

2013-2014

North Slope Science Initiative *Report to Congress*



North Slope Science Initiative
ALASKA

<http://northslope.org>



Scope, Mission and Vision

The North Slope Science Initiative (NSSI) was developed by local, state and federal governments with trust responsibilities for land and ocean management, to facilitate and improve collection and dissemination of arctic ecosystem information pertaining to Alaska’s North Slope region, including coastal and offshore regions. The *mission* of the NSSI is to improve scientific and regulatory understanding of terrestrial, aquatic and marine ecosystems for consideration in the context of resource development activities and climate change. The *vision* of the NSSI is to identify the data and information 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 and its adjacent seas. The NSSI uses and complements the information produced under other science programs, both internal and external. The NSSI also facilitates information sharing among agencies, non-governmental organizations, industry, academia, international programs and members of the public to increase communication and reduce redundancy among science programs.

2005 Legal Mandate

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

Credits

Dennis R. Lassuy, Ph.D., NSSI Deputy Director, John F. Payne, Ph.D., NSSI Executive Director, and the NSSI Oversight Group are the principal authors of this report, with input from the NSSI Science Technical Advisory Panel and Senior Staff Committee.

2013-14 Report to Congress

North Slope Science Initiative

Executive Summary

The United States is an arctic nation because Alaska is an arctic state; the North Slope Borough is home to much of Alaska's Iñupiat culture and the source of much of Alaska's energy production. And, because over two-thirds of our northernmost lands and seas fall under federal jurisdiction, we are in this together – and the connections are extensive.

In very real economic and ecological ways, the state, the nation and the globe benefit from the riches of the North Slope. The ecosystems of our arctic slope are both the sender and receiver of inputs to and from sources across the globe. For example, the life cycles of migratory species from distant lands and seas are inextricably connected to the ecosystems of the North Slope and its adjacent seas. After a period of feeding and growth and raising their young, these species return to those distant lands and seas having benefited from the relative health of our northern landscapes. Yet these same North Slope landscapes support oil and gas production that contributes heavily to the state's general fund revenue and Prudhoe Bay remains America's largest oil field. North Slope ecosystems also receive inputs from distant sources, both in the form of benefits such as harvestable migratory species and in the form of threats such as chemical and biological pollutants. The condition and continuity of all of these systems, on land, sea and ice are essential to Iñupiat culture and food security.



U.S. scientists get to work analyzing changes in the deposition of snow as the Arctic climate changes. (Dr. Matt Sturm, UAF)

In sustaining these resources and planning for safe energy exploration and development, managers also face a rapidly changing climate. Clearly the opportunity, indeed the need, for cooperation and collaboration is immense and increasingly challenging. To better prepare themselves to meet the unparalleled challenges and opportunities for partnered science and service, a group of federal, state, local and Alaska Native resource managers collectively formed the North Slope Science Initiative (NSSI) in 2001 and it was formally authorized under the Energy Policy Act of 2005 (Section 348).

The NSSI membership believes it can increase collaboration and coordination among its members and with industry, academia, non-governmental

Executive Summary (Continued)

organizations, the public, and the whole of the arctic community in a manner that will lead to better informed management decisions. This report to Congress briefly outlines the formation and organization of the NSSI and highlights its 2013 and 2014 accomplishments.

In fiscal years 2013 and 2014, NSSI member agencies, with the help of our Science Technical Advisory Panel made significant progress in several areas:

- ◆ **Energy and Resource Development Scenarios:** The NSSI has initiated a scenarios project to help identify plausible energy and resource development futures for the North Slope and adjacent seas to help inform future investment in appropriately targeted research and monitoring. The use of scenarios, an approach recommended in the “Integrated Arctic Management” Report to the President (Clement et al. 2013), is a deliberative and inclusive process that helps engage diverse stakeholders in thinking creatively yet realistically about plausible futures in a complex and uncertain environment.
- ◆ **Land Cover Mapping:** After years of collaborative effort, the NSSI land cover mapping effort was completed and now serves as the first consistent, accurate land cover map for the entire North Slope region. This is a landmark accomplishment for the NSSI and its partners, as this map now provides a reliable baseline reference for all parties, public or private, with applied interests in the North Slope. It is already being used by NSSI member agencies for monitoring and resource assessment.
- ◆ **Data Management:** The NSSI, in partnership with the University of Alaska – International Arctic Research Center, continued to improve the coverage, functionality and speed of its North Slope Science Catalog (<http://catalog.northslope.org>). Catalog maintains project tracking information that describes the who, what, when and where of on-going scientific research relevant to the North Slope. Catalog is also developing themed portals that will allow for improved visualization and access to various North Slope data sets.
- ◆ **Outreach and Communication:** The NSSI, through its staff and affiliates, has shared scientific and management knowledge of North Slope resources in many venues. The NSSI has also strengthened the connection between the scientific community and the public, and encouraged them to share experiences with each other, through the use of social media sites which allow users to interact in near real time.
- ◆ **Making Arctic Connections:**
 - ◆ **U.S.-Canada Oil and Gas Research:** The NSSI collaborated with its Canadian partners to organize and convene the third biennial Northern Oil and Gas Research Forum in Anchorage, Alaska. Over 200 attendees from Alaska Native and Canadian indigenous groups, government, industry, academia and non-governmental organizations shared traditional, technical and scientific knowledge related to oil and gas activities and discussed the links between research and informed decision-making.

Executive Summary (Continued)

- ◆ **Arctic Council and Circumpolar Monitoring:** With the complexity of arctic activities rapidly increasing and the U.S. Chairmanship of the Arctic Council rapidly approaching, the Secretary of the Interior directed its bureaus to increase DOI activities with the Arctic Council and its Working Groups. The NSSI's success in co-leading the Terrestrial Circumpolar Biodiversity Monitoring Strategy in 2013 has now led to the U.S. (through the NSSI and BLM) becoming the overall co-lead for the Arctic Council's Circumpolar Biodiversity Monitoring Program (CBMP). The CBMP provides the opportunity to harmonize monitoring programs in terrestrial, freshwater, coastal and marine environments to provide a more comprehensive (and defensible) slate of information and analyses for decision-makers.
- ◆ **Developing U.S. Arctic Science:** NSSI-affiliated personnel (from the Oversight Group, Senior Staff Committee, Science Technical Advisory Panel, and NSSI staff) assisted in several forward-looking gatherings to help identify critical research and monitoring needs in the U.S. Arctic. These included a Polar Research Board workshop on Emerging Research Questions in the Arctic, a National Research Council workshop on Responding to Oil Spills in Arctic Marine Environments, an Interagency Arctic Research Policy Committee workshop on Collaborative Research Approaches, the National Petroleum Council's Arctic Research Study, and a broadly co-sponsored Arctic Adaptation Exchange Workshop.
- ◆ **Coordination and Collaboration:** In furtherance of and enabled by the statutory purpose and structure of NSSI, we continued to collaborate closely with other initiatives including entities like the Arctic Landscape Conservation Cooperative and Alaska Climate Science Center and the Department of Commerce's NOAA Climate Services, and interagency bodies like the Alaska Interagency Working Group (on Energy Permitting in Alaska) and the Interagency Arctic Research Policy Committee, as well as non-governmental initiatives such as Alaska Oceans Observing Systems, North Pacific Research Board, Arctic Council working groups, and others within the circumpolar arctic community.

Since its inception, the NSSI has continued to evolve its organizational effectiveness and coordination on federal, state and local levels. This growth in cooperation is a clear benefit of the initiative. For the near future, the NSSI will focus on identifying future development scenarios on Alaska's North Slope and adjoining seas. It will also identify information needs for management decision making relative to those development scenarios; identify and coordinate long-term monitoring relative to development scenarios and emerging issues; improve coordination and communication among managers, residents and scientists; and develop NSSI informational materials for multiple audiences. It is essential for all of the NSSI member organizations, as well as the greater arctic community to move forward with a well-planned and coordinated inventory, monitoring and research efforts that can serve as a basis for more integrated arctic management and provide a strong and credible U.S. voice in a whole-of-the-Arctic approach.

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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 hereafter by (Obj. #).

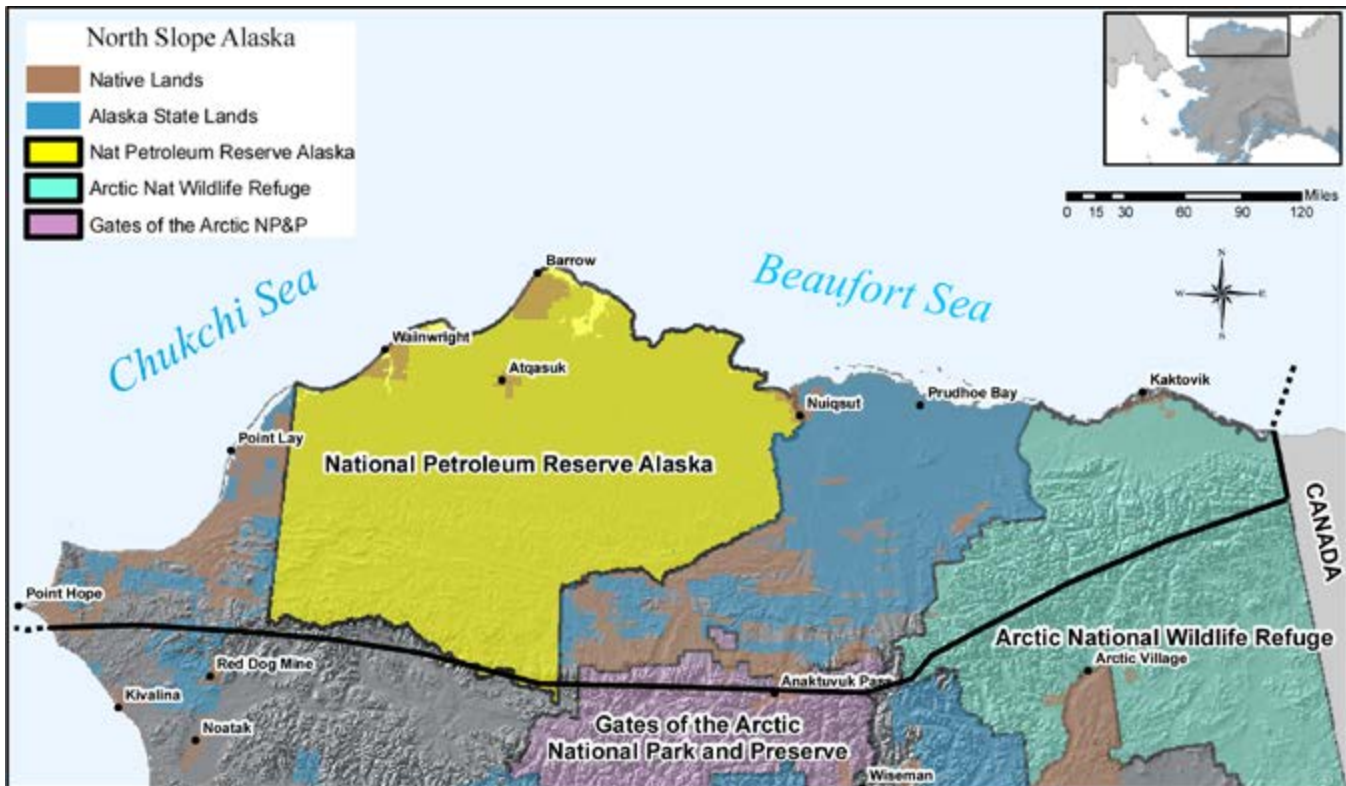
Background and Need for the North Slope Science Initiative

The North Slope of Alaska is a vast area of the polar arctic encompassing 231,000 km² (89,000 mi²) on land; with an additional 295,000 km² (114,000 mi²) in the offshore areas of the Chukchi and Beaufort Seas – in total, an area roughly the combined size of all of America’s eastern seaboard states from Maine through Virginia. 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 that supports the vibrant subsistence culture of the Iñupiat people who reside in the area. Balanced and scientifically informed management of fish, wildlife, subsistence, and energy resources continues to be the goal of agencies, Alaska residents, and industry.

The 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 (e.g., the threatened spectacled and Steller’s eiders), shorebirds and many others. These summer visitors migrate to the North Slope from nearly every U.S.



Seining for dolly varden on the Ivishak River. (ADFG)



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

state and as far away as South America, Africa, Asia, and Antarctica. Four caribou herds make their home on the North Slope and provide a significant portion of the wild native foods harvested by North Slope residents. Offshore areas provide habitat for a variety of marine mammals, including the polar bear, four species of ice seals, walrus, and several species of whale. Marine mammals comprise over 60 percent of the annual subsistence harvest. Freshwater fishes, particularly several whitefish species (e.g., Aanaakliq, Pikuktuuq, and Qaaktaq) and dolly varden (Iqalukpik), are also 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.

The North Slope, all of which is above the Arctic Circle, is a place where global forces have long been converging. In years past, 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; and oil companies developed a large industrial complex. Today the North Slope is a pan-arctic focal point of growing global awareness and is used for observation and assessment of the near- and long-term 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 governmental agencies to maintain healthy fish and wildlife populations and their habitats in a productive environment. The laws and regulations that govern oil and gas development and protect the environment are among the most

stringent in the United States, and Alaska is proud of its track record. Through continued technological improvements, industry has succeeded in reducing the footprint of development while expanding into new areas with directional drilling, targeting oil reservoirs miles from the main drill site. Reserve pits for holding drilling wastes have been replaced by grind and inject facilities which return these materials to the formation underground. Alaska has an impressive record of incorporating new technologies for exploration and development activities to reduce environmental impacts.

