2023 IN REVIEW

This was a year of growth and reflection for the AK CASC — strengthening capacity to serve agencies, Alaska Tribes, and communities while planning the next steps of this partnership to serve all Alaskans and adapt to the impacts of climate change.

The AK CASC's capacity to serve Alaska Native communities expanded greatly this year. The Tribal Resilience Learning Network (TRLN) is in its third year, hosting ten information sessions with 180 participants on topics from adapting to permafrost thaw to finding grant opportunities for Tribes. Our BIA-funded partnership with the Native American Fish and Wildlife Society (NAFWS) expanded as well, with three new Tribal Resilience Liaisons joining the team. Liaisons are now based in Juneau, Anchorage, Fairbanks, and on the Yukon-Kuskokwim Delta.

With an eye to the future, the AK CASC reaffirmed a number of existing relationships and formed new ones to build the framework for future research. Researchers and staff attended conferences like the Alaska Forum on the Environment and the American Geophysical Union Fall Meeting, but also contributed to the 40th Annual National Conference for the Native American Fish and Wildlife Society, as well as several Northern Latitude Partnership meetings and trans-Pacific research and collaboration meetings with our partners at the Pacific Islands CASC.

The AK CASC Fellows Program continues to grow as a co-learning community for early career researchers to develop the skills necessary for a strong career. Training topics included strategic planning and skills development, data visualization, and mental health. Several AK CASC fellows also had the opportunity to network and learn from their peers across the nation at an Early Career Researcher workshop hosted by the Southwest CASC in Albuquerque, New Mexico.

Read on to learn more about the AK CASC's 2023 activities.

As the sun sets, a boat arrives to pick up drone pilots Katie Daniels and Mike DeLue from their post-Merbok work in Napakiak. (photo: Mike DeLue)

NORTHERN NOTES

AK CASC HELLOES

Kaitlyn Demoski joined the AK CASC as an Assistant Tribal Climate Resilience Liaison. She is based in the Anchorage area.

Tess Hostetter joined the AK CASC as an Assistant Tribal Climate Resilience Liaison. She is based in Southeast Alaska.

Jerilyn Kelly joined the AK CASC as an Assistant Tribal Climate Resilience Liaison. She is based in Southwest Alaska.

Brianna Rick joined the AK CASC as an ORISE post-doctoral fellow under CASC scientist Jeremy Littel. Brianna's work is in glaciology and biology.

Megan Behnke joined the AK CASC as a post-doctoral fellow as part of the national cohort of Future of Aquatic Flows researchers.

AK CASC GOODBYES

We'd like to thank all of the following folks for their time at the AK CASC, and wish them luck in their next endeavors.

Bob Bolton has taken a position with the Oak Ridge National Laboratory in Tennessee but remains a partner in research.

Molly Tankersley has moved on to a communications position with the University of Washington.

Justin Leon has taken a position with the Kuskokwim River Inter-Tribal Fish Commission.

Climate Science Training for Alaska Tribes

Tribal communities need access to the same high-quality climate science for local planning as the state's larger municipalities. With three new BIA-funded Tribal Climate Resilience Liaisons joining the Alaska Tribal Resilience Learning Network (AK TRLN) this year, the AK CASC is well-suited to respond to this need by providing data, data consultation, and training. Learning from innovative climate adaptation projects for Tribes over the past four years, the AK CASC hosted a Tribal Climate Adaptation 101 training this year attended by 13 Tribes and communities as well as faculty from UAF's Bristol Bay campus.

With both old friends and new in attendance, Tribal Climate Adaptation 101 provided an opportunity for individuals to directly engage with AK CASC scientists, and learn from other Tribes about new adaptation strategies and approaches for community education and communication. Participants benefited from the introduction of new science tools and resources during the training, all of which will aid in finding funding to implement community plans.

While some communities were already aware of the AK TRLN or the AK CASC, new partnerships were also born during the training. From that training the communities of Hooper Bay, Paimiut, Unalakleet and Kokhanok returned later in the year as part of another project, the Strengthening Resilience Today program, which launched in 2023.

