

ARCTIC PERMAFROST THAW ADAPTATION & MITIGATION POLICY PRIORITIES

PERMAFROST PATHWAYS' RECOMMENDATIONS FOR URGENT CONGRESSIONAL ACTION

Rising temperatures across the Circumpolar North are catalyzing more severe and intense environmental hazards in the US-Arctic region. Among the most dangerous trends is thawing permafrost, i.e., the loss of continuously frozen ground that underlies roughly 38% of land surface in Alaska. As permafrost thaws, it destabilizes critical infrastructure, destroying homes, schools, roads, and public utilities. Compounding effects of flooding, erosion, and thaw-induced ground collapse pose imminent **environmental threats for at least 144 Alaska Native communities**. Permafrost thaw also holds global significance, as it contains an estimated **1.4 trillion tons of carbon**, or roughly twice as much carbon as is currently in the Earth's atmosphere. Without aggressive, near-term climate mitigation, resulting greenhouse gas emissions (carbon dioxide and methane) from permafrost thaw and increasingly intense wildfires in the Arctic-boreal region may be on par with the highest-emitting countries. Fortunately, Permafrost Pathways understands these challenges and is working to leverage the best available science to avoid worst climate scenarios and to advance equitable adaptation responses to permafrost thaw.

The following policy recommendations are informed by active collaboration with Arctic communities, scientific experts, youth leaders, and innovators in both the public and private sectors. They are intended to align with current US federal policies, including those named in the 2022 National Strategy for the Arctic Region and its Implementation Plan (2023), which identified Permafrost Pathways as a key partner in US government efforts to advance a more resilient and secure Arctic region.

PRIORITY 1. LEGISLATIVE FRAMEWORK FOR CLIMATE-RISK MITIGATION & COMMUNITY-LED ADAPTATION

Congress should enact national legislation that directs federal agencies to assess climate risk and implement community-led adaptation to environmental threats, including permafrost thaw, flooding, and erosion. Despite adaptation support from several federal agencies (including US ACE, FEMA, USDA, EPA, HUD, BIA, DOT, and Denali Commission), the efficacy of relevant programs in Alaska is undermined by a suite of well-documented legal, policy, and operational barriers. These barriers are currently frustrating the US government's response to permafrost thaw in Alaska and stalling community-driven action. Recognizing the need to balance national interests with the unique climate and governance in Alaska, Permafrost Pathways is seeking a whole-of-government, process-driven legislative response that upholds principles of Tribal sovereignty and self-determination, and achieves the following (*inter alia*):



Designates the Denali Commission as the “coordinating entity” to align federal adaptation responses to environmental threats in Alaska, including permafrost thaw, erosion, and flooding.


Per the recommendation of GAO (2022), Congress should consider establishing a coordinating entity to align various federal agency actions relevant to adaptation in Alaska. The Denali Commission's broad authority, collaboration with federal agencies involved in adaptation in Alaska, and flexible funding structure makes it well-suited to serve as the hub for inter-agency coordination; however, the Commission currently does not have explicit statutory authority to coordinate federal assistance from multiple agencies and has limited funding and resources that would enable it to do so. With Congressionally-granted authority, the Denali Commission could not only coordinate federal adaptation efforts in Alaska, but could serve as the receiving entity for a single committed funding source to fully cover the costs of protection in place, managed retreat, and community-driven relocation.




Establishes a single, committed funding source to cover costs of protection-in-place, managed retreat, and community-driven relocation of environmentally-threatened Alaskan communities.

Despite funding authorized through the Bipartisan Infrastructure Law and Inflation Reduction Act for hazard mitigation, climate resilience, and community-driven location, there is an estimated funding gap of \$80 million (in 2019 dollars) per year over the next 10 years to meet the needs of the most environmentally threatened communities in Alaska. This estimate is based on the conclusion that at least \$4.3 billion dollars over the next 50 years are required to protect the 144+ environmentally threatened communities in Alaska from flooding, erosion, and permafrost thaw. Unfortunately, most federal funds are not reaching permafrost-affected areas in Alaska, where project costs exceed those in the lower 48 and financial resources of tribal and local governments are comparatively lower (as most do not own taxable property). To address the funding gap, Congress should provide for a committed


funding source to support community-led environmental data collection and risk assessments, and provide technical assistance to environmentally-threatened communities pursuing managed retreat and relocation..

