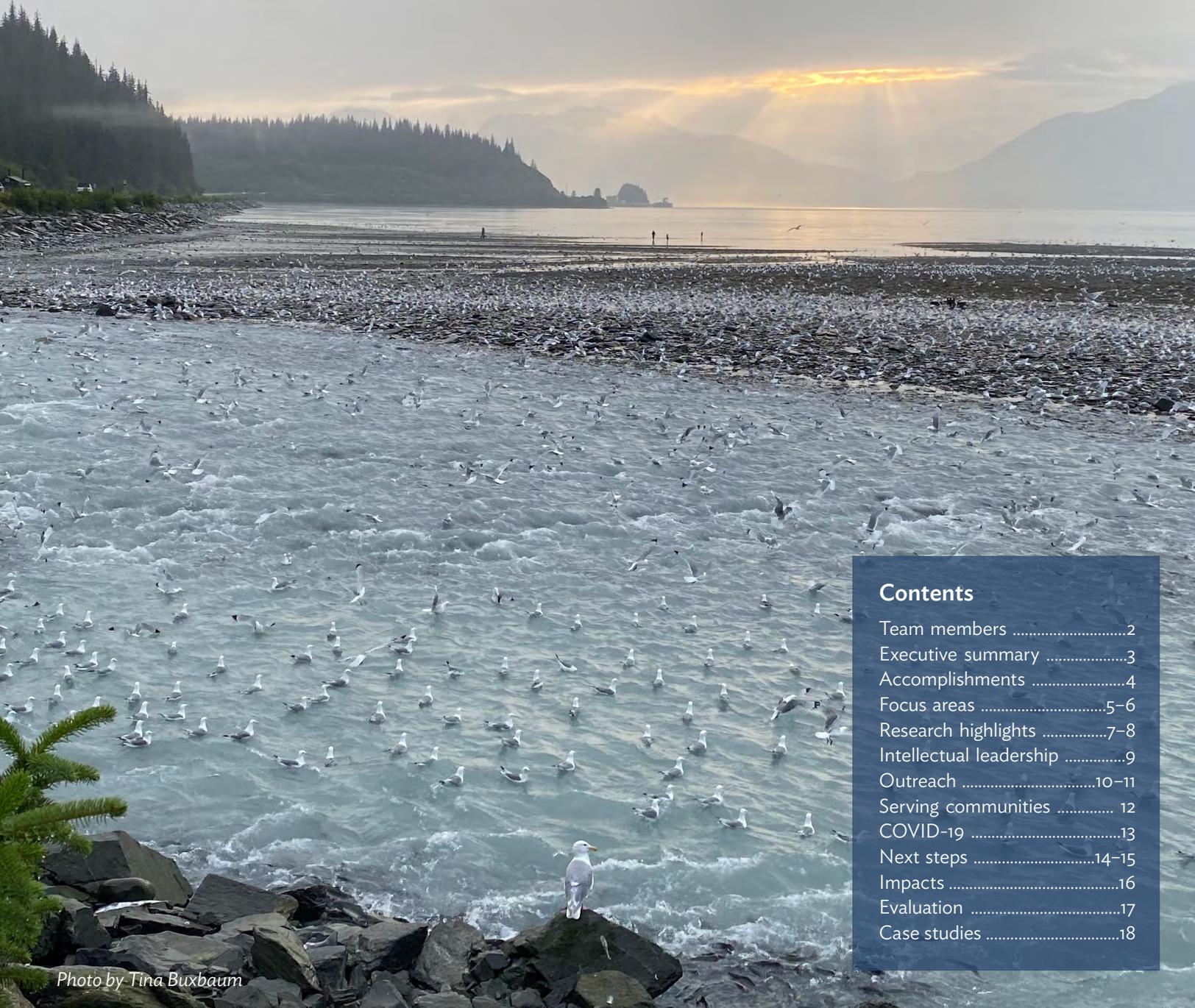


SCIENCE DECISION-SUPPORT CAPACITY BUILDING



FOR CLIMATE RESILIENCE IN ALASKA



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Photo by Tina Buxbaum



JUNE 1, 2020 – MAY 31, 2021

**This performance period covers year 5 of Award NA16OAR4310162*



TEAM MEMBERS



Sarah Trainor, Co-Director



John Walsh, Co-Director



Nathan Kettle, Co-Investigator



Davin Holen, Coastal Resilience Specialist (joint with Sea Grant)



Rick Thoman, Alaska Climate Specialist



Tina Buxbaum, Program Manager



Alison York, Editor



Danielle Meeker, Research Staff



Greta Goto, Research Staff



Kyle Redilla, Programmer



Carolyn Rosner, Web/Graphic Designer



Adelheid Herrmann, Post-Doctoral Fellow



Elizabeth Figus, Post-Doctoral Fellow

Students: Amy Hendricks - PhD; Margaret Rudolph - PhD; Sherri Wall - PhD; Eva Burk - MS; Fiona Rowles - MS; James White - MS (graduated 2020)

KEY PARTNER

Malinda Chase, Tribal Liaison, Aleutian Pribilof Islands Association Alaska Climate Adaptation Science Center

ADVISORY COMMITTEE

Lawson Brigham, University of Alaska Fairbanks (retired from board 2020)

Kevin Berry, Assistant Professor of Economics, UAA

Aimee Devaris, Director, US Geological Survey Alaska Region

Ginny Eckert, Director, Alaska Sea Grant

Stephen Gray, Director, Alaska Climate Adaptation Science Center

Amy Holman, Coordinator, NOAA Alaska Regional Collaboration Team

Kathy Jacobs, Director, Center for Climate Adaptation Science & Solutions, University of Arizona

Scott Lindsey, Director, NOAA-NWS Alaska Region

Molly McCammon, Sr. Advisor, Alaska Ocean Observing System

Vera Metcalf, Director, Eskimo Walrus Commission

Cheryl Rosa, Deputy Director, US Arctic Research Commission

Dee Williams, Deputy Director, US Geological Survey Alaska Region

Sheyna Wisdom, Executive Director, Alaska Ocean Observing System

Report layout by Heather McFarland

EXECUTIVE SUMMARY

This year highlighted ACCAP's flexibility and resiliency. This entire reporting period was spent in the midst of a global pandemic and required the team to use innovative ways to stay engaged and connected with each other and with those we work with. Through the use of Zoom we were able to connect with each other, our partners and the broader climate community.

We conducted a strategic planning effort with our Advisory Board remotely via Zoom and using online survey tools. We are happy with and proud of the resulting strategic plan for ACCAP. Additionally, we had students defend and graduate via Zoom and hosted student interns as part of the NOAA Hollings Scholar program entirely remotely. The team learned to work around home distractions, including young people attending school remotely, and poor internet connectivity all while moving the ACCAP mission forward.

