

Annual Report 2019



Alaska Climate Adaptation Science Center

Directors' Message

2019 YEAR IN REVIEW

Climate extremes. Alaska experienced another exceptional year of climate extremes and impacts. Spring 2019 was particularly warm, with most long-term climate sites reporting record or near-record warmth in March-May. Impacts of that warming were manifest in many ways, including the earliest ice out on the Tanana River in 103 years. March sea ice extent in the Bering Sea was at an all-time low, surpassing the record low observed just last year. In the southern Panhandle, record drought conditions continued for a second straight year. The 2019 fire season has been active and to date has burned over 2.5 million acres throughout the state.

Actionable science. In Year 2 of the AK CASC's current 5-year cooperative agreement, we continued to work with our federal and state partners on our pilot projects that aim to produce actionable science to address natural resource management challenges in Alaska. Visit our website at casc.alaska.edu/projects to learn more about all our projects.

Translating our science. Much of our Year 2 activities focused on communicating our science to diverse audiences. In this issue you will learn about how the AK CASC is working with our Tribal Liaison, Malinda Chase, to help coastal communities plan for climate change.

Building science capacity. We have continued to invest in developing our science capacity; AK CASC Senior Scientist Gabriel Wolken has been collaborating with the Swiss Institute for Snow and Avalanche Research to model avalanche hazards in the state. In Year 2 we also added another postdoctoral fellow and a masters student to our Fellows program. Read more to learn about AK CASC Fellow Rick Lader and his research in Southeast Alaska.

Please visit us online or contact us directly about our research, communication, and outreach efforts.

PUBLICATIONS

AK CASC researchers published 31 peer-reviewed publications/reports during Year 2. See last page for some featured publications.

AK CASC WELCOMES NEW FACES

Ross Spicer has joined the AK CASC as a fellow on the *Landscape evolution in Arctic and Western Alaska* pilot project.

Amy Macpherson joined the AK CASC as the new Data Steward.

John Walston joined the AK CASC as a fellow based at the University of Nevada, Reno.

CLIMATE DATA NOW AVAILABLE ON AMAZON

A new climate dataset representing historic and future conditions in Alaska, the Yukon and Northwest Territories is now available on Amazon's Public Dataset Program.

AK CASC SPONSORED MEDIA TRAINING

The AK CASC co-hosted a media training workshop with the International Arctic Research Center for scientists and fellows in June 2019 that was attended by thirteen participants.

CITIZEN SCIENCE SNOW PROJECT FEATURED IN NATURE

The Community Snow Observations citizen science project co-lead by AK CASC scientist Gabriel Wolken was featured in a Nature Climate Change Snapshot.

Coastal communities plan for climate change at AK CASC workshop

From the sweeping glass windows of the International Arctic Research Center at UAF, a dusting of mid-April snow brightens the room. Inside, fourteen representatives from five tribes have traveled to Fairbanks for a three-day knowledge-sharing workshop on a topic they are reckoning with daily: climate change.

The Looking Forward, Looking Back: Building Resilience Today workshop series, hosted by the AK CASC and Aleutian Pribilof Islands Association, aims to provide Alaska tribal communities who are at the forefront of climate change with the tools to plan and adapt to uncertain futures.

Jerilyn Kelly, the mayor of Quinhagak, was looking for a way to get a head start on climate adaptation planning for her community. The request for representative leadership teams made up of city, tribal, and corporation members piqued her interest. "There are not many opportunities for municipalities and especially corporations to get information on climate change," Kelly said.

"With the people (who we represent) as our focal point, we can put our differences aside and collaborate toward a better future," said Kelly.

Already, these communities are managing the loss of traditional hunting and gathering grounds, damage to infrastructure, and dangerous spring conditions that impede travel. As erosion eats away at their shores and smoke from wildfires impacts community health, they are coming together to share solutions and learn about tools available to them. Participants will return to their communities equipped with the knowledge shared during these workshops, both from climate experts and their fellow communities around the state.

Scientists studying climate projections, scenarios, policy, and responses spoke to the group and had the opportunity to hear from the people witnessing the changes they study. "Today's extremes will not be



▲ Participants in the Building Resilience Today workshop shared their experiences with change during an exercise.



▲ AK CASC Tribal Liaison Malinda Chase guides participants through a visualization activity.

tomorrow's extremes," says Rick Thoman, a climate specialist with the Alaska Center for Climate Assessment and Policy. As he shared trends and projections in temperature, permafrost, and more across the state, Thoman painted a picture of a future when events considered atypical today, such as the astounding decrease in sea ice in the Bering Sea, may be the norm. And the conditions people have relied on as normal, like winter travel across frozen landscapes, may be rare in the future. If the monumental shift in conditions is mind-boggling from a hypothetical standpoint, it's nearly unimaginable from the perspective of communities who are watching it happen before their eyes.

