14 ("Social and Economic Structure" paper is still being drafted). An



**Caribou form an important part of the subsistence diet of North Slope residents.** (Brian Person, NSB)

**Table 1. Emerging Issues Summary**

<b>General Issue</b>	<b>Examples of Specific Management Concerns</b>	<b>Potential Science and Information Needs to address issue</b>
Permafrost	<ul style="list-style-type: none"> <li>• Adequacy of measurement &amp; monitoring</li> <li>• Infrastructure stability &amp; seasonal travel</li> <li>• Impact on vegetation, hydrology, wildlife</li> </ul>	<ul style="list-style-type: none"> <li>• Expand monitoring, centralize data access</li> <li>• Active layer depth &amp; compression will be key in the short-term.</li> <li>• Combined ground measures &amp; remote sensing may hold promise for monitoring</li> </ul>
Coastal and Riverine Erosion	<ul style="list-style-type: none"> <li>• Location and rate of erosion</li> <li>• Risk to infrastructure, cultural sites</li> <li>• Links to permafrost, ocean condition</li> </ul>	<ul style="list-style-type: none"> <li>• Accessible current &amp; historic shoreline data</li> <li>• Accurate maps of at-risk sites &amp; resources</li> <li>• Models to generate change and risk maps</li> </ul>
Sea Ice & Ocean Condition	<ul style="list-style-type: none"> <li>• Access to data and model projections</li> <li>• Effect on oil spill response</li> <li>• Effect on species/distributions/harvest</li> </ul>	<ul style="list-style-type: none"> <li>• Need historic shore-fast and pack ice records</li> <li>• Evaluate technology, scenarios, risk models</li> <li>• Downscale and generate impact models</li> </ul>
Increasing Marine Activities	<ul style="list-style-type: none"> <li>• Increasing transport &amp; development</li> <li>• Impact on subsistence species &amp; hunters</li> <li>• Added pollutants &amp; invasive species</li> </ul>	<ul style="list-style-type: none"> <li>• Baselines (species, noise, water quality, etc.)</li> <li>• Development &amp; operational scenarios</li> <li>• Impact models, accessible data &amp; formats</li> </ul>
Species of Interest: (Caribou)	<ul style="list-style-type: none"> <li>• Data comparability across N. Slope herds</li> <li>• Climate &amp; development harvest impacts</li> <li>• Herd reaction to development activities</li> </ul>	<ul style="list-style-type: none"> <li>• Coordinated management planning, monitoring, and directed workshops</li> <li>• Herd-specific research, common database</li> </ul>
Species of Interest: (Marine Mammals)	<ul style="list-style-type: none"> <li>• Species shifts – northward &amp; sea-to-land</li> <li>• Shipping, whale migration, hunter access</li> <li>• Effects of changing acoustic environment</li> </ul>	<ul style="list-style-type: none"> <li>• Integrative studies of marine ecosystems</li> <li>• TEK, telemetry, real-time tracking</li> <li>• Acoustic baseline, arctic-specific tests</li> </ul>
Species of Interest: (Migratory Birds)	<ul style="list-style-type: none"> <li>• Migratory bird habitat shifts, loss</li> <li>• Subsistence harvest effects</li> <li>• Ice loss and oil spill risks for seabirds</li> </ul>	<ul style="list-style-type: none"> <li>• Habitat use/selection studies &amp; models</li> <li>• Bird population trend, subsistence use data</li> <li>• Bioenergetics studies, oil spill prevention</li> </ul>
Vegetation Change	<ul style="list-style-type: none"> <li>• Baseline from which to detect change</li> <li>• Change effects on habitat, food sources</li> <li>• Change via fire, hydrology, invasion, ...?</li> </ul>	<ul style="list-style-type: none"> <li>• Complete NSSI landcover map, put in GINA</li> <li>• Monitor greening, shrubs, species shifts</li> <li>• Model fire &amp; hydrology, prevent invasion</li> </ul>
Hydrology & Lake Drying	<ul style="list-style-type: none"> <li>• Energy development water requirements</li> <li>• Protection of water for species needs</li> <li>• Sufficiency of water availability info, peak and minimum flow estimates</li> </ul>	<ul style="list-style-type: none"> <li>• Studies of link to permafrost change</li> <li>• Water quality/quantity data and models</li> <li>• Gauging network and/or remote sensing alternative, real-time data access</li> </ul>

—table 1. continues on next page.

