A photograph of a fox sitting in a field with an oil rig in the background. The fox is in the foreground, sitting on a patch of green and yellow grass. In the background, there is a large oil rig with a tall derrick and several storage tanks, situated on a flat, brownish landscape under a clear blue sky.

2008 Report to Congress

North Slope Science Initiative

Organization and Accomplishments



NORTH SLOPE SCIENCE INITIATIVE
www.northslope.org



Scope, Mission and Vision of the North Slope Science Initiative

The North Slope Science Initiative (NSSI) was developed by federal, state and local governments with trust 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 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. (www.northslope.org)

2008 Report to Congress

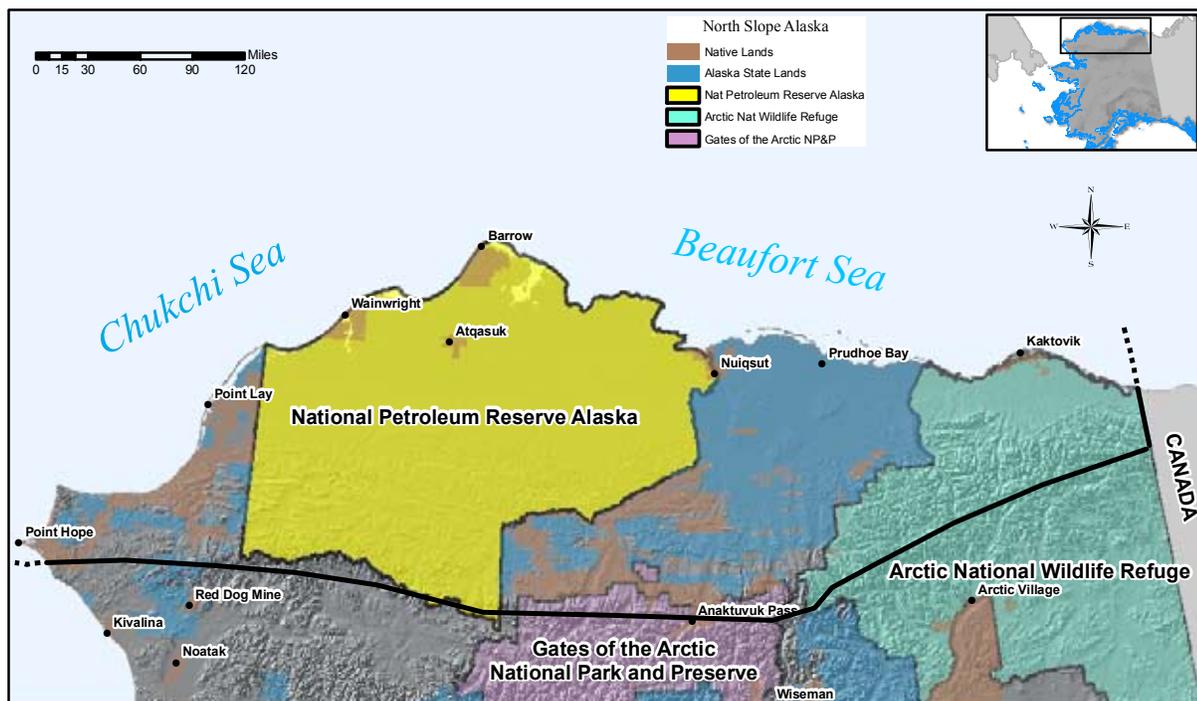
North Slope Science Initiative

Credits

The North Slope Science Initiative (NSSI) was established by Congress pursuant to Section 348 of the Energy Policy Act of 2005 (Public Law 109-58). Congress directed that the purpose of the NSSI is to implement efforts to coordinate collection of scientific data that will provide for a better understanding of terrestrial, aquatic and marine ecosystems of the North Slope of Alaska. The Secretary of the Interior is required to consult and coordinate with federal, state and local agencies and governments that have responsibility for land and resource management across the North Slope, including the marine environment, to ensure the comprehensive collection of scientific data.

This first report under the provisions of the enabling legislation describes the background, scope, mission and vision of the NSSI, outlines NSSI objectives, presents the administrative structure and initial accomplishments, and outlines future directions.

John F. Payne, Ph.D., Executive Director, North Slope Science Initiative, and the collective Oversight Group are the principal authors of this report.



North Slope Land Status. Source: BLM, Division of Geographic Services. (Information on this map should be used for graphic display only. For official land status information, refer to Cadastral Survey plats, Master Title plats, or land status case-files).

Executive Summary

The North Slope of Alaska is America's Arctic. It is a vast area, encompassing 231,000 km² (89,000 mi²) or roughly the size of all of the states from Maine to Maryland combined and is believed to have some of the largest oil, gas and coal potential remaining in the United States. The North Slope and adjoining marine environment is also home to an abundant and diverse array of fish, wildlife, marine mammals and plant resources which support a vibrant subsistence culture. While sustaining these resources and planning for and ensuring safe energy exploration and development, resource managers also face the challenge of a rapidly changing arctic climate. This convergence of forces, resources and interests makes collaboration and scientifically informed decision-making essential to a healthy and balanced future. The North Slope Science Initiative (NSSI) provides a structured means to inform the discussion and facilitate this balance. This initial Report to Congress outlines the formation and organization of the NSSI and highlights its early accomplishments.

The extensive resources and their patterns of development on the North Slope and its offshore waters are of vital importance both nationally and internationally, and to the residents of the North Slope who depend on them for subsistence and economic well-being. The state and federal laws and regulations that govern energy development and protect healthy fish and wildlife populations and their habitats in Alaska are among the most stringent in the United States. However, arctic-wide changes now being experienced are of such magnitude and rate that there is a broad federal, state and local consensus that enhanced, coordinated and sustained observation, research and monitoring are vital. To that end, federal, state, and local governments collectively formed the North Slope Science Initiative. The NSSI was formally created under the Energy Policy Act of 2005 (Section 348) and saw its first federal appropriation in mid-fiscal year 2007.

Since this initial appropriation, the NSSI has quickly moved to a series of accomplishments, perhaps the most important of which has been the formation of an effective forum for coordination and integration of the shared concerns and science needs of North Slope resource managers. We have also developed a public website, initiated a multi-entity geographic information sharing and decision support system, developed cost effective and accurate means of remotely collecting water quality and bathymetry data, improved the gathering of critical hydrological data on the North Slope, supported the building of a strong baseline for shared geographic information needs, and facilitated extensive coordination and collaboration 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. This first report details these accomplishments and how the NSSI will move forward to identify and address emerging issues.

Adequate funding is essential for the NSSI to continue this success as a forum for coordinating research and monitoring activities that support shared local, state and federal management needs in America's Arctic. Funds will support continuation of core data and information sharing tools, and implementation of mutually agreed upon priority needs among emerging concerns such as weather, permafrost, hydrology, erosion, a changing fire regime, increasing marine activities and the social and economic challenges associated with resource development and climate change. Each of these broad categories of information raises important management questions and challenges that require both short- and long-term budget planning. Funds will also support the NSSI's Executive Director and three staff positions, all of which provide critical support and oversight for NSSI operations.

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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.

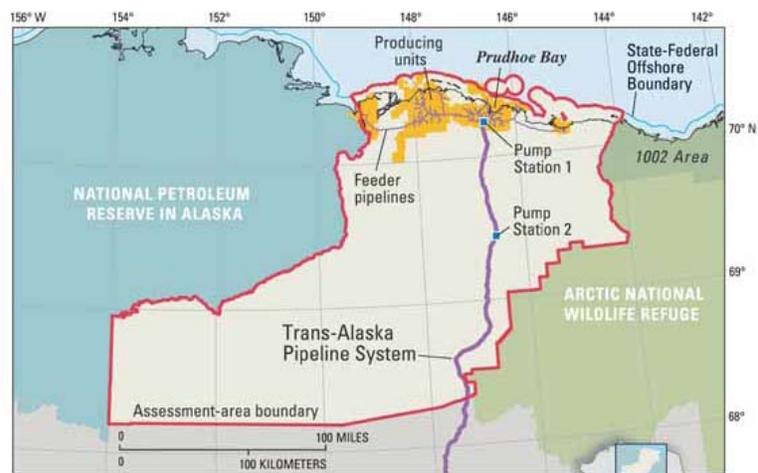
Note: Objectives will be referenced here after by (Obj.#).

