



*UNDERSTANDING THE ARCTIC
TO MAKE A DIFFERENCE*

YEAR IN REVIEW



Message from the Director

This year brought impactful reminders of the importance of IARC's core values, especially our commitments to being grounded in place, collaboration, and being a welcoming environment for all. These values are not abstract statements; they are the principles that shape how we approach science, partnerships, and our service to Alaska and the broader Arctic.

In this year's report, you'll see how IARC's work is deeply grounded in place. One example comes from our recent efforts to bring together people who care deeply about the future of Alaska's salmon amid rapid environmental change, including scholars, agencies, Indigenous leaders, and commercial fishers. Facilitated by IARC's Research Coordinator, Emily Lescak, IARC researchers like fish biologist Erik Schoen, community and policy expert Adelheid Herrmann, and resource economist Toby Schwoerer are laying the groundwork for organizing and sharing salmon knowledge to inform stewardship by engaging in international conversations around salmon knowledge opportunities and practices.

IARC's culture of collaboration opens doors and leads to unique impacts. This year, Scott Rupp and the Scenarios Network for Alaska + Arctic Planning (SNAP) team released the Arctic Environmental and Engineering Data and Design Support System (Arctic-EDS), a transformative platform that develops data and projections that strengthen the resilience of Department of Defense installations throughout Alaska. Meanwhile, Jessica Garron's drone community of practice in Western Alaska demonstrates how local expertise, science, and technological innovation can both elevate community concerns and enhance homeland security.

We're proud to share that this year Deputy Director Claudine Hauri, along with Delia Lopez-Ketzler, Katie Spellman, and Erik Schoen, accepted the Family-Friendly Workplace Award from the Greater Fairbanks Chamber of Commerce on behalf of IARC. This recognition reflects our fundamental value that our success is built on a welcoming environment where people feel supported to do their best work.

While much of our work is rooted in Alaska, IARC's reach extends far beyond the state. By leading and contributing to international research efforts and networks, we connect Alaska to the global stage. Collaborations with researchers and centers in Japan, Korea, Germany and elsewhere strengthen Arctic research and extend its benefits.

Please continue to connect with IARC's researchers, staff, and students – and imagine what we can accomplish together in the years ahead.



A handwritten signature in black ink that reads "Hajo Eicken". The script is fluid and cursive.

Hajo Eicken

IARC Director
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Contents

Alaska's changing environment	8
Rusting rivers in the Arctic	10
Yukon salmon	13
Ice science at all ages	16
IARC's family friendly culture	18
Arctic data developments	20
Sea ice forecasts	22
Drone community of practice	23
Online learning	26
Tools for glacial flooding	27
Resilient by design	29
The future of food security	29
IARC publications and media	30

We want to hear from you!

Email your comments or questions to
uaf-iarc@alaska.edu

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Researchers on the NABOS 2025 scientific cruise work to assess the state of the eastern Arctic Ocean. U.S. Coast Guard photo by Petty Officer 3rd Class Chris Sappey.



About us

We are the International Arctic Research Center (IARC) on the University of Alaska Fairbanks Troth Yeddha' Campus. Our purpose is to understand the Arctic to make a difference. These six core values guide our research and frame how we interact with our partners:

USEFUL, ACTIONABLE SCIENCE

Our research responds to society's needs in a changing Arctic and world.

DEEPER UNDERSTANDING

Our emphasis on fundamental research sets the groundwork for understanding and responding to Arctic change.

GROUNDING IN PLACE

Living and working in Alaska gives us a holistic knowledge and understanding of the Arctic. We value what the North and its people teach us.

WELCOMING

We actively cultivate an environment where all individuals and groups feel welcomed and heard. Our different experiences, expertise and ways of knowing are our strength, creating a variety of thoughts and ideas.

INNOVATION AND EXPERTISE

Drawing on our expertise, we value a culture of creativity that fosters innovation.

COLLABORATION

We solve problems through local to international collaboration with different disciplines, knowledge systems and by engaging with government agencies.



Our People

IARC is home to **46 faculty** and **51 staff**.

Thirty students have financial support and/or principal advisors at IARC. Nine of our faculty have joint appointments with UAF departments representing the College of Indigenous Studies, College of Liberal Arts and the College of Natural Science and Mathematics. Two IARC faculty have joint appointments with Japan's National Institute of Polar Research and Hokkaido University.

Our Projects

IARC scientists, analysts, students, and staff work on approximately **100 projects** spanning ocean, ice, atmosphere, land and societal systems – with the goal of understanding the Arctic to make a difference.

Our Funding

IARC research is funded through the support of nearly **30 different agencies and funding sources**. Major funders include the National Science Foundation (NSF), NASA, USGS, NOAA and the Office of Naval Research (ONR).

Our Research Facilities

IARC is home to the tracer geochemistry lab, nutrient analysis recharge center, Scenarios Network for Alaska + Arctic Planning (data products and software/web-based tools) and Poker Flat flux tower site.

Our International Partners

IARC has active agreements with international Arctic research institutions and programs around the world, including in **Japan, Germany, Republic of South Korea, Switzerland and many others**.

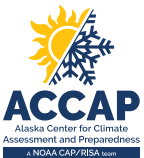
The IARC Group

Our scientists work on independent research as well as through larger initiatives. The following are groups and collaborations at IARC that build connections between research and partners within and outside the United States.



Alaska Arctic Observatory & Knowledge Hub • arctic-aok.org

Improving Arctic research through Indigenous-led environmental observations and stewardship.



Alaska Center for Climate Assessment & Preparedness • accap.uaf.edu

Building healthy and thriving Alaska communities, economies and ecosystems in a changing climate. A NOAA CAP/RISA team.



Alaska Climate Adaptation Science Center • casc.alaska.edu

Regionally relevant science for a changing climate. University partner with the U.S. Geological Survey.



Alaska Fire Science Consortium • frames.gov/partner-sites/afsc

Bridging the gap between wildland fire science research and managers. Regional consortia in the Joint Fire Science Program.

Alaska Resilience Center

Developing meaningful collaborations to make Department of Energy science actionable for Alaskans. University partnership with the DOE Los Alamos National Lab.



Arctic & Earth SIGNS and the GLOBE-Alaska Partnership

arcticandearthsigs.alaska.edu

Culturally responsive climate change education and youth-engaged environmental observing.