table I. continued from previous page—

General Issue	Examples of Specific Management Concerns	Potential Methods to address Science and Information Needs
Saltwater Intrusion	<ul style="list-style-type: none"> <li>• Species composition &amp; habitat changes</li> <li>• Water quality for winter ice roads/pads</li> <li>• Sea level rise and coastal inundation</li> </ul>	<ul style="list-style-type: none"> <li>• Clarify extent of existing salt marsh</li> <li>• Study/model plant community impacts</li> <li>• Avoid salt water use, develop mitigation techniques</li> <li>• Improved DEMs for sea level impact models</li> </ul>
Changing Fire Regime	<ul style="list-style-type: none"> <li>• Are fire regime &amp; risks changing?</li> <li>• Species &amp; subsistence use changes</li> <li>• Fire mgt. response &amp; village safety</li> </ul>	<ul style="list-style-type: none"> <li>• Monitor Anaktuvuk fire impact &amp; recovery</li> <li>• Finish land cover map, basis for fuel model</li> <li>• Alaska Wildland Fire Coordinating Group</li> </ul>
Weather & Climate	<ul style="list-style-type: none"> <li>• Adequacy of meteorological network</li> <li>• Timely access to accurate weather data</li> <li>• Effect on winter exploration, permafrost, erosion, hydrology, species survival/shifts</li> </ul>	<ul style="list-style-type: none"> <li>• Synthesize existing information on network</li> <li>• Coordinate data &amp; real-time access needs</li> <li>• Improve year round operation &amp; reporting</li> <li>• Scale down for impact modeling</li> </ul>
Contaminants	<ul style="list-style-type: none"> <li>• Spill response/planning</li> <li>• Contaminant release via thawing/erosion</li> <li>• Differentiation of natural vs. industrial</li> </ul>	<ul style="list-style-type: none"> <li>• Map sensitive areas &amp; contaminant sites, especially in high erosion risk areas</li> <li>• Spill response planning &amp; capacity</li> <li>• Pre-development baselines (for soil, water, species)</li> </ul>
Social and Economic Structure	<ul style="list-style-type: none"> <li>• Impact study structure &amp; comparability</li> <li>• Community burden of multiple studies</li> <li>• Efficacy of mitigation (prior/future)</li> <li>• Impact on subsistence, diets, networks</li> <li>• Economic &amp; health impact &amp; outlook</li> </ul>	<ul style="list-style-type: none"> <li>• Standardization of key social indicators</li> <li>• Coordination/clearinghouse for studies</li> <li>• Matching TEK and western science in study design, monitoring, and interpretation</li> <li>• Modeling economic, resource and social vulnerability and sustainability</li> </ul>



**Chukchi sea ice buckling** under the changing sea conditions. (Ben & Deb Greene, NSB)



**A rush of ice and water flow** over North Slope road. (Doug Kane, UAF)



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For additional information on the North Slope of Alaska, or the membership organizations of the North Slope Science Initiative, please visit these websites:

Bureau of Land Management-Alaska	<a href="http://www.blm.gov/ak">http://www.blm.gov/ak</a>
Minerals Management Service-Alaska	<a href="http://www.mms.gov/alaska">http://www.mms.gov/alaska</a>
National Park Service-Alaska	<a href="http://www.nps.gov/alaska">http://www.nps.gov/alaska</a>
U.S. Fish and Wildlife Service, Region 7	<a href="http://www.alaska.fws.gov">http://www.alaska.fws.gov</a>
U.S. Geological Survey, Alaska Science Center	<a href="http://www.alaska.usgs.gov">http://www.alaska.usgs.gov</a>
National Marine Fisheries Service-Alaska Region	<a href="http://www.fakr.noaa.gov">http://www.fakr.noaa.gov</a>
National Weather Service-Alaska Region	<a href="http://www.arh.noaa.gov">http://www.arh.noaa.gov</a>
North Slope Borough	<a href="http://www.north-slope.org">http://www.north-slope.org</a>
Arctic Slope Regional Corporation	<a href="http://www.asrc.com">http://www.asrc.com</a>
Alaska Department of Fish and Game	<a href="http://www.adfg.state.ak.us">http://www.adfg.state.ak.us</a>
Alaska Department of Natural Resources	<a href="http://www.dnr.state.ak.us">http://www.dnr.state.ak.us</a>
U.S. Department of Energy	<a href="http://www.doe.gov/alaska.htm">http://www.doe.gov/alaska.htm</a>
U.S. Arctic Research Commission	<a href="http://www.arctic.gov">http://www.arctic.gov</a>

# Appendix I: Oversight Group Charter

## North Slope Science Initiative

Department of the Interior (Bureau of Land Management, U.S. Fish and Wildlife Service, U.S. Geological Survey, Minerals Management Service, and National Park Service), Department of Commerce (NOAA National Marine Fisheries Service and National Weather Service), Department of Energy (National Energy and Technology Laboratory), State of Alaska (Department of Fish and Game and Department of Natural Resources), Arctic Slope Regional Corporation, North Slope Borough and U.S. Arctic Research Commission