Additionally, Hooper Bay and Paimiut are part of a separate BIA-funded cohort of communities currently considering relocation, managed retreat, or protect-in-place (RMP) strategies for their communities. This RMP cohort of Tribes in Alaska and the Pacific Northwest met in Anchorage this year. The program is convened by the Institute for Tribal Environmental Professionals and assisted by AK TRLN staff. It continues to meet monthly over Zoom.

Both the RMP Cohort and the communities involved in the AK TRLN Strengthening Resilience Today program will continue to meet over the coming year to learn and develop climate adaptation strategies for their communities. This autumn the RMP Cohort will reconvene to discuss the results of a summer of planning and will seek funding for implementation. Meanwhile, the next steps for the Strengthening Resilience Today cohort will include visits to each community in the winter of 2023/24 by Tribal Resilience Liaisons and researchers. These teams will work on the next steps of community adaptation planning. The final SRT meeting will be held in Fairbanks next year where participants will finalize individual community documents used for their planning processes and needs.

▲ Sustaining Resilience Today participants gathered at the first training in Fairbanks. (photo: Mike DeLue)

Modeling Change in Alaska's National Parks

▲ The landslide at Pretty Rocks in Denali National Park has caused regular road cancellations and hindered access to the park. (photo: National Park Service)

The Pretty Rocks landslide, spurred by warmer temperatures and increased rainfall, will force Denali National Park's main access road to close at the halfway point in 2023 for the second full summer, limiting visitor access past milepoint 43 into the Park. To help park managers plan for and mitigate such events, AK CASC scientists assessed future landslide risks along road corridors in Denali and other National Parks in Alaska.

"Park managers were interested in looking at park climate data to figure out how much warming has occurred and what the future might bring," explained Pam Sousanes, a physical scientist with the agency in Fairbanks. Pam and the National Park Service reached out to Rick Lader and the AK CASC for better information on what warmer temperatures mean for road corridors in Denali, Wrangell St. Elias, and Gates of the Arctic. "In Denali we had data from sites that were relatively close to the landslide area and we were able to determine that the average annual temperatures were approaching, and in some cases, exceeding the thawing threshold of zero degrees Celsius [32 Fahrenheit]," said Sousanes. "We wanted some way to incorporate those into really good downscaled climate projections, and we didn't have the skills to do that. So we reached out."

The Pretty Rocks landslide, which the Denali road has traversed since its completion in the 1930s, has increased in speed recently as warmer temperatures and heavy rain thawed frozen soil. Construction of a bridge at the crossing site, costing up to $102 million, has already begun. Read more about the results of this collaborative work in the Journal "Atmosphere".

Drones for Science in Action: Responding to Merbok

In late September of 2022, Typhoon Merbok made landfall in western Alaska bringing with it near record storm surge and driving winds. Rapid coastal erosion and inundation wreaked havoc up and down the coast. With clouds hanging over communities and recovery in progress a rapid mobilization of community drone pilots in Unalakleet, Bethel, and the AK CASC in Fairbanks began.

First in the air was John Henry in Unalakleet, a community of around 700 residents that held up well in the storm, but had their water supply severely damaged and knocked off line for several days. John flew transects of retaining walls and "rip-rap" (large stone and concrete blocks which protect from erosion) and passed the data along to local decision-makers and the State Emergency Operations Center to help them assess the impacts of the storm. A second pilot from Unalakleet, Katie Daniels prepared for further flights in the Yukon-Kuskokwim Delta and in the Norton Sound region. Soon pilots from both the coast and interior were on their way to communities along the west coast to perform flights.

Over the past several years with the support of the US Department of Homeland Security John Henry, Deputy Director of the Native Village of Unalakleet, and Jessica Garron, Deputy Director of the Alaska CASC, have been developing a community drone team as a capacity building tool for rural Alaska. The idea was to build up the team and equipment for data collection, maintenance, and basic data processing in Unalakleet to increase regional capacity for infrastructure inspections, community mapping, scientific data collection, and emergency response support.