Center for Arctic Policy Studies • caps.uaf.edu

Facilitates sharing of University of Alaska expertise to more readily serve policy makers in the Arctic.



Cooperative Institute for Climate, Ocean & Ecosystem Studies • cicoes.alaska.edu

Connecting experts at universities to help meet NOAA's research, education and public engagement goals.



Experimental Arctic Prediction Initiative

<https://sites.google.com/alaska.edu/eapi>

Innovative seasonal and subseasonal weather prediction for the North.



Inspiring Girls* Expeditions Alaska • inspiringgirls-alaska.org

Free wilderness, science and art expeditions for high school youth.



NABOS • uaf-iarc.org/nabos

Studies changes in the Nansen & Amundsen Basins of the Arctic Ocean.



Navigating the New Arctic Community Office Education & Outreach Field Office

nna-co.org

Builds collaboration across Arctic research programs, capacity in early career researchers and education opportunities to support and expand convergent Arctic research.



Scenarios Network for Alaska + Arctic Planning • snap.uaf.edu

Transforms scientific research and data into actionable decision-support tools addressing environmental hazards, engineering, human health, wildfire, resource management and climate.





Making sense of Alaska's changing environment

BY HEATHER MCFARLAND

IARC released “Alaska’s Changing Environment 2.0” and its wildfire companion, providing timely, reliable and understandable information about how Alaska is changing, including impacts to Alaskans and their livelihoods and ways to improve decision making at the state and local level.

This is the second edition of both reports which were first published in 2019 and 2020 respectively. The inaugural

reports proved to be popular resources for educators, scientists, media and policymakers, and were read well over 10,000 times each.

“Alaska’s Changing Environment 2.0,” led by IARC’s Alaska Center for Climate Assessment and Preparedness (ACCAP), covers nearly two dozen topics ranging from temperature and precipitation to salmon and polar bears. More than 40 scientists and experts from across the state contributed to it, and it has been read over 8,000 times since its release in December 2024. The recent increase in extreme events like avalanches, landslides, floods, and coastal storms was a key highlight. Extreme events like these led to nearly three dozen weather- or climate-related state disasters over the past five years.

“Alaska’s Changing Wildfire Environment 2.0” was led by IARC’s Alaska Fire Science Consortium (AFSC) and co-created with wildfire managers. The wildfire management community in particular uses the reports extensively to communicate

AFSC’s Alison York and IARC educator Emily Sousa review the Alaska’s Changing Wildfire Environment 2.0 report during a teacher training in spring 2025.



Alaska's Changing Environment 2.0

Read it online at uaf-iarc.org/communicating-change

10,000
downloads

Alaska's Changing Wildfire Environment 2.0

Read it online at www.frames.gov/alaska



with the public, train new employees and brief leadership and legislators. It has been read over 3,300 times since its release in March 2025. The report updates key long-term wildfire trends and highlights the changes and impacts that have emerged or accelerated over the past five years. Recent massive wildfires in southwest Alaska — a region where wildfires have historically been rare — was a focus of this report.

Both reports are available in print and online. The high resolution report graphics can also be downloaded for free to communicate about wildfire and other climate impacts. These resources make it easy for individuals to find, access and share trustworthy and realistic assessments of environmental conditions.

3,300
downloads

Read the reports online at:

<https://uaf-iarc.org/communicating-change>



ABOVE: Eric Miller, BLM Alaska Fire Service Fire Ecologist, monitors controlled burn piles on April 14, 2025 along the Wildfire Walk trail that was designed by IARC's Alaska Fire Science Consortium.



Thawing permafrost and rusting rivers: Understanding the changes in the Arctic

BY DIEGO NOREÑA

Imagine a creek cutting through the Arctic tundra in Northwest Alaska. You'd probably picture water that is clear, icy, maybe even turquoise. The reality is that in many parts of the region streams are turning a "shocking vibrant orange or rust red."

That's how IARC researcher Go Iwahana describes the emerging "rusting river" phenomenon. Rusting rivers are one of the clearest visual signs of rapid permafrost change in Arctic Alaska.

Since 2018, streams in the Ikalukrok Creek watershed near the Red Dog Mine have begun showing signs of discoloration and

elevated amounts of total dissolved solids. Understanding those mechanisms requires looking at the water, the material composition, ice content and history of the permafrost.

Iwahana and colleagues set out to understand why rusting rivers were appearing so suddenly and in such remote areas. Climate data revealed that 2018 and 2019 brought exceptionally warm summers, triggering a rapid increase in permafrost temperatures. Those warm years led to the formation of taliks, unfrozen areas within permafrost, and the deepening of the active layer.

Masters student Caitlynn Hanna used the GIPL2 permafrost model to simulate how ground temperatures and active layer thickness have changed over time. Her work showed that increased snow accumulation in the region has further insulated the ground, reinforcing warming trends. As the active layer deepens, summer rainwater can penetrate deeper than in the past.

"If the thaw depths increase, the summer rainwater can infiltrate deeper down and reach acidic bedrocks," Iwahana explained. Once that water interacts with mineral-rich or sulfur-bearing layers, the dissolved materials flow into downstream waters, creating the rusty coloration and chemical peaks observed in monitoring data.

Crucially, Iwahana noted that "the increase in permafrost temperature happened before the peak of the stream chemistry change." That timing helped demonstrate a tight connection between permafrost warming and shifts in stream chemistry.

To complete this picture, the team combined remote sensing, modeling and fieldwork. High-resolution PlanetScope imagery mapped the expanding stretches of rust colored streams. InSAR analysis using images from satellites ALOS 2 and Sentinel-1 revealed up to 20 centimeters of ground subsidence in 2018-2019 in places, showing evidence of thawing ice-rich permafrost beneath the surface.

"We cannot stop global warming or permafrost degradation, but knowing what is included in permafrost and the timing of the temperature increases, we can be proactive and react appropriately."

- Go Iwahana

PREVIOUS PAGE:
Permafrost thaw releases
minerals and turns this
creek orange.

RIGHT: Masters student
Caitlynn Hanna in the
field, studying permafrost
degradation.



Permafrost cores added another layer of insight. Samples from the region contained yellow and orange-stained ground ice. “That ice was formed thousands of years ago,” Iwahana said. “And the color is exactly the same as what we see in the rusting river.” This suggests that similar chemical processes occurred naturally in the past, though today’s warming is accelerating them.