Resource managers are seeking ways to adapt to a rapidly changing arctic environment. Climate change impacts to the Arctic have both regional and global implications and will likely have increasing significant arctic and worldwide environmental and societal consequences (IPCC 2007). These Arctic-wide changes are of such magnitude and rate that there is broad consensus that enhanced, coordinated, and sustained observation, research, and monitoring is vital. The Study of Environmental Arctic Change (SEARCH), along with the International Study of Arctic Change (ISAC), both International Polar Year legacies, has identified three components to adapting to change: observing change, understanding change, and responding to change. The NSSI, with its statutory purpose and management-driven structure, is one of few entities within the larger arctic science and resource management community that addresses each of these components. As such, the NSSI works within the greater community to move forward to help identify well-planned and coordinated inventory, monitoring, and research strategies.

The NSSI and Other National Initiatives: Putting the Power of Collaboration to Work

Since its authorization by Congress in 2005, the North Slope Science Initiative has continued to engage and collaborate with ongoing or new initiatives that help meet its mission. For example, from 2009 through 2011, the Departments of the Interior (DOI) and Commerce announced separate new national initiatives. On September 14, 2009, the Secretary of the Interior signed Secretarial Order Number 3289, “Addressing the Impacts of Climate Change on America’s Water, Land, and Other Natural and Cultural Resources.” This order established the Climate Change Response Council, chaired by



After a very slow start to the season, the first bowhead whale harvested out of Barrow in 2013 was finally taken by the Jacob Adams crew in late June. (Anne Jensen, Barrow)



The Terrestrial Environmental Observation Network (TEON), designed under the auspices of the Arctic Landscape Conservation Cooperative, is organized around representative focal watersheds. For more information, visit: <http://arcticlcc.org/projects/teon>. (ALCC)

the Secretary, to coordinate activities within and across the bureaus to develop and implement an integrated Departmental strategy for climate change response. Working at the landscape, regional, and national scales through the establishment of DOI Climate Science Centers (CSCs) and Landscape Conservation Cooperatives (LCCs), the Department is defining and implementing a vision that integrates DOI science and management expertise with that of NSSI's partners, providing available information and best management practices to support strategic adaptation and mitigation efforts on U.S. and international public and private lands. This vision is consistent with and advanced by the 2013 Executive Order 13653 (Preparing the United States for the Impacts of Climate Change). In combination, these Secretarial and Executive Orders support and leverage individual bureau missions while creating synergies with other DOI agencies and partners to implement integrated climate change science, adaptation, and mitigation strategies across broad landscapes. DOI bureaus will pool their resources to support and leverage the joint work of work of the CSCs, LCCs and NSSI. Project-level funding and

Relationship of the U.S. Arctic Policy Directives to the North Slope Science Initiative

The U.S. has had over 40-years of articulating U.S. Arctic interests and developing consistent policies. Beginning in 1971 with the issuance of the National Security Decision Memorandum, which created the Interagency Arctic Policy Group, the U.S. had its first national guidance that made agencies responsible for overseeing the implementation of the U.S. Arctic Policy. The guidance served as a starting point for continuing refinements in 1983, 1984, 1994, 2009, 2010, 2013 and 2014.

The most recent iteration of the U.S. Policy was issued in 2013 with the release of the *National Strategy for the Arctic Region*. This document was based in part on the findings of a report to the President in 2013 (Managing for the Future in a Rapidly Changing Arctic). The Strategy is built on three lines of effort:

- Advance U.S. Security Interests – evolve Arctic infrastructure and capabilities
- Pursue Responsible Arctic Region Stewardship – protect Arctic environments and conserve its resources; employ scientific research to increase our understanding of the region
- Strengthen International Cooperation – advance collective interests; promote shared Arctic state property; work toward U.S. accession to the “Law of the Seas Treaty.”

In 2014, the President released the Implementation Plan for the National Strategy for the Arctic Region. The implementation plan provides the objective for each Federal activity, lists the next steps and time period to accomplish the objective, specifies the way to measure programs, and designates the lead Cabinet entity and supporting Cabinet entities to accomplish the objective.

As the U.S. Arctic strategy has evolved, the NSSI has worked to facilitate access to scientific information for decision makers; promote international cooperation; and identify plausible scenarios to help decision makers better plan for future Arctic activity.

the implementation of regulatory, management, or policy decisions will continue to be the responsibility of each bureau and partner.

In addition, the National Oceanic and Atmospheric Administration (NOAA) created a Regional Climate Service in Alaska in 2010, finalized an arctic vision and strategy in 2011 (http://www.arctic.noaa.gov/docs/NOAAArctic_V_S_2011.pdf), and released an Arctic Action Plan in 2014 (<http://www.arctic.noaa.gov/features/action-plan.html>). NOAA envisions an Arctic where conservation management is based on sound science that supports healthy, productive, and resilient communities and ecosystems. The agency seeks a future that better understands and predicts the global implications of changes in the Arctic.

The NSSI has developed a solid intergovernmental and societally and academically informed partnership structure for identifying science needs and sharing information in the Arctic. The NSSI Emerging Issues Summaries (<http://northslope.org/issues>), combined with the pilot WildREACH report from the Arctic LCC, form an excellent foundational inventory of research and management issues facing the Arctic today. The NSSI scenarios effort, initiated in 2014 and ongoing through 2015, (see Scenarios for Energy and Resource Development section of this Report) will extend that look into plausible future issues facing arctic managers. This framework will continue to help prioritize science needs for the North Slope and put the power of collaboration to work. The DOI Climate Science Center is working with the University of Alaska system to meet climate science needs for conservation decisions in Alaska. The ability to meet these priorities and leverage multi-agency and partner resources will determine the success of these initiatives. All of the combined and integrated resources of the NSSI, Arctic LCC, Alaska CSC, and NOAA's Climate Service represent a good beginning for understanding and confronting the complexity of arctic issues.



U.S. Coast Guard Cutter Healy moves through an Arctic ice field. (NOAA)

National Research Council Reports and the NSSI

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 its impacts on the Arctic and more specifically the North Slope region.
- ◆ **Need for Comprehensive Planning:** Currently, multiple agencies make decisions on industrial activities on a case-by-case basis, without a comprehensive plan to guide the process. A comprehensive plan is needed to ensure that future decisions match the overall goals for the region, in all phases of development.
- ◆ **Ecosystem Research:** Currently, the North Slope lacks ecosystem-level research. There is a need to increase research activities and focus on ecological processes.
- ◆ **Offshore Oil Spills:** The potential for a large arctic offshore oil spill requires additional research to address the effects of such a spill, how marine life could be protected, and the effectiveness of various cleanup activities, especially in broken sea ice.

In 2009, the National Research Council released a second report (NRC 2009): Informing decisions in a changing climate: panel on strategies and methods for climate-related decision support. This report reaffirmed the organizational structure and benefits of the NSSI by outlining a cooperative, stakeholder-based, deliberative approach that decision makers can use. The NSSI was originally established to follow the six principles of the report, long before the report was released. These guiding principles are:

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

As the unparalleled challenges and opportunities of a changing climate, resource exploration, and development activities become more important to the nation, so does the need for information and more effective ways to support resource decisions. The NSSI, with its broad legislative mandate, is integrated across federal, state, and local governments with partnered research and service. The NSSI believes it can increase collaboration and coordination with industry, the public, academia, non-governmental organizations, and the greater pan-arctic community in a manner that will lead to better informed management decisions.

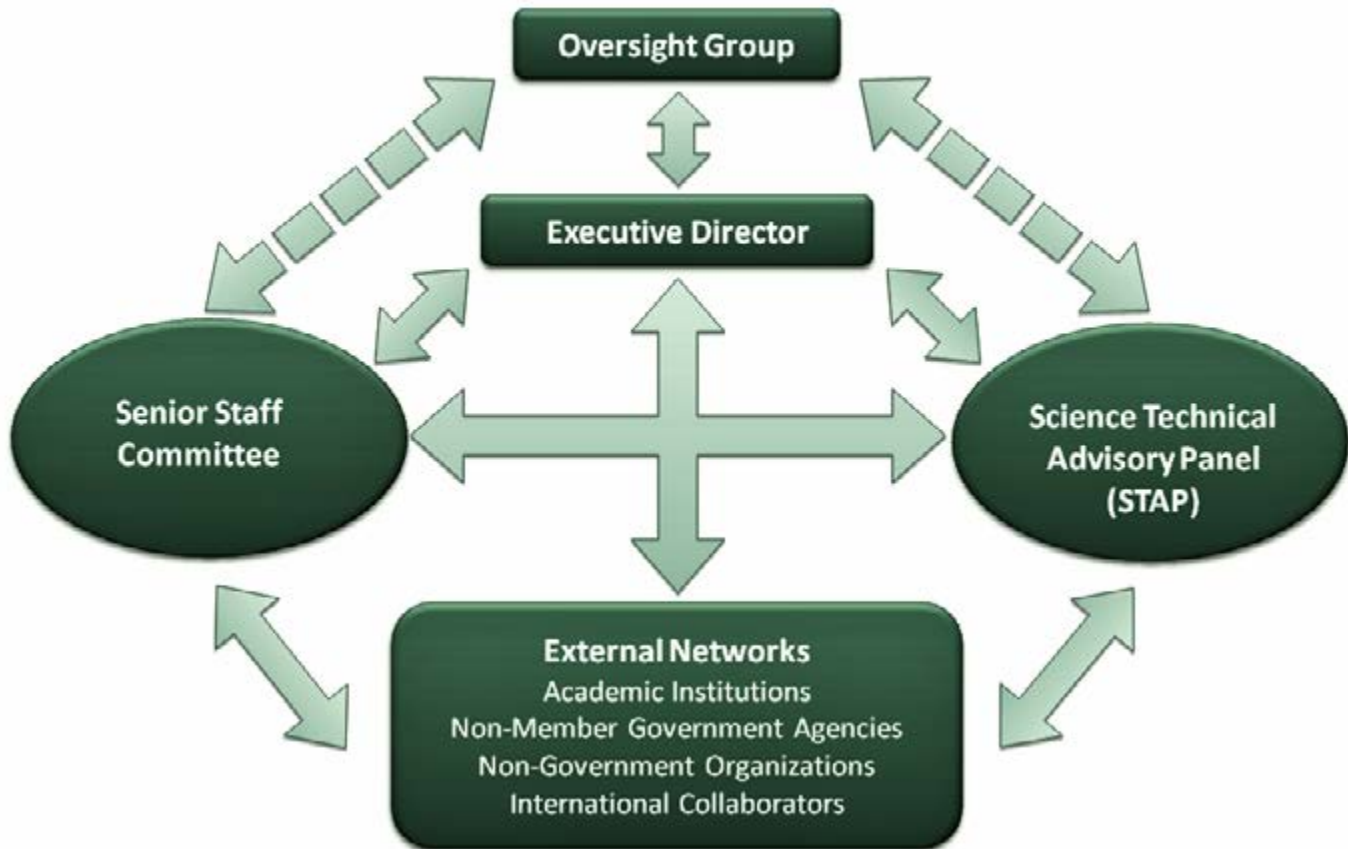
Organizational Structure and Administration of the North Slope Science Initiative

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

The NSSI's uniqueness begins with its senior leadership on the Oversight Group (See charter, Appendix 1). The group's membership comes from lead agency, government, and organization managers with responsibilities for resources on the North Slope and its off-shore environments. The NSSI also has a unique Science Technical Advisory Panel, operated under the Federal Advisory Committee Act, whose 15 members represent more than 300 collective years of expertise in the Arctic. NSSI's members include:

Department of the Interior	
Bureau of Land Management (administrative agency)	State Director
Bureau of Ocean Energy Management	Regional Director
Bureau of Safety and Environmental Enforcement	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	Chair
U.S. Department of Energy	Arctic Energy Office
U.S. Geological Survey	Regional Director
U.S. Coast Guard	Commander, 17th District

North Slope Science Initiative Implementing Legislation



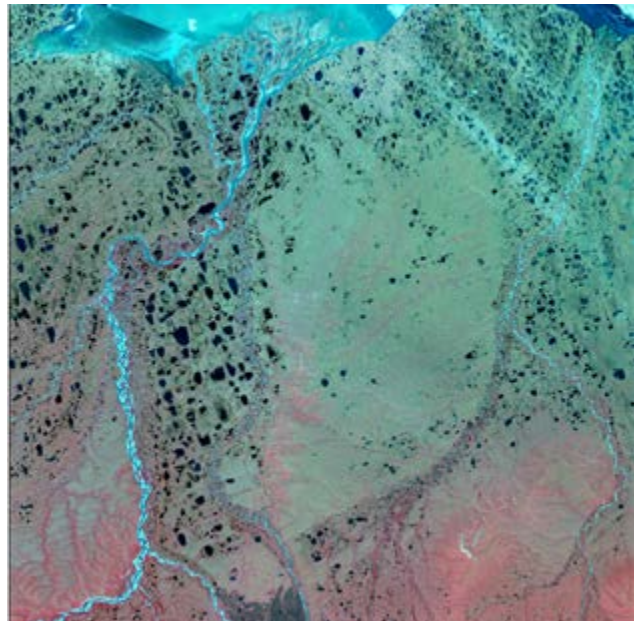
The NSSI is an organization that provides for highly effective interaction between government leadership, the senior staff specialists of member entities, its multidisciplinary Science Technical Advisory Panel, and outside networks to identify management needs and provide recommendations to address those needs to leadership. The NSSI organization is not intended to supplant individual agency science or management programs, but to facilitate many of the science directions already being addressed by some individual NSSI member agencies and help in the sharing of human and monetary capital to address needs beyond an individual agency capability. The NSSI is bounded by the collective needs of its membership while still providing individual agency science programs the opportunity to share in addressing those collective needs, or by offering an expanded network of expertise.

Consistent with its mission and vision, the NSSI is a highly interactive organization. It draws advice from a variety of disciplines, expertise, and knowledge. This functional structure is designed to assist federal, state, and local governments; academia; industry; and the public in making strategic, science-informed decisions based on short- and long-term ecosystem management needs. This structure, assisted by a small core of NSSI staff and a science advisory panel, provides independent expert review and advice; facilitates coordination and communication among member programs; and develops a common infrastructure for data management, publications, and information processing.

