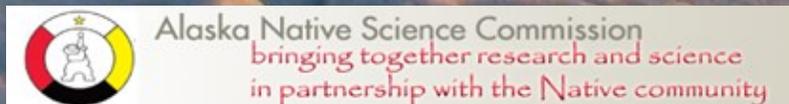
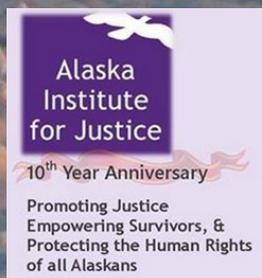


RIGHTS, RESILIENCE, and COMMUNITY-LED RELOCATION

Perspectives from fifteen Alaska Native coastal communities



This publication and workshop would not have been possible without the expertise and hard work by

Melvin Egoak and Daniel Waska of the **Village of Atmautluak**

Richard Tuluk of the **City of Chevak** & Cynthia Paniyak and Cody Pequeño of the **Chevak Traditional Council**

Toby Anungazuk, Jack Fagerstrom, and Carol Oliver of **Chinik Eskimo Community**

Robert Keith and Fred Daniels of the **Native Village of Elim**

John Whissel of the **Native Village of Eyak**

Janet Mitchell of the **City of Kivalina** & Dollie Hawley and Millie Hawley of the **Native Village of Kivalina**

Tanya Hunt and Victor Tonuchuk of the **Village of Kotlik**

Gavin Phillip, Lewis Amik III, and Ephraim Andrew of the **Native Village of Kwigillingok**

Mark McNeley, Angela Johnson, and Samantha McNeley of the **Native Village of Nelson Lagoon**

Bernice Sallison and Golga Frederick of the **Native Village of Nunapitchuk**

Jaelyn Christensen, Adrienne Christensen, Emil Christensen, Scott Anderson, and Gerda Kosbruk of the **Native Village of Port Heiden**

Ferdinand Cleveland and Mary Hill of the **Native Village of Kwinhagak**

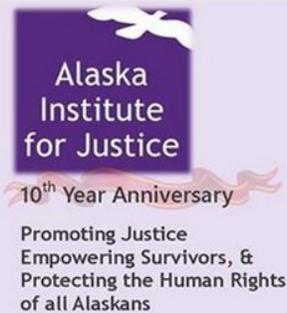
Annie Weyiouanna and Fred Eningowuk of the **Native Village of Shishmaref**

Tanya Ablowaluk and Dolly Kugzruk of the **Native Village of Teller**

John Henry and Steve Ivanoff of the **Native Village of Unalakleet**

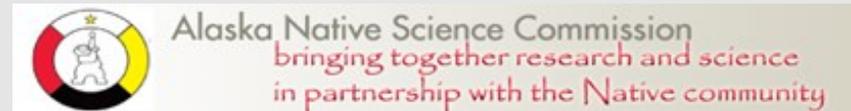


2015 Shishmaref ice photo on cover page by Curtis Nayokpuk and 2016 workshop group photo above by Denise Pollock.



The Alaska Institute for Justice (AIJ) is a nonprofit organization dedicated to protecting the human rights of Alaskans. AIJ's goal is to work with Alaska Native communities and State and Federal government agencies to design and implement a community-led relocation process based in human rights.

The **National Oceanic and Atmospheric Administration (NOAA) Coastal and Ocean Climate Applications (COCA) program** provided primary funding for AIJ's adaptation workshop and for the travel of Tribal members from Chevak, Golovin, Kotlik, Kwigillingok, and Shishmaref to participate in the 2016 adaptation workshop. COCA addresses the needs of decision makers facing pressing climate-related issues in coastal and marine environments. **NOAA's National Weather Service (NWS)** provides weather, water, and climate data and forecasts for the protection of life and property. AIJ is grateful for the growing partnership between NOAA and Alaska Native communities, which has enabled Alaska Native communities to make informed adaptation decisions and to respond to climate impacts.



The Alaska Native Science Commission (ANSC) brings together research and science in partnership with the Alaska Native community. ANSC provides an archive for significant research involving the Alaska Native community. ANSC is one of AIJ's grant partners under the NOAA project.



The Department of Interior (DOI) Bureau of Indian Affairs (BIA) provided funding to nine Alaska Native communities to participate in the 2016 adaptation workshop: Atmautluak, Elim, Eyak, Kivalina, Nelson Lagoon, Quinhagak, Port Heiden, Teller, and Unalakleet. The mission of the BIA is to enhance the quality of life, to promote economic opportunity and to protect and improve the trust assets of American Indians and Alaska Natives.



ALASKA NATIVE TRIBAL HEALTH CONSORTIUM

The Alaska Native Tribal Health Consortium (ANTHC) provides the health services for Alaska Native people through training, health education, disease and injury prevention, and rural water and sewer construction. ANTHC is one of AIJ's grant partners under the NOAA project.

AIJ would also like to recognize the critical work of the **State of Alaska Division of Community of Regional Affairs (DCRA) and the Alaska Climate Change Mitigation Program (ACCMP)**, which provide many Alaska Native communities with technical assistance and funding for climate adaptation planning. The DCRA's mission is to promote strong communities and healthy economies. ACCMP provides funding and technical assistance to communities threatened by erosion, flooding, storm surge, and thawing permafrost. The program assists impacted communities develop a planned approach to shoreline protection, and/or eventual village relocation.



The Department of Geological and Geophysical Surveys (DGGS) Coastal Hazards Program investigates how the coastline has evolved and how it will respond to hazardous events and long-term changes.



The Denali Commission is the lead federal agency designated by President Obama, to coordinate Federal, State, Tribal, Local, and Regional government responses to flooding, erosion, and permafrost thawing for rural Alaska communities.



The Alaska Division of Homeland Security and Emergency Management's (DHS&EM) mission is to lead emergency management to foster a prepared, resilient Alaska capable of meeting the needs of its communities and citizens in response to all-hazards events.



The United States Geological Survey provides science about the natural hazards that threaten lives and livelihoods; the health of our ecosystems and environment; and the impacts of climate and land-use change.

The Yukon River Inter-Tribal Watershed Council (YRITWC) is a non-profit organization, representing 73 First Nations and Tribes, dedicated to preservation of Yukon River Watershed. YRITWC provides technical assistance, research, training, education, and awareness programs to promote the health of the Yukon River.



The Alaska Ocean Observing System strives to increase access to existing coastal and ocean data; package data in useful ways for stakeholders; and increase observing and forecasting capacity in all regions of Alaska, with a priority on the Arctic and Gulf of Alaska.

CLIMATE CHANGE IN ALASKA

In Alaska, increased temperatures are causing thawing permafrost, decreased Arctic sea ice extent, and accelerated rates of erosion. Community members from Kotlik and Golovin highlight how accelerating climate change affects the health, well-being, and infrastructure of their entire communities:

Photo of Kotlik by Victor Tonuchuk.



“In November 2013, Kotlik experienced a devastating flood caused by a storm surge in the Bering Sea. The storm surge caused an unprecedented flood event that destroyed homes, severed water and sewer lines, demolished the water system, damaged the boardwalk system and forced hundreds of people to seek shelter in the school for an extended period of time. This rare flood event could become more common and worse as sea ice that shields coastal Alaska villages from storms becomes thinner and forms later in season.”