The project demonstrated that warming air temperatures, deeper seasonal thaw, talik formation, and mineral leaching are all interconnected. By tracing how these processes unfold, and in what order, the research provides a foundation for anticipating future events.

While permafrost thaw cannot be stopped, Iwahana emphasizes that knowledge can help communities prepare. “We cannot stop global warming or permafrost degradation,” he said. “But knowing what is included in permafrost and the timing of the temperature increases, we can be proactive and react appropriately.”

Permafrost thaw releases minerals, turning this creek orange.



A group of juvenile chinook salmon gather in front of the blocked culvert. Photo by Erik Schoen.

Spawning connections with Yukon salmon

BY LIA FERGUSON

A few miles from IARC, two graduate students, Kristen Reece and Raven Dawson, cast their lines into the rushing waters of the Chena River. They are hard at work, but you wouldn't know it from looking at them. Their research equipment might be mistaken for the kit of a well-prepared angler, but when they do catch a fish, the process looks a little different.

They begin by anesthetizing the fish with clove oil and gently pumping water through its body with a syringe to remove the stomach contents for study. Then they release the fish back into the cold embrace of the river with an empty stomach, feeling hungrier than before.

Reece and Dawson are part of a project run by IARC fish biologist Erik Schoen, who's interested in understanding the freshwater component of the decline of Chinook (king) salmon in the Yukon River Basin. They are

collecting data on the diets of salmon predators to illuminate the declining salmon problem that's been plaguing the region.

Yukon king salmon have been in decline for decades, with recent crashes causing a moratorium on subsistence fishing for this nutritionally and culturally important species. Multiple stressors are likely at work in this decline, with research pointing toward warming river and sea water, as well as disease and commercial fishing bycatch, but an often overlooked factor in king salmon decline is freshwater habitat change.

"There's this misconception that in Alaska our habitat is pristine...I think there are a lot of places where humans have changed the landscape, and there are opportunities to restore things," says Schoen.

The Chena River, where Dawson and Reece spent their summer, winds its way through Fairbanks, Alaska's second largest city. The Chena is also the second most productive king salmon hatching ground in the Yukon River Basin and provides an opportunity for Schoen's team to explore some of the ways this human-shaped habitat may be affecting salmon growth.

On one of their days in the field, the team gathered at the mouth of a blocked culvert on the upper Chena. At the mouth of the culvert, a group of juvenile salmon fed on drifting food and basked in warm water that filtered through the blockage. On the other side of the road was a slough that could provide more stable shelter, food and warmth for these little salmon.

"I always think of the littles," says Reece, who was previously the director of a preschool

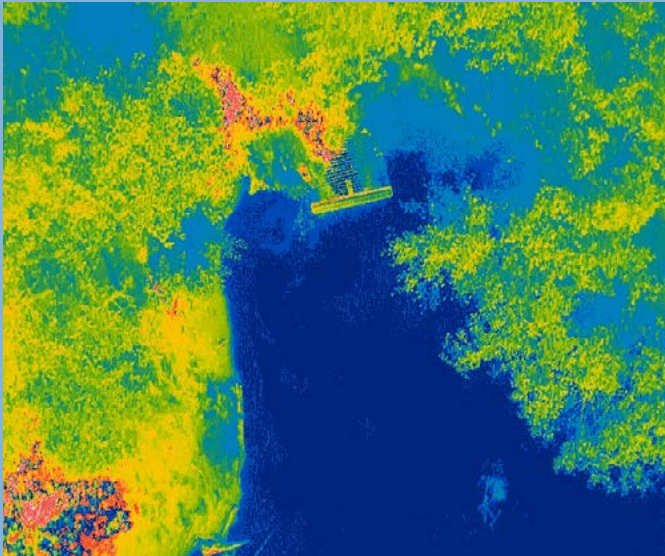
before returning to UAF. "There are a lot of people who are really focused on escapement goals and looking at the adult salmon, but if we think about the baby salmon and having a habitat for them, then we're already looking ahead for those adults."

The blocked culvert is emblematic of potential restoration projects that can take place along the Yukon's tributaries. However, ecosystems are never simple. Schoen explained, "say they fixed the culvert, replaced it, and salmon could get through, they could get eaten by a pike. There's potential that it would backfire because you're letting these salmon into an ecological trap, basically."

"The worry is that as the pike populations are increasing, and we know the king salmon populations are decreasing, that will put extra pressure and stop potential recovery of the salmon."

-Raven Dawson





This aerial thermal image shows a culvert allowing a slow trickle of warm water (light blue) to flow into the main stem of the Chena River (in dark blue at the bottom of the image). Juvenile salmon gathered here to feed.

Gif by Mike DeLue.

Predation by northern pike, a fish native to the area that can reach over 40 pounds, is another worry for salmon populations. "We know pike eat juvenile king salmon; we've heard stories of them eating full grown king salmon. The worry is that as the pike populations are increasing, and we know the king salmon populations are decreasing, that will put extra pressure and stop potential recovery of the salmon," said Dawson.

"Humans are another predator of salmon," said Schoen. "People have been part of this food web for thousands of years." One question the team hopes to answer is how our changing diets and cultural practices are affecting the ecosystem. To do this, Reece is interviewing Indigenous elders and hitting the university archives, looking at how life has changed for the communities on the Yukon.

Effective ecosystem research requires a perspective grounded in lived understanding that helps explain patterns like the ones Schoen's team is investigating. Immersed in the place they call home, the team has begun to piece together the many layers that define the ecosystem, allowing them to see the full story of the landscape and the solutions available.

