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A Small Fire with a Big Legacy

The Yankovich Road Fire may have been a minor blaze – it consumed less than 4 acres – but the conflagration looms large in the eyes of Alaskan fire researchers, including members of the Alaska NSF EPSCoR Boreal Fires team. They've taken advantage of the fire's convenient location on the University of Alaska Fairbanks North Campus to install monitoring transects for research and training purposes, and plan to erect a set of interpretive signs to raise public awareness of wildfires.

"It's mostly just that it's so easily accessible," said Alison York, coordinator for the UAF Alaska Fire Science Consortium (AFSC). "People know where it is, you can park there, you don't need a permit… It just hit all of us at the same time, this could be a really nice self-guided tour opportunity."

Photo by Leif Van Cise/University of Alaska Fairbanks

Researchers led by Alison York hike through the Yankovich Road Fire site in August 2022.

The Yankovich Road Fire began on the afternoon of July 16, 2021 on the northern edge of UAF, only a short distance away from the Skarland Ski Trail and from dozens of homes. Investigators concluded that a lightning strike had ignited the blaze a few days earlier, and it then smoldered until it was detected. Fortunately, the fire spread slowly due to calm conditions, and there were relatively few other fires in the state at the time, so firefighters were able to respond quickly with helicopter and airplane water drops, ground crews and even eight smokejumpers. The fire was swiftly contained to 3.6 acres, and stopped about 330 feet from the closest home.

What was left behind was a representative example of a burn in the wildland-urban interface – the area where houses intermix with burnable forests – that's a 10-minute walk from a public parking lot at the UAF Large Animal Research Station (LARS). Eric Miller, a Fire Ecologist with the Bureau of Land Management Alaska Fire Service, quickly saw the educational possibilities of the site. "What I was after was installing some transects to blend science and education, because I knew that often we have people coming into town, visiting scholars, or students, or collaborators, and they want to come out and look at a burn," Miller explained.

Under Miller's direction, researchers with BLM, the AFSC and EPSCoR descended on the area later in 2021 to install permanently marked transects to track post-fire changes in vegetation, permafrost, and fuel accumulation. They set up 30-meter transects both inside the burn and nearby to serve as controls, and sampled the transects in both 2021 and 2022 to track

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From the PI

Brenda Konar, Principal Investigator

Hello everyone,

"Glaciers to Gulf" is out the door!

After more than eight months of meetings, community visits, whiteboard brainstorming, writing, editing, and refining, a team of UA faculty hit the proverbial "send" button on August 22 to submit a proposal for the next phase of EPSCoR funding. Glaciers to Gulf is a five-year (2023-28), $20 million proposal to examine how changing land-ocean connections alter the living ocean resources used in mariculture and subsistence harvests. We're now playing the waiting game: we anticipate potential follow-up questions from the NSF within the next month, and a decision on funding the proposal will come in the spring.

It's been a relief to be able to once again focus on Fire & Ice, which recently wrapped up its final full season of fieldwork and began its fifth and final project year. The chief focus of Year 5 will be analyzing and synthesizing all of the data we've gathered since 2018 and publishing

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Yankovich Fire

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changes including living and dead trees, ground-level vegetation, permafrost depth, the thickness of the organic soil ("duff") on the forest floor, burn severity, age of the burned trees, and the state of the substrate. York said one area of particular interest is the depth and state of the duff – she noted that the dryness of duff can be a major indicator of likely fire severity, and also that duff can lead to "zombie fires" under some conditions that can smolder for days, weeks or an entire winter before reigniting.

Fire researchers plan to sample the transects annually to track changes; chief among their interests are the speed and amount of colonization by invasive species such as vetch, white sweet clover, and dandelion, as well as what form the forest will take as it regenerates. "I think what people are interested in is whether the site is going to come back to black spruce, which it was before the fire, or whether it's going to transform to a deciduous birch-aspen kind of forest," Miller noted. "It's still kind of early to say."