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 km² (89,000 mi²) roughly the size of all of the states from Maine to Maryland combined. The offshore areas of the Chukchi and Beaufort Seas have an additional 295,000 km² (114,000 mi²). The natural resources of the North Slope are considerable; the area is believed to 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 which supports the vibrant subsistence culture of the Inupiat people who reside in the area. Scientifically informed management of fish, wildlife, subsistence, and energy resources continues to be the goal of agencies and industry.

The coal resources of the North Slope are estimated to be a minimum of 2.7 trillion tons, or approximately 40% of America's reserves. The combined areas of the National Petroleum Reserve Alaska, central North Slope, Arctic National Wildlife Refuge 1002 area, and the MMS offshore program areas contain a mean average of 45 billion barrels of oil (BBO) and an estimated 200 trillion cubic feet (TCF) of natural gas. A U.S. Geological Survey (USGS 2005) assessment of undiscovered oil and gas resources of the central part of the Alaska North Slope and the adjacent state offshore area estimates that in this area alone there are 4.0 billion barrels of oil (BBO), 37.5 trillion cubic feet (TCF) of natural gas, and 478 million barrels of natural gas liquids that are undiscovered and recoverable using current technology.

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. Through 2004, 15 billion barrels of oil have been produced from this area, and remaining reserves are estimated to include between 6 and 7 BBO and 35 TCF of natural gas (DOE/NETL 2007). The Prudhoe Bay and Kuparuk oil fields are the two largest oil fields in the United States. Four other adjacent oil fields, Pt. McIntyre, Endicott, Alpine, and North Star, also are among the top ten U.S. oilfields. Together they have contributed about 20% of U.S. domestic production annually since oil production began in 1977. For comparison, recent USGS estimates of undiscovered oil in adjacent areas include 9.3 BBO in the National Petroleum Reserve in Alaska (NPRA) and 10.4 BBO in the Arctic National Wildlife Refuge (ANWR) 1002 area (USGS 2002). Most undiscovered oil accumulations in the central North Slope assessment area are expected to be relatively small in comparison to those already discovered.

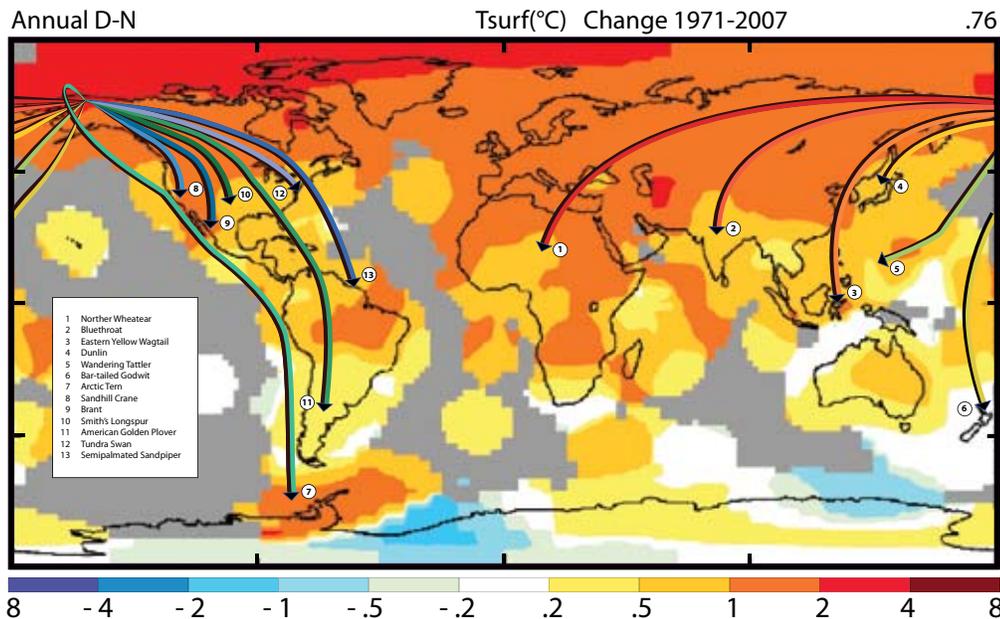


Central North Slope area in USGS (2005) economic analysis of undiscovered oil and gas resources.



The Minerals Management Service (MMS) divides most of the off-shore region into two large areas, the Beaufort Sea and Chukchi Sea, which covers over 295,000 km² (114,000 mi²) in its current five-year program. In 2006, MMS estimated a total of 104 trillion cubic feet of undiscovered technically recoverable natural gas and 23.6 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.

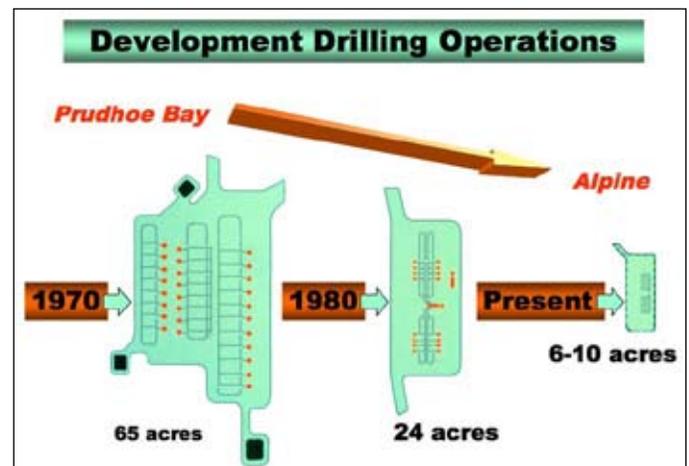
The wetland, coastal and off-shore habitats of the North Slope also support a wide variety of important fish and wildlife populations. Over 200 species of birds migrate to the North Slope each summer to nest and raise their young, including hundreds of thousands of waterfowl, shorebirds and others. These summer visitors migrate to the North Slope from nearly every U.S. state and as far away as South American, Africa, Asia, and Antarctica. Four caribou herds numbering more than 600,000 animals, roughly half of Alaska's caribou, make their home on the North Slope and provide a significant portion of the over three million pounds of wild native foods harvested annually by North Slope residents. Offshore areas provide habitat for a variety of marine mammals, including polar bear, four species of ice seals, walrus and several species of whale including bowhead and beluga. Marine mammals comprise over 60% of the annual subsistence harvest. Freshwater fishes, particularly whitefish species, are also an important food source. 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.



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)

The North Slope is also a place where global forces have long been converging. First, it was a pathway for the spread of the Inuit 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; oil companies developed one of the largest industrial complexes on the planet; and is today a focal point of growing global awareness and for observation and assessment of the near-term impacts of climate change.

All of these resources and their patterns of development are of vital importance both nationally and internationally, and to the residents of the North Slope who depend on them 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. Through continued technological improvements, industry has succeeded in reducing the footprint of development while expanding into new areas. Mud pits for holding drilling wastes have been replaced by grind and inject facilities which 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 the impacts to the environment.



Reducing the size of industry footprint. (BLM)

The people, resources, and managers of the North Slope 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 (National Science Foundation 2007). 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; and (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 Slope (NRC 2003). The purpose of 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:** Decisions on North Slope 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 match the overall goals for the region, in all phases of development.
- ✦ **Ecosystem Research:** There is currently a lack of ecosystem-level research in 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.

State and federal resource agencies and local governments have joined forces to create the North Slope Science Initiative to identify and develop credible answers to address these findings and recommendations about critical science issues; provide effective protections for fish, wildlife and their habitats from resource exploration and development; and to understand the management adaptations necessary to maintain those protections in a changing environment. Through NSSI, the membership believes it can collectively increase collaboration and coordination, both internally among membership and externally with industry, academia, non-governmental organizations, the public and the greater pan-Arctic community, that will lead to better informed management decisions in the future.

