# U.S. ARCTIC RESEARCH PLAN:
# Intersection with BOEM Environmental Studies

This table is organized to display recent BOEM-directed research as it supports relevant Research Goals and Objectives outlined in IARPC's *Arctic Research Plan: 2017-2021* released in December 2016.

| BOEM Study | BOEM Partner(s) | BOEM Funding | Study Duration | Relationship to IARPC Performance Element |
|---|---|---|---|---|
| **Research Goal 1: Enhance Understanding of Health Determinants and Improve the Well-being of Arctic Residents** | | | | |
| **Research Objective 1.1:** Support integrative approaches to human health that recognize the connections among people, wildlife, the environment, and climate. | | | | |
| *Performance Element 1.1.2:* In collaboration with the ANTHC, support community-based monitoring and Indigenous Knowledge and Local Knowledge by maintaining and strengthening the Local Environmental Observer (LEO) Network to help describe connections between climate change, environmental impacts, and health effects. | | | | |
| AK-16-05 Community Based Monitoring: LEO Network | ANTHC | $400,000 | 2016-2021 | Supports continued maintenance and expansion of the LEO network to improve reporting from the North Slope and Cook Inlet and enhance the quality, rigor, and consistency of data collection. |
| *Performance Element 1.1.4:* Increase understanding of how both natural climate change and the effects of human activities are affecting the ecosystem by documenting observations of changing sea ice conditions, with implications for development and subsistence. | | | | |
| AK-13-03-16 Northern Alaska Sea Ice Project Jukebox<br>OCS Study BOEM 2018-027 | UAF-CMI | $60,663 | 2016-2018 | Documented personal observations and traditional knowledge about ice near Barrow and Kotzebue to assess what has changed and how the Iñupiat are adapting to the changes. |
| **Research Goal 3: Enhance Understanding and Improve Predictions of the Changing Arctic Sea Ice Cover** | | | | |
| **Research Objective 3.1:** Conduct coordinated/integrated atmosphere-ice-ocean observations and research to understand the processes that determine the spatial and temporal variation of the thickness, extent, and volume of sea ice and their effects on atmosphere-ice-ocean interactions and feedbacks over multiple time scales (hourly, daily, weekly, seasonal, inter-annual, decadal). | | | | |
| *Performance Element 3.1.1:* Support investigator-driven observations and process studies of the pack ice (e.g., ice thickness distribution, topography/surface roughness and strength; ice motion and deformation; snow depth distribution and melt pond characteristics; surface albedo and energy balance) and landfast ice (e.g., extent, stability, and break-up). | | | | |
| AK-13-03-07 Development and Testing of a Low-Cost Satellite-Tracked Ice Drifter for Arctic Waters<br>OCS Study BOEM 2017-079 | UAF-CMI | $243,286 | 2014-2018 | Deployed drifters on landfast and mobile pack ice to develop new information on the fate of landfast ice in the Chukchi and Beaufort seas. |
| AK-13-03-17 Measuring Wave Forces along Alaska's Coastal Sea Ice | UAF-CMI | $311,392 | 2016-2019 | Improve understanding of wave energy propagation into sea ice, and determine its effect on landfast ice stability along the Chukchi coast. |
| *Performance Element 3.1.5:* Use multiple remote sensing data sets to: (1) investigate sea ice properties and processes and atmosphere-ice-ocean interactions; and (2) develop algorithms for automated ice edge detection and delineation of the marginal ice zone, landfast ice extent, ice classification (e.g., age/type of ice, melt ponds, floe size), and ice motion and deformation. | | | | |

| BOEM Study | BOEM Partner(s) | BOEM Funding | Study Duration | Relationship to IARPC Performance Element |
|---|---|---|---|---|
| AK-19-03 Landfast Ice in the Beaufort and Chukchi Seas | | | 2019-2023 | This new study will develop protocols to analyze satellite data and develop and maintain a landfast ice climatology database for the Beaufort and Chukchi seas. |
| *Performance Element 3.1.6:* Develop and deploy new technologies that enable persistent data collection on a variety of environmental variables using mobile platforms and sensors operating above, on, in, and under the Arctic sea ice cover to support a framework of observations that will improve forecasting and prediction of sea ice. | | | | |