## Charter

### *North Slope Science Oversight Group*

- 1. Official Designation:** North Slope Science Initiative, North Slope Science Oversight Group (hereafter the Oversight Group).
- 2. Background & Need:** Alaska's North Slope provides important terrestrial, marine and estuarine habitat for thousands of migratory birds, caribou and other terrestrial mammals, marine mammals, and fish, and is culturally important to many Alaskan Natives and their communities. Its petroleum resources are vital to the Nation and it currently provides about 11% of annual domestic oil production. When production of the large reserves of natural gas and coal in the region becomes economically feasible, the strategic and economic importance of the North Slope's hydrocarbon energy resources will be even greater. Past oil and gas activities have impacted habitats but those impacts have been difficult to measure. It is essential that state, federal and North Slope Borough and Arctic Slope Regional Corporation natural resource agencies collectively develop and implement cooperative North Slope-wide inventory, monitoring and research programs to provide the scientific information necessary to address development impacts, and to differentiate these impacts from those caused by natural processes.
- 3. Mission and Vision:** The North Slope Science Initiative is the effort of federal, state and local governments having responsibilities for land and ocean management, to facilitate and improve collection and dissemination of ecosystem information pertaining to the Alaskan North Slope region, including coastal and offshore regions. The *mission* of the NSSI is to improve scientific and regulatory understanding of terrestrial, aquatic and marine ecosystems for consideration in the context of resource development activities and climate change. The *vision* of the NSSI is to identify those data and information needs that management agencies will need in the future to develop management scenarios using the best information and mitigation to preserve the environments of the North Slope. The NSSI adopts a strategic framework to provide resource managers with the data and analyses they need to help evaluate multiple simultaneous goals and objectives related to each agency's mission on the North Slope. The NSSI utilizes and complements the information produced under other North Slope science programs, both internal and external. The NSSI also facilitates information sharing among agencies, non-governmental organizations, industry, academia and members of the public to increase communication and reduce redundancy among science programs.

- 4. Legislative Purpose and Objectives:** The NSSI was formally authorized in Section 348, Energy Policy Act of 2005 (Public Law 109-58). The legislative **purpose** and **objectives** are stated below:

§(a)(2) The **purpose** of the Initiative shall be to implement efforts to coordinate collection of scientific data that will provide a better understanding of the terrestrial, aquatic, and marine ecosystems of the North Slope of Alaska.

§(b) **Objectives-** To ensure that the Initiative is conducted through a comprehensive science strategy and implementation plan, the Initiative shall, at a minimum—

- (1) identify and prioritize information needs for inventory, monitoring, and research activities to address the individual and cumulative effects of past, ongoing, and anticipated development activities and environmental change on the North Slope;
  - (2) develop an understanding of information needs for regulatory and land management agencies, local governments, and the public;
  - (3) focus on prioritization of pressing natural resource management and ecosystem information needs, coordination, and cooperation among agencies and organizations;
  - (4) coordinate ongoing and future inventory, monitoring, and research activities to minimize duplication of effort, share financial resources and expertise, and assure the collection of quality information;
  - (5) identify priority needs not addressed by agency science programs in effect on the date of enactment of this Act and develop a funding strategy to meet those needs;
  - (6) provide a consistent approach to high caliber science, including inventory, monitoring, and research;
  - (7) maintain and improve public and agency access to—
    - (A) accumulated and ongoing research; and
    - (B) contemporary and traditional local knowledge; and
  - (8) ensure through appropriate peer review that the science conducted by participating agencies and organizations is of the highest technical quality.
- 5. Membership:** The Oversight Group consists of the following member agencies with voting privileges: the State Director of the Bureau of Land Management; the Regional Directors of the U.S. Fish and Wildlife Service, National Park Service, National Marine Fisheries Service, and the Minerals Management Service; the Commissioners of the Alaska Department of Natural Resources and the Alaska Department of Fish and Game; the Arctic Slope Regional Corporation President; and the Mayor of the North Slope Borough. These agencies represent the principal government agencies at the regional, state, and federal level with management responsibilities for public lands, fish, and wildlife on the North Slope. In addition, the U.S. Geological Survey, U.S. Arctic Research Commission, National Weather Service and the U.S. Department of Energy will participate on the Oversight Group as the primary advisory agencies on science issues related to the North Slope, but will not have voting privileges.

## 6. Summary of Agency Missions and Roles:

### A. Federal

1. Bureau of Land Management: collaboratively manages its Alaska lands and its uses on the North Slope to promote healthy and productive ecosystems for present and future generations, in accordance with the Federal Land Policy Management Act (FLPMA) and the Naval Petroleum Reserves Production Act of 1976 (NPRPA). The NPRPA encourages oil and gas leasing in the National Petroleum Reserve Alaska (NPR-A) while requiring protection of important surface resources and uses, including any activities related to the protection of environmental, fish and wildlife, and historical or scenic values.

2. Fish and Wildlife Service: is one of the primary natural resource management agencies on the North Slope. The mission of the Fish and Wildlife Service is to work with others to conserve, protect and enhance the fish, wildlife and plants and their habitats for the continuing benefit of the American people. The Fish and Wildlife Service manages the 19 million acre Arctic National Wildlife Refuge in northeast Alaska, and has primary management authority for migratory birds, certain threatened and endangered species, polar bear, and Pacific walrus. The Service also cooperates with other federal and state agencies and various industries to minimize the effects of development on fish and wildlife resources. To accomplish this mission, the Service is involved in a variety of research, monitoring and management projects of the North Slope and in adjacent coastal waters of the Beaufort Sea.

