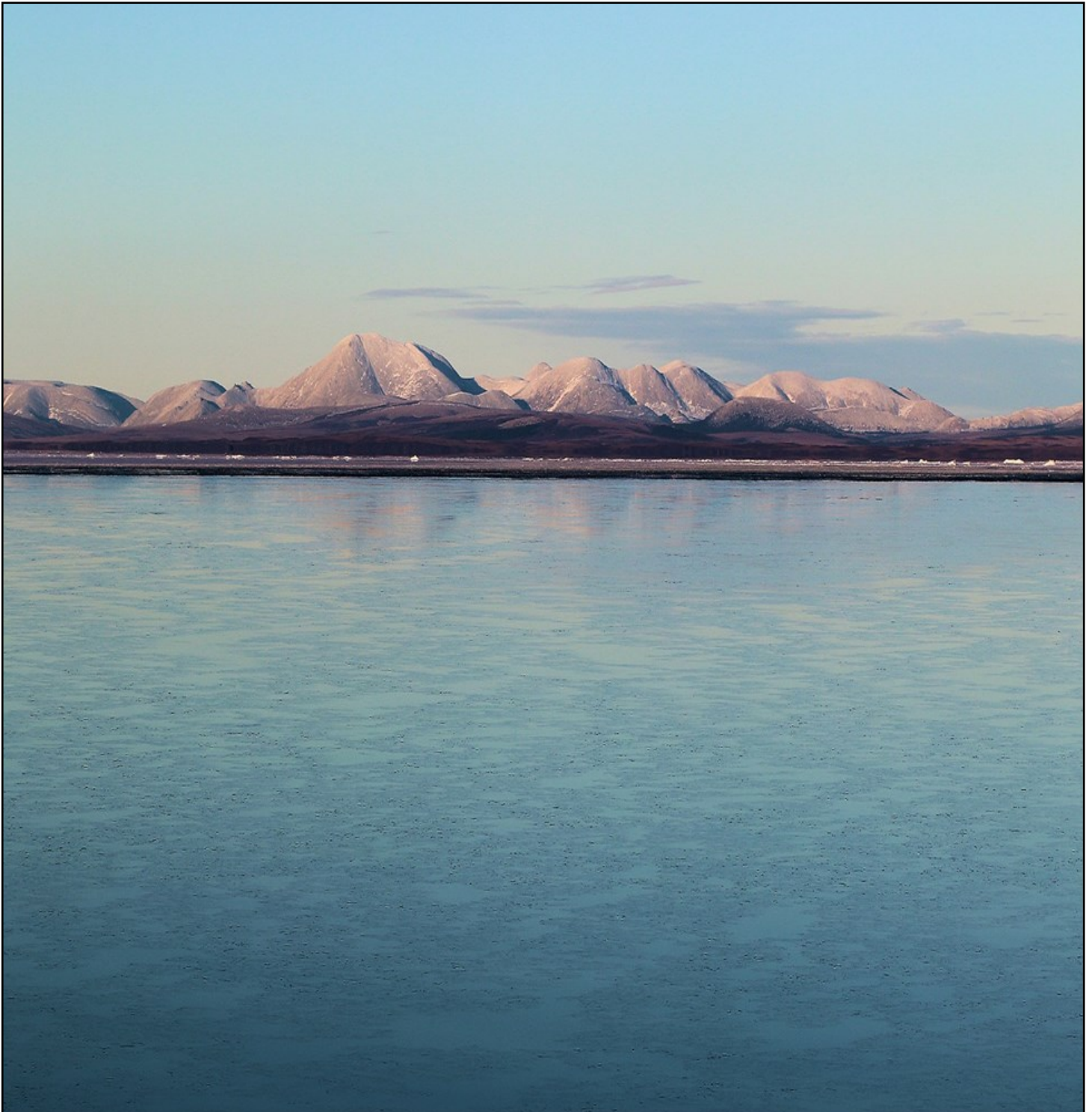


# **NATIVE VILLAGE OF KOTZEBUE ENVIRONMENTAL PROGRAM 1997 — 2022**

**Alex Whiting — Environmental Program Director**



*A view of Kotzebue Sound icing over from the beach at Kotzebue.*

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## COMMUNITY of KOTZEBUE

The community of Kotzebue is located in northwestern Alaska on the Baldwin Peninsula. Kotzebue's location was prehistorically known as Qikiqtagruk, or "place that is almost an island", and the Iñupiaq people living in the general area were the Qikiqtagrukmiut. For many generations, Qikiqtagruk and the nearby Sisualik Peninsula, has been a trading hub, bringing together tribal people from dispersed settlements and encampments across a large region that in the past included Bering Straits people and Chukchis from the Russian side, to exchange a wide variety of food resources, furs, and trade goods. The name Kotzebue was taken from Otto Von Kotzebue, who is credited with the historic recording of the Sound and the Baldwin Peninsula in 1818. During the 1800's there were occasional forays by whalers and others into Kotzebue Sound, many of whom brought European diseases such as measles and smallpox, that the locals had little resistance to. By the end of the 19th century, after great numbers of Iñupiaq had prematurely died, the Quakers sent missionaries to begin the process of building a permanent year-round community.

Kotzebue has a subarctic climate, with long cold winters, and short, mild summers. Freezing of the waters around Kotzebue begins in early October and breakup of the ice usually begins at the end of May. Monthly daily average temperatures range from  $-4^{\circ}$  F in February to  $55^{\circ}$  F in July, with an annual mean of  $22^{\circ}$  F. Days of above  $70^{\circ}$  F are not common, but can be expected for a few days per summer. Precipitation is both most frequent and greatest during the summer months, averaging 10 inches per year. Snowfall averages 40 inches a season. Extreme temperatures have ranged from  $-58^{\circ}$  F to  $85^{\circ}$  F.

Fur trapping and reindeer herding were major contributors to the monetary economy during the first half of the 20th Century, followed by commercial fishing, military installations, mining, government, retail, and transportation services during the second half of the 20th and into the 21st Century. The population of the community consists of approximately 3,300 persons, 77% are Alaska Native (mostly Iñupiaq), who depend on harvesting fish, wildlife and wild plants/berries for a large part of their nutritional needs. There are no roads linking the 11 communities in the region and travel is by airplane year round, with many small airlines providing flights to the villages and remote off airport sites and two flights a day with 737 Alaska Airlines jets to Anchorage and Nome. Boats and ATV's are commonly used during summer and snowmobiles and dog teams are used during winter.

Today, Kotzebue is still the regional hub and its central location provides a convenient and accessible location for supplying goods and services to the entire region. The community includes several offices of state and federal agencies and tribal organizations, a regional hospital, a regional airport, and alternatives for shopping and shipping for many smaller communities across the region. An electric cooperative formed in the 1950's continues to provide the main source of electricity to the community, while a lot of diesel fuel is still used to run the power plant, a transition to wind power has been ongoing since the late 1990's. The current wind farm is made up of 17 turbines with a maximum capacity of 1.14MW with additional upgrades planned to increase the capacity of the wind farm beyond KEA's peak electrical needs. Most home heating is currently with diesel fuel, although some homes burn tree wood, or wooden pallets.

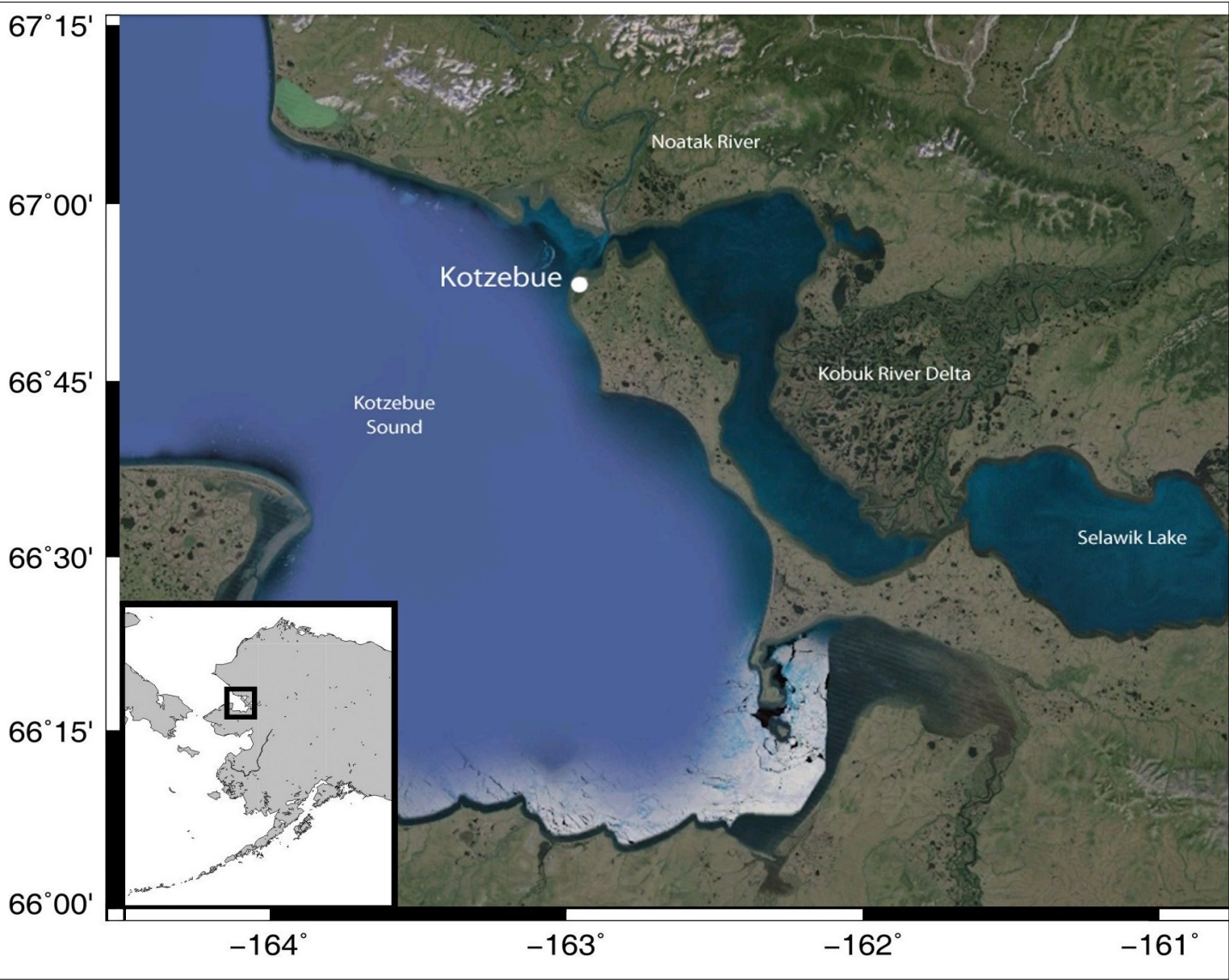


*Aerial view of the community of Kotzebue.*

Access to Kotzebue Sound was traditionally important for providing Qikiqtagruṃmiut with critical concentrated calories in the form of fish and especially marine mammal food products, in addition to providing light and heat during the long winter season from seal, walrus, and beluga oil. Seal oil remains a culturally important food with valuable characteristics that range from reaffirming Iñupiaq identity, to making dried fish more palatable. Even people living far inland made efforts to obtain marine resources for the dense energy they provided. While obtaining light and heat for houses from marine mammal oil is no longer necessary; efficient, cost effective local production of high quality protein, fats, and other nutrients is as important as ever. Today, the prominent role of locally harvested marine resources in the food economy continues, as the recent harvest survey of the Native Village of Kotzebue citizenship makes clear. It showed that the fish and marine mammals caught in Kotzebue Sound account for approximately 70 percent of the total annual wild food harvest.

**GEOGRAPHICAL DESCRIPTION**

Kotzebue is located on the northwest portion of the Baldwin Peninsula, with a lagoon positioned on the east side of the community and northern Kotzebue Sound on the west side, the community itself is almost an island with the narrowest point around an 1/8 of a mile, which is the reason it was named Qikiqtagruk, or “place that is almost an island,” by the original Iñupiaq inhabitants.



There are three major rivers that flow into Kotzebue Sound – the Noatak from the north, the Kobuk River from the east, and the Selawik River from the southeast. None of these rivers have major development projects on them and for the most part could be considered wild, as are all of their tributaries. However, there are villages located along these rivers, including: Kiana, Noorvik, Ambler, Shungnak and Kobuk on the Kobuk River; Noatak on the Noatak River; and Selawik on the Selawik River.



Qikiqtagruṃmiut use all these rivers and surrounding countryside for subsistence camping, fishing, hunting, and gathering and visiting friends and relatives living in the villages, however the core camping and subsistence area for the Qikiqtagruṃmiut is the same as it has been traditionally and that is the beachfront of northern Kotzebue Sound, the Baldwin Peninsula, and the lower Noatak, and Kobuk Rivers.



While a lot of the area around Kotzebue is composed of low lying treeless tundra, spruce trees do line the major river drainages and the foothills of the Brooks Range (with elevations up to 4,400 feet), begin rising just north of Kotzebue. The northern Sound and beaches are comprised of small gravel and sand/silt, with small changes in tide range. The wind is the main driver of water height during the open water period and major high-water flooding occurs about once every ten years or so, however the community of Kotzebue has not been entirely flooded in the modern era, only the east side of town has been inundated during extreme high water events due to strong winds and rain from the southwest.

### **SUBSISTENCE RESOURCES**

People still rely heavily on the fish, wildlife, and plants found in the area for their nutritional, economic, cultural, and spiritual needs. Many of the resources occur in great abundance near Kotzebue, although their occurrence is generally not year-round, but seasonal, due to the migratory nature of most. Caribou, moose, muskox, Dall's sheep and black bears are the large terrestrial mammals that are hunted for meat, with caribou being the most sought after and most numerous. In recent years the caribou population has fallen from its peak of over half a million, but a quarter of a million animals still occur in the Western Arctic Caribou Herd, which migrates within the vicinity of Kotzebue on most years during the fall and again in the spring. Grizzly bears are also very common, but mostly hunted for their hides these days.





Many smaller mammals also occur and are hunted and trapped for food, fur to make clothing, or to sell for personal income. These include: wolf, wolverine, otter, marten, mink, ermine, beaver, muskrat, arctic fox, red fox, arctic ground squirrel, hoary marmot, lynx, snowshoe hares and Alaska hares.

While only a few bird species are present during the long winter, with ravens and ptarmigan being the most abundant, in the spring the tundra comes alive with breeding flocks of waterfowl, seabirds, shorebirds, raptors and song birds. Geese, ducks, cranes and swans are the most commonly hunted for food in the spring and fall, while ptarmigan and the occasional snowy owl are caught for food during the long winter. Gathering eggs of waterfowl and seabirds remains an important contribution to the diet during the months of May and June, with thousands of eggs being collected every spring from the grassy islands and marshy coastal flats, especially those of the seagulls.

Plants are also gathered in large quantities, with young willow leaves being picked to store in seal oil, and sourdock leaves being picked, cooked, mashed and mixed with berries to be eaten with sugar and/or seal oil. However, berries rule the plant harvest, and untold multitudes cover the landscape in late summer, including: cloudberries, crowberries, blueberries and cranberries, being especially sought after, with many families gathering upwards of 20 -50 gallons, or more, each summer.



Marine mammals remain very important and central to the cultural identity of Kotzebue people. Beluga whales, walrus, and bearded, ringed and spotted seals, are all commonly harvested for their meat and oil. Seal oil especially, is still used as a daily condiment for many families, and is eaten with a wide variety of foods, but is especially desired when eating dried meat and fish, which are a common staple. It is also used to store dried meat and fish in to keep them moist, soft, flavorful and ready to eat. Seal skins are used for utilitarian purposes like making rope and the prettier skins are tanned with traditional methods or commercially, for making into garments, like hats, parkas, and maklaks.





Many fish species occur in the area, although they are all migratory in nature and are found throughout the year in various states of abundance. Fishing with gillnets in open water and under the ice, in addition to using hand held wooden jigging sticks to catch fish individually through the ice, are the most common methods for taking quantities of fish. Large sheefish especially are very abundant near Kotzebue during winter and many thousands are netted and caught with hand jigs. Chum salmon, Dolly Varden char, sheefish and whitefish are taken with gill nets during the open water season and are cooked, frozen, smoked, or dried outside on fish racks. King, silver, pink and sockeye salmon do occur and are caught in gill nets, but only in small numbers. Herring and rainbow smelt are snagged or caught in cast nets right after spring breakup for frying, baking or pickling. Saffron cod, arctic cod, rainbow smelt, and sheefish are all caught under the ice with nets or by jigging.

## **LOCAL and REGIONAL ACTORS**

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Many organizations and institutions are based in Kotzebue to serve the region. The two largest in scope and regional influence are the NANA Regional Corporation and the Northwest Arctic Borough. NANA is the regional for-profit corporation formed under the 1971 Alaska Native Claims Settlement Act (ANCSA) passed by Congress to deal with the land claims of the Alaska native people after Statehood, when the State and oil industry were interested in claiming land in Alaska for development purposes. Almost all of the Kotzebue tribal citizens that were alive at the time ANCSA was passed are shareholders in NANA and many afterborns (those born after the Act was passed in 1971) are also shareholders, after a vote was taken by the shareholders to include afterborns. Kikiktagruk Iñupiat Corporation (KIC) is the village for-profit corporation for the people of Kotzebue also formed under ANCSA. Kotzebue was the only village in the region to form a village ANCSA Corporation, all the other villages merged with the NANA Regional Corporation. The majority of Native Village of Kotzebue tribal citizens alive at the time of the passage of the Act are also citizens of KIC, although they have yet to include afterborns.

The Northwest Arctic Borough (NAB) was formed in 1986 as a home rule borough, in order for the local communities to collectively tax the developing Red Dog mine to pay for public services. Geographically, the borough area is roughly the size of the state of Indiana. With about 36,000 square miles of land and 3,560 miles of shoreline, the NAB is the second largest borough in the state, the largest being the North Slope Borough. Roughly 7,500 people in eleven communities call the NAB home. More than eighty percent of residents are Iñupiaq. The NAB helps support education and fund capital improvement projects. The Borough's three main departments are Planning, Public Services and Economic Development. Additionally, through a nonprofit corporation, the NAB subsidizes the Sulainich Art Gallery, which promotes traditional Native arts and crafts as a reliable source of income for residents. Recently, the NAB had a research funding program through an agreement with Shell Oil in December 2013. Under this agreement, they convened a Science Symposium in April 2014 and created a Science Office at the NAB to work in conjunction with a Science Steering Committee (SSC) made up of village, NGO, and Shell representatives to prioritize research needs, solicit research proposals and award funding related to the OCS development activities that Shell was pursuing. The Native Village of Kotzebue village representative on the SSC was their Environmental Director Alex Whiting. The Science Department and SSC was discontinued in fall 2015 when Shell Oil pulled out of their Alaska operations after a disappointing (in their view) Chukchi Sea OCS exploration effort.

Maniilaq Association was formed in 1966 to help settle Alaska native land claims issues and became an advocate for all native issues, including health, housing, and political rights. Maniilaq Association is now the regional non-profit tribal corporation representing the eleven federally-recognized tribes in Northwest Alaska and also includes Pt. Hope. They are empowered through tribal resolution to provide services to the Tribes. Maniilaq provides health and social services for the residents, running the Indian Health Service (IHS) hospital programs and services in the Maniilaq Medical Center. Maniilaq also coordinates tribal and traditional assistance programs, and environmental and subsistence protection services. In addition, they support a Traditional Foods Program, which provides traditional foods for Elders in the region. These foods are obtained by providing fuel and ammunition to hunters in each village that participate in the program. Foods like caribou, seal, and seal oil are the preferred food of the Elders in the region. They are also a lot healthier than the western store-bought choices, which are expensive and not always available in the villages in any event. Maniilaq began participating in the USEPA Indian General Assistance Program (IGAP) during the same year as the Native Village of Kotzebue, in 1997.

The City of Kotzebue is the local entity organized under the State of Alaska that runs public services for the residents of the community. The boundaries of the city encompass the entire town itself and the watershed for the drinking water source, which is an above ground lake. Their public works department takes care of wastewater, water delivery, waste management (including a baler facility and a landfill), police and fire departments. They also enforce a Municipal Code that includes waste management practices.

All villages have an Elders Council and along with a Regional Elders Council, they share their wisdom and insights with the Tribes and communities on the relevant topics of the day.



## **NATIVE VILLAGE of KOTZEBUE**

The Native Village of Kotzebue, commonly referred to as the Kotzebue IRA, is a Federally Recognized Tribe formed in 1939 under the Indian Reorganization Act and is the tribal government serving 3,300 Iñupiaq citizens. Its service area is essentially the area of Kotzebue Sound that was the traditional homeland of the Qikiqtagruṃmiut (see map above on page 5). It compacts with the US Bureau of Indian Affairs to provide trust services like Realty, Probates, Education, Vocational Training, Employment Assistance, Indian Child Welfare services, General Assistance, Burial Assistance, Food Assistance, Housing Assistance, NAGPRA, and Transportation funding. It also runs a summertime culture camp, an afterschool culture program, and an Iñupiaq Language Immersion School for preschoolers.

The Tribal Council is made up of seven tribal citizens elected at the annual meeting to serve staggered three-year terms, with an additional seat reserved for an Elders Council Representative and a Youth Representative. The Executive Director is responsible for administration of all Tribal programs and coordinates with all department directors on their specific program and the administrative needs. The Environmental Program has one full time staff person to accomplish the objectives of the program. The Environmental Director (ED) is considered a Director and reports directly to the Executive Director. The ED has been the same for the twenty years the Tribe has had the IGAP funding.

Because of its proven ability to administer federal programs, the Tribe received compacting status from BIA in 97/98. Annual audits since then by independent auditors have commended the Tribes Accounting Department for accuracy, quality standard of filing and timeliness of reports. A clean audit with an unqualified report has been issued to the Tribe each year. The Tribes yearly budget averages \$2,000,000.00, 90% of these funds come from the Federal Government.

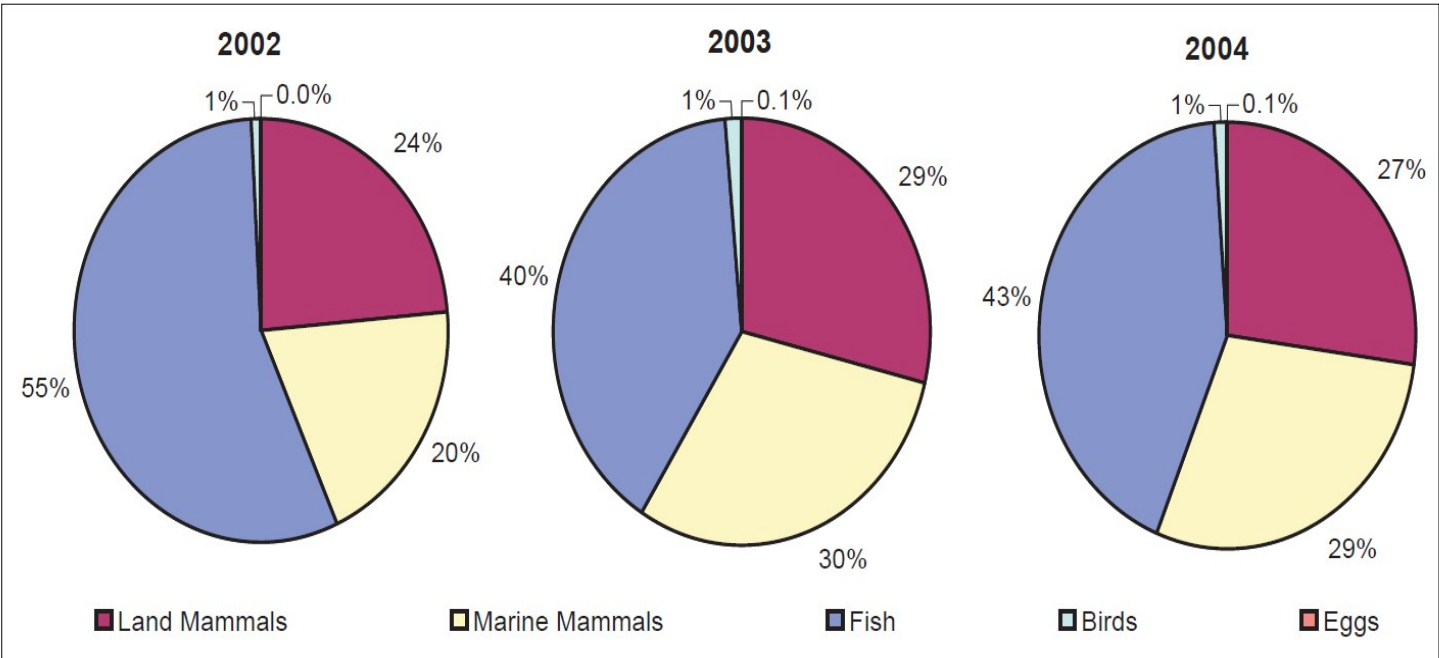


## **TRIBAL ENVIRONMENTAL PROGRAM**

The Native Village of Kotzebue received its first IGAP funds in 1997 and hired Alex Pamiuqtuuq Whiting as the Environmental Program Director (EPD) to set up and run an Environmental Program. The Tribal Environmental Program (EP) priorities were developed during the first year of the Tribes IGAP grant in 1998 after a survey of the citizenship and Tribal Council was completed asking about their concerns and areas that they would like for the Tribe to focus on related to the environment. The dominant issues from the survey related to the water quality and the health of subsistence resources found in the marine environment of Kotzebue Sound. While many federal and state agencies manage terrestrial resources in the area around Kotzebue, no agency specifically focused on Kotzebue Sound and the many species making up the ecology found there (with the exception of general marine research occurring in the Chukchi Sea and limited research on commercial fisheries). This presented an opportunity for the Tribe to address this deficiency by creating a program to research the ecology of Kotzebue Sound and focus especially on the fish and marine mammals that make up the majority of the subsistence harvest of the tribal citizens, especially bearded seals (*Erignathus barbatus*), ringed seals (*Pusa hispida*), beluga whales (*Delphinapterus leucas*), and sheefish (*Stenodus leucichthys*). Another focus was also on the issue of contaminants found in marine fish and mammals and the nutritional benefits provided by the same. In addition, some concern was expressed in regards to issues that were already a function of the City of Kotzebue, especially wastewater treatment, dust, and honey-bucket use. A Tribal environmental action plan was developed and instituted after the assessment was completed.

Communication to the tribal citizens was also a focus of the EP since its inception, informing them of current environmental issues and progress being made on environmental priorities and action plans. Along this same line, one of the concerns brought up by the Tribal Council was the unsatisfactory approach to research that had been practiced for years in the area. This concern was in reference to the common practice of researchers of all types arriving in the community with no collaboration or communication with the Tribe. The research carried out was according only to the needs and priorities of the researchers, with little or no input from the Tribe, and no way for the Tribe to track the progress, or results, once the research was completed. To address this situation the EPD developed a Research Protocol and accompanying Research Questionnaire (Appendix 1) and drafted an Ordinance for the tribal citizens and Tribal Council to consider for passage, requiring all third-party researchers to submit to the Executive Director a formal request to carry out research with tribal citizens and their resources. This Ordinance was passed in 1999 and since then it has allowed for a consistent approach to interacting with researchers and provides for a way to track project results and hold researchers accountable for their actions and commitments to the community. It also benefits both parties by dealing with the mutual expectations and commitments upfront during project development and creates a platform for collaboration from which the Tribe can tailor research efforts to address tribal priorities if they are within the scope and capabilities of the project and the particular researchers involved.

During the early developmental years of the Tribes EP, a 3-year harvest survey of tribal citizens was led by the EPD. The survey findings demonstrated that 70% by weight of all food procured locally came from Kotzebue Sound, which reaffirmed the Tribes commitment to focus research activities on the ecology and resources of Kotzebue Sound (figure below).



The EP has continued to focus on these initial priority areas and broaden the scope as progress on these topics has been made and as new concerns were brought to light and given a high priority by the tribal citizenship and Tribal Council. For example, the focus on Climate Change as an area of interest and concern has grown every year since the beginning of the EP and much of the research now carried out by the EP is providing valuable baseline information that can be used to understand the impacts and implications of the changes to the past regional climate past for the present and future climate.

Building the capacity of the Tribe to develop research projects, find partners, secure funding and administer the projects (including building a large cadre of tribal citizens that are essentially professional research technicians), has allowed for much progress to be made addressing tribal environmental priorities. This has contributed to the overall strengthening of tribal sovereignty by allowing for more control by the Tribe to proactively address those issues that are important to the Tribal Council and the tribal citizens and not have to rely on others to do so.