Miller stresses that though the transects will provide valuable data, their main purpose is to provide a field classroom for education. Several EPSCoR faculty and students have taken part in their installation and monitoring, learning how to follow the protocols used to

Photo by Zav Grabinski/Alaska Fire Science Consortium

Researchers Chris Waigl and Eric Miller measure tree heights with a laser tree altimeter at the Yankovich Road Fire site in August 2021.

monitor fire effects in Alaska. This field data collection is key to ground-truthing EPSCoR Boreal Fires projects that use remotely sensed data from aircraft or satellites to map vegetation and fire severity across broad areas of Interior Alaska.

Miller has also been using the site to teach out-of-state fire crews about the boreal fire regime. At the same time, the site has quickly become a destination for guided field trips, including visits by school groups, participants in the "In A Time of Change" art and science collaboration project, and tours organized by the Alaska Chapter of the

Photo by Zav Grabinski/Alaska Fire Science Consortium

Researchers at the Yankovich Road Fire site in August 2021.

Society of American Foresters and the National Indian Timber Symposium.

These visits in turn have grown into a larger project to make the fire site easily accessible to the public at large. The project team plans to install interpretive signage on a route leading from the LARS parking lot to the fire site on topics including the importance of wildland fire to the ecosystem; wildland fire management; ecological succession; the impacts of climate change to the boreal forest; and the importance of taking steps to protect homes from wildfire.

"The agencies that we work with said, we would really like to have some help in public education, especially around climate change and the wildland-urban interface," York said. "To show that Alaskan residents need to be prepared that on any random July afternoon, a fire could be erupting in the woods behind your backyard."

The general plan has been approved by UAF campus authorities, and the team will be working on graphics and specific messages for the signage over the winter with the goal of installation in summer 2023. Up to a dozen signs are planned and a short wood-chip trail would be installed through part of the burn site to improve access. Researchers also plan to interview nearby homeowners about their experience of the fire for an episode of the Alaska Voices podcast. The signs will include QR codes to enable visitors to find more details online, including updated information on changes to the site over time.

"There is interesting stuff at the site," Miller noted. "Every time we go out there we notice something new."

Financial support for the signage comes from the Alaska Fire Science Consortium, Alaska NSF EPSCoR, the USDA National Institute of Food and Agriculture Hatch project 1018914, and the State of Alaska. For more information visit the Alaska Fire Science Consortium web page about the project.●

"Glaciers to Gulf" Proposal Submitted

In August, a team of UA faculty submitted a proposal to fund the next five years of Alaska NSF EPSCoR research. Entitled "RII Track-1: Glaciers to Gulf: Assessing Climate-Induced Shifts to Marine Resources Critical to Gulf of Alaska Communities (G2G)," the $20 million project would study how changing land-ocean connections alter ocean resources used in mariculture and subsistence harvests. Below is the Project Summary submitted to the National Science Foundation as part of the proposal package.

Overview. Climate change and associated landscape changes are substantially altering the export of freshwater, sediments, and nutrients from coastal watersheds into the nearshore Gulf of Alaska and impacting critical marine ecosystems. This presents an unprecedented challenge to the harvesting and farming of marine resources, a mainstay of the economy and lifestyle of coastal residents throughout the North. The Glaciers to Gulf (G2G) project will build capacity to determine the impacts of climate change on marine species important to Gulf of Alaska coastal communities. G2G will use remote sensing, modeling, environmental data, biological field surveys, and lab and field experiments to understand and quantify changes to freshwater and material export into the Gulf of Alaska, and how they alter marine ecosystems and species of economic, subsistence, and cultural importance.

Photo courtesy Brenda Konar

G2G team members Scott Gabara (center) and Schery Umanzor (right) visit Jim Aguiar (left), owner of the Eagle Shellfish oyster farm in Simpson Lagoon outside Cordova.

The project will provide accurate and comprehensive data streams as well as web tools, reports and visualizations for use in preparing for, and responding to, climate-driven changes to key resources, including harvested species such as red seaweeds, clams, mussels, bidarki, salmon, and eulachon as well as farmed species such as oysters, mussels and kelp. This is a research focus of the University of Alaska, and the pressing need for increased research capacity in this area is recognized in Alaska's Science and Technology Plan as well as in a recent Alaska Mariculture Development Plan. The focus also reflects the express needs of community stakeholders, who contributed significantly to the proposal and will be heavily involved in the project.