| AK-13-03-17 Measuring Wave Forces along Alaska's Coastal Sea Ice | UAF-CMI | $311,392 | 2016-2019 | Improve understanding of wave energy propagation into sea ice, and determine its effect on landfast ice stability along the Chukchi coast. |
| AK-19-03 Landfast Ice in the Beaufort and Chukchi Seas | | | 2019-2023 | This new study will develop protocols to analyze satellite data and develop and maintain a landfast ice climatology database for the Beaufort and Chukchi seas. |
| *Performance Element 3.1.7:* Investigate Arctic Ocean processes, interactions and feedbacks that affect the dynamics and thermodynamics of the sea ice cover, including ocean circulation and stratification, turbulence and mixing, horizontal and vertical heat transport, and freshwater transport and storage. | | | | |
| NT-13-05 Marine Arctic Ecosystems Study (MARES): A Multi-Agency NOPP Partnership | NOPP | $5.32M | 2015-2020 | Describing ocean currents at different depths along the Beaufort Sea continental shelf, including the biogeochemical-physical interactions and feedback processes in ice free and ice covered areas. |
| AK-12-03a Characterization of the Circulation on the Continental Shelf Areas of the Northeast Chukchi and Western Beaufort Seas<br>OCS Study BOEM 2017-065 | CESU-UAF | $5,06M | 2012-2018 | Characterized the flow regimes and surface water exchange among areas of the inner and outer Chukchi shelf and the western Beaufort shelf under varying conditions of wind forcing and sea ice coverage. |
| AK-17-01 Wave and Hydrodynamic Modeling in the Nearshore Beaufort Sea | CESU-UAF; USGS | $2.12M | 2017-2022 | Using observations and a coupled ocean-wave model to obtain a better understanding of the physical processes related to wave conditions and their effects within Stefansson Sound in the Beaufort Sea. |
| AK-19-03 Landfast Ice in the Beaufort and Chukchi Seas | | | 2019-2023 | This new study will evaluate how changes in landfast ice relate to local and regional changes in temperature, pressure, and major storms. |
| **Research Objective 3.2:** Improve models for understanding sea ice processes and for enhanced forecasting and prediction of sea ice behavior at a range of spatial and temporal scales. | | | | |
| *Performance Element 3.2.1:* Support investigator-driven modeling studies designed to understand and parameterize key sea ice properties and processes, including ice thickness distribution, topography, and strength; ice motion, deformation and mechanics; snow depth distribution and melt pond characteristics; surface albedo and energy balance; and biogeochemistry. | | | | |
| AK-15-02 Development of a Very High-resolution Regional Circulation Model of Beaufort Sea Nearshore Areas<br>OCS Study BOEM 2018-018;<br>OCS Study BOEM 2018-007 | CESU-Rutgers University; UAF | $489,735 | 2015-2018 | Developed an updated coupled ice-ocean circulation model of the Arctic Ocean, including nested domains for high-resolution computations on the Beaufort Sea shelf. |
| AK-19-03 Landfast Ice in the Beaufort and Chukchi Seas | | | 2019-2023 | This new study will produce data that will support verification and validation of sea ice models. |

| BOEM Study | BOEM Partner(s) | BOEM Funding | Study Duration | Relationship to IARPC Performance Element |
|---|---|---|---|---|
| AK-17-01 Wave and Hydrodynamic Modeling in the Nearshore Beaufort Sea | CESU-UAF; USGS | $2.12M | 2017-2022 | Using observations and a coupled ocean-wave model to obtain a better understanding of the physical processes related to wave conditions and their effects within Stefansson Sound in the Beaufort Sea. |
| *Performance Element 3.2.2:* Enhance operational sea ice forecasting and research-oriented prediction capabilities through improvements to model physics (explicit and parameterized); initialization techniques; assimilation of observations, including newly available and future data sources such as VIIRS, AMSR2, CryoSat-2, SMOS, and ICESat-2; model evaluation and verification; evaluation of model skill, post-processing techniques and forecast guidance tools used in operational forecasts and decision support. | | | | |
