# Witness the ARCTIC

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## In this Issue



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# ARCUS Member Highlight: ABR., Inc.

*By: Amy Turner, Project Management Support Specialist and Proposal Coordinator, ABR, Inc.*

*Note: "Witness the Arctic" regularly features the research and related programs of ARCUS member institutions. This article spotlights ABR, Inc.—Environmental Research & Services in Fairbanks, Alaska*

ABR, Inc. (https://www.abrinc.com/)—Environmental Research & Services (formerly Alaska Biological Research) is a professional environmental consulting group founded in Fairbanks, Alaska in 1976. We are dedicated to promoting rigorous and objective science and measure our success by a triple bottom line philosophy: economic viability, environmental stewardship, and social responsibility. Our team of over 50 scientists and support staff in office in Fairbanks and Anchorage, Alaska serves a diverse array of clients, including the oil, gas, mining and timber sectors of private industry; resources management agencies; the military; Native entities; and utilities. Our services include: wildlife sciences; fisheries and aquatic sciences; marine science; wetland, vegetation, and landscape ecology; statistics, Geographic Information System (GIS), and database management; and National Environmental Policy Act (NEPA) and permitting.

# Wildlife Sciences

*ABR has been conducting caribou research on the North Slope since the mid-1970s. The work has focused on the effects of roads, pipelines and other development, distribution and movements during the calving and insect seasons, habitat selection and movement rates, and measurement of snow cover and vegetation with satellite imagery. Photo courtesy of ABR, Inc.*

ABR currently employs about 15 ornithologists and mammalogists with extensive experience in both terrestrial and marine environments. We provide state-of-the-art study designs and analyses employing traditional surveys methods (e.g., aerial and ground surveys) and remote sensing techniques (e.g., radar ornithology and satellite telemetry). We also take pride in our abilities to deploy large, experienced field crews, to operate safely in remote field situations, and to collaborate with resource agencies and local stakeholders. Our in-house capabilities in statistics, GIS, data management, and landscape ecology provide comprehensive studies of wildlife and their habitats. These capabilities allow us to develop defensible, quantitative solutions to NEPA, permitting, and management issues.

# Fisheries and Aquatic Sciences

*ABR has conducted detailed yearly monitoring of Arctic Cisco from the Colville River delta for ConocoPhillips Alaska since 2007 due to the importance of this species as a staple in the diet of Nuiqsut residents. The goals of the program are to obtain estimates of the total effort and catch data and to provide future harvest predictions. Photo courtesy of ABR, Inc.*

ABR's Fisheries and Aquatic Sciences Program specializes in providing environmental documentation of aquatic resources, including fish assemblages, fish habitat, and water quality, to those organizations who are either working to develop resources (e.g., the oil and gas, mining, hydroelectric industries) or who are working to manage or restore aquatic habitats, water quality and fisheries resources. Our client list includes state and local government agencies, not-for-profit organizations, and private industry. We are experienced with surveys in freshwater lakes, streams, large rivers, and nearshore marine environments throughout Alaska.

# Marine Science

*ABR provided expert observers to locate and identify threatened Steller's Eiders and marine mammals (especially cetaceans) occurring near the tracklines of seismic survey ships working in Cook Inlet. We helped the ships stay within their permit guidelines for both the Endangered Species Act and the Marine Mammal Protection Act. Photo courtesy of ABR, Inc.*

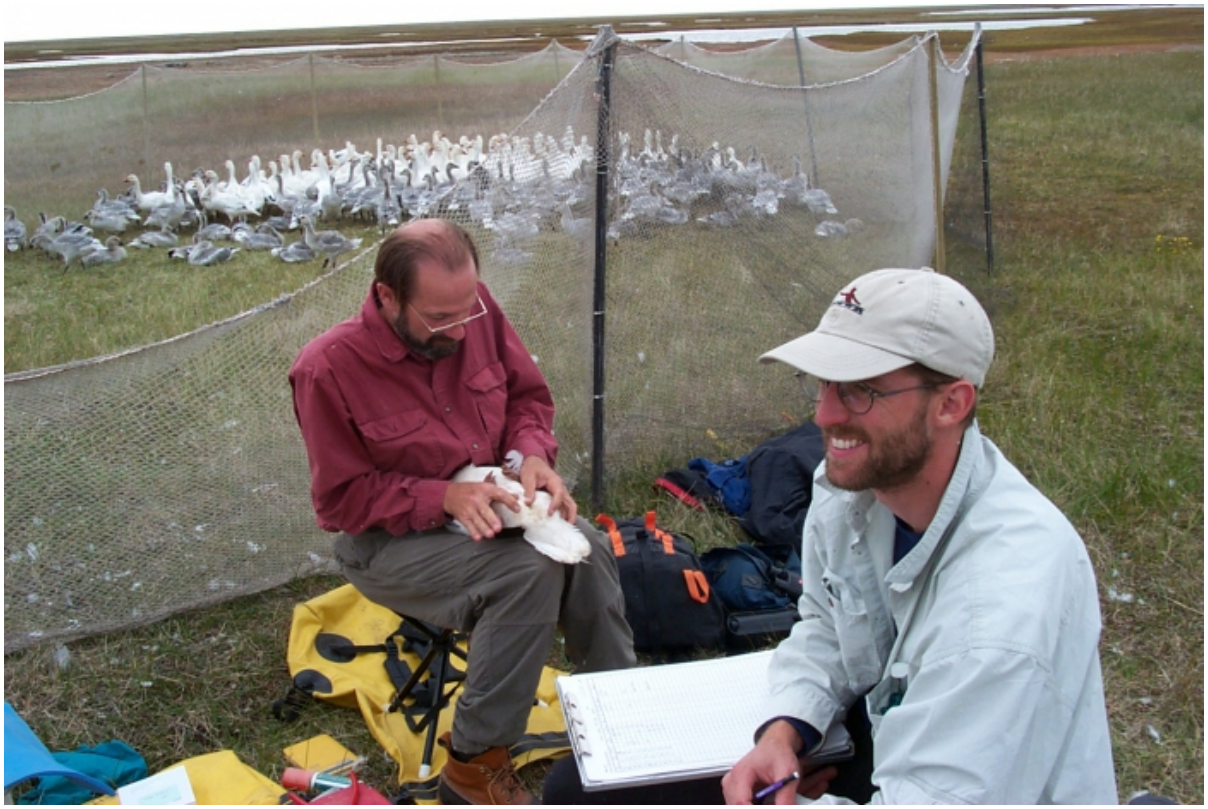
ABR's Marine Science Program is staffed by biological oceanographers, and seabird and marine mammal biologists experienced with ecosystems from tropical to Arctic waters. Our scientists have conducted studies in nearshore and offshore marine environments throughout Alaska from the Beaufort Sea to the Gulf of Alaska and in Washington, Oregon, California, and Hawaii. We have led and participated in multidisciplinary oceanographic studies that integrate physical and biological oceanography to characterize marine communities. We also have conducted short-term and long-term studies on the effects of oil spills and other anthropogenic activities on seabirds and marine mammals, including monitoring for compliance with Incidental Harassment Authorizations. Our specific areas of expertise and services include marine ecology, seabirds, marine mammals, and impact assessments in the marine environment.

# Wetland, Vegetation, and Landscape Ecology

*ABR has worked with the National Park Service since 2002 to map local-scale ecosystems and soils on 10 units within the national park system in Alaska. Using ecological land survey methods, we have mapped soils on nearly 32 million acres over a 12-year period. Photo courtesy of ABR, Inc.*

ABR's Vegetation Science Program is staffed by ecologists, wetland scientists, and land rehabilitation experts with decades of research experience in Alaska and other northern environments. A particular strength of our team is our ability to integrate field survey data with high-resolution imagery and other remote sensing data to characterize properties of vegetation, wetlands, and other natural resources relevant to land management issues and regulatory requirements. Our mapping and data products are used to support the preparation of Environmental Impact Statements and Biological Assessments; landscape evaluations and risk assessments; wetland determinations and aquatic site assessments; and Federal Energy Regulatory Commission (FERC) applications.