Organizational Structure and Administration of the North Slope Science Initiative

Membership of the NSSI 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. Unique to the NSSI is an advisory group of principals who are either science or resource based. The principal members of the NSSI include:

Department of the Interior	
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
Department of Commerce	
National Marine Fisheries Service	Regional Administrator
State of Alaska	
Department of Fish and Game	Commissioner
Department of Natural Resources	Commissioner
Local Government/ Resource Manager	
Arctic Slope Regional Corporation	President
North Slope Borough	Mayor
Advisory to the NSSI	
National Weather Service	Regional Director
U.S. Arctic Research Commission	Alaska Director
U.S. Department of Energy	Regional Manager, NETL
U.S. Geological Survey	Regional Executive

Consistent with the 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 but stable-funded core of NSSI staff, 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.

The organizational structure includes the following components: Oversight Group, Executive Director and staff, Science Technical Advisory Panel, and Senior Staff Committee. These four 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: www.northslope.org), the Oversight Group is the senior level management from the 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.

Executive Director

The Executive Director is responsible for providing managerial guidance and executive oversight on the day-to-day activities of the 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 the NSSI. The Executive Director coordinates and ensures 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 (FACA) 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 FACA 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 (Appendix 2). The members are 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, ecology, wildlife biology, biometrics, sociology, cultural anthropology, economics, ornithology, oceanography, fisheries biology and climatology. 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: 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 and providing recommendations on projects or proposals.



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



Teshekpuk Lake area of North Slope. (NASA)

Funding of the North Slope Science Initiative

Section 348 (f) of the Energy Policy Act of 2005 authorized appropriations as necessary to carry out the functions of the NSSI. These appropriations are made by Congress and administered by the Secretary of the Interior through the Bureau of Land Management (BLM) as the administrative agency for the NSSI. The approved NSSI Business Plan and Annual Operating Plans are posted on the NSSI website (www.northslope.org).

The President's budget for federal fiscal year 2007 provided the first funding allocation for NSSI. Due to a series of Continuing Resolutions, actual allocation was delayed until mid-April 2007. Although the President's budget requested a \$12.4 million increase for the BLM for energy related activities in Alaska, the language for this request was not separated into specific amounts for legacy wells, NPR-A, Arctic National Wildlife Refuge (for BLM to do the subsurface evaluation of oil and gas) and the NSSI. When the final allocation of funding was made by BLM, the NSSI received \$2.0 million. Congress significantly reduced BLM's 2008 request for Alaska's north slope activities. As a result, BLM reduced its allocation to the NSSI to \$1.0 million for its administration and operations. This has led to delays and/or reductions for both administration and operations. The planned target allocation for fiscal year 2009 is \$1.376 million. While individual member agencies have research programs that address many of their mandate specific science needs, the NSSI is positioned to enhance coordination efforts and fill information gaps that no single member agency is capable of accomplishing on their own. This type of enhanced coordination and collaboration is one of the major valued added benefits of the NSSI.

Budget limitations for NSSI will make the administrative and operational functionality of the NSSI difficult, at a time when energy exploration and development is a national emphasis and a rapidly changing climate appears to be affecting pan-Arctic.

Early Priorities for the North Slope Science Initiative

Prior to the passage of implementing legislation, several workshops were held in Anchorage, Fairbanks and Barrow, Alaska to gauge the status of North Slope knowledge from the perspective of information availability, information needs, and the setting of priorities should NSSI become a reality (Krummel et al. 2004). Nearly 500 people attended the workshops, including representatives from federal, state, and local agencies and governments, industry, non-governmental organizations, academic institutions, and the public-at-large. These workshops helped the Oversight Group set the initial direction for the NSSI by making it clear that while there is a substantial body of resource-oriented activity and knowledge on and about the North Slope and its off-shore environments is neither readily available, or well coordinated between and within agencies, or in formats that can be used effectively. Recommendations from the workshops served as the basis for developing the NSSI. These included:

- ✦ **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;
- ✦ **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 using functionality such as is available through the University of Alaska, Geographic Information Network of Alaska (GINA), and others;
- ✦ **Since the North Slope has extremely limited access by land, the type and availability of multi-resolution imagery from satellite and airborne systems must be increased** 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 of a resolution appropriate to define hydrologic and terrestrial needs more effectively;
- ✦ **Upgrade compatibility of existing information and set standards for future data collection.** Baseline information is, in many cases, either non-existent in usable formats (vegetation, land cover, hydrology, shoreline definition, transportation, etc.), or is available on a limited basis, but not compatible with similar data across the North Slope;
- ✦ **Use a conceptual scientific framework to address ecosystem changes.** The conceptual 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 uses the best scientific information available to aid resource managers in their decision-making roles. The framework would also illustrate how the NSSI is integrated into other science programs both internal to NSSI membership and to external science from other sources, both nationally and internationally;
- ✦ **Consider species-specific information in an ecosystem or landscape context and ensure that results of inventory, monitoring, and research projects are 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 to benefit to a wide user base** of agencies, governments, non-governmental entities, academia, public and the greater pan-Arctic community; and,
- ✦ **The NSSI should be at the forefront in the analysis and 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.

Progress and Accomplishments of the North Slope Science Initiative

The workshops, agency staff, and the Oversight Group also identified initial directions to meet the legislative mandate, needs, and recommendations for the NSSI. Those recommendations that have been or are currently being discussed include:

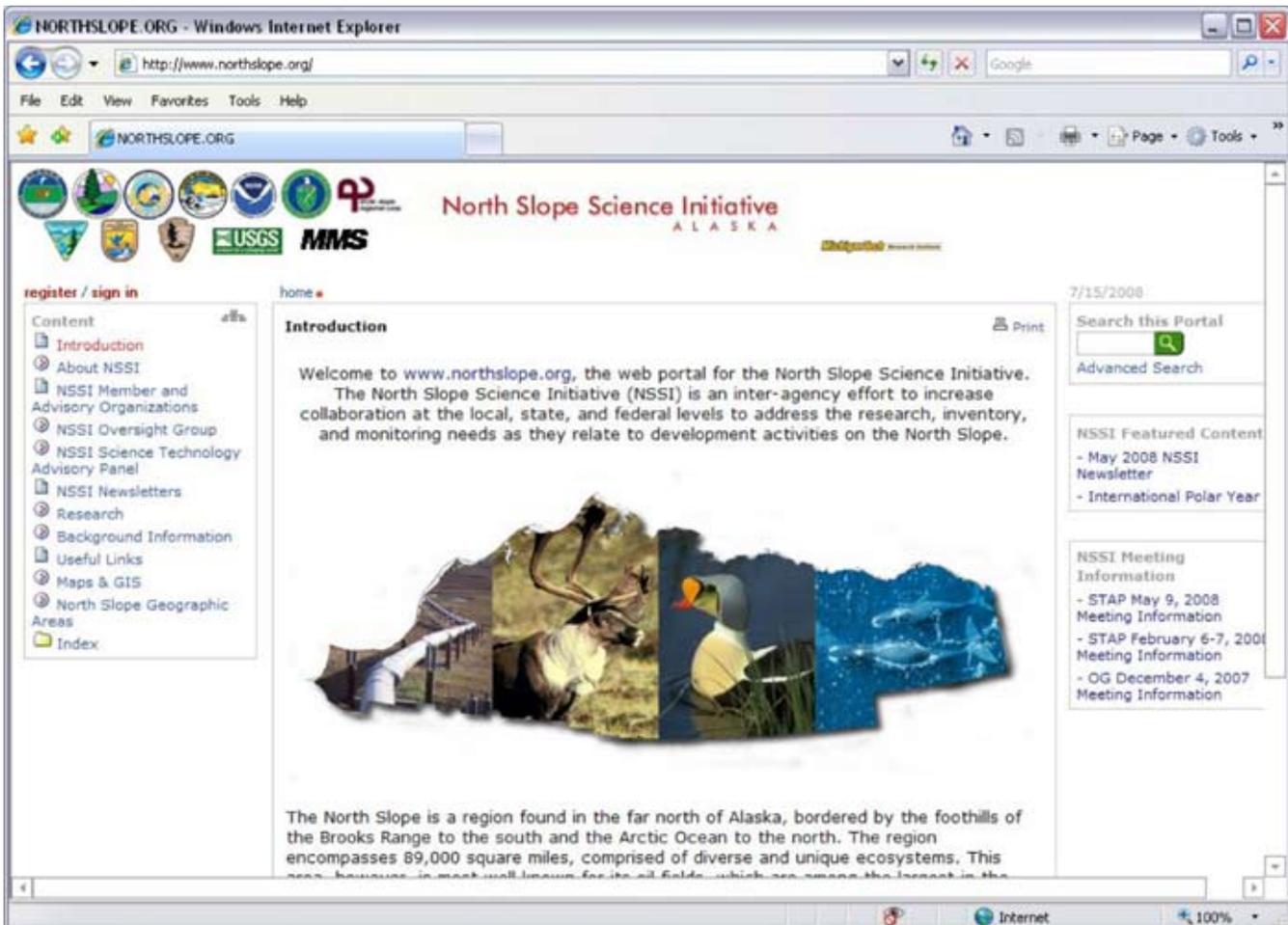
- ✓ Develop a public website for the NSSI.
- ✓ Initiate a database of ongoing North Slope projects.
- ✓ Design a data management and information sharing system for North Slope science.
- ✓ Address and monitor hydrologic processes on the North Slope.
- ✓ Gather and coordinate a consistent and accurate 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 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.

