



Implementation Plan 2025-2026

for the

Arctic Research Plan 2022-2026

Prepared by the

Interagency Arctic Research Policy Committee

of the

National Science and Technology Council

December 2024, amended June 2025

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The National Science and Technology Council (NSTC) is the principal means by which the Executive Branch coordinates science and technology policy across the diverse entities that make up the federal research and development enterprise. A primary objective of the NSTC is to ensure science and technology policy decisions and programs are consistent with the President's stated goals. The NSTC prepares research and development strategies that are coordinated across federal agencies aimed at accomplishing multiple national goals. The work of the NSTC is organized under committees that oversee subcommittees and working groups focused on different aspects of science and technology. More information is available at www.whitehouse.gov/ostp/nstc.

About the Interagency Arctic Research Policy Committee

The Arctic Research and Policy Act of 1984 (ARPA), Public Law 98-373, July 31, 1984, as amended, provides for a comprehensive national policy dealing with national research needs and objectives in the Arctic. ARPA establishes an Arctic Research Commission (USARC) and an Interagency Arctic Research Policy Committee (IARPC) to help implement the Act. A Presidential Memorandum issued in 2010 made the NSTC responsible for IARPC.

About This Document

This report represents the updated Implementation Plan for 2025 and 2026 under the 2022-2026 Arctic Research Plan. Originally published in December 2024, it was developed by IARPC and is published by OSTP.

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Acronyms and Abbreviations Used in This Document

ARPA	Arctic Research and Policy Act of 1984
CARE	Collective benefit, authority to control, responsibility, ethics
DATA	Data Management Foundational Activity
DHS	Department of Homeland Security
DHS-CBP-USBPDHS	U.S. Border Control - Customs and Border Protection
DHS-CISA	DHS Cybersecurity and Infrastructure Security Agency
DHS-FEMA	DHS Federal Emergency Management Agency
DHS-USCG	DHS United States Coast Guard
DOC	Department of Commerce
DOC-EDA	DOC Economic Development Administration
DOC-NOAA	DOC National Oceanic and Atmospheric Administration
DOC-NOAA/NCCOS	DOC NOAA National Centers for Coastal Ocean Science
DOC-NOAA/NMFS	DOC NOAA National Marine Fisheries Service
DOC-NOAA/OAR	DOC NOAA Office of Oceanic and Atmospheric Research
DOD	Department of Defense
DOD-ONR	DOD Office of Naval Research
DOD-Ted Stevens	DOD Ted Stevens Center for Arctic Security Studies
DOD-USACE	DOD United States Army Corps of Engineers
DOE	Department of Energy
DOE-SC	DOE Office of Science
DOI	Department of the Interior
DOI-BIA	DOI Bureau of Indian Affairs
DOI-BLM	DOI Bureau of Land Management
DOI-BOEM	DOI Bureau of Ocean Energy Management
DOI-BSEE	DOI Bureau of Safety and Environmental Enforcement
DOI-FWS	DOI Fish and Wildlife Service
DOI-NPS	DOI National Park Service
DOI-USGS	DOI United States Geological Survey

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DOT	Department of Transportation
EDU	Education and Training Foundational Activity
EPA	Environmental Protection Agency
FAIR	Findable, accessible, interoperable, and reusable
HEALTH	Community Resilience and Health Priority Area
HHS	Department of Health and Human Services
HHS-CDC	HHS Centers for Disease Control and Prevention
HHS-FDA	HHS Food and Drug Administration
HHS-FDA/CFSAN	HHS FDA Center for Food Safety and Applied Nutrition
HHS-FDA/CFSAN/OFS	HHS FDA CFSAN Office of Food Safety
HHS-NIH	HHS National Institutes of Health
HHS-NIH/NIEHS	HHS NIH National Institute of Environmental Health Sciences
HUD	Department of Housing and Urban Development
IARPC	Interagency Arctic Research Policy Committee
LIVELIHOODS	Sustainable Economies and Livelihoods Priority Area
MMC	Marine Mammal Commission
MOMP	Monitoring, Observing, Modeling, and Prediction Foundational Activity
NASA	National Aeronautics and Space Administration
NSF	National Science Foundation
NSTC	National Science and Technology Council
OSTP	White House Office of Science and Technology Policy
PFAS	Perfluoroalkyl and polyfluoroalkyl substances
RISK	Risk Management and Hazard Mitigation Priority Area
SAON	Sustaining Arctic Observing Networks
SI	Smithsonian Institute
STEM	Science, technology, engineering, and math
SYSTEMS	Arctic Systems Interactions Priority Area
TCEP	Tribal Consultation Effective Processes
TECH	Technology Innovation and Application Foundational Activity

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US AON	United States Arctic Observing Network
USARC	United States Arctic Research Commission
USDA	United States Department of Agriculture
USDA-NRCS	USDA Natural Resources Conservation Service
USDA-RD	USDA Rural Development
USDA-USFS	USDA United States Forest Service

Current IARPC Collaboration Teams and Communities of Practice¹

Priority Area Collaboration Teams

Arctic Systems Interactions

Community Resilience and Health

Risk Management and Hazard Mitigation

Sustainable Economies and Livelihoods

Foundational Activity Collaboration Teams

Data Management

Education and Training²

Monitoring, Observing, Modeling, and Prediction

Technology Innovation and Application

Tribal Consultation and Effective Processes³

Communities of Practice Supporting This Implementation Plan

Coastal Resilience

Cold/High Anaerobic Digestion

Early Career

Field Operations

Marine Ecosystems

Modelers

Observations

Permafrost

Physical Oceanography

Sea Ice

Terrestrial Ecosystems

¹This list reflects IARPC Communities of Practice as of February 2025. The current list of teams is available on the IARPC Collaborations website (<https://www.iarpccollaborations.org/teams/index.html>).

² Based on feedback received during the development of the Implementation Plan 2025-2026, the Education, Training, and Capacity Building Foundational Activity title has been changed to Education and Training. Removing “Capacity Building” reflects the strong capacity that exists within communities across the Arctic and refocuses efforts to training researchers.

³ The Tribal Consultation and Effective Processes Foundational Area replaces the Participatory Research and Indigenous Leadership in Research Foundational Area in this update.

Glossary of Plan Structural Terms

Implementation Plan: Document developed every two years that outlines specific objectives and deliverables that will be completed in the subsequent two years.

Convergence Research: Investigations driven by a specific and compelling problem that requires deep integration across disciplines.

Deliverable: Tangible, measurable, and easily communicated research product that demonstrates progress made toward satisfying the objectives and goals and is made available to relevant decision-makers and partners. Deliverables may also include achievements resulting from the establishment of new relationships.

Foundational Activity: Activity that relates to, supports, and informs the priority areas. Foundational activities are critical to improving research and better addressing each of the priority areas.

Goal: Intended convergent research outcome that is realized from federal investment and non-federal partner efforts.

Lead Agency/Agencies: The federal agency or agencies responsible for leading priority areas.

Objective: Specific research action that advances the goals.

Policy Driver: Underlying U.S. Arctic and research policy that guides the development of the plan.

Priority Area: Broad cross-cutting theme that needs additional research, supports one or more policy drivers, meets the mission and interests of more than one federal agency, and engages multiple existing communities of practice and non-federal partners.

Preface

In December 2021, the White House Office of Science and Technology Policy released the Interagency Arctic Research Policy Committee (IARPC)'s Arctic Research Plan 2022–2026. The Arctic Research Plan is a high-level research strategy to address emerging research questions about the dynamic, changing Arctic, presenting a research framework with thematic goals and outlining a vision for federal agencies. Beyond this is identifies pathways to strengthen relationships between federal agencies and Arctic communities, academia, non-federal researchers, the state of Alaska, Indian Tribes⁴, nonprofits, the private sector (including Alaska Native Corporations), and international organizations.

In order for IARPC to respond more swiftly to emerging and immediate needs, while continuing to support U.S. Arctic policy, the Arctic Research Plan is advanced through implementation plans that are updated every two years. This new implementation plan is focused on 2025 and 2026. It includes objectives, which are specific research actions, as well as deliverables, which are tangible, measurable, and easily communicated actions and research products. Many of the objectives and deliverables identify interconnected and cross-cutting research and illustrate areas where it is critical for informing management and decision-making. For example, many focus on research around infrastructure and food security, themes that thread throughout its priority areas and foundational activities.

This Implementation Plan 2025-2026 provides specific actions that IARPC and its member agencies will take to pursue research aimed at improving community resilience and well-being, advancing scientific understanding of ongoing changes in the Arctic system, creating more sustainable economies and livelihoods, and improving risk management and hazard mitigation. Results of these concerted efforts will yield greater predictive capabilities and improved capacity for more informed decisions and adaptation to other pressing environmental and societal changes. Deliverables outlined in this plan are subject to the availability of federal funds and agency staff capacity.

The Arctic Research Plan 2022-2026

The Arctic Research Plan adheres to four critical policy drivers in U.S. Arctic research policy that reflect long-standing and ongoing U.S. interests in the Arctic and the collective priorities of IARPC federal agencies: Well-Being, Stewardship, Security, and Arctic-Global Systems. The plan includes four priority areas with thematic goals that (1) represent broad, cross-cutting themes that need additional research; (2) support one or more policy drivers; (3) meet the mission and interests of more than one federal agency; and (4) engage multiple existing communities of practice and non-federal partners. Priority areas and goals are:

- **Arctic Systems Interactions:** Enhance the ability to observe, understand, predict, and project the Arctic's dynamic interconnected systems and their links to the Earth system.
- **Community Resilience and Health:** Improve community resilience and well-being by strengthening research and developing tools to increase understanding of interdependent social, natural, and built systems in the Arctic.