An important aspect of environmental management to the Tribe is the conservation of fish and wildlife resources that its citizens depend on for their sustenance and cultural way of life. The EP plays a role in this by reviewing federal and state fish and game regulations and management plans and submitting comments or drafting and submitting regulations on behalf of the Tribe. The EPD serves as Vice-Chair and Secretary for the State of Alaska Kotzebue Fish and Game Advisory Committee and also serves on the NPS Cape Krusenstern Subsistence Resource Commission, which allows the Tribe to be informed in a timely manner of current management issues and proposed conservation regulations. The EPD is also the contact for the G2G opportunities to discuss federal regulation actions with the Federal Subsistence Board. The EP plays a role in proactively working on wildlife conflict issues, most notably the muskox and grizzly bear conflict issues that arise in regards to the traditional camping areas of the Qikiqtagruṃmiut. The EPD participates in federal, state, and tribal working groups to address these conflicts and has researched the issue and provided documentation to the federal and state managers as part of this process. The EPD was also the Native Village of Kotzebue representative on the Unit 23 Working Group that brought together a broad coalition of federal, state, tribal, and commercial operator representatives to try and address the conflicts occurring between local people and outside hunters that was disrupting the traditional caribou hunts in the Region. The EPD has successfully proposed a number of changes to both the federal and state wildlife regulations to align them better with the needs and customs of the Qikiqtagruṃmiut. The EPD also successfully petitioned the NPS for the opening of the first federal muskox hunts for the Qikiqtagruṃmiut that lived at remote campsites and managed the hunt through the EP on behalf of the NPS, likely the first such example of federal/tribal partnership of this kind. The work by the EPD done on behalf of the Tribe in this arena has been recognized most notably by the State of Alaska Board of Game after a particular successful effort to address a major conflict that was occurring between the traditional use of snowmachines for caribou, wolf and wolverine hunting and the then current prohibition on this activity



(which included the EPD writing a lengthy white paper on the topic as part of the deliberative process), the BOG instituted an award to recognize contributions made by Advisory Committee members in the wildlife regulation process. The EPD received one of the first awards given and awards have now become an annual part of the Advisory Committee process.



## **ENVIRONMENTAL DOCUMENT and MANAGEMENT PLAN REVIEW**

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Another recurring item that became obvious as a role for the EP was the capacity of the Tribe to review and comment on development, policy, and management proposals from other entities. These could be official NEPA documents like federal NPDES permits, ACOE consistency reviews, or federal agency Resource Management Plans for example. It can also be commenting on Local, State, and Federal policy, or regulation changes, or even proposing and advocating for changes that the Tribal Council and citizens are calling for. This role we believe is a matter of Environmental Justice and is one way that Executive Order 13175 (Consultation and Coordination with Indian Tribal Governments) is meaningfully fulfilled.

Recently, the number of already occurring and proposed development projects impacting northwest Alaska has increased substantially. This creates a critical need for Tribes to be able to respond to the NEPA and permit processes accompanying these activities to relay specific impact concerns and suggest corrective mitigation measures based on cultural needs and the environmental conditions on which they depend. Tribal led research can become significant in this area, in light of the fact that agencies require documented and/or peer reviewed information for setting permit conditions. In addition, full tribal participation in the NEPA process provides unique understandings of the ecological relationships present in traditional use areas that improves the quality of the documents significantly, leading to more effective and responsive avoidance, exclusion, or other mitigation measures. The amount of material to assess and respond to becomes daunting when you have overlaps of multiple NEPA documents and processes, which is occurring more frequently as the Arctic development efforts expand (Appendix 2).

Even with a dedicated Environmental Program in the village, it remains a challenge to provide timely and sufficient comments. Without an environmental program in the villages, it would be almost an impossible task for Tribes (read: directly impacted communities) to keep up with the NEPA processes and all the activities affecting their environment. The NEPA process only is effective at meeting its purported goals if the people most impacted can be engaged, informed, and have a high level of participation. It makes a lot of sense, and is the correct ethical position, for the federal government to support a way for Tribes to participate fully in the NEPA process by funding IGAP programs that can be used, in part, to focus on current NEPA efforts. Industry and the federal agencies are fully represented by having paid positions to deal specifically with the NEPA documents and process; however it is the tribal peoples that arguably have the most at stake from these land management and development decisions. Tribes must have an opportunity to make sure their voice is heard and their needs addressed; the IGAP makes this possible.

This component of NEPA review has become a large part of the Tribes IGAP workplan and falls within the framework outlined in the Guidebook: ***Activities related to establishing environmental protection programs not administered by EPA, but that are consistent with the laws Congress has given EPA authority to administer, are allowable.*** Which is made consistent because of the following: ***“The National Environmental Policy Act (NEPA) requires federal agencies to integrate environmental values into their decision making processes by considering the environmental impacts of their proposed actions and reasonable alternatives to those actions. To meet NEPA requirements federal agencies prepare a detailed statement known as an Environmental Impact Statement (EIS). EPA reviews and comments on EISs prepared by other federal agencies, maintains a national filing system for all EISs, and assures that its own actions comply with NEPA.”*** In addition, the NEPA process is very clear on requesting and utilizing the Best Available Science (BAS) in order to understand reasonably foreseeable impacts and to mitigate same. In the Arctic where the Tribe is located and for the resources that the Tribe depends on, there has been a recognized lack of both the quality and documentation of BAS to forecast potential real world impacts and to develop useful mitigation strategies, or to understand actual impacts occurring related to the activity that is the subject of the NEPA document(s). The Tribe has been able to use its participation in the IGAP to help identify areas where the BAS is lacking or insufficient and to point this out in commenting on NEPA documents and to consult with agencies on specific NEPA processes and/or helping to develop projects with the goal of providing BAS to be included in the NEPA process to better understand impacts and develop effective mitigation measures.



## **CITY of KOTZEBUE COOPERATIVE EFFORTS**

The Tribe began partnering with the City of Kotzebue (City) since the very beginning of its EP. In large part because the City is responsible and has the authority to manage the local programs related to the type of activities that fall under the traditional focus of the EPA. These include solid waste management, wastewater management (including honeybuckets), drinking water source protection and distribution management, dust management, and enforceable codes for waste management, including hazardous waste and related issues. In 1999 the Tribe assisted the City, in cooperation with the Maniilaq Association Environmental Program, to complete a community survey of all households using honeybuckets and not hooked up to water and sewer, either because of domiciles that had never been hooked up to the sewer system, or disconnected from the system for failure to pay, or due to freezing of their pipes that have not been fixed since. The results of the survey were used by the City and Tribe to target assistance, either through providing funding through grant programs to install, or fix, connections to the main sewer system, or making sure that the honeybucket waste was managed effectively, to decrease sanitary risk issues to the household residents and the larger community.

Another effort the Tribe led was to fund an assessment on the potential to install a constructed wetland near the current sewage holding ponds in order to clean wastewater prior to it being released into the Sound, which was an identified high priority concern for Tribal citizens. The EP hired a consultant and submitted a full proposal of a constructed wetland plant to treat Kotzebue sewage. The City ultimately chose not to pursue this course, but did begin to use cultured bacteria in the sewage system to reduce the amount of solid waste and other components of the waste stream, including making efforts to reduce the amount of sludge buildup in the existing sewage cells. With the installation of a 3rd polishing pond, the City now has to rarely pump overflow into the Sound, which was the initial concern to be addressed.

The City Council created a Litter Control Board in July, 2001. It was a 5-member Board to work on waste issues within the City of Kotzebue. The EPD was the first and only Chairman of the Board during its existence. The first task assigned the Board was to review the Garbage and Sanitation code and to revise as necessary. This was accomplished over the next two years and a revised Sanitation code was passed by the City Council in August 2003. The main changes were to clarify the responsibility of residents in regards to the storage and disposal of their garbage. It added a raised covered platform as an approved method of storing bagged and boxed trash, defined hazardous waste, spelled out violations and fines, or actions allowable when violations occur. Additional efforts focused on working with the local community (residents, businesses, and organizations) on making efforts to control loose trash, citywide cleanup efforts and recycling. The Board disbanded shortly after the above activities were completed. The Tribe also worked with the City of Kotzebue to clean up and protect the area around the drinking water source through development of a watershed protection plan that has yet to be completed, but has been worked on periodically since it was initiated by the Tribe.



*Kotzebue waterfront 1949, with boys unloading seal pokes full of seal oil to the local stores.*

## STATE of ALASKA COOPERATIVE EFFORTS

The tribal member concern voiced by a great majority in the Environmental Survey carried out at the beginning of the Tribes EP, was with the dust created by roads/traffic in town. The ES addressed these concerns by coordinating 5 years (2004-2009) of PM<sub>10</sub> research in Kotzebue in partnership with and on behalf of the Alaska Department of Conservation Air Quality Division. Many tribal citizens participated in collecting filters and maintaining the collection sites over the course of 5 summers and one winter (harsh conditions to try and maintain dust collection). In addition, the ES facilitated a pilot effort for AK DEC to sample VOC in tribal citizen households. This data gained was useful in understanding health risks to the vulnerable part of the population (elderly and asthma sufferers) and also what times of the day and year when dust conditions are worse in order to inform the tribal citizenship and especially the vulnerable people when best to avoid exposure. Many roads in town were paved during this time, using the data collected from this cooperative effort to apply for various funding sources. The result of this has been the improvement of the health of the citizens, especially the young, elderly, and those with respiratory issues. This baseline will also be used to understand the levels of dust reduction achieved through paving.

### 2002-2005 PM<sub>10</sub> Dust Monitoring & Air Toxics VOC Study – Kotzebue, AK

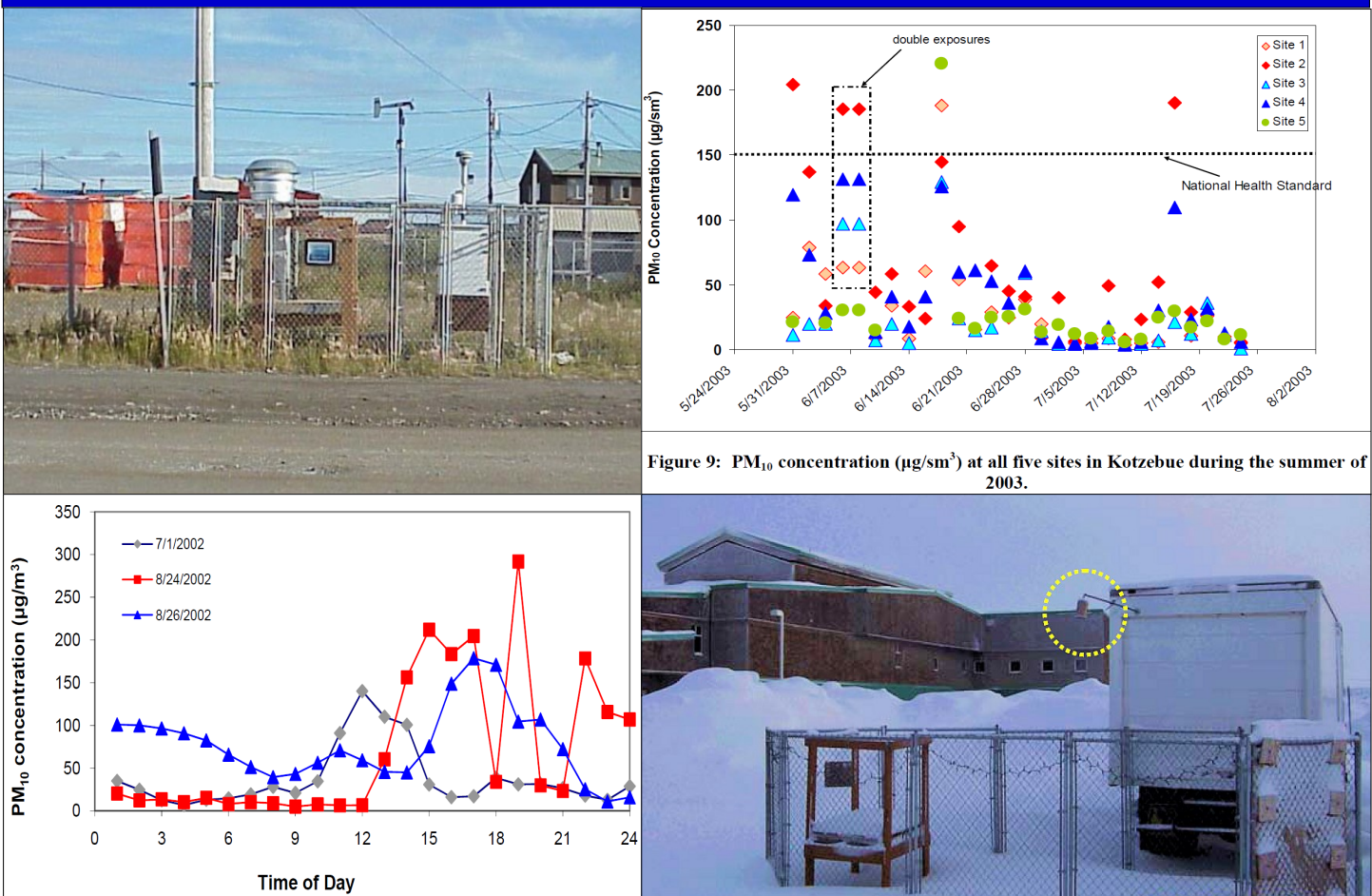
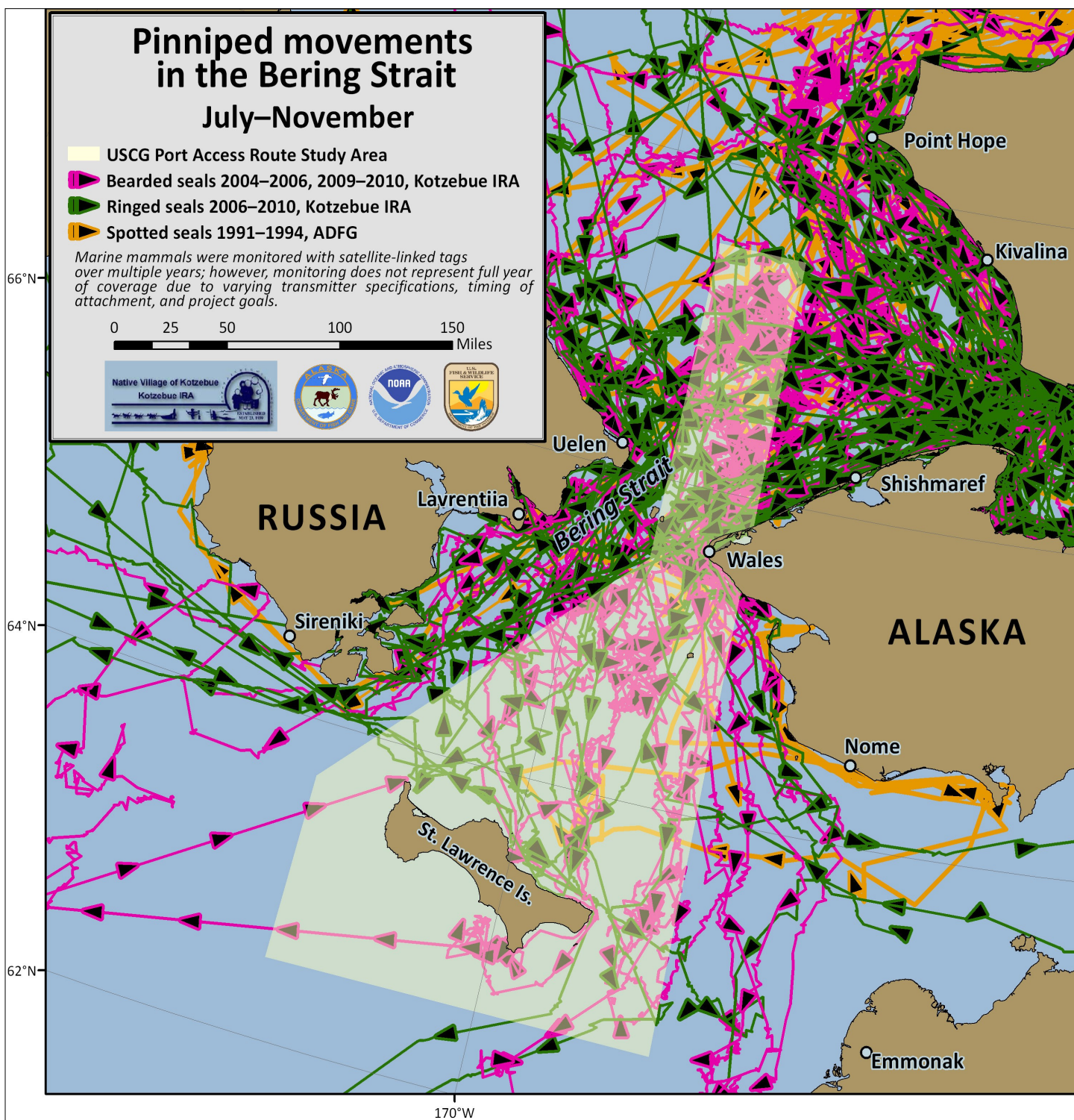


Figure 9: PM<sub>10</sub> concentration (µg/sm³) at all five sites in Kotzebue during the summer of 2003.

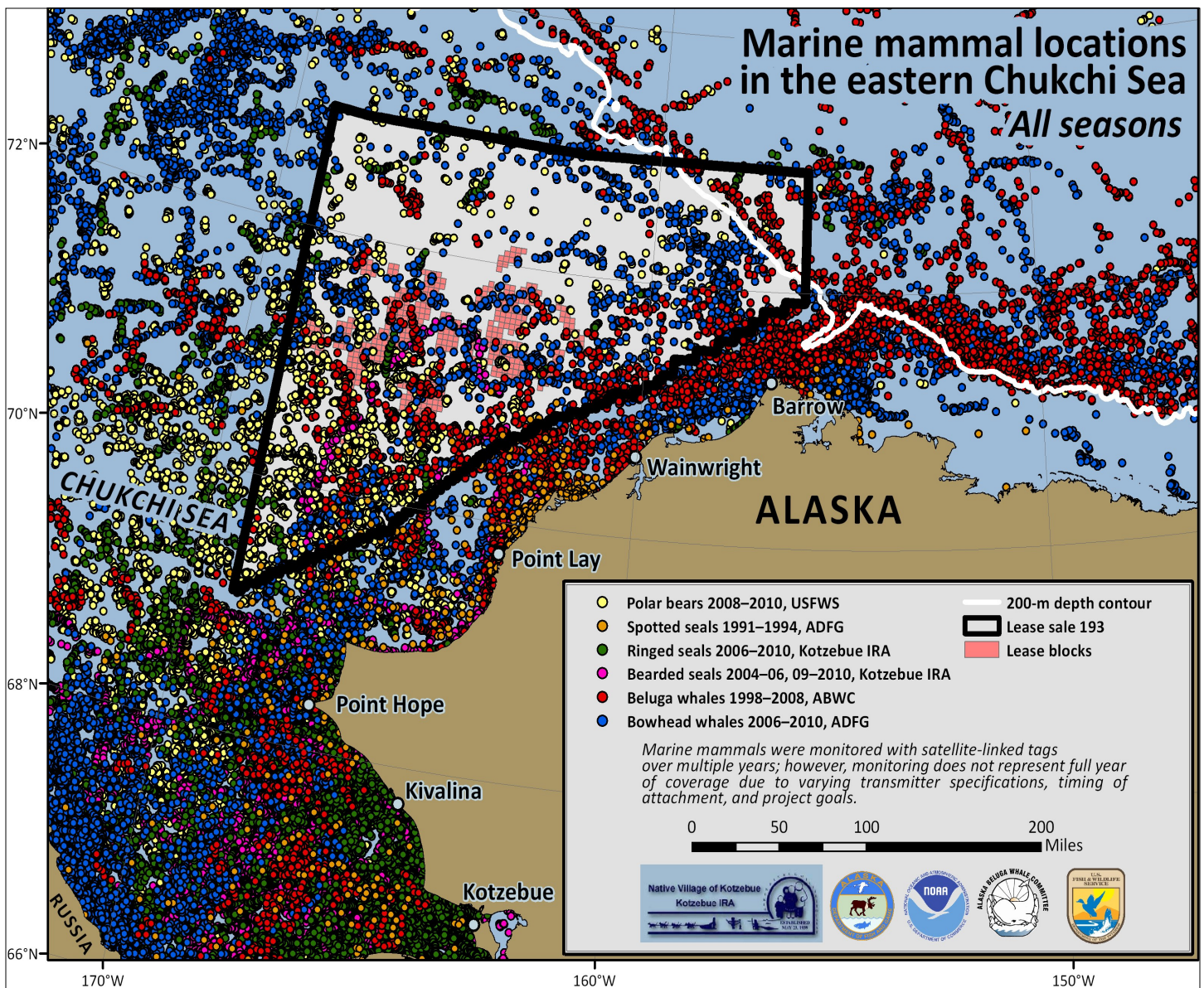
The Tribe also has had a long-standing relationship with the Alaska Department of Fish and Game Marine Mammal Division. In 2003 when the Tribe first applied for a Tribal Wildlife Grant from the USFWS, the ADF&G was a cooperator on the effort and provided technical expertise for the field efforts, the data analysis, and communicating results aspects. The ADF&G also facilitated the federal permitting of the EPD and two tribal citizens to capture, tag, and sample seals through designation as Co-Investigators for the ADF&G under their MMPA scientific research permit. This allowed tribal citizens to carry out scientific research of this type on their own without having to have a scientist in the field (likely a first). The ADF&G Marine Mammal Division in particular assisted with writing results to be published and developing maps of the results of the multi-year (2004-2008) tagging efforts to be used in posters, scientific presentations, communication to general audiences, and for informing processes, like in the case of the Coast Guard PARS in the Bering Straits.



In addition, the EPD encouraged ADF&G in the development of animated maps that continue to be used as effective tools to demonstrate the movements of seals in a way that is entertaining while educating. ADF&G has also co-authored the results of the seal tagging with the Tribal participants and with the other cooperators that have been published in peer reviewed journals like Polar Biology. More recently, the State has contracted with the EP to facilitate continued capture and tagging attempts of subadult (or northerly migrating) bearded seals, a program that was initially sponsored and led by the National Marine Mammal Laboratory under the MMS Alaska Environmental Studies Program. All of these efforts have resulted in creating BAS in regards to ringed seals and bearded seals that is being used by federal agencies for management purposes and is being included in ESA and NEPA processes. These tribally led efforts were, until recently, the only ones that have successfully satellite tagged bearded seals which has significantly increased understanding about bearded seal movements and behavior and is now part of the BAS on these species to be used in federal management actions and development mitigation strategies. Examples of products created from these efforts are below.







## **NORTHWEST ARCTIC BOROUGH COOPERATIVE EFFORTS**

Exploration efforts of the OCS for oil and gas in the northeastern Chukchi Sea began in earnest with the Lease Sale 193 in 2008. Although the actual exploration activities occurred north and west of Wainwright, support activities took place across a much broader area, including Kotzebue Sound. Operations included routine trips between Dutch Harbor and the Chukchi Sea during summer to deliver supplies. Shell staged two oil spill response barges and tugs, two resupply barges, and one landing craft in southern Kotzebue Sound (Goodhope Bay) during the exploration season of 2015. Because of this increase in activity and the use of Kotzebue Sound as a staging area, starting in 2014 the Northwest Arctic Borough entered into a funding agreement with Shell Oil to provide funding for locally prioritized environmental research of the Kotzebue Sound region and studies to identify the possible impacts of this increased activity. The Northwest Arctic Borough (NAB) and Shell developed a five year joint research agreement. The purpose of the agreement was to: 1) identify important research that will be useful to both Shell and the region's residents; 2) facilitate and fund this research; and 3) provide information back to the communities about the research findings. The NAB hosted an Arctic Science Symposium in April 2014 to review the kinds of research already occurring in the Northwest Arctic and to discuss research priorities. The ES presented at this Symposium on the various marine mammal related research the Tribe had been involved in over the course of its EP. The symposium was also meant to familiarize people with the Shell Agreement. Over 20 local, state, federal, and academic institutions that conduct research in the northwest Arctic region were present. As part of the agreement, a NAB Science Department and a Science Steering Committee (SSC) were set up. The first meeting of the SSC was held in conjunction with the Arctic Science Symposium. The SSC was formed to solicit, review and select local research projects and



the EPD was appointed as the village representative for Kotzebue to sit on the Committee. The Science Steering Committee met on a quarterly basis. One of the first things the Science Steering Committee did was to develop a Community Survey to get information from the villages about topics related to the environment, subsistence, climate change, and development. This information was to be used to help steer the science program towards issues of greatest interest to the communities. A subcommittee was tasked with compiling information from past and current scientific studies in the region to understand what has already been done and what research needs remain. The first year (2014), some research projects that were ready for immediate implementation were funded. These included support for the ongoing Kotzebue Sound beluga acoustic study, the Kotzebue Sound background noise study, and the capture of bearded seals for hearing research. All of these projects were carried out through contracts with the Native Village of Kotzebue EP. Funding was also provided to the EP for a Kotzebue Sound surface currents study, a cooperative effort between the University of Alaska Fairbanks (UAF) and the Native Village of Kotzebue.



*Long Marine Laboratory UCSC where bearded seals captured by the tribally led effort are being housed for hearing research.*



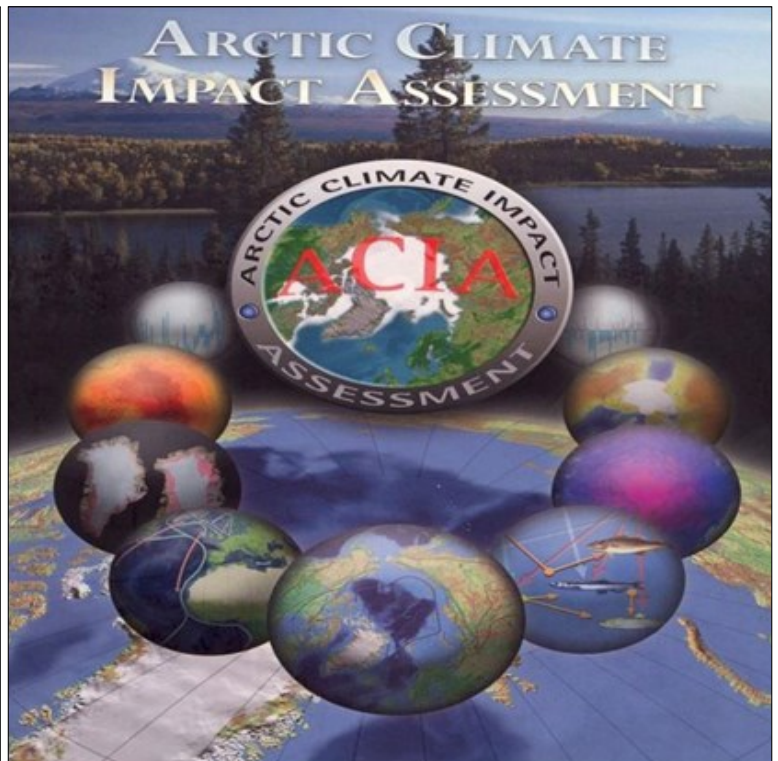
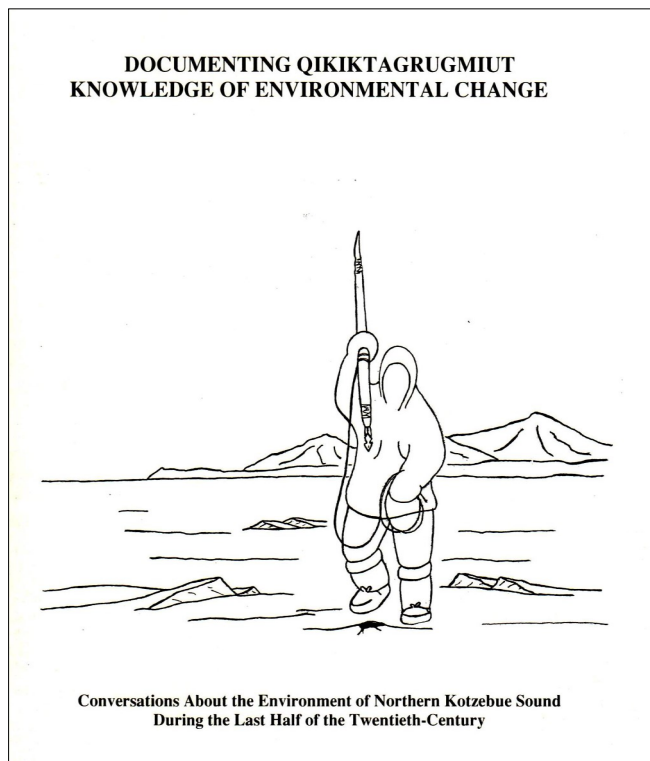
*Siku, the first bearded seal in captivity for scientific research in North America was captured in Kotzebue Sound through the Tribes EP in cooperation with tribal citizens.*



## FEDERAL GOVERNMENT COOPERATIVE EFFORTS

**Environmental Protection Agency** – The first federal government cooperative effort that was undertaken by the EP was the initial funding of the Tribes IGAP in 1997, which has continued every year since then. It is impossible to understate the importance of this relationship and the benefits derived therein for the progress that has been made on environmental issues and full participation by the Tribe in environmental decision making and mitigation strategy development. In regards to formal work with the EPA, the Tribe participated in the EPA-Tribal Environmental Agreement (TEA) process and formally signed an agreement with EPA during 2001 with Region 10 Administrator Chuck Findley and that agreement remains in effect to this day (Appendix 3), since it is self-renewing. The terms of the agreement and the commitments made, have been the underlying basis for the work-plan elements that are developed as part of the Tribes annual IGAP application. While the agreement never moved past the Tier I process, the Tribe has continued in good faith to work cooperatively with the EPA when opportunities arise. Related to this, the EPD participated in and helped facilitate, two EPA Preliminary Assessments (PA). The first PA in 1998-99, was for a Drum Dump Site that was sampled and assessed for potential environmental risks posed by the drum dump located adjacent to South Tent City and the lagoon on the south end of Kotzebue, under the Superfund Law. The other PA was initiated by the Tribe the following summer, to have EPA contractors sample a remote community camping site north of Kotzebue to determine whether contamination from an open dump (that the Tribe facilitated cleanup of the previous year with BIA Environmental funding), had contaminated the groundwater used for personal drinking water wells. The ES also filed a Citizen Petition under CERCLA to initiate an EPA Preliminary Assessment of the old dump site located underneath a block of residences in Kotzebue during 2004 and worked with EPA to complete this action. Additionally, the ES undertook an effort to demonstrate broad support for the implementation of Goal 2d of the EPA Tribal Strategic Plan (i.e. Region 10 assesses environmental conditions to identify environmental health threats that may be unique to tribes and their citizens, e.g., contamination of subsistence food chains, fish consumption studies) in the year 2000, due to the general concern expressed by tribal citizens in the 1998 Environmental Survey and the Tribal Council on this issue.