*Erik Schoen inspects the blocked culvert on Hot Springs Road while IARC researchers, Jessica Garron, Mike DeLue and Raven Dawson take aerial temperature measurements.
Photo by Mike DeLue.*



Ice science from pre-k to grey

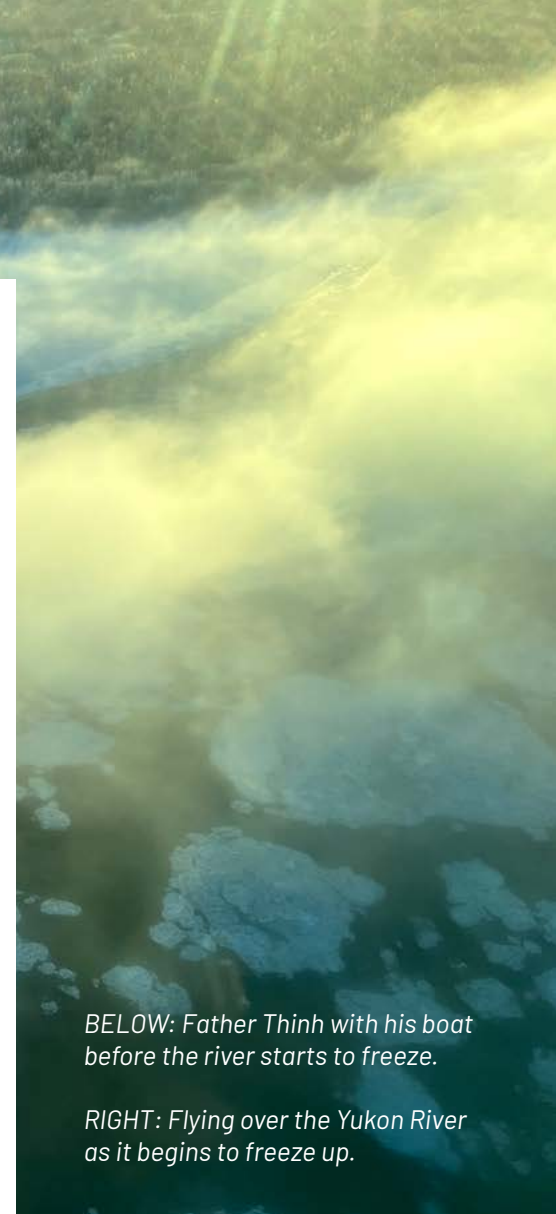
BY DIEGO NOREÑA

From pre-k to grey, IARC's Fresh Eyes on Ice (FEOI) project has involved students, educators, elders, pilots and even priests in the monitoring of ice conditions across Alaska. A top contributor is Father Thinh Van Tran, who serves in the Diocese of Fairbanks, in the towns of Nulato, Koyukuk, Galena and Kaltag, deep in the interior of Alaska.

Rivers serve as highways for Alaskans living off of the road system. In winter, if the ice fails, people's lives are at risk. In the fall, anticipation climbs when the river freezes and the water highway opens, providing a means of transportation again. Fr. Thinh described how the freezing of the Yukon River is an "exciting" event for Alaskans who rely on the frozen river for winter travel. "We are always waiting, waiting. When we see the cold, freezing cold, real cold temperatures, we're really happy with that because we know that it's really good freezing up and safe."

In 2024, Fr. Thinh fell through a slough near the Yukon river. "I broke the ice, my snow machine couldn't make it over the holes, then I fell into the water. There was a homestead two and a half miles from where I fell through, wolves and bears are still out there, so I took my axe and walked to that house. Then a guy at that house came out and helped me. I was so lucky."

Since 2019, Fresh Eyes on Ice has worked to connect Arctic communities and build a modernized water and ice observation network. The program's goal is to support and sustain observations of lake and river ice to inform public safety, document responses to a changing climate and promote science education and participation across the state of Alaska. The program also plays a critical role in



BELOW: Father Thinh with his boat before the river starts to freeze.

RIGHT: Flying over the Yukon River as it begins to freeze up.



“When we see the cold, freezing cold, real cold temperatures, we’re really happy with that because we know that it’s really good freezing up and safe.”

-Father Think

ground truthing what satellites see from the sky. The FEOI team found that satellites didn’t catch critical information observed by community monitors 23% of the time. Satellite data are made more robust and trustworthy when they are verified by local observers.

The local monitoring efforts are standardized using GLOBE (Global Learning and Observations to Benefit the Environment) research protocols, providing standard research methods for students and community members to make observations. The use of GLOBE in Fresh

Eyes on Ice is supported by the Arctic and Earth Signs project, a NASA-funded initiative focused on culturally responsive climate change education. It teaches youth science through the focus of climate change – a topic that will shape their future. Since 2019 over 4,000 participants have shared over 6,000 images of river and lake ice through the NASA GLOBE Observer app, the FEOI website and through social media.

This information is sent directly to the National Weather Service in real-time to help with travel safety and flood warnings.

To sustain the relationship and continue data collection, FEOI scientists completed a 1,500 mile traverse by snow machines over the course of 2022-2024, about 500 miles each year. Going this length, and by this mode of transportation on the rivers, to visit communities demonstrated the depth of commitment of the Fresh Eyes on Ice project to providing ways to monitor ice across Alaska.



Emily Lescak skis with her girls. Photo by Peter Bellino.



Stories of a family friendly workplace

BY HEATHER MCFARLAND

An 8-month-old was the youngest attendee at IARC's annual retreat this year. While colleagues lined up to strategize IARC's future, they took turns snuggling a squishy baby. This blending of work and personal life is not particularly unusual at IARC, which in August 2025 was one of eight employers that received the Family Friendly Workplace Award from the Greater Fairbanks Chamber of Commerce.

Chemical oceanographer Laura Whitmore was nine months pregnant at the retreat. Several months later — infant son in tow — she and her husband traveled to Kodiak to help mobilize the icebreaker Healy for an expedition to the Arctic Ocean. Though she didn't go on the cruise, she set up scientific instruments and trained colleagues on how to collect the water samples for her research.

"I was definitely nervous," Whitmore remembered. "Like, are we gonna get to the ship, and they're gonna be like, 'Get that baby off.'" But her peers were welcoming and flexible and

understood when she needed to pause to feed and care for her baby.

Now Whitmore and her husband both work 60% and share childcare duties. They often bring their toddler to work. He plays on the floor in their offices or naps in a stroller in the lab. He's been around Whitmore's scientific instruments so often that "he is a certified technician," she joked.

"What IARC does well is there is a community of families here," said Whitmore. "There is a general positivity around children."

Juggling kids' needs during the workday falls on IARC dads too.

Nathan Kettle is a social scientist with IARC's Alaska Center for Climate Assessment and Preparedness (ACCAP). During the school year he is responsible for pickups, after school activities, middle of the workday appointments and any unexpected needs of his two elementary-aged daughters. He deeply appreciates IARC and ACCAP's flexibility and their trust that he will get his work done even if it's not during a standard 9-5 schedule.