Despite funding challenges, considerable progress has been made towards addressing these initial directions. The NSSI has developed a public website (www.northslope.org), designed a data management and information system, collaborated and networked with many entities (both nationally and internationally), and focused on technology to efficiently collect water quality parameters. Each of these areas have gained substantial footing and are either fully implemented, or very close to implementation. Limited funding has hindered implementation and operations for establishing a project database and addressing and monitoring hydrologic processes. Although hydrologic gauging stations were deployed in a few strategic locations, 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. The development of a digital vegetation baseline map is underway, but behind anticipated completion dates even though the effort has benefited greatly from extensive interagency coordination.

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 (www.northslope.org)

This Website was developed as an “.ORG” site to reflect the NSSI’s diverse membership and to provide greater flexibility in both content and operation. Operated out of Michigan Technological University, the site is linked to information sites throughout the world that are actively involved in Arctic issues and research. The NSSI Website receives considerable traffic (over 35,000 visits/month average) and has internet map server (IMS) capabilities with a number of physical and biological data layers. Since this site is the public interface of the NSSI, it is updated on an ongoing basis. (Obj. 7)

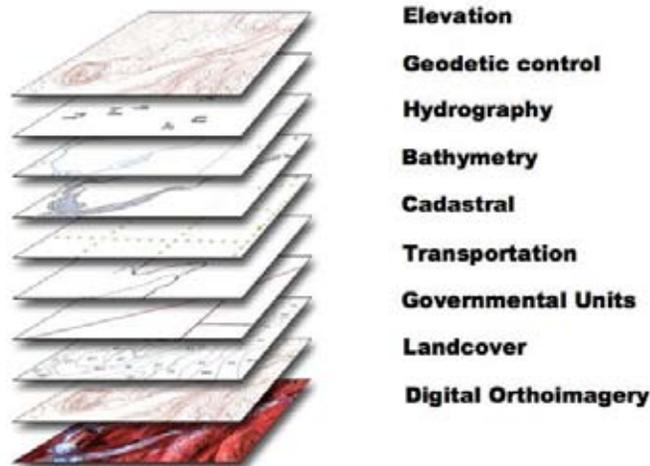


The NSSI website is a portal to a wealth of information on the North Slope.

Geographic Information Network of Alaska

A high value added function of the NSSI is the successful establishment of a functional multi-entity geographic information and decision support system. In partnership with the University of Alaska, Geographic Information Network of Alaska (GINA), the senior staff committee and the Science Technical Advisory Panel (STAP), this effort identified over 130 potential data layers that can be used to evaluate North Slope ecosystems and its off-shore environment. The geographic information and decision support system is well on its way to becoming the “one-stop shop” so greatly needed and will serve as a comprehensive distributed network that offers managers, staff, academia, and the general public an opportunity to search for credible geographic information about the North Slope. To help insure the system is always up to date, the NSSI has tasked the STAP to form a standing subcommittee on GIS/Remote Sensing to provide ongoing recommendations on content and operation. (Obj. 1-8)

Base Layers



- Elevation**
- Geodetic control**
- Hydrography**
- Bathymetry**
- Cadastral**
- Transportation**
- Governmental Units**
- Landcover**
- Digital Orthoimagery**

GINA serves as a storehouse and distribution network for data about the North Slope. (GINA)



ALWAS “Bathyboat” collecting data. (University of Michigan)

Research Institute and the University of Michigan to support the development of efficient and accurate remote sensing technology to collect water quality and bathymetry parameters. The first generation bathymetric device was so successful in the arctic environment, that a second generation device was created for water sampling and bathymetry during the summer of 2008. This “Bathy-Boat” is a compact, autonomous device that is pre-programmed to return to its deployment location. The device transmits up to 20 water quality parameters, plus bathymetry, to a ground station in real-time (no additional expensive laboratory analysis is needed). The “Bathy-Boat” reduces the cost per water body by roughly 10-fold to between \$1,000 and \$2,000, and greatly expands the number of sampling locations in the brief sampling season on the North Slope. (Obj. 1-8)

Automated Water Quality and Bathymetry Assessments (ALWAS)

The lakes on the North Slope continue to shrink and salt water intrusion is changing the chemistry and water quality. Data collection and establishing baseline parameters for detecting these changes continues to challenge industry and agencies responsible for land and water management. Costs of 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). The NSSI partnered with Michigan Tech

Project Database

The NSSI is addressing the acute lack of a consolidated project database of information and activities on the North Slope and its off-shore environments. The project database began with the compilation of a spreadsheet of 571 on-going projects. Rather than creating a wholly new database, the NSSI is partnering with the North Pacific Research Board (NPRB) to adapt their existing database programming code to meet NSSI needs. This will make readily available information about on-going project activities by various entities on the North Slope and its off-shore environments and serve as a central resource on who, what, where and when. Progress to date has been delayed due to personnel changes both at the NSSI and NPRB. When fully implemented, the project database will be served through the NSSI website.

(Obj. 4,5,7)

Hydrologic Gauging Stations

A high priority need for the North Slope is understanding the current and future hydrology. This is because water availability can be a limiting factor for both energy development and species survival, and the North Slope may see significant alteration in water availability in the face of climate change. To address this, the NSSI is working to establish a network of traditional hydrologic gauging stations across the North Slope. While several agencies had individually planned or implemented some of the hydrologic gauging stations at key locations, many of these stations are not maintained due to the lack of a consistent funding source. This “hit or miss” approach leaves the responsible agencies without information they need, whether it is for permitting bridges, facilities and infrastructure, defining the instream flow, or wintering habitat needs of aquatic species.

The 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 literally four to five times more costly than the 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



Ublutuoch River Gauge. (USGS)

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. The stations must be removed and stored during the winter months to avoid irreparable equipment damage caused by ice. This is in addition to the challenges of defining riverine flow during “break-up” (see images below of summer flow and break-up).