⁴ Tribes are classified as political entities because of their longstanding history as sovereign nations that existed before the United States was formed. The U.S. Supreme Court has consistently recognized Congress's special obligations toward Tribes, underscoring that tribal classifications are political rather than racial. The federal government has entered into agreements which established a unique trust responsibility with Indian Tribes, which include federally-recognized tribes in Alaska as well as Alaska Native Corporations, Alaska Native Organizations, and Alaska Native Villages. Relevant authorities are listed at <https://www.fws.gov/policy-library/e3510fw1>.

- **Risk Management and Hazard Mitigation:** Secure and improve quality of life through research that promotes an understanding of disaster risk exposure, sensitivity to hazard, and adaptive capacity.
- **Sustainable Economies and Livelihoods:** Observe and understand the Arctic's natural, social, and built systems to promote sustainable economies and livelihoods.

In addition to identifying four priority areas, the Arctic Research Plan 2022-2026 builds upon five foundational activities. These activities are critical to achieving the priority area goals and are likely to remain foundational to Arctic research beyond the five-year duration of the Arctic Research Plan. Foundational activities are: Data Management; Education and Training; Monitoring, Observing, Modeling, and Prediction; Technology Innovation and Application; and Tribal Consultation and Effective Processes.

Overarching Principles

Progress in Arctic research will remain incomplete without training researchers and others in respectful and meaningful engagement with the communities that live in the Arctic. This includes listening to communities about how and when federal investments should be made, and celebrating with and learning from communities when progress is made.

Throughout the development of the Arctic Research Plan 2022-2026 and its implementation plans, IARPC has been guided by the following overarching principles:

1. **Sustained Engagement:** Advance respectful, responsive, and continuous engagement with Tribal organizations, Arctic communities, federal agencies, the state of Alaska, and non-federal partners.
2. **Fairness:** Ensure that everyone is treated fairly and respectfully, and promote access by all to the tools needed to succeed.
3. **Transparency:** Commit to activities and decisions that are transparent and communicated clearly and in accessible formats.

These principles are woven through the work of all Arctic Research Plan objectives and will continue to guide all implementation activities.

Implementation Approach

IARPC's work under the Implementation Plan 2025-2026 will be carried out by IARPC priority area collaboration teams, foundational activity collaboration teams, and communities of practice. These are all open to anyone wishing to advance knowledge about the Arctic. Teams may include members from federal, state, academic, nonprofit, private sector, Tribal, community, and international organizations. IARPC collaboration teams direct and coordinate activities to reach the plan goals, ensure coordination and collaboration across agencies, and engage non-federal partners. These multi-disciplinary teams are co-led by at least two federal program managers and one non-federal partner and draw on federal agency and community of practice expertise to achieve their goals. As noted in the tables starting on page 13, agency leadership for some deliverables is pending, as of this May 2025 update. The status of deliverables will be updated as needed on the IARPC Collaborations website (<https://www.iarpccollaborations.org/>).

The IARPC Collaborations website is a critical component of IARPC and serves as a hub for building connections and facilitating research among federal government program managers and scientists,

the non-federal research community, Arctic communities, and other collaborators to accelerate the pace of Arctic research and achieve priority area goals. IARPC Collaborations is used to facilitate implementation of the Arctic Research Plan and its periodic implementation plans. It supports the work of the collaboration teams and communities of practice, and provides a tool to track progress toward the plan deliverables.

Implementation Plan Reporting

Progress on objectives and deliverables will be continuously tracked using the IARPC Collaborations website. Any organization or individual that is a member of IARPC Collaborations may report actions towards a deliverable.

In the fall of 2026, team leads will develop statements summarizing the impacts of the research conducted and how it ties to the goals of the Arctic Research Plan. Impact statements will be used to produce a public report to Congress. This and future reports to Congress will help the public, research, and policy communities understand the progress, obstacles, and pathways toward achievement of goals in implementation plans. They will also demonstrate connections and responsiveness to the U.S. Arctic Research Commission's Biennial Goals Report.

Conclusion

The IARPC implementation plans build from the strong collaboration teams and communities of practice formed around disciplinary and multidisciplinary research areas. As implementation proceeds, and as future Arctic research plans are developed, these communities of practice will become increasingly integrated in order to best respond to the complex, dynamic, and interconnected changes occurring in the Arctic.

IARPC recognizes the importance of working with entities across all sectors to achieve the goals of the Arctic Research Plan and the implementation plan objectives and deliverables. While the Arctic Research Plan and this implementation plan are developed to help guide federal research investments and collaboration, non-federal entities also play critical roles in Arctic research. Over the next two years, IARPC aims to build and strengthen relationships and to incorporate non-federal partners into research collaboration teams as leaders and participants.

Priority Area Objectives and Deliverables

NOTE

Achievement of all deliverables is contingent on Federal funding and agency staff capacity in Fiscal Years 2025 and 2026.

For some deliverables (shown in grey), agency leadership and participation is pending as of May 2025. Updated status for all deliverables can be found at <http://www.iarpcollaborations.org>.



Photo: Art Howard/DOD

Arctic Systems Interactions (SYSTEMS)

Goal: Enhance the ability to observe, understand, predict, and project the Arctic's dynamic interconnected systems and their links to the Earth system.

SYSTEMS Objective 1: Advance understanding of Arctic amplification and the associated connections with lower latitudes.

Arctic amplification is the accelerated warming of the Arctic compared to the rest of the Earth. It is the result of feedbacks and interactions within the Arctic system and interactions between the Arctic and lower latitudes. Work under this objective will focus on increasing understanding of Arctic amplification, including processes that contribute to it (e.g., sea ice albedo feedback), the interactions between changes in the Arctic and lower latitude weather and climate (e.g., transport of heat, moisture, salinity, and pollutants), and changes in the Arctic that are a result of this amplification (e.g., changes in extreme events in the Arctic). This objective will enhance understanding of Arctic systems interactions by emphasizing connections among atmospheric, oceanic, and cryospheric components of the Arctic system with the use of appropriate models, observations, and data. Changes in the Arctic that are of direct relevance to natural hazards influencing communities and the commercial sector will be considered.

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Deliverable	Collaborating Agencies	Contributing Collaboration Teams and Communities of Practice
SYSTEMS 1.1 Provide funding opportunities for investigator-driven modeling and observational studies that focus on the following aspects of Arctic amplification: (1) ice-albedo feedback; (2) impacts of atmospheric and oceanic circulation on Arctic amplification; and/or (3) transport of heat, moisture, and pollutants between Arctic and lower latitudes. Share knowledge and synthesize results arising from these studies.	NSF (lead); DOC-NOAA; DOD-ONR; NASA	Modelers; Monitoring, Observing, Modeling, and Prediction; Observations; Physical Oceanography; Sea Ice
SYSTEMS 1.2 Hold workshops and webinars and produce publications to encourage interagency research coordination on Arctic amplification and to share results.	Lead Agency Pending DOC-NOAA; NASA; NSF	Modelers; Monitoring, Observing, Modeling, and Prediction; Observations; Sea Ice
SYSTEMS 1.3 Provide opportunities to support and coordinate research to enhance the understanding of connections between Arctic and global ocean circulation with a particular focus on Atlantic Meridional Overturning Circulation.	NSF (lead); DOC-NOAA; NASA	Data Management; Modelers; Monitoring, Observing, Modeling, and Prediction; Observations; Physical Oceanography; Sea Ice
SYSTEMS 1.4 Advance understanding of the role of atmospheric rivers in Arctic amplification with a specific task of hosting conference sessions to facilitate knowledge sharing.	Lead Agency Pending DOC-NOAA; NASA; NSF	Modelers; Monitoring, Observing, Modeling, and Prediction
SYSTEMS 1.5 Hold cross-collaboration-team meetings and workshops, and produce publications, to explore the results of high-resolution and regional Arctic modeling. Meetings will focus on the importance of model resolution to capture Arctic amplification and its relationship with the lower latitudes.	Lead Agency Pending NSF	Modelers; Monitoring, Observing, Modeling, and Prediction
SYSTEMS 1.6 Quantify the contributions of surface properties, clouds, aerosol particles, and precipitation to the Arctic summer surface radiation budget and sea ice melt during the early melt seasons.	NASA (lead); DOC-NOAA DOD-ONR	Monitoring, Observing, Modeling and Prediction; Sea Ice

SYSTEMS Objective 2: Observe, understand, predict, and project Arctic marine and terrestrial ecosystem change and its impacts on humans and the entire Earth system.

Changes in the Arctic are having profound impacts on terrestrial, aquatic, and marine ecosystems. For example, ocean primary productivity in nearly all regions of the Arctic is higher than in the past, which can be linked to lower sea ice cover and increased nutrient availability. Terrestrial ecosystems are also experiencing changes resulting from a variety of factors such as extended growing seasons, earlier snow melt, altered precipitation patterns, and changing disturbance regimes. These changes in Arctic ecosystems have impacts on local human populations, as well as the Earth system as a whole.

