



CASE STUDY:

Policy gaps and erosion risk in Chevak, Alaska

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Introduction

Cev'aq (Chevak), a Cup'ik village located on a bluff along the northern bank of the Ninglikfak River in Alaska's Yukon-Kuskokwim Delta, is facing increasingly severe environmental threats from erosion and thawing permafrost (permanently frozen ground). Although these threats can be gradual, they can also escalate abruptly, destabilizing land, damaging infrastructure, and endangering human health and safety. These compounding hazards do not align with how federal and state disaster frameworks define emergencies, nor do existing laws and policies adequately respond, leaving communities like Cev'aq to bear the burden of both recognizing the crisis and responding to it without appropriate support.

This case study aims to strengthen policy responses to slow-onset and compounding climate hazards by identifying barriers to coordinated emergency action and proposing opportunities to improve adaptation planning and disaster relief. It draws on the lived experiences of Cev'aq residents, who are navigating permafrost thaw, erosion, flooding, and climate disruptions with limited institutional support and capacity but deep knowledge of place. Their story reveals how federal and state systems often fail to recognize the urgency of gradual, compounding threats, and how this disconnect leaves Tribal communities bearing disproportionate risk. Cev'aq's experience calls for policy reform through the lens of justice, partnership, and long-term resilience.

Environmental threats in Cev'aq

The combined effects of permafrost thaw, erosion, and increasingly intense storms threaten Cev'aq's land, infrastructure, and daily life. These processes do not occur in isolation, they interact in ways that make conditions more dangerous over time. For many residents, the visible signs of these changes, slumping ground, leaning homes, and disappearing riverbanks, are daily reminders of an accelerating crisis that threatens safety and ways of life. One of the primary challenges in addressing these hazards is their compounding and often gradual nature. Unlike sudden disasters such as typhoons or wildfires, these threats often develop over time and are frequently overlooked by agencies until

they reach a crisis point. Permafrost thaw can cause the ground that has been frozen for centuries to become unstable, which can accelerate erosion and create unpredictable surface changes that impact Tribal citizens' safety and well-being, homes, infrastructure, and essential services.

This compounding process is known as Usteq, a Yup'ik word meaning "the ground collapses."¹ Usteq describes a catastrophic form of land collapse caused by the convergence of thawing permafrost, flooding, and erosion, a hazard increasingly observed across western Alaska. Although Usteq is now recognized in Alaska's State Hazard Mitigation Plan, most federal disaster frameworks have not adapted to account for these interconnected, slow-onset threats, leaving affected communities without adequate support.

Public assessments have long warned of these risks in Cev'aq and of their growing vulnerability. The 2009 Alaska Baseline Erosion Assessment found Cev'aq identified active riverbank loss of 5-10 feet per year and recommended a detailed planning study due to the imminent risks.² The 2010 Imperiled Community Water Resource Analysis highlighted erosion and permafrost thaw-related risks to public water and sanitation infrastructure.³ The 2019 Denali Commission Statewide Threat Assessment further identified Cev'aq as one of the dozens of Alaska Native communities facing urgent threats related to erosion, permafrost thaw, and flooding.⁴

Despite these findings, Cev'aq's environmental threats have gone largely unaddressed. One reason is that these assessments often frame the risks as static vulnerabilities rather than escalating emergencies, contributing to a lack of coordinated action and continued health, environmental, and infrastructure vulnerability for the community.

Gaps in responding to slow-onset climate threats

The current federal system for disaster recovery is fragmented and not well-equipped to address slow-onset, compounding environmental threats like permafrost thaw and erosion.⁵ Most federal disaster response and assistance programs are governed under the Robert T. Stafford Disaster Relief and Emergency Assistance Act, which defines a "major disaster" as a sudden natural

Cev'aq

Understanding Usteq:



The interplay of thaw, flooding, and erosion

Warming temperatures thaw the permafrost, frozen ground that has supported homes and infrastructure for generations. As the ice-rich soils lose stability, heavier precipitation and redirected surface water (such as culvert runoff) erode the weakened ground. This creates feedback loops, where thaw accelerates erosion and erosion worsens thaw, culminating in sudden ground collapse. These impacts often appear slowly at first, but can quickly escalate to emergency conditions.