With pilots trained, and USA-made drones on-site in Unalakleet, a system for coordinating and managing the team was put in place. The Unalakleet team was hired with Garron to conduct Geographic Response Strategy confirmation flights with the Coast Guard and NOAA to demonstrate the core functionality and value of this team in the region just weeks before the storm hit. The exercise made it clear: a trained and confident team already on the ground in western Alaska would be an asset to the region.

▲ Emmonak, Alaska experienced significant riverine erosion during the storm, including in the area adjacent to the local women's shelter. Unfortunately low cloud cover cut flights short. (photo: Mike DeLue)

"When the storm did hit though, it was a classic problem for those of us in Fairbanks. We were prepared to do the flights that were requested, and to operate in the areas the flights needed to be done, but the real problem was getting there! The community pilots were already in place and ready to fly but expanding the number of pilots would be invaluable." explained Jessica.

Initially pilots joined a US Coast Guard rapid response inspection team. Later the team flew commercially out of Bethel once scheduled flights resumed. The team was able to fly drone surveys in Hooper Bay, Emmonak, Shaktoolik, Golovin, Kotlik, Koyuk, Newtok, Mertarvik, Scammon Bay, Nightmute, Chevak and Napakiak, providing the only geospatial data of the region to the emergency operations center at the time. From the communities visited, only one drone flight in Brevig Mission was grounded due to high winds. The imagery provided by the team improved situational awareness for local, Federal and State response agencies, but also proved a novel team structure and technology for future response efforts in remote communities.

▲ A US Coast Guard aircraft flys over Golovin, Alaska, one of the communities hit hardest by Typhoon Merbok. AK CASC's, Garron and DeLue mapped the village and its water source while clean up and recovery efforts were underway. (photo: Mike DeLue)

NORTHERN NOTES

AK CASC GOODBYES (cont.)

Hannah Juliussen has taken a position as a Fish & Wildlife Biologist with the Native American Fish and Wildlife Society.

Claire Delbecq has defended her thesis on streamflow variability and taken a position with the ADF&G.

Kevin Fitzgerald defended his thesis on environmental impacts to juvenile salmon growth this spring.

PACIFIC ISLANDS-ALASKA CASC COLLABORATION MEETINGS

The PI-AK Collaboration held meetings in Juneau and Honolulu this year to develop research goals for the collaboration. AK CASC representatives also participated in the 2023 Hawai'i Climate Week, attended the 2023 Hawaii Conservation Conference, and participated in the Kulana Noi'i training for respect and integrity in co-production research.

REGIONAL PARTNERSHIPS

AK CASC personnel attended meetings of the Northern Latitude Partnership and Sustainable Southeast Partnership in Sitka, Anchorage, and Whitehorse. Staff also provided drone training to a Northern Latitude Partnership cohort of Tribal Conservation District leaders.

Inspiring Girls* Expeditions

Three IG*E expeditions across Alaska on ice, ocean, and river hosted 27 participants and 14 instructors and onsite coordinators in summer of 2022. 8 participants were Alaska residents.

Science to Application - New Tool Highlights Local Change

Where can you find the most up-to-date information on climate variables, linked to one another, predicting future climate scenarios, and presented in an easy-to-use way? The Northern Climate Reports (NCR) web tool is built to answer questions about ecosystem change where people live and work.

Opening with plain language summaries of available information, the tool expounds upon the projections for a specific place in Alaska (and Northwest Canada) with charts and graphs of projected permafrost, temperature, precipitation, vegetation and wildfire shifts. All of the charts can be exported as an image and the text is crafted to balance scientific accuracy with readability.

In the **Tolovana River**, average annual temperatures may increase by about **13°F** by the end of the century.

Winter temperatures are increasing the most (**+18°F**).

Spring and **fall** may transition from below freezing to **above freezing** in the future.

▲ NCR Results for the Tolovana River HUC.