Oversight Group

The Oversight Group (OG) is the senior-level management from the NSSI member and advisory entities. The OG:

- ◆ Sets direction for the NSSI and cascades that direction through member agencies;
- ◆ Lays out a clear vision and sets goals and expectations;
- ◆ Serves as the decision maker for NSSI priorities and activities;
- ◆ Provides executive-level leadership;
- ◆ Provides a forum for looking forward; and,
- ◆ Approves NSSI's annual budget and Report to Congress



The lower Colville River area is a cross-roads of both oil and gas activity and subsistence activity. (BLM)

Executive Director and Deputy Director

The Executive Director's office provides the managerial guidance and executive oversight on day-to-day activities of the NSSI. In addition, it provides advice and consultation to governmental agencies, scientific and academic institutions, and other interested parties to further the Congressional objectives of the NSSI. It also coordinates and integrates science-based activities among NSSI member entities and their partners for the North Slope. The Executive Director:

- ◆ Identifies decision points for the Oversight Group;
- ◆ Implements the Oversight Group's decisions;
- ◆ Carries out direction from the Oversight Group through coordination with the Senior Staff Committee, Science Technical Advisory Panel, and others;
- ◆ Is the Designated Federal Officer for the Science Technical Advisory Panel;
- ◆ Manages the NSSI budget;
- ◆ Promotes the NSSI;
- ◆ Consults with the Oversight Group Chair when a subject matter may be outside the normal operations of the initiative. For example, a request to the NSSI for a response to a task may conflict with a member agency(ies) policy or operations. The Executive Director and Chair may consult with other members as necessary to draft the appropriate response;
- ◆ Speaks on behalf of the NSSI, but not on behalf of member agencies; and,
- ◆ Develops the annual Report to Congress.

The Deputy Director assists the Executive Director on all of the above-listed functions, and serves as the Chair of the Senior Staff Committee.

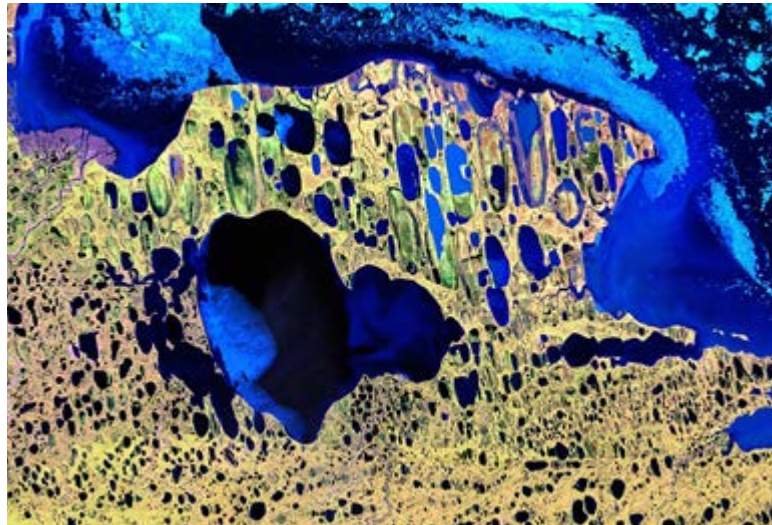
Senior Staff Committee

The Senior Staff Committee (SSC) members are representatives from member entities with experience in North Slope management and science. The respective OG members are expected to clearly communicate their role within the NSSI to their SSC member and their immediate supervisor. These roles may include:

- ◆ Identifying environmental issues or needs as assigned by their respective OG member;
- ◆ Advise their respective OG member on assignments and direction of the NSSI;
- ◆ Compile input and information from across their respective entities;
- ◆ Serve as the liaison between their respective OG member and their entity; and,
- ◆ Reviews Science Technical Advisory Panel work and provides feedback to the OG.

Science Technical Advisory Panel

The Science Technical Advisory Panel (STAP) is a legislatively mandated Federal Advisory Committee Act (FACA) group consisting of not more than 15 scientists and technical experts from diverse professions and interests (Appendix 2). This may include the oil and gas industry, subsistence users, Alaska Native entities, conservation organizations, wildlife management organizations, academia, and other areas as determined by the Secretary of the Interior. The panel's duties are listed in the STAP Charter (Appendix 3). Current panel members come from diverse disciplines such as:



Landsat image of the ecologically important but increasingly at risk Teshekpuk Lake area of North Slope. (Landsat 8 courtesy of USGS)

- | | | |
|---------------------------------|---------------------|----------------------------|
| ◆ Marine Ecology/Marine Mammals | ◆ Civil Engineering | ◆ Geography |
| ◆ Local & Traditional Knowledge | ◆ Remote Sensing | ◆ Modeling & Risk Analysis |
| ◆ Fisheries Biology | ◆ Public Health | ◆ Wildlife Biology |
| ◆ Ornithology | ◆ Oceanography | ◆ Landscape ecology |
| ◆ Social Science | ◆ Biochemistry | ◆ Biometrics |

2013-2014 Progress and Accomplishments

Scenarios for Energy and Resource Development

“Complex and uncertain” are good descriptors of America’s Arctic and its future. The identification and analysis of potential scenarios, an approach specifically recommended in the “Integrated Arctic Management” Report to the President (Clement et al. 2013), is a deliberative and inclusive process that helps engage diverse stakeholders in thinking creatively yet realistically about plausible futures in a complex and uncertain environment. The NSSI recognized the critical need for this dialogue and began an energy and resource development scenarios effort in the winter of 2013. A cooperative agreement was entered into between the NSSI and a team formed by personnel from the University of Alaska Fairbanks (with their extensive Arctic and North Slope experience) and GeoAdaptive LLC (a consulting firm with vast experience in geospatial and participatory scenarios projects).



A diverse group of stakeholders helps consider scenarios for the future of energy and resource development in the U.S. Arctic. (NSSI)

Involving a range of North Slope stakeholders in identifying plausible scenarios for future development will provide a practical context for a full and collaborative dialogue on important science and information needs for the future. With over 500 thousand square kilometers of land and sea, the North Slope and adjacent seas are home to a diverse array of fish, wildlife, and plant resources that support a vibrant subsistence culture and are also believed to have some of the largest oil, gas, and coal potential remaining in the United States. If we are to understand the potential benefits and impacts of future development on those lands, waters, and people, we need to assess what those plausible futures may be.

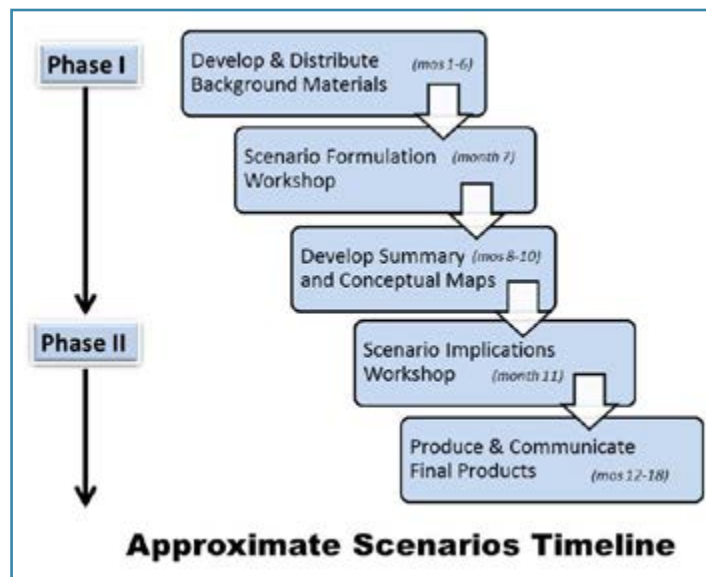
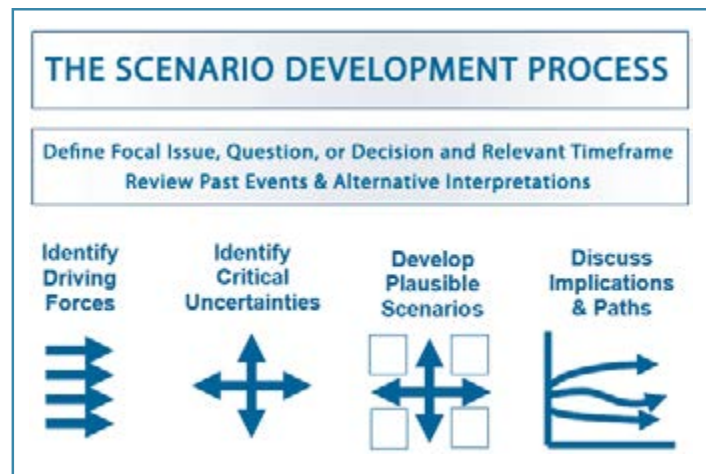
The focal question for this NSSI-sponsored scenarios identification and analysis effort is:

“What is the future of energy development, resource extraction, and associated support activities on the North Slope and adjacent seas through 2040?”

Many forces and many voices may shape the future of development on the North Slope and the Beaufort and Chukchi Seas. Energy demand and pricing, alternative energy sources, new oil and gas finds and technologies, societal priorities, regulatory framework, community health and food security, climate change, international politics – all of these and more may come into play as drivers of change.

A broad range of stakeholders will be key to helping this scenarios effort in assessing what is truly plausible as well in understanding the potential implications of the various scenarios identified. The NSSI has already formed a Scenarios Consultative Group, which is intended to help improve NSSI access to the expertise, knowledge, and thoughts of a diverse range of stakeholders who can help us understand the potential future trajectories and implications of energy and resource development on the North Slope and adjacent seas. This group includes several members of the NSSI Oversight Group and Science Technical Advisory Panel, but also a cross-section of stakeholders from different sectors and perspectives, including: industry and industry support organizations (e.g., ConocoPhillips Alaska, Inc., Statoil, Alaska Oil and Gas Association, Alaska Industrial Development and Export Authority), non-governmental organizations (e.g., Pew Charitable Trusts, The Wilderness Society, Institute of the North), and others with relevant information and understanding of the North Slope, its people and its resources (e.g., Alaska Natural Heritage Program, North Slope Borough Planning Department, BLM Planning Division, and others).

The identification of plausible development scenarios and an understanding of their implications will help prepare North Slope managers to make informed decisions about the research and monitoring that will be needed to sustain these resources and to plan for safe energy and resource development in the face of impending changes. The process will move from scenarios to strategies – all involved will help identify the plausible stories (scenarios) of future North Slope energy and resource development; then we will assess the science needed to understand the implications of each scenario so that



Caribou cross a changing tundra. (BLM)

regardless of which scenario comes to pass, the NSSI member entities will be prepared with strategies to collect the appropriate information to make effective decisions.

The following table provides a brief description of the project timeline and milestones. Additional information and materials relating to this scenarios project are posted on the NSSI website (<http://northslope.org/scenarios>).

Timeline	Milestone (Lead)
Jan 2014	Initial project scoping (NSSI & UAF/GA) ¹
Jan – Mar 2014	Hold initial meeting of SCG; begin to assess knowledge on key factors and systems, collect geospatial data, and synthesize materials for preparation of background papers (UAF/GA).
Apr – Sep 2014	Develop background papers and web resources, archive background materials, and provide draft background materials to SCG and others for review. (UAF/GA lead)
Oct 2014	Assess additional information needs; develop and share completed background material via mail, online methods, other means as appropriate (UAF/GA)
Oct 2014	Workshop I - Scenarios Formulation Workshop (UAF/GA & NSSI)
Nov – Dec 2014	Complete workshop summary; use workshop outcomes for initial scenarios analysis; develop geospatial & other intermediate products (UAF/GA)
Jan 2015	Workshop II - Scenario Implications Workshop; present developed spatio-temporally explicit scenarios to analyze implications of scenarios. (UAF/GA)
Feb 2015	Consolidate & synthesize stakeholder input from Workshop II; synthesize status of current research & monitoring activities related to scenarios. (UAF/GA)
Feb - Mar 2015	Consolidate & synthesize stakeholder input for final scenarios and implication summary; prepare visualizations and narrative products for final scenarios. (UAF/GA)
Apr 2015	Transfer data products (maps, GIS data, and narratives) to GINA; develop outreach and communication strategies for scenarios & final scenarios report.
May 2015	Workshop III - Research and Monitoring Workshop; facilitate stakeholder involvement (scientific and traditional knowledge holders) to analyze scenarios and implications and develop scenario-informed strategy for future research & monitoring. (UAF/GA & NSSI)
Jun – Jul 2015	Completion of final report; summary of Research and Monitoring Strategy Workshop; update website to present final scenarios. (UAF/GA & NSSI)
Aug 2015	Communication of final products: webinars, web visualization tools, narratives; distribution of final report. (UAF/GA & NSSI)

¹ Organization Acronyms: ACCAP = Alaska Center for Climate Assessment and Policy, GA = GeoAdaptive, LLC, GINA = Geographic Information Network of Alaska, NSSI = North Slope Science Initiative (staff, in consultation with Oversight Group), North Slope REA = North Slope Rapid Ecoregional Assessment, UAF = University of Alaska Fairbanks.

This NSSI Scenarios project is also benefiting from and providing benefits to a number of other projects. For example, the Bureau of Land Management is in the midst of a Rapid Ecological Assessment (REA) for the North Slope (http://www.blm.gov/wo/st/en/prog/more/Landscape_Approach/reas/northslope.html) which is gathering a great deal of geospatial information. Rather than duplicating this effort, the NSSI is working closely with that project to harvest many layers of data that can inform the background materials for the Scenarios project. In the end, because the REA is a “snapshot in time” type of effort, the Scenarios project will also benefit the BLM’s REA program by providing context for future priorities among the REA-identified data gaps. The NSSI Scenarios project also represents the central piece of a “nested” approach to scenario analyses across the Arctic. The UAF personnel involved in this NSSI project are concurrently involved in a complementary study of approaches to developing adaptive strategies for North Slope communities. The NSSI staff involved in this project are involved in numerous Arctic Council studies (including the CAFF Arctic Biodiversity Assessment [<http://www.arcticbiodiversity.is>] and the Circumpolar Biodiversity Monitoring Program [<http://www.caff.is/monitoring>]) and are working with the International Union for the Conservation of Nature to enhance its ongoing pan-Arctic scenario analysis. In short, this project is a core component of a highly coordinated look at the future of the Arctic and what science (biophysical, social, or other) is best suited to prepare natural resource management agencies to make effective decisions.