catastrophe such as a hurricane, earthquake, or flood that causes immediate damage (Stafford Act, 42 USC § 5122). Because this definition emphasizes rapid-onset impacts, it often excludes threats like permafrost thaw or gradual erosion unless these can be directly tied to an officially declared disaster event. This interpretation excludes many Arctic-specific environmental risks, leaving slow-moving threats and environmental damage that develop months after an initial trigger outside the recognized disaster response window, without clear funding pathways or response mechanisms.

Similarly, Alaska's Division of Security and Emergency Management (DHS&EM) provides recovery assistance in response to state-declared disasters. While the State of Alaska's 2024 Emergency Operations Plan recognizes permafrost thaw and erosion as serious hazards, in practice, DHS&EM's operational response authority is generally only activated when erosion is caused immediately and directly by a flood event.⁶ When there's a lag, such as thaw-driven collapse that occurs months after a storm, response programs are often not triggered.

This disconnect between hazard recognition and response eligibility contributes to inaction in communities like Cev'aq, where gradual environmental degradation can lead to sudden infrastructure failure. While federal agencies like the Federal Emergency Management Agency (FEMA), U.S. Army Corps of Engineers (USACE), and U.S. Department of Housing and Urban Development (HUD) administer funding mechanisms for disaster response and climate resilience, these programs are designed around event-based eligibility and typically do not accommodate cumulative or compounding risks like those in the Arctic.⁷

One exception is the Natural Resources Conservation Service (NRCS), whose Emergency Watershed Protection (EWP) program can support efforts to reduce imminent threats to life and property from natural events impairing a watershed, even without a federal disaster declaration. However, EWP regulations (7 CFR § 624) do not clearly define the term "watershed", instead relying on flexible language in the National Watershed Program Manual.⁸ This flexibility can be helpful in some cases, but it often fails to address Alaska's unique erosion and permafrost challenges, where natural and climate-driven factors can create

complex watershed boundaries.

As a result, the burden of response falls disproportionately on communities. The U.S. Government Accountability Office (GAO) has repeatedly called for a federal coordinating entity to improve adaptation efforts in Alaska Native communities.^{9,10} The Alaska Native Tribal Health Consortium (ANTHC) Unmet Needs of Environmentally Threatened Alaska Native Villages: Assessment and Recommendations report also highlights the persistent gap between community-identified threats and the availability of programmatic resources to address them.¹¹ Without dedicated, coordinated support, Tribal communities must navigate complex funding systems with limited capacity, raising the cost of adaptation, increasing risks to health and infrastructure, and worsening long-standing inequities in disaster response.

The culvert and its consequences

In 2021, the city of Cev'aq installed a culvert to manage road flooding during seasonal thaw. The decision was driven by necessity, and local leaders had to act with limited funding, engineering support, and external guidance, reflecting the burden placed on communities to solve complex environmental problems alone. While erosion was already occurring due to permafrost thaw and natural processes, the culvert inadvertently redirected water flow to the west end of the community along the bluff. This exacerbated erosion and accelerated land loss, placing nearby homes and infrastructure at risk.

Residents watched as the land beneath them, once solid, became unstable, a result of ongoing permafrost thaw likely intensified by the redirected water flow. This interaction compounded the erosion and slope failure along the bluff. The city extended the culvert in 2022, but the problem worsened. By 2024, erosion had further accelerated, threatening multiple homes and a steam house. Additional culverts have also begun causing drainage issues in the middle of town, where standing spring melt already surrounds homes. Because standing water accelerates permafrost thaw, these drainage issues are a critical concern for Cev'aq's future infrastructure stability, especially as climate-driven changes make seasonal flooding and ground instability more frequent and severe.



“ The elevated dirt roads and placement of the culvert have diverted the majority of the drainage to the southwest end of town, where the runoff from the culvert has created erosion from the bluff edge between two residential homes. New placements of culverts have also created standing snow melt water to flood homes/properties in the center of town along the east/west road that goes towards the west end of town.”