3. Minerals Management Service: manages the energy and mineral resources located on the Nation's Outer Continental Shelf, collects revenue from the federal OCS and onshore Federal and Indian lands, and distributes those revenues. The MMS Offshore Minerals Management Program administers the OCS competitive leasing program and oversees exploration and production of our Nation's offshore natural gas, oil, other mineral resources and alternative energy for safety and environmental soundness. MMS is also responsible for oil spill response reviews for all platforms off the Nation's coasts. MMS funds environmental and technology studies for ocean energy and minerals. The prime laws for the MMS Offshore Program are the Outer Continental Shelf Lands Act and the Oil Pollution Act.

4. National Park Service: preserves the natural and cultural resources and values of the national park system for the enjoyment, education, and inspiration of this and future generations. The Park Service cooperates with partners to extend the benefits of natural and cultural resource conservation and outdoor recreation throughout this country and the world.

5. Geological Survey: serves the Nation as the Department of Interior's lead science agency by providing scientific expertise responsive to important natural resources issues and natural hazards assessments. The mission of the USGS Alaska Science Center (ASC) is to provide scientific leadership and accurate, objective, and timely data, information, and research findings about the earth and its flora and fauna to Federal and State resource managers and policy makers, local government, and the public to support sound decision-making regarding natural resources, natural hazards, and ecosystems in Alaska and circumpolar regions. To meet the specific information needs of resource management agencies for the marine and terrestrial ecosystems of the North Slope of Alaska, the ASC will combine and enhance the Center's diverse science programs, capabilities, and talents with capabilities of USGS from across the nation to strengthen its scientific capacity and contribution to the resolution of the complex natural resource issues associated with change within the North Slope region.

6. NOAA/ National Marine Fisheries Service: provides stewardship of living marine resources through science-based conservation and management and the promotion of healthy ecosystems. NOAA's activities on Alaska's North Slope include consultation and coordination regarding federal water development

projects under the Fish and Wildlife Coordination Act and other laws, consultation regarding federal actions under the Endangered Species Act, and regulation of small take authorizations under the Marine Mammal Protection Act. Under this program, NOAA issues regulations or Incidental Harassment Authorizations for the unintentional take of small numbers of marine mammals. The authorizations often require monitoring and research to quantify the extent of take and to reduce harmful effects to marine mammals. NOAA also performs research concerning marine mammals under NOAA jurisdiction, including whales and seals. NOAA is especially involved with bowhead whales and whaling, including research, funding/grant work for the Alaska Eskimo Whaling Commission, and staffing for the U.S. delegation to the International Whaling Commission.

7. United States Department of Energy: seeks to protect our national and economic security by promoting a diverse supply and delivery of reliable, affordable, and environmentally sound energy. To tackle our immediate need for oil and gas, the DOE continues to develop and promote technologies that can lower the costs of oil and natural gas exploration and development, maximize the efficiency and stability of America's oil and gas production and supply, and protect the environment. The Department's research activities are closely coordinated with, and synergistic to, the activities of other federal agencies including Environmental Protection Agency, and various branches of the Department of the Interior. DOE recently established the Arctic Energy Office in Fairbanks and is sponsoring numerous research efforts regarding the Alaska North Slope through that office and other DOE programs.

8. National Weather Service: The National Oceanic and Atmospheric Administration's (NOAA) National Weather Service (NWS) Alaska Region provides weather, hydrologic, climate forecasts and volcanic ash and tsunami warnings for the state of Alaska and its surrounding waters. The Region has an outstanding team of employees in three Weather Forecast Offices (WFO), 12 Weather Service Offices, the Alaska-Pacific River Forecast Center, the Alaska Aviation Weather Unit, the Anchorage Center Weather Service Unit, the West Coast and Alaska Tsunami Warning Center, the Anchorage Electronics Unit, and the Alaska Region Headquarters.

Staff members are dedicated to delivering climate, weather, and water warnings and forecasts in support of our mission to protect lives and property and enhance the economic interests of our Nation. This team of dedicated professionals, in collaboration with our critical partners such as NSSI, supports the NWS strategic plan theme of "Working Together to Save Lives."

The office with responsibility for the North Slope is WFO Fairbanks. Collocated with the International Arctic Research Center at the University of Alaska Fairbanks campus, this WFO provides all the weather and flood warnings, daily forecasts, and meteorologic and hydrologic data for the northern two-thirds of the state. The terrestrial area of responsibility of this office is the largest assigned to any National Weather Service Weather Forecast Office, encompassing some 340,000 square miles. Its area extends southward to the crest of the Alaska Range, eastward to the Alaska-Canada border, westward to the Bering Strait and northward to the Arctic Ocean including Barrow.

9. U.S. Arctic Research Commission: The United States Arctic Research Commission was established by the Arctic Research and Policy Act of 1984 (as amended, Public Law 101-609). The Commission's principal duties are (1) to establish the national policy, priorities, and goals necessary to construct a federal program plan for basic and applied scientific research with respect to the Arctic, including natural resources and materials, physical, biological and health sciences, and social and behavioral sciences; (2) to promote Arctic research, to recommend Arctic research policy, and to communicate our research and policy recommendations to the President and the Congress; (3) to work with the National Science Foundation as the lead agency responsible for implementing the Arctic research policy and to support cooperation and collaboration

throughout the Federal Government; (4) to give guidance to the Interagency Arctic Research Policy Committee (IARPC) to develop national Arctic research projects and a five-year plan to implement those projects; and (5) to interact with Arctic residents, international Arctic research programs and organizations and local institutions including regional governments in order to obtain the broadest possible view of Arctic research needs.

