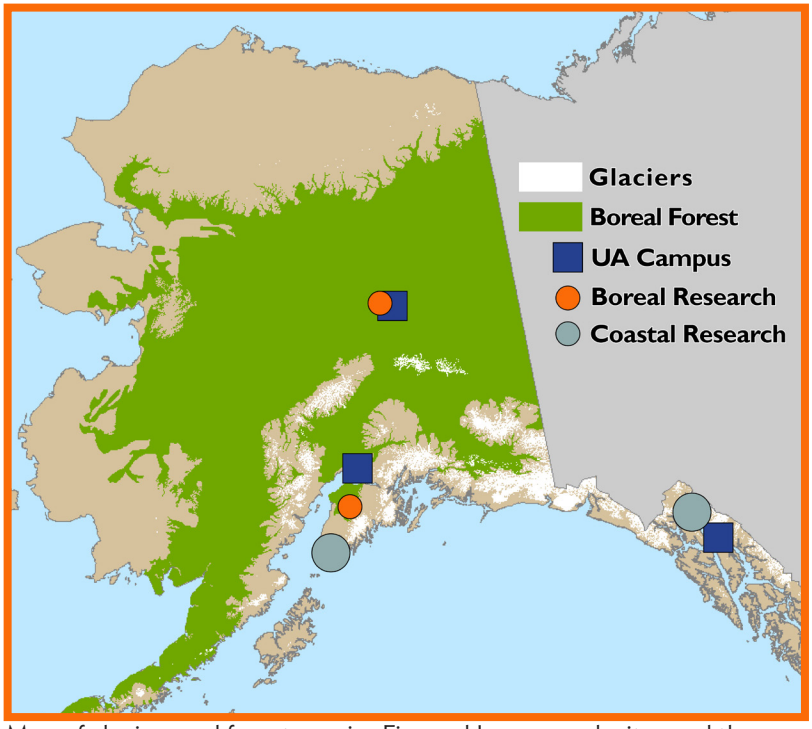
Fire and Ice

Navigating Variability in Boreal Wildfire Regimes and Subarctic Coastal Ecosystems

"Fire and Ice" is a 5-year (2018-23), $20 million effort to study changes to fire risk and behavior in **Alaska's boreal forest**, and changes to physical and chemical conditions impacting ecosystems and organisms in the nearshore **Gulf of Alaska**. Scientists across the University of Alaska (UA) will use remote sensing, fieldwork, lab experiments, and models to study these climate-driven changes to critical ecological systems.

A **Boreal Fires** team will identify large-scale climate factors impacting fire weather, and use advanced remote sensing to better map and measure fire fuels and active fire behavior. They'll also conduct research into fire management in settled areas like the Kenai Peninsula, and into the ways fire impacts subsistence resources. Researchers will develop new techniques for evaluating fire risk; better methods of processing remote sensing data; improved fire spread models; online fire forecast tools; and outreach products for fire managers.



Map of glaciers and forests, major Fire and Ice research sites and the three main University of Alaska campuses.

A **Coastal Margins** team will determine how climate change is altering the volume and character of materials that flow from land and rivers into the Gulf of Alaska, and how this affects communities of organisms in the nearshore. The team will study how large-scale ocean processes impact the nearshore marine environment, and establish how different levels of upstream glaciation can change characteristics of communities of nearshore organisms. They'll determine how organisms' physiological responses to physical conditions vary along different levels of glaciation, and study how fishing communities respond to changes in the availability of key marine species. Researchers will generate biological, physical and chemical data, as well as vulnerability assessments that will aid in managing resources.

A **Diversity, Education and Workforce Development** (DEW) team will involve more than 1,500 Alaskans in Fire and Ice activities, including K-12 out-of-school programs and teacher workshops; scientific expeditions for high-school girls; and UA mentoring, courses and training. DEW will also conduct research into formation of a science identity in first-generation college students, who will be a focus of F&I diversity efforts, along with women and Alaska Natives.