# Statistics, Geographic Information System (GIS), and Database Management



*ABR has monitored Brant and Snow Goose productivity along the central Arctic Coastal Plain since 1992 for the North Slope Borough. Aerial surveys have been used to monitoring Snow Goose and Brant colonies. In most years since 2000, with the assistance of North Slope Borough staff and residents, brood-rearing/molting Snow Geese were captured for banding. Recapture return data have been an important contribution to flyway management. Photo courtesy of ABR, Inc.*

ABR is an innovative company that helps set the pace of rapid developments in data collection, management, and analysis. Our team includes ecologists and statisticians with strong technical skills in programming, as well as information technology professionals with a passion for environmental services. We use efficient tools to organize, manage, and synthesize datasets that are often large and complex and deliver a variety of data reports and products to meet our clients' needs. Our GIS Department has extensive experience in GIS systems including ArcGIS, Arc/Info, ER Mapper, Erdas Imaging, and AutoCAD. Our experience with remote sensing formats includes high-resolution aerial photography, IKONOS, Landsat, SPOT, MODIS, and AVHRR imagery. We routinely produce maps of high technical and artistic quality that meet or exceed U.S. Geological Survey map accuracy standards. Our combination of field and technical experience allows us to effectively integrate scientific knowledge with spatial information.

# National Environmental Policy Act (NEPA) and Permitting

ABR's senior scientists have extensive training and experience with the NEPA process and related environmental documentation and permitting issues. We have led or participated as Subject Matter Experts in numerous Environmental Impact Statements, Environmental Assessments, and Categorical Exclusions. The vast experience of our scientists is a valuable asset to our clients when conducting data gap analyses or when describing biological resources potentially affected by proposed development activities. ABR has earned the respect of the resource agencies because of our reputation for scientific rigor and unbiased reporting.

ABR serves a diversity of clients, ranging from Fortune 500 companies to nonprofit organizations and government agencies, all of whom come to us for science-based solutions to resource issues. Because of our reputation for objective and rigorous work, our services are valued by not only our clients but also by many of the stakeholders who are affected by how resource issues are resolved. We also value collaborative and multidisciplinary projects, which leads to collaborations with scientists from academia, government agencies, and other consulting firms.

For more information, please visit our website (https://www.abrinc.com/) or contact one of our Directors:

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# Sea Ice for Walrus Outlook Expanded for 2017 Spring Season

*By: Lisa Sheffield Guy, ARCUS*

The Sea Ice for Walrus Outlook (SIWO) (https://www.arcus.org/search-program/siwo) combines sea ice, weather, and wind forecasting information from the National Weather Service (NWS) with local observations from indigenous subsistence hunters and sea ice experts in five Bering Strait communities. The 2017 season began early, on 31 March, in response to record low winter maximum sea ice extent. This first outlook provided a summary of the state of the ice (https://www.arcus.org/search-program/siwo/2017-03-31) at the season's start, contributed by Matt Druckenmiller (Study of Environmental Arctic Change Sea Ice Action Team) (https://www.arcus.org/search-program/sea-ice) and Hajo Eicken (University of Alaska Fairbanks), detailing the sea ice conditions over winter. Throughout the 11-week SIWO season, dedicated local observers from Wales, Shishmaref, Nome, Gambell, and Savoonga provided photographs and detailed descriptions of ice, weather conditions, and subsistence activities. Much of the Bering Strait was nearly sea ice-free by mid-May, with sea ice retreating from the Chukchi Sea at the earliest time in the satellite record. SIWO observers in Savoonga and Gambell reported very difficult spring hunting conditions for walrus due to the limited presence of seasonal ice. The season concluded Friday, 9 June with a final report focused on the Shishmaref area, which still had a small amount of shorefast ice remaining.


*An open lead in the sea ice near Shishmaref, Alaska on 19 May 2017. Photo courtesy of Curtis Nayokpuk.*


*A seal rest on the sea ice near Shishmaref, Alaska. Photo courtesy of Curtis Nayokpuk.*

During 2017, SIWO proved to be a valuable tool for information exchange between weather forecasters and local communities in the Bering Strait region. The NWS Alaska Sea Ice Program (http://www.weather.gov/afc/ice) was able to share time-sensitive information on dangerous storm

conditions during winter and unstable sea ice conditions during spring with ARCUS, the SIWO project office. We immediately distributed warnings and information via the ARCUS SIWO Facebook page (https://www.facebook.com/seaiceforwalrus), which has followers from 26 Alaskan communities. SIWO local observers also shared their own photos and observations of local conditions with NWS personnel.

ARCUS serves as the lead coordinator for SIWO, with support from NSF, and in close collaboration with the Eskimo Walrus Commission (http://www.kawerak.org/ewc.html), NWS Alaska Sea Ice Program (http://www.weather.gov/afc/ice), the University of Alaska Fairbanks/International Arctic Research Center (https://web.iarc.uaf.edu/), and local observers (https://www.arcus.org/search-program/siwo/observers).

The weekly reports are archived on the SIWO website (https://www.arcus.org/search-program/siwo). For questions or suggestions regarding SIWO, please contact Lisa Sheffield Guy at lisa@arcus.org.

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# SEARCH Program Highlights

*Contributors: Brendan Kelly (SEARCH Executive Director, University of Alaska Fairbanks); Helen Wiggins, Lisa Sheffield Guy, and Brit Myers (SEARCH Science Office, ARCUS); David McGuire (U. S. Geological Survey, University of Alaska Fairbanks), and Matthew Druckenmiller, SEARCH Sea Ice Action Team, Based at National Snow and Ice Data Center*

## SEARCH Develops *Arctic Answers*

Decision makers, Arctic residents, students, scientists, and others have questions about the rapidly changing Arctic, and—for many—the questions are not academic. Questions framed in immediate and policy-relevant terms call for answers in concise and accessible formats, and the Study of Environmental Arctic Change (SEARCH) (http://www.arcus.org/search-program) has developed *Arctic Answers* (https://www.arcus.org/search-program/arctic-answers) to address that need.

SEARCH commissions Arctic experts in diverse disciplines to answer policy-relevant questions in briefs, the *linqua franca* of the policy world, where sophisticated leaders have limited time to integrate input from diverse sources, including science. The expert answers are assembled in a web interface (https://www.arcus.org/search-program/arctic-answers) comprising what we refer to as knowledge pyramids. A one- to two-page jargon-free brief at the apex of each pyramid answers a specific policy question. Successively more information is contained in lower tiers including summary papers, synthesis papers, and—at the base of the pyramid—original research publications.

The tiers beneath the apex briefs assure policymakers of the supporting science and serve as alternative entry points for readers with more background and time. Thus, a science journalist might start with the summary papers collected in the second tier; a scientist in another discipline might start at the tier containing synthesis papers; and a specialist will be interested in the collection of primary literature at the base of the pyramid. We also note the potential for the one-page summaries to be useful not only for policymakers but also for efficient communication among scientists of different disciplines. Providing specialists windows into each other's science will facilitate the multidisciplinary collaborations necessary for a fuller understanding of environmental change in the

Arctic.

To date, questions addressed at *Arctic Answers* are:

- What do we know about the future of Arctic sea-ice loss?
- How is diminishing sea ice impacting marine ecosystems?
- How is diminishing Arctic sea ice impacting lower latitude weather patterns?
- How is diminishing Arctic sea ice impacting coastal communities?
- How is Arctic permafrost thaw impacting climate change?
- How are melting Arctic sea-ice and land-ice linked to sea-level rise?
- How fast is the Greenland Ice Sheet melting?

Several other knowledge pyramids are currently in development. At the same time, SEARCH is seeking input from policymakers and others to determine the most relevant questions and to refine the format of *Arctic Answers*. SEARCH invites your input (https://www.arcus.org/search-program/arctic-answers) on these resources and seek additional experts will to write briefs and/or serve as reviewers.

# Methane Workshop Report Released

A final report from SEARCH's International Workshop to Reconcile Methane Budgets in the Northern Permafrost Region (https://www.arcus.org/search-program/permafrost/methane-workshop) has been released. The report details near-term and longer-term priorities for addressing questions about methane dynamics in the northern permafrost region.

The workshop, held in March 2017, was funded by the National Science Foundation, the National Aeronautics and Space Administration, the U.S. Geological Survey, and the U.S. Arctic Research Commission. The primary goal was to produce a plan for reconciling methane budgets in the northern permafrost region. Forty-two scientists participated, including representatives of the atmospheric, inland (wetlands and lakes), marine (coastal and oceanic), and remote sensing communities.

Participants committed to completing a paper describing a roadmap for synthesis by the end of 2017, and developing plans to address near-term priorities to reduce uncertainties in methane budgets by the end of 2018. The longer-term priorities include addressing possible sensitivities of methane emissions to climate variability and change in the region and evaluating the degree to which changes

in methane dynamics are detectable. To address these longer-term priorities, there is a need to organize existing methane data for the region. Studies using these data can then evaluate how methane observation network enhancements would improve estimates of methane emissions and the detection of trends. The Permafrost Action Team of SEARCH (https://www.arcus.org/search-program/permafrost) will develop research summaries and briefs based on the follow-on activities from the workshop. An *Eos* Meeting Report is currently forthcoming/in press.