Victor Tonuchuk, Indian General Assistance Program (IGAP) coordinator at the Kotlik Traditional Council

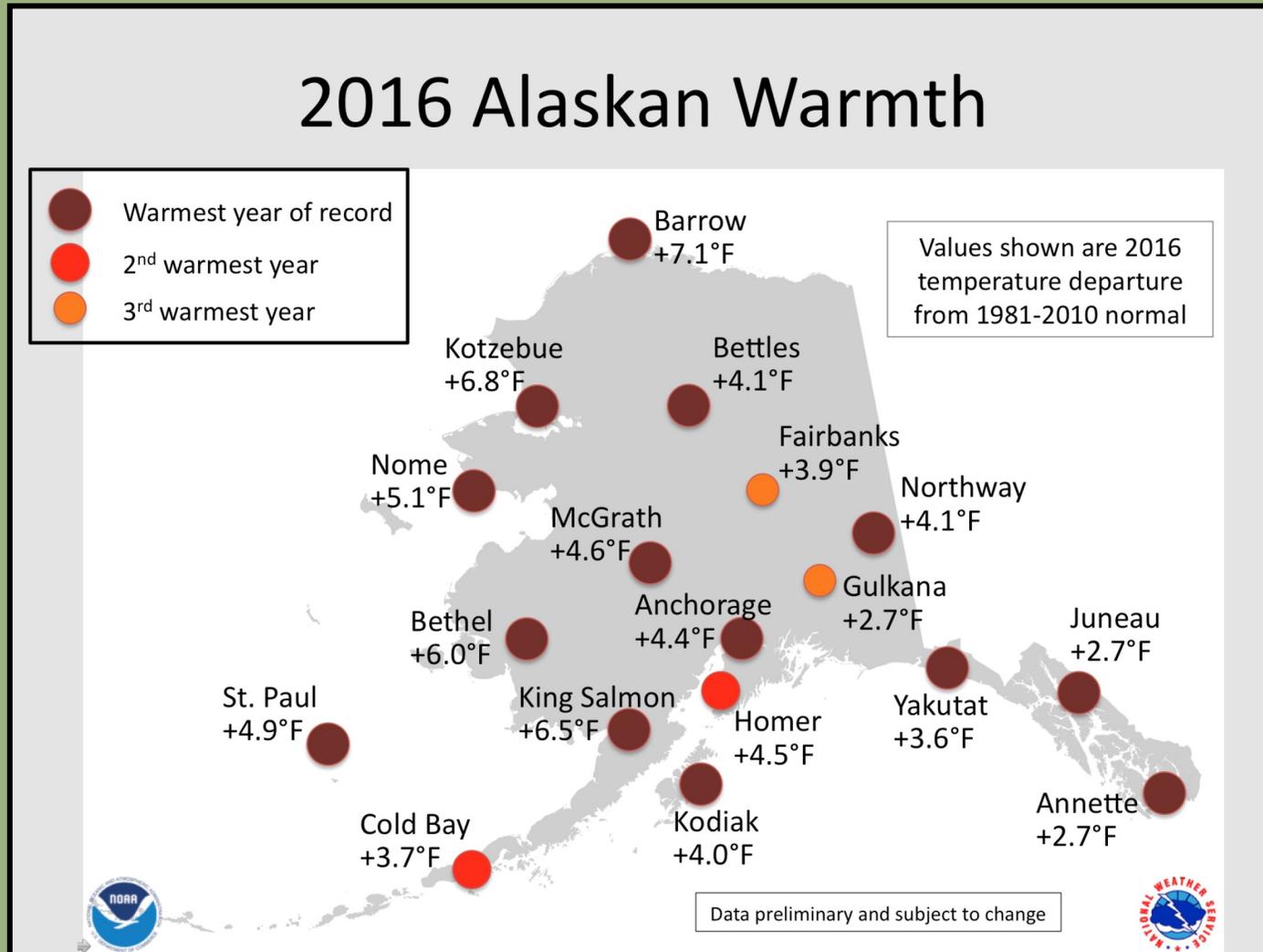
Photo of Golovin by Toby Anungazuk.



“Here is a climate change and storm surge picture of our village. We are not looking forward to fall or winter weather. We've had high tides as late as November and December. Earlier rainy seasons during the winter and spring caused our runway to shut down, either to ice conditions, or mud and slush. Golovin Airport is the only way into and out of our community. We were concerned when airplanes couldn't come in. Thankfully, we didn't have a life threatening emergency.”

**Toby Anungazuk,
Environmental Coordinator at Chinik Eskimo Community**

TEMPERATURE ANOMALIES IN ALASKA

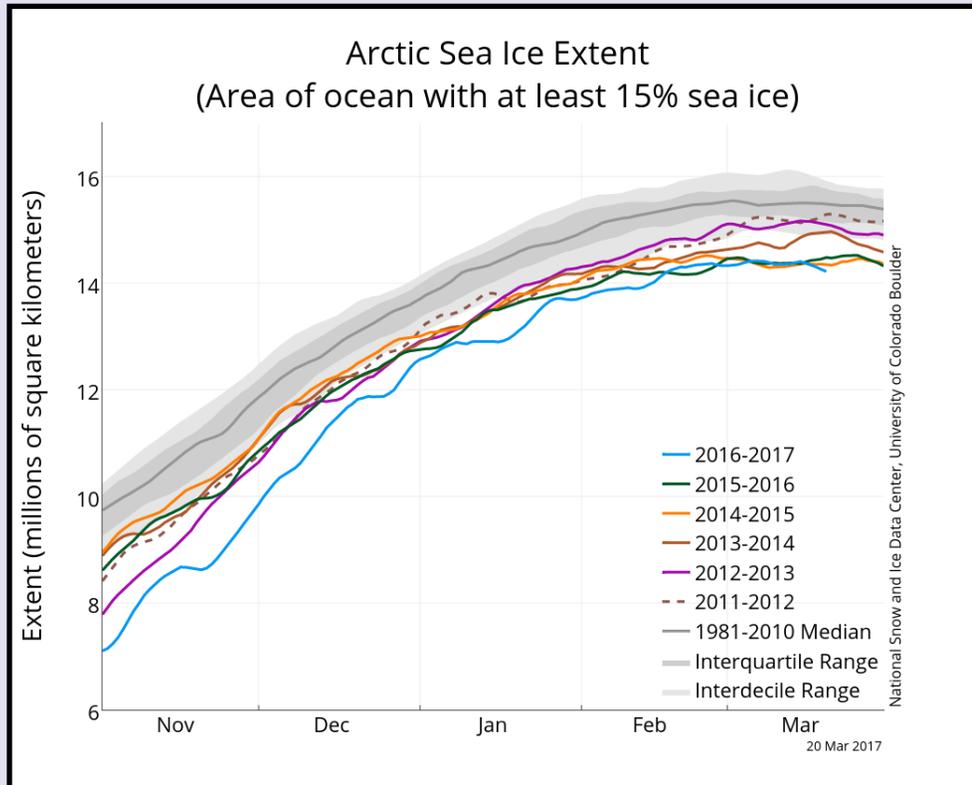


Graphic created by NOAA and NWS.

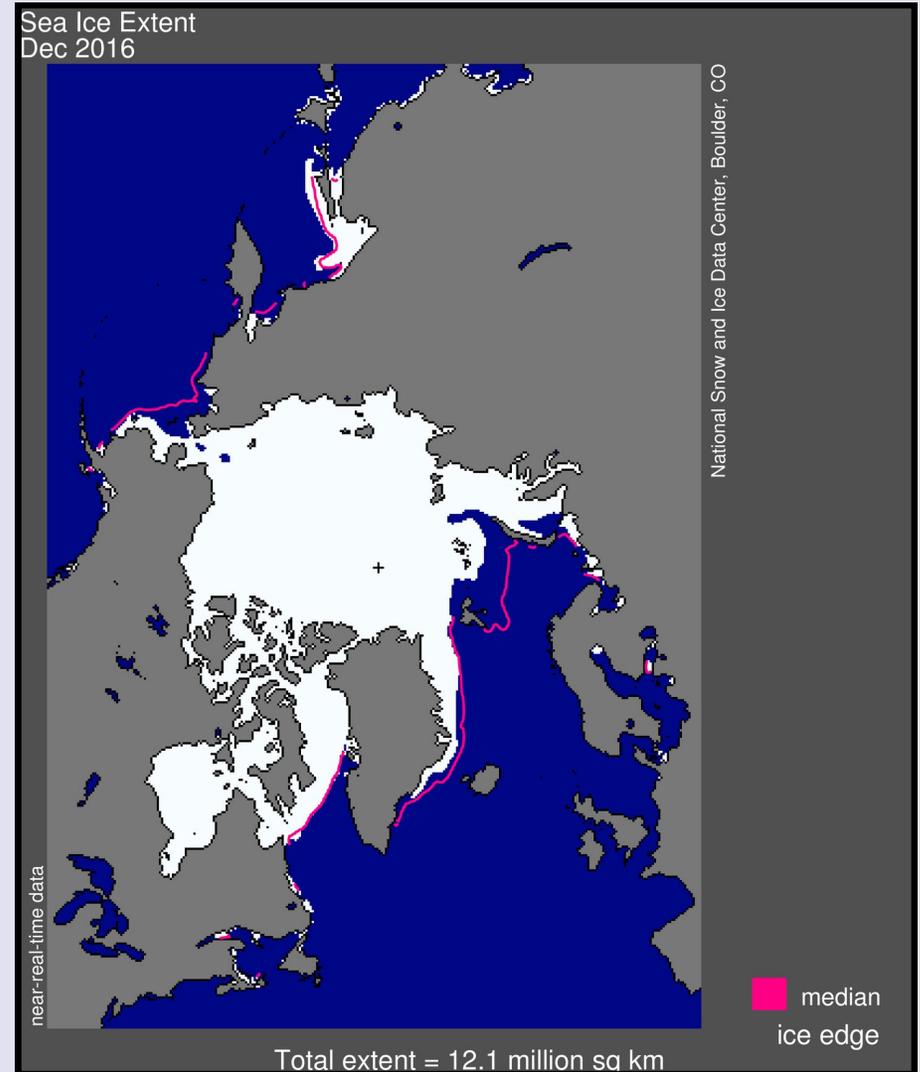
In 2016, Alaska had its second warmest winter, warmest spring, second warmest summer, and a warmer-than-average fall, resulting in its warmest year on record. At the local level, the annual average temperature in Barrow was 7.1°F above the 1981-2010 average. Nome was 5.1°F above, Fairbanks 3.9°F, Anchorage 4.4°F and Juneau 2.7°F above the 30-year average (NOAA National Centers for Environmental Information 2016). In November 2016, the North Pole and Arctic Ocean were more than 36 degrees Fahrenheit warmer than they have been in the last decades (Sean Birkel 2016).