"We know that communities are responding to the immediate impacts of climate change already, with some addressing erosion or frequent flooding, and relocation efforts. But many communities are starting to experience multiple impacts at once. In this project we are working with community teams on a specific area of adaptation – to look at changes to local lands, waters, and fish and wildlife and consider current and future climate projections along with traditional knowledge that can guide adaptation strategies," says Malinda Chase. As Tribal Liaison to the AK CASC through a partnership with Aleutian Pribilof Islands Association, Chase serves as the link between Alaska's tribes and the climate research community.

"We hope that by combining Traditional Knowledge with the latest western science into a useable format, these communities will be able to draw on the experiences of these workshops with meaningful results for their communities," said AK CASC scientist Ryan Toohey. Following the initial meeting in Fairbanks, the organizers have collaborated with participants to plan workshops tailored to each community's needs. These events, beginning in August 2019, will aim to address gaps in the adaptation planning process and document traditional knowledge.

Eye in the sky: Environmental monitoring with drones

AK CASC's Christian Kienholz taught a class at the University of Alaska Southeast titled "Using Drones for Environmental Monitoring." Together with Eran Hood and Gabriel Wolken, he trained students to use drones for aerial mapping and answer relevant environmental science questions from the maps students created. During the week-long class, participants planned and conducted several drone campaigns, choosing camera and drone settings appropriate for the task at hand.



▲ Kienholz lands a drone during a demonstration at Mendenhall River in Juneau.

What does drought look like in Southeast Alaska?

The term drought brings to mind cracked earth, forest fires, and dry river beds. But in Southeast Alaska, drought often spells a different set of problems.

In 2017/2018, southern Southeast Alaska experienced the most significant drought during the wet season in over forty years for this area. Communities across the Panhandle experienced impacts to drinking water supplies, electricity generation, and fish hatchery health. Petersburg, Wrangell, and Ketchikan relied on diesel-generated power when hydropower reservoirs were low. The drought prompted the USDA Northwest Climate Hub along with assistance from the AK CASC to host the Southeast Alaska Drought Workshop in Juneau, Alaska in May 2019. The aim of the workshop was to help gather information about drought impacts in Southeast Alaska, and improve the understanding of what constitutes drought in a rainforest.

Representatives from Alaska Electric Light & Power, the National Weather Service, USDA Forest Service, as well as local ecologists, forest health, soil, and salmon experts presented on the ecological, societal, economic, and cultural impacts of the recent drought. From altered avalanche patterns to widespread yellow-cedar decline and forest pests, the effects of the 2017/2018 drought are still coming to light.

They learned a technique known as Structure-From-Motion Photogrammetry, which they applied to model surface topography from photos captured during drone flights. Students were also taught how to use high accuracy GPS equipment to survey ground control points, which are needed to improve the accuracy of drone-derived surface models.

The main class project focused on fluvial erosion above Mendenhall River's Brotherhood Bridge. Erosion has evolved rapidly in that area, especially since 2018, when the Mendenhall River cut off a meander bend during a glacier lake outburst flood. By comparing the data they collected via drone to data from past years, the students determined recent river erosion rates and assessed potential future erosion.

"It was rewarding to teach students a range of new skills and to let them apply these skills to real-world problems in the University's backyard. I think the course gave students a taste of the work conducted in an environmental consulting firm," said instructor Kienholz. He hopes the 2019 campaign marked the beginning of a data time series that will be continued in future classes.



▲ Jeremy Littell participated in and presented at the Southeast Alaska Drought Workshop.

The recent drought is not the first dry period for Southeast Alaska, nor will it be the last. Though drought is a normal part of every climate, trends of rising temperatures and changing precipitation patterns could lead to more variation and extreme events.

"The future is a bumpy ride," said AK CASC senior scientist Jeremy Littell. "What to prepare for is not the smooth curve of climate trends, it's a combination of the expected trends and climate variability."

NORTHERN NOTES

AK CASC AT AGU

AK CASC scientists, fellows and staff presented and led sessions at the 2018 American Geophysical Union Fall Meeting. Topics presented spanned a wide range of areas, including permafrost dynamics and diversity and inclusivity in the geosciences.

INDIGENOUS OBSERVATION NETWORK

AWARDED JAMES R. BALSEY AWARD FOR EXCELLENCE IN TECHNOLOGY TRANSFER

AK CASC senior scientist Ryan Toohey, Nicole Herman-Mercer and Paul Schuster were presented with the James R. Balsey Award for Excellence in Technology Transfer for their work on the Indigenous Observation Network (ION). ION, which received National Science Foundation funding to continue through May 2021, engages Tribes and First Nations in collecting high-quality data on characteristics of the Yukon River for their own use and the global scientific community.