This year we focused on maintaining connections and forward momentum as well as responding to needs. ACCAP was called upon to use our webinar expertise to launch a Tribal Learning Network led by the Bureau of Indian Affairs Alaska Climate Tribal Liaison, Malinda Chase, in partnership with the Alaska Climate Adaptation Science Center. We also hosted online drought listening sessions, many many webinars, and stood up a new online tool. All in all, this last year was certainly challenging, but our continued work proved how the team can pull together and really respond to our changing world even under pandemic circumstances. We are excited for the future of ACCAP!



ACCOMPLISHMENTS

ALASKA DROUGHT WEBINAR SERIES

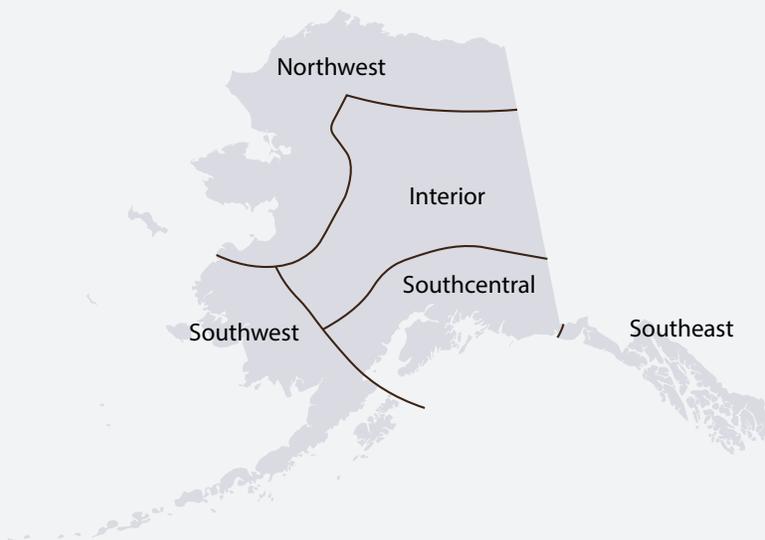
ACCAP leads: Rick Thoman & Tina Buxbaum

Partners: USDA Climate Hub (Holly Prendeville)

Prior to COVID-19 restrictions, we planned to conduct one or two statewide meetings to discuss drought in Alaska. Since we were unable to have an in-person Alaska drought workshop, we moved forward with a webinar series to begin the conversation about drought in Alaska.

There were seven webinars held in March and April of 2021. The first webinar presented by Rick Thoman of ACCAP covered a review of past climate information focusing on unusual dry period (2018-2019) and provided a statewide overview, including tools typically used to assess drought/precipitation deficit. A second webinar included a presentation from David Simeral, Drought Monitor author, who explained the U.S. drought monitor process.

These were then followed by five regionally-based, stakeholder listening sessions covering all of Alaska.



All listening sessions were two hours long. They began with presentations from invited speakers from each region who spoke to impacts and concerns being seen in their area. Then in the second hour of the sessions, participants were divided into smaller breakout groups with moderators and note takers to share what they

have been experiencing in their regions. The notes, stories, and concerns from the listening sessions were compiled into summaries for the regions as well as an overall summary of research needs around drought in Alaska. All in all, over 350 people attended at least one of the listening sessions or one of the two overview presentations.

It is hoped that the information from these sessions will help both inform drought research priorities pertaining to Alaska as well as serve as a starting point for discussion at a future in-person Alaska drought workshop. Regional summaries, session recordings and slides, and research priorities can be found on the [series website](#).

PAN ARCTIC SEA ICE ATLAS RELEASE

ACCAP lead: John Walsh

Partners: National Snow and Ice Data Center

In collaboration with the National Snow and Ice Data Center (F. Fetterer and J. Scott Stewart), we completed the pan-Arctic dataset spanning the 1850-2018 period with a monthly time resolution and a 25 km (0.25-degree lat-long) resolution. This dataset is built upon our earlier Alaska Historical Sea Ice Atlas, which was also constructed under NOAA support through the Alaska Ocean Observing System. The pan-Arctic database is a synthesis product, based on a fusion of sea ice data from about a dozen diverse sources ranging from satellite passive microwave grids of recent decades to digitized paper charts (Danish Meteorological Institute, National Research Council of Canada) and whaling ship reports from the 1800s. We have now created a web-based tool that includes a user interface of the pan-Arctic database. The Historical Pan-Arctic sea ice atlas interface includes the option for single-time map displays, single-point time series, and single-point open water season lengths displayed for all years in a user-selected time slice. Users may navigate the domain of the pan-Arctic tool to focus on Alaska's waters or any other region of the Arctic. The [tool](#) was launched in the spring of 2021.



Photo by Hajo Eicken

TRADITIONAL ECOLOGICAL KNOWLEDGE TALKS

ACCAP lead: Margaret Rudolf

Partners: Anika Pinzer, UAF Geophysical Institute

Margaret Rudolf and Anika Pinzer, two PhD students with career interests in working with Indigenous People and wanting to learn more, developed a lecture series on fostering understanding among scientists around working with Indigenous Peoples.

The series focused on:

- increasing respect and understanding of Indigenous People, their culture, and their knowledge;
- understanding the terminology and applying principles such as appropriate research ethics

when working with Indigenous People, including intellectual property, self-determination, equitable partnership, and transformative principles;

- knowing where to find appropriate resources and reaching out to others to make meaningful connections and to collaborating across UAF.

The series ran during the fall of 2020 and the spring of 2021 and featured eleven different presentations on a wide range of topics including sea ice research with communities, evaluation in an Indigenous context, allyship in research, and an Indigenous student panel to name a few. The series was very well received and often had 75 to 150 participants per presentation. The majority of the [talks were recorded](#).

NEW FOCUS AREA

SUSTAINED ASSESSMENT

ACCAP lead: Danielle Meeker

Danielle Meeker started in her role as a sustained assessment specialist at ACCAP in October 2020 and immediately began engaging with the RISA Sustained Assessment Specialist (SAS) network. Network activities discussed and proposed to date include: 1) conducting a status assessment of climate adaptation within our respective regions; 2) connecting decision-makers across regions experiencing similar compound social-environmental stressors in a series of cross-regional peer exchanges; 3) characterizing common information needs and identifying knowledge gaps that span multiple regions and 4) supporting cross-