G2G research will be conducted by three integrated teams that concentrate key expertise across disciplines and UA campuses, and entails the hire of four tenure-track faculty, six postdoctoral researchers and at least 75 students. A Terrestrial team will examine how watershed hydrologic drivers like glacier recession, groundwater discharge, and extreme events impact land-to-ocean biogeochemical, freshwater, and sediment export. A Marine team will combine Terrestrial team findings with data from a spectrum of glacial to non-glacial estuaries to determine how changing land-ocean connections impact important harvested and farmed species. A Human Dimensions team will document changes to community harvests and use of wild resources over time, and will work with researchers and local residents to co-produce knowledge and to create web-based tools to inform local adaptation strategies.

Intellectual Merit. G2G will pioneer integrative methods for land-to-ocean ecosystem study, which will generate scientific knowledge and facilitate innovative management to help communities address impacts of ecological change. Potentially transformative elements of the project include a collaborative research agenda driven by local stakeholders; wintertime and storm-event water sampling and discharge measurements; characterization of genetic connectivity and local adaptation of keystone blue mussels; the generation of a suite of climatic indices for important salmon and forage fish populations; and the use of a workshop format to co-produce web-based tools suited to marine harvester needs. Methods and findings will be applicable across northern coastal ecosystems and transferable to lower latitudes as well, and will result in at least 50 peer-reviewed publications and 100 applications for further funding.

Broader Impacts. G2G will co-produce web tools, reports and visualizations with managers, communities, Alaska Native groups, and other stakeholders along the Gulf of Alaska, an area that contains numerous subsistence-based Indigenous communities; a mariculture industry poised for rapid growth; and much of the state's population. Regular stakeholder meetings will enable two-way conversation about data collection and sharing, findings, and integration of results into useful tools. A Workforce Development, Education and Broadening Participation (WEB) team will partner with researchers to involve more than 3,500 Alaskans in G2G activities organized around a place-based, locally relevant educational framework. WEB efforts will include a traveling art-science exhibition; experiential field learning programs for high school students; internships and scholarships for Alaska Native students; fellowships for G2G scientists; and focused economic and workforce development initiatives to spur entrepreneurship in G2G communities.●

Data, Directly

By Joey Hogenson, Alaska NSF EPSCoR

Fire & Ice researchers Julie Schram and Jessica Glass are doing things the easy way.

At least, that's the idea. Schram, a Co-PI (and a faculty hire) of Fire & Ice and Assistant Professor of Animal Physiology at the University of Alaska Southeast, and Glass, a fellow Fire & Ice faculty hire and an Assistant Professor in the UAF College of Fisheries and Ocean Sciences, are using biochemical lab techniques that enable them to collect data about marine life and their interactions without having to directly observe them in real time.

Schram's students and colleagues are collecting marine invertebrates and seaweeds each month at selected Kachemak Bay and Juneau-area watersheds. They then freeze-dry the samples and crush them into a fine powder before extracting lipids from the organisms, which will be analyzed to gain a better understanding of the

Photo by Joey Hogenson/Alaska NSF EPSCoR

F&I researcher Julie Schram extracts lipids in her laboratory, located at Lena Point Fisheries Facility in Juneau.

respective organisms' diets and their overall condition. This information will be linked to environmental sensor data collected at the same sites and compared with stable isotope data collected by F&I researcher Katrin Iken and her students, helping us to increase our understanding of how environment influences organisms' conditions.