PROGRAM COORDINATOR JANE WOLKEN FEATURED IN SCIENTIFIC AMERICAN

Wolken published an article on the Scientific American Observations blog in May 2019 titled *As Alaska Warms, Wildfires Pose a Growing Threat*. Wolken produced the piece as part of a blogging course through the Alan Alda Center for Communicating Science.

The climate communication challenge

Where does one start when tackling the thorny challenge of talking about climate change? AK CASC's Tribal Liaison Malinda Chase and senior scientists Jeremy Littell and Ryan Toohey held an interactive seminar with former AK CASC science communicator Kristin Timm to help participants through these tricky conversations at the 2019 Alaska Forum on the Environment.

Don't start with science

Littell shared a tip that may come as unexpected from a climate scientist and ecologist. "Instead of pulling out the charts and projections, make connections on values first," he said. We all have shared values, in Alaska and as people. When we begin conversations by finding common ground, we can bridge ideological gaps.

Share your climate story

"I'm a berry picker," said Chase, as she shared her personal connection to climate change. In her hometown in Interior Alaska, berries are an important subsistence food. She spoke of a visit where she found the bushes nearly stripped of leaves and berries by caterpillars. Warming temperatures cause longer ice and snow-free seasons that allow more caterpillar larvae to survive. Talking about how climate change has impacted us personally can bridge the gap between abstract scientific concepts and what matters to individuals. It also helps demonstrate how climate change affects us here, now, and in our communities rather than as a distant threat.

Featured publications

Bieniek, P., Bhatt, U., Walsh, J., Lader, R., Griffith, B., Roach, J., Thoman, R. 2018. Assessment of Alaska rain-on-snow events using dynamical downscaling. *American Meteorological Society*, 57:1847-1863. <https://doi.org/10.1175/JAMC-D-17-0276.1>

DeLaFrance, A., and McAfee, S.A. 2019. Evaluation of synoptic-scale patterns during extreme temperature and precipitation events in Alaska. *International Journal of Climatology*. DOI: 10.1002/joc.6006

Herman-Mercer, N.M., Antweiler, R.C., Wilson, N.J., Mutter, E.A., Toohey, R.C., and Schuster, P.F. 2018. Data Quality from a Community-Based, Water-Quality Monitoring Project in the Yukon River Basin. *Citizen Science: Theory and Practice*. 3(2), p.1. <http://doi.org/10.5334/cstp.123>.

Lader, R., Walsh, J.E., Bhatt, U.S., and Bieniek, P.A. 2018. Agro-climate projections for a warming Alaska. *Earth Interactions*, 22(18): 1-24, <https://doi.org/10.1175/EI-D-17-0036.1>

Walsh, J.E., Bhatt, U.S., Littell, J., Leonawicz, M., Lindgren, M., Bieniek, P.A., Thoman, R., Gray, S., and Rupp, T.S. 2018. Downscaling of climate model output for Alaskan stakeholders. *Environmental Modelling and Software*, <https://doi.org/10.1016/j.envsoft.2018.03.021>.

▲ Find more publications at casc.alaska.edu/publications.

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▲ Tribal Liaison Malinda Chase helps rural community members communicate the climate impacts they have experienced.

Give solutions and hope

"We have a finite pool of worry," said Timm. "Climate change, because it's abstract, often falls to the bottom of the list." That's where providing solutions comes in. Ending conversations on climate change with actions and solutions can empower others to move past the disillusion phase into action. "To change behavior, people need to know that there are positive outcomes for them and that they will be successful," said Timm.

Having climate conversations is one of the most important things we can do to address climate change and inspire action. For many, the seminar provided the tools they needed to start talking.

Meet fellow Rick Lader

Meet Rick Lader, a two-time AK CASC Fellow. As an undergraduate student at Cornell studying communications and meteorology, he had long been interested in extreme weather and climate events. In 2011, he moved across the continent from New York to Interior Alaska to earn a master's degree at UAF. What might seem like a remote location to some for Lader was an obvious hub; a world-renowned research university in a state where he could experience the climate extremes he studied firsthand. "This is a great place to not only work to understand those changes, but to live those changes," said Lader.



Lader worked under AK CASC senior scientist Uma Bhatt, analyzing global climate models to identify which ones worked best for Alaska. After completing his degree and finishing a Ph.D. in atmospheric science, Lader began his second stint as an AK CASC fellow using global climate models to create detailed regional downscaled climate models for the state.

His work producing downscaled data is highly relevant to resource managers and fellow climate scientists, as this information doesn't exist for Alaska elsewhere. When the computing of models is complete later this summer, Lader hopes to use the regional climate data to develop a drought metric and track changes to variability in climate in Southeast Alaska.



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