Deliverable	Collaborating Agencies	Contributing Collaboration Teams and Communities of Practice
SYSTEMS 2.1 Advance understanding, quantification, and prediction of methane emissions from permafrost changes in the Arctic through international collaborations.	NSF (lead); DOC-NOAA; EPA; NASA	Data Management; Permafrost; Technology Innovation and Application; Terrestrial Ecosystems
SYSTEMS 2.2 Carry out and synthesize research and monitoring to improve understanding of important Arctic ecosystem processes and feedbacks. These processes will include responses to environmental changes, such as the associated impacts on wildlife and human communities and infrastructure. This work will be shared via conference sessions and scientific publications.	DOI-USGS (lead); DOI-BLM; DOI-BOEM; DOI-FWS; DOI-NPS; NASA; NSF; USDA-NRCS; USDA-USFS	Coastal Resilience; Monitoring, Observing, Modeling, and Prediction; Permafrost; Terrestrial Ecosystems; Tribal Consultation and Effective Processes
SYSTEMS 2.3 Develop and update meaningful products for delivering findings and information concerning key climate features, including the annual release of the peer-reviewed Arctic Report Card on the current state of the Arctic relative to the historical record.	DOC-NOAA/OAR (lead); DOI-BLM; DOI-BOEM; DOI-FWS; NASA; NSF	Monitoring, Observing, Modeling, and Prediction; Sea Ice; Terrestrial Ecosystems

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Deliverable	Collaborating Agencies	Contributing Collaboration Teams and Communities of Practice
<p>SYSTEMS 2.4 Continue coordinated interdisciplinary Arctic marine climate and ecosystem observations, and share data and promote synthesis of field observations. This includes generating accessible, public-facing tools and products that increase awareness of annual research activities and assets, as well as supporting enhanced collaboration, coordination, and transparency across research, federal, and local communities.</p>	<p>DOC-NOAA/OAR (lead); NSF (lead); DHS-USCG; DOC-NOAA/NMFS; DOI-BOEM; DOI-FWS; NASA</p>	<p>Field Operations; Marine Ecosystems; Monitoring, Observing, Modeling, and Prediction; Tribal Consultation and Effective Processes</p>
<p>SYSTEMS 2.5 Convene community-wide workshop highlighting how remote sensing data products can be used to inform multi-scale land models from plot to pan-Arctic and inform use of remote sensing data in land surface models.</p>	<p>Lead Agency Pending; DHS-CBP-USBP; DOI-BLM; DOI-FWS; DOI-NPS; DOI-USGS</p>	<p>Data Management; Monitoring, Observing, Modeling, and Prediction; Permafrost; Sea Ice; Terrestrial Ecosystems</p>
<p>SYSTEMS 2.6 Continue support for research programs that document Arctic marine species distribution, abundance, biodiversity, health and condition, foraging ecology, demography, habitat use in the Arctic, and basic life history information, as well as age and growth rates of key links in the food web.</p>	<p>DOC-NOAA/OAR (lead); DOD-ONR; DOI-BOEM; DOI-FWS; MMC; NASA; NSF</p>	<p>Marine Ecosystems; Monitoring, Observing, Modeling, and Prediction; Sea Ice; Tribal Consultation and Effective Processes</p>
<p>SYSTEMS 2.7 Produce and support publications and data products (in technical and non-technical venues) enhancing understanding of the linkages among marine species, oceanographic and sea ice conditions and changes. Specifically improve understanding of mechanisms that affect trends in trophic interactions, abundance, distribution, vital rates, and behavior.</p>	<p>DOC-NOAA/OAR(lead); DOD-ONR; DOI-BOEM; DOI-FWS; MMC; NASA; NSF</p>	<p>Data Management; Marine Ecosystems; Monitoring, Observing, Modeling, and Prediction</p>

SYSTEMS Objective 3: Understand interactions between social, ecological, and physical Arctic systems, particularly in the context of coastal and cryospheric change.

In order to understand Arctic systems interactions, it is important to focus on the spaces where these interactions occur. Coastal areas are important zones of interaction across a wide range of social ecological systems: atmosphere, ocean, sea ice, land-fast ice, land, glaciers, permafrost, animals, plants, and humans all interact at and around coastlines. Work carried out under this objective seeks to build better understanding of the interconnected pieces and processes contributing to Arctic coastal change and its multifaceted impacts, both proximal and relational. This objective includes short-term and long-term activities, and relies on a variety of observation types, including community observers and high-tech sensors. Deliverables will facilitate expanded connectivity and standardization of observations with the aim of bridging gaps between interconnecting Arctic systems and between observations and models. This objective focuses on building a broad, interconnected understanding of Arctic coastal change and working with Arctic communities to provide knowledge important for Arctic residents now, especially in responding to and mitigating the effects of change, and to build environmental understanding for the future.

Deliverable	Collaborating Agencies	Contributing Collaboration Teams and Communities of Practice
SYSTEMS 3.1 Through conference sessions, scientific and non-technical publications, and IARPC Collaborations meetings, highlight results from missions that contribute to long-term observations of land ice.	NASA (lead); DHS-CBP-USBP	Observations
SYSTEMS 3.2 Develop and assess ice sheet models for better prediction of sea level rise.	NASA (lead); DOC-NOAA; DOI-USGS; NSF	Monitoring, Observing, Modeling, and Prediction
SYSTEMS 3.3 Integrate information from field, laboratory, and remote sensing studies to examine and quantify relationships among surface topography, vegetation composition, hydrology, permafrost, disturbance effects (including fire, thermokarst, land use change, and wildlife), geophysical processes in permafrost soils, and humans. Share results in reports, presentations, and scientific publications.	Lead Agency Pending; DHS-CBP-USBP; DOI-BLM; DOI-NPS; EPA; NASA; NSF; USDA-NRCS	Community Resilience and Health; Data Management; Monitoring, Observing, Modeling, and Prediction; Permafrost; Risk Management and Hazard Mitigation; Sustainable Economies and Livelihoods; Technology Innovation and Application; Terrestrial Ecosystems

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Deliverable	Collaborating Agencies	Contributing Collaboration Teams and Communities of Practice
<p>SYSTEMS 3.4 Better understand the rate of terrestrial and subsea permafrost degradation and their roles in environmental and ecosystems processes and services (e.g., atmospheric and terrestrial carbon, Arctic greening, species invasion) by integrating empirical information into modeling efforts at various scales and delivering results via publications and presentations.</p>	<p>Lead Agency Pending; DOI-BLM; DOI-NPS; NASA; NSF; USDA-NRCS</p>	<p>Permafrost; Terrestrial Ecosystems</p>
<p>SYSTEMS 3.5 Foster continued efforts to link multi-agency investments while expanding empirical datasets and synthesizing information that will inform the development of updated essential variable maps for Alaska, Greenland, and the circumpolar Arctic (e.g., permafrost ground ice content, topography, bathymetry, vegetation).</p>	<p>NSF (lead); DOC-NOAA; DOI-BLM; DOI-NPS; EPA; NASA; USDA-NRCS</p>	<p>Permafrost; Terrestrial Ecosystems</p>
<p>SYSTEMS 3.6 Improve high-resolution models' ability to capture coastal processes at the interface of ocean, land, and atmosphere by supporting targeted collaborations among model developers, users, and decision-makers. Products will include an interagency scientific peer-reviewed publication (that is in compliance with the 2025 Executive Order on Restoring Gold Standard Science) and conference sessions that address these models, as well as non-technical publications.</p>	<p>Lead Agency Pending; DHS-CBP-USBP; DOC-NOAA; EPA; NASA; NSF</p>	<p>Coastal Resilience; Data Management; Marine Ecosystems; Monitoring, Observing, Modeling, and Prediction; Permafrost; Sea Ice; Terrestrial Ecosystems</p>



Photo: DOI

Community Resilience & Health (HEALTH)

Goal: Improve community resilience and well-being by strengthening research and developing tools to increase understanding of interdependent social, natural, and built systems in the Arctic.

HEALTH Objective 1: Support the health of Arctic residents through research on public health needs and delivery.

The COVID-19 pandemic is a stark reminder of the vulnerability of rural communities in the Arctic to infectious disease. Public health resources are limited in many communities, and services such as preventive care and health education are often lacking. Cultural wellness is also a vital component of community resilience and health. Through this objective, IARPC seeks to support the health of Arctic residents with research on public health needs and delivery. This research will be driven by community priorities, culturally responsive and respectful, and focused foremost on improving the health of Arctic residents.

Deliverable	Collaborating Agencies	Contributing Collaboration Teams and Communities of Practice
HEALTH 1.1 Reduce incidence of hepatitis C virus infection among Alaskan populations by defining the epidemiology, expanding screening in rural populations, and identifying barriers affecting access to treatment.	HHS-CDC (lead)	Tribal Consultation and Effective Processes

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Deliverable	Collaborating Agencies	Contributing Collaboration Teams and Communities of Practice
HEALTH 1.2 Conduct research on respiratory viruses (e.g., influenza, respiratory syncytial virus, SARS-CoV-2) and support implementation of public health interventions that protect remote populations.	HHS-CDC (lead)	Tribal Consultation and Effective Processes
HEALTH 1.3 Along with local health partners, conduct research to support understanding and awareness of emerging zoonotic disease threats identified in the CDC’s One Health Zoonotic Disease Prioritization for Alaska workshop report.	Lead Agency Pending DOI-FWS; HHS-CDC	Coastal Resilience; Marine Ecosystems; Permafrost; Terrestrial Ecosystems; Tribal Consultation and Effective Processes
HEALTH 1.4 Along with collaborating partners, investigate concerns about human illness associated with harmful algal blooms, develop strategies for assessing and filling knowledge gaps, and develop and distribute messaging based on what is learned.	Lead Agency Pending DOC-NOAA; EPA; HHS-NIH/NIEHS; USDA	Coastal Resilience; Marine Ecosystems; Tribal Consultation and Effective Processes

HEALTH Objective 2: Address emerging threats to food safety and access, as well as food and nutrition security in the Arctic, through research that addresses how environmental change is affecting the abundance, accessibility, and use of traditional foods and traditional ways of life.