Reggie Tuluk
Permafrost Pathways Tribal Liaison
Native Village of Cev'aq

August 2023



August 2024



Significant erosion of the culvert in just a year's time. Photos by Sue Natali, Darcy Peter / Woodwell Climate Research Center

In August 2024, the erosion edge along the west side of town was measured to be just four feet from a steam house adjacent to a main residence. Between the end of June and August, approximately 4.5 feet of ground was lost, and in another nearby location within the same erosion zone, up to seven feet had eroded away. This pace of land loss demonstrates just how rapidly conditions are deteriorating. Without immediate intervention, additional homes, structures, and cultural sites are at imminent risk.

Recognizing the urgency of the situation, with the guidance and assistance of local partners, Permafrost Pathways conducted site visits in August 2023, and May, August, and October of 2024, observing deteriorating conditions and identifying permafrost thaw as a contributing driver of accelerating erosion. Electrical resistivity surveys confirmed that thawing permafrost was destabilizing the bluff. Despite this scientific evidence, no agency stepped forward to address the worsening crisis due to jurisdictional limitations and the lack of a single entity responsible for addressing gradual, multi-driver environmental hazards. A key lesson from the culvert incident is that local climate adaptation efforts, if implemented without sufficient coordination and technical assistance, risk increasing existing vulnerabilities.

The following table outlines some of the key federal and state agencies and local entities involved in the culvert and erosion crisis in Cev’aq, their roles, and the challenges or limitations each faced in responding.

The risk of inaction

Without intervention, Cev’aq risks the continued loss of critical infrastructure, including homes, roads, and steam houses, as the bluff erosion worsens. If proactive measures are not taken, residents could face emergency relocations with little planning or support, leading to displacement and disruption to ways of life that sustain community and individual well-being.

In response, the community filled the erosion site with sandbags to stabilize erosion and divert water. While these efforts demonstrate Cev’aq’s determination and resilience, they are only temporary measures. Spring thaw and permafrost destabilization could render these efforts ineffective, increasing the urgency for long-term action. Despite repeated efforts to coordinate with agencies, external systems of support remain out of step with the scale and urgency of Cev’aq’s needs.

AGENCY/ENTITY	ROLE/INVOLVEMENT	BARRIERS/LIMITATIONS TO ACTION IN CEV'AQ
City of Chevak	- Initiated culvert installation and extension. - Managing local response efforts.	Limited funding and technical capacity; no single authority or funding stream to address large-scale erosion or permafrost-related issues.
Association of Village Council Presidents (AVCP)	Installed the original culvert to manage spring flooding.	Disagreement over responsibility for downstream impacts of the culvert; hesitant to fund further action due to unclear jurisdiction.
FEMA	Not activated by a qualifying disaster.	No qualifying disaster under the Stafford Act; erosion and permafrost thaw not recognized as triggering events.
NRCS	- Addresses erosion prevention. - Manages the Emergency Watershed Protection Program.	Watershed eligibility and project thresholds unclear; lacks Arctic-specific criteria; did not act due to ambiguity about Chevak’s qualification.
USACE	Provides engineering expertise and support for flood-related hazard response.	Authorities limited to flood risk under Public Law 84-99; erosion alone does not qualify under existing programs unless linked to a declared flood event.
State of Alaska DHS&EM Emergency Operations Center	- State-level emergency management authority. - Coordinates state and federal resources, assisting communities, and managing disaster recovery efforts.	Only responds to erosion directly caused by a state-declared disaster; no authority to address permafrost-driven or slow-onset erosion under current guidance.



Tribal Liaison Reggie Tuluk measuring erosion. Photo by Darcy Peter / Woodwell Climate Research Center

Recognizing the urgency, Chevak has applied for Congressional Directed Spending to fund a stabilization project protecting the bluff. Working with Engineering Without Borders at the University of Washington and FEMA Region 10, they developed a plan and budget, estimating the cost for the full project area at just over \$6 million. A long-term solution would provide lasting protection and have a substantially lower cost over time than repeated emergency repairs.