For more information on the workshop and report, contact David McGuire (U. S. Geological Survey, University of Alaska Fairbanks) at: admcguire@alaska.edu.

# Report Released from the First SEARCH Knowledge Exchange Workshop on the Impacts of Arctic Sea Ice Loss

The SEARCH Sea Ice Action Team's *First Knowledge Exchange Workshop on the Impacts of Arctic Sea Ice Loss* took place over two days in Washington, DC during September 2016 and brought together over 30 participants from a diverse range of perspectives. More information about the workshop is available via the SEARCH website (https://www.arcus.org/search-program/sea-ice/activities) and the SEARCH Sea Ice Action Network website (https://www.seaiceaction.org/articles/2017/3/15/knowledge-exchange-workshop-initiates-the-sea-ice-action-network). The resulting workshop report summarizes:

1. Best practices and opportunities for communicating with policymakers, the media, local Arctic residents and stakeholders, and other science disciplines.
2. Recommendations for development of sea ice SEARCH knowledge pyramids (https://www.seaiceaction.org/arctic-answers).
3. The state of scientific knowledge and engagement across three themes related to Arctic sea ice loss: Arctic marine ecosystems, lower latitude weather, and human activities in the Bering, Chukchi, and Beaufort Seas.

More information about the report, related activities, and upcoming plans for the Second SEARCH Knowledge Exchange Workshop, which is being planned for 25-27 September 2017, can be found at the SEARCH Sea Ice Action Network website (https://www.seaiceaction.org/) or by contacting Matthew Druckenmiller at druckenmiller@nsidc.org.

# Additional Talent on the Land Ice Action Team

Dr. Waleed Abdalati is taking the lead of SEARCH's Land Ice Action Team (https://www.arcus.org/search-program/land-ice/team). Dr. Abdalati is the Director of the Cooperative Institute for Research in Environmental Science and previously served as the Chief Scientist at NASA. His research uses satellite and airborne remote sensing techniques, integrated with *in situ* observations and modeling, to understand how and why the Earth's ice cover is changing, and what those changes mean for life on Earth. More information about Dr. Abdalati is available here (http://cires.colorado.edu/administration-council-fellows/waleed-abdalati).

Dr. Twila Moon (University of Colorado, Boulder) has joined the Land Ice Action Team as a SEARCH postdoctoral fellow. Dr. Moon brings extensive experience studying ice sheet dynamics as well as strong communication skills. She is a cryosphere scientist with a special interest in ice sheet motion, ice sheet and ocean interaction, and ice-ocean-atmosphere-ecosystem linkages. More information about Dr. Moon is available here (https://www.arcus.org/search-program/land-ice/team).

# For More Information and to Get Involved

More information on these and other SEARCH activities is available through the SEARCH website (https://www.arcus.org/search-program), by joining the SEARCH mailing list (https://www.arcus.org/search-program/mailing-list), or by contacting Brendan Kelly, SEARCH Executive Director, at: bpkelly@alaska.edu. Additional suggestions for participating in SEARCH can be found on the "Get Involved" webpage (https://www.arcus.org/search-program/get-involved).

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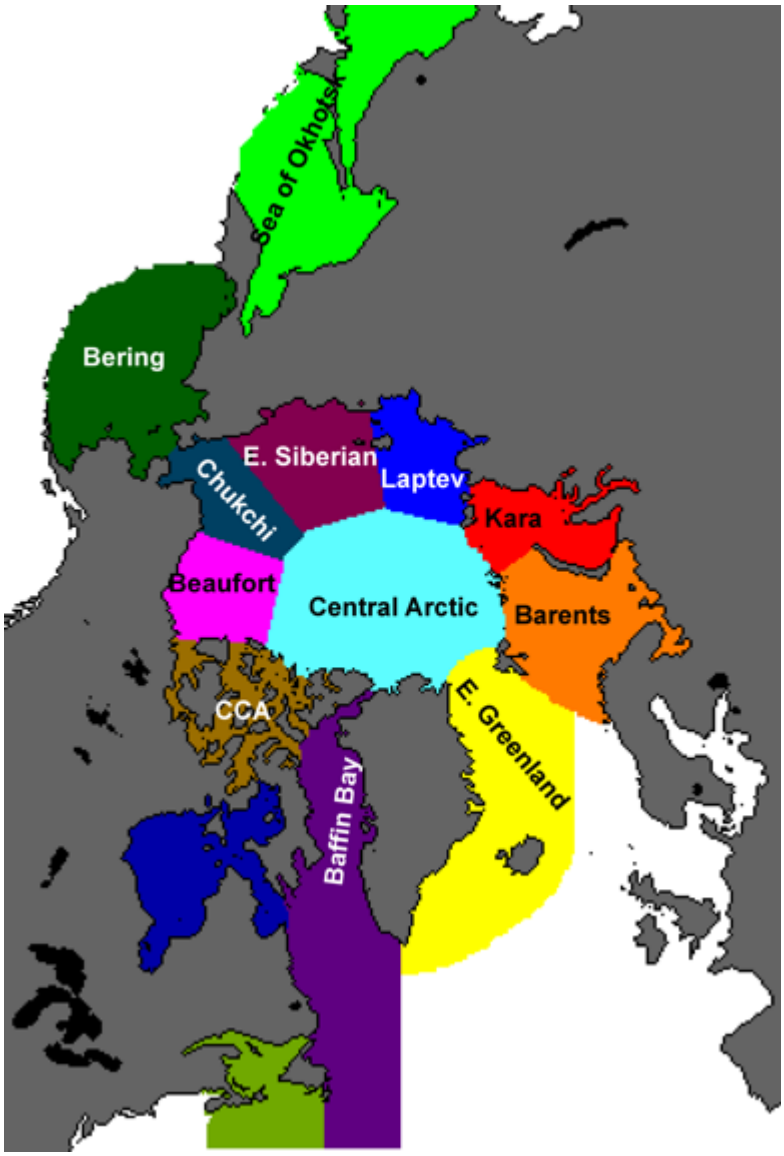
# Sea Ice Prediction Network Efforts for 2017

*By: Betsy Turner-Bogren, ARCUS*

The Sea Ice Prediction Network (SIPN) (https://www.arcus.org/sipn) is in transition as current grant funding comes to a close later this year and proposals are pursued to develop and expand SIPN science efforts.




*Map of defined regions in the Arctic Ocean. Image courtesy of the National Snow and Ice Data Center (NSIDC).*

In March, we co-organized the 4th Polar Prediction Workshop (http://www.polarprediction.net/meetings-calendar/science-workshops/polar-prediction-workshop-2017) along with the World Climate Research Programme - Polar Climate Predictability Initiative (WCRP-PCPI) (http://www.climate-cryosphere.org/wcrp/pcpi) and the World Weather Research Programme - Polar Prediction Project (WWRP-PPP) (http://www.polarprediction.net/). The workshop, held at the Alfred Wegener Institute in Germany, focused on environmental prediction in the polar regions on subseasonal to interannual timescales. Sea ice prediction was a main focus of the workshop, which produced recommendations for the 2017 Sea Ice Outlook season. Julienne Stroeve, member of the SIPN leadership team, gave a talk on "Preparing for the Sea Ice Outlook Season 2017 and SIPN2." Her presentation is available here (https://www.arcus.org

/sipn/presentations-and-publications).

During the remainder of 2017, our focus will be on core Sea Ice Outlook (SIO) (https://www.arcus.org/sipn/sea-ice-outlook) activities during the summer and fall, including a post-season report at the end of the Arctic sea ice melt season. The Sea Ice Outlook provides an open process for those interested in Arctic sea ice to share ideas. The monthly reports contain a variety of perspectives—from advanced numerical models to qualitative perspectives from citizen scientists.

The 2017 SIO will include community contributions to the regular June, July, and August monthly reports that synthesize predictions for the September monthly average extent of Arctic sea ice, as well as Alaskan regional sea ice extent. Informal contributions of fall freeze-up data, sea ice observations, and other relevant information will also be included. New for this year, we are accepting pan-Antarctic sea ice extent of the September monthly mean.