 **Proposes to amend (or instruct agencies to waive) hazard mitigation planning, eligibility, and funding thresholds for federal grant programs that are inaccessible to rural and insular Alaska Native communities.**

Where Federal agencies have the discretion to do so, they should systematically waive programmatic requirements that are posing undue burdens on the most environmentally threatened Alaska Native communities. These include: Maintaining valid (non-expired) FEMA-approved Hazard Mitigation Plans, as is required under the Stafford Act; securing other funding sources before pursuing HUD’s Indian Community Development Block Grant Imminent Threat resources; satisfying prohibitively high cost-share requirements of the FEMA BRIC program and non-federal match requirement for US ACE programs; and receiving reimbursement for subsistence infrastructure and equipment (such as fish camps) under FEMA’s Individual Assistance program, despite recent equity rule changes. To date, regulatory reforms have failed to effectively configure programs to address the unique challenges facing Alaska Native villages. Where these requirements are imposed in statute, Congress should eliminate requirements for insular and rural communities or provide waiver flexibilities to allow agencies to provide equitable assistance that serves the needs of Alaska Native constituents.

 **Convenes an interagency task force to analyze and propose a more effective methodology for assessing risks from compounding and slow-onset environmental hazards (including permafrost thaw, erosion, flooding, and “Usteq”).**

Environmental threats to Alaska Native communities are unique to those living in the lower 48, due largely to the existence of permafrost and the interaction of permafrost thaw with other natural disturbances. Alaska-specific reports, such as the 2019 Statewide Threat Assessment, seek to account for these risks by ranking communities according to environmental vulnerabilities. As rates of permafrost thaw, erosion, flooding, and land degradation will vary, such ranking systems have the potential to mislead government funding efforts. Assigning funding for an inter-agency task force to work with independent researchers on a more effective set of parameters for assessing these slow-onset risks that pose both protracted and immediate threats to the health and safety of communities may help to increase the efficacy and accessibility of key federal programs.

 **Inventories public lands suitable and available for transfer, exchange, and access for subsistence and cultural use, in partnership with local and Indigenous knowledge-holders.**

As environmentally threatened communities in Alaska (and elsewhere in the US) pursue managed retreat or community-driven relocation, there is a need to identify areas of land with lower risk from flooding, erosion, and/or degradation due to permafrost thaw. Congress should direct state and federal agencies, in consultation with local communities, to develop a geospatial inventory of public lands that are located outside of hazard zones, and thus may be suitable for managed retreat and relocation. Considerations may include permafrost depth and soil composition, the existence of or potential to construct critical infrastructure and utilities, and the natural and community resource values relevant to subsistence practices and traditional ways of life. Recognizing that these lands may fall under federal, state, municipal, or ANC control, additional protocols for facilitating land transfers, exchanges, easements, leasebacks, and other access rights will be required. A Congressionally-mandated inventory that is maintained and updated annually by Alaska Native communities, and federal and state agencies, and which contains the latest site assessments is an important foundational step for advancing community-led adaptation.

Permafrost Pathways recognizes that other entities have generated resources that provide a basis for legislative action and policy design for community-led adaptation and community-driven relocation. We recommend the following:

GAO. (2022). GAO-22-104241 Alaska Native Issues: Federal Agencies Could Enhance Support for Native Village Efforts to Address Environmental Threats. Washington, D.C.: U.S. Government Accountability Office, <https://www.gao.gov/assets/gao-22-104241.pdf>

ANTHC [Alaska Native Tribal Health Consortium]. (2024). Unmet Needs of Environmentally Threatened Alaska Native Villages: Assessment and Recommendations, https://www.anthc.org/wp-content/uploads/2024/01/Unmet_Needs_Report_22IAN24.pdf.

UAF, USACE, CRREL. (2019). Statewide Threat Assessment: Identification of Threats from Erosion, Flooding, and Thawing Permafrost in Remote Alaska Communities. Anchorage: Denali Commission.