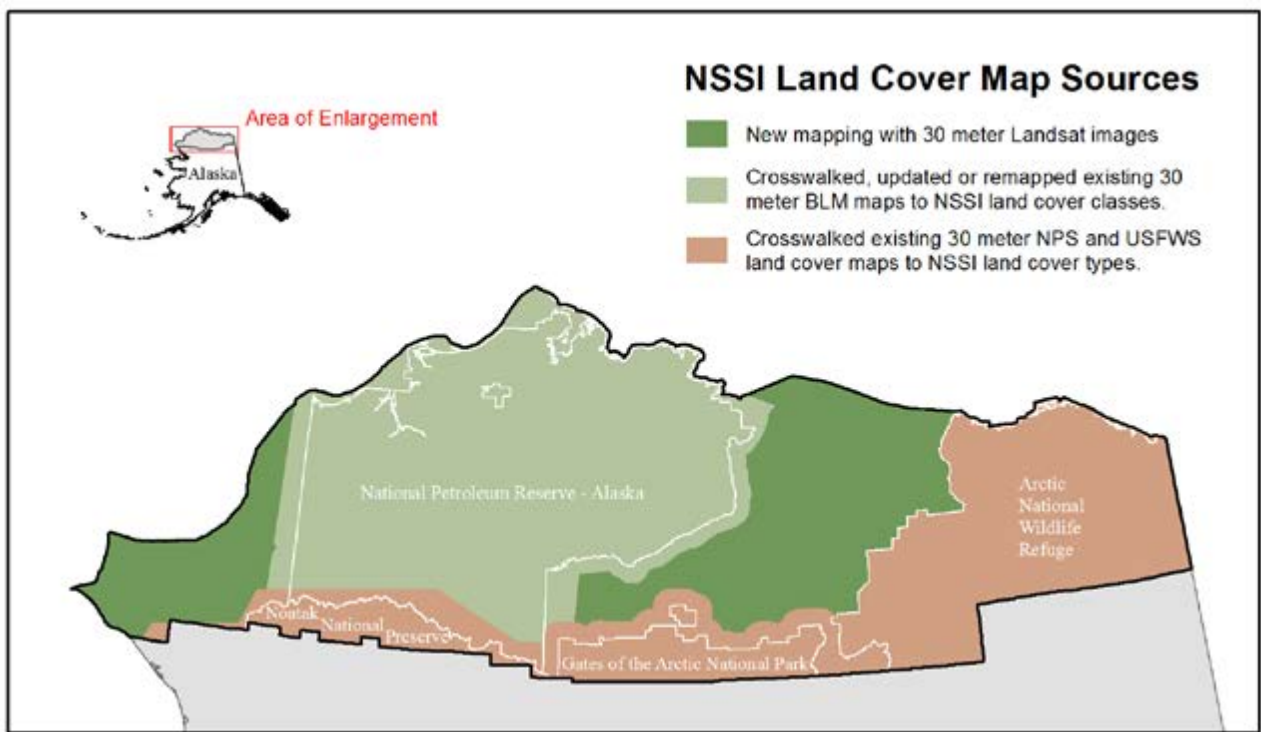
Arctic oil and gas sources are an increasing focus of energy exploration, but are still challenging to access. (BSEE)

North Slope Land Cover Map Completed

Map Provides Consistent Data Across Entire North Slope

The completion of the NSSI land cover map marks the end of an extensively partnered multi-year effort to produce what is now the first consistent, accurate land cover map for the entire North Slope region. Though this has been a primarily NSSI-led and funded effort, we had many collaborators including lead partners Ducks Unlimited, Inc., Alaska Natural Heritage Program, and Spatial Solutions, Inc., as well as Michigan Tech Research Institute, the Bureau of Land Management, U.S. Geological Survey, and the Arctic Landscape Conservation Cooperative. Now that it is completed, this map will provide a single reliable baseline reference for NSSI members and cooperators, or anyone else with applied interests in the North Slope, when conducting future initiatives on a range of potential subjects such as terrestrial habitat, hydrology, development, monitoring, and research.

Landsat Thematic Mapper 30-meter resolution satellite imagery was used as the source data for the map. A rigorous helicopter-based fieldwork effort visited more than 1,300 reference sites that were used to train and assess the processing of the satellite images. The mapping effort created new land cover maps for 14.2 million acres that had previously been mapped only at resolutions greater than 30 meters and used existing 30-meter resolution land cover maps from the National Park Service (NPS), the U.S. Fish and Wildlife Service (USFWS), and the Bureau of Land Management (BLM) for the remaining areas. Large portions of the National Petroleum Reserve - Alaska maps provided by the BLM were also updated or re-mapped with recent Landsat images. This new map represents the first seamless land cover map developed at a 30 meter resolution for the entire North Slope.



The NSSI drew from new sources and field work and improved upon existing sources to develop the first consistent, accurate land cover map for the entire North Slope. (Dan Fehringer, Ducks Unlimited, Inc.)

Insert Map fold out here

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A good pilot and clear communications were critical to land cover mapping on the North Slope. (BLM)

The land cover types represented in the map are taken from the Ecologic Systems of Alaska developed by NatureServe and the Alaska Natural Heritage Program. This classification scheme has been reviewed and accepted by state and federal agencies throughout Alaska, and it ensures that the map can be seamlessly joined with an existing statewide mosaic of land cover maps for Alaska that uses the same land cover classes. Additionally, the Alaska Natural Heritage Program is developing detailed plant descriptions of the NSSI land cover types using data gathered at ground reference sites visited during the fieldwork portion of the mapping project.

Land Cover Map Already Proving Useful

Through ongoing collaboration between the NSSI and agency staff, partners and contractors, the NSSI land cover map has already proven useful. For example, the map has already helped shape and provide critical information to support a landscape scale design for the Bureau of Land Management's Assessment, Inventory, and Monitoring (AIM) Strategy in the National Petroleum Reserve-Alaska (NPR-A). AIM is a national monitoring effort that provides an integrated method for evaluating natural resources across multiple scales of management. The monitoring program relies on a set of core indicators, standardized field methods, and a statistically valid study design to provide consistent and scientifically defensible information to track vegetation changes over time (Toevs et al. 2011).

In the case of AIM, the NSSI land cover map enabled scientists to use consistent, scientifically vetted land cover information in combination with landscape physiography information (provided by NSSI staff member Jess Grunblatt and his co-author, Jorgenson and Grunblatt 2013) to develop an ecologically derived sampling strategy from which to select long-term monitoring locations in an efficient and scientifically unbiased manner. The land cover map helped define landscapes with similar vegetation, soil, and ecological processes and enhances the ability to



Aerial reconnaissance of land cover types on North Slope. (Ducks Unlimited, Inc.)

detect changes to these landscapes over time. Within each sampling block, random monitoring points are selected for field data collection and remotely sensed data acquisition. Under AIM, a set of indicators is measured at each such sampling location that will ultimately allow the BLM to provide quantitative information on the condition, trend, amount, location, and spatial pattern of natural resources. This monitoring program, with the assistance of the NSSI's high quality land cover map, will thus allow scientists to make inferences about the condition and trend of vegetation across the North Slope of Alaska.

Because widespread environmental influences like climate change and energy development are affecting arctic landscapes, the BLM in 2013 initiated a Rapid Ecoregional Assessment (REA) across the North Slope. The purpose of the assessment is to help improve understanding of the existing condition of these landscapes and how conditions may be altered by ongoing environmental changes and land use demands. A critical component of the REAs is a high quality base land cover map. The NSSI land cover map is thus providing a baseline for the North Slope REA and enabling the description and mapping of conservation elements and regionally important habitats for fish, wildlife, and species of concern.



Land form varies from coastal plain to mountains along the pipeline corridor. (NSSI)



Alaska Natural Heritage Program personnel records observations during land cover mapping effort. (NSSI)

These REAs gauge the potential of such habitats to be affected by four overarching environmental change agents: climate change, wildfires, invasive species and development, and may also address other change agents based on ecoregional needs. In addition, REAs establish baseline ecological data to gauge the effect and effectiveness of future management actions. In this way, REAs provide a foundation for an adaptive management approach that enables implementation strategies to adjust to new information and changing conditions. The NSSI land cover map is thus playing a significant role in assisting BLM, through the North Slope REA, to identify key resource values and regionally significant terrestrial habitats which will provide opportunities for resource conservation and restoration.

Data Management and Information Sharing

Central to the NSSI mission is the coordination and collection of management-relevant scientific information to promote a better understanding of the terrestrial, aquatic and marine ecosystems of the North Slope of Alaska and their links to the circumpolar arctic region. To accomplish this, the NSSI has been working with the University of Alaska (UAF) – International Arctic Research Center to develop a web-based information exchange called North Slope Science Catalog (Catalog, <http://catalog.northslope.org>). Located within the Geographic Information Network of Alaska (GINA), Catalog provides project tracking and data management and development resources. Catalog facilitates the discovery and distribution of scientific data and information products for the North Slope of Alaska and its adjacent seas. The catalog also utilizes the metadata standards outlined by the Alaska Data Integration working group as recommended by the Arctic Policy Committee for access to other federal scientific data holdings and project data sharing across federal agencies in Alaska.

North Slope Science Catalog
Project Tracking and Data Sharing

Home Data Maps & Reports News Partners & Links Help About Contact Us NSSI

Ecological Mapping and Field Site Photography
Updated mapping of ecoregions, ecological sections, ecological subsections, physiography, general geology and ecological landscapes are provided for the North Slope region. Over 14,000 site photos are also available.
[Read more...](#)

Welcome to the North Slope Science Catalog
The North Slope Science Catalog has been developed by the North Slope Science Initiative (NSSI) to facilitate the discovery and distribution of science based data and information products. NSSI is an intergovernmental effort that promotes scientific collaboration to address research, inventory, and monitoring needs on the North Slope of Alaska. The goal of Catalog and NSSI is to provide access to data and information resources that promote science-based research and management within the North Slope as well as contribute to a better understanding of the circum-arctic region.

Catalog News
August 18, 2014 - IMIQ Update
The IMIQ Data Portal has been updated to enhance visualizations, downloads and map features. [More...](#) [Read more...](#)
July 22, 2014 - Data Summary Reports: Long Term Monitoring
Data summary reports listing long-term monitoring studies have been compiled from Catalog records... [Read more...](#)
July 11, 2014 - Visualization Portals
NSSI is developing portals to help users visualize spatial data. Links to other information site. [Read more...](#)
June 30, 2014 - Ecological Landscape of Northern Alaska (NOAK) 2014 Update
Ecological mapping of Northern Alaska has been updated to correct coding errors. The update is a... [Read more...](#)
May 27, 2014 - EPCOR Northern Test Case Update
The UAF EPSCoR Northern Test Case has provided over 30 technical reports to NSSC. These reports... [Read more...](#)

Additional North Slope Science Information
Landscape Data Climate Hydro Data Realtime Data Links

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North Slope Science Catalog (<http://catalog.northslope.org>) has been updated to incorporate new technology and tools in 2013 and 2014. (NSSI)

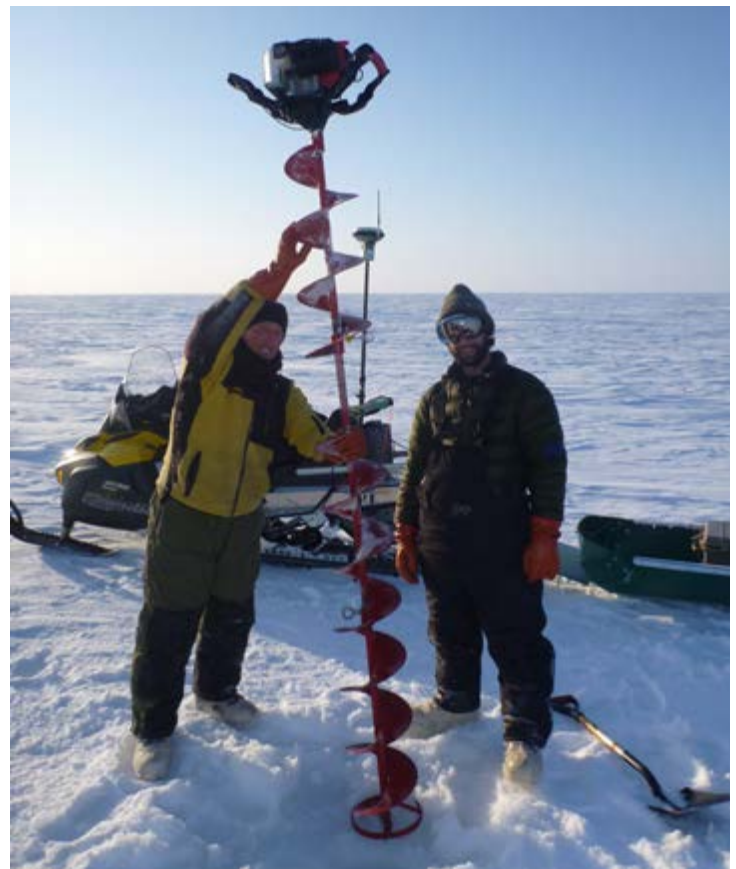
Project Tracking

Catalog maintains project tracking information that describes the who, what, when and where of ongoing scientific research relevant to the North Slope. This allows researchers to be better informed of ongoing work by other scientists and provides managers with a strategic view of scientific research by describing current efforts and anticipated data products. A wide range of ongoing science-based projects are described in the project tracking system including field sampling, modeling, teacher training and facility/systems infrastructure development. NSSI works closely with its members to update project information.