| AK-15-02 Development of a Very High-resolution Regional Circulation Model of Beaufort Sea Nearshore Areas<br>OCS Study BOEM 2018-018; OCS Study BOEM 2018-007 | CESU-Rutgers University; UAF | $489,735 | 2015-2018 | Contributed to advancement of predictive capabilities for sea ice in ocean circulation models. |
| **Research Goal 4: Increase Understanding of the Structure and Function of Arctic Marine Ecosystems and Their Role in the Climate System and Advance Predictive Capabilities** | | | | |
| **Research Objective 4.1:** Increase knowledge on the distribution and abundance of Arctic marine species across all trophic levels and scales, including an improved understanding of the formation and maintenance of biological hotspots and proximate causes of shifts in range. | | | | |
| *Performance Element 4.1.1:* Continue distribution and abundance surveys of Arctic marine species, for example, concurrent monitoring of polar bears and their ice seal prey. | | | | |
| AK-11-05 Synthesis of Arctic Research (SOAR): Physics to Marine Mammals in the Pacific Arctic<br>OCS Study BOEM 2018-017 | NOAA-PMEL | $1.79M | 2011-2018 | Used a synthesis approach to increase scientific understanding of the relationships of oceanographic conditions, lower trophic prey species and marine mammal distribution and behavior in the Pacific Arctic. The project included development of the Arctic Marine Pulses (AMP) model was developed that depicts seasonal biophysical 'pulses' across a latitudinal gradient by linking processes across contiguous ecological domains. |
| AK-12-04 U.S.-Canada Transboundary Fish and Lower Trophic Communities<br>OCS Study BOEM 2017-034 | UAF; DFO Canada | $5.19M | 2012-2018 | Documented baseline fish and invertebrate species presence, abundance, distribution and biomass. |
| AK-12-07 Arctic Whale Ecology Study (ARCWEST): Use of the Chukchi Sea by Endangered Baleen and Other Whales<br>OCS Study BOEM 2018-022 | MML | $4.60M | 2012-2017 | Assessed spatial and temporal patterns of use of the Chukchi Sea by endangered bowhead, fin and humpback whales, and beluga and gray whales and evaluated ecological relationships for the species. |
| AK-13-02 Chukchi Acoustic, Oceanography and Zooplankton Study: Hanna Shoal (Extension of CHAOZ)<br>OCS Study BOEM 2018-008 | MML | $3.93M | 2013-2019 | Assessed the spatial and temporal distribution of marine mammals near Hanna Shoal and the extent that environmental conditions such as sea ice, oceanic currents, water temperature and salinity, and prey abundance influence whale distribution and relative abundance. |

| BOEM Study | BOEM Partner(s) | BOEM Funding | Study Duration | Relationship to IARPC Performance Element |
|---|---|---|---|---|
| AK-13-06 Walrus Seasonal Distribution and Habitat Use in the Eastern Chukchi Sea | USGS | $1.69M | 2013-2018 | Evaluating seasonal abundance, distribution, and habitat use of walruses in the Chukchi Sea. |
| AK-16-07 Arctic Integrated Ecosystem Survey, Phase II | NOAA; UAF; USFWS | $2.50M | 2017-2022 | Quantifying the distribution, abundance, and condition of fishes, shellfishes, and seabirds throughout the U.S. shelf waters of the Chukchi Sea and Western Beaufort Sea. |
| AK-17-03 Marine Bird Distribution and Abundance in Offshore Waters | USFWS | $500,000 | 2017-2021 | Using long-term surveys to determine seabird spatial distribution, species composition, and seasonal changes in species abundance in the Arctic. |
| AK-16-01 Aerial Surveys of Arctic Marine Mammals (ASAMM) | MML | $11.44M | 2016-2019 | Long-term surveys to document the distributions and relative densities of marine mammals in the Chukchi Sea and Beaufort Sea Planning Areas. |
| AK-16-06 Estimation of Abundance and Demographic Rates of Pacific Walruses Using a Genetics-based Mark-Recapture Approach | USFWS | $250,000 | 2016-2019 | Estimating annual abundance of walruses for evaluation of population status and trends by applying mark-recapture analytical techniques to biopsy samples. |
| *Performance Element 4.1.2:* Continue studies to document Arctic marine species biodiversity (e.g. Arctic Marine Biodiversity Observation Network—AMBON—and programs that monitor loss of sea ice) and habitat use in the Arctic. | | | | |