For every dollar spent on hazard mitigation, an estimated \$6 is saved in recovery costs.¹² Approximately \$4.3 billion will be required over the next 50 years to protect infrastructure in environmentally threatened Alaska Native communities.¹³ Every year of inaction means

higher costs, greater risks, and fewer options for adaptation.

In early 2025, ANTHC's Center for Environmentally Threatened Communities (CEC) team visited Chevak to begin developing a drainage assessment plan. The community was awarded a planning grant through the Bureau of Indian Affairs (BIA) Tribal Climate Resilience program and continues to work with ANTHC and engineering consultants to assess options for improving or redesigning the culvert and surrounding drainage. These efforts, coordinated between Chevak Native Village, the City of Chevak, and ANTHC, reflect a growing commitment to collaborative, community-led solutions and demonstrate the value of continued technical and financial support to scale these efforts.



Seasonal flood area where standing spring melt surrounds the houses (right) and the erosion measured during the three site visits in May, August, and October 2024 (left), demonstrating the alarming rate of erosion.

Map by Jackie Dean / Woodwell Climate Research Center



“The fixes that they are doing right now are just going to continue to wash away the sand that they are filling the eroding area with. Putting the right drainage and/or redirecting the flow should stop or slow this failure.”

Cynthia Paniyak
Environmental Coordinator
Native Village of Cev'aq

Next steps

To address slow-onset climate disasters like erosion, flooding, and permafrost thaw, and the jurisdictional challenges preventing action on erosion in Chevak, agencies must work together more effectively. The following steps can be taken by the community, state, and federal agencies, and advocacy organizations:

Technical & Scientific Support

- Continue real-time local monitoring of erosion, flooding, and permafrost thaw using erosion stakes and other on-the-ground tools. This data is essential for tracking changes and supporting long-term mitigation efforts.
- Strengthen environmental monitoring through remote sensing, including GPS surveys, drone imagery, and, when available, high-resolution LiDAR and satellite data, to improve long-term risk assessment and mitigation efforts.
- Engage engineering partners such as Engineers Without Borders, private contractors, or relevant federal agencies (e.g., USACE) to conduct feasibility studies on protective measures and to secure additional site assessments.

Community & Tribal leadership actions

- Continue to engage in direct agency outreach and participate in interagency working groups to track responses and coordinate local efforts.
- Use this case study as a tool to raise awareness among policymakers, agencies, and the media about how jurisdictional gaps hinder climate adaptation.
- Identify funding opportunities by working with grant writers or federal liaisons to secure near-term funding for mitigation efforts.
- Highlight the importance of community-led documentation, activities like maintaining erosion stakes, photo logs, and recording seasonal changes provide critical on-the-ground data that can strengthen funding applications and demonstrate the urgency of the threat.

Collaborative efforts and opportunities for improvement

Addressing Chevak's erosion crisis requires a multi-

agency approach that leverages the expertise and resources of different federal, state, and local entities. Each agency plays a crucial role, but improving coordination and ensuring long-term support is essential for effective climate adaptation. The following considerations represent a non-exhaustive list of example opportunities to disentangle the coordination challenges and improve disaster relief.