The 2017 season was launched in May with the call for contributions for the June report, which will be released later this month. More information on this year's Sea Ice Outlook season, as well as access to the 2016 post-season report, is available here (https://www.arcus.org/sipn/sea-ice-outlook /2017/june/call).

For more information about SIPN, see the SIPN website (https://www.arcus.org/sipn), join the SIPN mailing list (https://www.arcus.org/sipn/mailing-list), or contact Betsy Turner-Bogren, ARCUS, at betsy@arcus.org.

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# Diagnosing Water Security in the Rural North with an Environmental Security Framework

*By: Henry J.F. Penn, Institute of Northern Engineering, University of Alaska Fairbanks and Arctic Institute of North America,University of Calgary; Philip A. Loring, School of Environment and Sustainability, University of Saskatchewan; and William E. Schnabel, Water and Environmental Research Center, University of Alaska Fairbanks*

This study explored the nature of water security challenges in rural Alaska, using a framework for environmental security that entails four interrelated concepts: availability, access, utility, and stability of water resources. The goal was to tease apart the divergent narratives regarding the state of water security in rural Alaska, and diagnose existing challenges such that effective and sustainable solutions can be identified.

*Drinking water source for Chignik Bay, Alaska (2015). Photo courtesy of H. Penn.*

Water security is generally defined as involving stable and affordable access to clean water in sufficient quality and quantities for maintaining health and enacting livelihoods (Cook & Bakker, 2012). In rural Alaska, water security at the household and community level has emerged as an important societal problem, though there's growing debate about both the nature and the relative scale of the issue, and these disagreements have led to different perspectives on the most appropriate solutions (Marino, White, Schweitzer, Chambers, and Wisniewski, 2009; U.S. Arctic Research Commission, 2015). In contrast to many areas of the world where local communities are challenged by water shortages and changing hydrological cycles (Vörösmarty et al., 2010; Wheater and Gober, 2015), the problem facing household water security in rural Alaska relates primarily to infrastructure (i.e., water and wastewater treatment facilities) (Eichelberger, 2010; U.S. Arctic Research Commission, 2015) and community development policies (Eichelberger, 2012). Reports about the severity and extent of the problems vary, however; it has become a regular anecdote, for example, to claim that it is not uncommon for homes in rural Alaska to lack piped water and sewer (Eichelberger,

2014). Conversely, official sources show that as of 2000, 93.7% of all Alaskan households had access to complete sanitation (U.S. Census Bureau, 2000; Hennessy et al., 2008), and health practitioners in the state contend that "nearly all villages have access to safe drinking water" (Hennessy et al., 2008). These findings notwithstanding, public health outcomes such as rates of water-washed diseases (infections that are caused by poor hygiene practices, such as handwashing and bathing) remain high (Hennessy et al., 2008; Gessner, 2008).

Many researchers and professionals agree that water insecurity is a problem in rural Alaska, although the scale and nature of the problem is contested. Some academics have argued that the problem is systemic and rooted in an approach to water security by the state that prioritizes economic concerns over public health concerns. Health practitioners and state agencies, on the other hand, contend that much progress has been made and that nearly all rural households have access to safe drinking water, though many are still lacking "modern" in-home water service.

We applied a four-dimensional framework for environmental security proposed by Loring et al. (2013) (see also Grumbine, 2014; Hossain, Loring, and Marsik, 2016) to synthesize ethnographic research on water security in rural communities in the Bristol Bay and Kotzebue Sound regions of Alaska (Penn, Loring, and Gerlach, 2016).

We identified key points of intervention for improving water security in the region and proposed a paradigm shift away from large-scale infrastructure projects, and instead toward community empowerment and stewardship as ways to improve the efficiency and stability of water systems, whether old or new. We specifically identified the importance of the Utility—the social institutions and organizations responsible for maintaining infrastructure, providing water services, and ensure people's needs are met—as the foundation of sustainable community water system management.

Our analysis highlights key human dimensions such as the role of policy and social narratives regarding modernization. Our analysis also illustrates the effectiveness of this environmental security framework for unpacking the human dimensions of water security at the community and household level, which Wheater and Gober (2015) identify as a priority for water security research.

Importantly, what the exercise revealed, which is very much in line with what community members have repeatedly expressed to us (Loring, Gerlach, and Penn, 2016; Penn et al., 2016), is that the problem of water security is primarily one rooted in historical legacies of poorly planned infrastructure development. Many communities are operating aged systems for water and wastewater management that are well past their planned end of life, that are expensive to operate and challenging

to maintain, and that were not designed with the nuances of Arctic landscapes and climate in mind (Marino et al., 2009; U.S. Arctic Research Commission, 2015).

The diagnostic approach we implemented helped to identify solutions to these challenges, which accordingly focus on place-based needs and empowering local actors. The framework likewise proved to be broadly applicable to exploring water security concerns elsewhere in the world.

This work is a part of the Sustainable Futures North program (http://www.sustainablefuturesnorth.org/), funded by a grant from the National Science Foundation Arctic Science, Education, and Engineering for Sustainability (Arctic SEES) (grant #1263853); from the National Oceanic and Atmospheric Administration, Climate Program Office Grant (grant #NA11OAR4310141) through the Alaska Center for Climate Assessment and Policy at the University of Alaska, Fairbanks; and from the National Oceanic and Atmospheric Administration's Climate-Society Interactions program (grant #NA11OAR4310135).

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# Interdisciplinary Researchers Connect During Anchorage Arctic Research Day

*By: Diane Hirshberg, Advisor to the Chancellor on Arctic Research and Education, University of Alaska Anchorage*

On 24 March 2017, ARCUS and the University of Alaska Anchorage (UAA) (https://www.uaa.alaska.edu/), in conjunction with the Interagency Arctic Research Policy Committee (IARPC) (http://www.iarpccollaborations.org/index.html), co-hosted the first ever Anchorage Arctic Research Day. This event, held on the UAA campus, brought together Arctic researchers from the university, indigenous, federal, state, local, and non-profit entities to share descriptions of the work they are doing and to foster new collaborations. The day included welcomes from Anchorage Mayor Ethan Berkowitz, UAA Chancellor Tom Case, and representatives of Senator Lisa Murkowski and the Alaska Department of Commerce, Community, and Economic Development. Fran Ulmer, chair of the U.S. Arctic Research Commission, gave a keynote address, discussing the USARC's current priority goals for Arctic research as well as highlights of the U.S. chairmanship of the Arctic Council and the White House Arctic Science Ministerial meeting in September 2016.


*Fran Ulmer, USARC Chair (left) and Diane Hirshberg, UAA Advisor to the Chancellor (right). Photo courtesy of Kirstin Olmstead.*

There were two panels featuring UAA faculty members discussing their current Arctic research projects, one focusing on Social Sciences, Health and Humanities, and another on Natural Sciences and Engineering research. A third panel included researchers from federal, state, and quasi-governmental agencies with offices in Anchorage; researchers and leaders from two Anchorage-based indigenous organizations—Inuit Circumpolar Council-Alaska and Aleut International Association—that participate as Permanent Participants to the Arctic Council; the head of the Arctic Studies Center of the Smithsonian Institution; and the Institute of the North. IARPC participants presented an overview of the recently-launched IARPC Arctic Research Plan and discussed ways that researchers and community members could be involved. The executive director of the University of Alaska's Arctic Domain Awareness Center (ADAC) also described the work of this Department of Homeland Security-funded Center of Excellence. Bob Rich, ARCUS Executive Director (https://www.arcus.org/witness-the-arctic/2017/1/article/27217), gave an overview of opportunities for researchers to engage with ARCUS. The day was capped off with a poster reception that was kicked off with a poem entitled "Ode to the Great Bear (Arktos)," written by UAA professor Toby Widdicombe for the occasion.

Download Ode to the Great Bear (Arktos) (PDF - 85 KB) (https://www.arcus.org/files/article/files/wta_21_1_ode_to_the_great_bear.pdf)


*Dr. Toby Widdicombe, UAA, presents on Arctic Thule: The Search for an Arctic Utopia. Photo courtesy of Diane Hirsberg.*

Participants were excited by the opportunity to connect with researchers with whom they typically do not get to meet in their regular work; there are plans to create an online network to facilitate ongoing discussions among the Anchorage Arctic research community and to develop new collaboration opportunities. There are also discussions about making the Anchorage Arctic Research Day a reoccurring event.

More information about the Anchorage Arctic Research Day, including the event agenda and presentations, is available here (https://www.arcus.org/meetings/2017/arctic-research-day).