Ublutuoch River Summer Flow. (BLM)



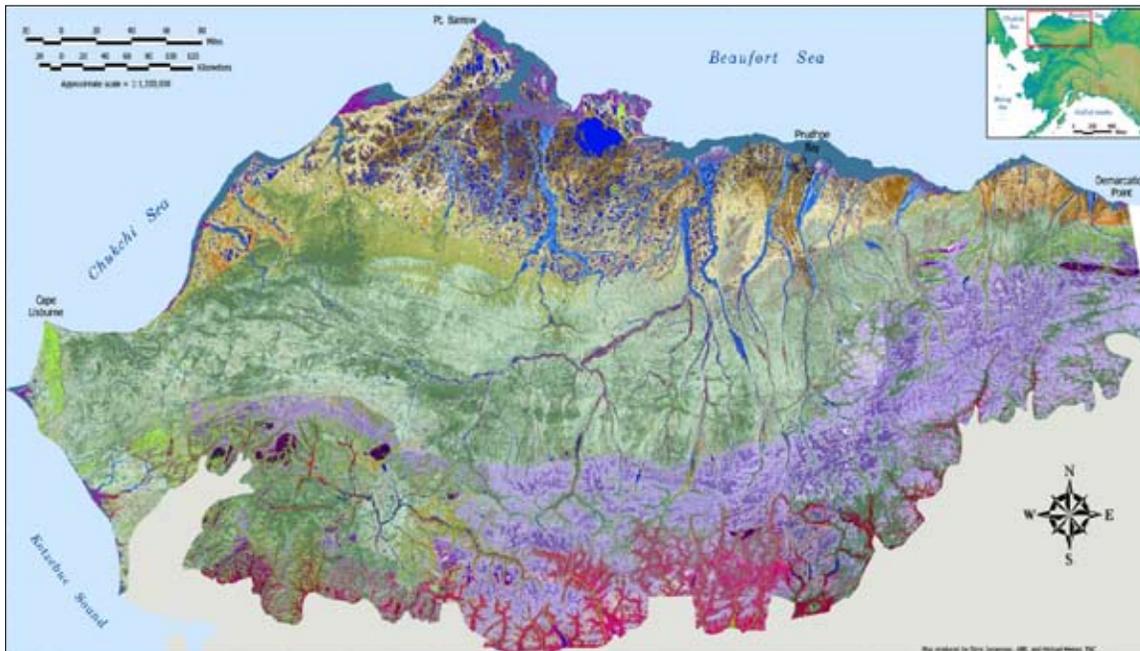
Ublutuoch River Spring Breakup. (BLM)

USGS funds several gauges on the North Slope but does not have funding for additional stations. Stations on the Canning and Tamayariak Rivers are the first stream gauges in the Arctic National Wildlife Refuge and furthest northeast gauges in Alaska, and first hydrological data collection in this area since the early 1970s. However, the costs of maintaining each of the stations may be as high as \$80,000/year/station. This makes the placement of additional stations, supported by NSSI, questionable in the future. Pending appropriations, the NSSI will continue to support the gauges that have been deployed in the near term through and interagency cost-share agreement with USGS. In addition, the NSSI has tasked the Science Technical Advisory Panel 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. 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, wildland fire suppression and rehabilitation, and can even be used to help parameterize habitat-based models of carbon sequestration. A number of agencies and industry have developed land cover maps across the North Slope, but most were created using decades-old Landsat Thematic Mapper (TM) imagery and targeted to addressing individual agency needs. Although some efforts have had significant field work to verify and “train” the imagery and assess accuracy, others have had no field verification. Since mapping efforts began, it is possible that portions of the North Slope have changed dramatically. No common, up-to-date land cover protocol or database exists across the North Slope. This situation makes it impossible to compare data and evaluate landscape level

changes. Because of the expense and potential redundancy involved in starting fresh to produce a quality land cover mapping system for the North Slope, the NSSI investigated the potential for working with the National Landfire Program (www.landfire.gov). Landfire products are primarily aimed at assessing fire potential, and are not robust enough to be used for future assessments of change on the North Slope without additional support and changes. However, greater field validation, particularly of wetland complexes, can increase the confidence level of the Landfire product and help meet the needs. In the spring of 2008, the NSSI established a formal partnership with Landfire and initiated additional field verification work that takes place during the summers of 2008 and 2009. The result of combining NSSI and Landfire capacities will be a far better product for the North Slope with a revised land cover map due in 2010. (Obj. 1-7)



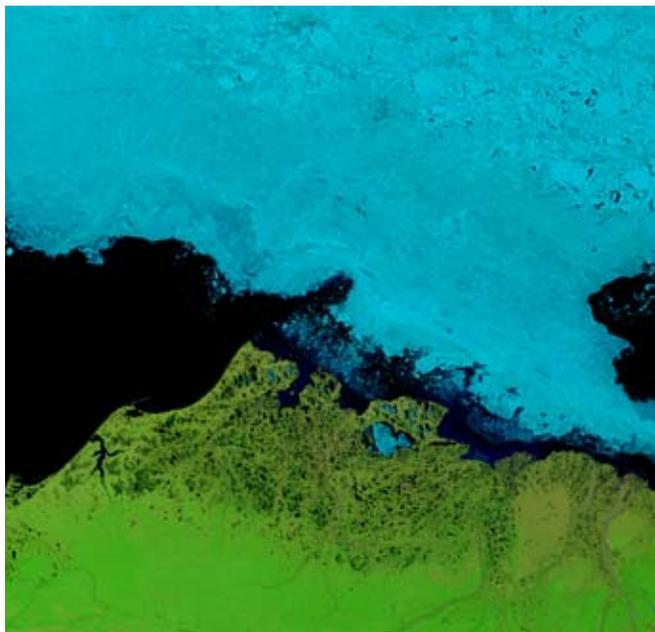
Land coverage map of North Slope. (Torre Jorgenson, ABR, Inc. and Michael Henier)

Workshops

Of significant value is the ability of the NSSI to host independent or partnered workshops. These workshops address the status of North Slope knowledge and information needs for issues that cross administrative and political boundaries. Two workshops have been completed; another is scheduled for the fall of 2008; and two more are under development for fiscal year 2009. Summaries of these workshops are presented below. The NSSI Oversight Group also frequently hosts guest presenters at its meetings as another option for internal and external cross-jurisdictional information sharing. A summary of some of these presentations is presented in Appendix 4 and more detail on other forms of internal and external communications are expanded upon in following sections of this report. (Obj. 1-7)



Science Technical Advisory Panel, Caribou Workshop, February 2007



Satellite image of western North Slope of Alaska, color enhanced to highlight ice, open water and land interface. (NASA)

U.S./Canada Oil and Gas Research Forum (Planned Workshop, Oct. 2008):

A planned NSSI-sponsored U.S. and Canada Northern Oil and Gas Research Forum for the Beaufort and Chukchi Seas, North Slope and MacKenzie Delta is scheduled for October 2008. 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 important research enables governments and industry to fulfill their responsibilities to the public by ensuring that oil and gas development is undertaken in a manner that minimizes environmental and social impacts and supports economic development. This joint forum will focus on the North, the renewed interest in exploration and potential future field developments, and the potential environmental concerns associated with such development. The forum will provide an opportunity to share research, identify synergies, build on existing partnerships, and move the research agenda forward. The two nations are planning such research forums as an annual event for the future.

Geographic Information System (GIS) and Remote Sensing Workshop: This workshop was to determine what kind of GIS and remote sensing base currently exists that supports North Slope activities and to develop protocols to be used in the design and implementation of GINA (described above). This workshop led to increased efforts to bring available data into GINA and bring remote sensing assets, which are common but not well organized, into a useful database. This workshop and the continued efforts of the standing GIS/remote sensing subcommittee of the Science Technical Advisory Panel identified over 130 potential information layers that are currently being evaluated for inclusion into GINA. The NSSI also implemented an organized remote sensing storage system through partnership with GINA and the University of Alaska Geophysical Institute.



A roadless oil pipeline spans North Slope tundra. (USGS)

Fire on the North Slope (Planned Workshop for 2009): In 2007, the largest fire in the State of Alaska (over a quarter of a million acres) occurred in the Anaktuvuk River area of the North Slope. Although fire has not historically been a major factor in structuring tundra ecosystems, this fire sparked concerns of a potential shift in fire regime linked to climate change and altered weather and ice patterns. Was the 2007 fire an anomaly or a sign of things to come? How might a changing fire regime affect wildlife and their food sources, or the air and water quality for North Slope residents? NSSI agencies and partners will be studying the Anaktuvuk River fire in the summer of 2008, and a workshop on the broader questions of a changing fire regime is in the planning for 2009.



Anaktuvuk River fire of 2007. (BLM)



Anaktuvuk fire study. (BLM, Randi Jandt)

Fish and Fisheries of Alaska's Arctic (Planned Workshop Nov. 2008): Fish and Fisheries of Alaska's Arctic): Changing ocean conditions, potential new energy development, changing precipitation patterns, potential new demands on North Slope water supplies, and predicted shifts in species composition all add up to a concern for the fish and fisheries of the North Slope and its marine waters. This concern will be the subject of an NSSI-sponsored session at the Alaska Chapter American Fisheries Society (AFS) meeting in November 2008. The session will highlight some of the ongoing work on the North Slope and begin to identify the pressing management and science needs that can position us all to help ensure the continued health of Alaska's arctic fish resources. Based on these findings, the NSSI and Alaska AFS will collaborate on a full scale Arctic Fisheries Workshop in 2009.