**National Park Service** – The EP received funding from the NPS Historic Preservation grant program to carry out an Environmental Change documentation effort with local Elders. The final report discussed changes to the regional environment noticed during the last half of the 20th Century. Since this Indigenous Knowledge based project was one of the first of its kind in Alaska on the subject of climate change, the EPD was invited to co-author a chapter in the 2005 Arctic Climate Impact Assessment on Indigenous Perspectives to share the results of this work. Currently, the EP is partnering with the Wildlife Conservation Society and the NPS, under NPS funding to explore whitefish and lagoon ecology, addressed in further detail below.





**Bureau of Indian Affairs** – As mentioned above, the EP also received funding from the BIA Environmental Division and the Alaska Native Health Board in 1999 to remediate an open dump site at a remote camp community. The EPD coordinated the effort and administered the grant. The result was that approximately 1,000 (55 gallon) sacks of trash were collected, along with 60 automotive batteries, and removed from the site. Additionally, the EP has been able to access Self-Governance funds provided by a compact agreement between the Tribe and the BIA to carry out small environmental research efforts and to supplement larger efforts funded under other entities.

**Department of Defense** – The ES fully participated in the G2G Consultation and sat on the community Restoration Advisory Board with Elmendorf Air Force Base during the decommissioning and site remediation of the Kotzebue LRRS. Contaminated soil containing PCB's and diesel fuel was cleaned during this effort, which was titled "Operation Clean Sweep," and occurred between 1999 and 2005.

**Geological Survey** – In 1999, the EP developed a relationship with the USGS-Alaska Biological Science Center, in order to train tribal citizens in the collection protocol of samples for the Alaska Marine Mammal Tissue Archival Project (AMMTAP). Contamination of marine mammals and fish was a topic of interest of the Tribal Council and tribal citizens as identified in the Tribal Environmental Survey conducted by the EPD in the beginning of the Tribes EP in 1998. A way to address the issue was to first have a process in place that facilitated the collection of samples from local fish and wildlife that were commonly eaten by tribal citizens. The EP received funding support from the USFWS to train tribal citizens to collect samples for archiving purposes (AMMTAP) and for contaminants testing through relationships that were to be developed in the future (see the Academia Cooperative Efforts below).

**Fish and Wildlife Service** – The FWS through both the local Selawik Refuge and the national agency has supported many of the efforts the Tribe has undertaken through its EP. Soon after the creation of the Tribes EP, the Selawik Refuge provided funding to the EP to participate in caribou research, which was led by a Dartmouth researcher to investigate the proposition that hunters could help monitor the population health of the Western Arctic Caribou Herd through reporting indices of observed fat and marrow in the animals they were catching to eat. At the same time, the Selawik Refuge also provided funding for tribal citizens to be trained by USGS and NIST representatives to collect ice seal tissue samples in the field to be archived for potential comparative use in future years in disease and contaminant studies. Both of these resources were identified as very important by Tribal citizens through the environmental survey carried out at the beginning of the EP. Additionally, the Selawik Refuge has facilitated the involvement of the EP in sheefish studies that were occurring in part on Refuge Lands and in the development of the Selawik Refuge Management Plan that was recently created. The Selawik Refuge also has contributed housing and equipment during the EP led seal tagging research and the cooperative efforts between the EP and the University of Alaska Wildlife Toxicology Lab in contaminants and nutrients work on sheefish and seals, over the course of many years. More recently, the Selawik Refuge has facilitated the sea ice research project Ikaagvik Sikukun by hosting the field effort of drones out of their airplane hangar and allowed for the projects weather station to be set up at their headquarters, in addition to helping with housing and other needs by the many visiting researchers on the project.

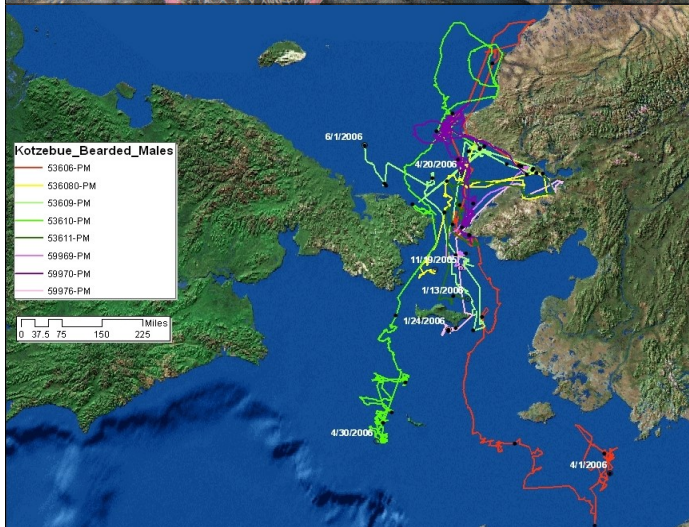
The national agency provided funding through the Tribal Wildlife Grant program in both 2004 and 2007 to the EP to initiate and carry out the live capture and tagging of ringed seals and bearded seals with satellite tags to uncover facts about behavior and travel patterns. This was the first time bearded seals had ever been tagged with satellite tags in Alaska. 41 ringed seals and 37 bearded seals were tagged over the course of the 2004-2009 TWG efforts. The success of the effort was highlighted by the FWS as an example of effectiveness of the TWG program (since the 2004 project was the first year of the TWG program the early success of projects was important to the continuation of the program nationwide).

The Tribe also partnered with FWS scientists to study the genetic mixed-stock composition of sheefish from the Hotham Inlet and Selawik Lake winter subsistence gillnet fishery in order to try and determine the makeup of the catch from the two different breeding stocks in the Region for future management purposes.

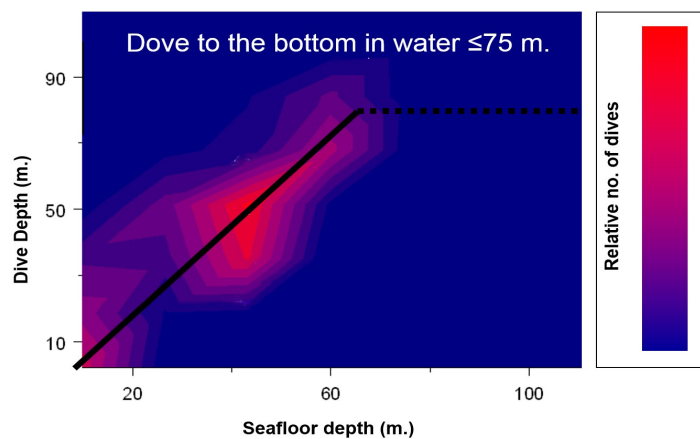
A pictorial showing examples of the results and activities of some of this work is included below.



# Diving Behavior, Habitat Use, and Movements of Bearded Seal Pups in Kotzebue Sound, the Bering and Chukchi Seas

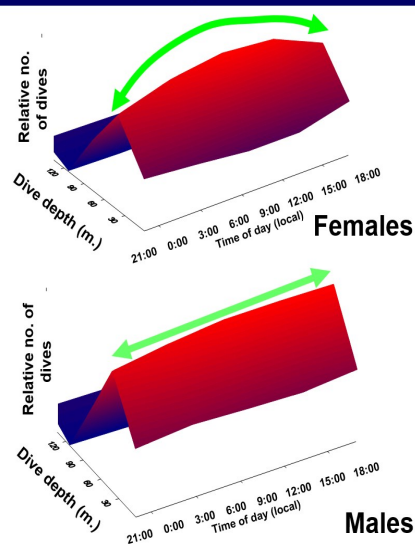


## Dive depth - Seafloor





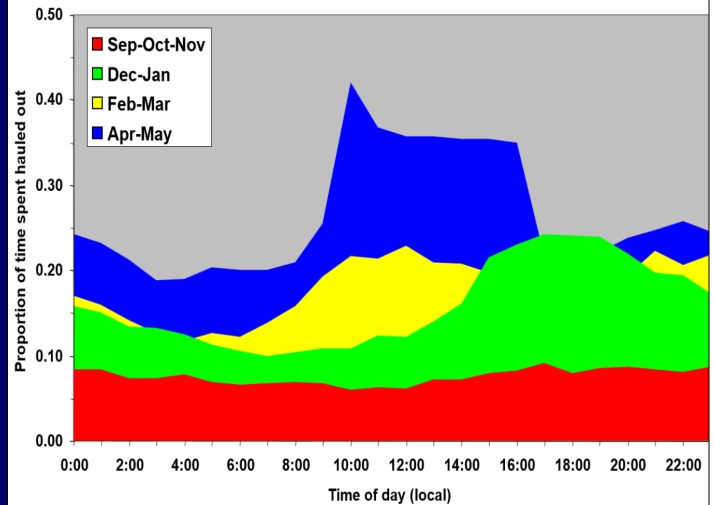
## Dive depth – Time & Sex



Females were more likely to dive during the middle of the day than at night.

Males showed no evidence of a diurnal dive pattern

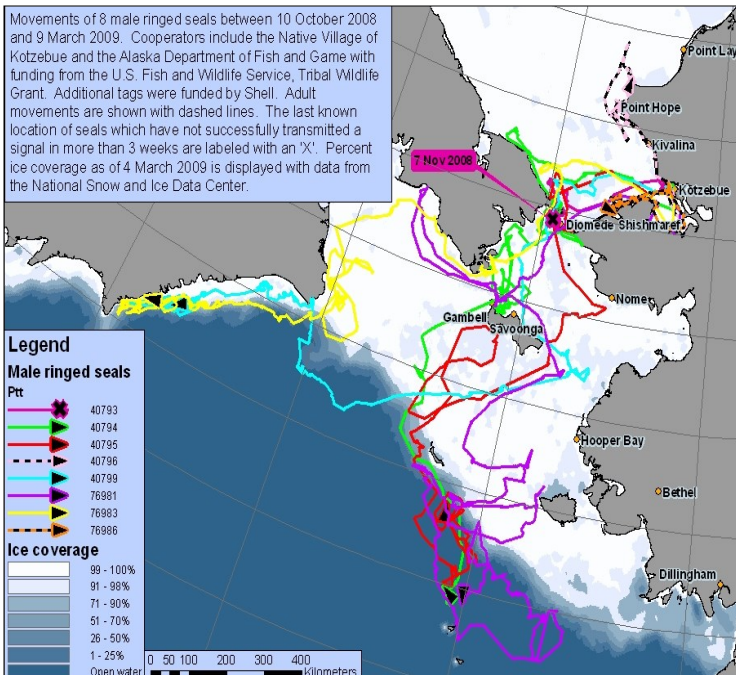
## Haulout – Season



## Wintering Areas and Habitat use of Ringed Seals in Kotzebue Sound, Alaska: A Community-based Study

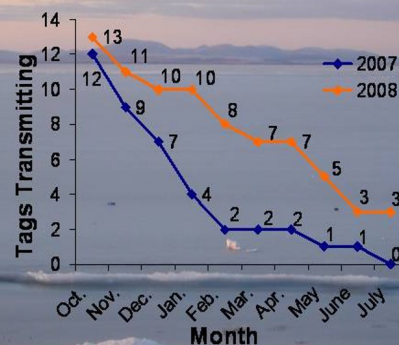






## Ringed Seals Tagged

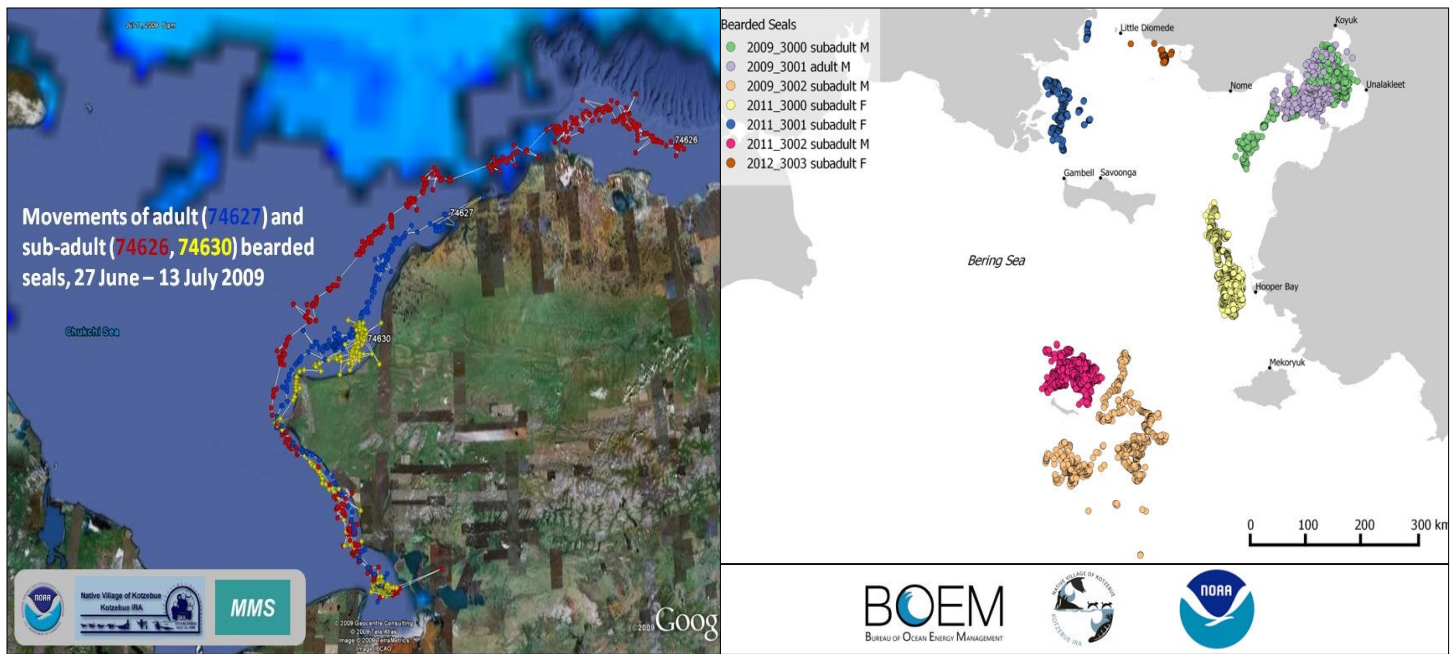
Year	Age	Seals Tagged	Avg. days on air
2007	Ad	8 (M=5, F=3)	96.0
	Juv.	4 (M=3, F=1)	102.5
2008	Ad.	3 (M=2, F=1)	172.0
	Juv.	10 (M=6, F=4)	169.8



## Habitat use and seasonal movements of adult and sub-adult bearded seals in Kotzebue Sound, Alaska







**Department of Commerce** – The EP began partnering with the Marine Mammal Lab in 2004 when they were invited to send a representative to participate in the tribally led bearded seal tagging effort. The purpose was to introduce them to rural Alaska community-based research efforts, as all their previous work of this type in Alaska had been carried out offshore from large research vessels. In 2007 the National Marine Fisheries Service invited Alaska Native partners to join on the first Bering Sea ice seal research cruise aboard the NOAA vessel *Oscar Dyson* and the 2 participants were Kotzebue tribal citizens, in part because of the experience they had working on seal research through the EP. In 2009 NOAA provided funding for the EP to lead an ice seal fatty acid research effort to investigate the diet of ice seals in Kotzebue Sound. In 2009-2012 the Tribe contracted with the MML to assist with capturing sub-adult bearded seals while migrating north from the Bering Sea to their summering grounds in the Chukchi and Beaufort Seas, in order to tag them with satellite tags (something that had never been done before). The effort was successful in tagging 7 seals. The EP also was provided funding by the NOAA Auke Bay Lab to carry out a pilot effort to explore 200 miles of coastline during the early spring to determine whether Arctic cod were present nearshore under the pack ice, as part of a larger stock investigation that was being coordinated by NOAA along the western Alaska coast.

**Bureau of Ocean Energy Management** – While the research of northerly migrating bearded seals is coordinated by MML and now ADF&G Marine Mammal Division, the funding is ultimately coming from the Alaska Environmental Studies Program that is overseen and funded by BOEM - formerly the Minerals Management Service. The EPD has also met with regional and national leadership of BOEM and BSEE in G2G meetings to discuss offshore development and mitigation strategies to protect resources of the Tribe.

**Department of Agriculture** – The EPD coordinated the assistance and involvement of the USDA Natural Resources Conservation Service in developing a watershed protection plan for the City of Kotzebue drinking water source. While an official watershed protection plan was never enacted; as a result of this effort, the City completed the clean up of old heavy machinery and other derelict equipment and waste items around the drinking water source, in addition to retrofitting the fuel supply system with more protective piping to prevent the spilling of fuel into the water source.

**Arctic Research Commission** – The EPD has presented EP activities to the Arctic Research Commission at their invitation when they held a Commission meeting in Kotzebue in 2009 and again in 2018 and was recently awarded a small grant project through them to continue investigating cyanobacteria blooms in Kotzebue Sound, with work to begin the summer of 2018.

**Marine Mammal Commission** – The EPD presented the marine mammal research work carried out through the EP to the Marine Mammal Commission when they were in Kotzebue. The EPD hosted them at the Tribe in a one-on-one setting and had the opportunity to go in depth with them on the research, in addition to the advocacy work carried out by the EP through its involvement with the various marine mammal co-management groups (see letter below).



## MARINE MAMMAL COMMISSION

22 February 2016

Mr. Alex Whiting  
Environmental Protection Program  
Native Village of Kotzebue  
P.O. Box 296  
Kotzebue, Alaska 99752

Dear Alex:

On behalf of the Commissioners, Committee of Scientific Advisors, and staff of the Marine Mammal Commission, I want to take this opportunity to tell you how much we appreciated meeting with you in Kotzebue during our visit in early February. We were honored to be able to meet with you, John Goodwin, and other members of your community to hear about marine mammal subsistence hunting activities, including how the hunts are being impacted by changes in the marine ecosystem and other factors.

We were particularly grateful for the time you took to provide us with an overview of the marine mammal projects that have been conducted by the Village's Environmental Protection program under your leadership. We were especially impressed with the level of cooperation and participation you sought out and received from local hunters, state and federal scientists, academics from various public and private institutions, and community members. Your commitment to a collaborative research approach and to the incorporation of traditional knowledge and wisdom have contributed significantly to the value, accuracy, and relevance of the Environmental Protection program's projects.

The Marine Mammal Commission is committed to following up on the input we received during our visit to Alaska. We have posted the presentation from our wrap-up meeting/webinar in Anchorage on our website [at www.mmc.gov](http://www.mmc.gov), which summarizes the input we received during our visits to Barrow, Kotzebue, and Nome, along with a list of proposed action items. We welcome your comments on these summaries and proposed actions. A written summary of the meeting is being prepared and also will be posted on our website.

As we move forward on next steps, please let us know if you have any additional thoughts or comments on any of the issues we discussed during our visit, or any other information you would like to share. Thank you again for meeting with us and providing us with your valuable input.

Sincerely

A handwritten signature in blue ink that reads "Daryl J. Boness".

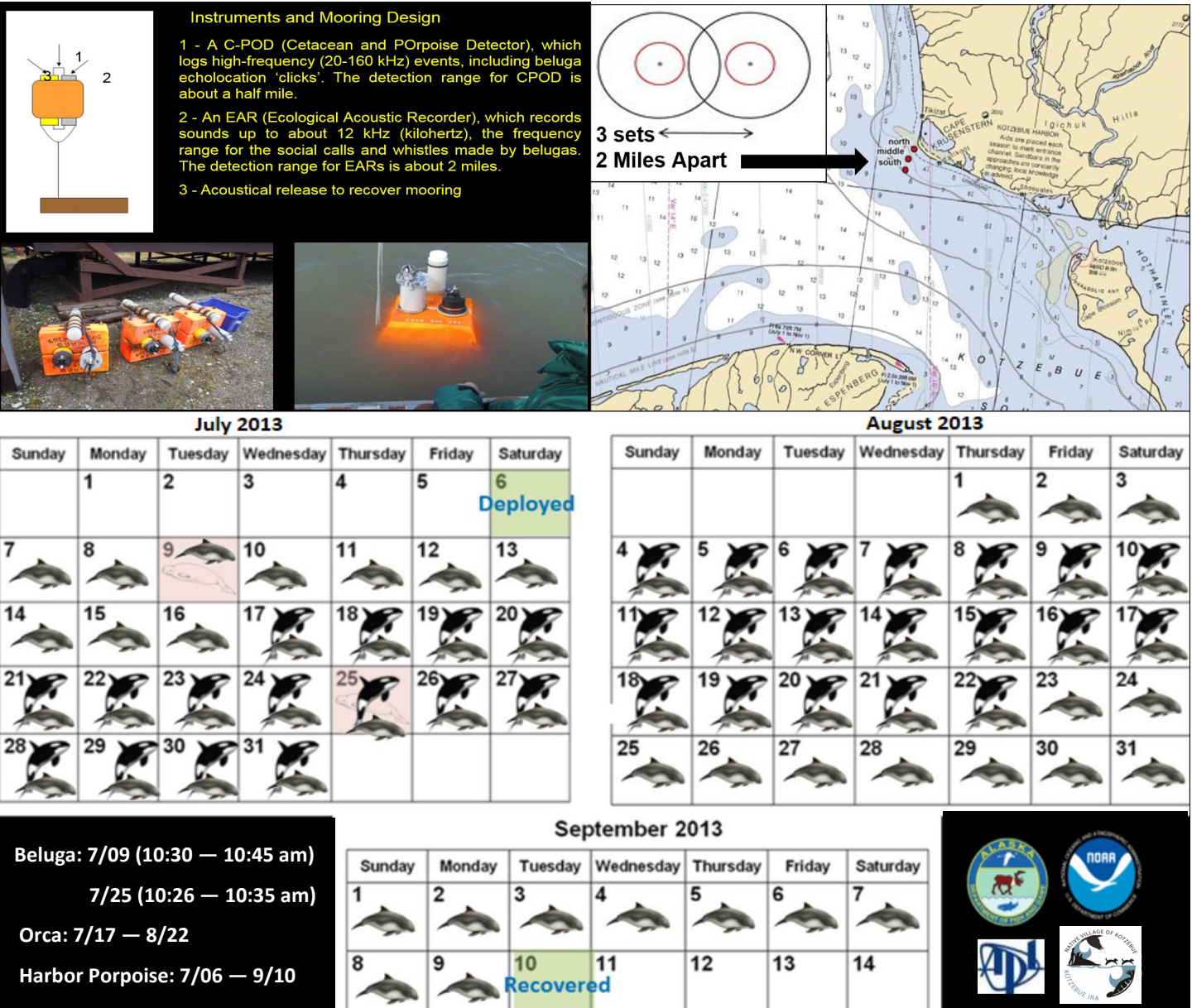
Daryl J. Boness, Ph.D.  
Chairman

cc: Rebecca Lent, Ph.D., Executive Director, Marine Mammal Commission



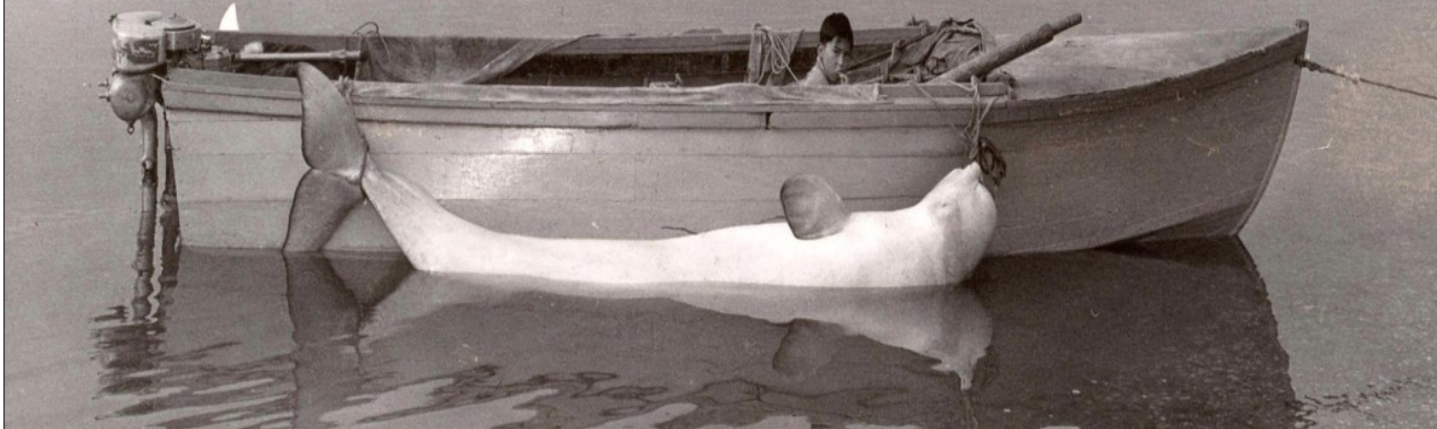
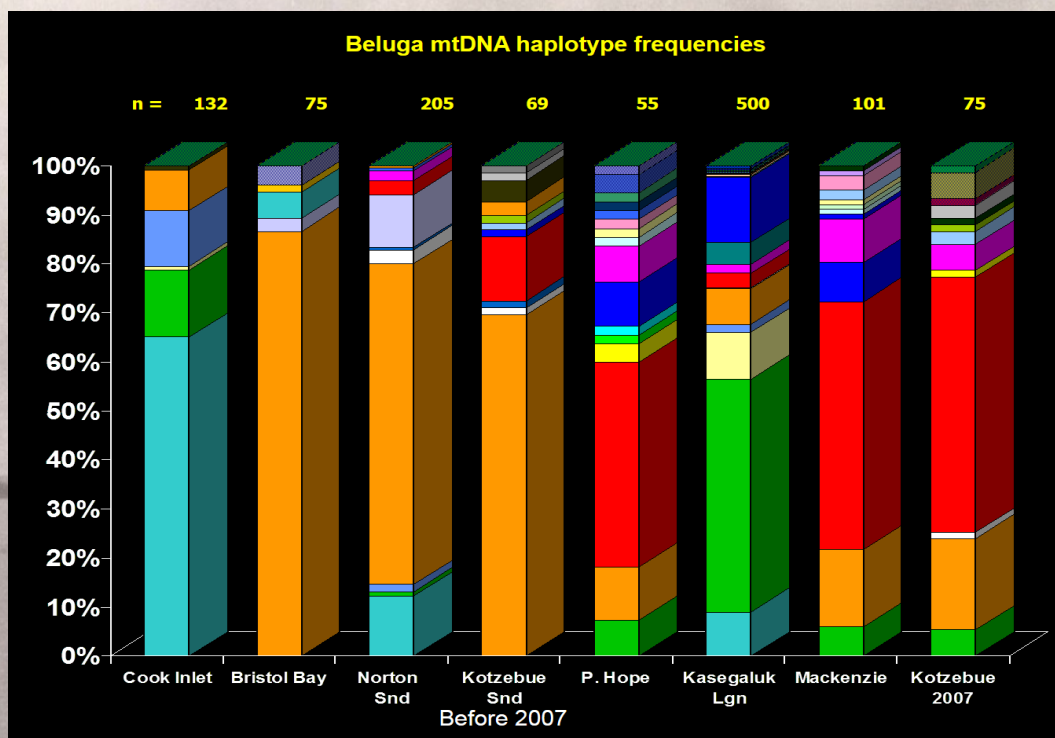
## NGO, ALASKA NATIVE ORGANIZATIONS, & INDUSTRY COOPERATIVE EFFORTS

Many of the research efforts that the EPD has coordinated have been funded in part or in whole by Alaska Native Organizations such as the Alaska Beluga Whale Committee (ABWC), which contributed to a pilot effort to place acoustic recorders in Kotzebue Sound to gather information about the movement of beluga whales in and out of the Sound and also genetic sampling efforts to determine the stock structure of beluga whales found in Kotzebue Sound. Recently a Kotzebue Sound Beluga Acoustics team was created composed of participants from the ABWC, NSB, MML, ADF&G, University of Washington and the Tribe. The team set out recorders in the summer of 2013 and based on the results (a snapshot of which is provided in the illustrations below) and subsequent advances in recorder technology, the NSB and NAB (Shell Oil contracts) funded the team to place 4 instruments in Kotzebue Sound during the fall of 2014 to attempt to overwinter them and record cetacean presence during freezeup and break up. Overwintering acoustic recorders had never been accomplished before, with the potential to provide new information about the movements of marine mammals during the breakup and freeze-up periods. A similar overwintering effort occurred again during 2015. These efforts were extremely successful, especially in learning new information about the presence of killer whales and porpoises, something that was not even considered during the development of the project. The most notable was that killer whales were present for lengthy periods of time in the area where Kotzebue Sound joins the Chukchi Sea, which has implication for the movement and behavior of beluga whales and other marine mammals in and out of Kotzebue Sound. The most surprising information learned was the presence of harbor porpoise in Kotzebue Sound during January, February and March 2016 when the Sound was almost completely covered with ice, neither the scientists nor the experienced tribal citizens expected this result.



