

**PERMAFROST
PATHWAYS**Connecting Science,
People, and Policy for Arctic
Justice and Global Climate**Woodwell
Climate
Research
Center**permafrost.woodwellclimate.org

@woodwellarctic

Northern wildfires, climate, and health

Wildfire management as a climate solution in the Arctic-boreal region

^Wildfire burning through the boreal and permafrost landscape in Canada.

Photo by Mason Dominic

EXECUTIVE SUMMARY

Warming at high latitudes is accelerating wildfires, generating large amounts of carbon emissions that are not accounted for in climate projections or climate policy responses. Currently, carbon and smoke impacts from fires are not metrics for fire management. Woodwell Climate Research Center and partners in Alaska are working to change this. Arctic-boreal fire management can be a cost-effective way to help keep wildfires at historical levels, protect permafrost and stored carbon, and reduce the impact of wildfire smoke on air quality and human health. There is a need for forward-looking policy and additional resources to better manage wildfires in Alaska and, ultimately, across the Arctic-boreal region.

THE THREAT OF INTENSIFYING ARCTIC-BOREAL WILDFIRES

Arctic and boreal regions store an immense amount of carbon. Boreal forests alone house roughly two-thirds of global forest carbon and protect much of the world's permafrost soils, playing a critical role in mitigating global climate change. Yet rapid climate warming at high latitudes has led to a pervasive intensification of Arctic-boreal wildfires, with roughly double the average annual burned area today compared to the mid-20th century. As these wildfires intensify, they combust and release to the atmosphere large quantities of ancient carbon stored within soils and warming permafrost. For example, massive wildfires across Canada in 2023 released approximately three times more carbon than all other sectors combined (CAMS 2023, Environment Canada 2023). Accelerating carbon emissions from Arctic-boreal wildfires present a large, growing, and mostly unrecognized threat to global climate goals. Recent estimates by Woodwell scientists suggest that projected emissions from circumpolar wildfire and fire-permafrost interactions reduces Intergovernmental Panel on Climate Change (IPCC) estimates of remaining carbon budgets to stay within 1.5 to 2°C of global warming by ~10%. Smoke also travels hundreds to thousands of miles, impacting the health and well-being of people across the continent, particularly northern rural and Indigenous communities.

PROTECTING CLIMATE AND PUBLIC HEALTH THROUGH FIRE MANAGEMENT

Pioneering work by Woodwell Climate Research Center and collaborators offers a new perspective on Arctic-boreal wildfires, turning a climate problem into a climate solution. Our research suggests allocating dedicated resources for fire management in Alaska that aims to protect carbon and permafrost could be a highly cost-effective way to keep substantial amounts of carbon in the ground. Specifically, we find that current fire management in Alaska is effective at reducing wildfire carbon emissions at a cost of ~\$13 per ton CO₂ of avoided emissions – comparable to or more cost-effective than many other climate mitigation measures (Phillips et al., 2022).

Today's Arctic-boreal fire management practices have limited climate and public health benefits because they are focused solely on other values at risk, primarily lives and property, and not on carbon or smoke. Hence, wildfires in areas distant from human settlements are allowed to burn, irrespective of their impacts on climate change or air quality. Limiting wildfire emissions to pre-climate change levels through targeted suppression and other management approaches would both provide a significant natural climate solution and support a suite of co-benefits for Indigenous communities in these regions and broader populations. Intensifying wildfires severely degrade air quality, disrupt aviation and tourism, impact subsistence and cultural resources, damage infrastructure, and affect other sectors of society with downstream negative economic impacts (estimated to be \$30 billion to \$200 billion per year in the lower 48). In addition to limiting these deleterious impacts, increased Arctic-boreal fire management would create jobs, give managers desperately needed resources, and help empower communities. Currently, Alaska wildfires contribute half of total U.S. fire carbon emissions each year, yet Alaska receives only 4% of federal resources for fire management.

PILOT PROJECT IN ALASKA

In direct response to research and collaboration with Woodwell Climate Research Center, in January 2023, the U.S. Fish and Wildlife Service, in consultation with the Alaska Fire Service, enhanced the fire suppression status of 1.6 million acres of Yedoma permafrost-rich land on the Yukon Flats National Wildlife Refuge. Yedoma permafrost has particularly high ice and carbon content and is highly vulnerable to post-fire thaw, degradation, and carbon emissions. This decision was the result of iterative consultation with Indigenous residents within the refuge who are impacted by increasing smoke pollution and disruption to subsistence activities. It also addresses a growing concern for the loss of old-growth habitat within the refuge.

This decision represents a step change in Arctic-boreal fire management and policy, whereby carbon and permafrost protection from intensifying wildfires is for the first time a specific federal agency priority. Over the next few years, Woodwell Climate scientists will seek to demonstrate the efficacy of valuing carbon and permafrost protection as part of this fire management decision. We will collaborate with the Fish and Wildlife Service and the Alaska Fire Service to estimate the avoided carbon emissions from reduced wildfires and permafrost thaw by combining data on suppression costs with modeled estimates of landscape fire progression. In tandem, we are working with the Alaska Venture Fund, state and federal land management agencies, fire protection agencies, and Indigenous leaders to build a wildfire coalition in Alaska to address the rapidly evolving need for fire management from a climate, health, and human rights perspective.