DECLINING ARCTIC SEA ICE

Decreased Arctic sea ice extent and warming temperatures delay the freezing of the Bering and Chukchi Seas. Since the 1980s, the Arctic seas have remained ice-free approximately three weeks longer in the fall (Shulski & Wendler 2007). In 2016, the Arctic experienced record low monthly sea ice extents in January, February, April, May, June, October and November, while the Antarctic experienced record low monthly sea ice extents in November and December (NSIDC 2017).



National Snow and Ice Data Center, Boulder, CO (Mar 2017).



National Snow and Ice Data Center, Boulder, CO.

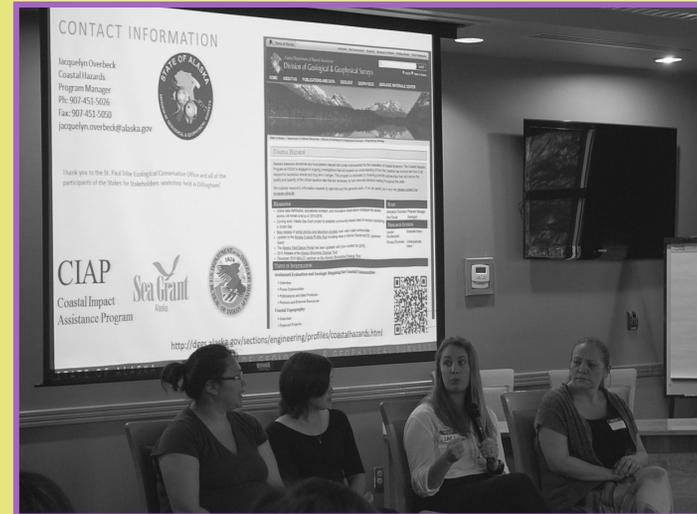
In December 2016, Arctic sea ice extent averaged 4.67 million square miles, the second lowest December extent in the satellite record. The magenta line shows the 1981 to 2010 median ice extent for the month (NSIDC 2016).

SEPTEMBER 2016 ADAPTATION WORKSHOP

The Alaska Institute for Justice (AIJ), in partnership with NOAA and the Alaska Native Science Commission (ANSC), held its first *Rights, Resilience, and Community-Based Adaptation Workshop* in September 2016 in Anchorage, Alaska. The 2016 adaptation workshop agenda was designed by and for the 15 Alaska Native communities during advisory committee meetings held several months before the workshop. The purpose of the workshop was to enable 15 Alaska Native communities to begin to design a relocation governance framework that protects their human rights.

WORKSHOP ACCOMPLISHMENTS

- ◆ Sharing expertise between Alaska Native communities
- ◆ Strengthening partnerships between Tribes, State and Federal government representatives
- ◆ Designing a social-ecological monitoring tool
 - Sea ice conditions
 - Permafrost melting
 - Shoreline erosion
 - Flooding & storm surge heights
 - Health & well-being
- ◆ Integrating traditional knowledge and western science
- ◆ Learning about resources that provide protection from flooding, erosion, and permafrost thawing



Jaclyn Christensen (Port Heiden), Angela Johnson (Nelson Lagoon), Jacquelyn Overbeck (DGGS), and Mary Mullan (ANTHC) collaborating on a panel regarding erosion monitoring (Robin Bronen).



Community group session on September 21, 2016 (Denise Pollock).

RESPONSES to RIGHTS, RESILIENCE, and COMMUNITY BASED ADAPTATION WORKSHOP



Jaclyn Christensen from Port Heiden presenting at AIJ workshop on September 20, 2016 (Robin Bronen).

“This has got to be one of the more meaningful conferences I’ve been too. Real good.”

-Tanya Ablowaluk, Council Member at the Teller Traditional Council

“This group of 32 community members told stories of the climate change battles that many of us are fighting. From erosion, to floods, to sinkholes, to sea-ice melting, the issues we face are endless. With that came the presentations from organizations to help us. We met with National Oceanic Atmospheric Agency, Alaska Dispatch News, Channel 11 news, and Alaska Native Tribal Health Consortium. We were able to voice our needs to these resources and shine a spotlight on our very real climate change troubles. This workshop was very important and we look forward to more in the future.”

-Angela Johnson, Indian General Assistance Program (IGAP) Coordinator at the Native Village of Nelson Lagoon

“I was only able to participate for the last day of the workshop but I found it to be so very insightful. The stories shared about the sea ice impacts on the communities had me tearing up at times. They give me a renewed purpose concerning why what we do here day to day at National Weather Service (NWS) Alaska Sea Ice Program (ASIP) is important. They also inspire me to explore new ways to better serve these communities and communicate sea ice information to them. I think the meeting was extremely valuable for both the community participants and those of us invited to participate.”

-Becki Heim, Sea Ice Program Leader at the Alaska Sea Ice Program in Anchorage

“This is very special—the workshop overall. Talking about climate change is very educational. It gives us hope that we’re not alone in this world. We hope you all would come into our village and explain information that you shared with us. Taiku!”

-Dollie Hawley, Local Coordinator at the Native Village of Kivalina

“I’m happy it allowed people to voice their concerns. I don’t feel so alone anymore. It opened my eyes to the severity of our issues and how many people are affected. I hope this workshop continues and I am able to attend next year. Hopefully, next year we will hear more success stories and more positivity! Hopefully our communities will get the hope they need!”

-Anonymous evaluation response

Alaska Native community participants highlight environmental factors that are important to monitor as climate change accelerates:



2013 erosion at Meshik site in Port Heiden (Jaelyn Christensen).

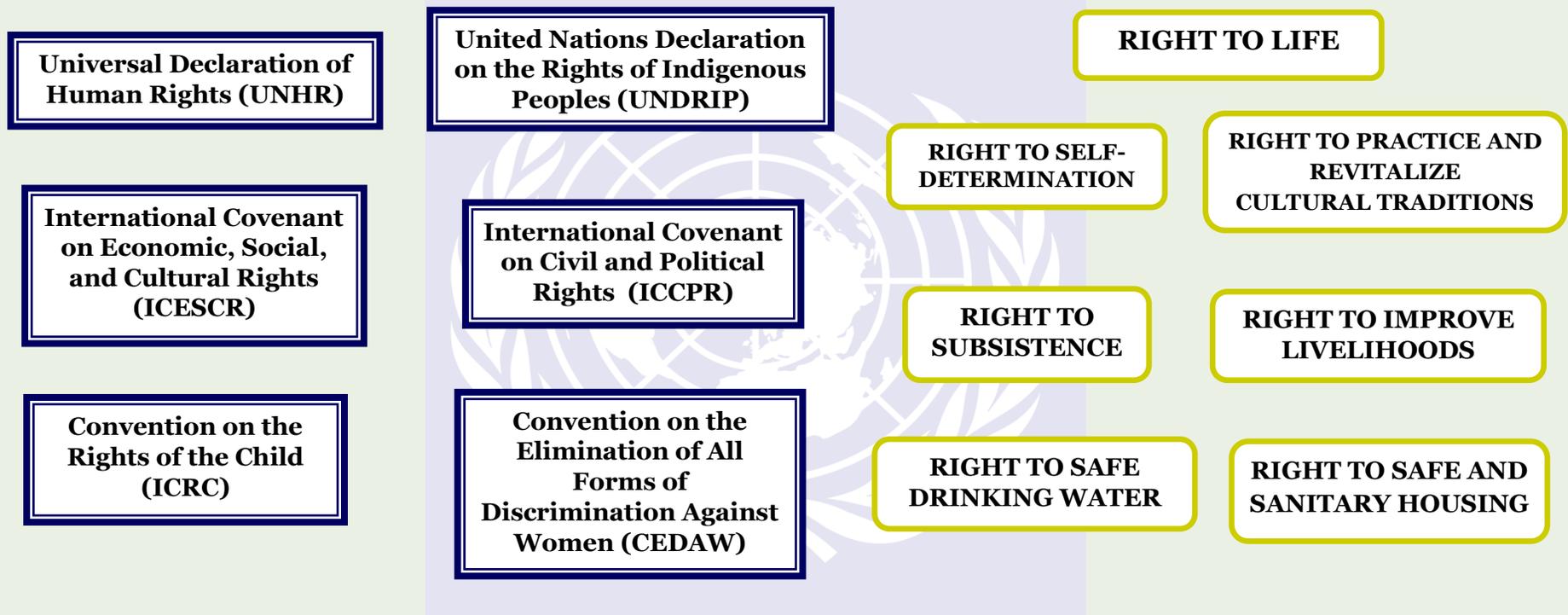
- * Erosion
- * Flooding
- * Wind direction, tides & storm surge heights
- * Sea level rise
- * Sea ice flow
- * Sea ice extent
- * Sinkholes
- * Warmer temperatures
- * Snowfall/rainfall
- * Water quality
- * Shift of seasonal time frame
- * Seasonal migration patterns of subsistence resources