"It makes me proud of where I work," said Kettle. "Without this flexibility I would burn out because it wouldn't be sustainable. This environment enhances the work that I do."

Kettle feels that cultivating a family friendly workplace also leads to positive interactions between colleagues. "It creates a culture of strong team relationships, and enhances empathy and cooperation."

Emily Lescak, IARC's research coordinator who works remotely from Anchorage, wishes she found IARC earlier. For years she struggled to find a sustainable balance between work and raising her two daughters.

"I had my first daughter when I was in my last year of my Ph.D., then my second was born the second year of my postdoc. I thought I would never be able to pursue a career in academia. I felt that all these doors slammed behind me," Lescak remembered. "It just felt like it was a place where I didn't belong."

The expectation of a standard 40-hour, in-person work week at another job meant her girls regularly put in 10 hour-days between drop off and pickups. It negatively affected their health and well-being.

The family-first approach at IARC is supported by director Hajo Eicken's positive attitude toward

"What IARC does well is there is a community of families here. There is a general positivity around children."

-Laura Whitmore

kids. Lescak recalled a particularly memorable Zoom meeting when her daughters were curious and chatty and wanted to be included. Eicken engaged them in conversation and pulled out cool trinkets to show the girls. His willingness to spend time talking to her daughters made a lasting impression on Lescak.

Lescak expressed how grateful she is to be back supporting academia without having to sacrifice time with her kids. "I couldn't ask for a better situation!"

In addition to the unparalleled flexibility and welcoming family atmosphere at IARC, the Broadening Participation Working Group is looking at ways to improve infrastructure. Members are considering things like adding changing stations in the bathrooms and making a kids corner in one of the conference rooms.



Nancy Fresco takes a turn holding an "IARC baby" during the 2025 annual retreat. Photo by Lia Ferguson.



Laura Whitmore and her son check the seawater chemistry equipment. Photo by Lia Ferguson.



Nathan Kettle and his girls with their 38 pound home grown cabbage.

A new home for Arctic data launches

BY MIKE DELUE

A new Arctic Data Collaborative expands access to highly-curated, relevant Arctic datasets. Launched by IARC's Scenarios Network for Alaska + Arctic Planning (SNAP), the website offers streamlined data access to support researchers in the North.

A brief visit to arcticdatascience.org, known as ARDAC, reveals a breadth of data displayed clearly and concisely. Users can easily extract data and 'maps without gaps' for over 25,000 locations across the circumpolar North.

"ARDAC isn't a repository, and it's not global," explained Bruce Crevensten, the project's tech lead. "It's just the best available Arctic climate data, categorized by variable and 'alive' — you can see maps, charts and click to extract spreadsheets for application-driven analysis." That means you won't find a streamflow record from 20 years ago, or other solitary measurements on the site. Instead, users can access globally relevant measurements like mean annual air temperature, or more region-specific variables like number of summer days.

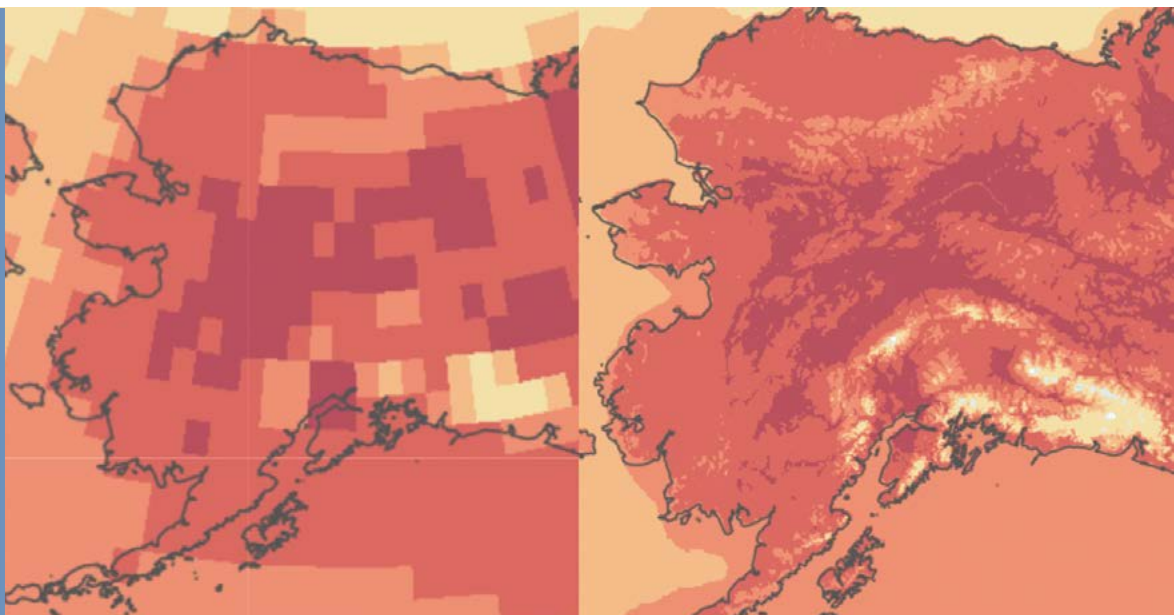
The Arctic Data Collaborative demonstrates SNAP's unique role at IARC. The team of programmers, researchers and communicators handle large scale climate model data and are well-known throughout the state for their accessible web tools.



"Our team has strong technical capacity and a deep familiarity with the peculiarities and challenges of Arctic data, and this combination has been instrumental in building ARDAC"

-Nancy Fresco

The website allows for the exploration of the best available temperature data at the original model output resolution of 1 degree (left) and downscaled to 4km (right).





"We provide easy access to climate data for people coming at the information from a variety of directions," explained Nancy Fresco, the group's network coordinator. "ARDAC, though, is different. It's a bit deeper and more detailed, because it's aimed at the research community."