# The New IARPC 5-Year Research Plan Outlines Arctic Research Goals

*By: Sandy Starkweather, Executive Director of the U.S. Arctic Observing Network, and Simon Stephenson, Head of the Arctic Sciences Section in the Division of Polar Programs, National Science Foundation*

The second comprehensive Arctic Research Plan was released December 2016 by the Interagency Arctic Research Policy Committee (IARPC) at a Town Hall meeting at the American Geophysical Union Fall Meeting in San Francisco. The Arctic Research Plan 2017-2021 (http://www.iarpccollaborations.org/news/7431) will advance Arctic research over the next five years and will be implemented in collaboration with Federal and non-Federal stakeholders through IARPC Collaborations (http://www.iarpccollaborations.org/index.html), a web platform to share knowledge, generate new ideas, and report on research progress. IARPC welcomes diverse participation in the implementation of the plan and encourages all who want to work together to solve hard challenges in the Arctic to join IARPC Collaborations.

*Coastal erosion reveals the extent of ice-rich permafrost underlying the active layer on the Arctic Coastal Plain in the Teshekpuk Lake Special Area of the National Petroleum Reserve - Alaska. Photo courtesy of Brandt Meixell, USGS.*

Created by the Arctic Research and Policy Act of 1984, IARPC is chaired by the National Science Foundation and is a subcommittee of the National Science and Technology Council in the White House Office of Science and Technology Policy. IARPC plays a crucial role in advancing scientific knowledge and understanding of the changing Arctic and its regional and global impacts. Comprising 14 Federal agencies, offices, and departments, IARPC is responsible for developing and implementing five-year Arctic Research Plans in consultation with the U.S. Arctic Research Commission, the Governor of the State of Alaska, residents of the Arctic, and the private sector.

Thanks to IARPC Collaborations and the implementation of the initial Arctic Research Plan 2013-2017, there is now an unprecedented degree of interagency communication, coordination, and collaboration that, together with numerous individuals and organizations outside of the Federal government, has advanced Arctic science. Many of the joint research successes are documented in the IARPC annual reports and the 2015 Biennial Report.

While IARPC has advanced Arctic science since implementing Arctic Research Plan 2013-2017, much remains to be done. The United States is an Arctic nation, and America's Arctic—Alaska—is at the forefront of rapid climate, environmental, and socio-economic changes that are testing the resilience and sustainability of communities and ecosystems. The changes that are occurring in the Arctic also have global consequences.

Through the Arctic Research Plan 2017-2021, IARPC will continue to address the need for fundamental research that will increase knowledge and understanding for science-informed decision- and policymaking for Alaska, the Arctic region, and planet Earth.

Consistent with U.S. Arctic Region Policy and the National Strategy for the Arctic Region (NSAR), the new plan supports U.S. policy across a range of scales, from Arctic people and communities to the global scale in order to:

1. Enhance the well-being of Arctic residents.
2. Advance stewardship of the Arctic environment.
3. Strengthen national and regional security.
4. Improve understanding of the Arctic as a component of planet Earth.

The research described in Arctic Research Plan 2017-2021 is organized into nine research goals: health and well-being; atmosphere; sea ice; marine ecosystems; glaciers, ice caps and the Greenland ice sheet; permafrost; terrestrial and freshwater ecosystems; coastal resilience; and environmental intelligence (observations, data integration, and models).

These goals are not mutually exclusive. Rather, they are connected, with scientific advances in one area supporting advances in others. The interconnectedness of the goals, and some aspects of the complexity of the Arctic system that the Plan seeks to understand, are illustrated by the dramatically changing Arctic sea ice cover. For example, the end-of-winter maximum sea ice extent in March 2016 was the lowest value since the satellite record began in 1979. The end-of-summer minimum sea ice extent in September 2016 tied with 2007 for the second lowest in the satellite record. And the ten lowest minimum sea ice extent values in the satellite record have occurred in the last ten summers (2007-2016).

As sea ice extent declines, impacts that ripple through the environmental system illustrate interconnectedness: as the Arctic sea ice cover retreats further from the coast of Alaska each summer, the area of open water and the sea surface temperature increase. Consequently, coastal communities

are becoming more vulnerable to increasing ocean surface wave heights, storm surges, inundation, and erosion accelerated by warming and thawing of coastal permafrost. These physical impacts are compounded by the social-ecological system response to the declining summer sea ice cover. For example, as the habitat of ice-associated species such as polar bears, seals, and walruses shrinks, the traditional ways of life and the well-being of coastal residents are affected.

The sea ice example above connects five goals in the Plan—health and well-being, sea ice, marine ecosystems, permafrost, and coastal community resilience and resources—and illustrates but one of many exciting opportunities for cross-cutting research into the Arctic System as Arctic Research Plan 2017-2021 is implemented.

The implementation of the Arctic Research Plan 2017-2021 will contribute to the delivery of the commitment the United States made at the first-ever Arctic Science Ministerial to collaborate with 23 foreign governments and the European Union, and with Arctic Indigenous peoples, to further advance Arctic science.

IARPC and IARPC Collaborations are meeting the need for Federal agencies to work together and with a broad range of domestic and overseas stakeholders to inform decision- and policymaking. This will be achieved through full and open access to scientific data, by enhancing scientific knowledge and understanding, and improving environmental prediction capabilities for the benefit of people, communities and ecosystems in the Arctic and elsewhere on planet Earth. To join in this effort, request an account at IARPC Collaborations (http://www.iarpccollaborations.org/index.html) and get involved.

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# Highlights of USARC Report on Goals and Objectives for Arctic Research 2017-2018

*By: Cheryl Rosa, Deputy Director, U.S. Arctic Research Commission*

The U.S. Arctic Research Commission (USARC) (https://www.arctic.gov/) released its "Report on the Goals and Objectives for Arctic Research 2017-2018 for the U.S. Arctic Research Program," (Goals Report) (https://www.arctic.gov/reports_goals.html) at the American Geophysical Union's (AGU) Fall Meeting in San Francisco in December 2016. Emphasizing the need for continued scientific research in all of its six major goals, the report includes new recommendations for these goals. In addition, the Commission also calls attention to progress made on these goals over the past two years.


*Cover of the USARC 2017-2018 Goals Report. Image courtesy of USARC.*

The Goals Report is published biennially and includes six priority research goals: 1. Observe, Understand, and Predict Arctic Environmental Change, 2. Improve Arctic Human Health, 3. Transform Arctic Energy, 4. Advance the Arctic "Built Environment," 5. Explore Arctic Cultures and Community Resilience, and 6. Enhance International Scientific Cooperation in the Arctic.

The Commission's research goals help shape the National Arctic Research Plan (http://www.iarpccollaborations.org/uploads/cms/documents /iarpc_arctic_research_plan_2017-2021.pdf), the most recent version of which, for the 2017-2021 period, was also released by the White House in December 2016. Implementation of this plan, developed by the Interagency Arctic Research Policy Committee (IARPC) that is chaired by the National Science Foundation and operates under the auspices of the National Science and Technology Council, involves teams from 15 federal agencies and from nonfederal partners, academia, non-federal organizations and the private sector. More on IARPC and the plan may be

found here (http://www.iarpccollaborations.org/index.html) and here (https://www.arcus.org/witness-the-arctic/2017/1/article/27215).

The USARC also coordinates three Alaska-based working groups (https://www.arctic.gov/working_groups.html) through the Anchorage office: the Alaska Rural Water and Sanitation Working Group (ARWSWG) (https://www.arctic.gov/water-san/index.html), the Arctic Renewable Energy Working Group (AREWG) (https://www.arctic.gov/arewg/index.html), and the Arctic Mental Health Working Group (AMHWG) (https://www.arctic.gov/amhwg/). All working groups are comprised of subject matter experts and policymakers from a variety of local, state, federal, and other groups.

The Alaska Rural Water and Sanitation Working Group (ARSWG) is in its eighth year of existence. This group is focused on health disparities related to the lack of access to in-home water and sewer services, an inequity particularly felt in remote Arctic villages. Alaska ranks last among U.S. states for the proportion of homes with running water and sewer service; approximately 22% of rural Alaskan households lack in-home water and sewer service. There is strong evidence that in-home water and sewer service is linked to better health and that installing in-home running water service reduces rates of respiratory, skin, invasive bacterial and intestinal infections, and dental disease. This research demonstrates that having in-home running water is directly linked to the improved health of rural Alaskans, especially young children and the elderly. The main goal of this working group is to maximize the health benefits of in-home water and sanitation services in rural Alaska. In 2017, we are focused on working with various groups and agencies to coordinate the creation of a database of existing water and sanitation infrastructure in rural Alaska, with particular emphasis on that which is "at-risk" from environmental change. It is our hope that this work will allow better recognition and coordination of these assets at the local, state, and federal level. We are also focused on the assessment and improvement of local capacity for both water and sewer and renewable energy projects. (Editor's note: see also, *Diagnosing Water Security in the Rural North with an Environmental Security Framework* (https://www.arcus.org/witness-the-arctic/2017/1/article/27219) in this issue of *Witness the Arctic*.)