2013 flood in Kotlik (Victor Tonuchuk).

RELOCATION PRINCIPLES BASED ON HUMAN RIGHTS

Climate-induced community relocations are perhaps the greatest human rights challenge of our time. Those who have least contributed to our climate crisis are now the first to face the permanent loss of their homelands, and thus, need to relocate. Population relocation affects the human right to life and self-determination, as well as a wide range of social, economic, and cultural rights. Alaska Native communities are among the first communities to decide that relocation of their entire community is the only long-term adaptation strategy to protect the lives of community residents from climate change impacts.



Relocation is a process whereby a community's housing and public infrastructure are rebuilt in another location. In addition, relocation can also include rebuilding livelihoods and social networks. UNDRIP, UNHR, and ICESCR confirm the right to self-determination, whereby Tribes decide whether, when, who, and how tribal members relocate. Under ICESCR, communities have a right to improve livelihoods and a right to safe and sanitary housing at the relocation site. UNDRIP and ICESCR recognize that communities have a right to maintain access to areas where traditional foods are gathered.

UNHR and ICCPR recognize the right to life, which mandates that a government protects people from climate threats, including the right to "protection in place" methods of erosion control and flooding protection until a relocation is fully carried out.

PROTECTING & HONORING TRADITIONAL KNOWLEDGE

The relocation of communities because of climate change presents an unprecedented challenge to the communities displaced, facing a loss of land and connection to ancestral heritage. Indigenous peoples have both individual and collective rights to practice and revitalize their cultural traditions throughout the relocation process (United Nations Declaration on the Rights of Indigenous Peoples). The right to protect archaeological and historical sites, artifacts, ceremonies, and cemeteries must be integrated in all stages of adaptation and relocation planning.

“Guidelines and protocols must be developed on a Tribal level to ensure that Tribal knowledge is recognized and implemented before Tribes engage with contractors on environmental review processes and the construction phase of erosion mitigation projects.”

**-John Henry, IGAP Coordinator
at the Native Village of Unalakleet**



Adaptation workshop participants (Robin Bronen).



Walrus hunters in Shishmaref (Curtis Nayokpuk).

“We need to document our traditional knowledge from our elders. Elders know about the land before there was erosion. Companies who come to our communities need to recognize our traditional knowledge. Our people and elders, our home and lands are our school, they learn from our parents and grandparents, and we’ve lived these lands for thousands of years; outsiders need to acknowledge our traditional knowledge.”

**-Cody Pequeño, Council Member
at the Chevak Traditional Council**

BUILDING A RELOCATION GOVERNANCE FRAMEWORK

Currently, no Federal or State government agency in the United States has the mandate or funding to implement a relocation process if a community makes the decision to relocate. This is the problem facing two of the Alaska Native communities, Shishmaref, and Kivalina, that participated in the September 2016 workshop. As a consequence, neither community has yet relocated despite the recognition by Federal, State and Tribal governments that relocation is the only sustainable long-term adaptation strategy.

If climate-induced environmental change renders the places where people live uninhabitable and causes land to disappear, new governance processes need to be designed to determine whether people can be protected in place or require relocation. Currently, no governance framework exists in the United States or elsewhere to evaluate climate change impacts and determine when people can no longer be protected in place. This lack of a governance framework hampers the ability of Tribal, local, regional, and national government agencies to address the urgent need for Alaska Native communities to determine whether and when relocation is the best long-term adaptation strategy.



Sally Russel Cox, planner at the State of Alaska Division of Community and Regional Affairs (DCRA) presenting at 2016 adaptation workshop. (Denise Pollock)

An adaptive governance relocation framework needs to be designed and implemented to determine whether, when and how climate-induced relocations should occur. Governance is a broad term that includes both decision-making power and the norms and rules that govern behavior. AIJ is working with 15 Alaska Native communities to develop this governance framework and to develop relocation indicators.

Implementing an adaptive governance relocation framework requires multi-level and diverse governmental and nongovernmental actors to engage in a collaborative process of knowledge production and problem solving.

Most importantly, relocation indicators need to be developed to determine the point in time that communities and the government agencies responsible for their protection need to shift from a protection in place strategy to relocation.

ADAPTIVE RELOCATION GOVERNANCE FRAMEWORK HUMAN RIGHTS PROTECTIONS

**PROTECT IN
PLACE**



Flooding in Newtok (State of Alaska DCCED DCRA).

**COMMUNITY
RELOCATION**



Seawall at Shishmaref (Shorezone).

**RELOCATION
INDICATORS**



Residents from Newtok building homes at relocation site Mertarvik (Stanley Tom).

“An adaptive governance relocation framework incorporates all of the institutional mechanisms to protect people in the places where they live and also create new mechanisms to implement a relocation process so that national, State, local, and Tribal governments can dynamically shift their efforts from protection in place to managed retreat and community relocation.” (Bronen and Chapin 2013).

DESIGNING SOCIAL- ECOLOGICAL MONITORING TOOLS

Community-based social-ecological monitoring and assessment, designed with Alaska Native Tribes and State and Federal government representatives, is an essential component of an adaptive governance relocation framework.

In this way, Alaska Native Tribes engage with state and federal financial and technical assistance resources as they monitor and respond to climate change so that they have the ability to dynamically adapt and assess whether a relocation strategy needs to be developed.

Objective assessment of a hazard, the social perception of that hazard, and the ability to anticipate ongoing environmental changes are critical to the development of sustainable adaptation strategies. To integrate the concept of collaboration into conventional risk management, those most directly affected by the hazard must actively participate in the gathering of data during the risk assessment process (Bronen 2015).