Beluga whales have traditionally used Kotzebue Sound as a calving and molting area in the early summer and have been harvested by the Qikiqtagrukmiut for their meat, oil, and maktak. In addition, beluga stomachs were used for storage containers and along with their intestines to make rainwear after they were aired up and dried. Since the 1980's the number and frequency of beluga in Kotzebue Sound has been declining, which has caused a large reduction in the harvest. Trying to understand the decline and also the genetic stock structure of Kotzebue Sound beluga has been a priority for the Tribe. Part of the challenge is that there are multiple stocks of beluga that travel through the Chukchi Sea and past Kotzebue Sound, so trying to understand what belugas are present and observed in Kotzebue Sound is a challenge. To this end the EP has participated in various studies of the beluga in Kotzebue Sound by using acoustic recorders (see above), sampling harvested whales for genetics, infectious disease and contaminant studies and by recording all observations of beluga for the last 16 years. The Tribes representative on the ABWC has also been trained to tag beluga with satellite tags and the EP has the tags on hand and would coordinate the effort if the opportunity ever arises to deploy them. The EPD has also participated in collaborative efforts to understand the impacts that climate change may hold for the Chukchi beluga whales. The ABWC is the focal point for this body of work with Greg O'Corry-Crowe a geneticist from the Harbor Branch Oceanographic Institute, Florida Atlantic University being the lead investigator in cooperation with the ADF&G Marine Mammal Division.

## Molecular Genetic Analysis of Kotzebue Sound Beluga Whales





The EP partnered with ABR Inc., to begin to study the near-shore fishes of Kotzebue Sound, which includes invertebrates and substrate. This is a critical component of Kotzebue Sound ecology with little baseline data. Funding was provided through the NAB Science Committee and the work was carried out in 2015 at three different sites during two separate sampling periods in August and again in September. Seining resulted in the harvest of more than 2,400 fish representing 17 species. Future nearshore fish work is planned and the EP submitted a 2018 proposal to the North Pacific Research Board for a 3-year project in cooperation with UAF, Blue World Research and NOAA Alaska Fisheries Science Center to expand the study sites to include the Bering Straits and the northern Bering Sea regions, in addition to Kotzebue.



Whitefish are a valued food resource for the Tribes citizens and they convert a large amount of the non-edible calories in the form of insect larvae, mysids and plankton into meat and oil, that is then available to be eaten by the people, fish and marine mammals present in Kotzebue Sound. This role, along with the role that the coastal lagoon systems (which whitefish use to feed and mature in their annual cycle) play in the ecology of the region has been little studied. To address this, the EP has partnered with the Wildlife Conservation Society and the National Park Service under NPS funding to study the lagoon systems and whitefish ecology with an emphasis on documenting Indigenous Knowledge of whitefish and the traditional and current relationship the Qikiqtagruṃmiut have with the abundant and varied whitefish species in the region. Much of the field-work has been completed, including a number of interviews with the tribal Elders and other citizens that continue to harvest and use whitefish.



*A tribal Elder waits after digging a traditional whitefish trap, as whitefish begin to appear. This ingenious trap uses the nature of the porous gravel to create a current which the whitefish in the lagoons follow to run out to the ocean, only to become stranded at the end. Many gunny sacks of fish can be collected in a short amount of time, once the effort to dig the trap has been made.*



ConocoPhillips and Shell Oil have also directly provided funding to the EP for different seal tagging efforts and Shell provided funding for some of the early acoustic recorder pilot studies. In addition, the ES consulted on and facilitated a Statoil led effort to document northern Alaska Indigenous Knowledge of marine mammals, especially in regards to human disturbance as part of their preparatory work for Chukchi oil exploration.

The Tribes representation on the marine mammal co-management committees (Alaska Native Organizations – ANO’s) is also coordinated through the EP. These include the Ice Seal Committee (ISC), Eskimo Walrus Commission, Alaska Beluga Whale Committee (ABWC) and the Alaska Nannut Co-Management Council (formerly the Alaska Nanuuq Commission). The Native Village of Kotzebue and its citizens played an instrumental role in the formation of the Beluga and the Ice Seal Committees and held the chairmanship of the Beluga Committee since its founding in 1988 and also the chairmanship for many years of the Ice Seal Committee in part because of the ice seal research led out of the EP. The EPD coordinates the ANO activities of the Tribe, like drafting tribal resolutions as needed for these ANO’s, reviewing materials produced by the bodies, relaying the information to the Tribal Council and facilitating the appointment of tribal representatives to these co-management groups. The ES also presents research projects and findings undertaken by the EP that are relevant to the work of these co-management organizations and also interfaces with federal research projects that investigate the marine mammals that are the focus of the ANO’s in Kotzebue Sound and the Chukchi Sea. Recently, the EPD played an active role on the steering committee for the founding of the new polar bear co-management council (Alaska Nannut Co-Management Council) after the Alaska Nanuuq Commission was decommissioned by the federal government and before the new body was convened.

ACADEMIA COOPERATIVE EFFORTS

The EP has partnered with many educational institutions throughout the years. The first relationship developed was with Dartmouth College to facilitate a caribou health research project in 1998-1999. This project focused on developing body condition indicators that would allow hunters to contribute to monitoring the health of caribou by identifying indicators that could inform underlying causes for population demographic shifts. This was a short-term project, but some have been long-term and have lasted for many years. One of the first long-term partnerships was with Eastern Carolina University (ECU) where both biological and social scientists from ECU, UAF, and Bates College participated in a cooperative project with the Tribe to study the ecology of Kotzebue Sound. This effort was initiated in the year 2000 and there is still ongoing collaboration to this day. The Tribe partnered with the UAF through Professor Todd O’Hara to undertake a multi-year effort (2004-2017) to investigate nutrients and contaminants in fish and wildlife that make up a large part of the diet of tribal citizens. As part of this effort, the ES was able to work with many graduate students that would get real world experience working in and with tribal communities to help educate them about tribal perspectives and concerns as it relates to wildlife health and consumption. All of these students were planning to go on to work for state, federal, university, or Tribal entities, in the arena of wildlife toxicology where this familiarization of the tribal perspective will be most helpful to their ability to inform their work and results (e.g. consumption advisories). One of the graduate students has already been hired by the Great Lakes Indian Fish and Wildlife Commission as an Environmental Biologist to work on exactly these type of issues.

**Alaska Marine Mammal Tissue Archival Project & Nutrient and Contaminant Profiles of Spotted Seals**

<b>Raw Spotted Seal Blubber</b>	
Serving Size 3.4 oz (100g or approx. ¼ pound)	
Amount per Serving	
Calories	NA
Calories from Fat	680
% Daily Value*	
<b>Total Fat</b>	<b>76g</b>
Saturated Fat	13g
Trans Fat	3g
Mono-Unsat.	41g
Poly-Unsat.	16g
Omega-3 PUFA	14g
Omega-6 PUFA	2g
<b>Cholesterol</b>	<b>48g</b>
<b>Sodium</b>	<b>27mg</b>
<b>Total Carbohydrates</b>	<b>NA</b>
Dietary Fiber	NA
Sugars	NA
<b>Protein</b>	<b>NA</b>
Vitamin A	103%
Vitamin C	0%
Calcium	0%
Iron	6%
Selenium	25%
*Percent Daily Values are based on a 2000 Calorie diet. Your Daily Values may be higher or lower depending on your calorie needs.	
Calories:	2000 2500
Total Fat	Less than 65g 80g
Sat Fat	Less than 20g 25g
Cholesterol	Less than 300mg 300mg
Sodium	Less than 2400mg 2400mg
Total Carbohydrate	300g 375g
Dietary Fiber	25g 30g

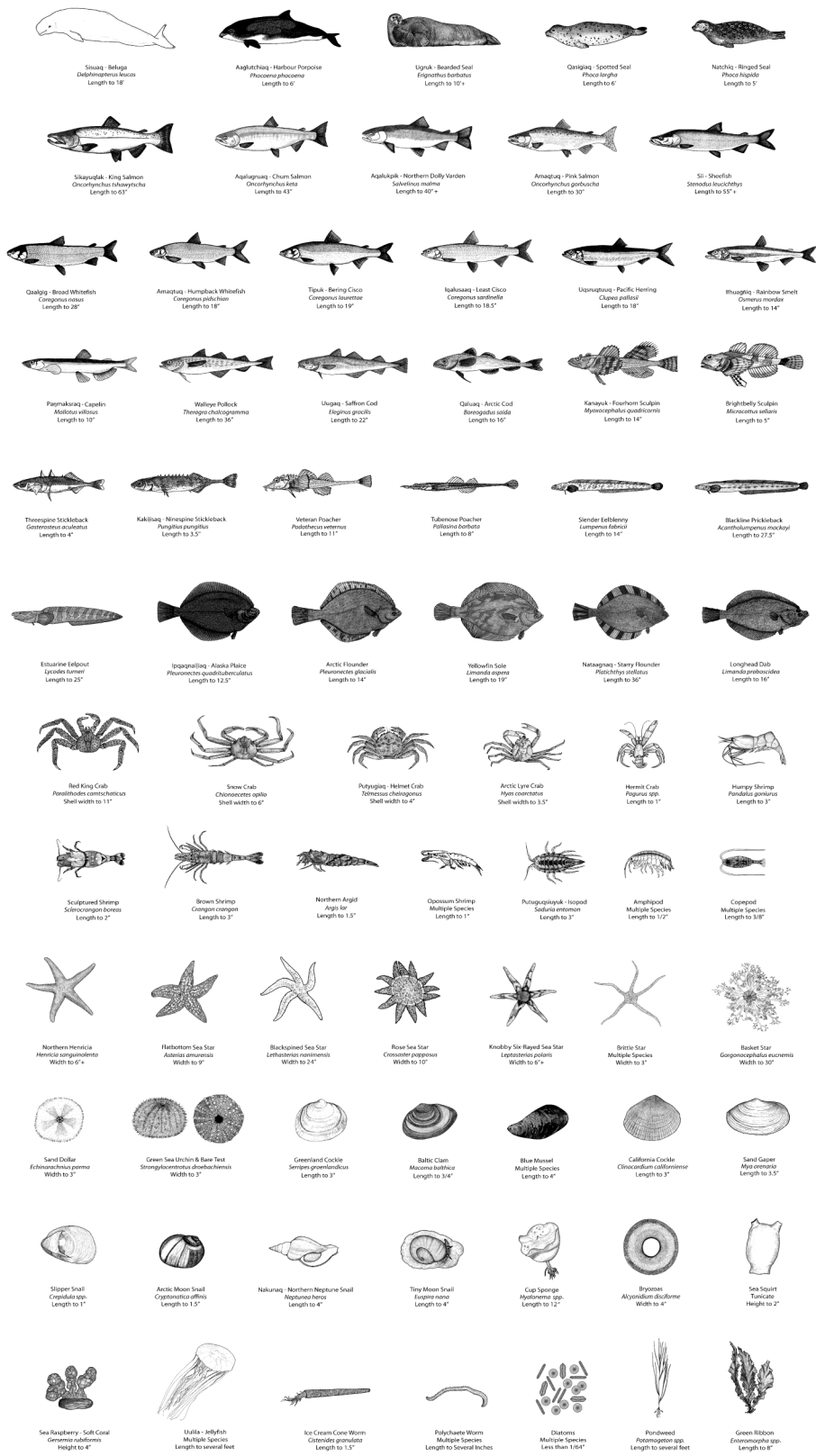
**COMBINING IÑUPIAQ AND SCIENTIFIC KNOWLEDGE**

Ecology in Northern Kotzebue Sound, Alaska

by Alex Whiting, David Griffith, Stephen Jewett, Lisa Clough, Will Ambrose, and Jeffrey Johnson



# Common Marine Life of Northern Kotzebue Sound



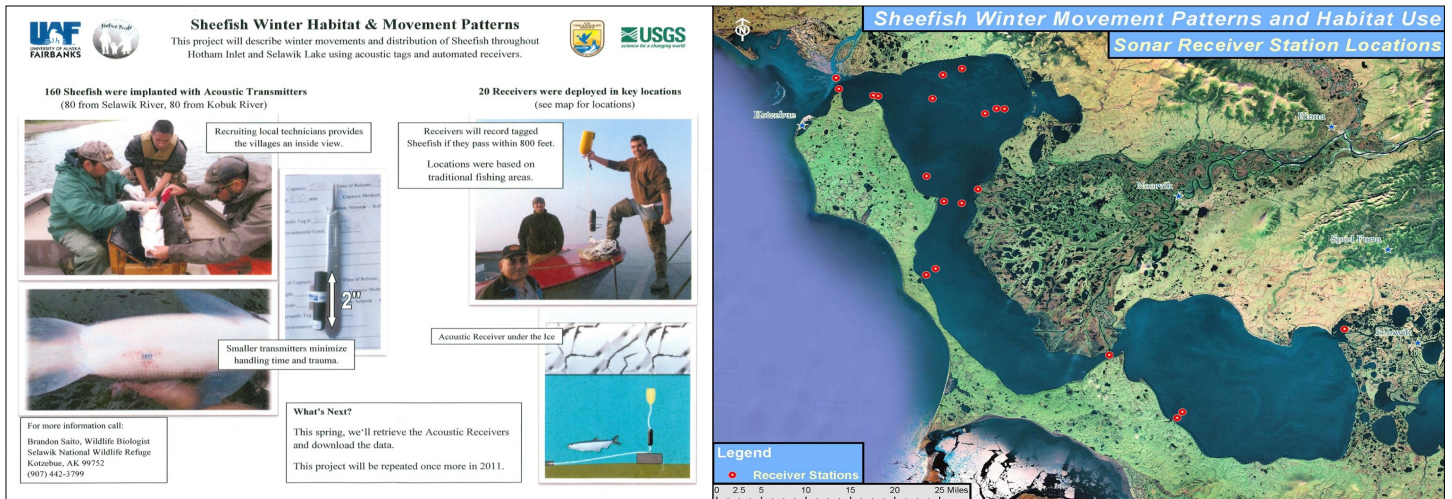
Successfully carrying out fieldwork on research projects, while crucial, is only one part of a successful effort. From the EP perspective, providing information back to the community in a user friendly, easily digestible form is very important, with the best approaches creating products that are accessible to the widest audience to include tribal youth. During the Kotzebue Sound ecology project discussed above, the EPD took the approach of illustrating a poster that included much of the marine life gathered in trawl surveys that were part of the effort. Many of these species, while common in the Sound, are rarely seen by local people due to their offshore habitat and the fact that there are no tide pools or other easily accessible ways to capture many of these species. However, a lot of these animals or their remains can wash up on beaches to be collected and observed by local people. This poster, which was made widely available locally and provided for free, is the kind of product that meets the needs described above. A number of these posters have made their way to coastal camps where beachcombing is ubiquitous, especially by the youth. Having access to this poster allows for them to begin to think about the wide diversity of marine life and practice basic forms of science in a fun and engaging way. For the wider audience outside the region it also helps to highlight the diversity of marine life in the Arctic, which is not as readily known as that of the oceans farther south. These illustrations were also used in the publication that resulted from the research, avoiding the need to deal with copyright issues and having to use a variety of illustrative forms that did not conform to one another, since these were all hand drawn using the same matrix.

## Kotzebue Sound Ecological Knowledge and Food Web Study

Illustrations and Layout by Alex Whiting  
Environmental Specialist - Native Village of Kotzebue

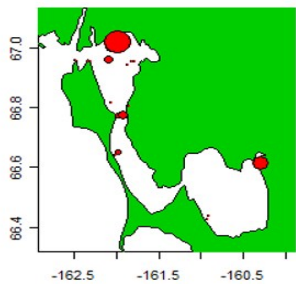


Revised 5/07

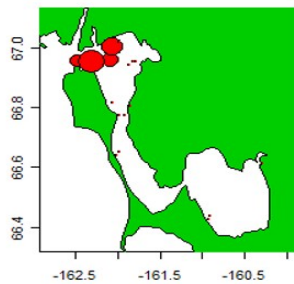


## Selawik and Kobuk Sheefish Movements Winter 2010-2011

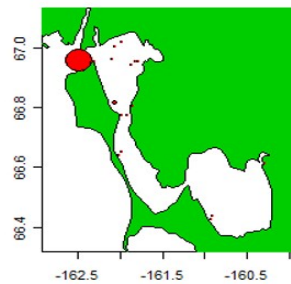
**Selawik October**



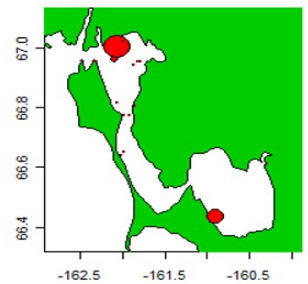
**Selawik November**



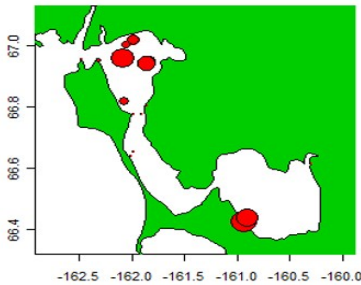
**Selawik December**



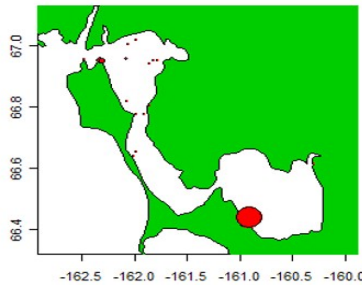
**Selawik January**



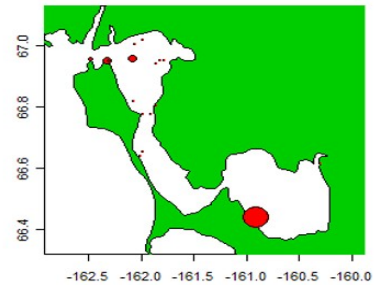
**Selawik February**



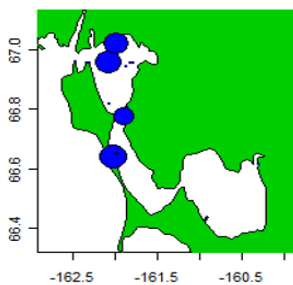
**Selawik March**



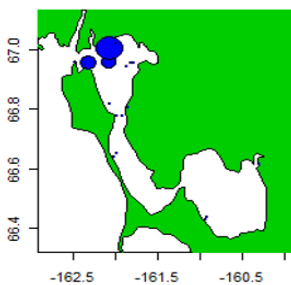
**Selawik April**



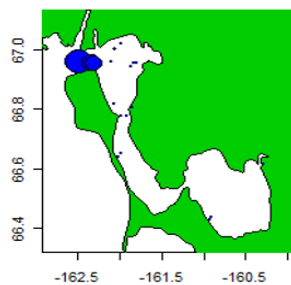
**Kobuk October**



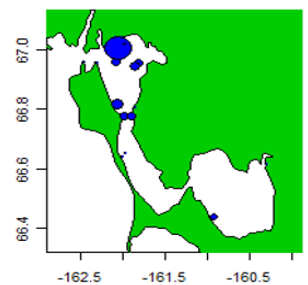
**Kobuk November**



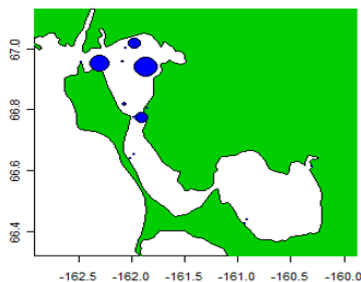
**Kobuk December**



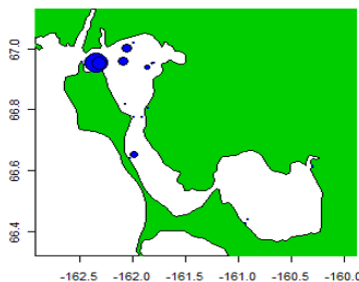
**Kobuk January**



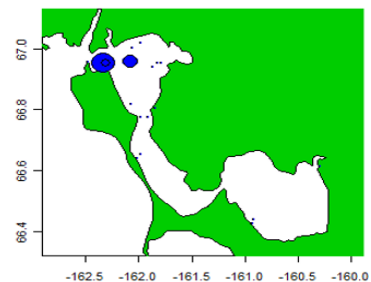
**Kobuk February**



**Kobuk March**

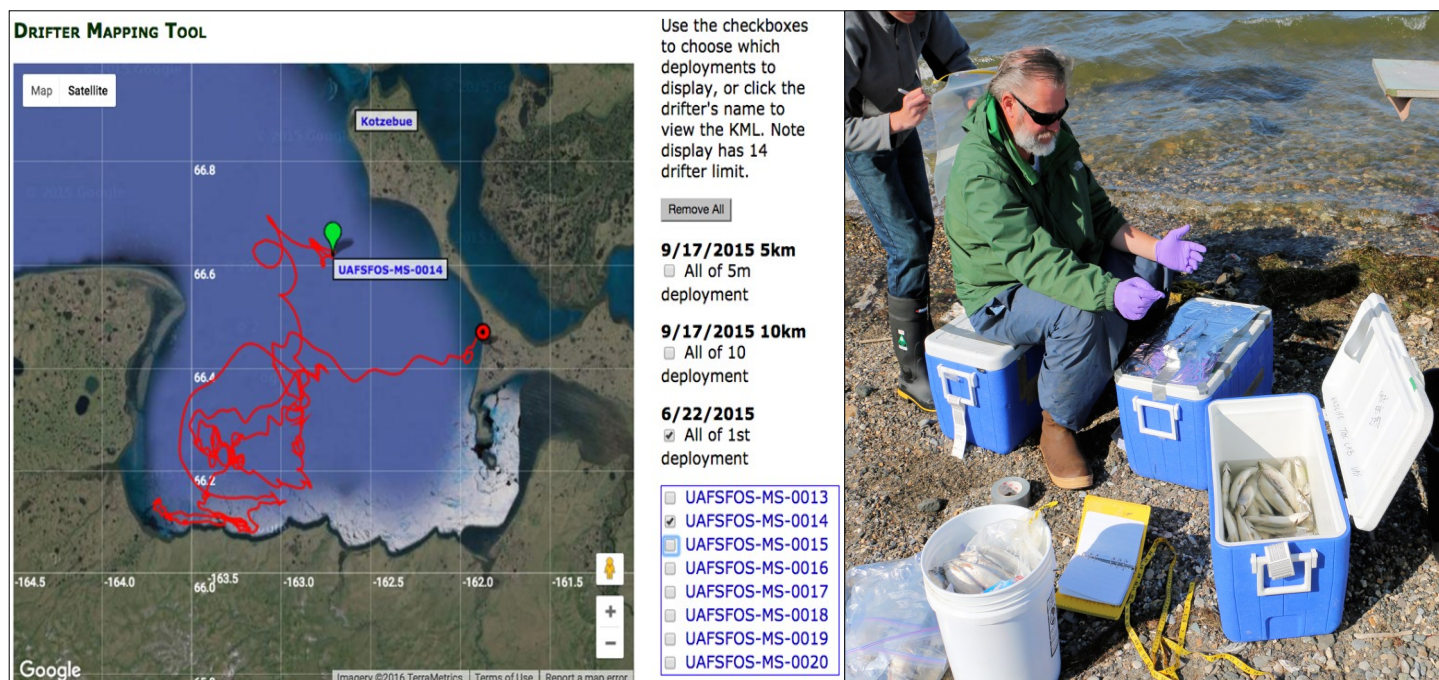


**Kobuk April**





The EPD has also collaborated recently with UAF School of Fisheries and Ocean Sciences to study the wintering habitat of sheefish from the Kobuk and Selawik Rivers, which are important subsistence resources for our tribal citizens. This was the first time that sheefish were able to be tracked over the course of the winter to determine the areas occupied and where they overlapped at what times of year (see above). This will be useful for future management of these two stocks for conservation purposes. More recently, the EPD cooperated with Dr. Seth Danielson with the UAF Institute of Marine Science, to deploy satellite surface drifters to map the surface currents of Kotzebue Sound to provide useful information for spill response, disabled vessel situations, and other areas where this knowledge will be usefully engaged. The EPD is currently supporting a graduate student out of UAF studying the marine ecology and mercury in Kotzebue Sound and is facilitating the collection of various fish tissues by Dr. Todd O'Hara of UAF to be included in the State of Alaska Bio-monitoring program for fish consumption advisories.



The EPD is cooperating with UCSC Long Marine Laboratory to undertake research into bearded seal hearing, which has not occurred previously, in order to inform offshore development mitigation and protection strategies. To this end, the EP carried out a capture effort with NAB funding during the fall of 2014 and 2015 during which two young of the year male bearded seals were captured and sent to the UCSC Laboratory to be housed for hearing research (see below and page 16 pictures). The hearing research itself is being funded under a 3-year Joint Industry Programme funding agreement with Long Marine Lab. In conjunction with the effort, two acoustic recorders were deployed off of Cape Blossom to overwinter in order to collect baseline background ambient noise levels and to record sounds produced by seals in the area.





The EPD has developed a relationship with the local high school field biology class, during which time the EPD: presented research projects to them; assisted with their statewide science competitions like the Tsunami Bowl; led them out in the field to beach seine and to introduce them to field protocols for collecting environmental information such as water temp, salinity and related measurements; provided them with the opportunity to participate in seal tagging (including taking morphometrics and releasing tagged seals); practiced using dichotomous keys to identify fish species caught during beach seining field trips; and generally communicated with them and their instructors about current research activities.