The summer day variable is an example of one of the unique features of the website – easy browsing organized by variables that matter in the Arctic. While a 77°F day may be mild by global standards, research shows that this is a meaningful break-point for temperatures in the Arctic. In Alaska, 77°F is a "hot" day so that's the threshold on display in the tool. "Our team has strong technical capacity and a deep familiarity with the peculiarities and challenges of Arctic data, and this combination has been instrumental in building ARDAC," said Fresco. The recent addition of projected Canadian fire weather indexes also keeps the site regionally-relevant. Because Alaska's boreal forest more closely

ABOVE: Mike DeLue presents the capabilities of the tool during the official launch of ARDAC in August of 2024. Photo by Chynna Lockett.

RIGHT: An example climate stripe visualization available on demand through ARDAC which combines historical and projected climate data.

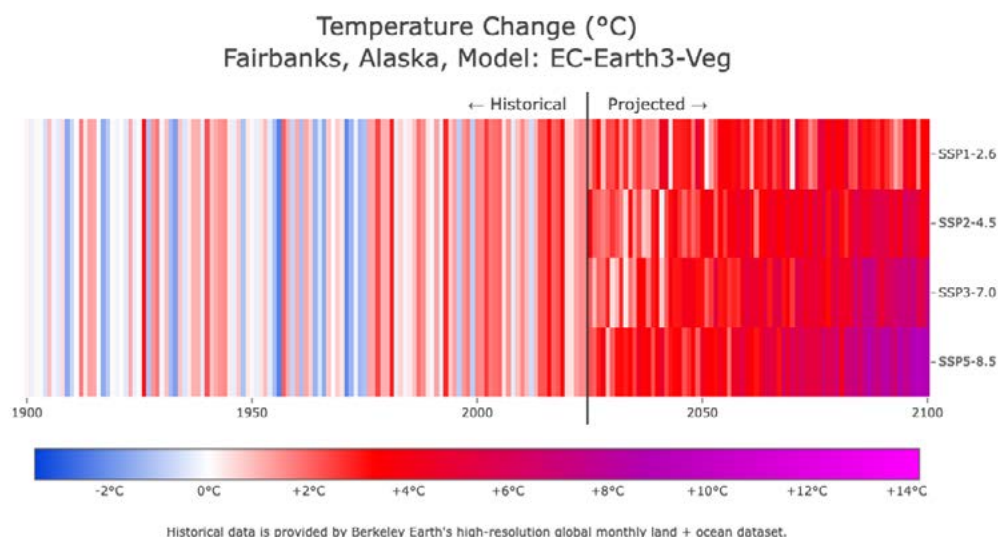
resembles the Canadian wildfire landscape, the state uses these Canadian measurements in place of the indexes popular in the contiguous United States for fire weather measurement and prediction.

There are three core types of entries in the Collaborative.

Data X-Rays provide a synoptic view of a single variable (or group of related variables) at a regional or pan-Arctic scale with explanations, maps, and widgets to explore the data – datasets which are enormous and otherwise challenging for researchers to download and analyze without extensive technical expertise.

Data stories weave text, visualizations and interactive widgets together to tell a story about climate data. These stories might summarize climate impacts to spruce beetle viability in Interior Alaska or illustrate differences between fine scale and coarse scale data in climate models using climate stripes.

Finally, **code examples** provide sample programming code explaining how to interact with SNAP's data services. They might explore the structure of a particular type of data or provide a template for procedurally combining climate data with data collected in the field.



Improving sea ice forecasts for rural Alaskans

BY HEATHER MCFARLAND

With the help of several IARC groups, the National Weather Service (NWS) designed and tested a new prototype wind tool for people living in rural northern Alaska. Hunters, local government, search and rescue staff and community researchers had previously identified the need for better wind forecasts in their region.

In coastal Arctic Alaska people rely on sea ice as a platform for hunting, fishing, and travel. To safely engage in these activities they need reliable sea ice and associated weather information. "If somebody could give me one useful piece of information for today, and for tomorrow, and for the next day, it's wind," said a Kotzebue resident during a project interview. "Because that controls everything. That controls how we make decisions...There's nothing more important than wind for figuring out whether you leave town or not."

Given the importance of sea ice for this region, the National Weather Service asked IARC's Alaska Center for Climate Assessment and Preparedness (ACCAP) and Alaska Arctic Observatory and Knowledge Hub (AAOKH)

to help gather feedback from coastal Arctic community residents to guide future delivery of NWS sea ice information. They wanted to explore ways to make weather and sea ice information, especially 10-day forecasts, more useful to communities, and to better understand how people in communities think about ice, use ice, and the kinds of ice information they need.

The project focused on two hub communities, Utqiagvik and Kotzebue, that serve over a dozen smaller communities. In 2023, ACCAP and AAOKH interviewed local experts about how they make travel decisions based on ice conditions, weather and climate-related information needs, and effective ways to communicate weather information. Based on guidance from the interviews, the National Weather Service created the prototype tool that shares 10-day wind forecasts for rural coastal communities.

Tapping into the expertise of AAOKH community-based observers, the project team held a workshop in 2024 to review the new wind prototype tool. The AAOKH observers reviewed sample forecasts and shared feedback to make them more useful on the ground, easier to find and other improvements.



Building a drone community of practice

BY MIKE DELUE

In 2018, John Henry, Deputy Director of the Native Village of Unalakleet, was seeing drones proliferate through the skies in Alaska and beyond. The buzzing robots got him wondering how they might be used to make better decisions for rural Alaska villages like his own, and who might be able to help him develop the idea. A few phone calls later and a recommendation from his longtime collaborator Margy Hall put him in contact with Jessica Garron, then lead scientist at the Alaska Center for Unmanned Aircraft Systems Integration.

"It was really a call out of the blue. But it didn't take long before I could tell that John, Margy and I could do some great work together," said Garron, now an IARC researcher, of their initial thoughts. Since then Garron has spent much of the past seven years growing the shared vision.

ABOVE: Allen Bondurant launches a drone to explore fish habitat at the confluence of the Delta and Tanana Rivers. Photo by Mike DeLue.

RIGHT: Jessica Garron presents to state and national representatives of the Department of Homeland Security in Anchorage in July of 2025. Photo by Jeff Kee.



“These partnerships are the foundation of the kind of data infrastructure and workforce development that is needed now for Alaskans to lead the world in drone use for operational decision-making.”

- Jessica Garron

Funded in large part by the US Department of Homeland Security (DHS) through the DHS Center of Excellence, Arctic Domain Awareness Center - ARCTIC (ADAC-ARCTIC), the work has trained a community of licensed and skilled drone pilots in Western Alaska to assess the environment for decision-making.