The tool utilizes a novel geographic search to summarize ecosystem shifts across national parks, game management units, ethnolinguistic regions, and hydrologic units with just a few clicks, and without the need for desktop geospatial processing.

A visualization output of the AK CASC's Integrated Ecosystem Modeling project, the tool and the research it builds on aims to develop a high-quality model of ecosystem change across multiple variables. The web tool is already serving as a location to deliver new data alongside the IEM project's results. Coming soon: forest susceptibility to spruce beetle infestation!

Featured publications

Behnke M, Tank S, McClellan J, Holmes R, Haghipour N, Eglinton T, Raymond P, Suslova A, Zhulidov A, Gurtovaya T, Zimov N, Zimov S, Mutter E, Amos E, Spencer R. 2023. Aquatic biomass is a major source to particulate organic matter export in large Arctic rivers. Proceedings of the National Academy of Sciences. Volume 120, No. 12: https://doi.org/10.1073/pnas.2209883120

Clement S, Spellman K, Oxtoby L, Kealy K, Bodony K, Sparrow E, Arp C. 2023. Redistributing Power in Community and Citizen Science: Effects on Youth Science Self-Efficacy and Interest. Sustainability. 15-11: DOI: https://doi.org/10.3390/su15118876

Bellmore JR, Sergeant CR, Bellmore RA, Falke JA, Fellman JB. 2023. Modeling coho salmon population response to streamflow and water temperature extremes. Canadian Journal of Fisheries and Aquatic Species. 80-2: 243-260. DOI: https://doi.org/10.1139/cjfas-2022-0129

Ballinger TJ, Bhatt US, Bieniek PA, Brettschneider B, Lader RT, Littell JS, Thoman RL, Waigl CF, Walsh JE, Webster MA. 2023. Alaska Terrestrial and Marine Climate Trends, 1957-2021. Journal of Climate. 36-13: 4375-4391. DOI: https://doi.org/10.1175/JCLI-D-22-0434.1

▲ Find more publications at akcasc.org.

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▲ A few of the many dynamic ice-marginal lakes on Kaskawulsh Glacier in Kluane National Park, Yukon where some of Brianna Rick's work is being applied. (photo: Brianna Rick)

Meet Fellow Brianna Rick

▲ AK CASC ORISE Fellow Brianna Rick.

Originally from Minnesota, outdoor trips hiking and camping sparked a curiosity in Bri Rick, a current Oak Ridge Institute for Science and Education (ORISE) Post-doctoral fellow with the AK CASC. "At first geology was just an excuse to go outside." This excuse to go outside quickly led to deeper questions about human-environment interactions during a study-abroad in Norway. Undergraduate research on Baranof Island in Southeast Alaska and Masters research at UAF's Toolik Field Station solidified a tie to Alaska's stunning landscape but the crux of her research came on the other side of the world.

"I was studying rock glaciers and permafrost on a Fulbright in Switzerland and became deeply interested in the 'why' of my research. There, people live right beneath the rock glaciers, so their movement is pretty important to everybody in town." says Rick about her work on what have been coined 'cryo-geohazards'. This focus has led to Alaska-wide work using satellite remote sensing satellites to study Alaska's glaciers and glacial lakes.

One focus has been on the Skilak Glacier dammed lake systems. These lakes are dammed by ice and when that ice fails it can release the lake's contents in large events with significant impacts for downstream ecosystems and communities. Brianna's work also builds on previous AK CASC-funded work done by Eran Hood on the Suicide Basin glacier lake outburst floods which have become an annual event in Juneau. Even in less populated regions shifts in glacier dynamics and the impact on stream regime is critical for fish habitat as well, another focus of her work.

Bri's experience leading wilderness trips for field work also led her to working as an instructor for the 2023 Girls* on Ice expedition. "The timing just worked out! It was great working with participants. The program really is the perfect combination of outdoors, STEM, and art!"

USGS science for a changing world · International Arctic Research Center · University of Alaska Anchorage · University of Alaska Fairbanks · University of Alaska Southeast