



Traditional Alaska Native boats, or umiaks, outside the community of Pt. Hope. A subsistence way of life defines culture and identity in these remote communities on the shores of the Beaufort and Chukchi seas.

A photograph of a coastal landscape. In the foreground, a large, weathered wooden post stands vertically, with a horizontal beam attached to it. To the left, a piece of white fabric or plastic is draped over the structure. In the background, a fence runs across the middle ground, and a small, simple wooden structure with a green tarp roof is visible. The sky is a mix of blue and white clouds, suggesting a clear but slightly overcast day. The overall scene is a mix of natural and man-made elements, likely related to coastal research or traditional knowledge.

Expanding Our Tool Kit

Traditional
Knowledge
& Ocean
Research

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Figure 1: BOEM representatives, Dr. Jill Lewandowski (second from left), Keely Hite (centre), and Tamara Sadoo (right), review a map with Alaska Native residents of Kotzebue, Alaska. Alaska Native communities depend heavily on subsistence hunting and fishing activities. BOEM routinely consults with residents regarding ongoing and proposed projects on the Outer Continental Shelf that could affect subsistence activities.

When governmental agencies engage Alaska Native Peoples in resource management, they encounter knowledge and belief systems far different from their own. Whether aware of it or not, the collaborators find themselves in an alternative management space in which there are more tools available than usual. A key component of this enhanced collaborative space is the traditional knowledge of Alaska Native Peoples, which can be used to improve decision making (see sidebar Definition).

By incorporating Alaska Native Peoples' generational knowledge, technology, and experience, resource managers and researchers can expand their own tool kits beyond their contemporary science, technology, and expertise. The tool kits of each partner are different because they have different perspectives of how people interact with natural resources. The tool kits take different forms, and the partners apply them in different ways. Nonetheless, two tool kits are better than

one. The partners are most successful when they collaborate, share knowledge, and learn from one another how to best use all available tools to responsibly manage resources.

The United States Bureau of Ocean Energy Management (BOEM) applies traditional knowledge throughout its comprehensive management and decision making process (see sidebar Decision Making). This essay discusses how BOEM engages with Alaska Native Peoples and incorporates their traditional knowledge to responsibly study and manage the energy and mineral resources of the Outer Continental Shelf (see sidebar BOEM Mission). While the essay focuses on BOEM's work with the Iñupiat living in the Arctic region of Alaska, the insights we discuss apply to all aspects of our work with Alaska Native Peoples and to other regions of Alaska. This essay presents examples of how we use technology and traditional knowledge in collaborative research.

Traditional Knowledge and Ocean Research

For more than 20 years, BOEM has actively sought ways to incorporate traditional knowledge into decision making. We rely on the traditional knowledge of our Alaska Native partners when implementing our collaborative research. We use a wide variety of methods, including ethnographic and biological fieldwork, workshops, household surveys, wildlife tagging and tracking studies, and mapping and monitoring Indigenous harvest of fish and wildlife. We design our studies to listen to, and show respect for, community input; establish trusting relationships with local leaders and institutions; involve local experts in research design; and include traditional knowledge (Figure 1).

As BOEM's research process evolved, we expanded our work with Alaskan Native Peoples to not only identify information needs but to also modify scientific protocols and incorporate Alaska Native hunters and their traditional knowledge into our data collection and analyses. This brings traditional knowledge, and the people who hold it, into direct contact with the latest in ocean technologies. For example, working collaboratively with our Alaska Native partners, we have designed and sponsored studies using global positioning systems (GPS); satellite tagging and tracking systems; meteorological and oceanographic instrumentation; and acoustic soundscape analyses. Applying technology to environmental research comes naturally for Indigenous Peoples, who have often incorporated the latest advances in technology into their cultures and tool kits to ensure survival in the Arctic.