PRIORITIES FOR U.S. FEDERAL POLICY

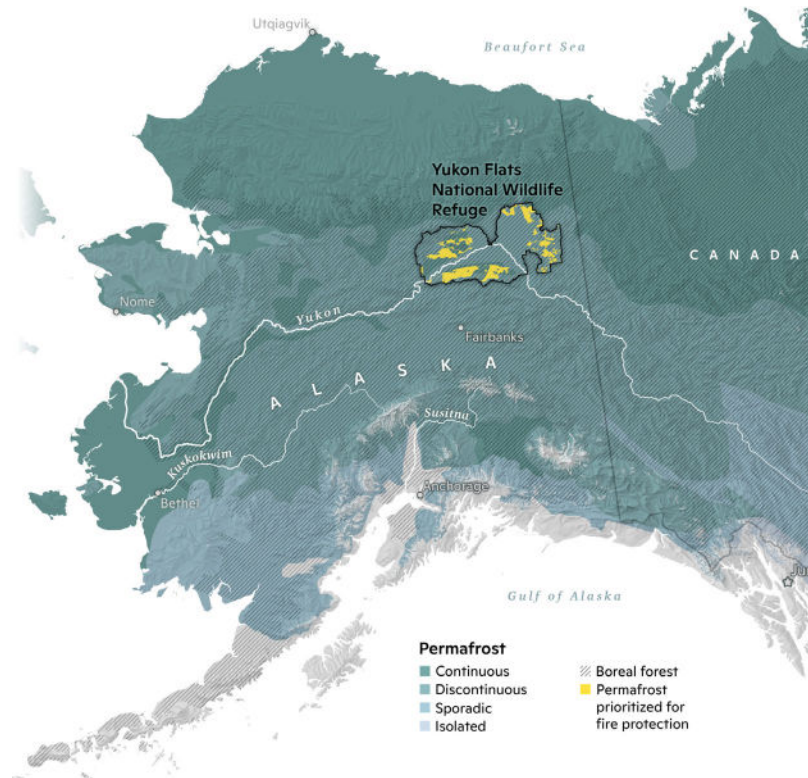
Limiting climate change requires deep and equitable reductions in greenhouse gases across sectors and nations. Yet emissions from Arctic-boreal wildfires are escalating. Well-designed policies and investments to keep these wildfires at pre-climate change levels are needed to keep carbon in the ground, protect permafrost, and limit the multitude of other damages that escalating wildfires inflict on society.

The U.S. is at the precipice of pursuing this course of action. Record-breaking wildfires in recent years have catalyzed a suite of U.S. policy proposals to strengthen wildland fire research, review, response, and recovery. In addition to dedicated funding for strengthening wildfire response from the Bipartisan Infrastructure Law and the Inflation Reduction Act, the Government Accountability Office has published several recent reports, congressional committees have increased hearings on wildfire risks and approaches, and lawmakers across the U.S. have proposed legislation to advance government responses.

REFERENCES AND ADDITIONAL RESOURCES

- CAMS 2023. [A year of intensive global wildfire activity](#). Copernicus Atmospheric Monitoring Service
- Environment Canada 2023. [National inventory report: greenhouse gas sources and sinks in Canada](#).
- Phillips, C. A., Rogers, B. M., Elder, M., Cooperdock, S., Moubarak, M., Randerson, J. T., and Frumhoff, P. C.: Escalating carbon emissions from North American boreal forest wildfires and the climate mitigation potential of fire management, *Science Advances*, 8, eabl7161, <https://doi.org/10.1126/sciadv.abl7161>, 2022.

For more information: Dr. Brendan Rogers, brogers@woodwellclimate.org; Dr. Peter Frumhoff, pfrumhoff@woodwellclimate.org



In April 2022, the Department of Interior published a 5-year plan for Wildfire Risk Monitoring, Maintenance, and Treatment, coupled with the U.S. Forest Service's 10-year wildfire crisis strategy, sets a direction for wildfire mitigation. A recently published Report of the Wildland Fire Mitigation and Management Commission consolidates many of these actions, calling for bipartisan support of innovative approaches to wildfire management, additional congressional appropriations for proactive measures, and allocation of additional funding for hazard data sets. Unfortunately, recent federal fire management activities and expenditures have not yet addressed the distinctive and outsized climate threats of escalating Alaska wildfires.

We call for an updated U.S. fire management policy framework that explicitly values carbon protection and air quality as key metrics for fire management priority setting in high latitudes. This will provide the needed scaffolding for dedicated additional federal funding for managing these wildfires. Such funding should be additional to current fire management expenditures and to federal funding for needed climate solutions in other sectors and geographies. Pursuant to other agreements, we further call on the U.S. to collaborate with Canada and other Arctic-boreal nations to jointly address the climate and public health threats of escalating wildfires.

^Map by Christina Shintani / Woodwell Climate Research Center