Terrestrial and marine ecosystems are changing rapidly with implications for accessibility and availability of healthy, nutritious, and culturally relevant foods. Environmental toxins and novel diseases also pose emerging risks to food security for Arctic residents. Both traditional and commercial foods, and the infrastructure to store and maintain them, play key roles in meeting communities’ nutritional and cultural needs. Improved observations, forecasts, and models are critical for a greater understanding of how Arctic environmental change and other factors are affecting Arctic food safety and security, including traditional food abundance, access, use patterns, and cultural connections and reliance.

Deliverable	Collaborating Agencies	Contributing Collaboration Teams and Communities of Practice
HEALTH 2.1 Provide funding opportunities for research on food systems, food safety, and food and nutrition security in the Arctic.	NSF (lead); DHS; USDA	Technology Innovation and Application; Tribal Consultation and Effective Processes
HEALTH 2.2 Provide funding opportunities and conduct studies on the impact of harmful algal blooms on the availability and safety of traditional and commercial foods.	NSF (lead); DOC-NOAA/NCCOS; DOI-FWS; DOI-USGS; EPA; MMC; NASA	Marine Ecosystems; Monitoring, Observing, Modeling, and Prediction; Technology Innovation and Application; Tribal Consultation and Effective Processes
HEALTH 2.3 Conduct investigations and report on marine mammal unusual mortality events in the Bering, Chukchi, and Beaufort seas to evaluate the severity, causes, ecological implications, and potential health risks to traditional users.	DOC-NOAA/NMFS (lead); DHS; DOI-FWS	Marine Ecosystems; Monitoring, Observing, Modeling, and Prediction; Tribal Consultation and Effective Processes
HEALTH 2.4 Conduct investigations and report trends in abundance, distribution, and condition of ice-dependent marine mammals in the Bering, Chukchi, and Beaufort seas to identify and forecast changes that may impact food security and the long-term sustainability of traditional food supplies.	DOC-NOAA/NMFS (lead); DHS; DOI-FWS; DOI-USGS	Marine Ecosystems; Monitoring, Observing, Modeling, and Prediction; Tribal Consultation and Effective Processes

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Deliverable	Collaborating Agencies	Contributing Collaboration Teams and Communities of Practice
HEALTH 2.5 Assess and model changes in abundance, distribution, and harvest of select marine mammals and fishes that are food sources in rural Alaska.	DOC-NOAA/OAR (lead); DHS; DOI-BOEM; DOI-FWS; DOI-NPS; MMC; NSF; USDA	Coastal Resilience; Marine Ecosystems; Monitoring, Observing, Modeling, and Prediction; Sustainable Economies and Livelihoods; Technology Innovation and Application; Tribal Consultation and Effective Processes
HEALTH 2.6 Fund and conduct research, and produce a report, on changes in abundance and distribution of migratory caribou in Arctic Alaska.	DOI-USGS (lead); DHS; DHS-CBP-USBP; DOI-BLM; DOI-FWS; DOI-NPS; NASA; NSF	Monitoring, Observing, Modeling, and Prediction; Technology Innovation and Application; Terrestrial Ecosystems; Tribal Consultation and Effective Processes
HEALTH 2.7 Provide funding opportunities, conduct research, and produce a report, on the impacts of rapid expansion of beaver habitat in the U.S. Arctic, including effects on fisheries and ecosystem services, access to traditional foods, and overall community health.	DOI-USGS (lead); DHS; DOI-BLM; DOI-NPS; NASA; NSF	Monitoring, Observing, Modeling, and Prediction; Technology Innovation and Application; Terrestrial Ecosystems; Tribal Consultation and Effective Processes

HEALTH Objective 3: Provide research and technical support for water and sanitation infrastructure.

The characteristics of the Arctic present unique water and sanitation infrastructure challenges. Solutions to these challenges need to address small and remote communities, energy availability and cost, operation and maintenance capabilities, freezing seasonal temperatures and thawing permafrost, and other issues. Through this objective, IARPC agencies and partners will analyze and evaluate potential impacts of environmental changes on infrastructure, synthesize available infrastructure solutions applicable to Arctic conditions and conduct research to support climate resilient and energy efficient infrastructure, provide a database for information on and treatment options for drinking water contaminants, and support research on perfluoroalkyl and polyfluoroalkyl substances (PFAS) treatment of surface water and groundwater in Arctic conditions.

Deliverable	Collaborating Agencies	Contributing Collaboration Teams and Communities of Practice
HEALTH 3.1 Synthesize and expand upon existing efforts to create data visualization maps of areas at high risk for coastal erosion, permafrost thaw, and flooding within specified future time periods (e.g., 10 years, 50 years, 100 years) to identify at-risk areas and inform investments in climate-resilient infrastructure.	NASA (lead); DHS-FEMA; DOC-NOAA	Coastal Resilience; Data Management; Permafrost; Risk Management and Hazard Mitigation; Terrestrial Ecosystems
HEALTH 3.2 Develop a publicly accessible database for information on drinking water contaminants (including PFAS) and effective treatment processes. The database will be of use to water treatment operators, regulatory agencies, researchers, and treatment process consultants and designers. It could also support responses to emergency contamination events.	EPA (lead)	Data Management; Tribal Consultation and Effective Processes
HEALTH 3.3 Test the potential for anaerobic digestion to provide sanitation options for communities where piped systems do not match environmental and financial settings. Document and disseminate results and determine if in-situ trial is appropriate.	EPA (lead); Denali Commission; NSF	Cold/High Anaerobic Digestion; Tribal Consultation and Effective Processes



Photo: Lisa Hupp/USFWS

Risk Management & Hazard Mitigation (RISK)

Goal: Secure and improve quality of life through research that promotes an understanding of disaster risk exposure, sensitivity to hazard, and adaptive capacity.

RISK Objective 1: Summarize currently available data and information requirements associated with hazard and risk mitigation, adaptation, and response efforts. Synthesize community-led activities and information to identify potential needs for future efforts.

Work carried out under this objective will improve understanding of how data and information generated by the Arctic research community and local communities can be applied to risks and hazards such as wildfire, permafrost thaw, and coastal erosion. In turn, this work will be used as a foundation to better address data gaps, accessibility, and other issues that often limit the use of Arctic research activities in risk management and hazard mitigation. Meeting this objective will require engagement and collaboration with communities, Tribes and local organizations, traditional knowledge holders, and the private sector, as well as cooperation across the full range of scientific and engineering disciplines, and state of Alaska and federal agencies working in the Arctic.

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Deliverable	Collaborating Agencies	Contributing Collaboration Teams and Communities of Practice
<p>RISK 1.1 Conduct a study identifying where information used in decision-making and planning around risks and hazards can be improved through access to new or additional data sources. This study should consider a wide range of activities associated with ongoing responses to common and emerging hazards, including risk reduction efforts and emergency preparedness and response. The scope of the study will be expanded to include information on tsunamis and volcanoes.</p>	<p>Lead Agency Pending DHS-CBP-USBP; DHS-USCG; Denali Commission; DOC-NOAA; DOI-BIA; DOI-USGS; EPA</p>	<p>Coastal Resilience; Data Management; Monitoring, Observing, Modeling, and Prediction; Marine Ecosystems; Modelers; Observations; Permafrost; Physical Oceanography; Sea Ice; Sustainable Economies and Livelihoods; Technology Innovation and Application; Terrestrial Ecosystems</p>
<p>RISK 1.2 Share findings of RISK 1.1 as a means to (1) spur additional research and science communication aimed at addressing unmet needs for planning, prevention, response, and recovery and (2) inform time-sensitive decision-making and planning processes.</p>	<p>Lead Agency Pending Denali Commission; DHS-CBP-USBP; DHS-USCG; DOC-NOAA; DOI-BIA; DOI-USGS; EPA</p>	<p>Coastal Resilience Data Management; Monitoring, Observing, Modeling, and Prediction; Marine Ecosystems; Modelers Observations; Permafrost; Physical Oceanography; Sea Ice; Sustainable Economies and Livelihoods; Technology Innovation and Application; Terrestrial Ecosystems; Tribal Consultation and Effective Processes</p>
<p>RISK 1.3 Develop a network that brings together scientists, the emergency management community, and key agency contacts to share knowledge, identify new and emerging challenges, and inform decision-making and operations through research.</p>	<p>Lead Agency Pending; DOI-USGS (lead); DHS-CBP-USBP</p>	<p>All communities of practice; All foundational activities</p>

RISK Objective 2: Update and improve the “Statewide Threat Assessment: Identification of Threats from Erosion, Flooding, and Thawing Permafrost in Remote Alaska Communities.”⁵

Work to meet this objective will involve reviewing, updating, and building upon the 2018 Statewide Threat Assessment by expanding and updating the scope of hazards cataloged in the assessment and integrating community resilience information. Sea ice and coastal erosion will be added to this effort. The goal is to better understand the threats to Alaska communities from acute and long-term hazards as well as what level of community intervention (adaptation, mitigation, and/or other protective measures) are in place. This will lead to identifying and developing an index of threat risk and community capacity for the variety of risks that Alaska’s villages face.