Alaska EPSCoR

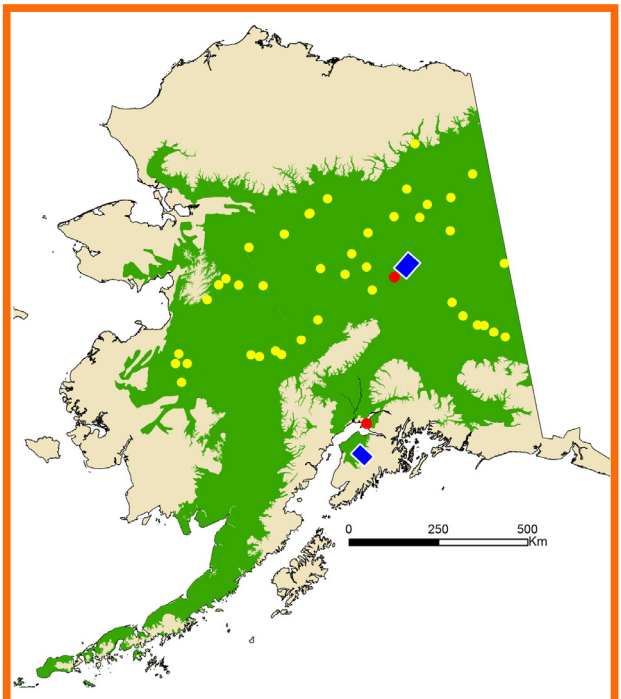
Fire and Ice is a project of **Alaska NSF EPSCoR** (National Science Foundation Established Program to Stimulate Competitive Research). EPSCoR builds research capacity in states and territories that have historically received below-average amounts of NSF funding. for more information visit **www.alaska.edu/epscor**.

Boreal Fires

The **Boreal Fires** team has three research goals:

Goal 1: *Produce seasonal fire outlooks by merging data on lightning probability and available fuels with seasonal climate forecasts.* First, researchers will determine which climate drivers increase the likelihood of lightning events and test findings through ground observations. Second, researchers will build and ground-truth a library of airborne hyperspectral data to improve fire fuel mapping. Third, researchers will identify phenomena that create atmospheric conditions conducive to fire weather in Alaska. The team will then combine these data into map layers and time series graphs indicating fire risk across fire management zones over the course of the fire season.

Goal 2: *Enhance active fire characterization, spread prediction, and severity assessment in the boreal through improved remote sensing, short-term weather data, and field measurements.* Researchers will overfly active fires and use resulting hyperspectral data to refine and calibrate satellite sensing. They will then generate fire case studies and evaluate them to refine fire spread models, and improve fire severity assessments by contrasting spectral indices and field surveys of recent fires.



Red dots are UA campuses, blue squares are major Boreal Fires research sites, and yellow dots are Interior communities for potential partnerships.

Boreal Fires core faculty members

Campus	Name	Expertise
UAA	Matt Berman	Risk mitigation
	Jennifer Schmidt	Field validation
	Terrestrial Ecologist hire	Ecosystem services
UAF University of Alaska Fairbanks	Uma Bhatt (co-lead)	Climate variability
	Todd Brinkman (co-lead)	Ecology
	Peter Bieniek	Climate variability
	Cathy Cahill	Unmanned aerial systems
	Krista Heeringa	Community liaison
	Teresa Hollingsworth	Fire ecology
	Randi Jandt	Fire agency liaison
	Joseph Little	Risk mitigation
	Santosh Panda	Remote sensing
	Martin Stuefer	Fire spread modeling
	Geospatial Scientist hire	Hyperspectral sensing

Goal 3: *Develop science-based options for improving wildfire management policy to maintain ecosystem service flows and foster community resilience.* An Interior Alaska team will catalog regional ecosystem services that may be vulnerable to wildfire. They will then conduct focus group discussions and interviews in 2-3 communities impacted by wildfires, and combine these results with existing data to identify ways that wildfires and fuels management can impact ecosystem services, and to recommend precautions and responses. A Southcentral Alaska team will model location, value, and vulnerability to wildfire of structures in Alaska's wildland-urban interface, conduct choice and field experiments, and develop an economic model of mitigation and suppression costs with which to run scenarios of different fire policy options.

The team will hire a UAF geospatial scientist and a UAA terrestrial ecologist, a well as two postdoctoral researchers. Up to six graduate and six undergraduate students will participate each year.