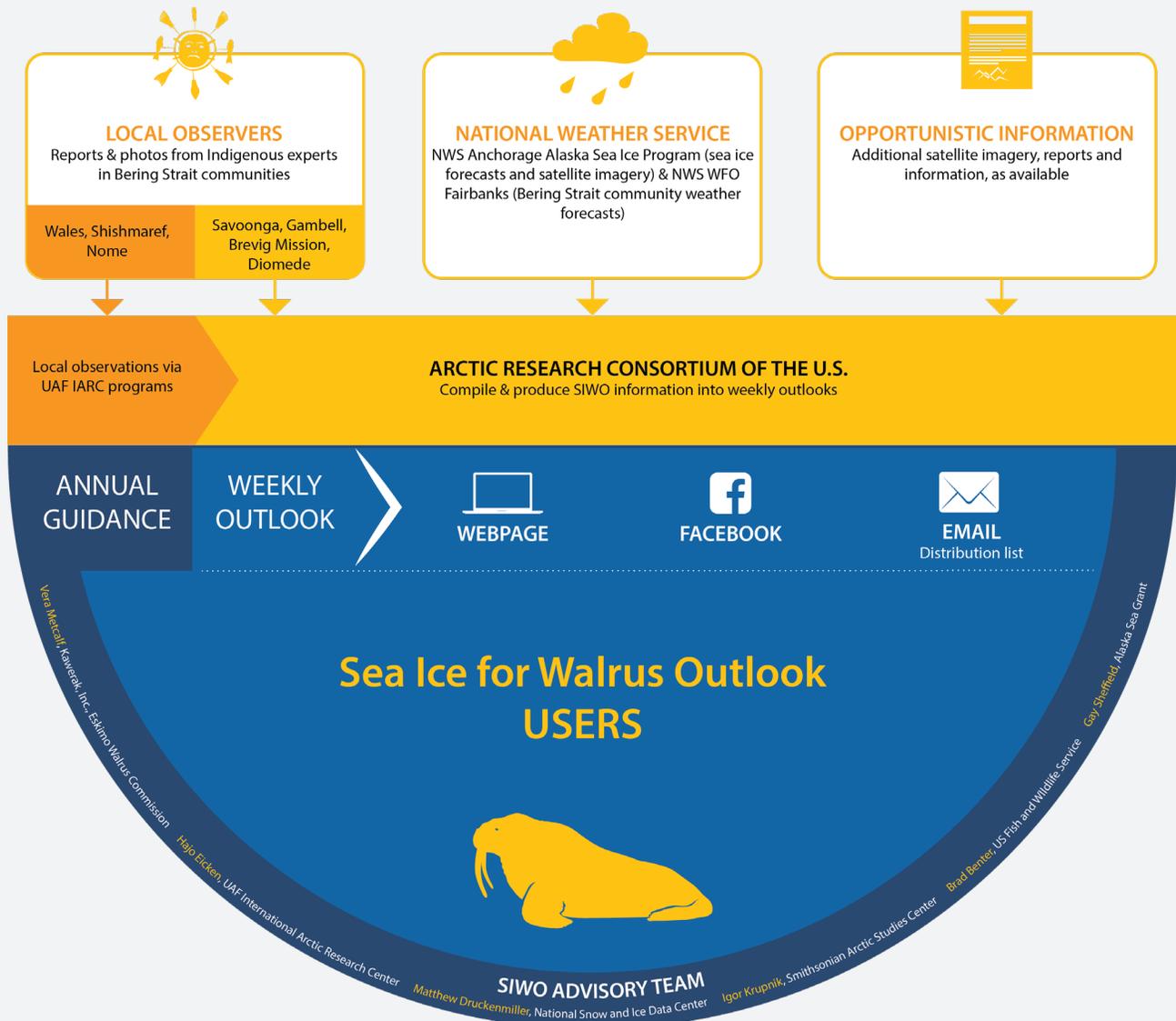
chapter coordination of RISA contributions to the National Climate Assessment (NCA). These efforts will be coordinated through monthly conference calls and biennial RISA meetings. The expected outcomes of these collaborative activities include the creation of coordinated methodologies for cross-RISA assessment of adaptation status and evaluation, as well as virtual cross-RISA peer exchanges. The findings of two rounds of status assessment will be delivered via a report or peer-reviewed paper, as well as in webinars and presentations to the RISA network, potentially accompanied by case studies or a web-based story map. ACCAP is excited to have Danielle on the team and we hope to use her role to build economic analysis capacity within ACCAP and the broader RISA network.

SUPPORTING COASTAL COMMUNITY RESILIENCE IN ALASKA: AN EVALUATION OF THE SEA ICE FOR WALRUS OUTLOOK

ACCAP leads: Nathan Kettle & Amy Hendricks
Partners: Arctic Research Consortium of the U.S., Eskimo Walrus Commission, Alaska Sea Grant

Walrus hunting is an important food source and cultural tradition for Indigenous peoples in the Bering Strait region. Sea ice is a critical platform for walrus in their feeding and breeding, and diminishing sea ice has led to shifting distributions of walrus hunting locations in the Bering Sea. There is increasing interest among Bering Strait hunters in understanding sea ice, reducing risks, using Indigenous knowledge and western science in decision support, and supporting knowledge sharing across communities. There is also a desire to validate the accuracy of National Weather Service models using local observations.

The Sea Ice for Walrus Outlook (SIWO) was designed and launched in 2010 to serve as a web-based resource for Alaska Native communities and other stakeholders and to supplement National Weather Service sea ice forecasts with feedback from community observers. Weekly SIWO reports are provided April-June and include information on sea ice conditions, weather, and marine mammal observations. Although there is a high level of interest in SIWO, there remains a limited understanding of who uses SIWO, barriers to information access and use, the extent that local observations have supported NWS operations, and how the tool may be improved to further support community resilience. The objectives of this project are to evaluate the SIWO to identify how to increase its usability and impact and optimize the SIWO based on a set of stakeholder-generated recommendations. With ACCAP's strong connections in both the National Weather Service and in the Bering Straits region, as well as our demonstrated expertise in evaluation, this project is a natural extension of our current portfolio.



ALASKA CLIMATE ADAPTATION COMMUNITY OF PRACTICE

ACCAP lead: Danielle Meeker

Partners: Alaska Native Tribal Health Consortium, Central Council of Tlingit & Haida, Alaska Climate Adaptation Science Center, & Northern Latitudes Partnership

This group convenes regional and state-level adaptation practitioners and climate service providers, including representatives from Alaska Native regional nonprofits, other non-governmental organizations, and state and federal agencies. The purpose is to share updates, reduce duplication of effort, and look for opportunities to collaborate. Although most group

members work at the regional or statewide level, it is our hope that familiarizing members with each others' work and capacity will make it easier for members to direct communities to the right person or organization when they are in need of adaptation resources. We are still in the early stages of starting this effort. The group has met three times. D. Meeker is providing most of the administrative support for the group. The other members of the organizing team are the Alaska Native Tribal Health Consortium (ANTHC), the Central Council of Tlingit & Haida, the AK Climate Adaptation Science Center (CASC), and the Northern Latitudes Partnership. It is hoped the group will be able to meet in person in 2022, contingent upon COVID-19 conditions and funding.