The Arctic Research and Policy Act was amended in 1990 to increase the number of Commissioners appointed by the President of the United States from five to seven voting members. Four members are from academic or research institutions; two members from private industry undertaking commercial activities in the Arctic; and one member from among the indigenous residents of the US Arctic. The Director of the National Science Foundation serves as an *ex officio* member.

## **B. State of Alaska:**

1. Department of Fish and Game: protects, maintains and improves the fish and game resources of the state, and manages their use and development for the maximum benefit of the people of the state, consistent with the sustained yield principle. The Alaska Department of Fish and Game has a responsibility to collect biological information necessary to evaluate land development activities, to present this information to decision makers so they can make informed decisions and to provide options for development activities that will minimize or mitigate negative impacts of development. The department also fulfills specific statutory responsibilities for protecting freshwater anadromous fish habitat under the Anadromous Fish Act and providing free passage of anadromous and resident fish in fresh waterbodies.

2. Department of Natural Resources: is the lead resource development agency for the State of Alaska. Its mission is to develop, conserve and enhance natural resources for present and future Alaskans. Several Divisions in DNR have major responsibilities regarding North Slope developments.

(a) The Division of Oil and Gas develops and manages the state's oil and gas leasing programs. The division staff identifies prospective lease areas; performs geologic, economic, environmental and social analyses, develops a five-year leasing schedule, and conducts public review of proposed sales. The division conducts competitive oil and gas lease sales and monitors collection of all funds resulting from its programs.

(b) The Division of Geological and Geophysical Surveys (DGGS) generates, analyzes and interprets data on geologic resources and natural conditions; maps and inventories mineral and energy resources on state land for use by government, private industry, scientists, educators and the public.

(c) The Division of Mining, Land & Water is the primary manager of Alaska's land holdings. Responsibilities include ensuring the state's title; preparing land-use plans and easement atlases; classifying land; leasing and permitting state land for commercial and industrial uses, and coordinating needed authorizations for major developments on the North Slope. The division allocates and manages the state's water resources on all lands in Alaska, adjudicates water rights, provides technical hydrologic support, and assures dam safety.

(d) The Division of Coastal and Oceans Management administers the Alaska Coastal Management Program which provides stewardship for Alaska's rich and diverse coastal resources to ensure a healthy and vibrant Alaskan coast that efficiently sustains long-term economic and environmental productivity. It also administers the State of Alaska's Large Project teams responsible for coordinating state agency participation on major resource development projects throughout Alaska.

(e) The Office of Project Management and Permitting administers the State of Alaska's Large Project teams responsible for coordinating state agency participation on major resource development projects throughout Alaska.

**C. Arctic Slope Regional Corporation (ASRC):** is the Alaska Native-owned regional corporation representing more than nine thousand Iñupiat Eskimos of Alaska's North Slope. The shareholders of ASRC own surface and subsurface title to more than four million acres of North Slope lands. By virtue of this title, the ASRC represents the largest private landowner on the North Slope. The ASRC ownership stems from an earlier claim of aboriginal title - covering the entire Alaskan North Slope - that was eventually settled in part by the Alaska Native Claims Settlement Act of 1971 ("ANCSA"). The mission of ASRC includes actively managing its lands and resources in order to enhance Iñupiat cultural and economic freedoms. ASRC is involved with a number of North Slope resource development activities, and has a variety of subsidiary companies that are active in North Slope resource development and other sectors.

**D. North Slope Borough:** Responsibilities include planning, zoning and permitting; coastal management; wildlife research with a focus on subsistence; and support for the traditional culture of the North Slope. The Borough's planning and zoning authority through its Home Rule Charter mandates active land use management across federal, state, Native and municipal lands. The Borough has a coastal management plan and participates in ACMP consistency reviews, stressing the health, safety and cultural welfare of NSB residents and compliance with environmental policies of local concern. The Borough monitors and conducts scientific research on marine and wildlife resources to ensure healthy population levels and to sustain a continued subsistence harvest for its residents. All of the Borough's planning and research activities are conducted in part to guarantee strong local input into subsistence resource management, with special emphasis on the blending of contemporary and traditional local knowledge as a mechanism to sustain the resources and the local indigenous culture.

## 7. **Officers and Organization:**

- A. Chair and Vice Chair:** The Oversight Group shall designate a chair and vice chair. The chair shall alternate annually between federal and non-federal voting members and serve from June 1 through May 31 of each year. The chair may participate in discussion and debate at the meetings and may vote on all questions before the Oversight Group. The vice chair shall assume the responsibilities of the chair in the event of the chair's absence. The vice chair shall be the chair elect for the annual rotation.
- B. Designees:** Oversight Group members may appoint designees to act on their behalf in their absence.
- C. Advisory Groups:** The Oversight Group may recommend to the Secretary of the Interior the establishment of formal advisory groups, such as the North Slope Science Technical Advisory Panel, as appropriate. Charters for any advisory group must be reviewed and approved by the Oversight Group and forwarded to the Secretary of the Interior following the guidance provided by the Federal Advisory Committee Act.
- D. Staffing and Budget:** Staffing and budget will be provided through the Bureau of Land Management as the designated administrative agency. Budgets will be prepared by the Executive Director and support staff and be reviewed and approved annually by the Oversight Group. An Executive Director will report programmatically to the Chair and Vice Chair of the Oversight Group. Support staff will report to the Executive Director.