Whaling maintains the social relationships and the cultural identity of the Iñupiat owing to the communal nature of whale hunts and the widespread sharing of important foods produced from the harvest (Figure 2). Furthermore, whalers and elders widely accept that bowhead whales are sensitive to noise in the marine environment. Responsible

Definition

Traditional knowledge is a body of evolving practical knowledge based on observations and personal experience of local residents over an extensive, multi-generational time period. People express traditional knowledge in a specific place in the form of technical mastery or expertise that promotes physical and cultural survival and well-being. Local experts share traditional knowledge through kinship or household networks. There are different names for traditional knowledge, including Indigenous knowledge and local knowledge.



Decision Making

BOEM uses a systematic, interdisciplinary, and integrated approach for making decisions. The process is adaptive with multiple feedback loops that allow us to use new knowledge to adjust management decisions when appropriate. Our environmental research supports the process by designing, funding, and managing research projects in physical, biological, economic, and sociocultural disciplines. Over the years, the process has evolved to incorporate, to the extent practicable, science, technology, and traditional knowledge shared by Alaska Native peoples. For a detailed explanation of how BOEM uses both science and traditional knowledge in its decision making process, see our paper in *Czech Polar Reports* 7(2): 151-163, ASSW 2017 found at www.sci.muni.cz/CPR/14cislo/Kendall-ASSW_web.pdf.





Figure 2: Children observe as North Slope Borough biologists take measurements of a harvested bowhead whale in the community of Utqiagvik. Annual bowhead whale hunts play a central role in the culture of Utqiagvik and other coastal communities.

BOEM Mission

BOEM's mission is to manage the energy and mineral resources in waters of the United States Outer Continental Shelf (OCS) in an environmentally and economically responsible way. The OCS off the coast of Alaska encompasses more than one billion acres in the Beaufort Sea, Chukchi Sea, Bering Sea, Cook Inlet, and Gulf of Alaska. These are federal lands submerged under the ocean seaward of state boundaries, beginning 3 nautical miles off the coastline and extending for 200 nautical miles.



Traditional Knowledge

Discussions regarding traditional knowledge are often concerned with the integration of data rather than with the integration of experts into a meaningful resource management process. Those who manage public trust resources should strive to improve engagement with partners in their communities. Meaningful engagement involves building mutual trust through continual collaboration rather than periodic meetings. Managers, scientists, and traditional knowledge holders should work together to develop strategies designed to enhance recognition of the local perspective. Working to better incorporate traditional knowledge in the scientific and decision making processes requires unprecedented collaboration and communication among all partners.

management requires BOEM to understand and protect Indigenous whaling practices. Accordingly, BOEM designed a study with the whalers to explicitly examine the question of effects of vessel traffic on whaling. Our 12-year study included outfitting Beaufort Sea whalers from Nuiqsut, Alaska, with GPS units to record offshore hunting tracks, whale sightings, and whale strikes. These tracks were geospatially mapped and colour-coded by year. The study combined traditional knowledge with GPS track lines to document important whaling areas and other marine interests of the Iñupiat. The study also recorded length of whale hunts, offshore interactions of whalers with industrial and commercial vessels, and whale butchering practices. This allowed BOEM to focus on recording changes over time to better analyze trends that could be important in relation to future energy exploration and development. The results of our study allowed us to better identify the sources of noise that could affect whaling success. We used both scientific results and traditional knowledge to develop mitigation measures to reduce or avoid interfering with whaling.

In other research, BOEM is working with its partners to develop an ambient environmental soundscape and to monitor the behaviour of marine mammals. This effort involves the use of passive acoustic monitoring devices and the satellite tagging of whales and seals (Figure 3). While the technology itself is state-of-the-art, actually getting such devices onto marine mammals can be challenging: Alaska Native hunters are helping to attach the tags to the animals. This effort allows local hunters and biologists, both of whom have extensive experience with the animals, to complete the tagging work together.

We use other strategies to effectively incorporate traditional knowledge into biological studies. Scientists often work with local hunters to obtain stomach contents and tissue samples from harvested animals for feeding, genetics, and contaminant studies. Researchers have

Figure 3: An adult seal, from a BOEM study, with a head-mounted, satellite-linked, geo-locating data recorder in Kotzebue Sound, Alaska.



utilized the expertise of hunters to help collect biopsy samples for genetic analysis to estimate population size, population growth rate, age- and sex-specific survival rates, and recruitment of marine mammals.