RESEARCH HIGHLIGHTS

USE OF MACHINE LEARNING TO CHARACTERIZE AND PREDICT WILDFIRE ACTIVITY IN ALASKA

ACCAP leads: James White & John Walsh

Addressing one of our key objectives of “developing integrated, actionable, interdisciplinary knowledge related to extreme climate and weather events,” ACCAP masters student James White dove into machine learning to improve understanding and prediction of wildfire events. While a mostly natural phenomenon, recent climate change in Alaska has increased the frequency and severity of wildfires across the state. This study used random forest machine learning models to better understand the variables that can be used to predict fire activity. While in-situ weather observations remain sparse, increasing station density and model accuracy provides the opportunity for data-driven methods to provide fresh insight on large-scale wildfire behavior. Given access to a wide variety of weather and fuel data sources, the methods explored show moderate skill when predicting remote sensing-based fire activity on any given day. When provided with a measure of previous fire activity, instantaneous measures of weather variables outperform longer term metrics of fuel conditions. Weather variables obtained from an atmospheric reanalysis (ERA5) generally make greater contributions

to forecast skill than do the sparse local observations. The models explored in this presentation aim to aid in medium range (up to two weeks) fire prediction.

Testimonials on Machine Learning

James White's project is an eyes-wide-open evaluation of the potential for machine learning to improve fire forecasting in Alaska, and the potential for ML in fire weather more broadly. The work illustrates what ML can do, but is also very explicit in recognizing what it cannot do, or what the limitations are. I see it as a valuable contribution to the field on its own, but also an important launching point for any further work to be done using machine learning to identify relative importance of various factors for fire growth. It has informed my own work on fire growth and weather, and how indices do or do not improve on raw weather inputs.

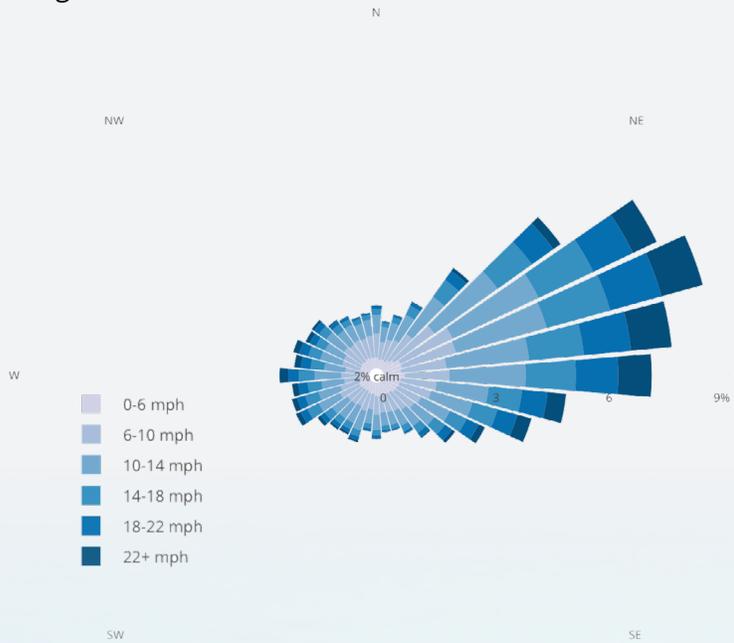
Brian Potter, research meteorologist at USFS Pacific Northwest Research Station

ALASKA COMMUNITY WIND DATA TOOL

ACCAP leads: John Walsh & Kyle Redilla

Partners: Scenarios Network for Alaska + Arctic Planning (SNAP)

This tool displays recorded hourly wind data back to 1980 and projected changes through 2099 for 67 Alaska communities. This tool allows users to explore past and future wind data from communities across Alaska by choosing a specific community. They can use the navigation menu to explore wind patterns from historical and future periods. The tool displays average wind speeds and, wind roses showing prevailing wind direction and speed for a given location annually and for each calendar month. Users can then explore future projections of these metrics to see how wind may change in the future.



A wind rose showing the relative frequencies of different wind directions and wind speeds at Utqiagvik (Barrow) over the period 1980–2014. Each spoke points in the compass direction from which the wind is blowing; shading indicates wind speeds (greater than 22 mph for darkest shade). Small inner circle denotes frequency of calm conditions (2%).

Users can switch between the two global climate models (NCAR-CCSM4 and GFDL-CM3) to explore possible futures. You can explore how the length and intensity of extreme wind events may change. Users can define “duration threshold” to choose the number of hours the storm will last. The graphs produced compares the number of wind events of that duration projected during six time periods (1980–2099). Some types of wind events (low speed, long duration) may become more common, while others (high speed, short duration) become less common and finally users can see how prevailing wind direction and speed might change over time.

The development of this tool directly addresses a key ACCAP objective of innovating climate services relevant to decision-support tools in Alaska with the goal of enhancing the use of science in decision making. Specifically, wind data is important for extreme event hazard mitigation and planning as well as for renewable energy planning and site selection. This [tool](#) is directly related to the work that produced the peer reviewed publication [Wind Climatology for Alaska: Historical and Future](#).



Photo by Doug Helton, NOAA, NOS, ORR

INTELLECTUAL LEADERSHIP

COMMUNITY OF LEARNING • CO-PRODUCTION OF KNOWLEDGE WITH FOCUS ON INDIGENOUS KNOWLEDGE

ACCAP Leads: Sarah Trainor w/ACCAP Postdocs and graduate students

Starting before this reporting period but really coming into its own during this period, ACCAP Co-Director Sarah Trainor has been leading weekly meetings via Zoom for postdoctoral fellows and graduate students at the University of Alaska Fairbanks. The group meetings have turned into a space to discuss co-production, workforce development issues in climate adaptation and mitigation planning, boundary spanning, and capacity building at the community level. It has become a space to share ideas and problems and has evolved into a community of learning around co-production and boundary spanning.

Initially begun as a way to stay connected with Trainor's students, the group has grown to include students working with other faculty members and in other departments at the university. With a core group of

four Alaska Native members including two students, a postdoctoral fellow, and a research associate, the group has been important for relationship building and information sharing specifically regarding Indigenous knowledge, capacity building, and engagement with Indigenous Peoples. Meetings often include discussions of readings in the literature surrounding boundary spanning and co-production, presentations of current work by the students in this realm, and also a chance for students to check in with each other and to share challenges and successes in their work. The group has grown organically through word of mouth and has turned into a valuable touchstone for not only the student and early career members but also for Dr. Trainor and the ACCAP staff that attend the meetings. This group is a productive step forward in evolving institutional cultures around learning about and sharing both scholarship and practice in co-production of knowledge with Indigenous Peoples, including successes and challenges in the university system and beyond.



OUTREACH & ENGAGEMENT

ACCAP Media Mentions: >650 media mentions in the reporting period

Webinar Attendance: three continuous webinar series (39 webinars) plus two shorter finite series (10 webinars) with total attendance of well over 2400 participants in this reporting period.

Testimonials

Webinars: “The professionalism, levels of administrative and scientific expertise make for true learning and sharing opportunities. ACCAP sets a high bar to model from. Thank you and keep up the great work!” ~Anonymous

“Consistently excellent content, understandable presentation and great moderation. Consistently the best webinar series I attend (one of many).” ~Anonymous

Additionally ACCAP researchers and staff presented for many different audiences over the course of this reporting period and provided information and content for countless others.