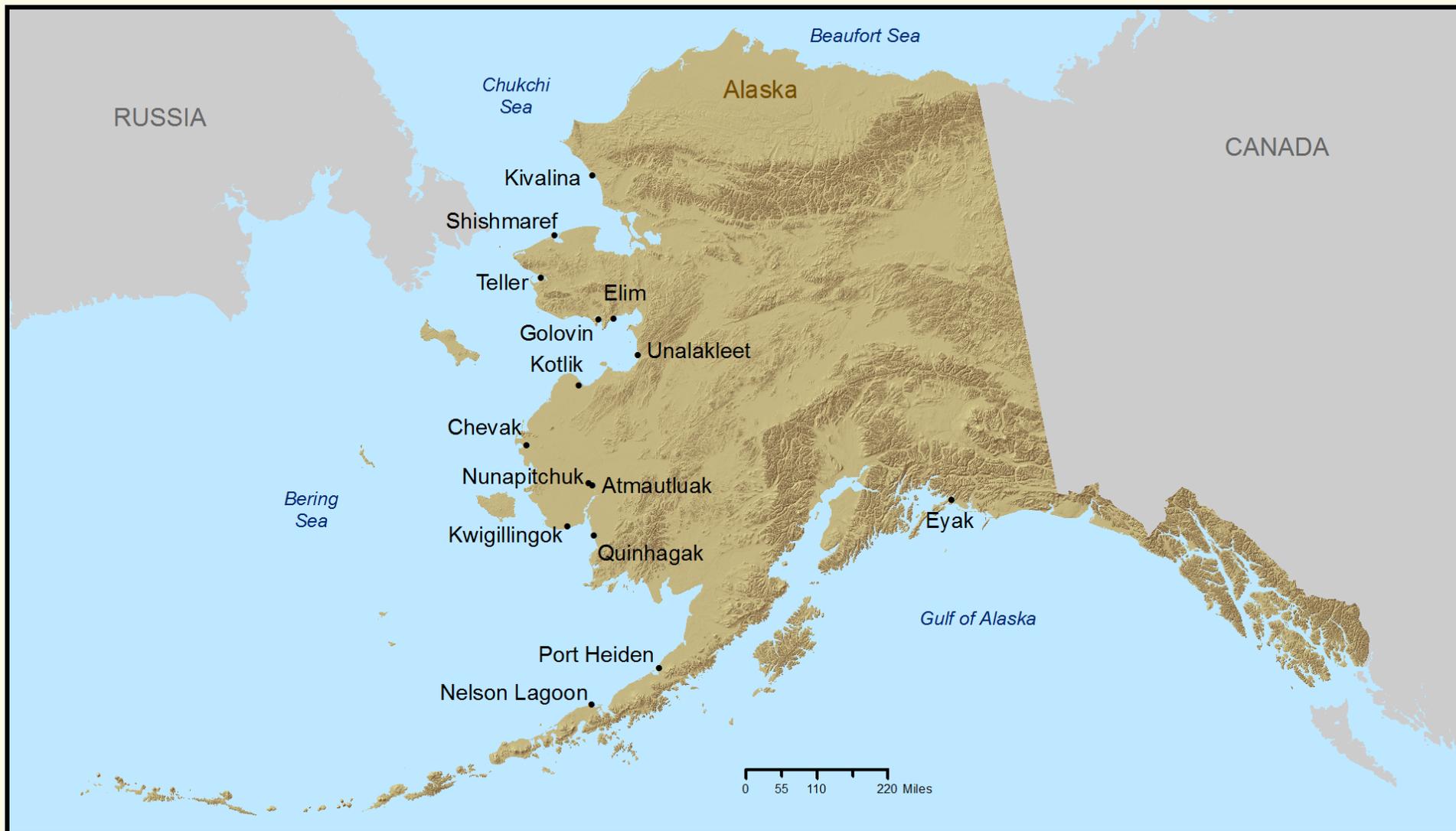


**Golovin color-indexed map
(Jacquelyn Overbeck, DGGs Coastal Hazards Program Manager).**

The Native Village of Golovin partnered with the Alaska Division of Geological Surveys (DGGs) and the National Weather Service (NWS) to implement the use of color-indexed maps for flood communication during the 2016 storm season. The color-indexed elevation maps were used by DGGs to describe where the NWS forecasted flood had potential to inundate and communicate that forecast to local residents. Golovin residents, recognizing the potential for inundation, hauled sediment from a local source to build a temporary protective berm over low elevation areas. Golovin residents took photos of storm waters at their highest, and corresponded with DGGs about the resulting impact of the storm to assess the accuracy of the forecast. The color-indexed elevation map allowed easy communication between NWS, DGGs, and Golovin so that Golovin could make informed adaptation decisions.

STORIES FROM FIFTEEN ALASKA NATIVE COMMUNITIES

The 2016 adaptation workshop brought together 32 community members from 15 Alaska Native villages: Atmautluak, Chevak, Elim, Eyak, Golovin, Kivalina, Kotlik, Kwigillingok, Nelson Lagoon, Nunapitchuk, Quinhagak, Port Heiden, Shishmaref, Teller, and Unalakleet. The September 2016 workshop is the first in a series of climate adaptation workshops that AIJ will organize with these communities to design a community-led relocation process.



Map of 15 communities participating in NOAA community-based project (Jacquelyn Overbeck, DGGs Coastal Hazards Program Manager).

Alaska is home to 229 Federally recognized tribes. Many Alaska Natives live in villages near the ocean or rivers, where they depend on hunting, fishing, and gathering wild plants for their livelihoods. Typically, an Alaska Native village has a population of several hundred people. Most villages are not accessible by roads and instead use planes and local airstrips for year-round access to the community (GAO 2009).

Ancestors of village residents moved their camps along inland and coastal areas, following the migration patterns of subsistence foods. In the 19th and early 20th centuries, the U.S. Department of Interior's Bureau of Education required Alaska Native children to attend schools. The permanent construction of schools, housing, and sewage, water, and electric infrastructure challenged the migratory lifestyle of Alaska Native communities. The location of schools and barge landing sites, which enabled the delivery of construction materials, were determined by the Federal government. This transition reduced the mobility of each village and increased the dependency on government to respond to environmental changes (Bronen and Chapin 2013). Despite the limited resources available and the accelerated impacts of climate change, Alaska Native communities continue to take strong measures to protect their lifestyles and their communities.



Shishmaref seal hunters (Curtis Nayokpuk).



Meat drying racks in Shishmaref (Curtis Nayokpuk).

Atmautluak is located on the west bank of the Pitmiktakik River, in the Yukon-Kuskokwim Delta. Atmautluak has 368 residents, ninety-six percent of whom identifies as Yup'ik (HDR Alaska Inc. 2010).

Melvin Egoak, former President of the Atmautluak Traditional Council, is most concerned about erosion, which has caused a steep drop off along the shoreline of the Pitmiktakik River. Here, children swim and residents access boats to engage in subsistence practices. The lake located in the heart of the village is expanding, which causes the land around it to float on water. Flooding and erosion create unsafe and dangerous conditions that can result in bodily harm, especially for elders and children.



Aerial photo of Atmautluak by Calista Corporation.



Energy efficient homes in Atmautluak by the Cold Climate Housing Research Center.

The Atmautluak Traditional Council partnered with the Cold Climate Housing Research Center to build an energy efficient housing model while also creating jobs for the community. The Atmautluak Traditional Council applied for funding through the Rural Innovation Fund (RIF) Program under the U.S. Department of Housing and Urban Development (HUD). An all-local construction crew worked to build two homes that minimize typical heating demand by over 50 percent and adjustable foundations that can respond to permafrost melting (Cold Climate Housing Research Center 2016).

The Rural Innovation Fund (RIF) is a program designed to improve the quality of life for residents in rural areas through job creation, education, and training, business development, and an increase of affordable housing.



**Aerial photo by ABR, Inc.
Environmental Research & Services - January 19, 2015.**



Chevak bluffs in 2015 by Cynthia Paniyak.

Chevak is located between the Yukon and Kuskokwim Rivers, on the bluff of the Ningliktak River. Chevak has 989 residents, 95 percent of whom identify as Cup'ik (NOAA 2013).

Erosion, flooding, and permafrost melting has impacted Chevak's access to traditional foods and also the viability of community infrastructure. Chevak has already relocated several buildings and roads as a result of erosion (average of 5 to 10 feet per year) along the beach and banks of the Ningliktak River (Ecology & Environment 2011).

Several homes located on the east side of town are situated in areas prone to sinkholes. Currently, the community fills sinkholes with local sand that often wears away from wind, water, and traffic.

Chevak monitors the active layer of permafrost and the erosion of the bluffs. Chevak also partners with the USGS Yukon-Kuskokwim Delta Berry Outlook project to identify berry vulnerabilities to climate using local knowledge and ecological data.

Elim is located on the northwest shore of Norton Bay on the Seward Peninsula. The City of Elim has a population of 330, most of whom identify as Alaska Native (City of Elim HMT 2014).

Erosion, flooding, and storm surges impact the infrastructure that community residents depend on for health and safety. The Elim IRA Council recognizes the critical need to relocate Elim's water source out of the floodplain and to build a seawall to protect wastewater disposal and sewer system from storm surges (Resolution #2016-09).

While the community built berms along the roadway leading to Moses Point, an area where traditional foods are gathered and prepared, increasing storm activity threatens the effectiveness of the berms.

"We built 13 to 14-foot berms near the road in the summer of 2013 but they were wiped out in a November 2013 storm. In November 2015, the ice was 18 inches thick. We didn't have any ice formed along the shore in 2013 when a bigger storm occurred. Storm surges caused the community to be packed with ice after a surge. There was minimal damage to the community but it had a tremendous impact on the fish camps."

**-Robert Keith, President
at the Native Village of Elim**



Photo of Elim by the State of Alaska Department of Commerce, Community, and Economic Development (DCCED) Division of Community & Regional Affairs (DCRA).