Deliverable	Collaborating Agencies	Contributing Collaboration Teams and Communities of Practice
<p>RISK 2.1 Identify the top threats/hazards to communities and critical remote state and federal government infrastructure in the state of Alaska that should be included in the Statewide Threat Assessment. This might include coastal and river erosion, flooding, thawing permafrost, and changes in the seasonal snowpack.</p>	<p>Denali Commission (lead); DHS-CBP-USBP; DHS-CISA; DOC-NOAA; DOI-BIA; DOI-USGS; NSF</p>	<p>Coastal Resilience; Data Management; Monitoring, Observing, Modeling, and Prediction; Marine Ecosystems; Modelers; Observations; Permafrost; Physical Oceanography; Sea Ice; Sustainable Economies and Livelihoods; Technology Innovation and Application; Terrestrial Ecosystems; Tribal Consultation and Effective Processes</p>

⁵ Statewide Threat Assessment: Identification of Threats from Erosion, Flooding, and Thawing Permafrost in Remote Alaska Communities. Nov 2019. <https://www.denali.gov/wp-content/uploads/2019/11/Statewide-Threat-Assessment-Final-Report-20-November-2019.pdf>

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Deliverable	Collaborating Agencies	Contributing Collaboration Teams and Communities of Practice
<p>RISK 2.2 Upon completion of RISK 2.1, establish a data collection and collation plan to include mechanisms to collect threat/hazard data that may not be readily available.</p>	<p>Denali Commission (lead); DHS; DOI-BIA;</p>	<p>Coastal Resilience; Data Management; Monitoring, Observing, Modeling, and Prediction; Marine Ecosystems; Modelers; Observations; Permafrost; Physical Oceanography; Sea Ice; Sustainable Economies and Livelihoods; Technology Innovation and Application; Terrestrial Ecosystems; Tribal Consultation and Effective Processes</p>
<p>RISK 2.3 Collect and integrate disparate threat/hazard information and perform modeling and analysis to understand where natural and human-made threats and hazards pose a risk to Arctic communities.</p>	<p>Denali Commission (lead); DHS-CBP-USBP; DHS-FEMA; DOI-BIA; DOI-BSEE; DOI-USGS;</p>	<p>Coastal Resilience; Data Management; Monitoring, Observing, Modeling, and Prediction; Marine Ecosystems; Modelers; Observations; Permafrost; Physical Oceanography; Sea Ice; Sustainable Economies and Livelihoods; Technology Innovation and Application; Terrestrial Ecosystems; Tribal Consultation and Effective Processes</p>

RISK Objective 3: Research to support more resilient and transformative infrastructure to withstand potential impacts from acute and long-term hazards.

This objective seeks to identify resilient infrastructure capabilities and technologies that can minimize infrastructure risk and reduce the impacts of hazards.

Deliverable	Collaborating Agencies	Contributing Collaboration Teams and Communities of Practice
RISK 3.1 Develop deliverables focused on expedient and enduring cold regions infrastructure, including water and wastewater, energy, and temporary and enduring structures. Results will be shared via multiple reports that will identify and provide background information on the variety of available and emerging water/wastewater, energy, and structure technologies and best practices.	DOD-USACE (lead); DHS-CISA; DHS-USCG; DOI-BIA; EPA; USDA-NRCS	Cold/High Anaerobic Digestion; Technology Innovation and Application; Tribal Consultation and Effective Processes



Photo: Tanadgusix Corporation via DOE

Sustainable Economies & Livelihoods (LIVELIHOODS)

Goal: Observe and understand the Arctic's natural, social, and built systems to promote sustainable economies and livelihoods.

LIVELIHOODS Objective 1: Foster the development of Arctic infrastructure and institutions that improve community capacity prioritized by Arctic communities.

Arctic infrastructure needs are urgent, and communities in rural Alaska have an important role in identifying these needs. Coordinated research can facilitate improved information sharing about funding resources, threats to existing infrastructure, and Arctic-relevant advances in construction and communication technology. Research efforts can support the development of models to better optimize decisions on cost avoidance and the use of local geography for the development of renewable energy, raw materials, and other human and built environment resources.

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Deliverable	Collaborating Agencies	Contributing Collaboration Teams and Communities of Practice
<p>LIVELIHOODS 1.1 Develop a list of where and how to access existing datasets on infrastructure, natural resources, and institutions as a prelude to constructing a comprehensive asset map to improve understanding of community resiliency. Facilitate sharing resources and improve information access.</p>	<p>Denali Commission (lead); DHS; DHS-CBP-USBP; DOC-EDA; DOC-NOAA; DOD-Ted Stevens; DOI-USGS; DOT; EPA; NSF; USDA-RD</p>	<p>Data Management</p>
<p>LIVELIHOODS 1.2 Identify best practices for enhancing sustainable and livable communities through infrastructure, natural resources variability, and institutions.</p>	<p>Denali Commission (lead); DHS-CBP-USBP; DHS-USCG; DOD-Ted Stevens; DOT; NSF</p>	<p>Data Management; Technology Innovation and Application</p>

LIVELIHOODS Objective 2: Improve local access to Arctic economic opportunities by identifying the linkages among economic initiatives, natural resources, infrastructure, socioeconomic factors, and values of rural Arctic communities.

Environmental changes in the Arctic have increased global pressure to transform and expand Arctic economies. However, sustainable pathways for achieving such transformation are not well understood. Transitioning undeveloped and under-developed locally accessible economic opportunities into sustainable economies will benefit from understanding effective support mechanisms (e.g., public and private funding) that can stimulate economic activity. Particularly important fast-growing economic sectors include healthcare and infrastructure development. Federal investment in infrastructure can be a valuable economic stimulus, but research is needed to support the transition to sustainable economies. Improved socioeconomic models, studies on the transferability of successful place-based economic programs, and research on community-defined priorities for sustainable livelihoods can provide insights for pathways towards more sustainable local job creation and retention while keeping the unique values of Arctic residents at the forefront.

Deliverable	Collaborating Agencies	Contributing Collaboration Teams and Communities of Practice
LIVELIHOODS 2.1 Support research on factors affecting economic sustainability and quality of life, identifying components of community well-being.	Lead Agency Pending; DHS; DOT; EPA; NSF; USDA-NRCS; USDA-RD	Community Resilience and Health; Data Management; Tribal Consultation and Effective Processes
LIVELIHOODS 2.2 Research options for supporting community development of regional economic development strategies and plans	Lead Agency Pending; DHS; DOT; USDA-NRCS; USDA-RD	Data Management; Tribal Consultation and Effective Processes
LIVELIHOODS 2.3 Create funding opportunities for research into community-defined priorities for sustainable livelihoods and economic development.	NSF (lead)	Tribal Consultation and Effective Processes

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Foundational Activity Objectives and Deliverables





Photo: DOI

Data Management (DATA)

DATA Objective 1: Encourage and implement Findable, Accessible, Interoperable, and Reusable (FAIR) and Collective benefit, Authority to control, Responsibility, and Ethics (CARE) data management principles through enhanced coordination and collaboration across multiple levels in Arctic research.

The overall Data Management goal is to create a well-coordinated and informed Arctic data management community committed to the FAIR and CARE data principles. Success will be measured by the establishment of robust networks, the integration and sharing of best practices and standards, and the implementation of innovative data management practices and systems. The deliverables will draw from three sustained lines of effort, culminating in comprehensive summaries of Arctic data management considerations. The first line of effort is to continue convening new and existing IARPC partners and members to develop a network focused on fostering and implementing FAIR and CARE data principles. This will build a network while also supporting new insights in data management. The Data Management Collaboration Team will maintain a living document to capture the community's ideas to allow IARPC Collaborations members to shape team efforts. The second line of effort is to help organize and facilitate semi-structured meetings in collaboration with IARPC communities of practice to share perspectives from individuals and groups on implementing FAIR and CARE. These meetings will help collect perspectives from data users, owners, publishers, providers, managers, and researchers on specific aspects of FAIR and CARE data management principles that communities care about. The third line of effort focuses on tracking and implementing specific funded projects and initiatives from different agencies on Arctic/polar data management and enhancing collaboration and engagement across local, national, and international levels towards Arctic data interoperability.

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Deliverable	Collaborating Agencies	Contributing Collaboration Teams and Communities of Practice
<p>DATA 1.1 Identify verified points of contact (e.g., agency champions, data practitioners, Arctic residents, Tribal organizations) and their areas of expertise and interests, and encourage them to join the Data Management Collaboration Team on IARPC Collaborations. As part of developing the points of contact, identify and track representation across many axes (disciplines/sectors, IARPC experience, career stage, for example) to ensure a representative group of contributors.</p>	<p>DOC-NOAA (lead); NASA (lead); Denali Commission; DHS; DHS-CBP-USBP; DOT; NSF; SI; USDA</p>	<p>All foundational activities; All priority areas; Coastal Resilience; Marine Ecosystems; Permafrost; Physical Oceanography; Sea Ice; Terrestrial Ecosystems</p>
<p>DATA 1.2 In order to build community buy-in and promote sustained efforts, regularly update and maintain the activities and progress related to data management on IARPC Collaborations. These efforts will ensure transparency, continuous engagement, and alignment with the FAIR and CARE data principles.</p>	<p>DOC-NOAA (lead); NASA; NSF</p>	<p>All foundational activities; All priority areas; Coastal Resilience; Marine Ecosystems; Permafrost; Physical Oceanography; Sea Ice; Terrestrial Ecosystems</p>
<p>DATA 1.3 Convene quarterly seminars, discussions, and training sessions on FAIR and CARE data management in collaboration with other IARPC collaboration teams and communities of practice. These sessions will address data-related topics that are of interest across different teams or specific to a few teams, with the goal of advancing and supporting the data-related deliverables within this implementation plan. Ensure that presenters and contributors provide a broad range of perspectives and expertise. Develop a common format and structure (e.g., questions, prompts) for team meetings to help elicit and articulate perspectives on all aspects of FAIR and CARE to support work towards the community summary/synthesis products.</p>	<p>DOC-NOAA (lead); Denali Commission; DHS; DHS-CBP-USBP; DOT; NASA; NSF; SI; USDA</p>	<p>All priority areas; Coastal Resilience; Education and Training; Marine Ecosystems; Permafrost; Physical Oceanography; Sea Ice; Technology Innovation and Application; Terrestrial Ecosystems; Tribal Consultation and Effective Processes</p>