Catalog project tracking information was used by the NSSI Science Technical Advisory Panel (STAP) to complete an inventory of long-term monitoring projects in the U.S. Arctic. This listing will be updated annually based on STAP and partner input and is available on the Catalog website.

Data Management

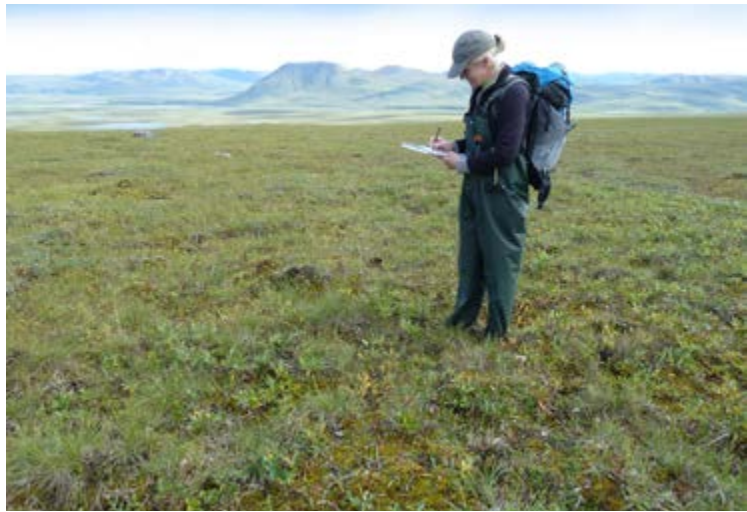
Catalog works closely with complementary systems of our partners to leverage existing capacity and provide a wide range of online products and data management services. Information products from Catalog and over 40 additional public repositories are discoverable at the Catalog website using advanced search tools. These products are downloaded directly if they are stored within Catalog or the user is directed to the appropriate remote site for download. This allows information products to be curated by the authoritative source, ensuring users get up to date and accurate information and eliminating duplicative effort. Catalog is designed to serve as a permanent data repository providing web-based data management services for users that might not otherwise have access to data archival resources. The technology behind Catalog is continually updated to provide a robust and secure data management environment. During 2014, the Catalog website underwent significant updates to improve its functionality and speed.



Collaborative research between the USGS, BLM, and UAF helps build on important findings reported in the 2012 NSSI Report to Congress (available at: <http://northslope.org>) for identifying potential winter freshwater habitat on the North Slope. In this image, Christopher Arp (UAF) and Benjamin Gaglioti (USGS) perform field measurements to be combined with ground penetrating radar and high-resolution SAR satellite imagery to create a classification of a 60km² area that is slated for oil and gas development. (Ben Jones, USGS)

Data Development

The NSSI also uses Catalog to work closely with partners to enable data development services. Recent work has included an update of ecological mapping for the North Slope that includes descriptions of ecological landscapes, biomes, physiography, lithology, soil landscapes, general geology and other landscape level features. Through Catalog, the NSSI is working with the Department of the Interior's Arctic Landscape Conservation Cooperative (ALCC) and other research scientists to compile existing permafrost borehole information across the North Slope.



Data starts at the field level, as seen here with Alaska Natural Heritage Program staff recording vegetation types for land cover mapping. (NSSI)

As part of NSSI's continuing efforts to improve access and understanding of scientific data for the North Slope, themed portals are being developed in Catalog to enhance visualization and access to various North Slope data sets. The ecological landscape and permafrost data have been compiled with other NSSI collaboratively developed data products such as land cover, field site photography and lake winter water availability to create a NSSI Ecological Landscape data portal that is available from the Catalog home page. This portal will improve the ability of the arctic science community to discover and visualize these important data. Links to other information portals will also be provided to promote access to data.

We recently completed another collaborative effort with the ALCC to provide web access to a comprehensive database of all available climate and hydrology records for the North Slope. This kind of data was identified by the NSSI's Science Technical Advisory Panel as an overarching priority for addressing a wide range of management concerns. The data was compiled and reviewed by scientists to allow development of a standard set of parameters and values that are comparable across the North Slope. The data can now be downloaded through a portal that is provided jointly within Catalog and at



Rain rolls across the North Slope. (Doug Kane, UAF)



Caribou, an important subsistence resource for North Slope residents, cross the Hulahula River on the Arctic National Wildlife Refuge. (USGS)

the ALCC website. These data can be used to document trends and develop better predictive models for North Slope hydrology and climate.

Another example of NSSI collaboration on data products and services is our recent work with the Bureau of Ocean Energy Management (BOEM). The BOEM Alaska Environmental Studies Program “conducts studies to obtain information pertinent to sound leasing decisions as well as to monitor the human, marine and coastal environments” (<http://www.boem.gov/akstudies>). The NSSI linked this program’s over 1,200 project reports to Catalog in an effort to improve the ability of the full arctic science community to discover and access this important set of studies.

In the coming year, we will be working with the Bureau of Land Management’s Rapid Ecological Assessment program to compile a wide range of North Slope social and ecological data for analysis by the NSSI Scenarios effort (see Scenarios section of this report). This effort will require coordinated input from NSSI partners and scientists to provide efficient access to accurate and up to date information.

The NSSI, through Catalog, is also partnering with NASA and the National Science Foundation’s Experimental Program to Stimulate Competitive Research (EPSCoR) to assist in compiling data and information products relevant to the North Slope. The NASA pre-Arctic-Boreal Vulnerability Experiment (pre-ABOVE) is leveraging Catalog technology to compile existing geobotanical data and imagery. The EPSCoR Northern Test Case is similarly using Catalog to archive relevant data as part of its research into community resilience and adaptive capacity. This partnership with EPSCoR is particularly relevant to North Slope managers and residents because a core focus is on examining the mechanisms by which communities adapt to environmental and social change.

Outreach and Communications

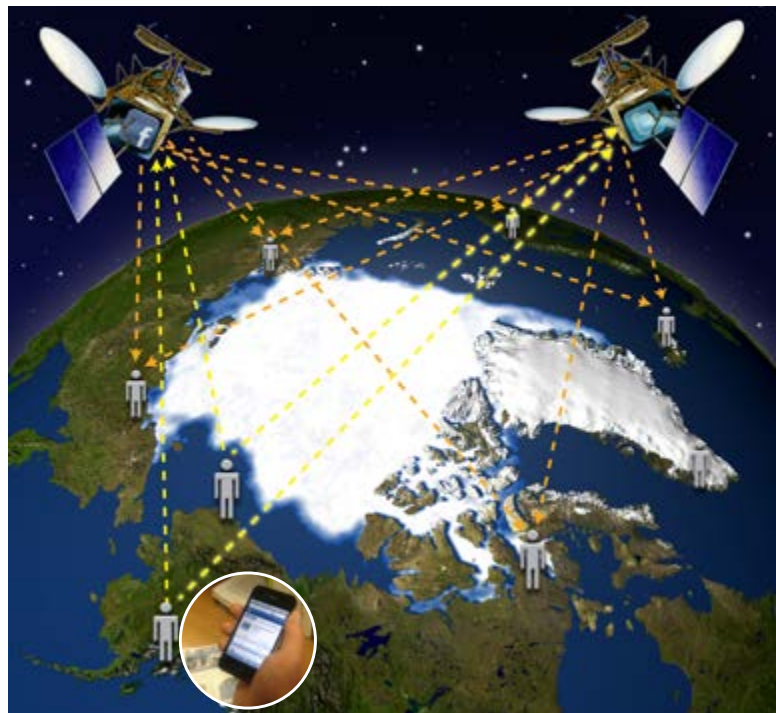
NSSI communications had a busy year. Continued updates to the newly enhanced NSSI website (<http://northslope.org>) allow users to easily find links to NSSI’s Data Catalog and Project Tracking functions, the NSSI’s ongoing analysis of long-term monitoring, social media sites, and other high priority information such as news & events, workshops, meeting times, reports and much more.

NSSI's expanded role in helping to lead the Circumpolar Biodiversity Monitoring Program (see section on CBMP in this Report) has similarly expanded our focus on an international approach to science coordination. This is an important step, but it makes communicating more complex. Time differences, language differences, lack of infrastructure to reach many of these locations, climatic conditions and the physical geography of the Arctic are just some of the difficulties that can hinder the communication process. By incorporating the use of social media sites (Facebook and Twitter, see links below), NSSI has been able to mitigate and overcome some of these barriers. Through the use of these social media sites, which allow users to interact in near real time, NSSI has reached citizens of at least five countries speaking seven languages or more. NSSI social media has strengthened the connection between the scientific community and the public, and encouraged them to share experiences with each other.

NSSI Oversight Group member Bud Cribley (BLM) stated "International collaboration is important if we are to fully understand what is happening, and what may be to come, in the Arctic. NSSI's involvement in leading and participating in international workshops, forums, conferences, and gatherings of the like, allows stakeholders from a broad spectrum of arctic interests to discuss and share their work. Having the ability, through modern communications technology, to quickly and effectively communicate scientific findings and successful approaches to working across cultures helps move us towards management-relevant research advancements."

NSSI recognizes that the ability to search and have access to information nearly instantaneously is not only becoming common, it is becoming standard practice. With increases in the use of smart phones and tablets, integration of social media with the NSSI website allows users to receive updates, photos, and reports before, shortly after and sometimes during conferences.

Moving forward NSSI will continue to use technology to aid in its mission of North Slope science coordination and its connection to an international network of arctic scientists, government agencies, Indigenous organizations and conservation groups working together to harmonize and integrate efforts to monitor the Arctic's natural resources.



NSSI communications span the Arctic to support a growing connection from local to international science and knowledge. (NASA and NSSI)

To stay current with North Slope issues and information, anyone can now "Like" our Facebook pages and "Follow" us on Twitter at:



<http://www.facebook.com/NorthSlopeScienceInitiative>



<http://www.twitter.com/NSlopeScience>

Making Arctic Connections

Focused workshops, information sharing forums and direct collaborations provide opportunities to identify common issues or concerns, share current knowledge, and improve communication and understanding. The NSSI has continued to support these important forums, including preparing for and hosting important international gatherings – the United States and Canada Northern Oil and Gas Research Forum and a Circumpolar Biodiversity Monitoring Program (CBMP) Workshop. In addition to this international coordination and outreach, the NSSI has contributed to other workshops to enhance scientific attention to the U.S. Arctic and to improve the relevance of that science to local and regional management concerns. For example, NSSI staff participated in workshops held by the National Research Council’s Polar Research Board and continues to work with NASA’s Arctic Boreal Vulnerability Experiment. Further details on the nature, outcomes and products of these important NSSI engagements with the broader arctic science community are provided in the following sections.

United States and Canada Northern Oil and Gas Research Forum

Oil and gas management in the Arctic is an urgent science and policy issue facing both Canada and the United States. With declining reserves of conventional oil and gas, there is an increasing interest in both the Arctic off-shore and on-shore. There are new opportunities for resource extraction in a time of increased energy demands, yet there are considerable challenges to working in an ecologically important, logistically difficult, and physically challenging environment.

Sound oil and gas management depends upon sound science, and the research community and government agencies have responded by increasing emphasis on research that informs decisions. As northern neighbors, the U.S. and Canada have a strong legacy of successful collaboration.

Highlight

The Bureau of Ocean Energy Management environmental study on transboundary fish and lower trophic communities, jointly funded with Canada’s Department of Fisheries and Oceans and led by researchers from the University of Alaska Fairbanks and Department of Fisheries and Oceans, is one of many examples of cooperation presented at the Forum. Changing ecosystems and increased interest in Beaufort Sea petroleum resources in recent years has accelerated the need to collect baseline data on fish and lower trophic organisms on both sides of the border. Shared research vessel methods are allowing experts to gather ecological data about abundance, distribution, habitat, and seasonal and inter-annual variability of species in a region with limited historical fish and invertebrate data. Information from this multi-disciplinary and multi-investigator study will inform decisions on lease sales, exploration plans, and potential development and production plans in both the United States and Canada, as well as contribute to other Arctic fish studies.

Photo Credit: Norcross Lab, UAF School of Fisheries & Ocean Sciences



To help collaboration and improve science in critical areas, the U.S. and Canada have supported a joint research forum, occurring biennially, since 2008. The primary recommendations from the 2012 Forum included:

- ◆ Improving communication, collaborating and sharing knowledge
- ◆ Promoting the use of traditional knowledge
- ◆ Implementing long-term monitoring
- ◆ Planning for, and adapting to change



Pod of beluga whales moves through Canadian waters. (Ed Struzik)

The next forum, hosted by Canada, was held early in FY 2015 and included sessions on the topics listed below. A full report on this forum will be included in the 2015 NSSI Report to Congress:

- ◆ Considerations for off-shore resources
- ◆ On-shore regulator and operator perspectives – opportunities and challenges
- ◆ Energy and access to communities
- ◆ Community engagement in oil and gas exploration
- ◆ Arctic Council: incorporating best practices across jurisdictions and sectors
- ◆ Readiness: oil spill preparedness and response; environmental baselines
- ◆ Mitigation strategies
- ◆ Research and developments gaps to address operational challenges
- ◆ Programs and potential for collaboration

Highlight

In Nunavut, the Qikiqtani Inuit Association is promoting the collection of Inuit Qaujimajatuqangit (traditional Inuit Knowledge) as an Inuit-driven process. This system of beliefs, values and knowledge characteristic of the Inuit culture are particularly relevant to the way governments should deliver programs. Successfully incorporating this collective Inuit knowledge throughout the regulatory process will help local Aboriginal communities, governments, regulators and industry make better planning decisions in the North.

For further information on the past and upcoming U.S. and Canada Northern Oil and Gas Research Forums, visit the NSSI website at: <http://northslope.org>.