| AK-15-01 Initiating an Arctic Marine Biodiversity Observing Network (AMBON) for Ecosystem Monitoring | NOPP; NOAA; UAF | $1.75M | 2015-2020 | Examining influences of sea ice dynamics on the phenology, distribution, and life history of upper trophic predators in response to availability of lower trophic prey resources; and improving knowledge about rates of consumption, growth, and reproduction of benthic and pelagic organisms. |
| AK-16-02 Collaboration with North Pacific Research Board (NPRB) Arctic Marine Research Program | NPRB | $1.00M | 2016-2021 | Provides support for NPRB's Arctic Integrated Ecosystem Research Program, including coordination among the ASGARD and Arctic IES (AK-16-07) components. |
| AK-16-07 Arctic Integrated Ecosystem Survey, Phase II | NOAA; UAF; USFWS | $2.50M | 2017-2022 | Quantifying the distribution, abundance, and condition of fishes, shellfishes, and seabirds throughout the U.S. shelf waters of the Chukchi Sea and Western Beaufort Sea. |
| *Performance Element 4.1.3:* Assess winter distributions of key Arctic species, via passive acoustic sampling and satellite tagging for marine mammals to include further development of autonomous, unmanned surface and underwater vehicles equipped with sensors capable of recording marine mammal vocalizations. | | | | |
| AK-12-02 Satellite Tracking of Bowhead Whales: Habitat Use, Passive Acoustic and Environmental Monitoring | ADF&G | $2.70M | 2012-2019 | Deployed satellite transmitters with environmental and passive acoustic monitoring capabilities to track the movements and document the behavior of bowhead whales. |
| AK-12-07 Arctic Whale Ecology Study (ARCWEST): Use of the Chukchi Sea by Endangered Baleen and Other Whales OCS Study BOEM 2018-022 | MML | $4.60M | 2012-2017 | Used passive acoustic monitoring to assess spatial and temporal patterns of use of the Chukchi Sea by endangered bowhead, fin and humpback whales, and beluga and gray whales. |

| BOEM Study | BOEM Partner(s) | BOEM Funding | Study Duration | Relationship to IARPC Performance Element |
|---|---|---|---|---|
| AK-13-02 Chukchi Acoustic, Oceanography and Zooplankton Study: Hanna Shoal (Extension of CHAOZ)<br>OCS Study BOEM 2018-008 | MML | $3.93M | 2013-2019 | Used passive acoustic monitoring to assess spatial and temporal distribution of marine mammals near Hanna Shoal. |
| **Research Objective 4.3:** Advance the understanding of how climate-related changes, biophysical interactions, and feedbacks at different scales in the marine ecosystems impact Arctic marine resources and human communities that depend on them. | | | | |
| *Performance Element 4.3.1:* Continue Distributed Biological Observatory (DBO) sampling in regions 1-5 and make data publicly available through upload of metadata to the Earth Observing Laboratory/DBO data portal. | | | | |
| AK-16-07 Arctic Integrated Ecosystem Survey, Phase II | NOAA;<br>UAF;<br>USFWS | $2.50M | 2017-2022 | Quantifying the distribution, abundance, and condition of fishes, shellfishes, and seabirds throughout the U.S. shelf waters of the Chukchi Sea and Western Beaufort Sea. |
| *Performance Element 4.3.4:* Continue research and make simultaneous observations of biological, chemical, and physical variables to examine linkages among marine species, oceanographic and sea ice conditions, and climate change to understand the mechanisms that affect performance and distribution. Quantify feedbacks and interactions of bottom-up and top-down processes that regulate production. | | | | |
| AK-11-03 Hanna Shoal Ecosystem Study<br>OCS Study BOEM 2016-047 | CESU-UT | $5.69M | 2011-2018 | Examined important chemical, physical and biological interactions with the unique ecological regime in the highly productive area of Hanna Shoal. |
| AK-13-02 Chukchi Acoustic, Oceanography and Zooplankton Study: Hanna Shoal (Extension of CHAOZ)<br>OCS Study BOEM 2018-008 | MML | $3.93M | 2013-2019 | Assessed the spatial and temporal distribution of marine mammals near Hanna Shoal and the extent that environmental conditions such as sea ice, oceanic currents, water temperature and salinity, and prey abundance influence whale distribution and relative abundance. |
| AK-16-02 Collaboration with North Pacific Research Board (NPRB) Arctic Marine Research Program | NPRB | $1.00M | 2016-2021 | Provides support for NPRB's Arctic Integrated Ecosystem Research Program, including coordination among the ASGARD and Arctic IES (AK-16-07) components. |