National Academies of Sciences, Engineering, and Medicine. (2024). Community-Driven Relocation: Recommendations for the U.S. Gulf Coast Region and Beyond. Washington, DC: The National Academies Press. doi: 10.17226/27213.

PRIORITY 2. NEEDED FUNDING FOR ARCTIC PERMAFROST THAW RESEARCH AND RESPONSE

Congress should continue to appropriate funds and direct agencies to dedicate resources for enhanced permafrost research and response. Permafrost Pathways and other research institutions are readily expanding understanding of Arctic climate changes, including rates and trends of permafrost thaw, boreal forest carbon management, and greenhouse gas (GHG) emissions from permafrost thaw and permafrost-wildfire interactions. Yet the continuation of this work requires a commitment from federal agencies to expand research calls and invest in programs that are best positioned to support adaptation and mitigation activities. Permafrost thaw research and responses that are co-produced with Arctic Indigenous Knowledge-holders are also more likely to have measurable impacts and outcomes. Signals from Congress to agencies in the form of programmatic appropriations and report language should highlight:



Permafrost-inclusive, climate resilience and adaptation technical assistance | Denali Commission and USDA

The Denali Commission's Village Infrastructure Protection (VIP) program is only one of two federal programs that is statutorily authorized to assist environmentally-threatened Tribal Communities that are facing climate-forced displacement. It is the only program that exclusively supports Alaska Native Communities to which the U.S. owes a Federal Trust responsibility. Nevertheless, the VIP program does not receive regular appropriations, and thus, the Denali Commission does not have sufficient funds to deliver VIP grants that meet the size or scale of community adaptation needs.

The USDA Natural Resources Conservation Service (NRCS) has effectively leveraged its programs, including the Emergency Watershed Protection (EWP) Program, to support planning and implementation for Alaska Native communities facing imminent environmental threats. NRCS Alaska anticipates that the Watershed Flood Prevention Operations program may become critical in assisting proactive and large-scale managed retreat and/or community-wide relocation projects in the most at-risk rural communities. This is the only federal program that effectively delivers both co-produced adaptation planning and engineering of new infrastructure with the goal of hazard mitigation.



Improved representation of permafrost thaw in Earth System Models | NSF Office of Polar Programs

Climate projections are an important tool in helping the U.S. government understand implications of global temperatures above 1.5°C and adopt responsive policies. Yet only 2 of the 11 Earth System Models (ESM) featured in the latest Intergovernmental Panel on Climate Change (IPCC) report cycle (AR6) and which are used to inform global carbon budgets included permafrost; neither of these ESMs fully accounted for emissions from abrupt thaw or wildfire-permafrost dynamics. Congress should ensure that the Office of Polar Programs (OPP) within the National Science Foundation (NSF) is prioritizing research calls for ESM development that account for missing Arctic emissions. Additional funding calls and longer-term grants will mobilize ESM development within the Arctic research community and support training of early-career researchers in the latest technology.



Boreal forest and Arctic wildfire management | Department of Interior FWS & Wildland Fire Management

As extreme fire regimes intensify across the U.S., there is an urgent need to understand evolving ecosystem impacts and related data gaps in the Arctic and boreal forests. Federal land managers in Alaska are well-positioned to deploy alternative wildfire management approaches on public lands, including those that prioritize permafrost carbon protection, in pursuit of more cost-effective and successful mitigation. Funding for baseline research in the national wildlife refuge system, for example, will enable the Fish and Wildlife Service in Alaska to expand research pilots like the one recently launched in the Yukon Flats National Wildlife Refuge with support from Permafrost Pathways.

Additional investments in the Department of Interior's Wildland Fire Management program may help mitigate fire spread across Alaska—as half of all carbon dioxide emissions from US wildfires originate in Alaska—yet less than 4% of all federal fire suppression funding is directed to the state. Additional funds may be directed to the Interior's Wildfire Suppression Operations Reserve Fund (which should be permanently authorized). Moreover, despite intensifying fire regimes across Alaska, budgets for the Bureau of Land Management Alaska Fire Service (AFS) workforce have been level or declining for nearly ten years. Congressional support for additional funding will enable AFS to carry out more robust fire suppression activities, increase active fuels management, and work with local communities and state and federal partners to reduce wildland fire risk in Alaska.