Additionally, Schram is working with UAF postdoctoral researcher Scotty Gabara and UAS undergraduate Gracelyn Ham on projects that combine field and laboratory experiments to better understand how glacial melt affects seaweed nutritional quality and how that may influence different aspects of intertidal marine invertebrates. Gabara conducted a lab experiment in which he measured the feeding rates of periwinkles and limpets collected from sites with different glacier extents over five months. His work will help us better understand how the amount of glaciation of a watershed impacts the nutritional quality of the seaweeds consumed by these herbivorous invertebrates. Ham's experiment focuses

Photo by Joey Hogenson/Alaska NSF EPSCoR

(l to r) UAF Master's student Maris Goodwin and UAS undergraduate Gracelyn Ham gather water samples for eDNA research near Juneau.

on how glacial melt may affect blue mussels, in terms of both their nutritional condition and characteristics like adhesion to rock surfaces and shell strength.

In conjunction with Schram's research, Glass' research team is collecting water samples from the same coastal sites and analyzing their environmental DNA (eDNA), which is DNA found free-floating in the water. This enables researchers to measure biodiversity across the Tree of Life, from fishes to invertebrates to seabirds and mammals, without having to collect each and every specimen. The team collects and filters ocean water, then uses Polymerase Chain Reaction (PCR) metabarcoding techniques to amplify DNA found in the sample. Once tests are completed they show what species' DNA was present in the water and in what amounts, shedding light on biodiversity at the sampling site.

These innovative techniques have the potential to

Photo by Joey Hogenson/Alaska NSF EPSCoR

Goodwin filters water samples to retrieve sediment for eDNA testing.

significantly expedite research into marine biodiversity and food webs, increasing our knowledge about northern marine environments undergoing climate-related changes. ●

Keeping up with Current Events

Think of them as high-tech messages in a bottle.

Since 2019, EPSCoR researchers led by UAF Professor of Oceanography Mark Johnson have been deploying drifters into Kachemak Bay and Lynn Canal and seeing where they end up.

“The drifters track the surface currents, with positions collected at ten-minute intervals,” explained Johnson. “The data from all years are combined to create a map of the surface circulation that can be used to assess freshwater and larval pathways, and to provide insight about the fate of possible pollutants.”

From 2019-21, 170 drifters were dropped from research boats into Kachemak Bay, and 23 into Lynn Canal. Fire & Ice PI Brenda Konar and her students handled both deployment and recovery of all of the Kachemak Bay drifters. Johnson said that the vast majority of drifters in Kachemak Bay have been recovered and reused, but that the Lynn Canal drifters tend to head out to the open ocean and are harder to recover, which is part of the reason there have been fewer deployments there.

The drifters are equipped with GPSes and telemetry devices, as well as data loggers to track temperature and salinity. The GPSes and telemetry are used to track the drifters’ patterns of dispersion – scientists deploy four drifters at a time and record how they spread apart. Seeing how dispersion patterns diverge in different areas enables discoveries about how larvae, freshwater, dissolved gases, nutrients and contaminants behave in the water column.

Johnson said the drifters have led to a number of discoveries about currents and freshwater mixing, including one that stretches across regions. “The key finding for the big picture is that Lynn Canal and Kachemak Bay are connected, as we’ve had drifters exit Lynn Canal and drift to the west of Cook Inlet,” he noted. “This means that larvae have the potential to be transported from Lynn Canal to Kachemak Bay.”

Photo by Brenda Konar/Alaska NSF EPSCoR

F&I student researchers Michael Kim, Jennifer Tusten, Emily Reynolds and Samantha Allen recover drifters on Kachemak Bay in summer 2022.

In terms of freshwater mixing, Johnson said the data show that both freshwater inputs and local winds combine to move the surface layer, and freshwater, around Kachemak Bay. He said they’ve found that the Wosnesenski River provides a considerable amount of freshwater to inner Kachemak Bay, but that more research needs to be done to understand the timing of it. The data also indicate that freshwater inputs are mixed into the upper 20 meters of the water column over the course of about a month, and then mix more deeply over a longer period.

Johnson and other F&I Stream Team researchers are preparing a manuscript on the subject. They also continued deploying drifters in 2022.●

Letter from the PI

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the results. We’ve already put out close to 50 articles based on F&I research and I’m looking forward to seeing what sort of synthesis papers and products come out of us putting our collective heads together over the next year.