| AK-16-07 Arctic Integrated Ecosystem Survey, Phase II | NOAA;<br>UAF;<br>USFWS | $2.50M | 2017-2022 | Quantifying the distribution, abundance, and condition of fishes, shellfishes, and seabirds throughout the U.S. shelf waters of the Chukchi Sea and Western Beaufort Sea. |
| AK-19-01 Impacts of Sedimentation and Drivers of Variability in the Boulder Patch Community, Beaufort Sea | | | 2019-2022 | This study will conduct a monitoring program to examine long-term drivers of community variability during activities at the Liberty Development. |
| NT-13-x11 WALRUS – Walrus Adaptability and Long-term Responses; Using multi-proxy data to project Sustainability | NSF | $200,000 | 2013-2019 | Tracking changes in walrus trophic position, foraging location, and genetic structure and diversity over the past 2500 years using multi-proxy datasets. |
| *Performance Element 4.3.7:* Continue development, testing, and runs of prognostic models that use Intergovernmental Panel on Climate Change (IPCC) scenarios in a regional context to explore current understanding of biophysical interactions and feedbacks, such as perturbations across several modeled food webs from the subarctic to the Arctic to estimate relative ecosystem sensitivities and rates of change. | | | | |

| BOEM Study | BOEM Partner(s) | BOEM Funding | Study Duration | Relationship to IARPC Performance Element |
|---|---|---|---|---|
| AK-11-05 Synthesis of Arctic Research (SOAR): Physics to Marine Mammals in the Pacific Arctic<br>OCS Study BOEM 2018-017 | NOAA-PMEL | $1.80M | 2011-2018 | This synthesis project included a component that examined sea-ice cover timing in the Pacific Arctic based on IPCC scenarios. |
| **Research Goal 8: Strengthen Coastal Community Resilience and Advance Stewardship of Coastal Natural and Cultural Resources by Engaging in Research Related to the Interconnections of People, Natural, and Built Environments** | | | | |
| **Research Objective 8.1:** Engage coastal communities in research to advance knowledge on cultural, safety, and infrastructure issues for coastal communities. | | | | |
| *Performance Element 8.1.1:* Engage coastal community members in research by seeking cooperative opportunities between community members, IK holders, and/or LK holders, and researchers in knowledge co-production research processes. Employ IK and/or LK to jointly conceive of and plan research activities and to report research results back to communities. | | | | |
| AK-15-05 Traditional Knowledge Implementation: Accessing Arctic Community Panels of Subject Matter Experts | NSB-DWM | $359,470 | 2016-2020 | Develops panels of subject matter experts to systematically incorporate Traditional (Indigenous) Knowledge from community members through co-production of knowledge and sharing with western scientists. |
| *Performance Element 8.1.2:* Engage coastal community members in research by supporting community-based monitoring focused on measuring physical and biotic information by strengthening initiatives led by groups such as the Arctic-focused LCCs, BOEM, NOAA, and FWS. | | | | |
| AK-19-04 Monitoring of the Cross Island Subsistence Whale Hunt for Effects from Liberty DPP | | | 2019-2024 | |
| AK-17-01 Wave and Hydrodynamic Modeling in the Nearshore Beaufort Sea | CESU-UAF; USGS | $2.12M | 2017-2022 | Involving local community members in collecting ocean observations. |
| **Research Goal 9: Enhance Frameworks for Environmental Intelligence Gathering, Interpretation, and Application toward Decision Support** | | | | |
| **Research Objective 9.4:** Enhance availability, discoverability, understanding, and interoperability of Arctic data and tools across Federal data centers. | | | | |
| *Performance Element 9.4.4:* Advance agile situational awareness and decision support for Arctic operators through efforts like ADAC's Arctic Information Fusion Capability28, ERMA, and NASA ACE project. | | | | |
| AK-12-03b Arctic Tracer Release Experiment (ARCTREX): Applications for Mapping Spilled Oil in Arctic Waters<br>OCS Study BOEM 2017-062 | BSEE; UAF | $1.25M | 2013-2018 | Tested the ability of available observational technology to sample a simulated oil spill in the Chukchi Sea and to transmit data to NOAA's Arctic Environmental Response Management Application (ERMA). |