**E. Committees:** The Oversight Group may establish other ad hoc and standing committees as deemed necessary, and will specify the purpose and duration of each committee. Any ad hoc committees established would automatically expire upon completion of their committee assignment. The Oversight Group will establish a standing staff level committee composed of one member from each representative Oversight Group member agency or organization. Staff committee members will advise their respective Oversight Group members on issues prior to each Oversight Group meeting, and will provide assistance to the Executive Director of NSSI as appropriate.

## **8. Oversight Group Meetings & Procedures:**

**A. Notice of Meetings:** Reserved

**B. Conduct of Meetings:** Oversight Group meetings will be open to the public and will be generally conducted according to *Roberts Rules of Order*. The Oversight Group shall provide a reasonable opportunity for public comment.

**C. Voting Procedures:** A quorum of Oversight Group members, or their designees, shall be convened prior to any voting (a quorum shall consist of at least three federal members and two non-federal members). All decisions shall be made by the voting members by consensus. Oversight Group members may participate by telephone or teleconference. The U.S. Geological Survey and Department of Energy will not have voting privileges. The use of a proxy by voting members is not permitted.

**D. Recusal:** Oversight Group members may recuse themselves from voting, if necessary to avoid a conflict of interest.

**E. Records:** Minutes of each Oversight Group meeting will be posted on the NSSI website (<http://www.northslope.org>). Hard copies will be available upon request.

**F. Closed Meetings (Executive Sessions):** The Oversight Group may close meetings on matters pertaining to confidential personnel issues, litigation, confidential information such as archaeological information, and other matters included under applicable State and Federal laws and Borough ordinances.

**G. Frequency and Location of Meetings:** The Oversight Group will meet a minimum of two times per year—once in Anchorage and once in Barrow.

**H. Expenses for Oversight Group:** Expenses related to travel, lodging and per diem for Oversight Group meetings shall be borne by the representatives' respective member agencies.

## **9. Availability of Funds:**

This agreement shall not be construed as a commitment by any federal agency signatory to expend funds in excess of available appropriations.

## Appendix 2: Science Technical Advisory Panel Appointees

<b>2008 Appointees and Representative Scientific Expertise</b>	
Sue Moore, Ph.D.	Marine Ecology
Robert Suydam, Ph.D.	Marine Biology
Alvin Ott, Ph.D.	Habitat Biology
Gary Kofinas, Ph.D.	Social Science
W. Scott Pegau, Ph.D.	Oceanography
Wendy Loya, Ph.D.	Ecology/Biogeochemistry
Dan Reed, M.S.	Biometrics
Bill Streever, Ph.D.	Wildlife Biology/Restoration Ecology
John Kelley, Ph.D.	Oceanography/Environmental Monitoring
Caryn Rea, M.S.	Wildlife Biology
Robert Shuchman, Ph.D.	Remote Sensing
Matthew Sturm, Ph.D.	Geophysicist/Hydrology
Douglas Kane, Ph.D.	Civil Engineering

## Appendix 3: Science Technical Advisory Panel Charter

**Official Destination:** North Slope Science Technical Advisory Panel.

**Scope and Objectives:** The purpose of the North Slope Science Technical Advisory Panel (the Science Panel) is to advise the North Slope Science Oversight Group on issues such as identifying and prioritizing inventory, monitoring and research needs, and providing other scientific advice as requested by the Oversight Group.

**Duration:** The need for the Science Panel is expected to continue indefinitely. In accordance with the Federal Advisory Committee Act (FACA), the Science Panel will be rechartered every 2 years by the Secretary of the Interior (Secretary).

**Agency or Official to Whom the Group Reports:** The Science Panel reports to the Oversight Group through the Secretary's designee who shall serve as the Designated Federal Official of the Science Panel.

**Bureau Responsible for Providing Necessary Support:** Administrative support and funding for activities of the Science Panel will be provided by the Bureau of Land Management.

**Estimated Annual Operating Costs:** The annual operating costs associated with supporting the Science Panel's functions are estimated to be \$45,000 per year plus 0.5 man years.