Providing data: “These are fabulous graphs and helpful info.Many thanks!” ~Fran Ulmer, former chair of the US Arctic Research Commission

After requesting recent info that could be easily digested by people who don't know much about Alaska to be presented to travelers visiting Alaska.

INTERNATIONAL

Arctic Climate Change Update 2021: Key Trends and Impacts

ACCAP Leads: Sarah Trainor & John Walsh

This report by the Arctic Monitoring and Assessment Programme (AMAP) within the Arctic Council presents an update of findings from the most recent full assessment of Arctic climate change, Snow, Water, Ice and Permafrost in the Arctic (SWIPA) 2017. The SWIPA 2017 report presented trends in key indicators of Arctic

climate change and concurrent changes to the Arctic cryosphere during the 2010–2016 period. The 2021 report is not an assessment report per se, but has been identified from the start as an interim report between the SWIPA 2017 report and the assessment reports proposed for 2023.

Preparation of the 2021 report involved over 50 scientists and experts from Arctic and non-Arctic countries. These experts were charged with compiling and evaluating information from Arctic monitoring networks, published literature, and recent national and international research activities. This assessment report is fully-referenced and peer reviewed.

John Walsh coordinated the entire publication and was lead author on chapter 4 on extreme events and Sarah Trainor was co-lead author on chapter 7 on societal implications. [See a summary for policy makers.](#)

NATIONAL

NOAA Arctic Report Card: Rick Thoman continues in his role as one of the general editors for the annual NOAA Arctic Report card. The 2021 report card will be released in December of 2021.

REGIONAL ALASKA INFORMATION PRODUCTS

Quarterly Climate Outlooks: Developed in partnership between ACCAP and Environment & Climate Change Canada, this publication presents a snapshot of recent weather and climate events and anomalies; regional weather impacts on the region's ecosystems and economy; and a climate forecast for the coming three months.

Bering Sea Conditions: Winter 2020/2021: This summary is the fourth in a series of summaries started in 2018 to address the record breaking sea ice loss in the Bering Sea. It is compiled by the Alaska Ocean Observing System (AOOS), International Arctic Research Center, and ACCAP. Content is based on requests from the Bering Sea communities relayed via the local Alaska Sea Grant Marine Advisory Program agent. The information is designed to help communities make sense of the unprecedented sea ice loss in the area.

Testimonials on Bering Sea publication

“We very much welcome this and thank all involved as we (family) are subsistence and commercial fishers in the area of concern (off Norton Sound & Nome). Please continue your work!”

“Thank you for keeping us informed on our changing world.”

~*Anonymous community feedback*

Alaska’s Changing Wildfire Environment (March 2021):

An overview of Alaska’s vast, complex, and changing wildfire environment. Highlights recent wildfire trends in Alaska, their impacts to humans and wildlife, and the strong relationship between wildfire managers and scientists to improve fire-related decision making.

LOCAL OUTREACH AND INFORMATION DELIVERY EFFORTS

Radio Lead: Rick Thoman (serving primarily rural and Indigenous communities

 **Beyond the Weather (KUAC, Fairbanks and Interior Alaska):** Weekly 90 second interview on a range climate related topics, including historical events to climate drivers to climate models, with a focus on Alaska’s Interior region

 **Climate Highlights (KNOM, Nome):** 90 second spots on a range climate related topics that are relevant to western Alaska, including sea ice

 **Translating weather for Alaska’s Iditarod sled dog race:** Iditarod weather forecasts for KNOM (Nome) to supplement KNOM’s 40+ years of Iditarod Race Coverage

 **Fish Reports (KDLG, Dillingham):** Weekly interviews (June–July) on climate and weather conditions as part of KDLG radio (Dillingham) “Fish Report” which airs during the multi-million dollar commercial salmon fishing season during the early summer in Bristol Bay.

Print and reports

 **Nome Nugget:** Weekly sea ice conditions and outlooks with a focus on Western Alaska stakeholders. The Nome Nugget is a regional

newspaper for the city of Nome and the surrounding communities on Alaska’s north west coast. These communities include a significant population of Alaska Native peoples.

 **Alaska Climate Dispatch:** Published biannually and written for a non-technical audience. Features seasonal weather and climate summaries as well as Alaska weather, wildfire, and sea ice outlooks and focused articles.

Testimonial - Tailored to local media

I would like to send you [Rick Thoman] a long-overdue Thank You on behalf of The Nome Nugget and our local and regional readers for supplying us weekly with the Climate Watch column and graphic. We find it very useful to get a weekly interpretation not only of the weather that we experience here, but also an interpretation of the broader context of climate and the changes that we experience. The graphics are outstanding by letting us visualize trends and are giving us data points that are strictly pointing to the facts of the dramatic changes we’re seeing.

I consider us very lucky to have a column tailored to our region as unfortunately the National Weather Service offers less and less services that help us understand the weather, much less climate. Thank you for going through the trouble to come up each week with a timely and interesting topic that helps us better understand what’s going on weather-wise. Please keep it up!

~*Diana Haecker, The Nome Nugget*

BROAD OUTREACH ACTIVITIES

-  Alaska Climate Webinar Series (monthly since 2007)
-  National Weather Service Alaska Climate Outlook Briefings (monthly since 2014)
-  Virtual Alaska Weather Symposium in partnership with the Geographic Information Network for Alaska (GINA) (monthly since 2017)

See all ACCAP webinars (past and upcoming)

SERVING COMMUNITIES

ALASKA TRIBAL RESILIENCE LEARNING NETWORK

ACCAP Leads: Nathan Kettle & Tina Buxbaum
Partners: Led by key partner Malinda Chase, AK CASC/BIA

The [Alaska Tribal Resilience Learning Network](#) (AK TRLN) hosted by the Alaska Climate Adaptation Science Center (AK CASC) is a community of learning, sharing, technical assistance, training, and support for Alaska Tribes, leadership, and Indigenous communities as they respond and adapt to the current and future impacts of climate change. This system of support is designed especially for Alaska Tribes and Indigenous communities that have received BIA Tribal Resilience Program funding.

ACCAP partnered with the BIA funded Climate Tribal Liaison and the AK CASC to launch the network with a series of three introductory webinars held in March of 2020 with a total attendance of over 120 people. The three introductory webinars highlighted examples of what the BIA Tribal Resilience Program (TRP) had funded in the past, the language of climate change planning, and the difference between a vulnerability assessment, risk assessment, and a desktop report. The webinar series was well received and was a strong launching platform for the network.

13TH WESTERN ALASKA INTERDISCIPLINARY SCIENCE CONFERENCE AND FORUM

ACCAP Leads: ACCAP Core Team, led by Adelheid Herrmann

The 13th annual Western Alaska Interdisciplinary Science Conference (WAISC) aimed to bring together local and indigenous knowledge of subsistence-based communities and other scientific research relevant to Western Alaska; including economic, ecological, social, and health issues important to rural communities. This year's virtual conference focused on the future threats and opportunities in the face of a changing climate.