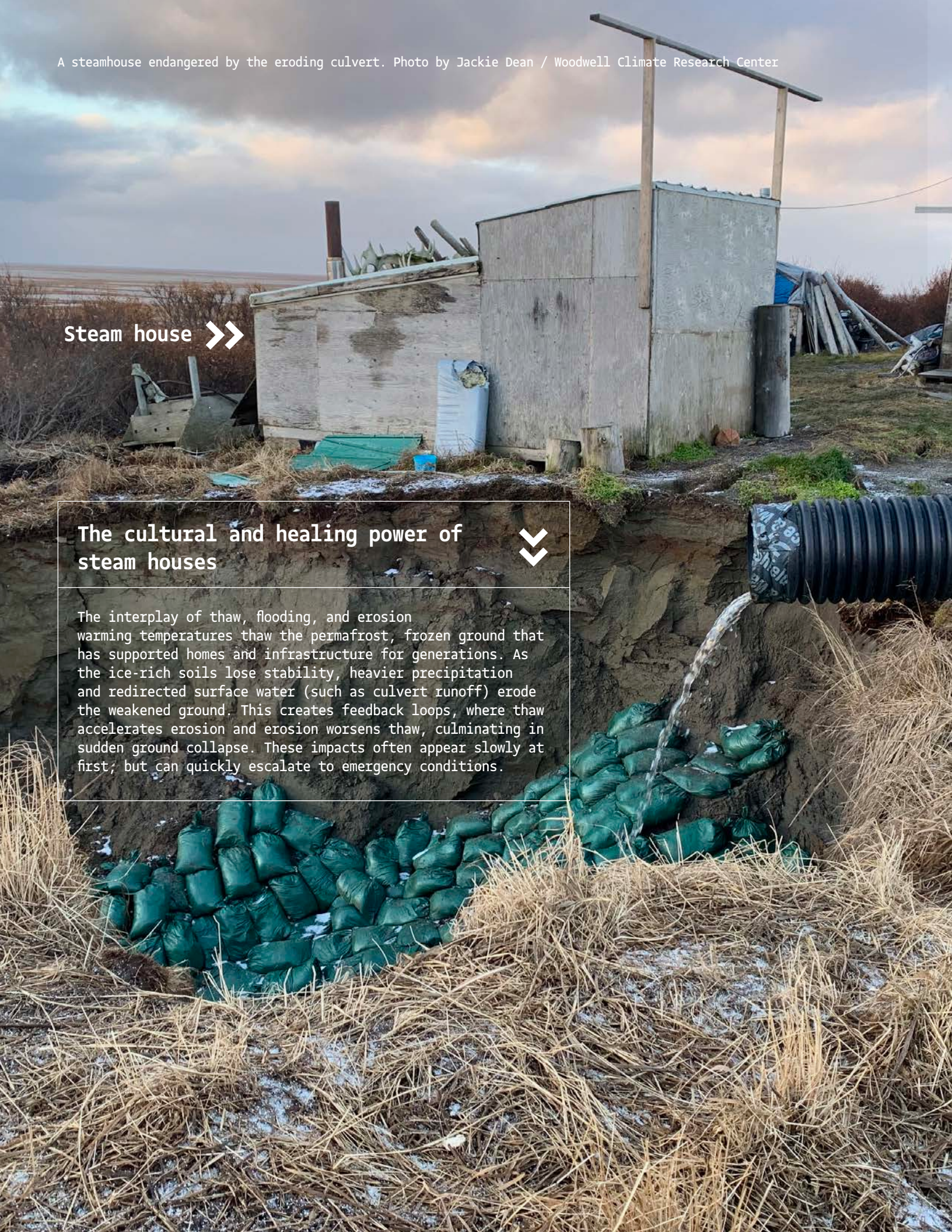
Federal Agencies

- **Federal Emergency Management Agency (FEMA):** FEMA could revise its Hazard Mitigation Assistance Program and Policy Guide¹⁴ or issue new guidance that explicitly recognizes slow-onset environmental threats, such as permafrost thaw and erosion, as eligible hazards under programs like Hazard Mitigation Assistance Grants. Additionally, FEMA could consider a Disaster Recovery Reform Act¹⁵ pilot focused on Arctic climate hazards to evaluate and document barriers faced by Alaska Native communities.
- **Natural Resources Conservation Service (NRCS):** NRCS could update the National Watershed Program Manual to clarify watershed eligibility criteria, explicitly recognize usteq as a compounding hazard, incorporate Arctic-specific erosion and permafrost dynamics, and broaden the definition of a watershed in permafrost-affected landscapes.
- **U.S. Army Corps of Engineers (USACE):** USACE offers essential engineering expertise and could take on a more significant role in evaluating and tackling erosion challenges caused by permafrost thaw. This could be achieved through interagency agreements that enable them to provide technical assistance earlier in the climate risk timeline, in line with the Climate Preparedness and Resilience Policy Statement.¹⁶
- **Denali Commission:** The Denali Commission could continue to formalize its coordinating role through interagency Memoranda of Understanding (MOUs) with NRCS, USACE, HUD, the Bureau of Indian Affairs, and other government agencies working to address environmental threats in Alaska Native villages.¹⁷ This would align climate adaptation investments in environmentally threatened Alaska Native communities, as the GAO Report 22-104241 recommended.¹⁸