Nuiqsut residents participating in winter subsistence fishing. (ConocoPhillips)

Caribou Research and Monitoring

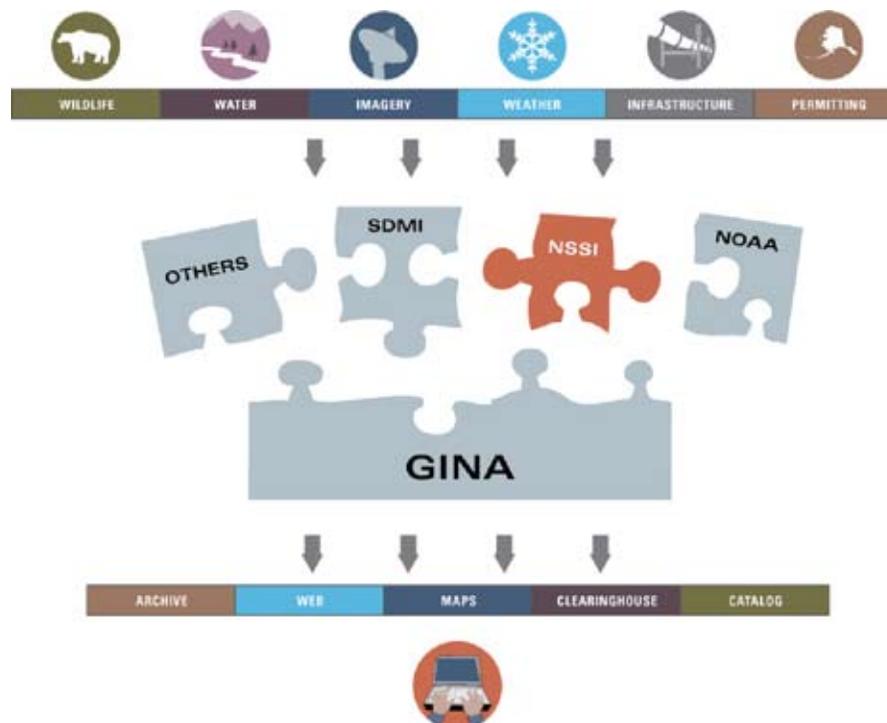
Workshop: Much of the caribou research and monitoring work on the North Slope is driven by information needs related to stipulations on development activities. The NSSI workshop reviewed prior research and monitoring efforts resulting from a January 2002 Alaska Oil and Gas Association-sponsored caribou workshop held in Fairbanks. The NSSI workshop evaluated how well the issues from 2002 have been addressed and what data gaps still exist. The workshop included status reports on monitoring activities across all four North Slope caribou herds as well as how monitoring activities in Alaska align with international efforts.



Porcupine Caribou Herd. (ADFG)

State and federal stipulations, and the differences between them, were highlighted and led to participant recommendations to periodically reassess the scientific basis for such stipulations. Presentations from the caribou research and monitoring workshop are posted on the NSSI website (www.northslope.org).

Database Integration (Planned Workshop, date pending): With the advent of modern data storage capacities and the renewed and diverse interest in Alaska as a focus of energy development and climate change, multiple parties have created a variety of databases for specific purposes. For decision makers, commonality in data and the translation into visual information is often its most useful form. This NSSI-sponsored workshop will facilitate links between GINA (described above) and other databases, enhance data sharing partnerships and protocols, and improve data integration and visualization.



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

Coordination and Cooperation

One of the primary goals of the federal, state, and local partners in forming the North Slope Science Initiative was to improve upon their collective understanding of each other's missions, management concerns, and science needs. This purpose was solidified under the enabling legislation (see sidebar on page 2) which 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.

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 four times/year and the Senior Staff Committee a minimum six times/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 progress of on-going 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). Every accomplishment detailed in this initial Report to Congress has 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 Future Directions section below). (Obj. 1-7)

External Communication

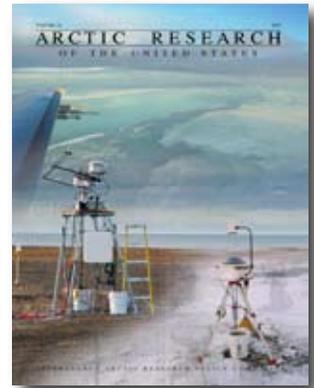
The mission and administrative structure of NSSI requires a viable network of external contacts with academia, non-governmental entities, industry and other science organizations. These contacts bring together potential partners, add a broader knowledge of North Slope endeavors, and assure scientific 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, July 31, 1984; amended as Public Law 101-609, November 16, 1990 (ARPA), provides for a comprehensive national policy dealing with national research needs and objectives in the Arctic. The ARPA established the Arctic Research

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

- ✦ 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 Arctic Research 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;
- ✦ 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; and,
- ✦ Submits a biennial report to the U.S. Congress through the President, containing a statement of the activities and accomplishments of the IARPC since its last report.



IARPC Report on the Arctic Observing Network.

Having principal 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)

Future Direction and Emerging Issues

In the brief time since its inception, the NSSI has developed a solid administrative structure and business plan and strong collaborative partnerships among local, state, tribal, national and international arctic leaders. The focus of the NSSI is on identifying and defining the future challenges we all will share. With the help of the Staff Committee and the Science Technical Advisory Panel (STAP), a deliberative process is now underway to develop a targeted list of management concerns and to match these concerns up with the appropriate scientific approaches that will be needed to credibly address them. The resultant compilation of management concerns and related science needs will provide the Oversight Group with a ground-truthed set of priorities to assist in critical decisions on the allocation of their respective and collective resources towards meeting these challenges. A preliminary listing of the broad categories of emerging management concerns was identified by the Oversight Group (Table 1).

Table 1. Emerging Issues Summary

General Subject Area	Potential Management Challenge/Data Need	Potential Science or Technology Challenge
Weather	<ul style="list-style-type: none"> Accurate and timely meteorological data 	<ul style="list-style-type: none"> Year round operation & reporting
Permafrost	<ul style="list-style-type: none"> Infrastructure stability Active layer depth/season 	<ul style="list-style-type: none"> Engineering design Measurement technology
Vegetation Change	<ul style="list-style-type: none"> Shifting vegetation associations Change detection Invasive plant detection 	<ul style="list-style-type: none"> Developing association protocols Differential adaptation
Hydrology	<ul style="list-style-type: none"> Peak & minimum flow Under ice water exchange Water availability 	<ul style="list-style-type: none"> Measurement technology Real-time data access
Saltwater Intrusion	<ul style="list-style-type: none"> Changing habitats Sea level rise 	<ul style="list-style-type: none"> Change detection Water chemistry/quality
Lake drying	<ul style="list-style-type: none"> Water availability for habitats and permitted activities 	<ul style="list-style-type: none"> Species shifts Alternative water supply for permitted activities
Coastal and Riverine Erosion	<ul style="list-style-type: none"> Rapid loss of shoreline Near-shore environments Siltation & habitat loss Legacy infrastructure 	<ul style="list-style-type: none"> Extent, site and rate Mapping precision Shoreline protection
Changing Fire Regime	<ul style="list-style-type: none"> Fire frequency and extent Fire management response 	<ul style="list-style-type: none"> Evaluation of extent of fire regime shifts & their effects
Sea Ice Degradation	<ul style="list-style-type: none"> Increased open water period Reduction of ice habitats 	<ul style="list-style-type: none"> Degree of degradation Food chain shifts Water temperature & acidity
Species of Management Concern	<ul style="list-style-type: none"> Migratory waterfowl Marine mammals Caribou Baseline of marine species Species & habitat changes 	<ul style="list-style-type: none"> Monitoring planning Natural Change vs. Anthropogenic Sampling protocol(s)
Social and Economic Impacts of Change	<ul style="list-style-type: none"> Increased/decreased subsistence opportunities Overall community health Human dietary shifts to non-traditional foods 	<ul style="list-style-type: none"> Social network analysis Analysis of traditional knowledge Integration and use of local knowledge Local role in monitoring
Marine Activities	<ul style="list-style-type: none"> Effect on marine mammals (migration/subsistence use) Spreading invasive species (ships, drill rigs, barges, ...) 	<ul style="list-style-type: none"> Noise interference Physical avoidance Invasive species baseline, prevention, detection
Contaminants	<ul style="list-style-type: none"> Spill response/planning Contaminant release from erosion (storage sites) Species impacts 	<ul style="list-style-type: none"> Sensitive/staging areas Site/risk mapping Burden/indicator species

This list serves as the basis for the NSSI deliberative process. The Staff Committee reviews each area of concern and further identifies the specific questions, concerns or needs from a management perspective. Because the list of emerging issues covers such a broad array of topics, this process sequentially considers only a subset of the issues at each iteration. For the initial effort, the categories chosen were permafrost, coastal and riverine erosion, and caribou (Table 2).