The **Native Village of Eyak** is 5.5 miles southeast of the City of Cordova, which is located at the southeastern end of Prince William Sound in the Gulf of Alaska. The Native Village of Eyak has a population of 133 (ADCCED 2015). Eyak territory is the traditional meeting place of the Eyak, Aleut, Tlingit, and Athabascan.

Glacial melting, flooding, and erosion along the banks of Eyak Lake and Eyak River impact homes, traditional and commercial fishing, airport, sewer lines, and the Eyak Water Plant. Winter storms cause erosion at Boswell Bay, where Tribal members live seasonally. Tribal offices sit at low-lying areas near the shore. The Tribe has purchased a parcel of land at a higher elevation in preparation for accelerating climate change impacts.



Hinchinbrook Island is a traditional gathering place about 20 minutes by air from Cordova. Nuuciq Spirit Camp occurs on Hinchinbrook Island every summer, where children and elders relive their heritage through language lessons, dances, beading, and the gathering and preparation of traditional foods. This photo, taken by John Whissel, provides evidence of erosion on the island.

John Whissel, Director of Environmental and Natural Resources at the Native Village of Eyak, describes why time-lapse cameras are needed to monitor erosion on Hinchinbrook Island:

“A road used to run parallel to the beach with a decent forest between the road and the beach, but the forest has been washed away, and the beach has moved well inland. This is a dramatic acceleration of the erosion we have been seeing here, and the first time a piece of infrastructure has been taken out in this spot. Instead of putting our camera up at the glacier as previously discussed, I believe that we will put the camera up in this area to watch the progress this winter. The trick will be to place the camera in a spot that won’t get washed out.”

Golovin is located on a point of land between Golovnin Bay and Lagoon near the Seward Peninsula. The City of Golovin has a population of 181 residents, 88 percent of whom identify as Alaska Native (ADCCED 2015). Golovin experiences coastal erosion as a result of thawing permafrost, flooding, and *ivu* events (ice pushing up on beaches or beach ridges).

A severe storm occurred in September 2005, where 7-9 feet high tides reached the school, tank farm, and many community buildings.

In response to the 2005 flood event, the City of Golovin Department of Public Works used local labor and resources to construct an elevated road to protect community infrastructure. Over the last three years, the community of Golovin has added gravel to the elevated road to ensure its safety.



Photo of Golovin by Bristol Engineering Services Corporation.



Fish cooperative impacted by floods (Toby Anungazuk).

“Carol Oliver, Golovin’s Indian General Assistance Program coordinator, successfully advocated for the Environmental Protection Agency (EPA) to assess how erosion could cause damage to the fish cooperative and result in toxicity issues for the community of Golovin. During community meetings with the EPA, elders’ knowledge was included in the planning and decision-making process.”

-Jack Fagerstrom, resident of Golovin

Kivalina is located at the tip of an 8-mile chain of barrier islands located between the Chukchi Sea and Kivalina River. The majority of the 412 people who reside in Kivalina identify as Inupiaq (ADCCED 2014). An increase in intensity of storms, permafrost thawing, and erosion of the shoreline has made relocation critical to the survival of the community. Emergency erosion control measures are in place, but are not sufficient to protect Kivalina's airport, landfill, drinking water source, and the majority of residences in Kivalina (City of Kivalina HMT 2015).

In 2011, the Native Village of Kivalina successfully won a lawsuit *Willie and Sophie Kasayulie et al., v. State of Alaska*, which alleged inequities in funding rural public schools. The legislature appropriated \$43 million dollars toward the construction of a new school in an area 7 miles away, called *Kismagiuqtuq*, but a road leading to the school is needed. Kivalina's leadership is committed to securing an access road to the new school, which would serve as an evacuation route during extreme weather events, providing better access to traditional foods (ADCCED DCRA 2016).

"It's getting worse and we don't have much time before this island is under water. Our community is still here and we'll continue to do our best to look out for our people."

-Millie Hawley, President of the Native Village of Kivalina



Photo of Kivalina by the State of Alaska Department of Commerce, Community, and Economic Development (DCCED) Division of Community & Regional Affairs (DCRA).



Aerial photo of Kotlik by Yukon River Inter-Tribal Watershed Council.

Kotlik is located on the east bank of the Kotlik Slough, about 5 miles inland from the southern coast of Norton Sound, where Kotlik and Little Kotlik Rivers come together. Of the 653 people who live in Kotlik, nearly all identify as Yup'ik (City of Kotlik HMT 2015). In 1989, almost 60 residents had to evacuate their homes because of flooding.

The City has cut brush and trees, gathered logs, filled sand bags with silt, and restacked concrete blocks in a continuing attempt to protect the Village of Kotlik (USACE 2008). Despite strong community measures to mitigate erosion, additional responses are needed to help slow erosion.



Photo of 1985 bank erosion project by Victor Tonuchuk.

“Pictured here on the left is what is left of the bank erosion project from 1985. Much of it has failed. Each year 1-2 feet of bank is washed away due to erosion. Climate shifts and permafrost thaw are causing erosion to happen quicker than usual. Kotlik needs bank erosion infrastructure put in place ASAP before more homes and public buildings get washed away or torn down.”

***-Victor Tonuchuk, IGAP Coordinator
at the Kotlik Traditional Council***

Kwigillingok is located on the western shore of Kuskokwim Bay. Kwigillingok has 361 residents, ninety-eight percent of whom identify as Yup'ik. The village experiences storm surge, erosion, ice jams, *venuq*, and winter and fall flooding. In Yup'ik, *venuq* means “ice override”, which occurs when high winds and tidal currents cause ice sheets to slide or override along the beach, and move inland up to several hundreds of feet (City of Kwigillingok HMT 2015).

In 2016, the Native Village of Kwigillingok received funding from the State of Alaska to buy equipment and materials to relocate homes. Kwigillingok will use local labor and skills of community members Lewis Amik III, Gavin Phillip, and Ephraim Andrew to relocate two homes.

Erosion along barge landing site on Kuskokwim Bay in 2011. Yellow plastic poles are placed along the bank to measure rates of erosion.

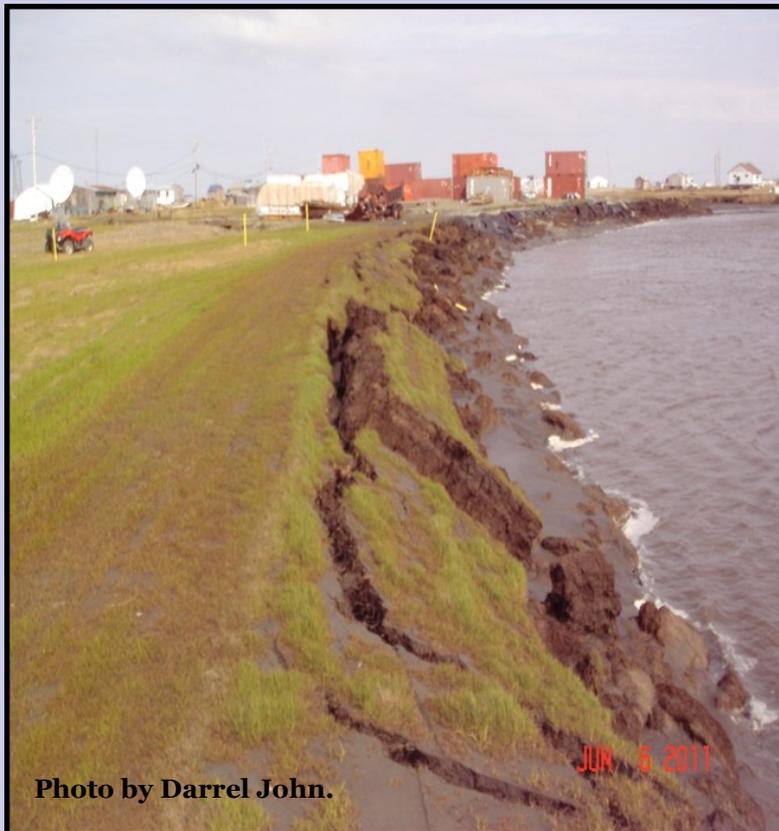


Photo by Darrel John.



Photo by Lewis Amik.

Relocation provides an opportunity to use local skills to improve living standards and to build infrastructure at relocation sites. Lewis Amik III (left) is a certified welder, who received his certificate from the Tulsa Welding School. Ephraim Andrew (center), Kwigillingok's recycling coordinator, has a Heavy Equipment operator certificate. Gavin Phillip (right), the Indian General Assistance Project coordinator, completed Job Corps with his heavy equipment operator certificate and has moved two homes in 2004 and 2005.