**Description of Duties:** The duties of the Science Panel are solely advisory to the Oversight Group, which will give direction to the Science Panel regarding priorities for decisions needed for the Department of the Interior's management. Duties could include the following:

- a. Advise the Oversight Group on science planning and relevant research and monitoring projects;
- b. Advise the Oversight Group on scientific information relevant to the Oversight Group's mission;
- c. Review selected reports to advise the Oversight Group on their content and relevance;
- d. Review ongoing scientific programs of North Slope Science Initiative (NSSI) member organizations on the North Slope at the request of the member organizations to promote compatibility in methodologies and compilation of data;
- e. Advise the Oversight Group on how to ensure that scientific products generated through NSSI activities are of the highest technical quality;
- f. Periodically review the North Slope Science Plan and provide recommendations for changes to the Oversight Group;
- g. Provide recommendations for proposed NSSI funded inventory, monitoring and research activities to the Oversight Group;

- h. Provide other scientific advice as requested by the Oversight Group; and
- i. Coordinate with groups and committees appointed or requested by the Oversight Group to provide science advice, as needed.

**Allowances for Science Panel Members:** Members of the Science Panel will receive no compensation as members. Members shall, however, be allowed travel expenses, including per diem, when engaged in actual performance of Science Panel duties, in the same manner as persons employed intermittently in Federal Government service are allowed such expenses under 5 U.S.C. 5703.

**Frequency of Meetings:** The Science Panel will meet two to four times annually, but in no case less than once. Additional meetings may be called as deemed necessary.

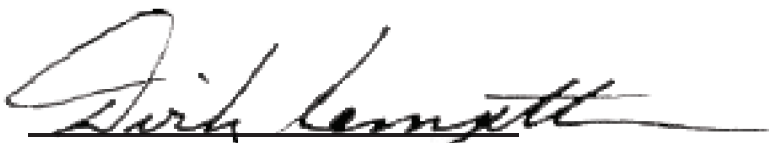
**Science Panel Membership:** The Science Panel shall consist of a representative group of not more than 15 scientists and technical experts from diverse professions and interests, including the oil and gas industry, subsistence users, Native Alaskan entities, conservation organizations, wildlife management organizations, and academia, as determined by the Secretary. The members will be selected from among, but not limited to the following disciplines: expertise in North Slope traditional and local knowledge, landscape ecology, petroleum engineering, civil engineering, geology, botany, hydrology, limnology, habitat biology, wildlife biology, biometrics, sociology, cultural anthropology, economics, ornithology, oceanography, fisheries biology, and climatology.

**Ethics Responsibilities of Science Panel Members:** All members will comply with applicable ethics rules and regulations. The Department of the Interior will provide materials to those members appointed as Special Government Employees, explaining the ethical obligations which the members should be familiar. Consistent with the ethics requirements, members will endeavor to avoid any actions that would cause the public to question the integrity of the Science Panel's operations, activities, or advice. The provisions of this paragraph do not affect any other statutory or regulatory ethical obligations to which a member may be subject.

**Subgroups:** The Science Panel may establish such workgroups or subgroups as it deems necessary for the purposes of compiling information or conducting research. However, such workgroups may not conduct business and must report to the full Science Panel.

**Termination Date:** The Science Panel is subject to the provisions of the FACA, 5 U.S.C. Appendix 2, and will take no action unless the charter filing requirements of section 9 of FACA have been met. The charter is subject to biennial renewal and will terminate 2 years from the date the charter is filed, unless prior to that time, the charter is renewed in accordance with section 14 of the FACA.

**Authority:** Section 348(d), Energy Policy Act of 2005 (PL 109-58).



SECRETARY OF THE INTERIOR

APR - 9 2008

DATE SIGNED

## Appendix 4: External Presentations to the Oversight Group and Science Technical Advisory Panel, Organizational Affiliation, and External Networks

### Academic Institutions

Buck Sharpton, University of Alaska Fairbanks, *North Slope Research*

Dan White, University of Alaska Fairbanks, Institute of Northern Engineering, *Experimental Program to Stimulate Competitive Research (EPSCoR)*

David Atkinson, University of Alaska Fairbanks, International Arctic Research Center, *Coastal Processes and Climate Change*

Doug Causy, University of Alaska Anchorage, *North Slope Research by UAA*

Hajo Eicken, University of Alaska Fairbanks, Geophysical Institute, *North By 2020 Initiative*

Rich Haut, Houston Advanced Research Center, *Ecosystem and Biodiversity Measurement and Assessment*

Robert Shuchman, Michigan Technological Research Institute, Michigan Technological University, *Automated Lagrangian Water Quality Assessment System (ALWAS) Measurements of North Slope Lakes*

Sergei Marchenko, University of Alaska Fairbanks, International Arctic Research Center, *Permafrost Issues in the Arctic*

Syndonia Bret-Harte, University of Alaska Fairbanks, Toolik Research Station, *Long-Term Ecological Research at Toolik Lake*

Tom Heinrichs, University of Alaska, Geographic Information Network of Alaska, *Project Tracking System/Data Catalog*

### Industry

Bill Streever, BP Alaska, Inc., *Environmental Studies*

Caryn Rea, ConocoPhillips Alaska, Inc., *Avian Studies in the Colville Delta and Northeastern Planning Area of NPR-A*

Caryn Rea, ConocoPhillips Alaska, Inc., *Mammal Research in the Colville River Delta and the Northeastern NPR-A*

Caryn Rea, ConocoPhillips Alaska, Inc., *Alpine Satellite Development Program: Environmental Studies Overview*