ACCAP participated in the second day of the conference as part of the session focused on social and ecological effects of climate change. The team presented a high level overview of ACCAP work that was highly relevant to the heavily Indigenous audience. The talk focused on issues of importance to rural communities and presented tools and resources available from ACCAP that can help communities in their efforts to respond to and adapt to their changing environments. Additionally ACCAP and Alaska Sea Grant-jointly-funded Coastal Resilience specialist Davin Holen presented in the same session on both the Adapt Alaska effort and on a [Alaska Emergency and Disaster Homeowner's Handbook](#).



HOLLINGS SCHOLARS

ACCAP Leads: John Walsh & Rick Thoman

Partners: National Weather Service

During the summer of 2020 ACCAP and the Alaska Fire Science Consortium in partnership with the National Weather Service (Fairbanks office) hosted two NOAA Ernst Holling Scholars for 8 week internships. Due to the COVID-19 pandemic and travel restrictions both students completed their entire internship remotely from their home communities in the lower 48 states. The use of Zoom for daily meetings was vital to the successful completion of these projects and we commend both students and their ACCAP and NOAA mentors for their hard work and enthusiasm despite the challenging conditions.

1. An exploration of the Hot Dry Windy Index & its applicability to the Alaska wildfire environment, Hollings Scholar, Emily McCutchan

Hot, dry, and windy conditions have a well-established link to wildfire growth. The Hot-Dry-Windy Index (HDW) combines daily values of wind speed and vapor pressure deficit to provide insight into large fire growth days. This study explored trends in HDW from 1980-2019 for Alaska based on ERA5 Reanalysis data, compared daily values of HDW to MODIS fire detections for individual predictive service areas, and examined case studies to provide insight into HDW's utility for fire forecasting in Alaska.

2. Changing Summer Nighttime Climate and its Impact on Alaska Fire Growth, Hollings Scholar, Clairisse Reiher

Growth of wildfires in Alaska is generally expected to occur with the assistance of heat and low moisture during daylight hours, while overnight low temperatures and relative humidity recoveries limit this growth. However, the progression of climatological warming in the Arctic, combined with prolonged exposure to sunlight at high latitudes during the summer, may be providing more capability for overnight fire growth than previously thought. This project made use of historical wildfire records and ERA5-Land reanalysis data to investigate the potential of taking nighttime temperatures and relative humidity recoveries into consideration for fire weather forecasts.

GENERAL PROJECT DELAYS DUE TO COVID-19

While our team is adaptive and resilient, travel restrictions and at-home work mandates due to COVID-19 resulted in notable project delays and adjustments. In some cases, field work in rural Alaskan communities was halted for a 6 month period or longer. When field work resumed for our co-production project in Kake, Alaska, travel costs were significantly higher due to the longer stay needed to meet quarantine requirements. In other cases, field work is still being delayed and we are waiting until our community partners let us know it is advisable for us to visit in person. Partner concerns involve safety and participant availability. While some professional meetings were held virtually, lack of in-person meetings restricted our networking, relationship building, and stakeholder engagement which is a core element of our work.

NEXT STEPS

DROUGHT WORKSHOP IN SOUTHEAST ALASKA

ACCAP Lead: Davin Holen, Danielle Meeker, Tina Buxbaum & Rick Thoman

Southeast Alaska is a temperate rainforest that typically receives 62-160” of rain and 33-143” of snow annually. However, this region experienced prolonged drought conditions in 2018/2019, taking everyone by surprise. Since Southeast Alaska is a temperate rainforest, drought is not at the forefront of minds nor expected, as future climate projections indicated similar or more precipitation in the region. Moreover, tactics to mitigate the effects of drought that are commonplace in the continental US are not well-known nor practiced in this region.

In May 2019, the Northwest Climate Hub hosted a drought workshop for Southeast Alaska to refine drought categories for the region, increase awareness of the National Drought Monitor and drought-impacts reporting, and begin to highlight available information and resources to assist with adapting to drought.

Continuing that effort ACCAP will plan, organize, and conduct a two-day workshop focused on drought adaptation planning in Southeast Alaska with timing and format contingent on the on-going COVID-19 pandemic. The goal of this next phase is to build on the foundation established in the 2019 workshop, maintain continuity for local stakeholders, and work to assist with the development of community-driven adaptation strategies to serve the specific needs, challenges and opportunities of remote, temperate rainforest communities.

The workshop is being planned collaboratively with the Central Council of Tlingit and Haida Indian Tribes, the regional Tribal cooperative in Juneau and will develop drought adaptation strategies and showcase programs and resources to implement these strategies. Participants will co-produce drought adaptation strategies with ACCAP team members, regional technicians, Natural Resources Conservation Service (NRCS) tribal liaison, NRCS and Forest Service natural resource specialists, and scientists in order to meet the specific and vast needs of Southeast Alaska.

CLIMATE CHANGE IN ARCTIC ENVIRONMENTS MASSIVE OPEN ONLINE COURSE (MOOC)

ACCAP Leads: John Walsh & Rick Thoman

Partners: Michael Delue, Alaska Climate Adaptation Science Center at the University of Alaska Fairbanks

John Walsh and Rick Thoman of ACCAP are leads for a [MOOC](#) covering modern climate science and the impacts of climate change across the Arctic and scheduled for release in November 2021. Students will learn from researchers and staff from a variety of disciplines at the University of Alaska Fairbanks and its collaborators. Modules developed by the subject matter experts will help students develop a basic understanding



Photo by Jeremy Bynum

of climate change in the circumpolar Arctic through examining four primary systems: atmospheric systems, marine systems, terrestrial systems, and human systems.

Key concepts will be explained with practical examples including Arctic climate modeling, climate policy, physical properties of the ocean, and more. Students should come away with the ability to trace impacts through those complex systems from physical science, through the biodiversity of flora and fauna, and on to the societies that depend on those resources. Key texts to understanding environmental change will be made available to participants with guidance, giving you the skills to understand reports and policies impacting the region. Enrollment began in August 2021.

INDIGENIZED EVALUATION AND ANALYSIS OF KNOWLEDGE CO-PRODUCTION AND BOUNDARY SPANNING

ACCAP Lead: Margaret Rudolf, PhD student under Sarah Trainor

Interdisciplinary Ph.D. Student Margaret Rudolf is developing and testing an Indigenized framework for evaluating knowledge co-production based on literature

review, Indigenous methodologies, best practices, and ethical frameworks. Her framework and analysis is focused on boundary spanning and co-production between university researchers and Alaska Native communities and engages the co-production process involving close research partnerships. The Indigenous-led Food Security Working Group will provide peer-review before publication and presentation of her first paper at the American Geophysical Union fall meeting 2021. Rudolf will also host a workshop with a group of 12-15 boundary spanners to define roles in the context of working in Alaska Native communities on climate change research. These boundary spanners are liaisons, Indigenous scientists, social scientists, scientists working for communities or Native organizations, and Tribal and community leaders. Rudolf is using the co-production of knowledge approach along with knowledge integration methods and facilitated discussions to develop a conceptual model of boundary spanning with Alaska Native peoples and communities. The key findings are expected to define actions, backgrounds, education, challenges, barriers, and metrics of success and will lay important ground-work for both the theory and practice of engaging in equitable and respectful cross-cultural research partnerships in climate research in Alaska.