The first operational case came in 2022, during the wake of ex-Typhoon Merbok when near-real-time drone surveys of impacted communities collected by Garron's team were integrated directly into the State Emergency Operations Center for decision making after the storm. Since then more pilots have been trained, and new drones are now flying in communities along Alaska's Western coast from Kwigillingok to Shishmaref.

This distributed and well-trained drone community of practice (DCoP) relies on each other's expertise, experience and constant communication up and down the coast. In 2025, pilots from St. Michael and Unalakleet undertook a post-storm field campaign across Norton Sound, touching base with supporters in Fairbanks, but independently

training additional members of the DCoP while collecting thousands of images and developing orthomosaic maps.

“We’ve done about three flights here in Stebbins and we’ve just got one more to go before we’ll be out of batteries. Just in time before the light is gone. It’s been a good day!” said Stebbins community pilot Frank Myomick Jr. The goal is to have pilots in their own communities, flying missions designed by their tribe or city or non-profit, to make better decisions — all while knowing they can get help from the team at IARC if they run into an issue.





Data agreements between the DCoP, IARC, Alaska tribes and federal partners, facilitate Garron's team's ability to partner to monitor permafrost thaw, erosion and to support community planning and decision-making with recovery partners like FEMA.

Building on these experiences, her own remote-sensing expertise and an established DCoP team, Garron is developing new partnerships and objectives to accelerate operational science. "We are investing in technical partnerships with circumpolar data service providers and users to release these change detection technologies for use in austere operational environments, globally. These partnerships are the foundation of the kind of data infrastructure and workforce development that is needed now for Alaskans to lead the world in drone use for operational decision-making."

The next step is to support and utilize the infrastructure that the team has spent the past several years building for better decisions and better science. In 2026, Garron's team will be integrating real-time drone data collected by the DCoP into automated marine mammal detection processing streams with partners from Whaleseeker, Inc.

When Garron considers the future she can't help but note, "this multidisciplinary team is really at the cutting edge. Whether we're supporting Tribes' information needs in relocation, advancing capacity for marine mammal monitoring or mapping permafrost subsidence we're all excited about what's next for this ongoing collaboration and what it means for our Alaska."

COLLABORATION

PREVIOUS PAGE: Community pilots receive flight instruction from John Henry in Shaktoolik (left) and from Skydio Instructor Paul Cooper in Nome (right). Photos by Jessica Garron (left) and Mike DeLue (right).

ABOVE: The Skydio X10 drone flies autonomously during a 3D scan training flight in the Nome Beltz school gymnasium. Photo by Mike DeLue.

Behind the scenes filming Kristin Timm and Margaret Rudolf. Photo by Mike DeLue.



Lessons learned - Lessons taught

A small team at IARC is using the lessons learned from actionable science projects to teach others how to do engaged research in the Arctic.

With support from a University of Alaska Arctic Leadership Initiative grant, IARC researchers Margaret Rudolf and Kristin Timm, and science communicator Mike DeLue have released a Massive Open Online Course “Navigating Actionable Science in the Arctic” now available on the EdX platform. Content in the course follows the stages of a research project and passes along lessons learned from experiences in both Tribal and government actionable science work. USGS Research Scientist Jeremy Littell and IARC Senior Research Professional Adelheid Herrmann provide context across the course and are joined by practitioners who have collaborated on a number of IARC research projects. “We’re trying to address the training gap for actionable research. Everybody wants it, but there hasn’t been a lot of formal training until now” said Timm.

Visit the course



bit.ly/ActionableScienceMOOC

Transforming Arctic Research Outreach and Engagement

The best practices for science education and outreach in the Arctic have shifted dramatically over the past 30 years as “parachute scientists” presentations in classrooms have gradually been replaced by learner-centered approaches.

IARC’s Education and Outreach Field Office of the Navigating the New Arctic Community Office, led by IARC researchers Elena Sparrow and Katie Spellman, with collaborators from IARC and University of Colorado Boulder, are working to continue this transformation through a new mini-course. Through hands-on practice and examples, this course introduces scientists to the principles of evidence-based, community-centered design for education and outreach. “How do you know what the community or classroom wants or needs to learn from your time with them? How do we braid local knowledge and the research? What are the right teaching and learning frameworks to use? These are the kinds of questions this course gets at,” said Sparrow.

Visit the course



bit.ly/Arctic-Classroom



Eran Hood and Amy Holt fly a drone survey over Suicide Basin. Photo by Diego Noreña.

Community tools for recurring glacial outburst floods

Since Suicide Basin began draining into Mendenhall Valley in 2011, residents have increasingly relied on information about flood risk. Thanks to funding from IARC's Alaska Climate Adaptation Science Center (AK CASC), that information is now easier to access.

In 2025, the AK CASC supported the development of a new flood dashboard, a project led by University of Alaska Southeast professor Eran Hood, research assistant Sean Fagan, and currently being transitioned for long-term management to IARC's Scenarios Network for Alaska + Arctic Planning (SNAP). The dashboard provides residents with flood inundation maps and was visited over 500,000 times in the summer of 2025. Residents can plug in their address and see at what flood stage their home might become compromised. In addition to the flood maps, AK CASC Science Communication intern Diego Noreña created an ArcGis storymap, which explains the lifecycle of glacial lake outburst floods. Taken together, the dashboard and story map translate scientific data into accessible, place based information.



Visit the Dashboard



<https://juneauflood.org>

Visit the Story Map



<https://bit.ly/4plx0SU>

Eran Hood flies drone survey in front of Suicide Basin. Photo by Diego Noreña.

NEXT PAGE: Suicide Basin.
Photo by Diego Noreña.



Resilient by design: Planning for Alaska's future climate

In April of 2025, participants traveled to Fairbanks from nine communities, primarily from the Yukon-Kuskokwim Delta, for the Climate Information and Adaptation Planning Workshop hosted by the Alaska Climate Adaptation Science Center's (AK CASC) Tribal Resilience Learning Network (TRLN).