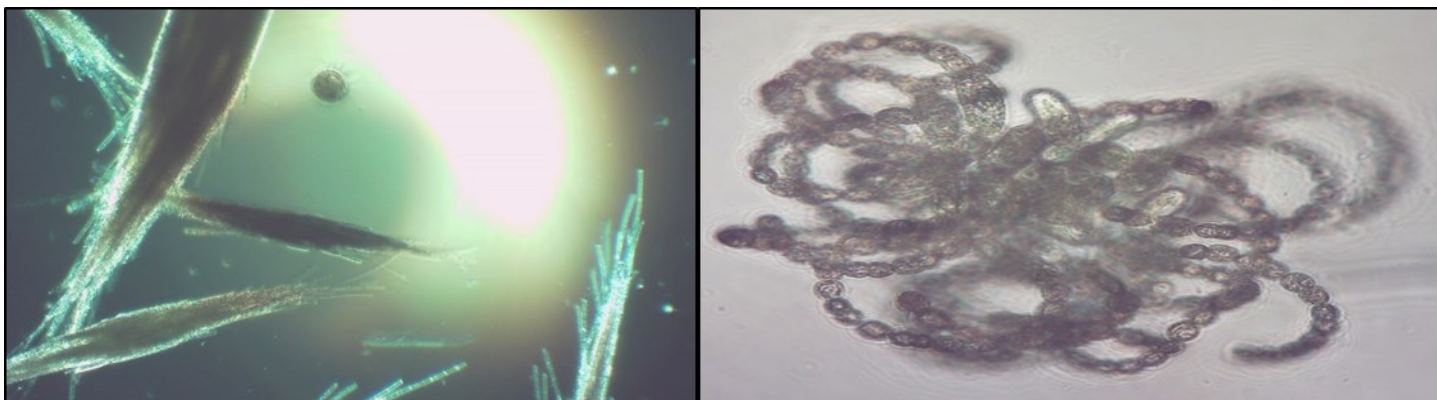
In 2009, a new concern arose of large cyanobacteria blooms occurring in Kotzebue Sound. The Tribe developed a project in cooperation with Eastern Carolina University, Woods Hole MBL, and SUNY College of Environmental Science and Forestry to investigate this new development. The results were published in Harmful Algae News No. 46. This is one of only a couple Arctic studies published on the newly emerging phenomenon of harmful algae blooms (HABs) in the Arctic. Because HABs are of statewide concern, a statewide effort

has come together to more fully explore the concerning issue of cyanobacteria and similar blooms that produce toxins that make their way into the food chain and are responsible for killing fish and wildlife found off Alaska, which support the local subsistence economies. This effort is called the Alaska Harmful Algae Bloom Network and is organized under the Alaska Ocean Observing System. The Native Village of Kotzebue is a partner in this Network and initially facilitated a US Arctic Research Commission project to carry out a pilot effort to methodically monitor the water in Kotzebue Sound for harmful blooms and the



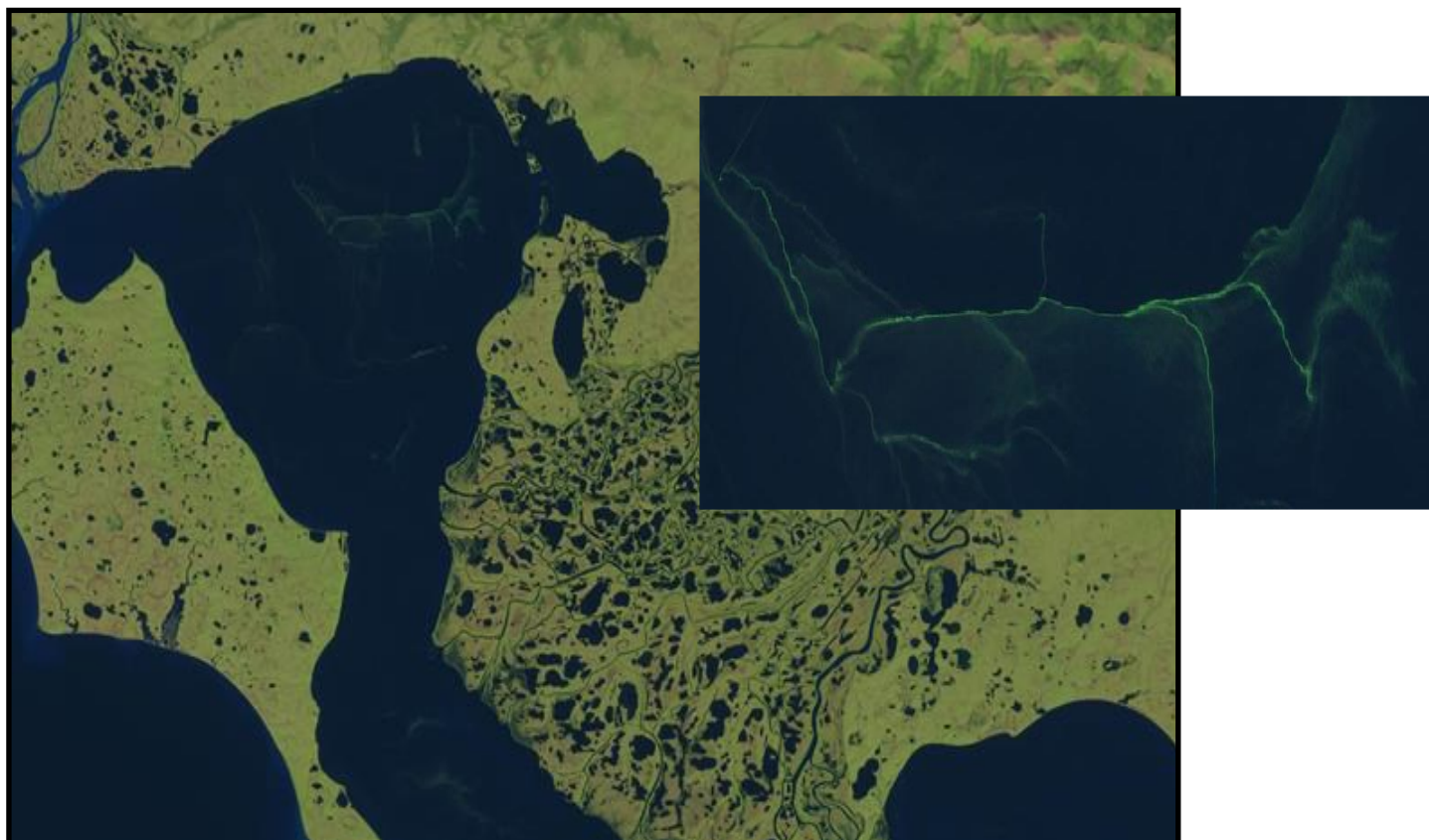


associated toxins. Since then, the EPD has built the capacity to sample waters for cyano toxins and to photograph and identify cyanobacteria that occur in the area using a digital microscope.



*Aphanizomenon sp. and Dolichospermum sp. make up the harmful algae blooms seen near Kotzebue.*

In 2018, Ajit Subramaniam a Lamont Research Professor at the Lamont-Doherty Earth Observatory of Columbia University who specializes in physical oceanography and was one of the principle investigators on the recent Ikaagvik Sikukun research project discussed below, partnered with the EPD to develop a funding proposal for a long-term monitoring program for cyanobacteria. The Gordon and Betty Moore Foundation supplied funds for a pilot effort to assist with program development. This included purchasing a mooring to be used with a YSI Sonde to collect water information over the course of a summer, along with funds to purchase additional equipment to be used in a boat based monitoring program. The summer of 2021 multiple sampling trips were made and the mooring was tested out in preparation for deployment for the full summer of 2022. Ajit also enlisted the assistance of a graduate student Anindita Das who used past satellite imagery to identify cyano blooms in Kobuk Lake to document their prevalence and pinpoint areas for optimum placement of the mooring. Edward Carpenter, a professor at San Francisco State University specializing in microbiology, has also partnered with the EP to perform identification and quantification of the phytoplankton and zooplankton collected from the sampling sites near Kotzebue.



*Cyanobacteria blooms in Kobuk Lake as seen through satellite imaging.*

In 2017, the EP began a 4-year cooperative effort funded by the Gordon and Betty Moore Foundation to investigate the sea ice in Kotzebue Sound using drones. The Principal leads of this effort are Christopher Zappa, of the Lamont Doherty Earth Observatory, Columbia University and Andrew Mahoney, with the Geophysical Institute University of Alaska Fairbanks. This project titled: **“IKAAĠVIK SIKUKUN: Bridging the Scientific and Indigenous Communities - Sea Ice Change in Arctic Alaska,”** was designed to answer questions important to the tribal citizens. An Elders Advisory Council made up of 4 local Elders knowledgeable about sea ice and Kotzebue Sound ecology crafted research questions, led field-work, and assisted with collecting observations and synthesizing the findings of the project. Ultimately, the findings will contribute predictive assessments of the changing cryosphere of Kotzebue Sound, the implications of such change for the ecology, and utilization of same for the cultural components relying on it. Through this approach, we addressed key questions concerning the mechanisms and impacts of rapid changes taking place in the Arctic while ensuring that our answers incorporate indigenous ways of knowing and are relevant to local needs. Notably, the Office of the White House Press Secretary included the project in a statement titled: **White House Announces Actions to Protect Natural and Cultural Resources in Alaskan Arctic Ocean** in December 2016.

## Research important to Kotzebue

Ikaagvik Sikukun scientists and the advisory council of Elders spent a year identifying research questions that are: 1) important to the community of Kotzebue, and 2) possible to answer using unmanned aerial systems and other tools and expertise available to the team.



### Q1. What environmental factors control marine mammal use of Kotzebue Sound?

Bearded seal and beluga need openings in the ice to enter Kotzebue Sound. These openings form during break-up, a process complicated by the enclosed nature of the Sound and the freshwater input from the Noatak and Kobuk Rivers. Q1 identifies how these unique coastal characteristics influence sea ice openings.



### Q2. What environmental factors control the length of the bearded seal hunting season in Kotzebue Sound?

The community of Kotzebue hunts bearded seal when suitable sea ice habitat is accessible from town. This usually happens when freshwater from the Noatak River creates a channel through the landfast ice. In recent years changing sea ice conditions severely shortened the hunting season. Q2 explores the complex processes that controls access to seal hunting.



### Q3. What determines ice transport processes in Kotzebue Sound?

Currents and wind move ice around Kotzebue Sound, but complex patterns can emerge as water levels fluctuate due to tides, wind and river discharge. The advisory council reported that recently east and west winds blow more often changing how ice openings and shorefast ice develop in the Sound. Q3 investigates how these changes impact ice movement.



### Q4. What snow and ice surface properties promote ringed seal denning and pupping?

The advisory council reported that ice develops in the Sound later than usual with less snow accumulation. This change could reduce the number of suitable ringed seal denning (lair) sites which are often found in snow drifts behind pressure ridges. Q4 maps snow cover, sea ice roughness, and identifies denning sites.



### Q5. What role does sea ice play in sediment transport / accumulation in Kotzebue Sound?

Wind and flooding rivers deposit sediment on the sea ice in Kotzebue Sound. Because the Sound is shallow and usually freezes to the sea bed, as sea ice becomes thinner, it is more likely to melt and deposit its sediment load before leaving the Sound. Q5 explores sea ice and sediment interactions and how sediment may change the Sound's seafloor.



### Q6. Why did no ice form in Kotzebue Sound during winter 2018/2019?

According to Kotzebue elders, 2018/2019 was the first winter when Kotzebue Sound did not freeze over. The loss of sea ice compromised traditional harvest practices. To respond to this pressing issue, Ikaagvik Sikukun was asked to add Q6 focusing on what caused the unprecedented loss of winter sea ice in the Sound.

## Diverse research approaches



**Local Indigenous knowledge** The advisory council of Elders is involved in all aspects of research from deciding research questions, collecting data, guiding how and when to make observations, to interpreting the significance of results.



**Unmanned aerial systems** Ikaagvik Sikukun combines long-range unmanned aerial systems with an Indigenous way of looking at the ice to observe sea ice during critical periods for marine mammals and subsistence hunting.



**On ice measurements** Responding to recent sea ice thinning, Ikaagvik Sikukun measures sea ice growth and melt over the winter and spring, and tracks snow depth—which insulates the ice keeping it warmer in winter (less sea ice growth) and cooler in spring (less ice melt).



**Measuring seal habitat** Ringed seals rely on specific snow and ice characteristics that are disappearing with changing ice conditions. In spring Ikaagvik Sikukun surveys the snow roughness and depth to see how much habitat is available and if there are any used denning sites.

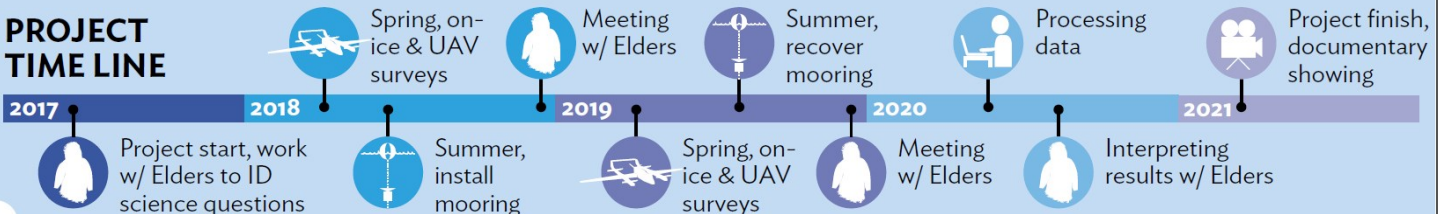


**Filming the documentary** Ikaagvik Sikukun's filmmaker is documenting the project from start to finish. The final community-based film will bridge communication between local Indigenous knowledge and western science.



**Oceanographic mooring** Ikaagvik Sikukun's ocean mooring measures how heat enters and leaves Kotzebue Sound. The mooring, which sits on the sea floor, also captures biological processes at the base of the ocean's food chain.

## PROJECT TIME LINE





## UAV cameras & sensors

Ikaagvik Sikukun uses four main UAV science instruments, also referred to as payloads: VNIR and ATOM are cameras, MET and RAD are sensors. These cameras and sensors sit inside the nose of the UAV. Read below to see what these instruments do and how they work together to answer complex questions.

### VNIR camera

Specialized camera that captures color variations of a surface, this reveals features in the ice like ridges, ponds, and open water.

### ATOM camera

The ATOM is a thermal camera that shows heat given off by seals. A separate high resolution color camera helps identify hot spots as adult or pup seals and the ice features the seal was using.

We often fly the MET & VNIR together to see what sea ice features are associated with which wind patterns.

We often fly the RAD & VNIR together to see which sea ice features absorb the most heat from the sun.

### MET sensors

The MET sensors measure wind properties like speed, direction, and turbulence.

Wind swirls and has irregular patterns across rough ice, this motion can make the ice break-up faster.

### RAD sensors

The RAD sensors measure how much heat from the sun is absorbed by a surface. Snow covered ice absorbs little solar heat. Other features like melt ponds, bare ice, and open water are darker and absorb more heat leading to faster break-up.

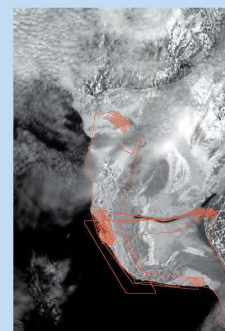
## Focusing on break-up

What happens when the channel out of Kotzebue Sound opens up and ice begins breaking up? Ikaagvik Sikukun intensively observed the Sound from April 1 to May 19, 2019 to find out. During this period, the team surveyed for seal habitat, gathered sea ice samples, and completed 22 UAV science flights.



**May 6**

Pre break-up. The section of the ice edge nearest the river channel (orange arrow) was identified as an area to repeatedly survey throughout break-up to see how sea ice melt evolves.



**May 9**

Darker colored melt ponds identified with the VNIR camera showed that ice was disintegrating. The UAVs targeted the channel as often as possible during surveys (orange lines show UAV survey routes).



**May 14**

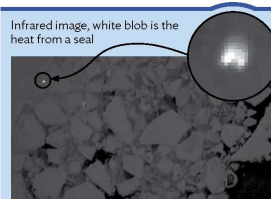
A large section of ice broke off, likely related to a crack near the channel that was identified by the color camera (see page 7).

The Noatak, Kobuk, and Selawik Rivers flow into Kotzebue Sound. In spring they break up the sea ice, forming a channel that hunters use to access bearded seals. How the channel breaks up can help us understand ice melt in the Sound!

## Finding seals with UAVs

Where are the seals in Kotzebue Sound? What type of ice and snow features do they prefer? To answer these questions, UAVs carried the ATOM infrared camera along with a high-resolution color camera.

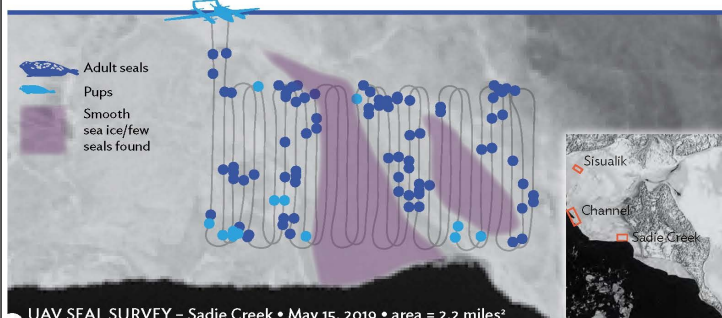
Being warm-blooded in a cold Arctic environment, seals give off heat which is seen by the infrared camera as a white "blob" against a dark background. Once a heat blob is found, scientists zoom in with the high-resolution color camera to determine the species of the seal and whether it is an adult or pup.



Jessie Lindsay  
NMFS Permit No. 193109

### How many seals?

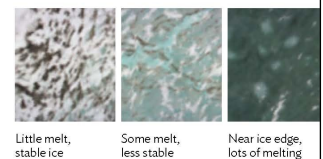
UAVs carrying the ATOM camera found 953 adult ringed seals and 87 pups during the spring 2019 surveys. Most seals were on rougher ice and the seals seemed to avoid sections of smooth ice (highlighted in purple). Most of the seals in these preliminary counts were in three survey areas: Sisualik, the river channel and Sadie Creek. The sites were chosen by the Elders Advisory Council and based on on-ice ringed seal searches. The UAV seal surveys were repeated up to three times during the intensive observing period.



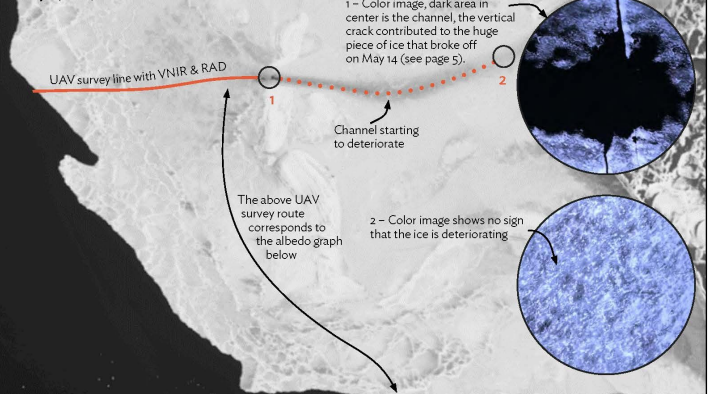
## Ice & snow features

### Ice color is important!

Ikaagvik Sikukun's Elders Advisory Council says that the color of ice is important, for example, bearded seals prefer white ice. Bright white, snow covered ice is also often more stable and absorbs less heat than darker ice with melt ponds. The VNIR camera allows us to explore wavelengths of light that our eyes cannot see. It reveals colors and features in the ice, such as ponds, ridges or cracks, that would not be picked up using a regular camera.



**May 6, 2019**



### RAD sensor shows albedo

Knowing which areas absorb the most heat from the sun can help us predict where break-up will happen first. This graph from the RAD sensor shows the 'whiteness', known as albedo, of the above survey line.

Open water is the darkest, absorbs the most heat, and has the lowest albedo (left side of graph). On the ice, the albedo varies depending on where there are ponds, cracks or other dark features. The section on the image and graph labeled "1" has the lowest albedo of all the ice areas and is where the river channel is opening.





## On ice measurements

How do snow depth and sea ice thickness change throughout the year?  
Does the river channel impact ice thickness?

### Measuring sea ice & snow

Ikaagvik Sikukun measured snow depth and sea ice thickness in Kotzebue Sound. These measurements help explain how, when and why ice grows and melts. The Elders Advisory Council helped choose the two sites: 1) a high-current site in the channel where the Noatak and Kobuk rivers merge and flow out of the Sound, and 2) a low-current site at the edge of the Sound. Comparing the two sites may help explain how currents and river water impact sea ice growth and melt.

### Who measures ice & snow?

The Kotzebue Sound snow depth and sea ice thickness sites were initially set up in January 2018 by graduate students **Kate Turner** and **Carson Witte** and project leader **Alex Whiting**. Each year the site is set up in January when the sea ice is stable. Gauges are removed before break-up in late April or early May. In spring 2018, Elder Advisor **Bobby Schaeffer** and Alex recorded the data. Since January 2019, Kotzebue's **Vince Schaeffer** took over measurements. Although field work ended for Ikaagvik Sikukun in 2019, these measurements continued in 2020 through a partnership with the Alaska Arctic Observatory & Knowledge Hub.

### What did we measure?

Each week from January to May snow and ice measurements were taken at the channel and bay sites. Sites had 4 gauges for measuring both snow depth and ice thickness, and 9 more to measure only snow depth.

This diagram shows how the snow depth and ice thickness was measured. Data on **page 3** came from these measurements.

1. Marks the "zero point" at the **ice surface** when the gauge was frozen in place in January.
2. The **gauge markings** are used to measure snow and ice depth.
3. **Steel weight** sitting under the ice.
4. **Steel cable** runs from the steel weight to the top of the gauge.
5. **Copper wire** can be connected to a car battery. Doing so heats up the steel cable, melting the ice so the cable can move. Vince pulls the cable until the steel weight rests on the ice's bottom.
6. **Car battery** connects to the copper wire at the positive end and the steel cable at the negative end.
7. Once the cable is pulled tight, ice thickness is measured by seeing where the **wooden handle** hits the gauge markings.



## Under ice measurements

How do currents and salinity impact how sea ice grows and melts?  
Which seasons are most impacted by ocean water compared to river water?

### What happens under the ice?

To understand how sea ice forms and melts in Kotzebue Sound Ikaagvik Sikukun, graduate student **Carson Witte** and project leader **Christopher Zappa** used specialized science instruments to explore the interactions between three forces:

**Salty ocean water.** Saltier water is usually further from its freezing point so it can cause more melting.

**River channel.** As the river water moves out of the Sound, its current can erode away sea ice.

**Heating and cooling.** Driven by the sun (or lack of sun in winter) and by the water too. Movement of ocean water into the Sound usually was driven by wind.



### What did we measure?

Under ice measurements were taken with sensors at the channel site only. These sensors remained in the ice all winter. In spring they were retrieved and the data stored within was downloaded. Data at the top of **page 5** came from these sensors.

1. This "T" brace against the ice keeping the under ice sensors, which are attached to a string with a weight at the bottom, in place.
2. This sensor uses pulses of sound to measure the current at different depths.
3. The orange sensors on this string measure the temperature.

4. The white sensor measures both the salinity and temperature.
5. This windmill and solar panel provided power to the instruments throughout the winter.
6. This weather station sits on top of the ice, measuring the effects of air temperature, humidity, wind and sunlight on the growth and melt of the ice. The difference between how much heat the sun gives off and how much the ice reflects back, tells us how much melting happens directly from the sun.
7. These are the snow and ice gauges discussed on **page 2**.

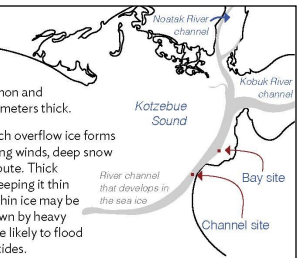
## Overflow on sea ice

Sometimes the weight of the snow, along with wind and strong incoming tides, pushes the sea ice down and seawater from below floods the surface. On rivers, this flooding is often called "overflow." Flooded sea ice can impact wildlife such as seal pups, if their lairs no longer provide a warm place to dry off.

In 2019, flooded snow from overflow was common in the Sound (see photo below). When this overflow refroze it made up 50% of the total sea ice thickness. Local residents often find overflow near the channel and the

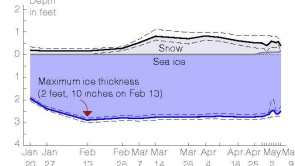
mouth of the Noatak River. In the open ocean overflow ice is less common and typically only a few centimeters thick.

It is not clear why so much overflow ice forms in Kotzebue Sound. Strong winds, deep snow and thin ice likely contribute. Thick snow insulates the ice, keeping it thin throughout winter. The thin ice may be more easily weighted down by heavy snow, and therefore more likely to flood under strong winds and tides.

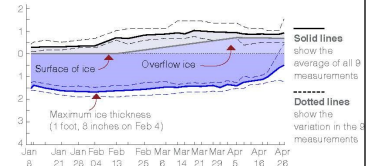


### Check out the data

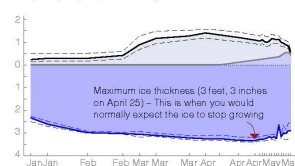
**2018 channel site** There was little snow in 2018 and considerable ice grew in January. It stopped growing relatively early, reaching its maximum in mid February. The snow was deepest, only 10 inches, in mid March.



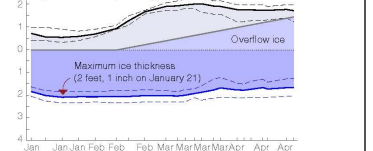
**2019 channel site** Ice was over a foot thinner in 2019 than in 2018. Deeper snow and strong winds/tides likely contributed to the thinner ice. By the middle to end of February, overflow ice began to build up on top of the existing sea ice.



**2018 bay site** Without strong currents to erode ice from below, Bay site was about 5 in thicker than channel ice. Ice grew until late April. Snow was also deeper (1 ft 5 in) at the Bay site.



**2019 bay site** Bay site ice stopped growing three months earlier than usual and was over a foot thinner than 2018. Strong southerly winds and deep February snow pushed the surface of the ice down, causing overflow. By winter's end overflow was ~1 foot 5 inches thick, making up 50% of the total ice thickness.

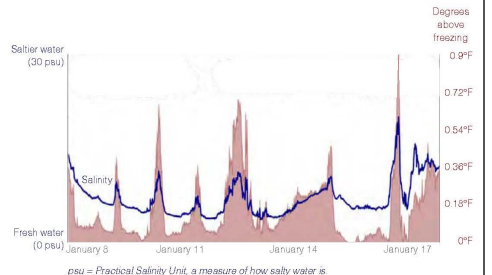


Three consistent patterns emerged. Bay site ice was thicker than in the channel where the current was stronger. Strong winds and thin ice in 2019 caused more flooding so thick overflow ice formed. Ice stopped growing earlier in the winter than expected (ice typically continues growing until mid to late April), which suggests that heat from the ocean limits ice growth.

### Check out the data

### Ocean — most impact in winter

As expected, water moving north into Kotzebue Sound was usually saltier, and water moving south out of Kotzebue Sound was usually fresher. Ikaagvik Sikukun temperature and salinity sensors showed that peaks in salinity, meaning that ocean water was moving into the Sound, usually happened simultaneously with warmer water. This means that in winter, the ocean brings heat into Kotzebue Sound. Movement of ocean water into the Sound usually was driven by wind.



### River channel — most impact in spring & fall

On **page 2 and 3** we learned from the "on ice measurements" that sea ice is thinner in the middle of the river channel. The "under ice measurements" (**page 4 and 5**) revealed that the ocean was the biggest contributor of heat in winter (all these sensors were only in place during winter). To understand what happens during freeze-up and break-up, a mooring was tethered to the seafloor near the mouth of the Sound for two years. This instrument, which is pictured in the photo to the right, measures salinity and temperature year-around. The data are shown below.



### Fall

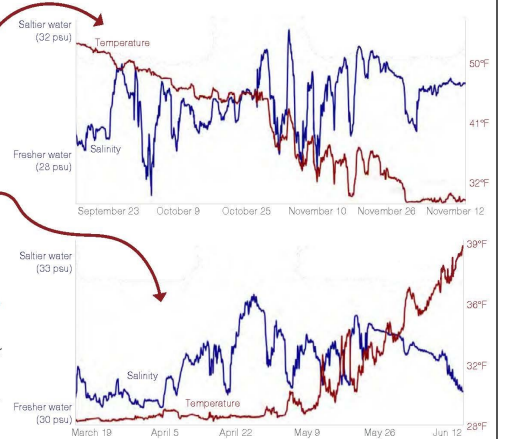
In fall, the river is cooler than the seawater in the Sound. The cool, fresh river water drives the water temperature down and promotes freeze-up of Kotzebue Sound.

### Spring

In spring, the opposite is true. The relatively shallow river warms up faster than the deeper Sound. As the rivers flow into the Sound the channel raises the water temperature and drives break-up.

### Why does it matter?

These data show that the Kobuk and Noatak rivers control how sea ice near Kotzebue forms in fall and breaks up in spring. This means that one way to anticipate when freeze-up and break-up will occur is by monitoring river temperatures upstream.





## Seal habitat surveys

What kind of ice and snow features do ringed seals need to build pupping lairs and breathing holes in Kotzebue Sound?

Female ringed seals birth pups in snow covered lairs built into snowdrifts on the downwind side of pressure ridges. The pups are covered in white, woolly hair for the first few weeks of their life while they build blubber. Well-built lairs keep pups safe, warm and dry.

**Jessie Lindsay** is an Ikaagvik Sikukun graduate student studying seals and their habitat in Kotzebue Sound. Jessie, along with project leaders **Donna Hauser** and **Andy Mahoney**, measured snow and ice characteristics at seal lairs and breathing holes compared to ice without any seal structures. These surveys help explain how rough the ice needs to be in order for snow to accumulate deep enough for seal lairs. All seal research was conducted under NMFS Permit No. 19309.

### Finding seals

It can be hard to find seals, seal lairs and their breathing holes. In 2018 and 2019, Ikaagvik Sikukun used a combination of snowmachine expeditions, led by the Elders Advisory Council; surveys with unmanned aerial vehicles (commonly known as drones) equipped with thermal cameras; and an airplane to follow the drone and photograph seals from the air.