The Arctic Council and the Circumpolar Biodiversity Monitoring Program

Geographically, the United States is an arctic nation solely because the State of Alaska has a significant portion of its land and water included in the definition of the U.S. Arctic (Arctic Research and Policy Act of 2004, as amended). The Arctic Council was established in 1996 with the primary function of building international cooperation in the areas of environmental protection and sustainable development. Its members include the original eight arctic nations (Canada, Kingdom of Denmark, Finland, Iceland, Norway, Russian Federation, Sweden and the U.S.), plus six permanent indigenous groups as participants (four of which are in Alaska). Increasing international interest in the Arctic Council as an effective forum for collaboration is apparent by the number of nations requesting observer status. In 2013, new observer nations to the Arctic Council included China, India, South Korea, Japan, Singapore and Italy, and a number of other non-Arctic nations are applying for that status in 2015. The U.S. takes the Chairmanship of the Arctic Council in April 2015 for a period of two years. While the Department of State has the lead for the U.S. in the Arctic Council, the state of Alaska and over 20 Federal agencies have missions in the U.S. Arctic and will thus be valued resources to the Department.



A diverse array of ground flowers like this phlox liven up the arctic tundra. (BLM)

Like the rest of the circumpolar Arctic, the U.S. Arctic has also seen a significant increase in activity ranging from oil and gas leasing, exploration and development to infrastructure, tourism, transportation, and collaborative science to support decision makers. U.S. Arctic policy has also been evolving from a basic “out-of-sight, out-of-mind” approach 25-years ago to one of active engagement in both domestic and international forums such as the Arctic Council and its working groups. The current administration updated the 2009 U.S. policy in 2013 with strategic

goals that advance U.S. security interest by improving arctic infrastructure and capabilities; pursue responsible arctic region stewardship to protect the arctic environments and conserve its resources; employ scientific research to increase the understanding of the region; strengthen international cooperation by actively participating in Arctic Council activities; and, developing an integrated approach to arctic management through decision making using a balance of economic development, environmental protection and cultural values. In 2012, the Secretary of the Interior directed its bureaus to increase DOI activities with the Arctic Council and Arctic Council Working Groups.

Completion of the Terrestrial Circumpolar Biodiversity Monitoring Strategy in 2013 (see following section), co-led by NSSI and Greenland/Denmark, created the first collective opportunity for traditional knowledge holders, communities and scientists to detect, understand

and report on long-term change in arctic terrestrial ecosystems. This successful partnership provided an opportunity for NSSI, in conjunction with the BLM and Greenland/Denmark, to become a leader in the overall Circumpolar Biodiversity Monitoring Program (CBMP). The CBMP provides a framework that uses an ecosystem approach to integrate monitoring, assessment and reporting of focal species, ecological functions, ecosystems, interactions and potential drivers. The goal of the CBMP is to scale-up existing local observations to improve regional, national and global understanding of arctic systems. For the U.S. Arctic, the CBMP provides the opportunity to harmonize numerous monitoring programs in terrestrial, freshwater, coastal and marine environments to provide a more comprehensive (and defensible) slate of information and analyses for decision-makers.

The NSSI is legislatively mandated to improve scientific and regulatory understanding of terrestrial, aquatic and marine ecosystems of the North Slope. As policy makers continue to implement the U.S. Arctic policy, organizations such as the NSSI are challenged with ever increasing demands for more collaborative science to support decision makers. In addition, the State of Alaska has its own legislatively formed Alaska Arctic Policy Commission which will provide recommendations to the Governor on priorities for Alaska's Arctic. A preliminary report released in January 2014 recommends increased collaboration with federal entities on arctic issues and cites the NSSI as a model of such collaboration. Opportunities abound for participation, collaboration and coordination with many of the state and federal agencies having an arctic mission and with many of the over 140 groups that have scientific or administrative mandates in the Arctic. This includes opportunities for NSSI to provide input to both the U.S. Chairmanship of the Arctic Council and to collaborate in the implementation plan for the National Strategy for the Arctic Region.



Arctic monitoring has its challenges, not the least of which is dealing with mosquitos. (BLM)



White-fronted goose and goslings in their summer Arctic wetlands habitat. (USGS)

Terrestrial Circumpolar Biodiversity Monitoring Plan

The United States and the Kingdom of Denmark (Denmark, Greenland, and the Faroe Islands) agreed in 2010 to serve as lead countries for the Terrestrial CBMP. As reported in the 2012 NSSI Report to Congress (posted at: <http://northslope.org>), the NSSI, as U.S. lead, then helped carry out a series of workshops to provide a thorough and focused discussion of the critical elements of the Arctic Terrestrial Biodiversity Monitoring Plan and to reach agreement on priority parameters, key ecosystem monitoring components, and sampling approaches that can be employed across the Arctic.

This terrestrial effort is one of four under the broader CBMP which will include similar efforts for marine, freshwater, and coastal ecosystems. Working with representatives from all arctic nations, the CBMP terrestrial co-leads developed the terrestrial monitoring plan which underwent peer review and country review and was approved by the CAFF Governing Board in the fall of 2013 and published (<http://www.caff.is/terrestrial/terrestrial-monitoring-plan>). The terrestrial CBMP is designed to provide a framework for the harmonization of existing arctic monitoring data and coordination of future, long-term terrestrial ecosystem-based biodiversity monitoring. The goal of the plan is to improve the collective ability of Arctic Traditional Knowledge (TK) holders, communities, land managers, and scientists to detect, understand, and report on changes in arctic terrestrial biodiversity and ecosystems. The plan focuses on terrestrial species and ecosystems in the high-arctic, sub-arctic, and high-latitude alpine regions adjacent to and contiguous with the Arctic.

Four terrestrial biotic groups were selected for status and trend monitoring: vegetation, birds, mammals and invertebrates. Best practices in monitoring design and available technology were used to develop a framework that is efficient and practical (given the size and isolation of the Arctic), scalable from individual study plots to regional needs, and allows for participation along a range of capacity and expertise. The plan is structured around a set of focal ecosystem component attributes (e.g., caribou population abundance) that serve as indicators of terrestrial biodiversity status and trend. As with the marine and freshwater plans, a steering group will be established to develop an implementation strategy for the terrestrial plan. Implementation will be coordinated nationally through the development of Terrestrial Expert Networks and also via dynamic linkages to existing and potentially new sites and species based networks for monitoring and assessment. The implementation phase of the Terrestrial Plan began in 2013 with a State of the Terrestrial Arctic report planned for 2017.



The changing landscape of the Arctic, like the erosion and newly exposed permafrost along the Ikkillik River in this image, drives the need to monitor changes in the living resources that depend upon these lands and waters. (USGS)

*National Research Council / Polar Research Board**

NSSI staff participated in a National Research Council (NRC) workshop in Fairbanks on “Responding to Oil Spills in Arctic Marine Environments.” The purpose of this workshop was to help NRC assess the current state of science regarding “oil spill response and environmental assessment in the Arctic region,” with an emphasis on “potential impacts in U.S. waters.” This NRC undertaking will review ongoing research activities; recommend “strategies to advance research and address information gaps;” assess the types of baselines needed for monitoring impacts; identify areas where current or future potential activities “could lead to an oil spill in the marine environment” (e.g., near marine transportation routes, pipeline locations, fuel storage facilities, oil and gas exploration and production sites); and assess “ancillary effects of response operations on the indigenous communities, environment, and marine species.”

Virtually all of these areas of focus are relevant to NSSI members and their partners and most can be informed by existing or planned NSSI activities. Making this link, building a familiarity and level of collaboration, was the purpose of NSSI staff participation. The NRC panel was familiarized with the trove of information accessible through the North Slope Science Catalog (<http://catalog.northslope.org>, and see Data Management section of this report), as well as the ongoing long-term monitoring summary (<http://northslope.org/monitoring>), Emerging Issue Summaries (<http://northslope.org/issues>), and the excellent “Arctic Connectivity” paper published by former Science Technical Advisory Panel chair, Dr. Bill Streever (BP Senior Environmental Studies Advisor) and his fellow STAP and Senior Staff Committee members. This paper is posted at http://northslope.org/nssi/media/doc/Streever_et_al_2011.



Disturbances like the Kucher Creek fire near the Colville River bring new vulnerabilities to Arctic ecosystems. (USGS)

[pdf](#) and outlines some commonalities and priorities for management-relevant U.S. Arctic science. One area of strong interest from NRC panelists, particularly with regard to their interest in the impacts of potential future activities, was NSSI's soon to be initiated energy and resource development scenario planning effort (see Scenarios for Energy and Resource Development section of this report).

A summary and link to the final NRC report, which was released in 2014, is posted at: <http://dels.nas.edu/Report/Arctic-Anthropocene-Emerging/18762?bname=prb>.

NSSI staff also participated in a Polar Research Board (PRB) workshop in Anchorage on “Emerging Research Questions in the Arctic.” This workshop was one of a series whose purpose is to develop “guidance on future research questions in the Arctic over the next 10-20 years,” and identify “key scientific questions that are emerging in different realms of Arctic science” (within and across disciplines such as marine, terrestrial, atmosphere, cryosphere, health, and social sciences) as well as “cross cutting realms” such as integrated systems science and sustainability science. Their study also seeks to help identify “research infrastructure needs (e.g., observation networks, computing and data management, ship requirements, shore facilities, etc.)” and collaboration opportunities. As in the March NRC workshop, NSSI staff participation enabled PRB panelists to learn about NSSI capabilities, data systems, prior analyses, and ongoing projects to help their study focus on management-relevant science questions.

A summary and link to the final PRB report, which was also released in 2014, is posted at: <http://www8.nationalacademies.org/onpinews/newsitem.aspx?RecordID=18625>.

*Quotes in this section are from the NRC/PRB website (<http://dels.nas.edu/prb>).

Arctic Boreal Vulnerability Experiment

NSSI staff members have continued to be involved in advising NASA's Arctic Boreal Vulnerability Experiment (ABoVE, <http://above.nasa.gov>) through involvement in workshops and teleconferences designed to bring management relevance to the design and products of this potential multi-year, multi-million dollar project. ABoVE will look at the role of "interactions between climate, permafrost, hydrology, and disturbance in driving ecosystems processes" in arctic and boreal ecosystems of Alaska and western Canada. The initial gist of this project was on boreal forests, but early NSSI involvement (dating back to 2008) helped add an arctic focus, with two of the three northernmost study sites now planned for the North Slope.



Vegetation, hydrology and surface topography can change as thermokarst areas form on the North Slope when ice-rich permafrost thaws. (USGS)

The study will address scientific uncertainties through research that "integrates and synthesizes geospatial information products generated from airborne and spaceborne remote sensors with data from field studies and ground-based monitoring." The ABoVE organizers have expressed the hope that this approach will "substantially and measurably increase our ability to project realistic scenarios of environmental change in Arctic and Boreal regions." Clearly, however, this ability to project realistic scenarios will also depend upon future energy and resource development activity in the U.S. Arctic. Therefore, the opportunity for productive interaction between ABoVE and the upcoming NSSI scenario planning effort (see Scenarios for Energy and Resource Development section of this report) stands to enhance our collective results.

As currently envisioned, the ABoVE study will focus on "changes in ecosystem dynamics and land surface characteristics;" processes, interactions, and feedbacks that "control the vulnerability" (of Arctic and Boreal ecosystems) to "structural and functional change in a changing climate;" and how potential future changes may "contribute to positive and negative feedbacks to local, regional and global climates." Notably, this focus on landscape level changes in relation to climate change has also drawn the interest and helpful involvement of an NSSI partner, the Arctic Landscape Conservation Cooperative (<http://www.arcticlcc.org>). An increasingly important focus for NSSI/NASA collaboration on this project will be to ensure that data generated by ABoVE is shared with and accessible through the North Slope Science Catalog (see Data Management section). As with the NRC/PRB efforts described above, continued collaboration between NSSI and ABoVE will be important to both inform NSSI members and partners of these studies' results and to ensure that ABoVE retains its management-relevant focus. The final "concise experimental plan" for ABoVE was released in 2014 and is posted at the project website: <http://above.nasa.gov>.

*Quotes in this section are from the ABoVE website.

National Petroleum Council: Arctic Research Study

In May 2014, the NSSI was asked to join the Coordinating Subcommittee, established by the U.S. Department of Energy (DOE) and the National Petroleum Council (NPC) to develop a report on Arctic Research. The objective of the report is to provide DOE with a perspective on research and technology pursuits that support prudent development in the Arctic. The study will be organized around two themes: (1) prudent development in the Arctic, and (2) arctic research and technology. The intent of the first theme is to provide broad context on a range of topics, considering global arctic development experience, resource potential, commercial viability, regulatory practices, and the ice and sea environment. This theme will provide the basis for focusing the more forward looking arctic research and technology on higher priority emerging research opportunities, technology development and collaborative approaches with applicability to continued prudent development of arctic oil and natural gas resources. NSSI was asked to participate and bring to the discussion our emerging issue papers and the work on the North Slope Scenarios Project. The efforts of both the NPC and NSSI are highly complementary and address many of the NSSI's legislative mandates on coordination and collaboration.



New studies and traditional knowledge can provide an improved understanding of ice dynamics. (Hajo Eicken, UAF)

Arctic Adaptation Exchange Workshop: Building Relationships

NSSI participated in the Arctic Adaptation Exchange Workshop in February 2014. Adaptation is critical to addressing climate change effects and risk to community sustainability in the Arctic. The workshop goal was to synthesize knowledge to date and initiate discussion on global and environmental change agents and adaptation in the North. The biggest challenge for effective decision-makers is locating and accessing the right information. In bringing together a diverse group of people who live and work in the Arctic we can gain a better understanding of information needs with respect to the impacts, challenges and opportunities associated with a changing environment. The workshop was organized by the Alaska Experimental Program to Stimulate Competitive Research (EPSCoR), project leads within the Sustainable Development Working Group (SDWG) of the Arctic Council, Natural Resources Canada, Environment Canada, Government of Yukon, Aleut International Association and Gwich'in Council International.