The goal of this gathering was to create a hands-on learning space for finding, interpreting and applying climate projections and publically available imagery that can be used in climate adaptation planning. In addition to learning how to use climate projections and remote sensing tools, including tools from IARC's Scenarios Network for Alaska + Arctic Planning (SNAP), participants shared climate adaptation strategies from years of engaging in complex systems of funding, research, land rights and rapid change. The workshop included presentations from residents of Hooper Bay, Kipnuk and Kwigillingok – villages facing existential climate threats due to permafrost thaw and increasing extreme storms. The group was brought together in the name of resilience, which isn't just a matter of spirit, but a question of preparedness, accessibility and resources. Access to climate projections and cutting-edge science help communities predict and communicate changes occurring to their homes.

Kuigilnguq (Kwigillingok), Alaska

Native Village of Kwigillingok, Alaska is a Yup'ik community located on the western shore of the Kuskokwim River.

Lucy Martin, Tribal Resilience Planning Assistant
November 2, 2024



Lucy Martin, Tribal Resilience Coordinator for Native Village of Kwigillingok presents on the village's adaptation strategies.

The next generation of food security leaders



Food security is an increasing concern across Alaska, Arizona, Guam and Hawai'i, where communities face both shared and region-specific pressures – from record-breaking heat and drought, to ocean acidification and rising seas, to receding glaciers and melting permafrost.

Despite their differences, these regions similarly face significant climatic challenges, are located at the end of long food supply chains where most food must be imported and have large Indigenous populations with deep knowledge of local ecosystems. Recognizing these shared challenges, universities from each region are collaborating through the Next Generation (NextGen) program, funded by the U.S. Department of Agriculture. "The overall purpose of the project is to create a more diverse workforce to address food security and land management under conditions of rapid ongoing change," says IARC researcher, Nancy Fresco. Every year since 2023, Fresco and her colleagues bring climate expertise to agriculture, support student scholarships, and host a climate symposium that helps students build fluency in climate science and resilience thinking.

Publications & Multimedia

Recently published by IARC authors



Alaska's Changing Environment 2.0

Edited by Rick Thoman & Heather McFarland.
Published by Alaska Center for Climate Assessment and Preparedness, IARC, UAF.

A clear, timely look at Alaska's rapidly changing climate and its impacts.



Alaska's Changing Wildfire Environment 2.0

Edited by Zav Grabinski & Heather McFarland.
Published by Alaska Fire Science Consortium, IARC, University of Alaska Fairbanks.

An overview of the shifting wildfire environment shaping life and ecosystems in Alaska.

Co-Production of Knowledge in Arctic Research: A Paradigm Shift or Another Cycle of Oppression?

Chapter by IARC postdoctoral researcher Margaret Ruldolf in Indigenous Critical Reflections on Traditional Ecological Knowledge, edited by Lara A. Jacobs, published by Oregon State University Press.

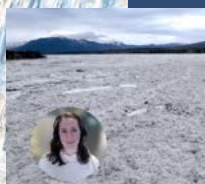
Reflections on co-production of knowledge through Inupiaq values and lived experience. Image courtesy of Oregon State University Press. The cover showcases Mvskoke/Choctaw artist Rhode Grayson's artwork.



Fresh Eyes Drone Pilots on Ice

By IARC's Fresh Eyes on Ice Project.

Film documenting how drone pilots and scientists team up to explore and monitor Alaska's river and lake ice.



Alaska Voices - Season 2

Produced by Micah Hahn, Lia Ferguson, Mike Delue, Diego Noreña and Annika Ord at the Alaska Climate Adaptation Science Center.

Podcast featuring the stories of Alaskans dealing with one of the most rapidly changing environments on Earth.



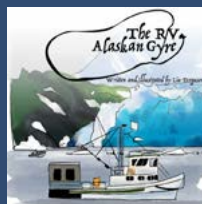
It's All About the Happy People: Sea Ice and Whaling on Alaska's North Coast

By former IARC graduate student Kimberly Pikok and Lloyd Pikok Jr.

Uplifting and joyful film centering local voices, experiences and livelihoods around the Arctic sea ice and whaling.

The R/V Alaskan Gyre

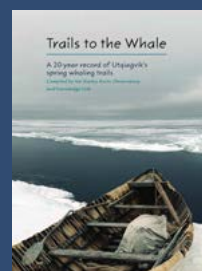
By Lia Ferguson at the Alaska Climate Adaptation Science Center. Published by Alaska Climate Adaptation Science Center, International Arctic Research Center, University of Alaska Fairbanks.



An illustrated overview of Alaska's coastal science, created with USGS scientists and inspired by adventures of the USGS's Research Vessel Alaskan Gyre.

Trails to the Whale: A 20-year record of Utqiagvik's spring whaling trails

By Alaska Arctic Observatory and Knowledge Hub. Edited and compiled by Matthew L. Druckenmiller, Joshua Jones, Roberta Tuurraq Glenn-Borade, Kimberly Kivvaq Pikok, and Donna D. W. Hauser. Report for the Barrow Whaling Captain's Association.



Celebrating 20 years of trail mapping and spring whaling collaboration in Utqiagvik.

Alaska Weather Voices

Produced by Elizabeth Carter at the Alaska Center for Climate Assessment and Preparedness.



Special 4-episode miniseries of the Alaska Voices podcast featuring Alaska's beloved weather and climate communicator, Rick Thoman.

Help us make a difference!

Climate change is one of the greatest challenges facing Alaska today. Arctic residents experience a near constant barrage of new threats, from severe weather extremes, to failing infrastructure and changing subsistence resources. Climate research can give communities, agencies and private enterprise an advantage to better understand and address climate change impacts. Sound climate modeling and localized data can help Alaskans be proactive about the future.

You can support our team of world renowned scientists, talented staff, and forward thinking students whose research makes a difference in the lives of Alaskans. Consider making a donation to our fund, **Alaska Climate Research Makes a Difference Fund**. With your support, IARC scientists can:

- Nimbly respond to needs of Alaskans adapting to climate change
- Build strong collaborative relationships with Indigenous communities, private sector, agency partners and policy makers
- Providing trusted climate information to the public
- Engage students in meaningful climate change research

Make your donation today: uaf-iarc.org/donate

Researchers on the NABOS 2025 scientific cruise work to assess the state of the eastern Arctic Ocean. U.S. Coast Guard photo by Petty Officer 3rd Class Chris Sappey.



Let's connect

linktr.ee/IARC_Alaska



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