IMPACTS

ASSESSING SUSTAINABLE SOUTHEAST PARTNERSHIP AS A MODEL FOR CLIMATE RESILIENCE NETWORKS IN ALASKA

ACCAP Leads: Danielle Meeker & Davin Holen

The Sustainable Southeast Partnership (SSP) is a collective impact initiative working to build cultural, ecological, and economic prosperity in Southeast Alaska. The Partnership is diverse and inclusive with representatives from tribal governments and regional and community-based organizations, including businesses and corporations. Collectively, the SSP network supports community-identified projects and priorities with dedicated staff and investment in seven communities in Southeast Alaska: Hoonah, Hydaburg, Kake, Kasaan, Klawock, Sitka, and Yakutat. Over the past decade, SSP has initiated, supported, or assisted in over 100 projects and programs in these and other adjacent communities.

In spring and summer 2020 with support from the Cargill Foundation, ACCAP collaborated with the Alaska Conservation Foundation (ACF) to research the development and impact of SSP and assess the potential of adapting the SSP model to support climate resilience in other regions of Alaska. The project included two surveys: one for climate adaptation practitioners to describe climate adaptation priorities, challenges, and successes in Alaska, and one for SSP participants to describe outcomes, strengths, and weaknesses of the SSP network. Survey results indicated that there is potential for a new collective impact initiative to meaningfully address climate adaptation in other regions of Alaska, but that this effort must be preceded by intentionally building trust with community partners and identifying shared values among partner organizations. The three greatest needs identified by Alaska climate adaptation practitioners were capacity-building, funding, and administrative support. Research findings were shared in a report, as well as a presentation to the Alaska Climate Adaptation Community of Practice in April 2021.

ALASKA EMERGENCY & DISASTER HOMEOWNER'S HANDBOOK

ACCAP Lead: Davin Holen

Alaskans—whether in large or small communities that are coastal or inland, connected by roads or accessible only by plane or boat—can and should prepare for extreme weather conditions and potential natural disasters. These include heavy rains, high winds, freezing temperatures, earthquakes, tsunamis, wildfires, volcanic eruptions, erosion, and flooding from storm surges.

Davin Holen, ACCAP and Alaska Sea Grant's coastal community resilience specialist, worked with energy specialist Art Nash at the University of Alaska Fairbanks Cooperative Extension Service to create this [handbook for Alaska](#) inspired by the Hawaii Sea Grant's Homeowner's Handbook to Prepare for Natural Hazards. Nash has authored several guides, each focused on a specific natural hazard, which he pulled together into this more comprehensive guidebook. The introductory chapter of the guidebook highlighted climate data and decision support tools compiled by ACCAP on Alaska's changing environment. Holen used this information to inform homeowners on how to plan for future risks and uncertainties, creating a narrative about preparing for the future in communities across rural Alaska.

Alaskans need to plan for unique logistical challenges, including transportation and supply chain issues, when building and maintaining homes to cope with the conditions and events particular to their region. The authors kept a view toward self-sufficiency, given the geographic remoteness and limited emergency services of many small communities.

“We wanted this guidebook to be useful to all homeowners, including in rural Alaska,” said co-author Holen. “It’s focused on simple ways they can fix their homes’ foundations to mitigate effects of thawing permafrost, clearing the area around the house to limit fire danger, or fastening a roof to withstand high winds. We also looked at preparedness, in case you have to leave your home, and what to expect when you return.”

EVALUATION

As reported previously, we contracted with evaluation specialist Susanne Moser in 2019 to conduct an external evaluation of ACCAP. Through interviews with ACCAP stakeholders and a focus group with ACCAP's external Advisory Board, this evaluation revealed that stakeholder perception of ACCAP is overwhelmingly positive, with profound respect for the depth and diversity of expertise, integrity, level of engagement of individual team members and for the ways in which ACCAP partners with others. Of particular note were the accessibility and responsiveness of ACCAP team-members, our capacity for relationship and trust-building, innovation in communicating complex

scientific information, and our ability to make scientific information actionable in the context of community and state planning and decision-making. The evaluation also illuminated the perception by our Advisory Board that ACCAP would do well to emphasize more strongly the 'Assessment' and 'Policy' elements in our name. In this reporting period, we used this 2019 external evaluation as the basis for an intensive strategic planning process described below.

We continue to assess our webinar series through a brief questionnaire following each webinar. Testimonials from this continued evaluation are included in this report.

VISION Healthy and thriving Alaskan communities, economies, and ecosystems in a changing climate

MISSION Conduct innovative and collaborative research and engagement to inform climate policy, decision-making, and action for a just and sustainable future.



Photo by Heather McFarland

STRATEGIC PLANNING EFFORT

ACCAP Leads: ACCAP team with facilitation by Kathy Jacobs (ACCAP Advisory Board member)

Building on the 2019 evaluation of ACCAP done by Susi Moser, ACCAP undertook a strategic planning effort via Zoom with our Advisory Board in the summer of 2020. From that effort we defined a vision and mission for ACCAP moving forward as well as defining our values, and our audience.

We also worked to define success for ACCAP, identify strategies and activities that will drive ACCAP forward, and envision what the team and the board would want ACCAP to look like in five years. With that vision in mind we outlined key focus research areas, actions to enhance ACCAP's policy relevance and metrics and benchmarks to track our progress.

The board felt that ACCAP does an excellent job conducting robust and credible science, including interdisciplinary science, providing information and decision support, hosting multiple webinar series, engaging with stakeholders, communicating climate science, generating knowledge, and collaborating with rural communities. They thought it would be very advantageous for ACCAP to increase its focus on:

1. Economic research and partnership
2. Being policy-relevant and meeting policy needs
3. Engaging scientists, Indigenous experts, and rural communities to ensure respectful partnership in knowledge co-production

Our strategic visioning process has highlighted the need for ACCAP to place more attention on the policy element of our work, i.e. developing the ‘P’ in ACCAP. This involves developing relationships with policy makers, creating policy-relevant products, and hosting events for policy making audiences. We acknowledge the need to target our efforts at an appropriate level, i.e. local, regional, statewide, national and international, based on audience interest and receptivity. We have begun this effort through on-going discussions with several groups and individuals including UAF’s state and federal legislative affairs specialists, the Center for Arctic Policy Studies at IARC, the BIA Tribal Resilience Liaison, and other research partners and advisors. These have included discussions about creating a bi-monthly Alaska Climate Policy call modeled off of the successful bi-monthly Alaska Marine Policy calls hosted by the Alaska Ocean Observing System and Alaska Sea Grant, however potential interest in this type of forum has been eclipsed by the COVID-19 pandemic and other economic issues in Alaska .