Table 2. Management questions/challenges/needs regarding permafrost, erosion, and caribou.

Permafrost	Coastal/Riverine Erosion	Species of Interest (Caribou)
		
<ul style="list-style-type: none"> a) How and where is permafrost being measured? Is it adequate? Is the data accessible? b) Are current measurement techniques sufficiently precise (e.g., to address subsidence)? c) How do we deal with the potential instability of current infrastructure, and how can new infrastructure be engineered to withstand a changing environment? d) NSSI agencies' immediate need is to be able to predict how permafrost will change temporally and spatially over the next one to two decades. e) How will changes in permafrost condition manifest for winter tundra travel, does the increasing depth of the active layer impact seasonal tundra travel? f) What are the restoration methods for such structures as Vertical Support Mechanisms (VSM) in a changing environment? 	<ul style="list-style-type: none"> a) How and where is erosion being measured? Is it adequate? Is the data accessible? b) What are the extent and rate of erosion? c) What are the erosion risks to communities and to subsistence opportunities and access? d) What are the links between coastal or riverine erosion and contaminant risk? Have contaminated sites been mapped? What is the overlap between such sites and predicted erosion? e) What are the engineering considerations for current and future infrastructure as erosion processes accelerate? f) What are the links between coastal & riverine erosion and changing permafrost conditions? 	<ul style="list-style-type: none"> a) Need management plans for each North Slope herd, which accounts for movement between herds and reflects shared herd traits, but differentiates each herd's unique challenges (threats, uses, mgt. goals). b) Need monitoring and research plans for each North Slope caribou herd, including which data are: needed, being collected (& by whom) or not yet being collected, and how to access the data. c) Need to establish a network to share caribou information between and among herd managers, researchers and users. d) Can we identify caribou parameters that can help measure impacts from anthropogenic activities vs. natural cycles? e) What is the effect of changes in caribou numbers and distribution on subsistence use?

Photo Credits: Permafrost © 2008 William W. Bacon/ AlaskaStock.com, Coastal Erosion (BLM), Caribou Research (ADFG)

Table 2. (continued)

(continued) Permafrost	(continued) Coastal/Riverine Erosion	(continued) Species of Interest (Caribou)
<p>g) Is seabed permafrost adequately mapped, and what is the interaction between seabed permafrost and permafrost in coastal areas as exploratory drilling and off-shore to on-shore infrastructure is developed?</p> <p>h) What is the impact on seabed permafrost from noise generated by exploration and production drilling in the marine environment, and how can it be mitigated?</p> <p>i) What are the changes in habitat and vegetation related to changing permafrost conditions, and what will these changes mean to wildlife and habitats?</p> <p>j) How does the changing active layer affect water distribution and availability?</p> <p>k) What is the impact of changing permafrost to traditional ice cellars?</p> <p>l) What is the effect of fire on permafrost?</p>	<p>g) What are the expected changes to habitat as a result of erosion and related redistribution of both fresh and saline water?</p> <p>h) What are the impacts to water quality (sediment load, dissolved oxygen, conductivity, etc.) in the fresh water and near-shore environments?</p> <p>i) Are there mechanisms to consider for adapting to or mitigating for erosion?</p> <p>j) What are the erosional threats to cultural sites? How can the threats be addressed? How can cultural sites be salvaged? Are there technologies that can help locate, salvage or protect sites?</p> <p>k) How will erosion patterns change with the changing patterns in weather, sea ice and wave climate, and sea level changes? How do we plan for this in the future?</p>	<p>f) Need more information on the winter ecology of caribou.</p> <p>g) Need to develop a database of industry activities for the winter and spring.</p> <p>h) Better reporting of subsistence and sport harvest data would aid in determining relationship with impacts from exploration and development activities;</p> <p>i) Need to review the appropriateness of stipulations and their value to caribou.</p> <p>j) Are there baseline measurements not already being documented that are needed?</p> <p>k) Seasonal variation in caribou food production under changing climate conditions.</p> <p>l) Is there a better technology for gathering consistent census data across the Slope?</p> <p>m) What may be the response of naïve caribou herds to oil and gas exploration?</p> <p>n) How might changing fire regimes and fire response affect caribou distribution and the distribution of caribou food sources?</p>

The Science Technical Advisory Panel then reviews this list to identify the appropriate science needed to address each listed concern, or to clarify that the need is for management action rather than further scientific investigation. Examples of some of the early results of the deliberative process are presented in Exhibit 1.

Exhibit I. Examples for permafrost and caribou of how ideas flow from the Oversight Group through the Senior Staff Committee in identifying emerging issues and future challenges, and the Science Technical Advisory Panel to help define the science needed to address them.