For over four decades, BOEM has sponsored aerial surveys of marine mammals in the United States Arctic. The purpose of the surveys is to record distribution, relative abundance, and behaviour to better understand the potential effects from proposed industrial activities in offshore waters. Scientists take great care to avoid disturbing the animals during the surveys, including discussions with local hunters to avoid interfering with hunting activities. For example, planes used in monitoring studies avoid flying transects in areas where whaling is occurring to avoid disturbing the whales and the hunters.

BOEM uses geographic information system (GIS) technologies and other mapping tools for community-based education and documentation of traditional knowledge. Elders, community members, and youth review and discuss maps together. This allows elders to share stories related to the land, coast, animals, harvest activities, and their observations of change. Younger community members comment on how they see coastal resources in the future. BOEM also uses the mapping tools to identify and document areas along the coast and offshore that are important for Indigenous hunting and fishing.

Looking to the Future

Reflecting on the progress we have made in applying traditional knowledge and ocean science and technology allows us to envision future opportunities. One example is using unmanned aircraft systems to conduct marine mammal aerial surveys. This is an area of active research and development with several potential benefits, including more survey opportunities; sensors capable of capturing data in less than optimal light and weather conditions; and fewer safety risks for researchers.

Technological advances also allow for increased sampling and data collection in ice-covered areas and seasons. BOEM will continue to apply the traditional knowledge of its local partners in project design in this new frontier of scientific investigation (Figure 4). Our Alaska Native partners will continue to help us focus the timing and location of research to more quickly answer questions regarding the marine environment under the ice and provide details about key life stages of species dependent on sea-ice.

Expanded use of technology, including social media and web archives for posting of films, oral histories, and historic photographs, will help us share traditional knowledge with a broader audience. Web portals and phone apps provide wide-ranging opportunities for greater citizen participation in scientific data collection and interpretation. As with our previous and ongoing work, we will include our Alaska Native colleagues early in the process as we develop and implement new technologies for ocean research.

Lessons Learned

We have learned that traditional knowledge can often complement and expand our collective understanding of ocean resources. Consequently, it is important to allow local experts ample time and opportunity to review and guide environmental research throughout the process. Conducting community workshops and discussion panels with traditional knowledge experts early in the process can greatly improve research design. This practice allows BOEM to demonstrate respect for local expertise while discovering previously unrecorded observations and insights. These discussions can often lead to an improved synthesis of existing data and hypotheses that are more refined.

In Alaska Native communities, traditional knowledge is often part of a larger dialogue regarding trust and respect. When scientists consult with local experts, they often form trusting relationships and research partnerships.

Figure 4: Participants in a BOEM-sponsored study conduct research with a local sea-ice expert on shore-fast ice near Kotzebue, Alaska.



By working together and trusting one another, the partners are in a better position to validate interpretations and review the plausibility and credibility of emerging patterns in data. Local experts have helped us improve data analyses and interpretations by identifying alternative explanations not readily apparent to scientists. Moreover, our local partners often suggest additional variables to improve statistical analyses.

We have found that the traditional knowledge and cultural practices of Alaska Native Peoples provide important sources of information for studying and managing human activities in the marine environment. As our understanding of how to use traditional knowledge evolved under the mentorship of our Alaska Native colleagues, we learned to not become preoccupied with concerns over how or if traditional knowledge should be integrated with science. Instead, we treat traditional knowledge and science as distinct and complementary knowledge systems that can improve our research, decision making, and management of ocean resources (see sidebar Traditional Knowledge). BOEM would not have realized many of these improvements without being open to meaningful engagement with traditional knowledge holders. ~



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James (Jim) Kendall serves as the Regional Director of the Bureau of Ocean Energy Management's Alaska Outer Continental Shelf Region. Prior to moving to Alaska, Dr. Kendall served in research management positions in BOEM's Gulf of Mexico and

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