Lairs found during on-ice surveys were in 12.5 inches of snow on average. They were usually in snow drifts associated with rougher ice. It is possible that some lairs were in marginal habitat. For example, one lair was in 10.8 inches of snow. The actual lair was 8 inches tall with only about an inch of snow over top.

Breathing holes usually were on smoother ice with an average 7.9 inches of snow.



Photo by Jessie Lindsay  
NMFS Permit No. 19309

### Flooded seal lairs

On page 3 we saw that at times deep overflow occurs in Kotzebue Sound. The seal surveys found two flooded seal lairs in 2018 and one in 2019. The picture on the left shows a collapsed lair with liquid water covering the floor. Lairs provide a safe place for pups to dry off after they get out of the water. This is especially important when pups are first born because they rely on fluffy fur rather than blubber to keep them warm. Wet fur is not as warm as dry fur.

**Help us understand if flooded lairs are normal in Kotzebue Sound. How often do you find seal lairs with water in them? Send your insights to [ikaagvik\\_all\\_pis@lists.ideo.columbia.edu](mailto:ikaagvik_all_pis@lists.ideo.columbia.edu).**

## Elder Advisory Council



**Bobby Schaeffer**  
Kotzebue Elder



**Cyrus Harris**  
Sisualik Elder



**John Goodwin**  
Kotzebue Elder



**Roswell Schaeffer Sr.**  
Kotzebue Elder

### Guided by Elders

The Ikaagvik Sikukun Elder Advisory Council shared their Indigenous Knowledge, passed down through generations, and learned from decades of observing the animals, ice, water and weather in and around Kotzebue Sound. The Elders proposed the questions Ikaagvik Sikukun studied. They used their knowledge of the ice to guide when, where and how to collect data, and led the science team on the ice to ensure safe travel. The Elders also helped interpret the significance of results.

In this section, we share perspectives from the Elders on Ikaagvik Sikukun and the changes they are observing.

### Messages from the Elders

#### Different ways of knowing

The Iñupiaq have called the Arctic home since time immemorial and have developed a knowledge system shaped by the environment. For thousands of years, hunters have studied the animals, ice, land and ocean. Ikaagvik Sikukun acknowledges these different ways of knowing and believes that knowledge is stronger when scientists and Indigenous Knowledge work together as equal partners.

Cyrus Harris said: "The Indigenous people from way back in the day, they've always studied the climate and the weather as a way of survival. It gives them an idea of what conditions are going to look like for harvesting in certain areas or traveling."

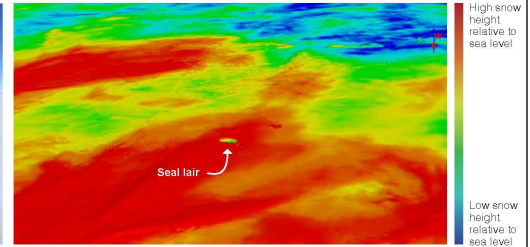
Several findings from Ikaagvik Sikukun were already known to the residents of Kotzebue. For example, the on-ice measurements showed that there is less ice where deep snow accumulates.

Cyrus Harris said: "We do a lot of ice fishing. Before we had augers we had homemade ice chisels which we call a *tuq*. When I was growing up my parents, they would select a spot to start chipping ice. What I noticed is that the spot they were actually picking is an area that's got a fair amount of snow cover... And as they are ice chipping it is obviously a foot thinner than 20 feet away where the snow was 4 or 5 inches. That kind of thing was always known. With this project it was great to see that the Indigenous Knowledge and science fit well together."

Ikaagvik Sikukun acknowledges that there is a long history of science conducted in ways that were not equitable to Alaska Native communities. Ikaagvik Sikukun endeavored to do better and always accept Indigenous Knowledge as equal to western science.

John Goodwin said: "We worked as a team. It was not one sided, it was not from the science department only, [Ikaagvik Sikukun] worked with the locals and with us Elders. And by doing that you get better results."

## Check out the data

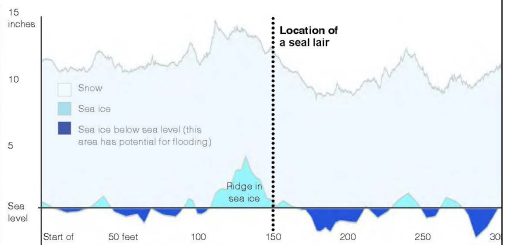


### Lasers for snow roughness

This 3D model was created by surveying a 200 x 200 meter area with a laser. The red shows where the snow was higher relative to sea level. A collapsed seal lair is visible in the center of the image. The lair is in a drift with deeper snow. The laser only shows what happens on the snow's surface. It doesn't reveal the structure of the ice hidden beneath. To learn what kind of ice features seals need, Ikaagvik Sikukun used a magnaprobe.

### Magnaprobe for ice roughness

A magnaprobe is a pointy rod with a basket (like a ski pole) at the base. When the rod is pushed into the snow to the ice, the basket slides up resting on top of the snow. Each time this is done the person holding the rod presses a button. Doing so records the snow depth while simultaneously taking a GPS location. Merging the laser 3D model with the snow depth from the magnaprobe tells us where the ice is rough and snow drifts accumulate.



### Searching a larger area with UAVs

The seal habitat surveys were used as anchor points for unmanned aerial vehicle (UAV) surveys. The detailed measurements at seal structures helped the team understand what to look for in UAV footage. Since UAVs can quickly survey a much larger area than a person on foot, this combination allowed Ikaagvik Sikukun to look for seals across much larger portions of the landfast ice in Kotzebue Sound. The Ikaagvik Sikukun fall 2019 newsletter covered the UAV work more fully. Read about it at <https://bit.ly/3oFXBkS>.



## Messages from the Elders

### Climate change

When humans burn fossil fuels like coal, natural gas and oil, they release high concentrations of carbon dioxide into the air. These emissions heat the atmosphere and are the leading cause of global climate change. The Arctic is impacted more than any place on Earth. Several processes in the Arctic accelerate climate change. Thawing permafrost releases methane gas which further warms the atmosphere. As sea ice melts, the darker open ocean absorbs more heat, causing additional warming.

The Elders stressed that overcoming climate change will take action and national leaders, scientists and Indigenous communities working together.

Roswell Schaeffer Sr. said: "There are a lot of us that felt that our country [around Kotzebue Sound] is changing too fast. We have to understand these problems and these changes... To help our people be ready for it, it is really important that they support this kind of science and Native knowledge working together."

Bobby Schaeffer said: "We can't shut our eyes [to climate change]. It's not going to go away... We have to change what we are doing, we have to quit burning fossil fuels otherwise there is no hope. We are on a very fine line right now. If we continue with our habits we're going to go over that hump."

### The past five years

According to the Elders, the past five years differed notably from what had been the norm for decades. Recent observations include thin, dangerous ice, shorter winters, thawing permafrost, and changing animal, fish and bird movements.

Roswell Schaeffer Sr. said: "Yesterday [October 2, 2020] it was 51°F above which is unheard of in the Arctic in October. It should be freezing. The bay should be frozen, or at least partially frozen. The ducks are still here, the geese are still here."

"Since about five years ago it started doing this, getting warmer and warmer each year. We're getting longer falls. Falls are all the way toward November. Our spring is occurring in March or April, rather than May or June. So our winters are becoming very very short. It causes so much changes for all animals, including us humans."

### Why invest in science?

Over the years, the four Elders have participated in a variety of roles related to the environment, fish and wildlife monitoring, and science research projects. When asked why they invest so much time on science, observing and sharing their knowledge, they focused on future generations.

Roswell Schaeffer Sr. said: "I do this because I want my grandkids and my great-grandkids to have this knowledge after I'm gone. That way the kids in the future will be able to understand our culture right now and why it is important to continue this way of life and not lose it."

Cyrus Harris said: "Indigenous Knowledge is through memory and passing down that information through voice. Putting this [findings from Ikaagvik Sikukun] together in written form will help the younger generation catch up."

### Observations can't stop here

Efforts to respond and adapt to climate change in the Arctic must be guided by long-term environmental monitoring. For this reason, the Elders emphasized the importance of continuous and unbroken data gathering in Kotzebue Sound. Many science projects are funded for relatively short periods. For example, Ikaagvik Sikukun is only a five year project, but the changes documented will continue into the future. This is one of the many reasons why strong partnerships between scientists and Indigenous communities are so critical.

Bobby Schaeffer said: "The information we're gathering should be continuous, it shouldn't end, in order to use data it has to be done on a continuous basis."

To carry on the important science started during Ikaagvik Sikukun, the Alaska Arctic Observatory and Knowledge Hub will continue local efforts to gather sea ice measurements and observations of wildlife and coastal waters.



Photo by Sarah Betzner  
Fairbanks, Alaska, 2019



# Hunting ugruk



**Alex Whiting**  
Native Village of Kotzebue,  
Environmental Director



**Donna Hauser**  
Scientist, marine mammal  
ecology

Spring *ugruk* (bearded seal) hunting ends about 26 days earlier in Kotzebue Sound than it did in 2003. Sea ice breaks up three weeks earlier.

## Hunting *ugruk* is like hunting ice

*Ugruk* in Kotzebue Sound are closely tied to certain ice conditions, so hunting them is essentially the same as hunting ice. To quantify how the loss of sea ice has impacted the *ugruk* hunting season length, start and end dates in Kotzebue Sound, Alex Whiting and Donna Hauser co-lead a project interviewing Elders, examining Tribal records, and analyzing sea ice data.

## Interviewing Elders

The Elder Advisory Council provided Indigenous Knowledge about the sea ice conditions that impact *ugruk* and *ugruk* hunters in Kotzebue Sound.

## What *ugruk* need

Kotzebue Sound is the only major estuary north of the Bering Strait where fresh and salt water mix in a shallow, productive nearshore environment. The Sound is important for fish, shrimp, clams and other animals *ugruk* eat while breeding and molting. To enter Kotzebue Sound, *ugruk* need open leads (linear cracks in the ice) and the ice to start breaking up. Persistent "white ice" floes make ideal places for the *ugruk* to feed, molt, and haul out directly above their feeding areas. In this habitat, *ugruk* build fat reserves before continuing their migration north to the northern Chukchi and Beaufort Seas.

## What hunters need

To avoid shooting *ugruk* in the water and risk having them sink, hunters prefer harvesting *ugruk* that are hauled out on ice floes. To access the floes, Kotzebue hunters need to wait until the channel (where the Noatak and Kobuk rivers merge and flow out of the Sound) in front of town opens and they can launch their boats. To make hunting safe and affordable, the broken ice floes need to be relatively close to town.



Photos by Susan Gardner  
Native Village of Kotzebue

## Tribal records

As the Environmental Program Director for the Native Village of Kotzebue, Alex Whiting has made weekly reports on weather, travel conditions, wildlife and fish, and hunting and fishing since 2002. Each spring, he records when *ugruk* hunting season starts—based on when the first hunters are able to boat out of Kotzebue—and when the season ends—the last *ugruk* harvested or when people can no longer find *ugruk*. Alex's journals created a way for Ikaagvik Sikukun to quantify how much the *ugruk* hunting season changed since 2003.

## Sea ice data

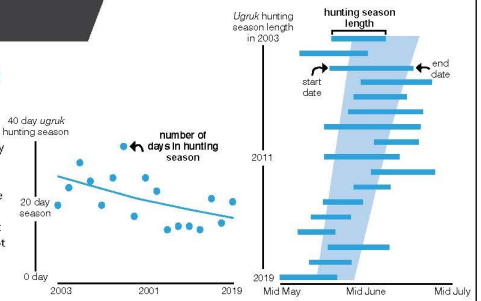
Ikaagvik Sikukun scientists used satellite data to understand why the *ugruk* hunting season was shortening. They examined satellite images to detect annual events in the ice cycle that the Elders said were important for *ugruk* and hunters. They identified the day of each year (from 2003–2019) when:

- Spring sea ice first broke up and was presumably favorable for *ugruk* to enter the interior region of Kotzebue Sound.
- The channel in front of town first opened allowing hunters to launch boats.
- Ice was gone from interior of Kotzebue Sound.
- All broken ice floes were gone from Kotzebue Sound.

## Check out the data

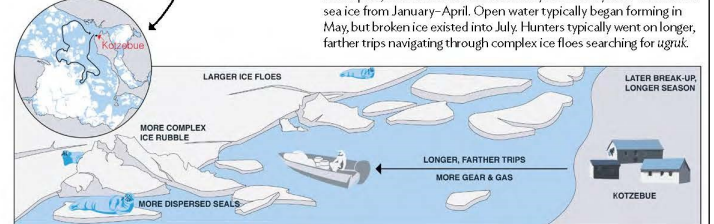
### Shorter *ugruk* season

Alex and Donna's team found that over the past 17 years, the length of the spring *ugruk* hunting season for the Olingaituqmiut people decreased nearly a day per year. Kotzebue Sound now breaks up about 22 days earlier than it did in 2003 and is the main reason for the shrinking hunting season. Compared to the early 2000's, the hunting season start date is now slightly earlier, but there is not a significant trend. The most significant change is that the hunting season now ends in mid-June rather than early July.



### Ice pattern in a typical past season

Consistent ice, more searching for *ugruk* (black line shows hypothetical hunting route).



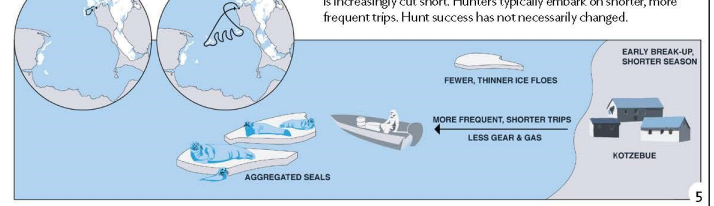
### Past *ugruk* hunts

In the past, Kotzebue Sound was reliably covered by near-continuous sea ice from January–April. Open water typically began forming in May, but broken ice existed into July. Hunters typically went on longer, farther trips navigating through complex ice floes searching for *ugruk*.

### Ice pattern in 2019

Many *ugruk* on a few ice floes close to Kotzebue. Low effort to hunt, high success.

Alternate future ice pattern: Few ice floes further from shore, hunting requires more searching, less chance of success.



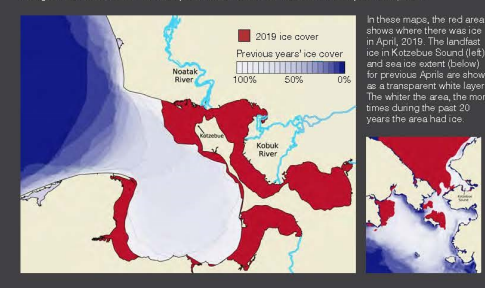
### Current *ugruk* hunts

Around 2010 sea ice patterns changed in Kotzebue Sound. Ice floes disappear from the Sound about three weeks earlier than they did in the past. Today's May/June ice looks like historical June/July ice. While hunters are not necessarily able to begin hunting any earlier, the season is increasingly cut short. Hunters typically embark on shorter, more frequent trips. Hunt success has not necessarily changed.

# Sea ice

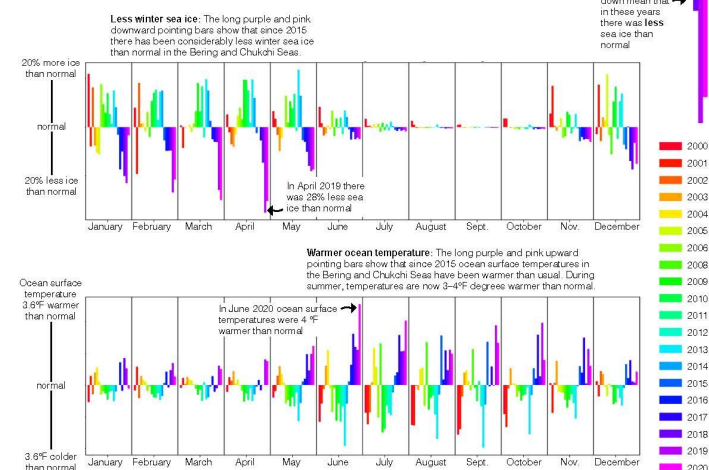
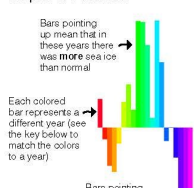
## Winter 2019 was unusual

2019 had the lowest sea ice on record. In Kotzebue Sound there were relatively few ice floes and landfast ice covered only near-shore areas. Ikaagvik Sikukun is helping to understand what caused the unusual conditions. Carson Witte and Chris Zappa used images from satellites to compare shorefast ice in 2019 to the past 20 years.



## Learn how to read these graphs

The two panels of graphs below, created by Carson, show 20 years of sea ice and ocean temperature data. Each of the 24 boxes shows data from 2000–2020 for a given month. Compare the colored bars to learn how sea ice and ocean conditions have changed during the past two decades.



## Simulating the past

### How unusual was 2019?

Has the sea ice in Kotzebue Sound ever been as thin as it was in 2019? The short answer, not likely.

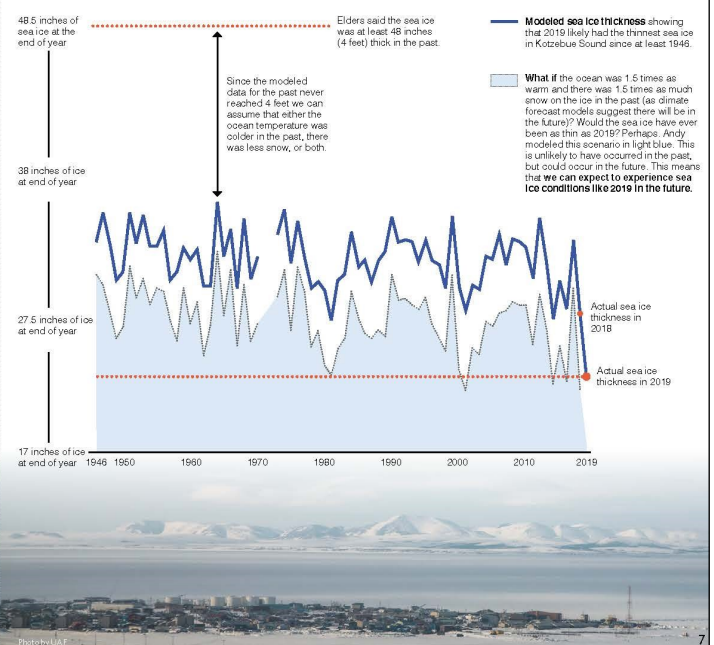
Unfortunately there are not records of sea ice thickness in the Sound going back in time, but Elders indicate that historically the sea ice was commonly four to five feet thick by end of the season. For comparison, in 2019 the ice was less than two feet thick.

Ikaagvik Sikukun scientist Andy Mahoney used a computer to model (simulate) sea ice thickness based on different past scenarios. He used the following three things, known to

impact sea ice thickness, to set up his model:

1. Air temperature (available back to 1940s)
2. Ocean temperature (no historical data, so in model used 2019 temperatures)
3. Snow depth on the ice (no historical data, so in model used 2019 snow depth)

Andy simulated the potential sea ice thickness back in time using the actual air temperature from each year, but the ocean temperature and snow depth from 2019. The dark blue line shows that in the past the sea ice was likely never as thin as it was in 2019.





## EDUCATION, COMMUNICATION and OUTREACH

These three components are all part of the same effort for the Tribe through the EP to increase the knowledge and awareness of our tribal citizens about the environment around them and the resources on which they depend and utilize in their daily lives. It is also part of encouraging youth and others to become interested in participating in the research and other advocacy activities, to carry on efforts to understand the environment and help conserve, manage, and protect the resources that are critical to the long term cultural, nutritional, and spiritual survival of the tribal community. The tribes website [www.kotzebueira.org](http://www.kotzebueira.org), KOTZ radio station, the local newspaper, newsletters/books/articles, and in-person classroom outreach, local meetings, and even films, are all ways in which the EPD reaches out to the local community on EP activities.

**Arctic research on camera** — Filmmaker Sarah Betcher joined Ikaagvik Sikukun to create a documentary and several short films about Ikaagvik Sikukun science. The films give viewers a front row seat as Elders and scientists snowmachine across the frozen sea ice in search of seals, and from the air as unoccupied aerial vehicles (UAV) soar across the sky taking measurements of the sea ice.



Sarah used a discreet approach so that filming wouldn't interfere with the Elders and scientists as they went about their research. Focusing on one person at a time, Sarah held a casual conversation with each Elder or scientist so that they could explain their work and how each measurement helps answer questions about Kotzebue Sound.

Photo by Bjorn Olson

### Kotzebue Marine Mammal News

May 2012

#### Kotzebue Sound Ringed Seals – what have we learned?

##### Background

In 2007 the Native Village of Kotzebue received a grant from the U.S. Fish and Wildlife Service to catch ringed seals in Kotzebue Sound and instrument them with satellite tags. The tags recorded movements, diving and hauling out behavior and sent this information to NOAA satellites. The project was officially called "Wintering areas and habitat use of ringed seals in Kotzebue Sound, a community-based study." Kotzebue-area residents and biologists worked closely together to catch and tag seals, collect data, and take samples.



Tagged ringed seal re-entering water at Sisualik.

in catching and tagging the seals. Twenty-one young bearded seals (10 males and 11 females) were caught and fitted with satellite tags during 2004-2006.

During the bearded seal project, ringed seals were sometimes also caught in the nets. This gave us the idea to develop a new project that focused on ringed seals. Up until that time there was almost no information about movements, habitat use and dive behavior for ringed seals in Kotzebue, despite their importance for subsistence, as a major prey of polar bears, and as a species likely to be greatly affected by climate change and loss of sea ice habitat.

Results of satellite tagging conducted by this project will be used to better understand the seasonal movements, habitat use, and diving behavior of ringed seals. This information can then be used to help manage human activities to minimize impacts to ringed seals. This includes things like shipping, oil and gas exploration activities in the Chukchi Sea, and Bering Sea fisheries that occur in ringed seal wintering areas. This information also contributes to the baseline for evaluating the effects of climate change on ringed seals and their environment and for improving seal census efforts.

##### Project Goals

- 1) Build tribal capacity to conduct research on a marine mammal species of tribal importance, and strengthen working relationships with federal and state management agencies;
- 2) Refine methods for catching ringed seals in open water through a partnership involving Kotzebue-area Tribal members hunters and biologists;



Getting ready to tag a ringed seal on the beach at Sisualik. Left to right: Edward Ahpook, Doc Harris, Grover Harris Jr., Grover Harris.

### QIKIOTAGRUGMIUT TUSAAYUGAAT

By Alex Pamiqtuq Whiting - Environmental Specialist — February 2005

#### Outdoor Air Quality Testing Continues

The Northwest Arctic Borough hired Stephen R. Brand & Associates to undertake a land use / GIS mapping project for the area surrounding Rabbit Creek to Cape Seepings. They interviewed persons in the villages of Kivalina, Nulato, and Kotzebue. While they were in Kotzebue many of our members took the time to come in and talk to them about their history and uses of these areas. Kotzebue lacks good mapping records of subsistence use areas and having these records for future use in planning will become especially important in light of the continued efforts to build roads and expand port facilities in areas Tribal members depend on for subsistence purposes.

For the past two years the Alaska Department of Environmental Conservation (DEC), in cooperation with the Tribe monitored air quality along Second Avenue. The monitors specifically measure large dust (PM10) particles. There is a National health standard for dust, which is 150 micrograms per cubic meter (µm/m3) per 24 hour period and 50 µm/m3 for an annual average. Dust is of interest to health because it can aggravate existing respiratory and cardiovascular problems, as well as damage the lungs. The most vulnerable people are children, the elderly and people with asthma or heart problems. Measurements in Kotzebue along Second Avenue during May through July in 2003 and 2004 have recorded very high dust levels. In 2003 there were 15 times the level of dust exceeded the health standard for a 24 hour period. The concentrations ranged from 194 to 560 µm/m3. In 2004 there were 16 times the levels of dust exceeded the health standard, from 175 to 351 µm/m3. Typically, exceeding the health standard twice a year is enough to violate the standards and be declared a "non-attainment" area, which places a

need on fixing the problem. Kotzebue has good air quality for long periods of the year, but during the dry parts it can get really dusty, which means poor air quality. Because of the numerous times the health standard was shown to have been exceeded, the State of Alaska and the U.S. EPA are negotiating an approach to take to try and address the problem. Continued paving of City streets will of course help, but there will still be many areas not paved. The Alaska Department of Transportation is planning on paving Second Avenue sometime this summer. The plan is to monitor the same area the following summer in 2005 to determine the effect paving has on controlling the levels of dust. Vehicle traffic is believed to cause much of the high dust levels, so people can help by driving less and slower, during the dry parts of summer and fall. We all need to work together to improve the air quality of Kotzebue. The Tribe will continue to work with the DEC and the EPA in order to monitor the air quality of Kotzebue and work towards improving it.



Personal vehicles contribute the most to dust levels

QIKIOTAGRUGMIUT TUSAAYUGAAT	
OUTDOOR AIR QUALITY TESTING CONTINUES	1
SEWAGE LAGOON UPDATE	2
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BEARDED SEAL SATELLITE TAGGING	
BEARDED SEAL SATELLITE TAGGING	
SISUALIK CLEANUP	
WILDLIFE HUNTING PROJECT	

### STORIES FROM THE LAGOONS

Lagoons are critically important shallow, brackish water bodies found across the coast of Arctic Alaska. They provide dynamic and productive areas for fishes, birds and marine mammals.

**Autumn**

Lagoon birds are most active in autumn and fall storms, creating a natural fish trap. The traditional Inuit subsistence diet is largely composed of fish caught in the lagoons.

**Winter**

Ice covers the lagoons in winter. The traditional Inuit subsistence diet is largely composed of fish caught in the lagoons.

**Spring**

In the spring, high water levels from meltwater and ice melt allow fish to escape from the lagoons, leading to fish kills.

**Summer**

Lagoons usually freeze connected to the ocean in the early summer, creating a highly productive and fish-rich environment.

The dynamic nature and changing connectedness to the ocean of the lagoons leads to a complex and diverse food web. The lagoons have high levels of primary productivity, which drives large abundances of zooplankton and mysids that in turn drive the fish productivity that is important for ecosystems and subsistence fisheries.

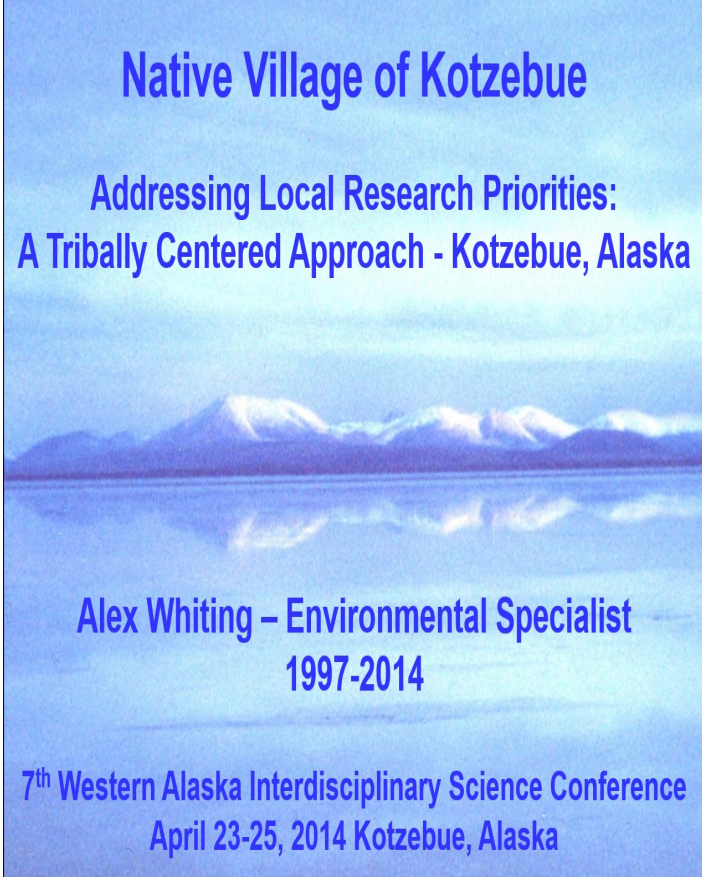
Indigenous food security is more than just the ability to catch and consume fish. It also includes the traditional preparation of foods rooted in place and season, the passing of knowledge to younger generations, and the sharing of products within both families and the community as a whole.

Despite their importance in productive ecosystems supporting local fisheries across the coast of Arctic Alaska, very little is known about how lagoon systems function.

This is a conservation concern as the Arctic faces the challenges of climate change and the persistent threat of oil spills, which could devastate these important and fascinating ecosystems.