The evaluation work from Susi Moser and the subsequent strategic planning process and resulting plan was used to structure and inform our competition proposal and is being used to shape ACCAP as we move into our next funding cycle. We plan to continue to work with Dr. Moser to further evaluate ACCAP’s impact on Alaska and beyond and build a more in-depth theory of change for ACCAP.

SOCIETAL IMPACT

Evidence of our social impact was documented in the dedicated evaluation effort with Susanne Moser in 2019. In the current reporting period, we have received numerous unsolicited thank yous and testimonials that demonstrate our value to our partners and audience. A selection of these quotes and testimonials are provided throughout this report along with the relevant project or effort.



CASE STUDIES

BUILDING RESILIENCE TO EXTREME EVENTS AND WATER HAZARD PLANNING IN RURAL COMMUNITIES

ACCAP Leads: Sarah Trainor, Rick Thoman, Davin Holen, & Nathan Kettle

Partners: Southern Climate Impacts Planning Program (SCIPP)

Although in very different regions of the United States, water and wastewater management in the western Alaska and southern Louisiana are similarly impacted by extreme weather events. In 2018, with leveraged funding from NOAA Sectoral Applications Research Program (SARP), ACCAP and the Southern Climate Impacts Planning Program (SCIPP) investigated water and wastewater resilience to extreme weather events in rural coastal communities. The goal of the project was to reduce flooding risk to small community water systems in Alaska and Louisiana through better information, communication, and networking. The research focused on communities in western Alaska and Terrebonne Parish in Louisiana.

Working with project advisors including the Environmental Protection Agency (EPA), the Water Resources Foundation, the US Arctic Research Commission and the Alaska Native Tribal Health Consortium, the team wanted to understand: (1) how weather and climate extremes impact water and wastewater systems; (2) contextual factors that shape the level of risk and impact; and (3) the role of networks in supporting community planning and response.

In 2019, the project team concluded surveys and interviews with 60 water and wastewater managers and support staff in Alaska and Louisiana. Key findings around the role of networks supporting resilience to extreme events are detailed below.

The role of networks in supporting community planning and response

Water and wastewater utilities use multiple local- to national-level networks to maintain operations as well as prepare for, respond to, and recover from extreme weather and climate events. These networks include local water managers, regional organizations supporting planning and response (e.g., Regional Tribal Health entities in Alaska, Louisiana Conference on Water and Sewer) as well as national-level organizations (e.g., National Rural Water Association) and federal and state agency partners (e.g., Federal Emergency Management Agency or FEMA).

We found that these networks support resilience in the following ways:

- **Build technical, managerial, and financial capacities.** Networks provide training opportunities for managers on topics related to treatment and distribution, disinfection, collection, leadership, asset management, and emergency response.
- **Provide operations, emergency response, and longer-term planning support.** Networks share resources during crises, provide maintenance and technical assistance, assist with developing preventive plans and engineering feasibility analyses, share information and coordinate response during emergencies, and assist with planning for energy and power resilience.
- **Support data collection and monitoring.** Networks track energy use to increase power resilience, collect remote data on temperatures, flow rates, water

level, and pressure to provide automated alerts for local operators, track system performance, establish long-term operational records to identify trends, and provide baseline data that can be used in grant applications.

- **Facilitate information sharing.** Networks provide opportunities for water managers to share best practices related to recent weather extremes and weather forecasts.

ACCAP and SCIPP presented their findings as part of the 18th Annual EPA Drinking Water Workshop: Small System Challenges and Solutions in September of 2021. Additionally, full project fundings, including handouts for water managers, city planners, and funders can be found at the [project website](#).

KAKE CLIMATE PARTNERSHIP

ACCAP Lead: Elizabeth Figus

Project Partner: Organized Village of Kake, Kake Tribal Corporation, & the City of Kake

Kake (pronounced “cake”) is a rural coastal village in Southeast Alaska. The region around the village has been inhabited by the Tlingit people for thousands of years. Residents of Kake still depend on subsistence harvesting of local animals and plants to provide food for their families.

As the signs of climate change become increasingly obvious in Alaska, the tribe and community members in Kake are concerned about how climate change and pollution might impact the ocean and stream waters they depend on for food. The community is concerned with food security and food sovereignty.

In January 2020, ACCAP formed a climate research co-production partnership with the Organized Village of Kake (a federally recognized tribe), Kake Tribal Corporation, and the City of Kake. All members agreed to work together with the goal of benefitting Kake, and to uphold the values described in a shared Declaration of Principles and Expectations document, created on the recommendation of the First People’s Conservation Council.

To characterize the impacts of climate change and pollution on traditional foods across the area, ACCAP has worked with our partners in Kake to co-produce two local monitoring projects. In the first—ocean

monitoring—members of the community-led project team collect ocean water and shellfish tissue samples while documenting climate indicators. The second project—stream monitoring—documents the health of local streams and their ability to support robust salmon populations in the face of climate change. Research partners are interviewing local elders about local salmon streams, gathering and analyzing fish tissue samples, and documenting climate indicators to monitor stream health over time. Data from both projects will document how climate change and pollutants are affecting the quality of local ocean and stream waters as habitat for traditional food species.

RISA has made this partnership possible by funding the postdoctoral researcher at ACCAP who is coordinating our part of this work. ACCAP funding has also made our partnership in Kake flexible and stable over time. Through a sustained funding approach, we are better able to leverage other funding sources to maximize the economic return of RISA funding. Since January of 2020, the Kake Climate Partnership has been able to leverage funding from the United States Department of Agriculture, the Environmental Protection Agency, Alaska Sea Grant, NOAA Hollings Preparation Program, the UAF International Arctic Research Center, the Bureau of Indian Affairs Tribal Resilience Program and the UAF Undergraduate Research and Scholarly Activity program

Kake, AK, is an underserved Indigenous community. Through the Kake Climate Partnership, RISA funding has helped invest over \$50,000 of funding directly to more than 30 local residents as pay for part-time and

full-time work on our field sampling teams. Using RISA and leveraged funding that RISA makes possible, our team has been able to fund:

- > 30 local residents as paid research techs in 2020/2021
- 9 paid local high school research assistants during 2021
- 1 paid undergraduate research assistant and subsequent thesis, spring 2021
- 3 paid undergraduate interns, summer 2021
- 13 students mentored by ACCAP faculty in 2020 and 2021
- 2 seasons ocean monitoring data collection (owned and stored locally)
- 2 field trips with local high school students
- 3 scientific conference presentations with partners
- 1 joint meeting with tribes from Louisiana

Through investments of time, training, and mentorship, we are building long-term, local capacity for climate adaptation. The on-the-job experience we have been able to provide has already begun to yield this capacity as two members of our part-time field sampling team have secured full-time employment using skills they developed working with the Kake Climate Partnership. We are further confident that our continued mentorship and support of local high school and college students will prepare them to act as the next generation of climate adaptation leaders in their community.



Photo by Lloyd Davis, 2020