Woodwell Climate Research Center submitted FY2025 appropriation requests reflecting these permafrost adaptation and mitigation priorities.

PRIORITY 3. EXPERT CONTRIBUTIONS TO POLICY DISCOURSE ON ARCTIC SCIENCE AND SECURITY

Permafrost Pathways scientists at Woodwell Climate Research Center are available to provide peer-reviewed research, articles, briefings, official testimony, and/or informal advice to Congress on Arctic science, strategies, and climate security. Specific areas of expertise include, *inter alia*:



Indigenous-led/co-produced environmental monitoring and geospatial mapping of climate impacts in Alaska

Permafrost Pathways scientists are monitoring Arctic environmental changes under the direction of and collaborating with Indigenous knowledge-holders in the Alaska Native villages of Akiak, Akiachak, Chevak, Golovin/Chinik, Kipnuk, Kuigilnguq, Kwinhagak, Kwethluk, Nunapicuaq, and Nelson Lagoon. Monitoring activities include: weather station installation, soil composition assessment, permafrost coring, water quality testing, and geospatial mapping of past and current changes to the landscape. We can speak to guidelines to operationalize federal requirements for co-produced Arctic research, the integration of Western science and Indigenous Knowledge, and balancing principles of open science and data sovereignty of Tribes.



Impacts of permafrost thaw and slow-onset disasters on critical infrastructure and Alaska communities

Permafrost Pathways is regularly engaging with community partners in the Yukon-Kuskokwim delta that are most affected by slow-onset disasters, such as permafrost thaw, and coastal storms, to assess resilience and adaptation solutions. We can speak to the impacts of permafrost thaw-induced degradation of critical infrastructure and public utilities, ongoing efforts to engineer solutions, and examples of landscape degradation. We can also speak to challenges associated with addressing permafrost thaw and other slow-onset environmental threats in Alaska within existing disaster governance frameworks and regulatory programs. We can also speak to the importance of expanding adaptation pilots in Alaska and actions of the Interagency Community-Driven Relocation Subcommittee.



Pan-Arctic carbon flux monitoring (carbon and methane emissions) and new technologies

Permafrost Pathways is working with an international team of scientists who work across the permafrost region to install strategically placed eddy covariance towers used to measure carbon fluxes (methane and carbon) from permafrost thaw, supporting existing towers, and learning best practices for consulting with Arctic communities living near tower installations. We are also 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. We can speak to these technical efforts and the importance of scientific cooperation to close greenhouse gas (GHG) monitoring gaps and sustain Arctic environmental observations.



Terrestrial ecosystem models and predictive climate models with improved Arctic representation

Permafrost Pathways is 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. We are also 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. We can speak to the importance of developing climate projections that are inclusive of permafrost-carbon feedbacks and other Arctic processes for purposes of informing more accurate climate budgets and responsive policy.



Arctic (boreal forest) wildfire management and emerging research on permafrost-fire interactions

Permafrost Pathways is collaborating with federal land management agencies, Alaska fire managers, Indigenous Knowledge-holders, and other experts to research cost-effective and climate-protective alternative fire management strategies in the boreal forest region. In collaboration with the US Fish & Wildlife Service, and other experts, we are involved in an ongoing pilot in the Yukon Flats National Wildlife Refuge (YFNWR) that examines potential climate mitigation and cost-saving benefits that result from prioritizing permafrost/carbon and public health protection. We can speak to the often-overlooked GHG emissions from boreal forest fires, the significance of boreal forests as a carbon source/sink, and the opportunities for innovative fire management approaches.



Subsistence fishing and salmon decline in permafrost-affected areas of the Yukon-Kuskokwim region.

Permafrost Pathways is raising awareness of salmon declines and disruptions to subsistence practices in the Yukon-Kuskokwim region, where communities are also impacted by permafrost thaw and other environmental threats. Our Alaska subsistence fishery-expert on staff can speak to ongoing challenges associated with dual management in Alaska, efforts to Indigenize salmon and protect traditional ways of life, and opportunities for the federal government to more effectively uphold Tribal governance and subsistence rights. ■