NSSI Deputy Director Denny Lassuy presents a summary of Arctic Council's Conservation of Arctic Flora and Fauna Working Group activities at a meeting of the East Asian-Australasian Flyway Partnership held in Anchorage, Alaska in June 2013. (NSSI)

Coordination and Cooperation

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

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 through:

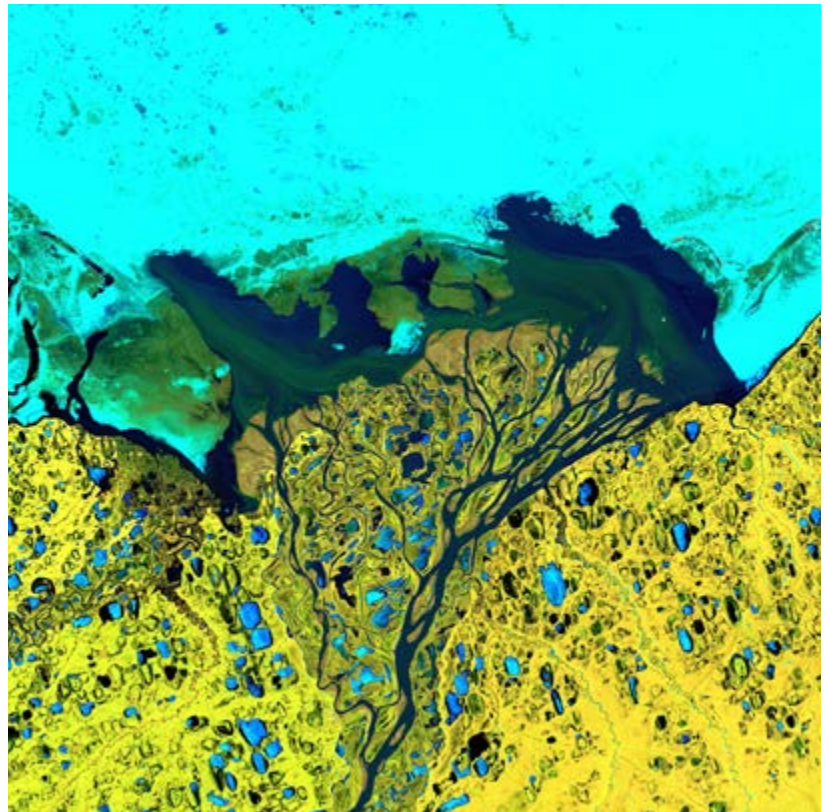
1) internal communications with member agencies to gain knowledge of projects or programs occurring or planned for the North Slope (facilitated by an annual coordination meeting of the Senior Staff Committee and through the North Slope Science Catalog); 2) Science Technical Advisory Panel expertise (enabled through several face-to-face meetings each year); and 3) academia, workshops, seminars, interaction with the National Science Foundation Office of Polar Programs, and other external networks having knowledge of arctic and pan-arctic environments (see Appendix 4).

Collaboration under Presidential Executive Order 13580

Executive Order 13580 (July 2011), Interagency Working Group on Coordination of Domestic Energy Development and Permitting in Alaska, declares it to be U.S. policy that “Interagency coordination is important for the safe, responsible, and efficient development of oil and natural gas resources in Alaska, both onshore and on the Alaska Outer Continental Shelf (OCS), while protecting human health and the environment, as well as indigenous populations.” In furtherance of this policy statement, the Executive Order established the Alaska Interagency Working Group (AIWG), led by the Department of the Interior with representation from the Departments of Defense, Commerce, Agriculture, Energy, Homeland Security, the Environmental Protection Agency and the Office of the Federal Coordinator for Alaska Natural Gas Transportation Projects.

Among the assigned functions of this working group were to “facilitate the sharing of information and best practices,” “ensure the sharing and integrity of scientific and environmental information and cultural and traditional knowledge among agencies”, and “promote interagency dialogue.” A regional, Alaska-based working group complements and informs the national AIWG. Given these charges, the NSSI has fully engaged with and supported both the regional and national AIWG discussions.

For example, the NSSI-generated Emerging Issue Summaries (see: <http://northslope.org/issues>) contribute directly to AIWG purposes such as helping the federal government to use a comprehensive, science-based approach and to fill science needs in a broad spectrum of disciplines. We also help the



Flooding of the Colville River Delta and landfast sea ice in June 2013. The patchwork of frozen and unfrozen lakes reflects differences in lake hydrology, depth, and size. (USGS)

AIWG in its efforts to facilitate the delivery of relevant scientific information to officials responsible for making decisions related to energy development in Alaska and to include non-federal scientists, NGOs, industry officials, Alaska Natives, and State and Federal decision-makers in that dialogue. The structure of the NSSI, particularly with regularly scheduled and structured interactions between the Science Technical Advisory Panel and the NSSI Oversight Group, directly contributes to the delivery of this commitment. NSSI staff also participates in the AIWG's coordination calls and contributes information and services (e.g., web-hosting) as needed.



Changing hydrology on the North Slope can lead to drained lakes, like this one along the Meade River. (USGS)

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 Act was followed on January 9, 2009, by two Presidential Directives (NSPD-66 and HSPD-25) that brought U.S. Arctic policy to the forefront of security and climate change. The ARPA established the U.S. Arctic Research Commission (USARC) 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. For example, the NSSI Executive Director (as panelist) and Deputy Director (as facilitator), on behalf of the IARPC, helped organize and run a “Collaborative Research Approaches” workshop in Anchorage in January 2013.

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, State, and local governments in scientific arctic research;
- ◆ Coordinates and promotes cooperative scientific arctic 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 Congress through the President, containing a statement of the activities and accomplishments of the IARPC since its last report.

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 a key player and contributor for the design and development of both the U.S. and the international observing systems.

NSSI Internal Communication

Even before the formation of the NSSI, the various member organizations each supported 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 the Oversight Group members and their senior staff regularly communicate and coordinate new and ongoing projects and their implications to management decisions. The Oversight Group generally meets three to four times a year; the Senior Staff Committee often meets jointly with the Science Technical Advisory Panel a similar number of times a year. These groups discuss each agency's specific North Slope issues and use of science for better decision making. Each of the 2013 and 2014 accomplishments described in this report has benefited from NSSI-assisted coordination.

NSSI Member Agency Cooperative Science on the North Slope

The NSSI has also provided a forum for its members to build on their own agency's study or research programs. Each year, the members of the Senior Staff Committee gather to present their individual agency projects planned for the upcoming fiscal year. This forum provides a basis for additional cooperation and collaboration that is focused on the work each agency is planning within their mandates. They can share, collaborate, and coordinate both knowledge and resources (e.g., monetary, equipment, and human capital). Such interface also helps determine future information needs by providing these forums for emerging management questions. Descriptions of some of the coordinated science efforts of each NSSI agency that has an operational component on the North Slope can be viewed either on the NSSI website through the Data and Projects Search portal (<http://catalog.northslope.org/search>) or on each of the member agency websites.

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

Federal:

Bureau of Land Management, Alaska	http://www.blm.gov/ak
Bureau of Ocean Energy Management, Alaska OCS Region	http://www.boem.gov/Alaska-Region/
Bureau of Safety and Environmental Enforcement, Alaska OCS Region	http://www.bsee.gov
National Park Service, Alaska Region	http://www.nps.gov/akso
National Marine Fisheries Service, Alaska Region	http://alaskafisheries.noaa.gov
National Weather Service, Alaska Region	http://www.arh.noaa.gov
U.S. Arctic Research Commission	http://www.arctic.gov
U.S. Fish and Wildlife Service, Alaska Region	http://alaska.fws.gov
U.S. Geological Survey, Alaska Science Center	http://alaska.usgs.gov
U.S. Department of Energy, Arctic Energy Office	http://www.netl.doe.gov/technologies/ oil-gas/AEO/main.html
U.S. Coast Guard	http://www.uscg.mil

North Slope:

North Slope Borough	http://www.north-slope.org
Arctic Slope Regional Corporation	http://www.asrc.com

State of Alaska:

Alaska Department of Fish and Game	http://www.adfg.alaska.gov
Alaska Department of Natural Resources	http://dnr.alaska.gov

Appendix I: Oversight Group Charter

1. **Official Designation:** North Slope Science Initiative, North Slope Science Oversight Group (hereafter the Oversight Group).
2. **Background and Need:** Alaska's North Slope and adjacent seas provide important terrestrial, estuarine, and marine habitat for a wide range of fish, migratory birds, terrestrial and marine mammals (for example, caribou, seals, whales), and other species that are culturally important to many Alaska Natives and their communities. This area is also believed to have some of the largest remaining oil, gas, and coal potential in the United States. As production from these reserves becomes more economically feasible, the strategic and economic importance of the North Slope's energy resources will be even greater. In sustaining these resources and planning for safe energy exploration and development, managers also face the challenge of a rapidly changing Arctic climate. The domestic and international scale of these challenges, opportunities, and changes are of such magnitude that there is federal, state, and local consensus that enhanced, coordinated, and sustained inventory, monitoring, and research are vital to supporting an integrated ecosystem-based management approach. In response, federal, state, and local governments collectively formed the North Slope Science Initiative, which was formally authorized under the Energy Policy Act of 2005 (Public Law 109-58, Sec. 348).
3. **Mission:** The mission of the Oversight Group is to enhance the quality and quantity of the scientific information available for aquatic, terrestrial, and marine environments on the North Slope and to make this information available to decision makers, governmental agencies, industry, and the public. This mission will be accomplished through a coordinated and integrated approach to conducting inventory, monitoring, and research activities on the North Slope.
4. **Goals:** The Oversight Group directs and facilitates a coordinated approach to information gathering and analysis on the North Slope and its associated marine environment, including the integration of contemporary and traditional local knowledge. Specifically, the Oversight Group will:
 - Develop an understanding of informational needs for regulatory and land management agencies, local governments, and the public;
 - Identify and prioritize informational needs for inventory, monitoring, and research activities to address the impacts of past, ongoing, and anticipated development activities on the North Slope;
 - 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;
 - Identify priority needs not addressed by existing agency science programs, and develop a funding strategy to meet these needs;

- Maintain and improve public and agency access to accumulated and ongoing research, and to contemporary and traditional local knowledge; and
- Ensure through appropriate peer review that the science conducted under the oversight of the NSSI and by participating NSSI 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 Bureau of Ocean Energy Management; 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 represent the principal agencies at the regional, State, and Federal levels with management responsibilities for public lands, fish, and wildlife on the North Slope. In addition, the U.S. Geological Survey, National Weather Service, and U.S. Arctic Research Commission 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/Voting

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 in 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. U.S. 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 on the North Slope and in the adjacent coastal waters of the Beaufort Sea.
3. Bureau of Ocean Energy Management manages the exploration and development of the nation's offshore resources. It seeks to appropriately balance economic development, energy independence, and environmental protection through oil and gas leases, renewable energy development and environmental reviews and studies. Functions include: Leasing,

Plan Administration, Environmental Studies, National Environmental Policy Act (NEPA) Analysis, Resource Evaluation, Economic Analysis and the Renewable Energy Program.

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. NOAA/National Marine Fisheries Service (NMFS) provides stewardship of living marine resources through science-based conservation and management and the promotion of healthy ecosystems. NMFS 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 the effects of federal actions on species listed under the Endangered Species Act, and authorizations for the unintentional take of small numbers of marine mammals under the Marine Mammal Protection Act. NMFS also conducts research concerning marine mammals and fish under NMFS jurisdiction. NMFS assesses populations of bowhead whales, ribbon seals, ringed seals, spotted seals, and bearded seals, and works routinely with partners in Alaska Native Organizations such as the Alaska Eskimo Whaling Commission and the Ice Seal Committee. Additionally, NMFS staffs the U.S. delegation to the International Whaling Commission.

B. Federal/Ex Officio

1. U.S. 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.
2. NOAA/National Weather Service Alaska Region provides weather, hydrologic, climate forecasts and volcanic ash and tsunami warnings for the state of Alaska and its surrounding waters to protect lives and property and enhance the economic interests of our Nation. Alaska Region offices and facilities include the Weather Forecast Offices, Weather Service Offices, Alaska-Pacific River Forecast Center, Alaska Aviation Weather Unit, Anchorage Center Weather Service, and the Alaska Region Headquarters.

3. U.S. Arctic Research Commission 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.

C. 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, present this information to decision makers so they can make informed decisions, and provide options for development activities that will minimize or mitigate negative impacts of development.
2. Department of Natural Resources is the lead resource-development agency for the State of Alaska. 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 and 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, and 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 Office of Project Management and Permitting administers the State of Alaska's Large Projects Team which is responsible for coordinating State agency participation on major resource development projects throughout Alaska.

D. Arctic Slope Regional Corporation (ASRC)

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

E. North Slope Borough

The North Slope Borough's 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 which stresses 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 a 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

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. 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. The Chair will hold the position from July 1 through June 30 of each year.

Designees: Oversight Group members may appoint designees to act on their behalf in their absence.

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 Group, 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.

Staffing and Budget: Base staffing and budget will be provided through the BLM, as the administrative agency of record. For operations and/or salary beyond the base budget provided by BLM, this Charter, along with an interagency, intergovernmental, assistance agreement, or other legal instrument will be established through the Executive Director. Salary and/or operational funding provided through such process shall have overhead expenses waived by BLM.

The Executive Director will report programmatically to the Chair and Vice Chair of the Oversight Group. Annual performance evaluations of the Executive Director are completed by the BLM with input from the Chair and past-Chair (both are required as the Chair rotates based on a State fiscal year of July 1 through June 30, while the performance evaluation period is based on a Federal fiscal year of October 1 through September 30).

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. Salary, travel or other expenses incurred by staff committee members are paid by their respective supporting organization.

8. Oversight Group Meetings and 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, National Weather Service, and U.S. Arctic Research Commission 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.