Steam house >>

The cultural and healing power of steam houses >>

The interplay of thaw, flooding, and erosion warming temperatures thaw the permafrost, frozen ground that has supported homes and infrastructure for generations. As the ice-rich soils lose stability, heavier precipitation and redirected surface water (such as culvert runoff) erode the weakened ground. This creates feedback loops, where thaw accelerates erosion and erosion worsens thaw, culminating in sudden ground collapse. These impacts often appear slowly at first, but can quickly escalate to emergency conditions.



- **U.S. Department of Housing and Urban Development (HUD):** HUD could waive cost-share and pre-funding requirements for environmentally threatened communities applying to the Indian Community Development Block Grant – Imminent Threat Program, reducing barriers to urgent infrastructure assistance.

State Agencies

- **Alaska Division of Homeland Security & Emergency Management (DHS&EM):** The Department of Homeland Security and Emergency Management (DHS&EM) could revise its internal emergency response guidelines to explicitly include slow-onset hazards, such as permafrost thaw, erosion, flooding, and usteq. This revision would ensure that its operational response is in line with the 2024 Alaska Emergency Operations Plan, which acknowledges these threats but currently lacks a mechanism for addressing them through state-level disaster declarations or assistance programs.

Local and Regional Entities

- **City of Chevak & Tribal Council:** Local leadership plays a central role in adaptation planning and could benefit from stronger partnerships with agencies offering technical and financial support.
- **Association of Village Council Presidents (AVCP):** AVCP can help facilitate regional collaboration and advocate for solutions that align with local needs.

Conclusion

Chevak's erosion crisis illustrates the broader inadequacy of current climate adaptation policies in responding to slow-onset, compounding threats facing many Alaska Native communities. Despite their efforts to protect homes, infrastructure, and cultural lifeways, residents are navigating these risks without sufficient federal or state support. The continued failure to address these challenges places a disproportionate burden on Indigenous communities, forcing them to take on the costs and responsibilities of climate adaptation.

This case also highlights a deeper policy design flaw: disaster response and resilience frameworks are structured around sudden, event-driven

hazards, not gradual environmental changes like permafrost thaw or chronic erosion. While multiple public assessments have documented Chevak's erosion and infrastructure risks, these reports often portray the issues as static vulnerabilities, rather than compounding threats building toward a crisis. As a result, they fail to prompt urgent or coordinated action. Chevak's experience reveals a critical mismatch between the realities of Arctic climate impacts and the tools available to manage them.

Yet, Chevak's response also reflects a path forward. Through local leadership, collaboration with scientific and regional partners, and persistent advocacy, the community is working to secure resources and push for systemic reform. Their experience offers vital insight for policymakers seeking to modernize climate adaptation frameworks to reflect the lived realities of frontline communities and to ensure that no village is left to face these threats alone.



Photo by Sue Natali / Woodwell Climate Research Center

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“After this erosion increased with each rainfall or spring melt, everyone really can see the impacts of permafrost thaw and how quickly it can increase with the amount of rain we’ve been getting the last few years.”

Cynthia Paniyak
Environmental Coordinator
Native Village of Cev’aq

PERMAFROST PATHWAYS

Permafrost Pathways was launched in 2022 with funding through the TED Audacious Project—a collaborative funding initiative catalyzing big, bold solutions to the world's most urgent challenges. Led by Woodwell Climate Research Center, Permafrost Pathways harnesses 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.



Woodwell Climate Research Center conducts science for solutions at the nexus of climate, people, and nature—solutions that are urgently needed to propel us toward a more equitable, healthy, and sustainable world.