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Deliverable	Collaborating Agencies	Contributing Collaboration Teams and Communities of Practice
<p>DATA 1.4 Develop and share communication products such as summaries and public-facing one-pagers of perspectives on implementing FAIR and CARE in Arctic contexts. These concise communication products will be designed to inform and educate a broader audience, including users, researchers, decision-makers, and the general public.</p>	<p>DOC-NOAA (lead); NASA (lead); NSF</p>	<p>All priority areas; Tribal Consultation and Effective Processes</p>
<p>DATA 1.5 Develop an end-to-end Arctic data management system that includes data submission, metadata curation, data archival, and data access. Overall, these data management services will improve Arctic data FAIR compliance and interoperability, as well as streamline long-term data preservation and archival.</p>	<p>DOC-NOAA (lead); NASA; NSF</p>	<p>All priority areas; Marine Ecosystems; Physical Oceanography; Sea Ice; Technology Innovation and Application</p>
<p>DATA 1.6 Support the development of an Integrated Arctic Ecosystem Toolkit that leverages existing data servers to allow for the synthesis of public hydrographic and satellite-derived environmental measurements with a diverse array of biodiversity data. Building the tools to connect these datastreams will shorten the time required for each ecosystem health assessment, enabling rapid management response for resilience. By including publicly available observations from NOAA National Marine Fisheries Service, NOAA ‘Omics, and academic-led ocean observatories, as well as publicly available observations derived from open-source community science platforms, this toolkit will provide a critical holistic integration platform for the Arctic region. By further developing tools to foster the integration of non-public datastreams alongside the integrated biodiversity observations, this toolkit will serve a diverse array of federal, state, local, and community partners.</p>	<p>DOC-NOAA (lead); NASA; NSF</p>	<p>All priority areas; Marine Ecosystems; Physical Oceanography; Sea Ice; Technology Innovation and Application</p>

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Deliverable	Collaborating Agencies	Contributing Collaboration Teams and Communities of Practice
<p>DATA 1.7 Support a catalog of systems (a registry of polar observing networks) that conduct or coordinate polar observation and monitoring. This resource will advance beyond a proof of concept through an iterative process with outreach, community engagement, collaboration, metadata curation, and web usability testing. In concert, software design and development will enable a scalable technology architecture, resulting in a fully operational, and encompassing tool for discovery. This project will also include a polar observing site discovery tool: an innovative demonstration of aggregating documentation for thousands of research and monitoring sites, stations, facilities, observatories, supersites, buoys, moorings, and community-based observations with a view to interoperability. The end result will be a single-window search for the discovery of observing assets within and across a multitude of networks.</p>	<p>DOC-NOAA (lead); Denali Commission; DHS; DHS-CBP-USBP; DOT; NASA; NSF; SI; USDA</p>	<p>All priority areas; Coastal Resilience; Education and Training; Marine Ecosystems; Permafrost; Physical Oceanography; Sea Ice; Technology Innovation and Application; Terrestrial Ecosystems; Tribal Consultation and Effective Processes</p>
<p>DATA 1.8 Convene a series of webinars on the incorporation of Indigenous data sovereignty⁶ principles into Arctic data management. These sessions will aim to embed CARE data principles in the data management plan process and to explore and learn about the possibility of establishing tribally managed CARE-structured data centers. The goal is to ensure that Arctic communities have authority and control over their data, with an eye on future implementation plans and the Arctic Research Plan.</p>	<p>DOC-NOAA (lead); Denali Commission; DHS; DOT; NASA; NSF; SI; USDA</p>	<p>All priority areas; All foundational activities; Coastal Resilience; Marine Ecosystems; Permafrost; Physical Oceanography; Sea Ice; Terrestrial Ecosystems</p>

⁶ Indigenous Data Sovereignty is an internationally recognized concept; IARPC engagement facilitates international collaboration and data sharing.

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Deliverable	Collaborating Agencies	Contributing Collaboration Teams and Communities of Practice
<p>Data 1.9 Actively engage with and support expert and advisory panel work through the US Arctic Observing Network (US AON), the Sustaining Arctic Observing Network (SAON)'s Arctic Roadmap for Observing and Data Systems (Arctic ROADS), and the Arctic Data Committee in developing Arctic observing and data systems plans. Additionally, support U.S. engagement in and the implementation of data-related recommendations from the Arctic Observing Summit. These efforts will ensure that the United States contributes to and benefits from international coordination and collaboration on Arctic data management.</p>	<p>DOC-NOAA (lead); DHS-CBP-USBP; DOD-ONR; NASA; NSF</p>	<p>All priority areas; All foundational activities; Coastal Resilience; Marine Ecosystems; Permafrost; Physical Oceanography; Sea Ice; Terrestrial Ecosystems</p>



Photo: Lisa Hupp/USFWS

Education & Training (EDU)

EDU Objective 1: Develop resources to support the Arctic STEM education and research communities.

Science, technology, engineering, and math (STEM) education and training are foundational to successful research activities in the Arctic. The deliverables outlined here support existing and next generation practitioners in Arctic research and research-related policy careers in the U.S. Arctic.

Deliverable	Collaborating Agencies	Contributing Collaboration Teams and Communities of Practice
EDU 1.1 Evaluate and enhance the OneSTEM Hub.	Lead Agency Pending; DHS; MMC; SI	All priority areas
EDU 1.2 Continue to provide access to Arctic STEM and STEM policy internships, skill development opportunities, and career pathways, for Arctic communities.	Lead Agency Pending; DHS; DOI-NPS; NASA; SI; USDA	All priority areas;

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Deliverable	Collaborating Agencies	Contributing Collaboration Teams and Communities of Practice
EDU 1.3 Engage in ongoing and respectful dialogue with STEM professional communities and Arctic youth organizations about education and training, and document feedback received.	Lead Agency Pending; DHS; NASA; SI	All priority areas; Data Management
EDU 1.4 Use quarterly meetings of the Education and Training Collaboration Team to build a robust community of practice and to share resources and best practices that promote Arctic STEM and STEM policy careers and skills.	Lead Agency Pending; DHS; MMC; NASA; SI	All priority areas



Photo: Allyson Woodard via ARCUS

Monitoring, Observing, Modeling, & Prediction (MOMP)

MOMP Objective 1: Coordinate activities and communities of practice that bring together Arctic modeling, observing, monitoring, and prediction to advance Arctic research.

Work under this objective will improve the synthesis of monitoring, observing, and modeling activities to advance Arctic science and prediction. Models require observations for initialization, evaluation, and assimilation and can in turn provide critical information to inform the design and optimization of observing networks. Integrating observational and modeling output enables creation of value-added products and can help fill spatial and temporal gaps in analysis. Improved coordination and integration of observational and modeling activities will accelerate the advancement of knowledge of the dynamic Arctic system and lead to improved predictive capabilities.

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Deliverable	Collaborating Agencies	Contributing Collaboration Teams and Communities of Practice
MOMP 1.1 Support development of synthesis products, best-estimate datasets, and model intercomparison studies using cases from major Arctic field campaigns and long-term observational sites to better enable the use of observational data in model evaluation.	Lead Agency Pending; DHS-USCG; DOC-NOAA; DOI-BSEE DOI-USGS; NASA; NSF; USDA	Arctic Systems Interactions; Observations; Modelers; Permafrost; Sea Ice; Terrestrial Ecosystems
MOMP 1.2 Support development of metrics that measure key Arctic processes and implementation of these metrics in benchmarking packages to facilitate model validation against observations.	Lead Agency Pending; DOC-NOAA; DOI-BLM; USDA	All priority areas; Modelers; Observations
MOMP 1.3 Provide support and/or funding opportunities for researchers to integrate Arctic observational and modeling data through data assimilation and reanalysis.	NASA (lead); DOC-NOAA; DOD-ONR; NSF	Arctic Systems Interactions; Modelers; Tribal Consultation and Effective Processes
MOMP 1.4 Support ongoing work, such as observing system experiments, to quantify the current and potential value of Arctic ocean, atmosphere, sea ice, and land observations for initialized predictions spanning daily to decadal timescales	NASA (lead); DOC-NOAA; DOD-ONR; NSF	Arctic Systems Interactions; Modelers; Observations

MOMP Objective 2: Support assessment, gaps analysis, and intercomparisons to understand observational and modeling needs in Arctic research.

Work under this objective will identify observational and modeling capability gaps that hamper predictive skill of models of the Arctic system, barriers that hold back progress in filling these gaps, and key activities most critical to improving predictability, including the need to maintain critical existing MOMP capabilities.

Deliverable	Collaborating Agencies	Contributing Collaboration Teams and Communities of Practice
MOMP 2.1 Conduct observational gap analysis case studies using the Benefit Assessment methodology to inform understanding of the capabilities, opportunities, and gaps in Arctic observing and data systems, with an initial focus on risk management and hazard mitigation.	DOC-NOAA (lead); DHS; NASA; NSF	Arctic Systems Interactions; Observations; Risk Management and Hazard Mitigation
MOMP 2.2 Provide support and/or funding opportunities for researchers to participate in existing Arctic-focused model intercomparison projects and explore the feasibility of developing new model intercomparison projects focused on the Arctic system, its components, and/or its coupling with the broader climate system to understand gaps in modeling and predictability of the Arctic system.	Lead Agency Pending; DOC-NOAA; NASA; NSF	Arctic Systems Interactions; Modelers; Sea Ice
MOMP 2.3 Conduct workshops to identify needs and priorities for improving models of the Arctic system. For example, workshops could focus on improving a single model component (such as sea ice) or on improving coupling across model components.	Lead Agency Pending; DOC-NOAA; DOD-ONR; NASA; NSF	All priority areas; Modelers

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Deliverable	Collaborating Agencies	Contributing Collaboration Teams and Communities of Practice
<p>MOMP 2.4 The US AON Board will build on the 2022 Report to Congress by recommending clear parameters for agencies to identify existing AON investments for inclusion in future budget cross-cut efforts; advancing technological capacity building by inviting more participation from groups focused on data management and technology in US AON Board discussions; and evaluating agency policies and programs, interagency efforts, and community protocols.</p>	<p>NSF (lead); DOC-NOAA; DOD-ONR DOI-BOEM; DOI-NPS; EPA; NASA; SI</p>	<p>All priority areas; US AON Board</p>

MOMP Objective 3: Support coordination and engagement with federal, state, international, and non-federal partners who are conducting monitoring, observing, modeling, and prediction in the Arctic.