Caryn Rea, ConocoPhillips Alaska, Inc., *Integration of Traditional Knowledge and Western Science*

Diane Sanzone, BP Alaska, Inc., *Long-Term Ecological Program on Alaska's North Slope: Challenges, Progress and the Future*

Joanna Roth, ABR, Inc., *An Ecological Land Survey in the Northeastern NPR-A*

John Norman, Alaska Oil and Gas Conservation Commission, *Program Overview*

Lawrence Moulton, MJM Research, *Alpine Development Satellite Development Program: Fisheries Surveys*

Michael Baker, Jr., ConocoPhillips Alaska, Inc., *Colville River Delta Breakup Studies*

Michael Baker, Jr., ConocoPhillips Alaska, Inc., *Lake Monitoring and Recharge Studies*

Torre Jorgenson, ABR, Inc., *Geomorphology Studies in Northeastern NPR-A*

URS, Inc., Hydrologic/Hydraulic Assessment: *Fish Creek, Judy Creek and Ublutuoch River*

### **U.S. Department of Energy**

James Hamseth, Office of Fossil Energy, *Briefing on Key North Slope Projects*

### **International**

Jay Van Oostdam, Safe Environments Program, Health Canada, *Human Health Implications of Arctic Contaminants*

### **Organizations and Initiatives**

Alaska Oceans Observing System (AOOS) (<http://www.aos.org>)

Alaska Oil and Gas Association (AOGA) (<http://www.aoga.org>)

Arctic Monitoring and Assessment Programme (AMAP) (<http://www.amap.no>)

Arctic Observing Network (AON) (<http://www.nsf.gov/pubs/2008/nsf0842/index.jsp>)

Arctic Ocean Biodiversity (ArcOD) (<http://www.arcodiv.org>)

Arctic Portal (<http://www.igospartners.org>)

Arctic Research Consortium of the United States (ARCUS) (<http://www.arcus.org>)

Arctic Research Mapping Application (ARMAP) (<http://www.armac.org>)

Arctic Systems Science Program (ARCSS) (<http://www.arcus.org/arcss/>)

ArcticNet, Canadian Network of Excellence (<http://www.arcticnet.ulaval.ca>)

Barrow Arctic Science Consortium (BASC) (<http://www.arcticscience.org>)

Barrow Area Information Database (BAID-IMS) (<http://www.baidims.org>)

Barrow Area Information Database Geospatial Data Sets (BAID) ([http://nsidc.org/data/docs/arcss/arcss400/access400\\_summary.html](http://nsidc.org/data/docs/arcss/arcss400/access400_summary.html))

Canadian Sea Ice Service (<http://www.ice.ec.gc.ca/app/WsvPageDsp.cfm?id=11872&Lang=eng>)

Circum-Arctic Environmental Observations Network (CEON) (<http://www.ceoninfo.org>)

Circumarctic Environmental Observatories Network (CEON) (<http://www.ceon.utep.edu>)

Circumpolar Active Layer Monitoring (CALM) (<http://www.udel.edu/Geography/calm>)

Conservation of Arctic Flora and Fauna (CAFF) ([http://arctic-council.org/working\\_group/caff](http://arctic-council.org/working_group/caff))

Forum of Arctic Research Operators (FARO) (<http://www.faro-arctic.org>)

Gateway to the United Nations Work on Climate Change (<http://www.un.org/climatechange/>)

Group on Earth Observations (GEO) (<http://earthobservations.org>)

Integrated Global Observing Strategy (IGOS) (<http://www.igospartners.org>)

Interagency Arctic Research Policy Committee (IARPC) (<http://www.nsf.gov/od/opp/arctic/iarpc/start.jsp>)

International Arctic Science Committee (IASC) (<http://www.arcticportal.org/iasc/>)

International Permafrost Association (IPA) (<http://ipa.arcticportal.org>)

International Polar Year (IPY) (<http://www.ipy.org>)

Marine Biological Laboratory (MBL), Woods Hole (<http://ecosystems.mbl.edu/>)

National Science Foundation, Office of Polar Programs (OPP) (<http://www.nsf.gov/dir/index.jsp?org=OPP>)

National Snow and Ice Data Center (NSIDC) ([www.nsidc.org](http://www.nsidc.org))

NOAA Arctic Science Laboratory (<http://asl.arctic.noaa.gov>)

North Pacific Research Board (NPRB) (<http://www.nprb.org>)

North Pole Environmental Observatory (<http://psc.apl.washington.edu/northpole/>)

SCANNET, Circumpolar Arctic Network of Terrestrial Field Bases (<http://www.scannet.nu>)

Study of Environmental Arctic Change (SEARCH) (<http://psc.apl.washington.edu/search/>)

Sustained Arctic Observing Network (SAON) (<http://www.arcticobserving.org>)

U.S. Army Cold Regions Research and Engineering Laboratory (CRREL) (<http://www.crrel.usace.army.mil>)

United States Global Change Research Program (<http://www.globalchange.gov>)

Unmanned Aerial Systems (UAS) (<http://uas.noaa.gov/testbeds/arctic/>)