The Arctic Renewable Energy Working Group (AREWG) promotes research on renewable and efficient energy systems in remote Arctic communities. Integration of renewable resources and supporting technologies into a community's current power generation capacity has the potential to increase local employment and decrease air pollution, carbon footprint and, ideally, cost to consumers. Pushing the boundaries of energy efficiency and conservation are critical components of

this effort. The AREWG is composed of Alaska-based energy experts familiar with the energy challenges facing remote villages. This year, the AREWG is focused on new options for home heating and electricity aimed at increasing efficiency/use of renewable energy and reducing heating oil consumption. The second in a series of three workshops was recently held to assess progress on filling research needs related to how heat is used in villages. The workshop also prioritized unmet data and research needs and developed pathways and strategies to address outstanding data gaps and research needs. This workshop report is expected in summer of 2017 and will be accessible through the AREWG webpage (https://arctic.gov/arewg/index.html).

The Arctic Mental Health Working Group (AMHWG) aims to work collaboratively with tribes, healthcare providers, and other stakeholders to promote research on, and raise awareness of, the significant mental and behavioral health disparities that exist between Arctic and non-Arctic populations. As an initial focus, AMHWG has chosen to address suicide prevention in Arctic communities with a specific emphasis on early intervention approaches for children and youth. In addition, the group is currently working on a variety of projects that raise awareness of unmet mental health provider needs in Alaska; encourage research needed to better understand and address the instability of the mental health care provider workforce; promote improved information technology infrastructure to support data integration and analysis; and support the forensic review of suicides to refine prevention strategies and provide support to communities. More information on this group can be found at the AMHWG webpage (https://arctic.gov/amhwg/).

Finally, the Commission will hold both its *107th USARC Meeting* and its *7th Symposium on the Impacts of an Ice-Diminishing Arctic on Naval and Maritime Operations* in Washington DC during the week of 17-20 July 2017. The commission meeting will take place on July 17th at the Naval Heritage Center at the US Navy Memorial, 701 Pennsylvania Ave., NW, Washington, DC. More information can be found at arctic.gov/upcoming_meetings.html. The biennial Symposium on the Impacts of an Ice-Diminishing Arctic on Naval and Maritime Operations runs from July 18-20th and focuses on naval and other maritime operations in an "ice-free Arctic". It will bring together experts on Arctic marine operations, the environment, science, policy, law, and governance. High-level opening remarks are anticipated from members of the Alaska Congressional Delegation, NOAA, Navy, U.S. Coast Guard, USARC, industry, and other representatives from the U.S., Arctic nations, and international community. More information can be found here (https://www.star.nesdis.noaa.gov/Ice2017/).

# Board on Atmospheric Sciences and Climate (BASC) Reviews Draft Climate Science Special Report

*By: April M. Melvin, Associate Program Officer, Polar Research Board, Board on Atmospheric Sciences and Climate*

In March 2017, the Board on Atmospheric Sciences and Climate (BASC) (http://dels.nas.edu/basc) of the U.S. National Academies of Science, Engineering, and Medicine (http://www.nationalacademies.org/) released the Review of the Draft Climate Science Special Report (https://www.nap.edu/catalog/24712/review-of-the-draft-climate-science-special-report). This report was conducted at the request of the U.S. Global Change Research Program (USGCRP) (http://www.globalchange.gov/) and as the report name indicates, provides a review of the draft Climate Science Special Report (CSSR). The draft CSSR is a technical document intended to provide an updated, detailed analysis of how climate is changing across the U.S. and to serve as a technical input to the Fourth National Climate Assessment. The draft CSSR contains a chapter dedicated to "Arctic changes and their effects on Alaska and the rest of the United States." The review committee's task was to evaluate the accuracy and comprehensiveness of the included scientific literature, the treatment of data, analyses, and statistical approaches, and the effectiveness of the report in conveying information in a transparent and traceable way for the intended audience.

The review committee concluded that the draft CSSR is timely, accurate, and well-written, representing the breadth of available literature relating to the current state of climate science. The committee found the draft CSSR to also be new and significant in several ways, including particular focus on how the climate system affects the United States and discussion of significant recent advancements in the science of climate change, such as the rapid development of the field of extreme event attribution and new research on Antarctic ice sheet melt and projected sea level rise. Synthesis of recent manifestations of continued climate change observed since the publication of the last

Intergovernmental Panel on Climate Change (IPCC) report in 2013, including continued decline in Arctic sea ice, among others, was also noted.

To strengthen the impact of the draft CSSR, the study committee recommended the CSSR authors increase the distinction between recent advancements in the science and long-understood aspects of the climate system, add quantitative statements to the key findings, and expand the discussion of specific topic areas to more fully reflect the literature. Standardization of the time periods used for the present and historical baseline, wherever possible, and inclusion of significance statements and/or ranges in values where appropriate, was also recommended. For the Arctic-focused chapter, the committee found that the draft CSSR provides a sound foundation. Specific recommendations included greater articulation of the science relating to carbon release from permafrost and expanded discussion of the linkages between Arctic change and mid-latitude weather that better reflects the breadth of current research on this topic, among other suggestions.

Overall, the committee found the draft CSSR, by building on previous solid work and incorporating recent advances, provides a valuable update. The CSSR is currently being revised by the author team and is expected to be released in final form later this year.

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# Suicide Prevention Among Arctic Indigenous Communities

*By: Roberto A. Delgado, Health Science Administrator and Program Officer, Office for Research on Disparities and Global Mental Health, National Institute of Mental Health and National Institutes of Health*

*Sunrise over Anchorage; Photo by Beverly Pringle*

Under the 2015–2017 U.S. Arctic Council Chairmanship, the Reducing the Incidence of Suicide in Indigenous Groups – Strengths United through Networks (RISING SUN) (https://www.nimh.nih.gov/about/organization/gmh/risingsun/index.shtml) initiative used a community-based and consensus-building process to identify common outcomes and their measures for evaluating suicide prevention efforts across the circumpolar North. Specifically, RISING SUN was designed to develop a web-based toolkit comprising the key correlates associated with successful suicide prevention interventions across Arctic states. The toolkit will include:

- Information on the determinants of suicide across the Arctic.
- A general introduction to suicide prevention efforts in circumpolar indigenous communities.
- Information about what can be done to alleviate this public health threat and lessons learned from communities that have successfully implemented effective suicide prevention interventions.
- A collection of prioritized outcomes and measures to assess the impact and effectiveness of suicide prevention interventions being implemented across the circumpolar Arctic.
- A strategy with best practices for using the toolkit.

RISING SUN employed diverse approaches, including an adaptation of the consensus-building technique known as Delphi (https://www.ncbi.nlm.nih.gov/pubmed/11403587). Following selection of a Scientific Advisory Group, RISING SUN recruited and selected members for a Delphi panel—from the eight Arctic States (http://arctic-council.org/index.php/en/about-us/member-states)

*Evon Peter, Vice Chancellor for Rural, Community and Native Education at UAF, leading a drum dance; UAF Photo by Todd Paris*

and five of the six Permanent Participants (http://arctic-council.org/index.php/en/about-us/permanent-participants) of the Arctic Council (http://arctic-council.org/index.php/en)—to represent the diverse advocacy, clinical, indigenous, policy, and research groups, as well as communities whose interests are covered within the initiative's scope of suicide prevention among Arctic indigenous groups.

A process was added to incorporate the viewpoints of key local stakeholders through face-to-face meetings across circumpolar regions. In addition, to achieve a shared vision and inclusive priority-setting, the RISING SUN initiative held a series of regional meetings in September 2015 (Anchorage, USA), May 2016 (Tromsø, Norway), and March 2017 (Iqaluit, Canada). Collectively, participants at these meetings reviewed the international community's understanding of suicide. Participants also learned about and assessed various local activities over the past five years pertaining to evidence gathering and intervention strategies. During the final meeting, project co-leads reported on the findings from RISING SUN including:

- The outcomes from the Delphi process.
- A discussion of methodological approaches.
- The form and function of the proposed RISING SUN toolkit.
- The knowledge gaps that remain.
- Future opportunities for dissemination, implementation, and research.

