

ARCTIC PERMAFROST, BOREAL FIRE MANAGEMENT, AND CLIMATE MITIGATION

POLICY STATEMENTS RESPECTFULLY SUBMITTED TO US CONGRESS

EST. 2023

ABOUT US. Woodwell Climate Research Center launched the Permafrost Pathways project in 2022 with funding from the TED Audacious Project—a collaborative funding initiative catalyzing big, bold solutions to the world’s most urgent challenges. Through partnerships with the Arctic Initiative at Harvard Kennedy School, the Alaska Institute for Justice, and the Alaska Native Science Commission, and in collaboration with Alaska Native Tribes, Permafrost Pathways seeks to harness the combined expertise of leading research institutions and on-the-ground organizations specializing in climate science, policy, and environmental justice to inform and develop adaptation and mitigation strategies to address permafrost thaw.

OUR GOAL. To drastically improve monitoring, accounting, and incorporation of greenhouse gas (GHG) emissions from permafrost thaw and Arctic-boreal fires and into climate projections and mitigation strategies.

OUR CHALLENGE. Current estimates of GHG emissions that inform our target global temperature thresholds and carbon budgets do not currently account for the full spectrum of potential emissions from permafrost carbon. As permafrost thaws and Arctic-boreal fires reach record frequency and intensity, the resulting emissions are more likely to pose immediate health risks and exacerbate irrevocable harm on a global scale.

1.4 trillion tons Of carbon stored in permafrost soils (2x the amount currently in the atmosphere).	20-25% Of our remaining carbon budgets could be taken up by permafrost emissions under 1.5°C and 2°C scenarios	2 out of 11 Climate models in the latest IPCC climate assessment included the full spectrum of permafrost emissions	1/2 Of the average annual US fire CO2 emissions are from Alaska.	<4% Of the \$3 billion federal fire suppression funding is directed to Alaska,
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OUR APPROACH. As an independent scientific organization, Woodwell Climate Research Center is uniquely positioned to support the US government’s efforts to account for the full spectrum of potential emissions from permafrost thaw and to research innovative approaches for mitigation, including new fire management regimes that more effectively safeguard permafrost soil carbon.

- **PAN-ARCTIC MONITORING NETWORK.** Limitations in atmospheric data systems, process models, and ground observations due to challenges unique to the Arctic landscape and more general capacity and resources constraints are contributing to data collection gaps.

OUR PROGRESS

- **Measuring carbon dioxide and methane fluxes (release and removal) across the Arctic.** With guidance from our Arctic Carbon Flux Steering Committee—an international team of scientists who work across the permafrost region—we are in the process of installing 10 new, strategically placed eddy covariance towers, supporting existing towers, and learning best practices for consulting with local Arctic communities living near tower installations.
- **Supplementing ground measurements with remote sensing, machine learning technology.** We are working to combine ground measurement data with synthesized flux data from across the Arctic, satellite remote sensing products, and machine learning to extrapolate and map carbon fluxes at a larger scale across the permafrost region.

- **MORE COMPLETE CLIMATE PROJECTIONS.** All climate models, including those featured in the latest assessments from the Intergovernmental Panel on Climate Change (IPCC), do not adequately include the full spectrum of permafrost thaw processes, and therefore misrepresent the amount of carbon that is remaining in our global budget.

OUR PROGRESS

- **Collaborating on advanced Earth System Models that account for abrupt permafrost thaw, wildfire, and permafrost processes.** We are helping to bring together international Earth system modeling groups and experts to improve permafrost representation in climate models. We are also developing the first-of-its-kind data assimilation model of Arctic carbon that includes permafrost-related ecosystem processes to improve historical assessments, near-term forecasts, and longer-term projections.
- **Developing a policy-relevant model to predict more likely climate scenarios.** We are integrating permafrost processes into a compact Earth system model (OSCAR) to provide timely information on the impact of permafrost carbon emissions on global climate and remaining anthropogenic carbon budgets.
- **NEW APPROACHES TO FIRE RESEARCH AND MANAGEMENT.** Record-breaking wildfires across Canada this year decimated North American and Canadian boreal forests that serve as an important land-based carbon reserve and provide insulation for permafrost soil. As the climate continues to warm, the likelihood of fire in these forests increases; burned areas are even more susceptible to permafrost thaw, which releases additional carbon into the atmosphere, accelerating this feedback loop.

OUR PROGRESS

- **Piloting fire suppression as a cost-effective natural climate solution and safeguard for public health.** In direct response to our research and collaboration, in January 2023, the US Fish and Wildlife Service (FWS) enhanced the fire suppression status of 1.8 million acres of the Yedoma permafrost-rich land on the Yukon Flats National Wildlife Refuge (YFNWR). This decision was made in consultation with the Alaska Fire Service and Alaska Native communities living in the area and represents the first time a government agency has designated land to specifically protect carbon and permafrost from fires.
- **Supporting a community of practice among experts and co-production of knowledge.** We are working with FWS, the National Academy of Sciences, Environmental Defense Fund, and Alaska Venture Fund, and other collaborators to convene fire science experts and those with local and Indigenous Knowledge of boreal fire dynamics to explore alternative management approaches.

OUR CALLS FOR ACTION.