Nelson Lagoon is located on the northern coast of the Alaska Peninsula on a sand spit that divides the lagoon from the Bering Sea. Fifty-two people live in Nelson Lagoon, 78 percent of whom identify as Alaska Native. In the 1970s, ocean spray freezing during the winter would form “ice benches” as high as 15 feet tall on the north side of the island. In recent years, ice benches have reached two feet tall, providing little protection against spring storms.

From the 1980s to the present, the community has constructed several major erosion protection measures along the beach: a wooden seawall, gabion baskets, and geotube structures filled with sand and geotextile fabric (HDR Alaska Inc. 2011). In summer 2016, Nelson Lagoon community members used their own labor to fill geotubes with sand, to sew up the bags, and to place the bags along the coastline using local equipment.

Photo of Nelson Lagoon in 2016 by Angela Johnson



Moravian Church affected by permafrost thawing (Bernice Sallison).



Nunapitchuk is located on both banks of Johnson River. Among the 607 residents who live in Nunapitchuk, the majority identify as Yup'ik. Accelerated flooding, erosion, and permafrost thawing have impacted the cultural structures, community infrastructure, and nutritional needs of the village. In 2006, the Native Village of Nunapitchuk signed a climate resolution along with 162 Tribal entities demanding U.S. Congress and the President to adopt legislation to reduce carbon emissions because of these accelerated climate change impacts (NARF 2016). The village has made it a priority to collaborate with the Alaska Institute for Justice because erosion and permafrost monitoring is critical to making adaptation decisions for the future.

“The older people are saying that Nunapitchuk will be under water soon. That is why we have decided to relocate and ensure that there is a safe space for our future generations.”-**Bernice Sallison, personal caretaker at Risk Care**



Old BIA generator and building impacted by erosion (Bernice Sallison).

Port Heiden is located on the mouth of the Meshik River on the north side of the Alaska Peninsula. Port Heiden has a population of 114, 83 percent of whom identify as Aleut. Erosion along the Bristol Bay coastline led the community to use local labor and resources to relocate the school, clinic, several homes, and two cemeteries further inland (USACE 2008). In this photo, erosion has reduced part of the village into a small strip bordering the coast of Goldfish Lake, which is expected to breach the lake near the old townsite as erosion continues.



Goldfish Lake by Jaclyn Christensen.

“The community eventually came together and volunteered to clean up the old homes before they fell into the ocean like other homes. The local general contractors Christensen and Sons & Aniakchak Contractors LLC, the City, and Village Council acted and came together to resolve the problem. Funding sources are needed to pay people for their response efforts.”

**-Jaclyn Christensen, Brownfield Coordinator
at the Native Village of Port Heiden**

The Environmental Protection Agency (EPA) Brownfield’s Program provides grants and technical assistance to communities, states, and Tribes to assess, safely clean up, and sustainably reuse contaminated properties.



Photo of Matson home in 2013 by Jaclyn Christensen.

04.11.2013 16:48

Shishmaref is located on Sarichef Island in the Chukchi Sea. Almost all 600 residents of Shishmaref identify as Inupiaq. In response to accelerating impacts of erosion and flooding, the community has successfully advocated for a gabion wall, sandbag revetments, and rip rap seawalls along its coastline (City of Shishmaref and LeMay Engineering & Consulting, Inc. 2015).

On January 18, 2017, Shishmaref re-established its Erosion & Site Expansion Coalition, which includes governing members of the City of Shishmaref, Native Village of Shishmaref (IRA), and the Shishmaref Native Corporation. In addition to electing a chair, co-chairperson, secretary, and treasurer, the relocation coalition also represents the voices of elders and youth. The purpose of the Erosion & Site Expansion Coalition is to protect the community of Shishmaref to the best of its ability while the community studies and determines the course of its future.

As the community works to identify the location of a new village site and road on the mainland, it is critical that protection in place measures are implemented immediately to keep the community safe. Extension of its seawall is needed to protect the community's sewage lagoon, road to the landfill, drinking water sources, subsistence meat racks and old graves.



Aerial Photo of Shishmaref (Dennis Davis).

“The people of Shishmaref are committed to keeping our community intact and we are committed to our heritage, which includes the subsistence way of life passed on to us by our ancestors.”

**-Luci Eningowuk, former Chairperson
at the Shishmaref Relocation Coalition**



Photo of erosion at Quinhagak's old airstrip (Stephan Jones).

*“Alaska Natives have gone through generations of great changes. In order to survive, we have had to adapt to these changes. We have faced challenges: epidemics, cold winter months without electricity or stoves, and now climate change. **We are still here. Even with the high cost of living in rural areas, we love where we live.** That is why we will strive to live in the areas where our ancestors came from.”*

-Quinhagak Resident

Quinhagak is located on the south bank of the Kanektok River, on the east shore of the Kuskokwim Bay, less than a mile from the Bering Sea coast. Quinhagak's Yup'ik name is *Kuinerraq*, which means “new river channel”. The community of Quinhagak has over 700 residents who primarily identify as Yup'ik. Storms and melting permafrost cause erosion of the embankment along a three-mile stretch of the Kanektok River (City of Quinhagak HMT 2012).

If any further erosion of the coastline occurs near the sewage lagoon and landfill, this important infrastructure could soon be under water. If solid waste contaminates the water near the landfill, it could cause serious health consequences for Quinhagak community members. Quinhagak worked together to protect its water pump station from erosion by constructing a rock boulder wall.

Teller is located on a sand spit between Port Clarence and Grantley Harbor. Teller has a population of about 250, most of whom identify as Alaska Native.

Storm surges and wind-blown saltwater have damaged the sea wall, the cemetery, the road to the sewage lagoon and the sewage lagoon. Storm surges also cause the sewage lagoon to overflow into Teller's potable water source and solid landfill.

The community of Teller welded sheet pile walls and barrels together and filled them with gravel as a means of temporary protection (City of Teller HMPT 2013). While community efforts have slowed ongoing erosion, a seawall is critical to protect the community.

In 2013, a storm damaged Teller's sea wall and eroded the shore right to the edge of the graveyard. Without prevention measures, the graveyard will fall into the beach in a few years.

“Reindeer herding provides the residents with income, food, and materials for clothing and handicrafts. Teller area provides important habitat for many species of fish, wildlife, and plants that can be affected by global environmental change. The many natural hazards in our area could adversely affect human health and safety. Important historic and prehistoric cultural sites that may be located in our area should be protected.”

**-Willie A. Topsekok,
former President at Teller Native Corporation**

waves

Teller, AK



Photo 1: Waves hitting Teller seawall; photo courtesy of David E. Atkinson, UAF, International Arctic Research Center, 2007.

Unalakleet is located on Norton Sound at the mouth of Unalakleet River (City of Unalakleet HMPT 2015). Of Unalakleet's 745 residents, 88 percent identify as Alaska Native (DCCED 2014). In 2009, Unalakleet elevated beach road as high as 3 feet in some areas, which prevented flood and debris inundation of residential areas during floods in 2011 and 2013. Unalakleet is committed to strengthening its erosion mitigation projects until the community can migrate to the hillside northwest of the village.

Thirty homes are constructed on four different hills, which can serve as evacuation shelters for residents seeking a safe place to ride out the storms. All 4 sub-divisions have surveyed lots large enough for residences to put septic systems and wells in and comply with the Environmental Protection Agency (EPA). The village corporation is also looking at smaller lots on a 5th hill for shareholders wanting to construct smaller flood shelters without the need for water and septic systems.

The Tribe has been and continues to seek funds to construct an elder's care facility. This facility may also take residents in for safety in the event of an intense storm.



Four subdivisions and homes along the hillside in Unalakleet (Steve Ivanoff).

“Not every village is fortunate to have access to safe, higher ground close to their residences as in Unalakleet and Golovin. We are making the migration into the hillside gradually with our own resources but we do need assistance with access roads.”