Overall, the findings from the Delphi process revealed that panelists identified and prioritized outcomes resulting from family- and community-level interventions. To supplement information collected through the Delphi process, several regional focus group discussions were convened. These

focus groups were designed to ensure that additional community and indigenous participants (who did not otherwise attend the workshops or participate in the Delphi) could provide input and feedback to the RISING SUN initiative. These activities included interviews conducted with indigenous leaders, elders, youth, and other stakeholders. The purpose was to evaluate what local assets are already in place and that lead to the outcome of healthy communities, and to prioritize the outcomes identified through the Delphi process. In a qualitative analysis of the interviews, one emergent theme arose acknowledging the wide variety of relationships that are held sacred and kept in balance when it comes to the health and wellbeing of indigenous communities.

Common outcomes and their measures, developed through engagement with Arctic Council Permanent Participants and community leaders and mental health experts, will facilitate data sharing, assessments, and interpretation of research findings across service systems in the Arctic region. The principal goal was to generate shared knowledge to aid health and community workers in better serving their communities, and to help policy-makers measure progress, evaluate interventions, and identify regional and cultural approaches to implementation. Arriving at common outcomes, their measures, and reporting systems is important in the Arctic. The vast geography, high number of remote communities, and breadth of cultural diversity pose challenges for systematic and evidence-based approaches to suicide prevention and the delivery of mental health care services in the Arctic.

In the United States, the National Institute of Mental Health (NIMH) (https://www.nimh.nih.gov/index.shtml) is committed to furthering research focused on reducing the burden of suicide and promoting resilience among indigenous youth. Specifically, through cooperative agreements (e.g., RFA MH-17-350 (https://grants.nih.gov/grants/guide/rfa-files/RFA-MH-17-350.html)), NIMH aims to provide funding to establish and support regional collaborative hubs whose research teams will (a) conduct preventive interventions research, including strengths-based/resilience-focused approaches, with the goal of reducing suicide in indigenous youth, and (b) conduct outreach and dissemination activities to promote community engagement in research activities and enable community decision-makers to use science-based information to develop and assess mental health policies and programs.

More information on RISING SUN is available here (https://www.nimh.nih.gov/about/organization/gmh/risingsun/index.shtml).

# Report from ARCUS – Help Us to Support You by Connecting Arctic Research

*By: Robert H. Rich, Ph.D., CAE*

Since the last issue of Witness the Arctic (https://www.arcus.org/witness-the-arctic/2016/3/article/26064), Arctic research has seen much change. There were the changes in sea ice, changes in glaciers and the Greenland Ice Sheet, and changes in permafrost. There were also changes in the policy context for Arctic research, with a new U.S. Administration, new leadership, and new priorities. During this time, ARCUS has been both actively making a difference in supporting Arctic research and planning to be even more supportive in the months and years to come.

There are many highlights from our activities to report. I'm particularly excited about the new class of PolarTREC (https://www.polartrec.com/) educators, who I had a chance to meet at their orientation in January. I'm confident that they will accomplish great things during their research experiences and after their return home. Previous generations of PolarTREC alumni have become true educational leaders in their communities. In 2016 alone, three of them won the Presidential Award for Excellence in Science & Mathematics Teaching and were invited to the White House.

We were pleased to initiate the first issue of Witness Community Highlights (https://www.arcus.org/witness-the-arctic/community-highlights), a companion to Witness the Arctic, providing monthly updates of timely and important developments. We're always looking for items to share in Witness the Arctic and Witness Community Highlights, so please let editor Betsy Turner-Bogren know if you have something of wide interest to share with the Arctic community.

Internationally, ARCUS signed a memorandum of understanding with the Association of Polar Early Career Scientists (APECS) (http://www.apecs.is/) and with the Arctic Institute of North America (AINA) (http://arctic.ucalgary.ca/), and I've been invited to senior advisory roles within those organizations. Since we are all about connecting, we're excited by the possibilities of what we can do together with those groups and with all of our other partners. At Arctic Science Summit Week

(ASSW) (http://www.assw2017.eu/) in Prague, we organized a panel on Multiple Knowledge Systems for Arctic Understanding, which I facilitated on behalf of an international organizing committee. At that meeting, I also gave a presentation about ARCUS approaches and lessons learned as we've developed excellence in Arctic research project management, and spoke about career development at an APECS panel. One-on-one and in small groups, we made a lot of progress there in connecting U.S. researchers to the broader international Arctic research community. More information about ARCUS activities during ASSW is available here (https://www.arcus.org/meetings/2017/assw).

Our Arctic Research Webinar/Seminar Series in Washington, DC has grown in popularity and maintained an excellent lineup of speakers. In November, the University of Alaska Fairbanks' Hajo Eicken spoke about his Arctic sea ice studies. In January, Alaska Arctic Policy leader Craig Fleener presented the state's Arctic research priorities. Complementing that, U.S. Arctic Research Commission's John Farrell presented an update on Federal-level plans and science policy in February. In March, we explored Arctic shipping and related issues with Heather Conley from the Center for Strategic and International Studies. Stephen Fiore provided insights on the science of collaborative team science, a field which he has helped to pioneer at the University of Central Florida, and which ARCUS puts into practice every day. Leading Arctic blogger Mia Bennett spoke in April about infrastructure and the impacts of development in the region. Finally, Robert Corell shared his perspective in May on why the Arctic matters and how it affects us all. All of the seminars are archived and freely available here (https://www.arcus.org/research-seminar-series/archive). You can register for upcoming webinars here (https://www.arcus.org/research-seminar-series).

Building upon the success of this seminar series, a new initiative to be launched in 2017 will bring leading Arctic Indigenous Scholars to Washington, DC for a seminar presentation and a series of meetings to help them to connect with the research administration and resource management communities. If you are, or if you know someone who is, an accomplished Indigenous contributor to Arctic knowledge, I encourage you to apply when the announcement is released.

ARCUS is also completing our Strategic Plan for 2017 and Beyond. This blueprint prepared by our Board and staff, informed by member and community feedback, sets a bold vision for maximizing the progress we make on the four ARCUS goals: Clear Identity, Organizational Strength, Fiscal Stability, and Impact. All of this, in turn, supports the overall purpose of ARCUS to connect Arctic research across boundaries through communication, coordination, and collaboration. If you have ideas for activities or priorities that ARCUS should pursue, I'd love to hear from you at

bob@arcus.org.

As a part of the Arctic research community, you and all of your colleagues are invited to become ARCUS members. We are a member-driven organization, and our Board is elected by the members. All types of organizations and individuals are eligible to become ARCUS members. If you are reading this and share our passion for Arctic research across boundaries, we invite you to become a member. ARCUS membership information is available here (https://www.arcus.org/arcus/member-information). ARCUS membership allows you not only a voice in leadership but the opportunity to be among the first to know about our various activities. We look forward to hearing from you, getting to know you, and helping you to connect across boundaries.

## Welcome New ARCUS Members (Since November 2016)

Rutgers, The State University of New Jersey
Norwegian Polar Institute
University of Northern British Columbia

Plus 43 new individual members!

ARCUS Membership Information (https://www.arcus.org/arcus/member-information)

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# A Note from the ARCUS President

## Arctic Facts, Thoughts, and Movement Forward

The Arctic encompasses far more than the assumption that the Arctic is everything north of the Arctic Circle (66˚ 30' N Latitude). In fact, there are many other definitions of the Arctic. Some prefer to define the Arctic as those areas where the average July temperature is 10 ˚C or less, or the presence of continuous permafrost as opposed to the discontinuous permafrost found in the sub-Arctic, or even those areas lying north of the tree line. Yet another definition, specific to the United States, is found in the Arctic Research and Policy Act of 1984 (https://www.nsf.gov/geo/opp/arctic/iarpc/arc_res_pol_act.jsp), as amended: the U.S. Arctic includes all the U.S. territory north and west of the boundary formed by the Porcupine, Yukon and Kuskokwim Rivers; all contiguous seas, including the Arctic Ocean and the Beaufort, Bering and Chukchi Seas; and the Aleutian chain (the Aleutian change boundary is demarcated by the "Contiguous zone" limit of 24-nautical miles). Whichever definition one uses, the Arctic is BIG, roughly twice the size of Australia. (Maps of the Arctic are available here (https://www.arctic.gov/maps.html).)