1. Formalize national guidance on greenhouse gas monitoring and information systems with explicit support for data collection in the permafrost region.

The federal government is currently working to address data collection gaps and improve reporting of greenhouse gas emissions and removals, including from “natural sources.” The Draft *Federal Strategy to Advance an Integrated U.S. Greenhouse Gas Monitoring and Information System (GHGM&IS)* proposed by the White House National Climate Task Force, for example, describes specific avenues for improving our emissions accounting, with explicit consideration of emissions from permafrost thaw among other land-based processes. Endorsing and implementing this framework is an important first step towards more accurate accounting of potential emissions from the Arctic region and national reporting.

2. Establish partnerships and support to implement a Sustained Arctic Observing Network consistent with recommendations set forth by the White House Office of Science and Technology Policy.

There are several Federal Agencies working to enhance Arctic research pursuant their respective mandates and in collaboration with the Interagency Arctic Policy Committee and US Arctic Research Commission. Recent observations and data that are confirming rapid changes in the region (for example, some areas of the tundra have already shifted to a net source of CO₂ to the atmosphere), indicate the need to prioritize support for a coordinated and sustained observation network. A recent report prepared by the US Arctic Observing

Network for the Office of Technology Policy (at the request of Congress) sets forth recommendations for delivering this support, but additional congressional resources and support are likely required for effective implementation.

3. Permanently establish the Arctic Executive Steering Committee (AESC), and Arctic Indigenous Advisory Committee within the Office of Science Technology Policy and confirm an Ambassador-at-large for the Arctic Region.

To strengthen coordination across the Interagency Arctic Research Policy Committee, the U.S. Arctic Research Commission, and other executive and legislative entities with an interest in the Arctic region, formal legislation should legally establish the AESC. The AESC originated from President Obama's 2015 Executive Order 13689: Enhancing Coordination of National Efforts in the Arctic and was revived under President Biden. While previous legislative attempts have proposed the Department of Homeland Security as the chair of the AESC, maintaining the existing structure with OSTP at the helm will ensure that scientific research remains at the foundation of US Arctic policy. An Advisory Committee composed of appointed members from Alaska Native communities in each of the eight Arctic regions and pan-Arctic regions would help inform equitable decision-making and consideration of Indigenous knowledge and tribal sovereignty. An Ambassador for the region will complete this enhanced governance of the Arctic.

4. Dedicated funding and partnerships to support the development of climate models that include underrepresented processes, including abrupt thaw and wildfire.

Climate projections are an important tool in helping the US government understand implications of global temperatures above 1.5°C and adopt responsive policies. Accordingly, it is necessary to rely on models that incorporate gradual and abrupt permafrost thaw, wildfire-mediated thaw, and the release of carbon from below-ground combustion during wildfire. Recognizing that model development takes time and investments, Congress should consider directing substantial funding (in the order of multiple millions of (US) dollars per US climate model) to provide the necessary infrastructure and support for this purpose. Funding for longer-term federal science grants for Earth system modeling teams will help support the development of processes key to representing permafrost carbon emissions (e.g., disturbance, hydrology, plant carbon uptake, and snow physics), and provide training for highly skilled developers and users.

5. Support research and implementation of cost-effective wildfire management approaches for Arctic-boreal forests that prioritize carbon protection, human health safeguards, and coordination among federal agencies, independent experts, and Indigenous communities.

Record-breaking wildfires in recent years have catalyzed a suite of Government Accountability Office reports (on wildfire smoke, disaster assistance, and capacity for response), congressional hearings, and proposed legislation. The recently published Report of the Wildland Fire Mitigation and Management Commission (established through the 2021 Infrastructure Investment and Jobs Act) consolidates many key messages, including the need for bipartisan support of new approaches to wildfire management, additional Congressional appropriations for proactive measures, and allocation of additional funding for hazard data sets. Given the significance of Arctic-boreal forests to climate change mitigation and the permafrost-carbon cycle, there is a need for enhanced attention to wildfires in this region. Too often, Alaska is excluded from dialogues, research, and funding packages for wildfire risk reduction and response.

To more effectively and efficiently address Arctic-boreal wildfires, Congressional support is needed to: (i) secure additional funding and direction for agencies to include smoke exposure/human health and carbon as a primary metric for fire management; (ii) better integrate wildfire research into preparedness and response actions at the federal, State, local Tribal, and territorial levels; (iii) advance mapping, detection, and wildfire mitigation as part of disaster frameworks; and (iv) leverage public-private partnerships to enhance wildfire response. Congressional action should also prioritize agency cooperation with Indigenous Knowledge-holders in the Arctic region to co-produce research on the most complex impacts and interactions of boreal forest fires and to develop strategic management approaches.

OUR SUPPORT. Woodwell Climate Research Center scientists are available to provide peer-reviewed research articles, fact-sheets, testimony, or informal advice on the permafrost carbon feedback; accounting and predicting for carbon dioxide and methane emissions from permafrost via monitoring, remote sensing, and data assimilation, and modeling; and arctic-boreal wildfire research and management.

For more information, we invite you to reach out to [Dr. Brendan Rogers, brogers@woodwellclimate.org](mailto:brogers@woodwellclimate.org).