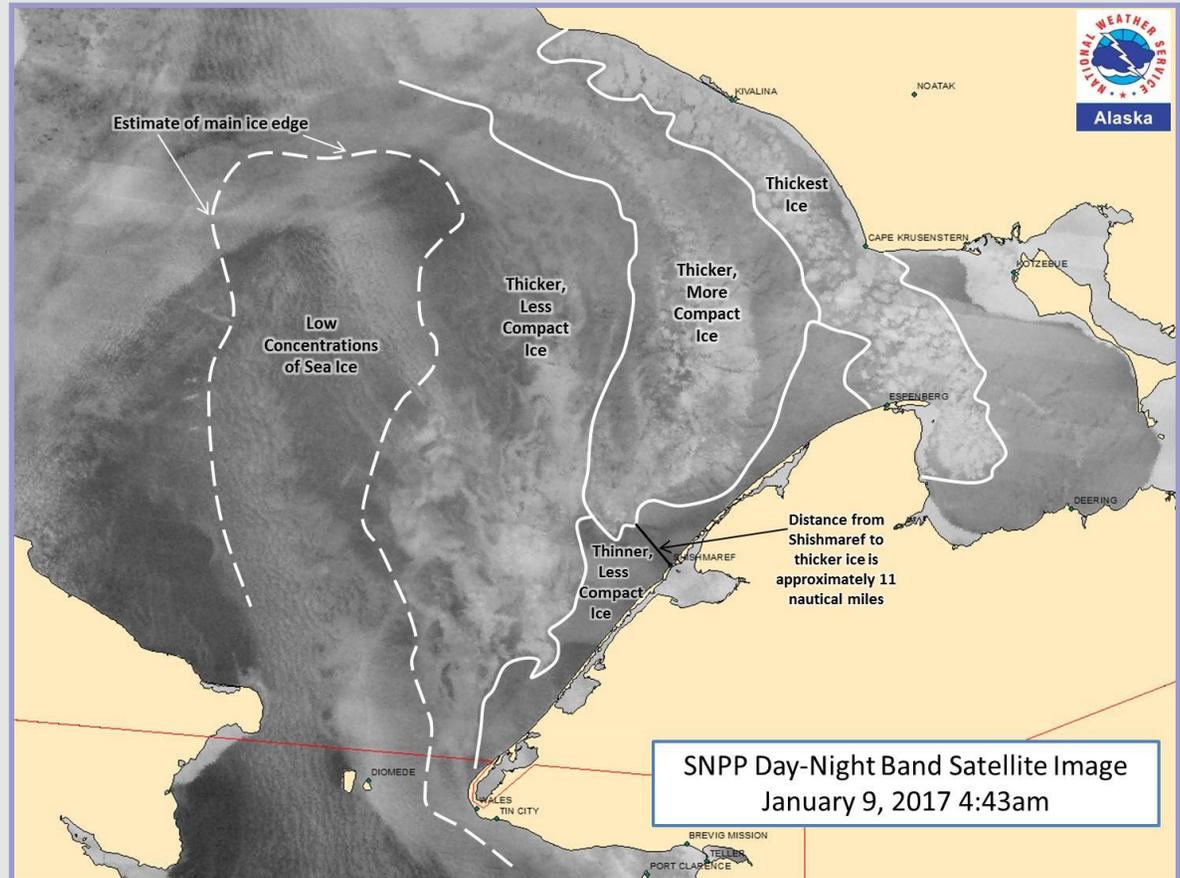
**-Steve Ivanoff,
Transportation Planner at Kawerak Inc.**

Integrating Traditional Knowledge & Western Science

During the 2016 *Rights, Resilience, and Community-Based Adaptation* workshop, Shishmaref's relocation coordinator Annie Weyiouanna made a lasting connection with the National Weather Service (NWS) Alaska Sea Ice Program (ASIP). Shishmaref's collaboration with NWS has helped Shishmaref residents make informed decisions about when to travel and hunt near or on the ice.

Annie takes pictures, provides observations of local sea ice conditions, and shares them with NWS. Local observations are especially important when clouds cover areas of ice in satellite images. Annie will ask NWS specific questions, such as "What do you think will happen to our ice when a storm comes through?"

NWS utilizes sea ice analyses, weather models and forecasts and satellite imagery to identify where the ice is thicker and the direction and strength of winds. NWS shares this information with Annie and she then shares the NWS satellite images and weather reports during tribal council meetings and on social media.



Satellite image generated by the National Weather Service Alaska Sea Ice Program.



Photo of the Chukchi Sea from Shishmaref (Annie Weyiouanna).

Enhancing Tribal, State, and Federal Collaboration

AIJ ensures ongoing communication amongst Tribal, State, and Federal entities through biweekly teleconferences, documentation of flooding and erosion events, adaptation workshops, and travel to Alaska Native communities.

- Since spring 2016, AIJ has facilitated bi-monthly teleconferences for the 15 Alaska Native communities to share climate change impacts and adaptation strategies. Agency representatives are invited to outline funding strategies or scientific background helpful for adaptation responses. These conversations also help to refine the design of a social-ecological monitoring tool and to ensure that AIJ is meeting needs of community residents.
- During winter 2016, AIJ worked with Golovin, Kotlik, and Kwigillingok to draft narratives describing the impact of flooding events. These narratives accompanied by photographs of the flood damage were shared with state and federal agencies. AIJ will continue communication between Alaska Native communities and government agencies to determine how to best document storm or flooding events so that communities receive appropriate responses.
- In summer 2017, AIJ will travel to Chevak, Golovin, Kotlik, Kwigillingok, and Shishmaref with Jacquelyn Overbeck, Division of Geological and Geophysical Survey (DGGS) Coastal Hazards Program Manager. The purpose of the trip will be to facilitate a community meeting to describe the monitoring project and install erosion and flooding monitoring devices. By using time-lapse cameras and stakes, residents will review data to document the rate of shoreline erosion during single events.
- In fall 2017, AIJ will bring together the 15 Alaska Native communities and agency representatives to Anchorage, AK for a second adaptation workshop. Alaska Native communities will discuss how community-based monitoring has built capacity to respond to flooding and erosion. Communities will also share how coordination with Federal and State government representatives assisted with their efforts and whether any changes need to be made.



Fall flooding in Kwigillingok by Gavin Phillip.



Fall flooding in Kotlik by Victor Tonuchuk.

PLANNING FOR THE FUTURE

PRIORITIES FOR COMMUNITY-LED RELOCATION AND TOOLS FOR CLIMATE MONITORING

The combination of extreme weather events and slow-ongoing environmental change, such as erosion, will force communities to relocate. Building the capacity of communities to monitor and assess both is critical in order to understand the rapidity that change is occurring and to determine when communities need to plan for relocation. The predictive capacity for storms or erosion trends is enhanced when Tribes or local communities can ground truth or confirm regional environmental data generated by State or Federal agencies.

Slow-Ongoing Events

NWS Alaska Sea Ice Program:
NWS is partnering with Shishmaref to better understand future ice conditions by monitoring ice thickness and ice concentration. Sharing this knowledge has enabled Shishmaref hunters and travelers to make informed decisions about when and where to travel on the ice.

DGGS Community-based Shoreline Monitoring:
Communities will install time-lapse cameras and stakes to measure the change in shoreline position. DGGS will use an online coastal geo-hazard mapping tool to help communities recognize erosion trends through time.

Extreme Weather Events

National Weather Service:
NWS is partnering with Chevak, Kotlik, and Kwigillingok to customize low bandwidth webpages with information on wind direction, ice conditions, and storm events for each community. Bridging regional and local observations between NWS and communities will help refine forecasting and enhance community preparedness.

DGGS COLOR-INDEXED ELEVATION MAPS:
DGGS will create color-indexed maps for Chevak, Kotlik, and Kwigillingok. Residents use NWS flood forecasts with the maps to determine and assess what infrastructure might be impacted. Local residents share before and after photos or data about floodwater levels to help NWS modelers improve future forecasts.

QYANAQPAK—QYANA CAKNEQ—THANK YOU!

THANK YOU to the Federal, State, scientific, academic, and non-profit institutions who attended the 2016 adaptation workshop and who are committed to collaborating with our communities to ensure resilience and strong climate adaptation for all Alaskans.



Alaska Native Science Commission
bringing together research and science
in partnership with the Native community



ALASKA NATIVE
TRIBAL HEALTH
CONSORTIUM



UAF
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ALASKA
FAIRBANKS

AOOS
Alaska Ocean Observing System

ONE PEOPLE-ONE RIVER

Yukon River Inter-Tribal Watershed Council

USGS
science for a changing world

Although the logos are not pictured above, we also would like to thank the State of Alaska Division of Community and Regional Affairs (DCRA) and the University of Victoria for their participation. AIJ is deeply appreciative to the expertise and hard work from all community members, which made this workshop so successful. We are also grateful to the Tribal Councils, Village Corporations, Bureau of Indian Affairs (BIA) and National Oceanic Atmospheric Agency (NOAA) for supporting travel funding and workshop costs for all community participants.

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