Significant activities in monitoring, observing, modeling, and prediction of the Arctic system are conducted by both federal and non-federal entities. Additionally, the Arctic is an important component of the broader Earth system, and Arctic monitoring, observing, modeling, and prediction activities should be coordinated with other federal interagency activities focused on observation and modeling of the Earth system. Work under this objective will strengthen monitoring, observing, modeling, and prediction capabilities for Arctic research by improving coordination and integration of Arctic observational and modeling activities conducted or supported by federal agencies with those conducted or enabled by non-federal partners and with broader federal Earth system activities.

Deliverable	Collaborating Agencies	Contributing Collaboration Teams and Communities of Practice
MOMP 3.1 Support participation of U.S. researchers in international Arctic modeling and prediction efforts in order to improve the predictive capabilities of Arctic models. Products of this deliverable may include relevant scientific papers, presentations, and meeting sessions.	Lead Agency Pending DOC-NOAA; DOD-ONR; NASA; NSF	Arctic Systems Interactions; Data Management; Modelers
MOMP 3.2 Coordinate among state and federal agencies that support fieldwork and share information among researchers and Alaska communities through the research expedition vessel and mooring matrices and spring and fall public meetings focused on research season activities.	DOC-NOAA (lead); DHS-USCG; DOD-ONR; DOI-BOEM; DOI-BSEE; DOI-FWS; NASA; NSF	Arctic Systems Interactions; Community Resilience and Health; Field Operations; Marine Ecosystems; Sea Ice; Sustainable Economies and Livelihoods; Terrestrial Ecosystems; Tribal Consultation and Effective Processes
MOMP 3.3 Coordinate U.S. federal Arctic observing and modeling research efforts with other relevant U.S. interagency groups to identify priority activities to support the Arctic component of the Earth System Predictability Research and Development Strategic Framework and Roadmap ⁷ .	Lead Agency Pending DHS; DOC-NOAA; DOD-ONR; NASA; NSF	Arctic Systems Interactions; Modelers; Observations; Risk Management and Hazard Mitigation; Tribal Consultation and Effective Processes

⁷ Earth System Predictability Research and Development Strategic Framework and Roadmap. Oct 2020.
https://www.icams-portal.gov/organization/researchandinnovation/esp_randd_strategic_framework_roadmap.pdf

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Deliverable	Collaborating Agencies	Contributing Collaboration Teams and Communities of Practice
<p>MOMP 3.4 Support participation of U.S. researchers in international Arctic observing and observational planning efforts to evaluate and improve the Arctic Observing Network. Progress will be tracked in relevant scientific papers, presentations, international arrangements, and/or meeting sessions.</p>	<p>DOC-NOAA (lead)</p>	<p>Data Management; Early Career; Observations; Technology Innovation and Application</p>

MOMP Objective 4: Support best practices in field observations and modeling.

The purpose of this objective is to identify, share, and implement best practices around Arctic observing and modeling activities and to make Arctic observational and modeling data more accessible.

Deliverable	Collaborating Agencies	Contributing Collaboration Teams and Communities of Practice
MOMP 4.1 Build on existing efforts within federal agencies to share resources and implement best practices for improving field safety culture, and enforcing safe working environments in the field, including both physical safety while working in harsh and remote Arctic environments and emotional safety from harassment and hostile working conditions.	NSF (lead); DHS-USCG; DOC-NOAA; NASA	Early Career; Field Operations; Observations; Tribal Consultation and Effective Processes
MOMP 4.2 In coordination with the Data Management Collaboration Team, promote and support FAIR and CARE principles for observational and modeling data.	Lead Agency Pending; DOC-NOAA	Data Management
MOMP 4.3 Promote the integration of early career students, researchers, and professionals working in Arctic-related fields in MOMP activities, meetings, webinars, and workshops to facilitate early career engagement in IARPC activities.	DOC-NOAA (lead); NSF	Early Career

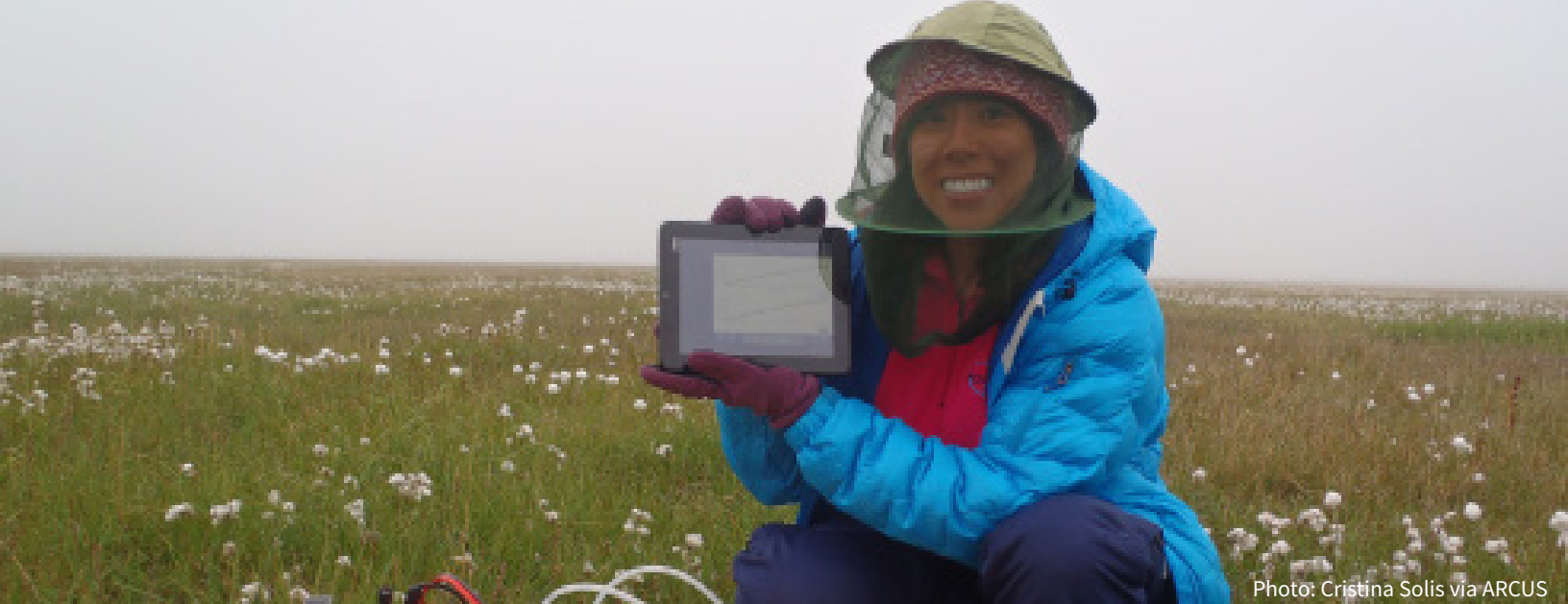


Photo: Cristina Solis via ARCUS

Technology Innovation & Application (TECH)

TECH Objective 1: Survey federally funded research technology.

Technology is a crosscutting challenge for Arctic researchers, as the Arctic setting requires dedicated investments in technology support to make research activities possible. As such, many IARPC collaboration teams and communities of practice highlight technology innovation and application as part of their work. The Technology Innovation and Application Collaboration Team is unique in its practical insight and know-how about technology development that transcends jurisdictional, disciplinary, geographic and sectoral boundaries.