It’s also been a very busy few months in terms of EPSCoR events and activities. We handed out a final round of seed grants to students and faculty as well as 33 travel awards, which folks will be using to attend AGU, the Alaska Marine Science Symposium, and a raft of other events. We helped run workshops on implicit bias, science communication, grant-writing, facilitation, and even NFT’s. Led by our Student Ambassadors, we put together five presentations about career opportunities for UA students. You can find recordings of many of these events on the EPSCoR website – and while you’re there, be sure to check out Faces of STEM, a set of 10 interviews we put together to display the many routes people have taken to STEM careers.

A highlight of the coming month will be the EPSCoR National Conference, which will be held in Portland, Maine. I’m looking forward to seeing some of you there – and speaking of seeing people in person, if you’re on the UAF campus please feel free to join us on Monday mornings at 10 AM for our Snack Breaks, right outside the EPSCoR office suite on the second floor of WRRB. They’ve been a welcome opportunity to put names to faces and to interact with people outside of a Zoom screen.

And along those same lines, I’m happy to announce our 2023 All-Hands Meeting will take place in person, and we’re tentatively planning to hold it at the Alyeska Resort in Girdwood. So keep up the good work, and mark your calendars for February 8-9!

Sincerely,

Brenda Konar

EPSCoR in Brief

Faces of STEM

EPSCoR has completed a set of 10 interviews with University of Alaska students who went on to succeed in science, technology, education and math (STEM) careers. Interviewees include (pictured, from top to bottom) pediatrician Carla Cartagena de Jesus, engineer Shawn Takak, and ecologist Nikki Grant-Hoffman, among many others.

The goal of the project is to showcase the different journeys Alaskans have made to prosper in STEM, and to encourage diverse UA students to picture themselves in STEM fields. The interviews were conducted by EPSCoR Southeast/Southcentral Outreach Coordinator Courtney Breest and are hosted on the EPSCoR website. They're also being shared widely across the UA.

Student Ambassador presentations

EPSCoR's Student Ambassador program pairs two graduate students with program leads to brainstorm content for student meetings and events. In spring 2022 the ambassadors gathered speakers for five presentations focused on career skills and career exploration. Three are available for viewing:

- "Working with nonprofits" (passcode: e0?B&&X*)
- "Research careers outside academia and resume writing" (passcode: +Aq5!yHm)
- "The NOAA Corps" (passcode: 674L#=YG)

Save the Dates

Three upcoming EPSCoR events are worth noting. First, on January 11-12 EPSCoR and Alaska INBRE are teaming up to offer a targeted professional development workshop called "IGNITE: Individual Growth and New Ideas Through EPSCoR/INBRE."

Second, the 2023 Fire & Ice All-Hands Meeting is set for February 8-9. The tentative location is Girdwood.

Third, EPSCoR is helping stage a Science Olympiad for Alaskan middle-school students February 24-25 on the UAF campus. See the event's website for information about registering a team.

Alaska TREND "Phase 0" winners

Alaska NSF EPSCoR has maintained a longtime partnership with the Technology Research and Development Center of Alaska (Alaska TREND), a UAA-based economic development organization. One major role of EPSCoR is to competitively provide "Phase 0" grants to Alaskan entrepreneurs, which they can then use to make themselves more competitive for larger federal grant funding. EPSCoR awarded five grants this year:

- **GRAYSTAR Pacific Inc.** (Anchorage) is developing novel medical products, as well as technologies to reduce discharge of waste to the environment and to enhance rural economic development.
- **North Iron Engineering, LLC** (Anchorage) is developing a low-cost, high-throughput method to chemically remove contaminants from soil waste streams.
- **Golden Umbrella Growth** (Fairbanks) is producing unique cold-tolerance cucumber seedlings and facilitating the adoption of the new cultivars in Alaska.
- **PKS Consulting, Inc.** (Anchorage) is developing a process to upcycle beach plastic into plastic lumber.
- **Airhounds, LLC** (Anchorage) is developing wearable sensors that enable people to track their risk of infection from airborne disease in real time.

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If you wish to be added to (or removed from) the EPSCoR mailing list, please contact ua-epscor@alaska.edu.