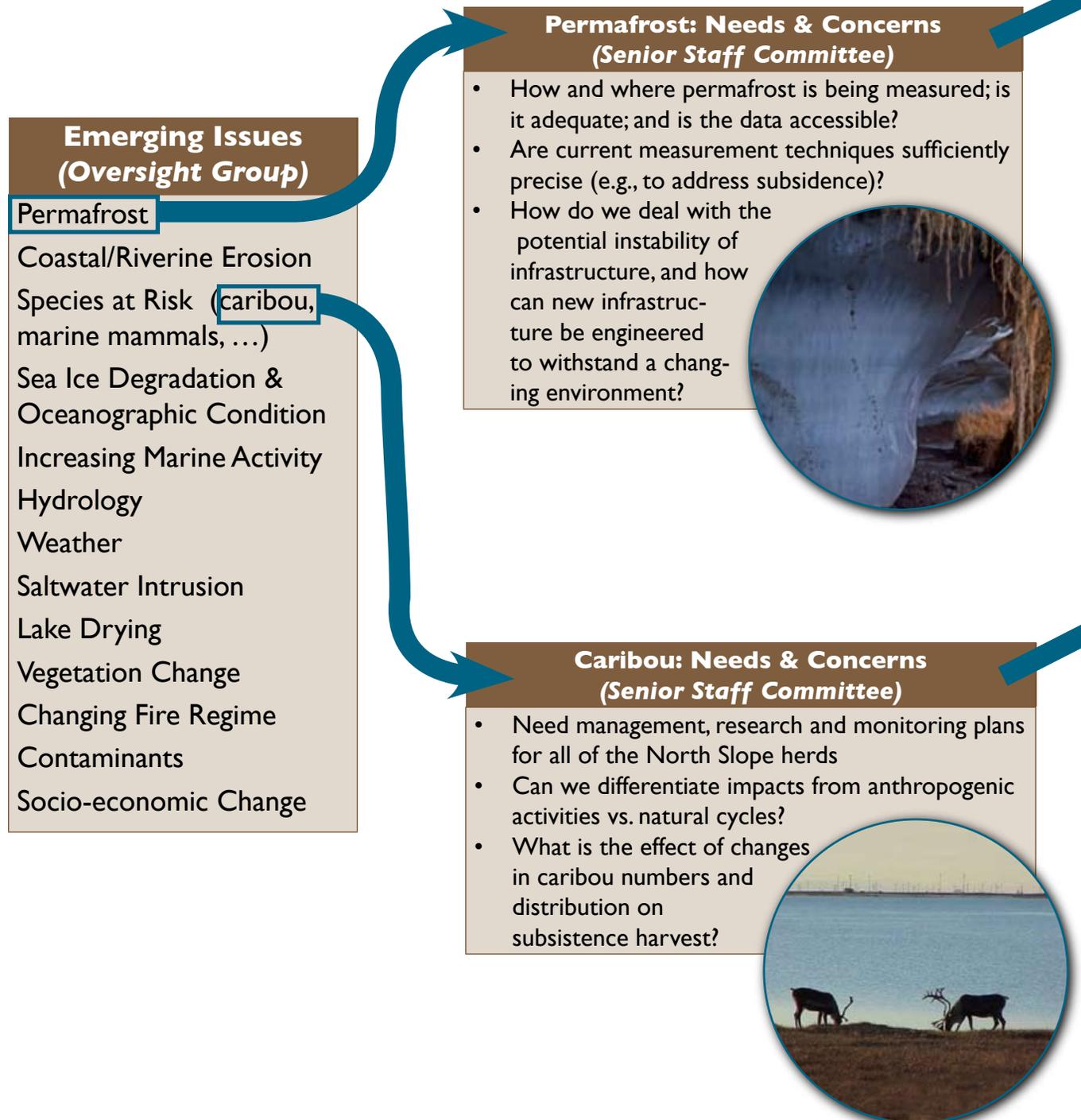


Photo Credits: Permafrost © 2008 William W. Bacon, Caribou with Prudoe Bay facilities in background (USFWS)



Science to Address Permafrost Concerns *(Science Technical Advisory Panel)*

Current permafrost science has only a limited understanding of the distribution of permafrost on the North Slope, and a similarly limited sense of how it may change. What information we have comes primarily from a network of index sites (see Circumpolar Active Layer Monitoring network, <http://www.udel.edu/Geography/calm>). Combining CALM data with Synthetic Aperture Radar (SAR) data has shown some potential to augment traditional measures and extend their spatial coverage, but more research in this area is needed. Thermal models of permafrost change are also useful, but accurate baseline monitoring is the critical first step. All relevant data need to be centralized in one accessible location. Only then can we begin to address questions both general (will change be gradual or catastrophic?) and localized (will the permafrost thaw under a specific section of pipeline?).



Science to Address Caribou Concerns *(Science Technical Advisory Panel)*

Such plans would need to address: 1) demographic data (population, calving data, survival information, ...); 2) distributional and movement data (obtained, for example, from satellite collar technologies); 3) information on the distribution and condition of caribou food production and habitat; 4) harvest information, including composition of the sport hunt and subsistence harvest and the distribution of that harvest across the range of the herd(s); and 5) information on factors that may affect these other attributes (e.g., climatological data [temperature, snow cover and persistence, icing events, ...] and data on distribution and timing of new exploration activities or infrastructure placement) to aid in data interpretation and forecasting. Each plan should identify who is (or will be) collecting the information, how it will be communicated to data users, and information on the level of uncertainty in the data. To the extent such data collection is planned, implemented, and communicated, this will improve North Slope managers' understanding of and ability to differentiate between the impacts of anthropogenic activity (e.g., energy development) and more stochastic (e.g., weather-mediated) changes to caribou populations and distribution, and thus the availability of caribou to subsistence users.

The next subset of issues currently being considered under this process, focuses on oceanic concerns and includes sea ice degradation, oceanographic conditions (currents, temperature, water chemistry), increasing marine activity (offshore oil and gas, shipping, shoreline infrastructure), and marine mammals and their prey base. This second set of issues is expected to be developed by the end of fiscal year 2008. Assessment of the full list of emerging issues will be completed in fiscal year 2009 and should provide the basis for future NSSI project planning, coordination, and shared investments in information gathering.

What does the future hold for whales and whaling in the marine waters of America's Arctic?



Bowhead whale cruises the Arctic Coast. (NOAA, Dave Rugh)



Whaling crews pull together to tow whale ashore. (J. Craig George)

Literature Cited

Circumpolar Arctic Vegetation Map Team. 2003. Circumpolar Arctic Vegetation. Scale 1:7,500,000. Conservation of Arctic Flora and Fauna (CAFF) Map No. 1. U.S. Fish and Wildlife Service, Anchorage, Alaska.

Department of Energy - National Energy Technology Laboratory. 2007. Alaska North Slope Oil and Gas: a promising future or an area in decline? DOE/NETL-2007/1280.

Intergovernmental Panel on Climate Change. 2007. Climate change 2007: synthesis report (AR4). Summary for Policy Makers. 22 pages.

National Research Council. 2003. Cumulative environmental effects of oil and gas activities on Alaska's North Slope. National Academies (<http://nationalacademies.org>)

Noel, Lynn E., Keith R. Parker and Matthew A. Cronin. Caribou distribution near an oilfield road on Alaska's North Slope, 1978-2001. Wildlife Society Bulletin, Vol. 32, No. 3 (Autumn, 2004), pp. 757-771.

Krummel, John, et al. 2005. North Slope Science Initiative: A strategy for inventory, monitoring and research. Draft. May 2005. 44 pages.

Sherwood, Kirk W. 2006. Petroleum potential of the Arctic offshore of Alaska. Newsletter of the Geophysical Society of Alaska, Vol 20, Number 7 (April 2006), p 1-3.

United States Geological Survey. 2001. Arctic National Wildlife Refuge, 1002 area, petroleum assessment, 1998, including economic analysis. USGS Fact Sheet FS-028-01. April 2001.

United States Geological Survey. 2002. U.S. Geological Survey 2002 petroleum resource assessment of the National Petroleum Reserve in Alaska (NPRA). USGS Fact Sheet 045-02.

United States Geological Survey. 2005. Oil and gas assessment of central North Slope, Alaska, 2005. USGS Fact Sheet 2005-3043, Version 1.1.

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

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 Inupiat 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 Inupiat 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 (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

2008 Appointees and Representative Scientific Expertise	
Sue Moore, Ph.D.	Marine Ecology
Robert Suydam, M.S.	Wildlife 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.	Environmental Science
Robert Shuchman, Ph.D.	Remote Sensing
Matthew Sturm, Ph.D.	Geophysicist/Hydrology
Dirk Derksen, Ph.D.	Ornithology
Douglas Kane, Ph.D.	Civil Engineering
Arnold Brower, Sr.	Traditional and Ecological Knowledge

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.

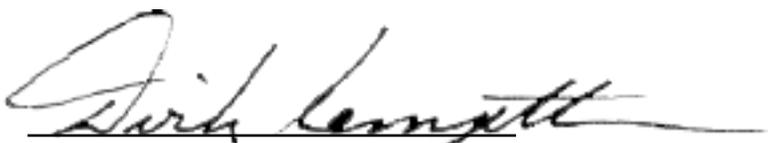
Science Panel Membership: The Science Panel shall consist of a representative group of not more than 15 scientists and technical experts from diverse professions and interests, including the oil and gas industry, subsistence users, Native Alaskan entities, conservation organizations, wildlife management 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

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

Tom Heinrichs, University of Alaska Fairbanks, Geographic Information Network of Alaska, Data System Development

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

Buck Sharpton, University of Alaska Fairbanks, North Slope Research

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

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

Industry

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

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

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

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

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

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

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

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

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

Bill Streever, BP Alaska, Inc., Environmental Studies

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) (www.aoos.org)

Alaska Oil and Gas Association (AOGA) (www.aoga.org)

Arctic Monitoring and Assessment Programme (AMAP) (www.amap.no)

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

Arctic Research Consortium of the United States (ARCUS) (www.arcus.org)

Arctic Research Mapping Application (ARMAP) (www.armac.org)

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

Barrow Arctic Science Consortium (BASC) (www.arcticsscience.org)

Barrow Area Information Database (BAID-IMS) (www.baidims.org)

Circum-Arctic Environmental Observations Network (CEON) (www.ceoninfo.org)

Conservation of Arctic Flora and Fauna (CAFF) (http://arctic-council.org/working_group/caff)

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

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)

North Pacific Research Board (NPRB) (www.nprb.org)

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

Sustained Arctic Observing Network (SAON) (www.arcticobserving.org)

U.S. Army Cold Regions Research and Engineering Laboratory (CRREL) (www.crrel.usace.army.mil)



Fresh water "pans," National Petroleum Reserve-Alaska. © 2008 Steve Kazlowski/ AlaskaStock.com