Technology supports the Arctic Research Plan and implementation plan goals and objectives when existing technology is reconfigured and modified for the Arctic setting, or when a research objective necessitates research and development into new technology. Surveying technology activities of Arctic researchers compiles information about research activities in a novel way that may benefit the IARPC enterprise and will help Arctic communities be aware of the benefits of federal technology investments

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Deliverable	Collaborating Agencies	Contributing Collaboration Teams and Communities of Practice
TECH 1.1 Strategically engage externally, across IARPC, and within the Technology Innovation and Application Collaboration Team.	DOI-BOEM (lead); DHS-CBP-USBP; DOC-NOAA; DOD-ONR; DOI-BSEE; NASA; NSF	All communities of practice; All foundational activities; All priority areas
TECH 1.2 Use the Technology Innovation and Application Collaboration Team to support and coordinate technology-related conversations and activities throughout IARPC Collaborations.	DOI-BOEM (lead); DOC-NOAA; DOI-BSEE; NASA; NSF	All communities of practice; All foundational activities; All priority areas

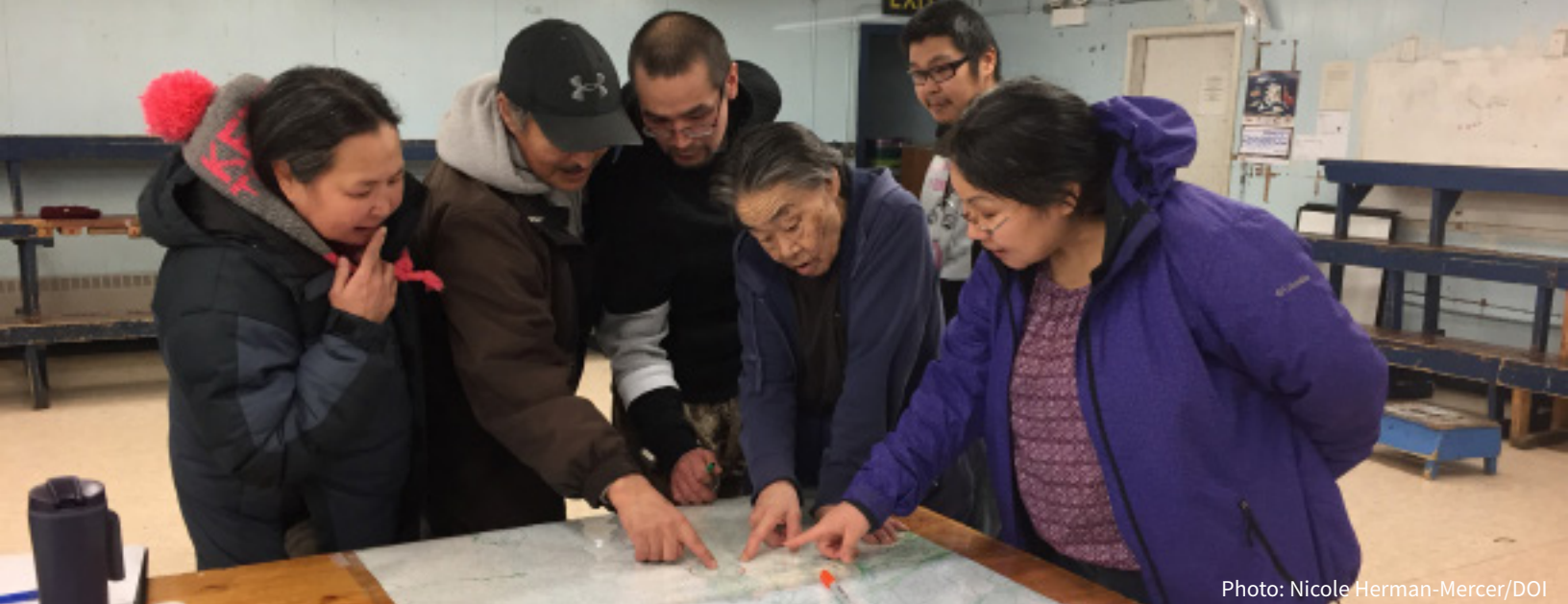


Photo: Nicole Herman-Mercer/DOI

Tribal Consultation and Effective Processes (TCEP)

TCEP⁸ Objective 1: Strengthen and streamline Tribal consultation processes related to Arctic research activities by enhancing coordination, transparency, and accessibility across IARPC Agencies, as well as other federal agencies and entities engaged in Arctic research.

The U.S. federal government has a trust responsibility to federally recognized Alaska Native Tribes deriving from the historical relationship between the federal government and Tribes as expressed in certain treaties, statutes, executive orders, and other sources of federal law. Consistent with the federal trust responsibility, each federal agency developed Tribal consultation policies that honor Tribal sovereignty and ensure that Tribal officials have the opportunity to provide meaningful and timely input when federal actions or decisions have Tribal implications. Agencies have also developed consultation policies to meet legal obligations regarding Alaska Native Claims Settlement Act (ANCSA) Corporations⁹ and to protect subsistence resources for rural Alaskans under the Alaska National Interest Land Claims Act.

⁸ This Foundational Area, previously ‘Participatory Research and Indigenous Leadership in Research’ has been adjusted to focus on the statutory requirements for U.S. government Consultation and fulfillment of Trust obligations with federally recognized Indian Tribes. ‘Indian Tribes’ is a broad term that includes federally recognized Tribes as well as Alaska Native Corporations and other organizations designated by federally recognized Tribes.

⁹ Public Law 108-199, 118 Stat. 452 (2004), as amended by Public Law 108-447, 118 Stat. 3267 (2004), requires agencies to “consult with [Alaska Native Claims Settlement Act] corporations on the same basis as Indian tribes under Executive Order 13175.”

To provide consistency in consultation practices implemented in the Arctic for this implementation period, IARPC will reframe this Foundational Area as Tribal Consultation and Effective Partnerships (TCEP). While many government actions on which agencies consult with Tribes and ANCSA corporations are not related to research, IARPC agencies do engage in both Tribal consultation as well as partnerships with Alaska Native Villages.

Deliverable	Collaborating Agencies	Contributing Collaboration Teams and Communities of Practice
<p>TCEP 1.1 Identify and engage with IARPC Federal Agencies and associated entities that have the largest volume of Arctic research activities that may affect Alaska Native Villages and ANCSA corporations. Characterize the type of activities that fall into this category, and identify opportunities for coordination and efficiency, as well as good practices and lessons learned</p>	<p>EPA (lead); DOC-NOAA</p>	<p>All communities of practice; All foundational activities; All priority areas</p>
<p>TCEP 1.2 Develop a report of Tribal and ANCSA corporation consultations and engagement practices conducted by IARPC Federal Agencies and associated entities as they relate to Arctic research. This will include compiling a report on consultation practices (e.g., federal Tribal and ANCSA corporation consultations) across IARPC Federal Agencies and associated entities using consistent metrics, highlighting key processes, transparency measures, and community engagement and reporting expectations. The report will include agency-specific consultation practices, links, and a clear outline of how Alaska Native and local community input is collected and used.</p>	<p>EPA (lead); DOC-NOAA; MMC; USARC</p>	<p>All communities of practice; All foundational activities; All priority areas</p>

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Deliverable	Collaborating Agencies	Contributing Collaboration Teams and Communities of Practice
<p>TCEP 1.3 Enhance IARPC’s Tribal Engagement Resources. This will include designing a strategy for leveraging the IARPC website as a centralized hub for Tribal consultation opportunities, reporting mechanisms, and accessible guidance for Tribes and Tribal entities. It will also include developing resources for Arctic researchers, including best practices and engagement guidelines that support long-term partnerships with Alaska Native Villages and ANCSA corporations.</p>	<p>EPA (lead); DOC-NOAA; MMC; USARC</p>	<p>All communities of practice; All foundational activities; All priority areas</p>



Photo: Lisa Hupp/USFWS

Appendix 1: Stewardship

This implementation plan is stewarded by the IARPC Principals, Staff Group, collaboration teams, and participating agencies and partners, with support from the IARPC Secretariat as funding and resources allow.

Collaboration: Priority area and foundational activity collaboration teams collaborate on and advance

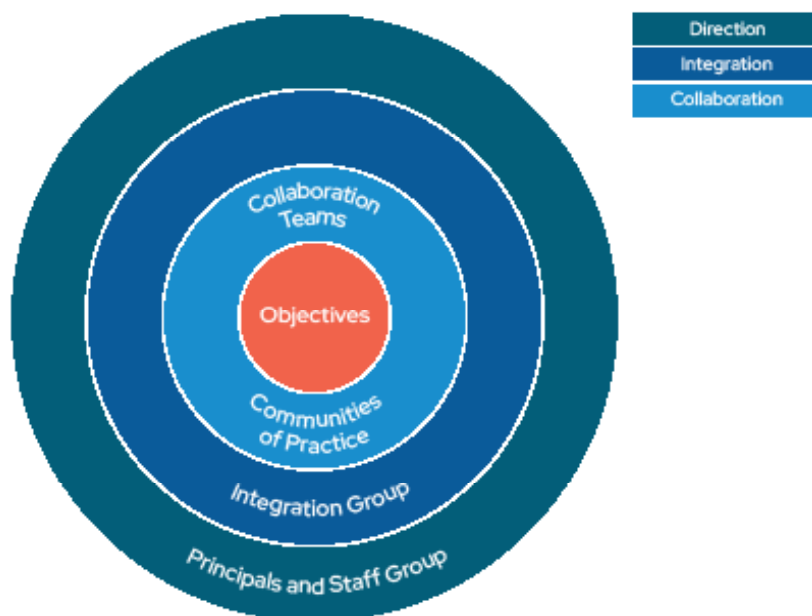


Figure 1: Implementation Plan Stewardship Structure

objectives and deliverables. In addition to these teams, the communities of practice contribute expertise and knowledge necessary to meet the objectives and deliverables of this implementation plan.

Integration: The Implementation Plan Integration Group will:

- Receive updates from collaboration teams on progress toward meeting implementation plan objectives and deliverables. Input from communities of practice will be received via the collaboration teams. Integrate across collaboration teams to facilitate progress toward objectives and deliverables.
- Address challenges and opportunities brought forward by collaboration teams and communities of practice.
- Evaluate, encourage, identify gaps and emerging research topics, and consider adjustments to implementation as necessary.
- Prepare reports on activities under the implementation plan and assist as requested with other IARPC reports, such as the report to Congress.
- Evaluate, and make recommendations regarding the development of, subsequent implementation plans.
- Provide implementation updates to the IARPC Staff Group as necessary.

Direction: The IARPC Principals and Staff Group provide direction on this implementation plan. The Principals provide policy direction, suggest adjustments for future implementation plans, and, when needed, approve official IARPC reports. The Staff Group facilitates agency engagement in designing and implementing objectives, addresses issues brought forth by the Implementation Plan Integration Group, approves updates to new objectives and deliverables, and reviews and clears drafts of official IARPC reports when needed.

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IARPC

Interagency Arctic Research Policy Committee

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