In addition, bringing local people into the research projects themselves to use their skills and traditional knowledge in substantive ways is a great way to educate the community about the latest research efforts, while increasing the knowledge base for everyone, including the scientific community. Over 120 tribal citizens have participated at some level in EP projects – with a core group of about a dozen who have continuously played major roles in research effort s– which has led to some being able to go out on the Bering Sea with federal research ships like the Healy and Oscar Dyson to assist scientists in their seal research activities. This education and outreach function also includes communicating with, and educating, the non-tribal population on tribal viewpoints, traditional knowledge, research efforts and findings, which includes updating ANO groups such as the Alaska Ice Seal Committee with the ongoing tribal seal research, presenting research projects at conferences of the scientific community like the Alaska Marine Science Symposium, the University of Alaska WAISC, or other relevant conferences, publishing newsletters to send out to boxholders in the region and other interested parties, publishing research findings in peer reviewed journals (Appendix 5) and incorporating research findings into comments that the Tribe submits on NEPA and other policy and management processes.



**Native Village of Kotzebue**

**Addressing Local Research Priorities:  
A Tribally Centered Approach - Kotzebue, Alaska**

**Alex Whiting – Environmental Specialist  
1997-2014**

**7<sup>th</sup> Western Alaska Interdisciplinary Science Conference  
April 23-25, 2014 Kotzebue, Alaska**

**PLOS ONE**

RESEARCH ARTICLE

**Habitat selection and seasonal movements of young bearded seals (*Erignathus barbatus*) in the Bering Sea**

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**Abstract**

The first year of life is typically the most critical to a pinniped's survival, especially for Arctic phocids which are weaned at only a few weeks of age and left to locate and capture prey on their own. Their seasonal movements and habitat selection are therefore important factors in their survival. During a cooperative effort between scientists and subsistence hunters in October 2004, 2005, and 2006, 13 female and 13 male young (i.e., age <2) bearded seals (*Erignathus barbatus*) were tagged with satellite-linked dive recorders (SDRs) in Kotzebue Sound, Alaska. Shortly after being released, most seals moved south with the advancing sea-ice through the Bering Strait and into the Bering Sea where they spent the winter and early spring. The SDRs of 17 (8 female and 9 male) seals provided frequent high-quality positions in the Bering Sea; their data were used in our analysis. To investigate habitat selection, we simulated 20 tracks per seal by randomly selecting from the pooled distributions of the absolute bearings and swim speeds of the tagged seals. For each point in the observed and simulated tracks, we obtained the depth, sea-ice concentration, and the distances to sea-ice, open water, the shelf break and coastline. Using logistic regression with a stepwise model selection procedure, we compared the simulated tracks to those of the tagged seals and obtained a model for describing habitat selection. The regression coefficients indicated that the bearded seals in our study selected locations near the ice edge. In contrast, aerial surveys of the bearded seal population, predominantly composed of adults, indicated higher abundances in areas farther north and in heavier pack ice. We hypothesize that this discrepancy is the result of behavioral differences related to age. Ice concentration was also shown to be a statistically significant variable in our model. All else being equal, areas of higher ice concentration are selected for up to about 80%. The effects of sex and bathymetry were not statistically significant. The close association of young bearded seals to the ice edge in the Bering Sea is important given the likely effects of climate warming on the extent of sea-ice and subsequent changes in ice edge habitat.

**OPEN ACCESS**

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## TRIBAL ENVIRONMENTAL PROGRAM PRIORITIES including CAPACITY BUILDING and PROGRAM IMPLEMENTATION

The Tribes Environmental Program continues to build the capacity to participate as a Principal Investigator to facilitate cooperative projects to research the environment of Kotzebue Sound in order to advance the knowledge base of its citizens and that of the larger society through directed research that combines western science with indigenous knowledge to produce exponential understandings and to advocate on behalf of these resources. Its priorities, which are anchored on Tribal Council and tribal citizen priorities as relayed to the Tribe through an Environmental Survey undertaken with IGAP funding, are to carry out:

- Direct participation and personal capacity building of tribal citizens in structured research efforts, which contributes to the protection of their environment and natural resources.
- Continued implementation of a formal structure on which to monitor and engage in research being carried out by academic, federal, and state actors and to influence through its leadership how cooperative research should be carried out in the Arctic.



- Documenting and understanding the rapidly changing Arctic environment and its implications for the resources its citizens depend on.
- Proactively seeking out and developing relationships with leading scientific researchers on topics of interest to the Tribe to undertake cooperative research efforts and obtain project specific funding to carry out research.
- Contributing to the production of the Best Available Science (BAS) through cooperative research efforts by increasing the capacity of the Tribe and its citizens to directly participate in world class science research that overtly acknowledges and is driven by their indigenous knowledge, experience/wisdom, and is responsive to their concerns and priorities.
- Creating opportunities to bring together scientists from many disciplines under umbrella research efforts that more approximately mirror tribal sensibilities as it relates to how tribal citizens approach and understand the world holistically.

Another of the Environmental Program priorities is to author and edit grant proposals, research proposals, or publications of research relating to the environment of the Tribe and contribute to the publication of materials to educate the public about the environment and natural resources of the Tribe based on findings from the various research efforts undertaken with the cooperation of the Program. Its priorities in this area are to:

- Maintain environmental and natural resource information for the Tribe.
- Author and co-author content for newsletters, books, posters, and refereed journal articles based on the work carried out by the Program.
- Respond to inquiries from tribal citizens, Tribal Council, public, press and federal and state agencies on information produced through Program activities.
- Author and manage grant proposals to undertake research that addresses the priorities of the Tribal Council and tribal citizens.
- Mentor high school students in science related activities, including fieldwork and science competitions, while demonstrating the role local people can play in driving research and managing resources.
- Support ongoing robust education efforts of staff and the Tribal Council to build the capacity to participate fully in both research and policy that is of interest to the Tribe.

The third broad priority area for the Environmental Program is to review and provide tribal comments/input into NEPA and other federal or state policy documents, management plans, or development proposals. Its priorities to achieve this goal is to:

- Facilitate communication and consultation between the Tribe and outside entities with permit and management authority over tribal resources and/or the environment the Tribe depends on.
- Facilitate communication and consultation between the Tribe and outside entities undertaking development related activities that impact tribal resources and the environment the Tribe depends on.
- Actively participate in and support government-to-government relationships.
- Build a well-regarded reputation within federal and state agencies with responsibility for resources found in northwest Alaska and the Chukchi Sea, which results in influence over management policy and mitigation strategies.
- Review Environmental Assessments, Environmental Impact Statements and other documents to be able to have informed discussions with the Tribal Council and draft formal comments on behalf of the Tribe.

- Support ongoing robust education efforts of staff and the Tribal Council to build the capacity to participate fully in policy that is of interest to the Tribe.
  - Facilitate through participation the Tribes involvement in Alaska Native Organizations and other bodies that seek to provide tribal input into management and cooperative management of resources the tribal citizens depend on to meet their cultural, nutritional, and spiritual needs.
  - Participate in the development of mitigation strategies to ameliorate the negative impacts to the northwest Alaska environment from climate change and development activities like mining and oil exploration/production.
  - Facilitate when necessary EPA led Preliminary Assessments and Site Inspections and/or initiate the process by petitioning under CERCLA.
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*Representatives of the Ikaagvik Sikukun research team outside of KOTZ Radio where we introduced and presented the project to the regional community. This project and group is emblematic of the kinds of activities that the Native Village of Kotzebue Environmental Program has worked to promote and make possible through its efforts. Ikaagvik Sikukun brings together a wide variety of expertise, that includes academic (sea ice and marine physics, marine mammal ecology), federal (marine mammal biology/ecology), technical (drone engineers/pilots and video documentary) and Indigenous Knowledge holders (driving the research questions and proofing the findings) to accomplish the goal of learning more about the Kotzebue Sound sea ice, the ecology that is dependent on it and the ongoing changing climatic conditions that is impacting it. With the rapidly changing conditions in the Arctic, it is more important than ever, that indigenous communities are at the forefront of driving research that will allow for a better understanding of what Climate Change means for the future of the Arctic, the potential to change the way of life of Arctic communities, and how best to protect the resources and cultural traditions that lie at the heart of these communities and define who they are as a people. It is an honor to serve the people and contribute to the strengthening of tribal sovereignty and self governance in my role as the Environmental Director of the Native Village of Kotzebue. Quyanna.*

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## APPENDIX 1.

### NATIVE VILLAGE of KOTZEBUE RESEARCH PROTOCOL

(Adapted from the Principles for the Conduct of Research in the Arctic)

All researchers working in *Qikiqtagruṃmiut* (Native Village of Kotzebue Citizens) territory or with *Qikiqtagruṃmiut* have an ethical responsibility towards our Tribal culture, environment and citizens. The following principles have been adopted to provide guidance for researchers in any and all fields.

This statement intends to promote mutual respect and communication between scientists and the Tribe.

#### **Implementation**

Research directly involving Tribal Citizens should not proceed without their clear and informed consent.

In all instances, it is the responsibility of the lead Principal Investigator on each project to do the following:

1. Inform the **Native Village of Kotzebue (Tribe)** of planned research that will be carried out on lands, waters, or territories used or occupied by Tribal Citizens or that will involve Tribal Citizens. The duty of researchers to inform the Tribe continues after approval has been obtained.
2. Explain the purposes, goals, time frame, and methodology of the research, including the sponsoring institutions and affiliations of the research project and identify the person in charge, as well as all investigators involved in the research, and the need for consultants, guides, or interpreters and proposed compensation rates for same.
3. Researchers shall consult with the Tribe in project development, planning, and implementation.
4. Research results should be explained in nontechnical terms and should be communicated to the Tribe.
5. Subject to the requirements for anonymity, publications should always refer to the informed consent of participants and give credit to those contributing to the research project by acknowledging the **Intellectual Property Rights** of individual Tribal citizenstaking part in the research and unless provided for on a contractual basis all information belongs to the Tribe and divulgence of such information is expressly forbidden without permission of the Tribe. When **Indigenous Knowledge** is sought out and used for purposes of the research project the persons involved shall be compensated at a fair rate. The Tribe can provide researchers with the suggested and current rates.
6. In cases where information of a confidential nature is provided, anonymity must be guaranteed in both the original use of data and in its deposition for future use. If anonymity cannot be guaranteed, the subjects must be informed of the possible consequences of becoming involved in the research.
  - a. All research involving children must be fully justified in terms of goals and objectives and never undertaken without the consent of both the children and their parents or legal guardians. As with any research involving Tribal Citizens, the Tribe shall also be notified of any research proposing the involvement of *Qikiqtagruṃmiut* children.
  - b. Participation of subjects, including the use of photography in research, shall always be based on informed consent. Recordings, video, audio or other, will be specifically defined and agreed to by participants, if any additional uses are wanted the participant or their agent must be contacted to consent to the new use.
  - c. The use and disposition of human tissue samples shall always be based on the informed consent of the subjects or next of kin.

7. All relevant Federal, State, and local regulations and policies pertaining to cultural, environmental, and health protection, must be strictly observed and any required permits procured before activities begin.

8. Sacred sites, cultural materials (including artifacts), and cultural property cannot be disturbed or removed from *Qikiqtaġruṃmiut* territory without Tribal and/or individual consent. The precise location of specific sites may not be published without the consent of the Tribe. All work related to such areas and material, shall be conducted in accordance with Federal, State, and local laws and regulations.

The Tribal contact for researchers is the **Executive Director** who can be reached at **1-800-442-3467**.

To facilitate a working relationship and the implementation of the above responsibilities, a research questionnaire is attached to be filled out prior to the beginning of any projects and to be submitted to:

**Native Village of Kotzebue – P.O. Box 296 – Kotzebue, Alaska 99752**





**NATIVE VILLAGE of KOTZEBUE  
RESEARCH PROTOCOL – QUESTIONNAIRE**

**Name (PI):**

**Institution:**

**Contact: Phone**

**E-mail:**

**Mailing Address:**

**Title of Project:**

**Summary of Project (Brief**

**Funding Source(s):**

**Dates of Project / Duration:**

**Other Personnel and Affiliations:**

**Relevance to Tribe/Tribal Citizens:**

**Role of Tribe/ Tribal Citizens:**

**Benefit to Tribe/ Tribal Citizens:**

**Potential Risks:**

**Need for Local Involvement:**

**Compensation Rates for Local Involvement:**

**Expected Results/Publications/Final Product(s):**

**Plans for Returning Results to Community:**

**How will Intellectual Property Rights be Protected (if relevant):**

**How will Anonymity/Confidentiality be Protected (if relevant):**

**Other Considerations (e.g., Use of Artifacts, Identification of Sacred Sites, etc.):**

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**Signature of Principal Investigator**

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**Date**

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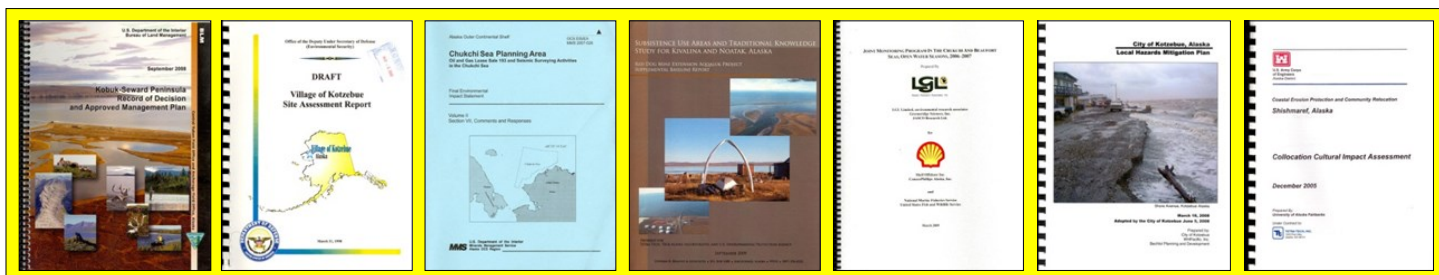
**Executive Director  
NATIVE VILLAGE OF KOTZEBUE**

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**Date**

## **APPENDIX 2. NATIVE VILLAGE of KOTZEBUE — ENVIRONMENTAL PROGRAM NEPA/MANAGEMENT PLANS — REVIEW and COMMENT**

Alex Whiting - Environmental Director



- 1998-2014 State of Alaska and Army Corp of Engineers Local Permits
- 1998-1999 DOD Air Force Kotzebue DEW Site Cleanup
- 1998-1999 Squirrel River Wild and Scenic River Suitability Study
- 1999 DOT Northwest Area Transportation Plan
- 2004 BLM Northeast NPRA 2004 NMFS Groundfish
- 2004 FHWA and ADODOT Kotzebue Airport Expansion and Improvements
- 2004-2008 DOT Shore Avenue Construction
- 2005-2006 BLM South NPRA Leasing Program
- 2005-2006 BLM NPRA North
- 2005-2008 State of Alaska revisions/amendments to the ACMP
- 2005 MMS 5-Year Chukchi OCS Lease Plan
- 2005-2007 BLM Kobuk-Seward Peninsula Resource Management Plan EIS
- 2006 Red Dog Mine NPDES Permit
- 2006 Red Dog Port Site Expansion
- 2006 ACOE Shishmaref Relocation Study
- 2006 ACOE Draft Port Site Expansion Cumulative Impact Statement
- 2007 MMS Chukchi Sea Seismic Surveys
- 2007 MMS Chukchi Sea Lease Sale 193
- 2007-2009 North Pacific Fisheries Management Council Arctic EEZ
- 2008 NPS 810 Analysis of Transporters and Guides
- 2008-2010 Red Dog Aqquluk Expansion
- 2008 State of Alaska Application to Take Over the NPDES Program
- 2009 NPFMC Arctic Fisheries Management Plan



- **2009 MMS Draft EIS Chukchi Sea Multi-lease Sale**
- **2009 NOAA ESA Petition for Ice Seals Listing**
- **2010 Bering Sea Chinook Salmon By-catch Management**
- **2010 Natural Resource Damage Assessment in Arctic Waters**
- **2011 Proposed Changes to the Makeup of the Federal Subsistence Board**
- **2011 ESA Petition to NOAA to List Bearded and Ringed Seals as Threatened**
- **2011 Coast Guard Port Access Route Study: Bering Strait**
- **2011 Draft Environmental Assessment – Bering Sea Non-Chinook Salmon Bycatch Management from the NPFMC**
- **2011 Draft EPA GAP Guidebook for Building Tribal Environmental Capacity**
- **2011 Draft Environmental Assessment Kotzebue Airport and Runway Safety Area Improvements**
- **2011 BOEMRE Draft SEIS on the Chukchi Sea Planning Area Oil and Gas Lease Sale 193**
- **2011 BOEMRE Final Supplemental Environmental Impact Statement for Chukchi Sea Lease Sale 193**
- **2011 Draft EPA Exploration Air Permits for Shell and ConocoPhillips in the Chukchi Sea**
- **2011 Northwest Subarea Contingency Plan**
- **2012 Shell Chukchi Sea Exploration Plan**
- **2012 Shell Chukchi Sea Regional Oil Discharge Prevention and Contingency Plan**
- **2012-2017 Draft PEIS: BOEM OCS Oil and Gas Leasing Program**
- **2012-2017 Draft Plan: BOEM OCS Oil and Gas Leasing Program**
- **2012 Subsistence Collections & Uses of Shed or Discarded Animal Parts and Plants from NPS Areas in Alaska Public Review EA**
- **2012 TEK Alaska Draft Fugitive Dust Risk Management Uncertainty Reduction Plan**
- **2012 NPS BELA Grazing Enclosures EA**
- **2012 EPA Authorization to Discharge Under the National Pollutant Discharge Elimination System (NPDES) For Oil and Gas Exploration Facilities on the Outer Continental Shelf in the Chukchi Sea**
- **2012 EPA Biological Evaluation In Support of the Chukchi Sea Oil and Gas Exploration NPDES General Permit (NPDES Permit No.: AKG-28-8100)**
- **2012 EPA NPDES Appendix A: Essential Fish Habitat Assessment for the Chukchi Sea and Beaufort Sea Program Areas**
- **2012 EPA Ocean Discharge Criteria Evaluation for Oil and Gas Exploration Facilities on the Outer Continental Shelf in the Chukchi Sea, Alaska**
- **2012 EPA Draft Beaufort and Chukchi Exploration NPDES General Permits Environmental Justice Analysis**

- **2012 NOAA/NMFS Effects of Oil and Gas Activities in the Arctic Ocean Draft Environmental Impact Statement**
- **2012 USCG Arctic Shield EA**
- **2012 BLM National Petroleum Reserve- Alaska Draft IAP/EIS**
- **2012-2017, Final PEIS: Outer Continental Shelf Oil and Gas Leasing Program**
- **2012 BLM Squirrel River Management Plan Talking Points**
- **2012 BLM Alaska Hunting Guide Capacity Study Scoping**
- **2013 BLM Final NPR-A IAP/EIS**
- **2013 NOAA Ice Seal Critical Habitat Designation**
- **2013 EPA Policy on Environmental Justice for Tribes and Indigenous Peoples**
- **2013 Federal Subsistence Board Tribal Consultation Implementation Guidelines**
- **2013 U.S. Arctic Marine Transportation Plan: Overview and Priorities for Action – Public Review Draft**
- **2013 NOAA Supplemental Draft Environmental Impact Statement (SDEIS) on the Effects of Oil and Gas Activities in the Arctic Ocean**
- **2013 Brice, Inc. Proposal for the Kotzebue Airport Safety Area Improvements - Stage III Project (No. 63851)**
- **2013 TGS Geophysical 2013 2D Seismic Survey in the US Chukchi Sea and International Waters**
- **2013 FAA Supplemental Section 106 Kotzebue Airport Safety Area Expansion project**
- **2013 Department of Interior: Bureau of Ocean Energy Management (BOEM) & Bureau of Safety and Environment Enforcement (BSEE) Review of Alaska Outer Continental Shelf Oil & Gas Drilling Standards – Listening Sessions**
- **2013 Draft Ocean Discharge Criteria Evaluation for Geotechnical Surveys in State Waters of the Beaufort and Chukchi Seas, Alaska (APDES General Permit No.: AKG283100)**
- **2014 RIN 0648-XC969 Draft Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammals – Acoustic Threshold Levels for Onset of Permanent and Temporary Threshold Shifts**
- **2014 FAA Cultural Resource Field Investigations at the Isaac Lake Material Site, Kotzebue, Alaska**
- **2014 USEPA Draft NPDES General Permit for Oil and Gas Geotechnical Surveys and Related Activities in Federal Waters of the Beaufort and Chukchi Seas (Permit No. AKG-28-4300)**
- **2014 USCG Draft Programmatic Environmental Assessment Arctic Operations and Training Exercises Alaska**
- **2014 Teck Fugitive Dust Risk Management Monitoring Plan for Red Dog Operations**
- **2014 NMFS ConocoPhillips Company (COP) Incidental Harassment Authorization (IHA)**



- **2014 U.S. EPA Re-proposed NPDES General Permit - Oil and Gas Geotechnical Surveys and Related Activities in Federal Waters of the Beaufort and Chukchi Seas (AKG-28-4300)**
- **2014 NMFS Marine Mammal Disaster Response Meetings: Northwest Arctic Borough**
- **2014 Involvement in Agency Decision-Making: The Use of Traditional Wisdom in Environmental Decision-Making**
- **2014 NPS Finding of No Significant Impact (FONSI) Subsistence Collections and Uses of Shed or Discarded Animal Parts and Plants from National Park Service Areas in Alaska**
- **2014 BOEM Draft Second Supplemental EIS for the Chukchi Sea Planning Area Oil and Gas Lease Sale 193 in the Chukchi Sea, Alaska**
- **2015 CEQ Revised Draft Guidance for Federal Departments & Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in NEPA Review**
- **2015 NOAA 50 CFR Part 226: RIN 0648–BC56 – Endangered and Threatened Species; Designation of Critical Habitat for the Arctic Ringed Seal**
- **2015 Request for Public Involvement in Preparing an Environmental Assessment BOEM-2015-0025. Shell Gulf of Mexico, Inc. Revision 2 (March 2015), Outer Continental Shelf Lease Exploration Plan, Chukchi Sea, Alaska, Burger Prospect: Posey Area Blocks 6714, 6762, 6764, 6812, 6912, and 6915**
- **2015 Shell Gulf of Mexico, Inc. Revision 2, Outer Continental Shelf Lease Exploration Plan, Chukchi Sea, Alaska, Burger Prospect: Posey Area Blocks 6714, 6762, 6764, 6812, 6912, and 6915**
- **2015 Department of Homeland Security Coast Guard 33 CFR Part 165 [Docket Number USCG**
- **2015–0267] RIN 1625–AA00 Safety Zone—Oil Exploration Staging Area in Goodhope Bay; Kotzebue Sound, AK**
- **2015 (RIN) 1082-AA00; “Oil and Gas and Sulphur Operations on the Outer Continental Shelf – Requirements for Exploratory Drilling on the Arctic Outer Continental Shelf**
- **2015 Proposed Regulations Amendment 110 Bering Sea Aleutians FMP**
- **2017–2022 BOEM OCS Oil and Gas Leasing Proposed Program Draft EIS**
- **2016 Department of Interior, National Park Service 36 CFR Part 13 [NPS-AKRO-19165; PPAK-ROZ5, PPMPRLE1Y.L00000] RIN 1024-AE28 Alaska; Subsistence Collections**
- **2016 Federal Subsistence Board WSA16-01 NWARAC Special Action Request**
- **2016 Proposed Rulemaking – NOAA-NMFS-2015-0081 [50 CFR Part 679 - RIN 0648–BF52] - Fisheries of the Exclusive Economic Zone off Alaska: Bycatch Management in the Bering Sea Pollock Fishery**
- **2016 ENVIRONMENTAL PROTECTION AGENCY [EPA–HQ–OW–2016–0150; FRL–9945–67 OW] General Permit for Ocean Disposal of Marine Mammal Carcasses**
- **2017 DOI National Park Service 36 CFR Part 13, Alaska; Subsistence Collections - Final Rule**
- **Draft FY 2018-2022 EPA Strategic Plan Public Review Draft**
- **2017 USFWS Migratory Bird Subsistence Harvest in Alaska; Use of Inedible Bird Parts in Authentic Alaska Native Handicrafts for Sale**

- **2018 Interagency Arctic Research Policy Committee revised *Principles for Conducting Research in the Arctic***
- **2019 BLM National Petroleum Reserve-Alaska Integrated Activity Plan/Environmental Impact Statement Scoping**
- **2019 Coast Guard Port Access Route Study: Alaskan Arctic Coast [USCG–2018–1058]**
- **2019 BLM Ambler Road Draft EIS**
- **2019 Ambler Mining District Industrial Access Project at Gates of the Arctic National Park and Preserve Environmental and Economic Analysis**
- **2019 Fish and Wildlife Service Proposed Rule Change to Regulations Governing Take of Migratory Birds**
- **CEQ-2019-0003 Update to the Regulations Implementing the Procedural Provisions of the National Environmental Policy Act**
- **2020 National Petroleum Reserve-Alaska (NPR-A) draft Integrated Activity Plan/Environmental Impact Statement (IAP/EIS)**
- **2020 ADEC Public Scoping Notice on Contingency Plans (Article 4 of 18 AAC 75. and contingency planning guiding statutes in AS 46.04)**
- **2020 BLM National Petroleum Reserve-Alaska (NPR-A) draft Integrated Activity Plan/Environmental Impact Statement (IAP/EIS)**
- **2020 BLM Final Ambler Road EIS and Ambler Road Record of Decision**
- **2020 Department of the Interior National Park Service 36 CFR Parts 1 and 13, RIN 1024–AE63, National Park Service Jurisdiction in Alaska**
- **2020 BOEM Proposed Rule - Oil and Gas and Sulfur Operations on the Outer Continental Shelf – Revisions to the Requirements for Exploratory Drilling on the Arctic Outer Continental Shelf**
- **2021 Department of Commerce NOAA Endangered and Threatened Species; Designation of Critical Habitat for the Beringia Distinct Population Segment of the Bearded Seal**
- **2021 Department of Commerce NOAA Endangered and Threatened Species; Designation of Critical Habitat for the Arctic Subspecies of the Ringed Seal**
- **Presidential Memorandum on Tribal Consultation and Strengthening Nation-to-Nation Relationships January 26, 2021**
- **2021 Marine Mammal Commission Action Plan for the Implementation of Executive Order 13175**
- **2021 Army Corp draft National Shoreline Management Study (NSMS) 80% Alaska Regional Assessment**
- **2022 NOAA Procedures for Government-to-Government Consultation With Federally Recognized Indian Tribes and Alaska Native Corporations; NOAA Administrative Order 218-8; NOAA Fisheries and National Ocean Service Guidance and Best Practices for Engaging and Incorporating Traditional Ecological Knowledge in Decision-Making**
- **2022 ADEC Oil Discharge Prevention and Contingency Plan Regulations Update**
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**APPENDIX 3. TRIBAL ENVIRONMENTAL AGREEMENT**  
**between**  
**the NATIVE VILLAGE of KOTZEBUE (KOTZEBUE IRA)**  
**and the UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, REGION 10**

**PREAMBLE**

This agreement identifies the commitment to the environment of the Qikiqtagruṃmiut made by the Native Village of Kotzebue (TRIBE) and the TRIBE's expectations of the U.S. Environmental Protection Agency (EPA) in working with the TRIBE in a government-to-government relationship and under the EPA Indian Policy and in accordance with any and all Executive Orders, Federal mandates, and other Federal Policies that are in force and effect this relationship. The traditional territory as referred to in this agreement is defined as that area of northwest Alaska that includes the Baldwin Peninsula, Hotham Inlet, and northern Kotzebue Sound, its waters and associated terra firma.

**PARTIES TO THE AGREEMENT**

The Native Village of Kotzebue, the federally-recognized sovereign Tribal Government, representing its citizens, the descendants of a group of original occupants of northwest Alaska, otherwise known as the Qikiqtagruṃmiut.

and the;

Environmental Protection Agency, Region 10, the Federal Agency established for the primary purpose of representing the citizens of the United States of America in preserving and protecting the environment in and of the United States, and Region 10 specifically that area of the northwestern United States including the State of Alaska.

**THE AGREEMENT BODY**

**The EPA's Commitment**

The EPA agrees:

to recognize the TRIBE as the Tribal Government responsible, in part, for the protection of the environment in its traditional territory and to provide fiscal resources, when available and allowable, to the TRIBE for the strengthening of the TRIBE's environmental protection capacity and activities.

to coordinate all of its activities that occur in the traditional territory of the TRIBE, including those of its contractors or agents working on its behalf, with the TRIBE.

to notify the TRIBE of pending actions or investigations occurring within the TRIBE's traditional territory, except where such notification would interfere with the enforcement action.

to solicit comments from the TRIBE on EPA actions that affect the TRIBE or its traditional territory.

to solicit comment from the TRIBE on EPA policy and strategic plan development that may affect their Tribal community and other areas where Tribal comment is needed and sought out.

to send notices to the TRIBE of granting opportunities available through the EPA.

to provide requested technical assistance to the TRIBE, if available and possessed by the EPA, and consultation and referral service in those cases where the EPA cannot provide the specific assistance requested but has knowledge of where to acquire the requested assistance.