When the first maps of the world were sketched, those regions of the far North were marked with signs of shipwrecked seas, monsters, and bottomless chasms. For several centuries, the far North remained a place of extreme unknown. In the 19th century, the quest for a Northwest Passage became an obsession for Britain, as did the North Pole itself for the United States and other nations later in the century. Then in 1882-83 Adolphus Washington Greely was appointed to lead the United States' contribution to the First International Polar Year. The purpose of Greely's expedition was to establish a series of research stations (along with other nations) to monitor polar conditions. Finally, the quest for knowledge and understanding of the Arctic began in earnest.

Today, for many, the Arctic is a cold, distant place that is captured in photographs and movies as beautiful, remote, and having an abundance of wildlife, but far from their everyday lives. But the scientific quest to gain a better understanding of the Arctic, its Peoples, and the rapid changes taking place in its ice, seas, water, coasts, and terrestrial environments is more important than ever. The increased knowledge of the Arctic gained through research and monitoring is helping us understand the influence the Arctic has on lower latitudes and offers insights in how we must adapt to the challenges compounded by environmental, social, and economic changes.

Researchers questing for more knowledge in the Arctic have always faced competition for limited resources, challenges to scientific integrity, and questions as to why more research is needed. At the same time, extractive, global transportation, and tourism industries are exploring new frontiers. Looking to potentially save hundreds of millions of dollars by shipping across the Arctic instead of the Panama Canal or around South America, companies are navigating the northern passage in the Russian Republic Arctic Ocean, or through the Northwest Passage through Canada, to get to Asia or the west coast of North America with their trade. Multi-national oil and gas companies are expanding their exploration in Arctic waters and on the land. Warning signs of extreme changes in the environment include rising sea levels, more frequent and intense weather in the Arctic, melting permafrost releasing increased levels of methane gas, decreased water availability, and migration of non-indigenous species of fish, wildlife, vegetation and insects as the environment becomes more favorable to their niche. Add pressures of increased tourism, the possible decline of the Native cultures and their lifestyles, and we face serious emotional, political, and financial conflict in the north.

Are we prepared both fiscally and physically for these changes? Partnerships, coalitions, and initiatives now exist that are helping decision and policy makers to utilize new tools (or sometimes refreshing old tools) when planning their mandated activities in the Arctic. We have a very real opportunity to look across the Arctic and share knowledge from other nations. Using the experience of others, and of our own Arctic stakeholders, we can achieve a comprehensive vision of a future Arctic through an integrated process that has broad goals instead of the more traditional single focus. ARCUS supports increased understanding of a changing Arctic by helping to build those strong relationships between diverse stakeholders and disciplines—from researchers to the public, from decision and policy makers to industry. The Arctic is a fascinating and important region, and its importance spans the entire globe. The United States is an Arctic nation; Alaskans are particularly vested because without Alaska the United States would not be an Arctic nation. But the Arctic's

reach extends far beyond those of us who live here. Sea ice and glaciers, oil and mineral exploration and development, and the vast ecosystems housed by the Arctic's land and marine spaces all have important implications for the rest of America and the world at large.

Here at ARCUS, we play a neutral, science-based role. We do not advocate for specific policy implementations or play favorites regarding what research or scientific issues get our focus. We rely solely on grants, membership dues, and donations to implement our programs. Now, more than ever before, all of us need to support Arctic research. As President of the Board of Directors for ARCUS, I want to convey my sincere thanks for your support of our programs and efforts to increase our understanding of our Arctic. More information on ARCUS, including how you can join our community or provide support to us, is available through our website (http://www.arcus.org/).

John F. Payne, Ph.D.
President

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# Meet Audrey Taylor

Audrey Taylor serves as the Treasurer for ARCUS. She is also the Chair of the Education Committee and a member of the Membership Committee. She joined the Board of Directors in 2014 and her term ends in 2017.

In her "real" job, Audrey is an Assistant Professor of Environmental Studies at the University of Alaska Anchorage (https://www.uaa.alaska.edu/academics/college-of-arts-and-sciences/departments/geography-and-environmental-studies/). She was trained as an Arctic avian ecologist and earned a PhD from the University of Alaska Fairbanks, but her current projects include a variety of species and habitats. She has graduate students studying nesting loon responses to human disturbance on Alaska's North Slope, the effects of a water temperature and invasive macrophyte gradient on waterbird distributions on the Copper River Delta, and how wetland and landscape-scale habitat features influence distribution of boreal wetland birds in southcentral Alaska. She also maintains a long-standing citizen science project observing declining boreal bird species in Anchorage, and a tree swallow monitoring project that is part of the Alaska Swallow Monitoring Network (http://aksongbird.org/alaska-swallow-monitoring-network/) on Joint Base Elmendorf Richardson (http://www.jber.jb.mil/).

Audrey was originally drawn to working in the Arctic through her interest in shorebirds, which breed in vast numbers on the tundra of northern Alaska. Over time she has recognized the need for a greater understanding of the complex linkages between manifestations of physical climate change and the biological responses that affect wildlife populations and the humans that depend on them.

These multi-trophic level interactions can only be deciphered through an integrated, cross-disciplinary Arctic research program, such as that sought by ARCUS and its member institutions. In addition, Audrey would like to see greater utilization of citizen science and community-based monitoring programs in the Arctic, especially in Arctic tourism settings, to foster information-gathering capability in remote areas as well as the integration of multiple knowledge systems, such as traditional and Indigenous knowledge and Western science, for example.

From Audrey's perspective, being on the ARCUS Board has been a tremendously positive experience because ARCUS plays a unique role in advancing a vision for collaborative, interdisciplinary Arctic research and outreach. By bringing disparate individuals and institutions together and providing a venue for disseminating knowledge of all types, ARCUS has been instrumental in promoting the development of truly integrated Arctic research and education programs. In particular, Audrey looks forward to seeing the Education Committee develop its goals for encouraging citizen science and community-based monitoring efforts in the near-term by co-hosting a session on Polar Tourism and Citizen Science at the upcoming POLAR2018 (http://www.polar2018.org/) conference in Switzerland next June.

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# Meet Olivia Lee

Olivia Lee is an Assistant Professor in the International Arctic Research Center (IARC) (https://web.iarc.uaf.edu/) at the University of Alaska Fairbanks. Her research focuses on the integration of community observations and remote sensing imagery of sea ice to assess walrus and ice seal habitat in northern Alaska. She also works on participatory scenarios projects that aim to broaden our understanding of the socio-economic and biophysical drivers affecting the future of the Arctic. As the science lead for the Alaska Arctic Observatory and Knowledge Hub (https://arctic-aok.org/), she is working to build a coastal observing program that takes into account the interests of coastal communities in Arctic Alaska.

Olivia's involvement in Arctic research has primarily involved cross-disciplinary collaborations. As a co-lead for the Interagency Arctic Research Policy Committee (IARPC) Sea Ice Collaboration Team (http://www.iarpccollaborations.org/teams/Sea-Ice) and a council member of the Association of Polar Early Career Scientists (APECS) (http://www.apecs.is/), she helps to promote greater collaborations to improve understanding and predictions of sea ice change, while supporting opportunities for greater engagement by early career researchers. She sees science communication as an important part of research, and encourages better communication about the importance of Arctic research at national and international levels. One important collaborative opportunity is the development of an Arctic Observing System, which is key to monitoring Arctic change, and would help provide a better system-level understanding of the connection between the Arctic and lower latitudes.

Olivia has served on the ARCUS Board of Directors since 2015. She sees ARCUS as invaluable for helping the Arctic research community coordinate activities to tackle broad system-level issues, such as an Arctic Observing System, and also regionally-relevant issues, through programs such as the Sea Ice for Walrus Outlook (https://www.arcus.org/witness-the-arctic/2017/1/article/27220). ARCUS provides the infrastructure to access reports and information that keeps the state of knowledge up-to-date, and helps to ensure longevity and forward progress on issues. ARCUS has also supported

communication and outreach of Arctic research through programs such as PolarTREC (https://www.polartrec.com/) that help to make Arctic science more accessible to students and teachers. Olivia believes supporters of Arctic science can help support a broad range of issues by becoming ARCUS members (https://www.arcus.org/arcus/member-information).

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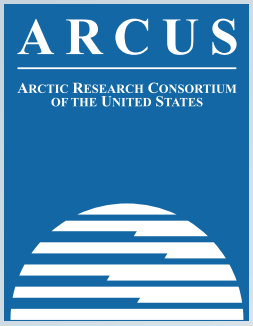


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