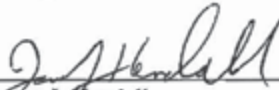
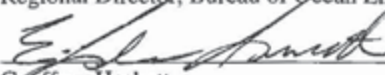




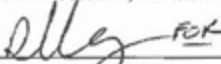
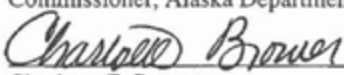
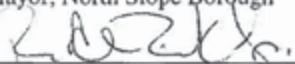
- E. Records:** Meeting minutes and summaries of key decisions will be posted on the NSSI website. Hard copies will be available upon request.
- F. Closed Meetings (Executive Sessions):** The Oversight Group members, or their designees, and the Executive Director may close meetings, or portions of meetings, 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. Ex Officio members, or their designees, may participate in Executive Sessions by permission of the Oversight Group Chair.
- G. Frequency and Location of Meetings:** The Oversight Group will meet a minimum of two times per year-preferably once in Anchorage and once in Barrow.
- H. Expenses for Oversight Group:** Expenses related to salary, 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. However, it does suggest the sharing of funds, without direct or indirect overhead, to accomplish the collaborative mission of the NSSI.

SIGNATURE AUTHORITY:

Voting Members

	11/09/12
James J. Kendall Regional Director, Bureau of Ocean Energy Management, Alaska Region	Date
	12/4/12
Geoffrey Haskett Regional Director, U.S. Fish and Wildlife Service, Alaska Region	Date
	10/31/12
Sue Masica Regional Director, National Park Service, Alaska Region	Date
	11/15/12
^{FR} James W. Balsiger Administrator, NOAA/National Marine Fisheries Service, Alaska Region	Date
	12/5/12
Bud C. Cribley State Director, Bureau of Land Management, Alaska State Office	Date
	11/7/2012
Daniel S. Sullivan Commissioner, Alaska Department of Natural Resources	Date
	4 DEC 2012
Cora Campbell Commissioner, Alaska Department of Fish and Game	Date
	6 th - May 2013
Charlotte E. Brower Mayor, North Slope Borough	Date
	6/12/13
Rex A. Rock, Sr. President, Arctic Slope Regional Corporation	Date

Ex Office Members

	6 Dec 2012
Leslie E. Holland-Bartels Regional Executive, U.S. Geological Survey, Alaska Area	Date
	12/13/12
Aimee Devaris Acting Regional Director, NOAA/National Weather Service, Alaska Region	Date
	11/13/12
John Farrell Executive Director, U.S. Arctic Research Commission	Date

Appendix 2: Science Technical Advisory Panel Appointees

STAP Appointees and Representative Scientific Expertise	
W. Scott Pegau, Ph.D.	Oceanography (Chair)
Dan Reed, M.S.	Biometrics (Vice-Chair)
Bill Streever, Ph.D.	Arctic Restoration
Robert Suydam, Ph.D.	Marine Biology
Wendy Loya, Ph.D.	Ecology/Biogeochemistry
Michael Macrander, Ph. D.	Marine Mammals
Robert Shuchman, Ph.D.	Remote Sensing
Donie Bret-Harte, Ph.D	Landscape Ecology
Robyn Angliss, Ph.D	Marine Ecology
Jerry McBeath, Ph.D	Social Sciences
Robert Meyer	Fisherhies Biology
Jeffery Organek	Civil Engineering
Robert Shears	Geographical & Traditional Knowledge
Elizabeth Snyder, Ph.D	Public Heath
Ronnie Wilcock, Ph.D.	Modeling & Risk Analysis

Appendix 3: Science Technical Advisory Panel Charter

1. **COMMITTEE'S OFFICIAL DESIGNATION:** North Slope Science Initiative Science Technical Advisory Panel (Panel).
2. **AUTHORITY:** The Panel is a statutory advisory committee established under Section 348(d), of the Energy Policy Act of 2005 (42 U.S.C. 15906); Section 309 of the Federal Land Policy and Management Act (FLPMA), as amended (43 U.S.C. 1739); the Forest and Rangeland Renewable Resources Planning Act of 1974 (16 U.S.C. 1600); Section 14 of the National Forest Management Act of 1976 (16 U.S.C. 472a); and the Wilderness Act (16 U.S.C. 1131). The Panel is established in accordance with the provisions of the Federal Advisory Committee Act (FACA), as amended, 5 U.S.C. Appendix 2.
3. **OBJECTIVES AND SCOPE OF ACTIVITIES:** The Panel will advise the North Slope Science Oversight Group through the Designated Federal Officer (DFO) on proposed inventory, monitoring, and research functions.
4. **DESCRIPTION OF DUTIES:** The Panel's duties and responsibilities are as follows:
 - a. Advise the Oversight Group on proposed inventory, monitoring, and research functions;
 - 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 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; and
 - h. Provide other scientific advice as requested by the Oversight Group.

5. **AGENCY OR OFFICIAL TO WHOM THE PANEL REPORTS:** The Panel reports to the Secretary of the Interior through the DFO.
6. **SUPPORT:** Administrative support and funding for activities of the Panel will be provided by the Bureau of Land Management.
7. **ESTIMATED ANNUAL OPERATING COSTS AND STAFF YEARS:** The annual operating costs associated with supporting the Panel's activities are estimated to be \$45,000, including all direct and indirect expenses and 0.50 Federal staff years.
8. **DESIGNATED FEDERAL OFFICER:** The DFO is the Executive Director, North Slope Science Initiative, who is a full time employee appointed in accordance with Agency procedures. The DFO will approve or call all Panel and subcommittee meetings, prepare and approve all meeting agendas, attend all Panel and subcommittee meetings, adjourn any meeting when the DFO determines adjournment to be in the public interest, and chair meetings when directed to do so by the Secretary.
9. **ESTIMATED NUMBER AND FREQUENCY OF MEETINGS:** The Panel will meet approximately two to four times annually, and at such other times as designated by the DFO.
10. **DURATION:** Continuing.
11. **TERMINATION:** The Panel will become inactive 2 years from the date the charter is filed, unless, prior to that date, it is renewed in accordance with the provisions of Section 14 of the FACA. The Panel will not meet or take any official action without a valid current charter.
12. **MEMBERSHIP AND DESIGNATION:** The Panel shall consist of a representative group of not more than 15 scientists and technical experts from diverse professions and interests, including:
 - a. the oil and gas industry;
 - b. subsistence users;
 - c. Native Alaskan entities;
 - d. conservation organizations;
 - e. wildlife management organizations; and
 - f. academia.

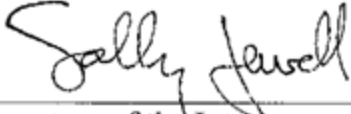
Members are appointed as special Government employees (SGEs) and may be required to file on an annual basis a Confidential Financial Disclosure Report.

13. **ETHICS RESPONSIBILITIES OF MEMBERS:** No Panel or subcommittee member will participate in any specific party matter including a lease, license, permit, contract, claim, agreement, or related litigation with the Department in which the member has a direct financial interest. As provided in 43 CFR 1784.2-2, members of the Panel shall be required to disclose their direct or

indirect interest in leases, licenses, permits, contracts, or claims that involve lands or resources administered by the BLM, or in any litigation related thereto. For the purposes of this paragraph, indirect interests include holdings of a spouse or dependent child.

The Department of the Interior will provide materials to members appointed as SOEs explaining their ethical obligations. Consistent with the ethics requirements, members will endeavor to avoid any actions that would cause the public to question the integrity of the 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.

14. **SUBCOMMITTEES:** Subject to the DFO's approval, subcommittees may be formed for the purposes of compiling information or conducting research. However, such subcommittees must act only under the direction of the DFO and must report their recommendations to the Panel for consideration. Subcommittees must not provide advice or work products directly to the Agency. The Panel's Chair, with the approval of the DFO, will appoint subcommittee members. Subcommittees will meet as necessary to accomplish their assignments, subject to the approval of the DFO.
15. **RECORDKEEPING:** The Records of the Panel, and of formally and informally established subcommittees of the Panel, shall be handled in accordance with General Records Schedule 26, Item 2, and other approved Agency records disposition schedule. These records shall be available for public inspection and copying, subject to the Freedom of Information Act, 5 U.S.C. 552.


Secretary of the Interior

JUN 18 2014
Date

JUN 19 2014
Date Charter Filed

Appendix 4: Organizations and Initiatives Related to the Arctic

Advanced Cooperative Arctic Data and Information Service (ACADIS)
(<http://www.aoncadis.org/home.htm>)

Alaska Center for Climate and Policy (ACCAP) (<http://www.uaf.edu/accap>)

Alaska Climate Change Executive Roundtable
(<http://www.doi.gov/csc/alaska/Stakeholder-Advisory-Council.cfm>)

Alaska Department of Commerce, Community & Economic Development
(<http://www.commerce.state.ak.us>)

Alaska Department of Environmental Conservation (<http://www.dec.alaska.gov>)

Alaska Department of Transportation & Public Facilities (<http://www.dot.state.ak.us>)

Alaska Fisheries Science Center (NOAA, NMFS) (<http://www.afsc.noaa.gov>)

Alaska Nanuuq Commission (<http://www.thealaskananuqcommission.org>)

Alaska Native Tribal Health Consortium Local Environmental Observer Network
(<http://www.anthc.org/chs/ces/climate/leo>)

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

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

Arctic Science Portal (of USARC) (<http://www.arctic.gov/portal>)

Alaska Sea Grant (<http://seagrant.uaf.edu>)

Arctic Council (<http://www.arctic-council.org>)

Arctic Contaminants Action Program (ACAP)
(<http://www.arctic-council.org/index.php/en/about-us/working-groups>)

Arctic Domain Awareness (<http://www.piersystem.com/clients/c780/261751.pdf>)

Arctic Environmental Atlas (<http://maps.grida.no/arctic>)

Arctic Health (<http://arctichealth.nlm.nih.gov/home>)

Arctic Landscape Conservation Cooperative (<http://www.arcticlcc.org>)

Arctic Monitoring and Assessment Programme (AMAP)
(<http://www.arctic-council.org/index.php/en/about-us/working-groups>)

Arctic Observing Network (AON) (<http://www.arcus.org/search/aon>)

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

Arctic Policy Group (APG) (http://arctic-council.org/member_state/united_states_of_america)

Arctic Portal (<http://arcticportal.org>)

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

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

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

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

Appleton Charitable Foundation (<http://www.appletonfoundation.org/arctic%20initiatives.html>)

Canadian Sea Ice Service (<http://www.ec.gc.ca/glaces-ice/default.asp?lang=En&n=0A70E5EB-1>)

Circum-Polar Environmental Observatories Network (CEON)
(<http://irpsrvgis28.utep.edu/Website/ceon/viewer.htm>)

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

Conservation of Arctic Flora and Fauna (CAFF) (<http://www.caff.is>)

Emergency Prevention, Preparedness and Response (EPPR) (<http://eppr.arctic-council.org>)

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

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

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

Integrated Global Observing Strategy (IGOS) (<http://www.un.org/earthwatch/about/docs/igosstr.htm>)

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

Interagency Ocean Observing Committee (<http://www.iooc.us>)

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

International Long-Term Ecological Research (ILTER) (<http://ilternet.edu>)

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

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

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

Morse Arctic Coastal Initiative (<http://www.morsearctic.net/links.php>)

National Energy Technology Laboratory
(<http://www.netl.doe.gov/technologies/oil-gas/AEO/FossilEnergy/TransAlaskaPipeline.html>)

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

National Security Presidential Directive/NSPD-66 & Homeland Security Presidential Directive/HSPD-25
(<http://www.fas.org/irp/offdocs/nspd/nspd-66.htm>)

National Snow and Ice Data Center (NSIDC) (<http://nsidc.org>)

Naval Research Laboratory Arctic Initiatives
(<http://www.star.nesdis.noaa.gov/star/documents/meetings/Ice2011/dayOne/Stewart.pdf>)

NOAA Arctic Theme Page (<http://www.arctic.noaa.gov>)

Nordic Council (<http://www.norden.org>)

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

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

Office of Science and Technology Policy (OSTP) (<http://www.whitehouse.gov/administration/eop/ostp>)

Polar Bear Specialist Group (<http://pbsg.npolar.no/en>)

Polar Research Board (PRB) (<http://dels.nas.edu/prb>)

Prince William Sound Oil Spill Recovery Institute (OSRI) (<http://www.pws-osri.org>)

Protection of the Arctic Marine Environment (PAME) (<http://www.pame.is>)

SCANNET, Circumpolar Arctic Network of Terrestrial Field Bases
(<http://www.scannet.nu/content/view/85/152>)

State of Alaska, Governor's Sub-Cabinet on Climate Change (<http://www.climatechange.alaska.gov>)

Study of Environmental Arctic Change (SEARCH) (<http://www.arcus.org/search/index.php>)

Sustainable Development Working Group (SDWG) (<http://www.sdwg.org>)

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

U.S. Arctic Research Commission (<http://www.arctic.gov>)

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

United States Global Change Research Program (www.globalchange.gov)

University of Alaska Fairbanks-Arctic Research (<http://www.uaf.edu/uaf/research>)

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

Vision for the Canadian Arctic Research Initiative
(<http://scienceadvice.ca/en/assessments/completed/canadian-arctic.aspx>)

Woods Hole Research Center (http://www.whrc.org/global/arctic_system/index.html)

World Wildlife Fund – Arctic Initiative (<http://worldwildlife.org/places/arctic>)



North Slope Science Initiative
ALASKA

<http://northslope.org>



<http://www.facebook.com/NorthSlopeScienceInitiative>



<http://www.twitter.com/NSlopeScience>

Front Cover Photo Captions:

(Top) Abundant vegetation spreads across the landscape near Toolik Lake. (NSSI); *(Inset 1)* Satellite image of Wainwright area. (NSSI); *(Inset 2)* Forget-me-not, the Alaska state flower, flourishes even on the North Slope. (NSSI); *(Inset 3)* Land cover varies from tundra to mountain across the North Slope. (NSSI); *(Inset 4)* Vast wetlands sit atop permafrost on the North Slope coastal plain. (NSSI)

Back Cover Photo Caption: The Toolik Lake Field Station (UAF, Institute of Arctic Biology) offers a jumping off point for many studies in the U.S. Arctic, including the NSSI land cover mapping effort (NSSI)