## **The Native Village of Kotzebue Commitment**

The TRIBE agrees:

to recognize the EPA as the Federal agency responsible, in part, for the protection of the environment in its traditional territory.

to build its capacity to carry out environmental protection activities, provided that it possess project specific monies to do so.

to pursue those resources and monies available to accomplish its environmental goals.

to educate its citizens on making responsible environmental choices.

to advocate for a healthy productive environment in which its citizens can pursue their cultural prerogative to be sustained by their environment.

to make informed comments, when the opportunities arise, on Federal and State actions/legislation/activities that may impact the integrity of its environment.

to investigate and propose those changes to the communities environmental health structure that may be more efficient or beneficial to the long term health and stability of the communities environmentally related infrastructure (e.g. wastewater treatment, etc.).

to work cooperatively with the EPA or its agents to accomplish specific goals, tasks, and investigations that may occur in its community and traditional territory.

## **AGREEMENT CONTACTS**

The following positions will be used to discuss this agreement or to carry out any of the objectives outlined within the body of the agreement, listed in descending order of point of contact:

### **Native Village of Kotzebue**

Environmental Director  
Executive Director  
Tribal Council Chair

### **U.S. Environmental Protection Agency**

Alaska Tribal Coordinator  
Alaska Operations Director  
Regional Administrator

## **EFFECT OF THIS AGREEMENT**

This Agreement is intended for the purpose of facilitating the government-to-government relationship between the Parties, and stating the expectations of both Parties of this relationship. This Agreement does not grant any special rights or responsibilities that currently do not exist, including judicial review, and the Parties, by entering into this Agreement, do not waive any rights, powers, immunities or remedies otherwise available.

## **DURATION AND MODIFICATION**

This Agreement is self-renewing and is effective upon the date of signature by both Parties. Either Party providing thirty (30) days written notice to the other Party can nullify this Agreement. Unless otherwise specifically provided, termination of this Agreement will not in any way affect program delegations, funding agreements, or any other agreements between the Parties.

This Agreement may be modified upon the request of either Party. All modifications must be mutually agreeable, in writing, and signed by the signatories or their duly appointed representatives. The Parties will negotiate modifications to this Agreement where it is appropriate to do so.



## **SOVEREIGNTY AND DISCLAIMER**

The Parties to this Agreement recognize the sovereignty and legal status of one another and that each reserves all rights, powers, immunities, and remedies now or hereafter existing at law or in equity, or by statute, treaty or otherwise. This Agreement does not modify or supersede Agreements with other entities or other Agreements between the Parties.

## **SAVINGS CLAUSE**

If any provisions or elements of this Agreement are held or decided by legal, regulatory or funding legislation, to be invalid, all other provisions of the Agreement remain in full force and effect. All efforts will be made to interpret the Agreement in terms that are favorable to the protection of the TRIBE's traditional territory.

Nothing in this Agreement is intended to abrogate the Agreement between the EPA and the State of Alaska or Agreements the EPA has with other entities. Conversely, Agreements between the EPA and other entities shall not abrogate this Agreement.

## **SIGNATURES**

The undersigned official representatives of the Parties now hereby affirm and concur with the Agreement and do hereby enter into this Agreement on behalf of their respective Parties.

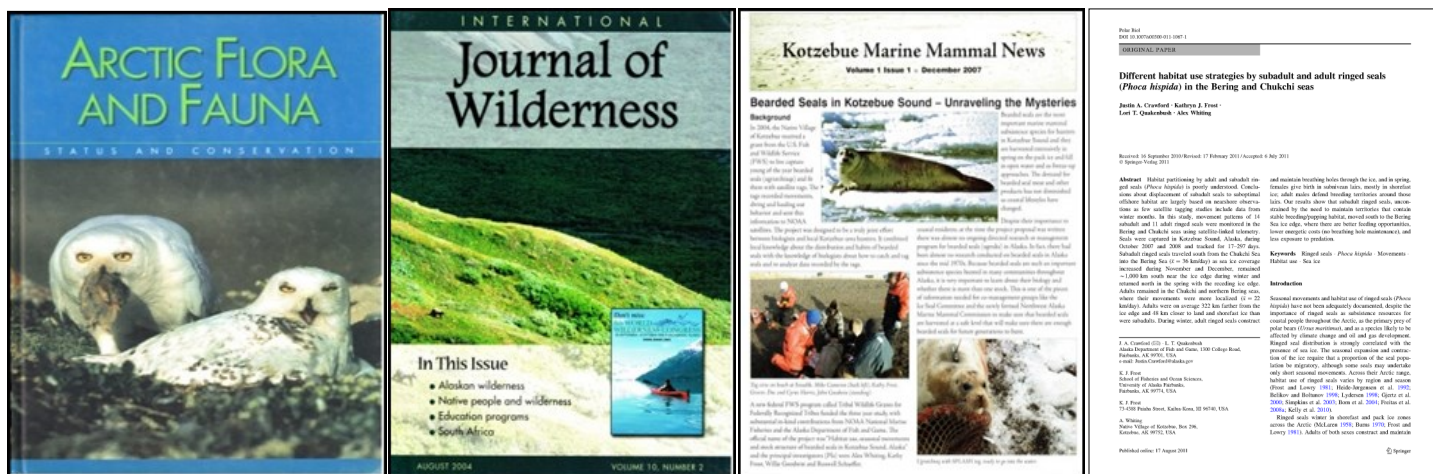
02-27-01  
Date

  
\_\_\_\_\_  
Eugene Smith - Council Chairman  
Native Village of Kotzebue

8-13-01  
Date

  
\_\_\_\_\_  
Chuck Findley – Acting Regional Administrator  
U.S. Environmental Protection Agency, Region 10

# APPENDIX 4. NATIVE VILLAGE of KOTZEBUE – ENVIRONMENTAL PROGRAM COMMUNICATING RESEARCH RESULTS Alex Whiting – Environmental Director



Contributor: **“Assessing the Consequences of Climate Change for Alaska and the Bering Sea Region, Subsistence Chapter”** - Proceedings of a Workshop UAF. October 1998

Author: **“Kotzebue Base Camp”** - Alaska Geographic, Living off the Land. 2000

Contributing expert: **“CAFF Arctic Flora and Fauna: Status and Conservation,”** Helsinki: Editapub. 2001

Author: **“Documenting Qikiqtagrũmiut Knowledge of Environmental Change – Conversations about the Environment of Northern Kotzebue Sound during the Last Half of the Twentieth Century,”** Native Village of Kotzebue. 2002

Contributor: **“A Synthesis of Recent Climate Warming Effects on Terrestrial Ecosystems of Alaska,”** UAF Published. 2004

Author: **“The Relationship between Qikiqtagrũmiut (Kotzebue Tribal Members) and the Western Arctic Parklands, Alaska, U.S.”** – International Journal of Wilderness. August 2004

Co-author: **“Forging Cooperative Ties between Scientists and the Arctic Indigenous Peoples: An Inupiaq Example,”** Native Village of Kotzebue. 2004

Co-author: **“Indigenous Perspectives - Arctic Climate Impact Assessment,”** Cambridge University Press. 2005

Co-author: **“Diving Behavior, Habitat Use, and Movements of Bearded Seal (*Erignathus barbatus*) Pups in Kotzebue Sound and the Chukchi Sea.”** Poster presented at the 16th Biennial Conference on the Biology of Marine Mammals, December 2005. San Diego, CA.

Author: **“Qikiqtagrũmiut Tussayugaat,”** 5 Environmental Newsletters sent out to our membership 1998-2005

Co-author: **“Nutrients and Contaminants in Spotted Seals (*Phoca largha*) of NW Alaska: Linking the Health of Arctic Mammals and Subsistence Users.”** The Wildlife Society Meeting, Anchorage, Alaska. September, 2006

Co-author: **“Nutrients and Contaminants in Spotted Seals (*Phoca largha*) from Kotzebue, Alaska: Changes Due to “Cooking,”** The Wildlife Society Meeting, Anchorage, AK. Sept., 2006



Author: **“Native Village of Kotzebue HARVEST SURVEY PROGRAM 2002 – 2003 – 2004: Results of Three Consecutive Years Cooperating with Qikiqtagruṃmiut to Understand their Annual Catch of Selected Fish and Wildlife,”** Native Village of Kotzebue. March 2006

Author: **“The Historic Relationship between the Qikiqtagruṃmiut and Shore Avenue,”** For Alaska DEC. December 2006

Co-author: **“Tourism in Rural Alaska: The Challenge of Accommodating Both Locals and Visitors,”** in Polar Tourism, CAB International. 2007

Co-author: **“Diving Behavior, Habitat Use, and Movements of Bearded Seal (*Erignathus barbatus*) Pups in the Bering and Chukchi Seas,”** 2007 AK Marine Science Symposium, Anchorage, AK.

Co-author: **“Identifying the Habitat Preferences and Seasonal Movements of Bearded Seal (*Erignathus barbatus*) Pups in the Bering Sea,”** Abstract for the 17th Biennial Conference on the Biology of Marine Mammals, 2007. Cape Town, South Africa.

Co-author: **“Foraging and Hauling Out Behavior of Young-of-the-Year Bearded Seals (*Erignathus barbatus*) During Fall and Winter in Alaska,”** Abstract for the 17th Biennial Conference on the Biology of Marine Mammals, 2007. Cape Town, South Africa.

Author: **“IGAP in Alaska: An Insider’s Perspective,”** A report to the GAO at the request of EPA Region 10 and Workplan was used to train EPA regional tribal coordinators when introducing GAP Online. 2007

Co-author: **“Kotzebue Marine Mammal News, Vol. 1, Issue 1, Dec. 2007: Bearded seals in Kotzebue Sound – Unraveling the Mysteries,”** Native Village of Kotzebue. 2007

Co-author: **“Ringed Seal Population Structure and the Threat of Early Snow Melts; An International and Cross Cultural Collaboration,”** presentation at 2007 Arctic American Association for the Advancement of Science.

Co-author: **“Kotzebue Marine Mammal News, Vol. 1, Issue 2, September 2008 – Beluga Whales in Kotzebue Sound,”** Alaska Beluga Whale Committee. 2008

Co-author: **“Different Habitat Use Strategies by Subadult and Adult Ringed Seals (*Phoca hispida*) in the Bering and Chukchi Seas,”** Polar Biology Fall 2011 and 18th Biennial Conference on the Biology of Marine Mammals (abstract and poster). October 2009. Quebec City, Canada.

Co-author: **“Inorganic Nutrients and Contaminants in Subsistence Species of Alaska: Linking Wildlife and Human Health,”** International Journal of Circumpolar Health 68:1. 2009

Co-author: **“Organic Nutrients and Contaminants in Subsistence Species of Alaska: Concentrations and Relationship to Food Preparation Method,”** International Journal of Circumpolar Health 68:4. 2009

Co-author: **“Nearshore Macrobenthos of Northern Kotzebue Sound, Alaska, With Reference to Local Sewage Disposal,”** Polar Biology. July 2009

Co-author: **“Utilizing TEK and SEK to Delineate the Coastal Food Web of Kotzebue Sound, Alaska,”** Abstract presented at the Western Alaskan Interdisciplinary Science Conference. Nome 2009

Author: **“Native Village of Kotzebue: Kotzebue Sound Research Program Synthesis – September 2009.”** Report to the U.S. Arctic Research Council. 14 Sept. 2009, Kotzebue, Alaska

Lead Author: **“Combining Inupiaq and Scientific Knowledge – Ecology in Northern Kotzebue Sound, Alaska,”** Sea Grant. 2011

Co-Author: **“Seasonal Changes in Diving Behavior of Adult and Subadult Ringed Seals (*Pusa hispida*) in the Bering and Chukchi Seas,”** Poster presented at the 19th Biennial Conference on the Biology of Marine Mammals, Tampa, Florida. November 2011

Co-Author: **“Using Bio-Logging to Study Exposure of Western Alaska Marine Mammals to Industrial Activities.”** Fourth International Science Symposium on Bio-logging. Hobart, Tasmania, Australia. March 14-18 2011 (abstract and poster)

Co-Author: **“Different Habitat Use Strategies by Subadult and Adult Ringed Seals (*Phoca hispida*) in the Bering and Chukchi seas,”** Polar Biology. August 2011

Co-Author: **“A Recurring Bloom of Toxic Marine Cyanobacteria above the Arctic Circle,”** Harmful Algae News No. 46. June 2012

Co-author: **“Kotzebue Marine Mammal News, May 2012, Kotzebue Sound Ringed Seals – What Have We Learned?”** Native Village of Kotzebue. 2012

Co-author: **“Seasonal Migration of Bearded Seals between Intensive Foraging Patches,”** Poster presented at 2012 Alaska Marine Science Symposium.

Co-author: **“Mercury in Marine Mammals and Human Health: Alaska Perspective,”** International Conference on Mercury as a Global Pollutant Edinburgh. July 2013

Author: **“Cape Krusenstern Campers, Muskox, and Grizzly Bear Interaction Summer 2013 Survey,”** Native Village of Kotzebue. September 2014

Author: **“The Economic and Cultural Benefits of Northwest Alaska Wilderness,”** Alaska Park Science, Volume 13, Issue 1, 2014

Author: **“Addressing Local Research Priorities: A Tribally Centered Approach - Kotzebue, Alaska,”** presentation Western Alaskan Interdisciplinary Science Conference. Kotzebue, April 2014

Author: **“Researching Ice Seals in Kotzebue Sound: 1997-2014,”** presentation Kotzebue Science Symposium. April 2014

Co-author: **“Interpreting Environmental Change in Coastal Alaska Using Traditional and Scientific Ecological Knowledge,”** Frontiers in Marine Science. August 2014

Co-author: **“Kotzebue Marine Mammal News, June 2015,”** Native Village of Kotzebue. June 2015

Co-author: **“Variation in Bioaccumulation of Persistent Organic Pollutants Based on Octanol–Air Partitioning: Influence of Respiratory Elimination in Marine Species,”** Marine Pollution Bulletin 100 (2015) 122-127

Co-author: **“Nearshore Seining in Coastal Waters of Kotzebue, Alaska,”** Poster presented at the 2016 Alaska Marine Science Symposium

Co-author: **“Blubber Fatty Acids in Three Pagophilic Phocid Seals of Northwest Alaska: Stratification and Potential Applications,”** Poster presented at the 2016 Alaska Marine Science Symposium

Co-author: **“Unexpected Presence of Transient Killer Whales in Kotzebue Sound,”** Poster presented at the 2016 Alaska Marine Science Symposium

Co-author: **“Foraging Ecology of Ice Seals in Kotzebue Sound, Alaska: Insights from Fatty Acid Markers,”** Marine Mammal Science, 32(2): 765–776 (April 2016)

Author: **“Native Village of Kotzebue: Kotzebue Sound Marine Mammal Research Program Synthesis,”** Report to the Marine Mammal Commission. February 6, 2016, Kotzebue, Alaska



Co-author: **“2015 Circulation and Hydrographic Structure of Kotzebue Sound,”** Report to the Northwest Arctic Borough. June 2016

Co-author: **“Beach Seine Sampling of Fish in Marine Waters near Kotzebue, Alaska, August and September 2015,”** Report to the Northwest Arctic Borough. June 2016

Co-Author: **“Genetic Profiling Links Changing Sea Ice to Shifting Beluga Whale Migration Patterns,”** Biology Letters. November 2016

Co-author: **“Assessing Mercury Accumulation in Alaskan Fishes using Chemical Feeding Ecology,”** presentation National Environmental Monitoring Conference, Washington D.C. August 2017

Co-author: **“Identifying Overwintering Habitat for Whitefishes in Coastal Arctic Lagoons Using Remote Sensing,”** presentation Alaska Marine Science Symposium, Anchorage, AK. January 2017

Co-author: **“Acoustic Habitat Utilized by Ice-living Seals: Hearing and Masking in Natural Noise Environments,”** presentation Acoustical Society of America Conference, Boston, MA. June 2017

Co-author: **“Genetic Mixed-Stock Analysis and Composition of Inconnu from the Hotham Inlet and Selawik Lake Winter Subsistence Fishery,”** Final Report Fisheries Resource Monitoring Report. March 2017

Co-author: **“Methylmercury Accumulation in the Kotzebue Sound Finfish Food Web: Implications for Wild Fish Consumption,”** presentation American Fisheries Society Fairbanks, AK, and the Society of Environmental Toxicology & Chemistry Conference, Anchorage, AK. April 2017

Co-author: **“Seasonal Movements and Dive Behavior of Pup and Yearling Bearded Seals in the Pacific Arctic,”** presentation 2017 Society for Marine Mammalogy 22nd Biennial Conference in Halifax, Nova Scotia

Co-author: **“Bearded Seal Foraging Related to Benthic Communities and Environmental Characteristics of the Chukchi Sea,”** presentation 2017 Society for Marine Mammalogy 22nd Biennial Conference in Halifax, Nova Scotia

Co-author: **“Genetic Profiling and Traditional Knowledge Links Changing Sea Ice to Shifting Beluga Whale Migration Patterns,”** presentation 2017 Society for Marine Mammalogy 22nd Biennial Conference in Halifax, Nova Scotia

Co-author: **“Overlap of Marine Mammal Ranges and Multi-Species Core Use Areas: A Synthesis of Satellite Telemetry Data in the Pacific Arctic,”** Deep Sea Research II. February 2018

Co-author: **“Biological Drivers of Total Mercury and Monomethyl Mercury Concentrations in Subsistence Fish from Kotzebue Sound,”** presentation at the 2018 Alaska Marine Science Symposium

Co-author: **“Movements and Dive Behavior of Young Bearded Seals as Related to Sea Ice in the Pacific Arctic,”** presentation at the 2018 Alaska Marine Science Symposium

Co-author: **“Stories from the Lagoons,”** presentation at the 2018 Alaska Marine Science Symposium

Co-author: **“Characterization of the Genetic Variability in the Full Coding Regions of the Genes of the Major Histocompatibility Complex in Alaskan Populations of Beluga: What can Next Generation Sequencing Tell Us on the Risk of Infectious Disease on Arctic Marine Populations,”** presentation at the 2018 Alaska Marine Science Symposium

Co-author: **“Habitat Selection and Seasonal Movements of Young Bearded Seals (*Erignathus barbatus*) in the Bering Sea,”** PLOS ONE. February 2018

Co-author: **“Seasonal sea ice dynamics drive movement and migration of juvenile bearded seals *Erignathus barbatus*,”** MARINE ECOLOGY PROGRESS SERIES. July 2018

Co-author: **“Seasonal and Diel Differences in Dive and Haul-out Behavior of Adult and Subadult Ringed Seals (*Pusa hispida*) in the Bering and Chukchi Seas,”** Polar Biology. October 2018

Co-author: **“Ecotoxicoparasitology of the Gastrointestinal Tracts of Pinnipeds: The Effect of Parasites on the Potential Bioavailability of Total Mercury (THg),”** Science of The Total Environment. Volumes 631–632, 1 August 2018, Pages 233-238

Co-author: **“Ecological Drivers of Mercury Concentrations in Fish Species in Subsistence Harvests from Kotzebue Sound, Alaska,”** Environmental Research. Volume 177, October 2019, 108622

Lead author: **“Unexpected Mid-winter Presence of Harbor Porpoise (*Phocoena phocoena*) in Kotzebue Sound, Alaska,”** Marine Mammal Science. September 2019

Co-author: **“The Maniilaq Seal Oil Project Part 2: Serving Safe Seal Oil to Iñupiat Elders at Utuqqanaat Inaat Long-term Care Facility,”** Poster presented at the Alaska Public Health Association (ALPHA) 2020 Health Summit. January 2020. Anchorage, Alaska

Co-author: **“Freshwater Input and Ocean Connectivity Affect Habitats and Trophic Ecology of Coregoninae In Arctic Coastal Lagoons.”** 14th International Symposium on the Biology and Management of Coregonid Fishes. University of Jyväskylä, Finland. June 22–26, 2020

Co-author: **“Auditory Biology of Bearded Seals (*Erignathus barbatus*).”** Polar Biology. August 2020

Co-author: **“Are Cyanobacterial Blooms Common in the Coastal Waters of Alaska?”** Presentation at the American Geophysical Union Earth and Space Sciences Conference. December 2020

Co-author: **“The Mass Balance of Landfast Sea Ice in Kotzebue Sound: Addressing Community-Driven Research Questions through Knowledge Co-Production.”** Presentation at the American Geophysical Union Earth and Space Sciences Conference. December 2020

Co-author: **“A Co-Production of Knowledge Approach to Understand how Sea Ice Loss Constrains Indigenous Hunting Opportunities for Traditional Marine Mammal Resources in Northwest Alaska.”** Presentation at the American Geophysical Union Earth and Space Sciences Conference. December 2020

Co-author: **“Ikaagvik Sikukun: Bridging the Scientific and Indigenous Communities to Study Sea Ice Change in Arctic Alaska.”** Presentation at the American Geophysical Union Earth and Space Sciences Conference. December 2020

Co-author: **“Evolution of Sea Ice Radiometric Properties During Melt and Breakup.”** Presentation at the American Geophysical Union Earth and Space Sciences Conference. December 2020

Co-author: **“Observations of the Heat Budget of Coastal Arctic Sea Ice under the Influence of a River Outflow.”** Presentation at the American Geophysical Union Earth and Space Sciences Conference. December 2020

Co-author: **“Quantifying Characteristics of Natchiq (Ringed Seal) Lair Habitat Through Knowledge Co-Production in Kotzebue Sound, Alaska.”** Presentation at the Arctic Change 2020 Conference. December 2020

Co-author: **“Quantifying characteristics of ringed seal (natchiq) lair habitat through knowledge co-production in Kotzebue Sound, Alaska.”** Poster presented at the 2021 Alaska Marine Science Symposium. January 2021

Co-author: **“Co-production of knowledge reveals how sea ice loss constrains Indigenous hunting opportunities for ugruk (bearded seals) in Kotzebue Sound.”** Poster presented at the 2021 Alaska Marine Science Symposium. January 2021



Co-author: **“Are Cyanobacterial Blooms Common in the Coastal Waters of Alaska?”** Posted on Earth and Space Science Open Archive. January 2021

Co-author: **“Human-salmon Relationships in Alaska: Understanding Deep Connections and Fractures through Time.”** Ecology and Society as part of the Special Feature: Alaska’s Salmon and People - Synthesizing Knowledge and Dimensions. February 2021

Co-author: **“Trophic Ecology and Proximate Composition of Marine and Diadromous Fishes in Chukchi Sea Coastal Lagoons.”** Presentation at the Alaska American Fisheries Society Annual Meeting. March 2021

Co-author: **“Quantifying Cyanobacterial Blooms In The Coastal Waters Of Northwest Alaska.”** Presentation at the ASLO 2021 Aquatic Sciences Meeting. June 2021

Co-lead author: **“Co-production of Knowledge Reveals how Sea Ice Loss Constrains Indigenous Hunting Opportunities for Ugruk (Bearded Seals) in Kotzebue Sound.”** Presentation at the virtual UAF Center for One Health Research Food/Safety/Security/Sovereignty/Contaminant Monitoring Poster Session. April 2021

Co-author: **“The Genetic History and Stock Identity of Beluga Whales in Kotzebue Sound.”** Presentation at the Society for Marine Mammalogy Biennial Conference. December 2021

Co-author: **“Arctic Lagoon and Nearshore Food Webs: Relative Contributions of Terrestrial Organic Matter, Phytoplankton, and Phytobenthos Vary with Consumer Foraging Dynamics,”** Estuarine, Coastal and Shelf Science. May 2021

Co-lead author: **“Co-Production of Knowledge Reveals Loss of Indigenous Hunting Opportunities in The Face of Accelerating Arctic Climate Change.”** Environmental Research Letters. August 2021

Co-author: **“Thin Ice, Deep Snow and Surface Flooding in Kotzebue Sound: Landfast Ice Mass Balance During Two Anomalously Warm Winters and Implications for Marine Mammals and Subsistence Hunting.”** Journal of Glaciology. August 2021

Co-author: **“The Winter Heat Budget of Sea Ice in Kotzebue Sound: Residual Ocean Heat and the Seasonal Roles of River Outflow.”** Journal of Geophysical Research: Oceans. September 2021

Co-lead author: **“Co-Production of Knowledge Reveals how Sea Ice Loss Constrains Indigenous Hunting Opportunities for Ugruk (Bearded Seal) in Kotzebue Sound, Alaska.”** Presentation at the ArcticNet Annual Scientific Meeting. December 2021.

Co-author: **“Freshwater Input and Ocean Connectivity Affect Habitats and Trophic Ecology of Fishes in Arctic Coastal Lagoons,”** Polar Biology. September 2021

Co-author: **“Energy Condition of Subsistence-Harvested Fishes in Arctic Coastal Lagoons.”** Marine and Coastal Fisheries. November 2021

Co-author: **“Genetic History and Stock Identity of Beluga Whales in Kotzebue Sound.”** Polar Research. November 2021

Co-author: **“UAV-Based Radiometric Observations of First-Year Sea Ice Undergoing Spring Melt.”** Presentation at the Ocean Sciences Meeting. Feb 2022.

Co-author: **“Terrestrial Organic Matter is an Important Organic Carbon Source Across a Five Trophic Level Coastal Arctic Food Web.”** Presentation at the Ocean Sciences Meeting. Feb 2022.

Co-author: **“Observations of a Sea Ice Heat Budget and New Perspectives on the Existing Parameterizations of Ocean-Ice Heat Flux.”** Presentation at the Ocean Sciences Meeting. Feb 2022.

**APPENDIX 5. NATIVE VILLAGE of KOTZEBUE— ENVIRONMENTAL PROGRAM  
RECOGNITION for PROGRAM ACCOMPLISHMENTS**


# HONORING NATIONS

*An Awards Program that  
Identifies, Celebrates, & Shares  
Outstanding Examples of Tribal Governance*

## HONORS Environmental Program Native Village of Kotzebue

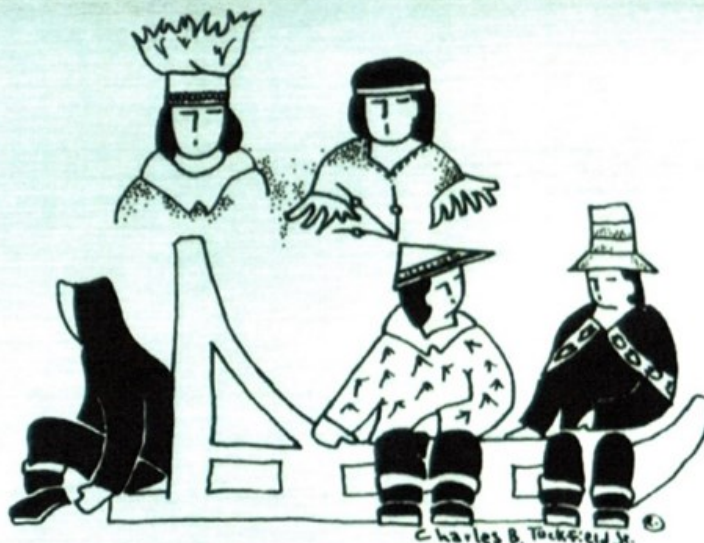
THE HARVARD PROJECT ON AMERICAN INDIAN ECONOMIC DEVELOPMENT

2018

  
JOSEPH P. KALT  
CO-DIRECTOR OF THE HARVARD PROJECT ON  
AMERICAN INDIAN ECONOMIC DEVELOPMENT

  
REGIS PECOS  
CHAIRMAN OF THE HONORING  
NATIONS BOARD OF GOVERNORS

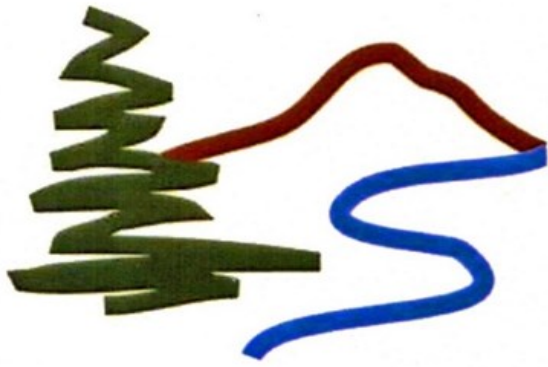
  
MEGAN MINOKA HILL  
DIRECTOR OF  
HONORING NATIONS



2015 Alaska Federation of Natives  
Presidents Award

**Denali Award**  
**Alex Whiting - Kotzebue, Alaska**





**ENVIRONMENTAL EXCELLENCE AWARD**

Alaska Forum on the Environment, 2011

This Environmental Excellence Award is presented to

**Alex Whiting**

recognizing his commitment to promoting a healthy  
environment.