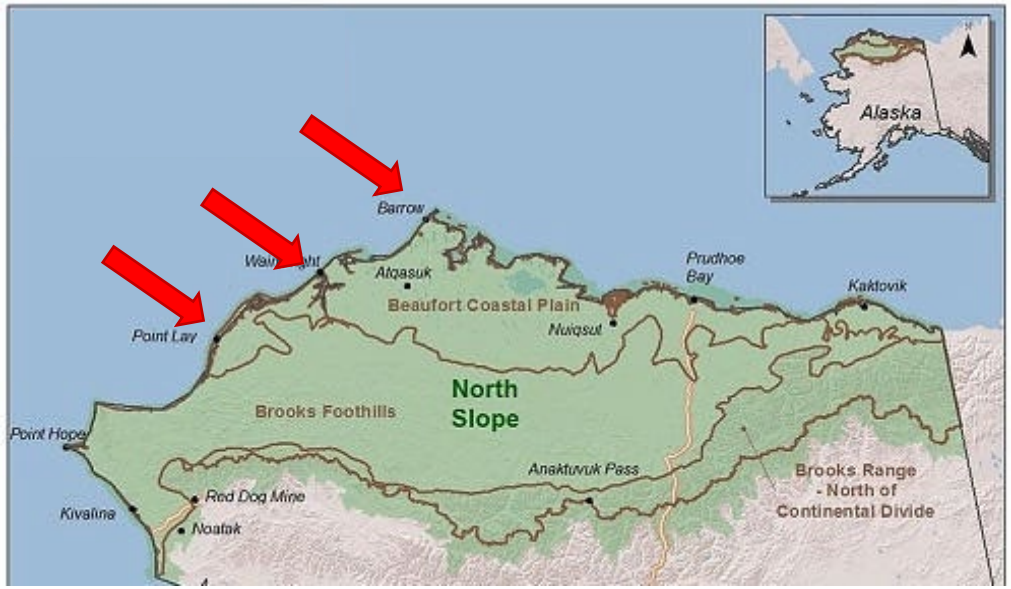
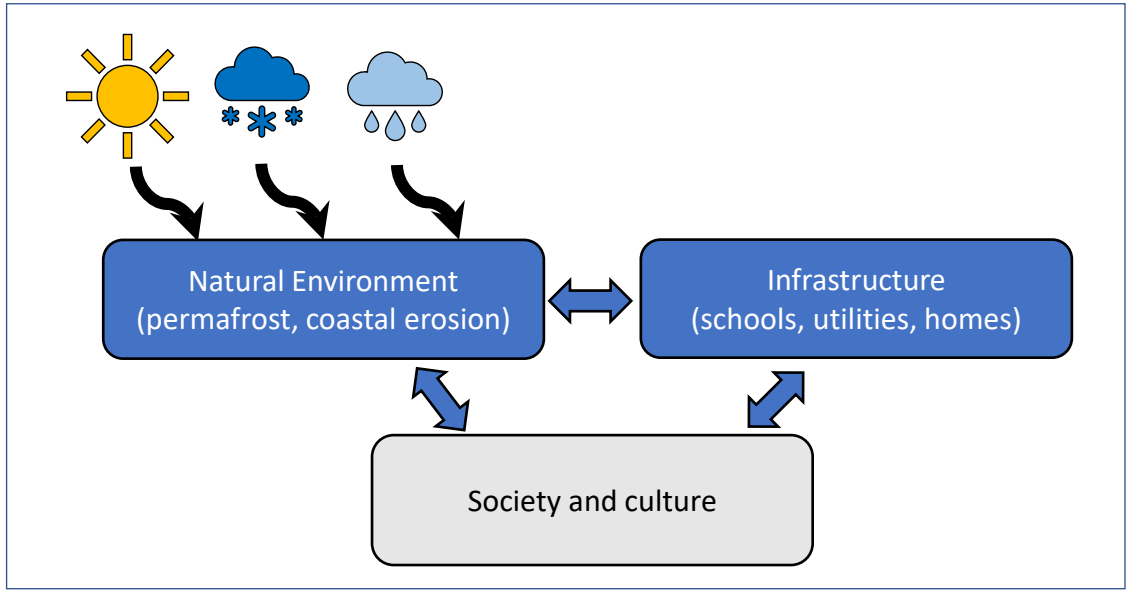
PIPER Project: Resilience and Adaptation to the Effects of Permafrost Degradation and Coastal Erosion

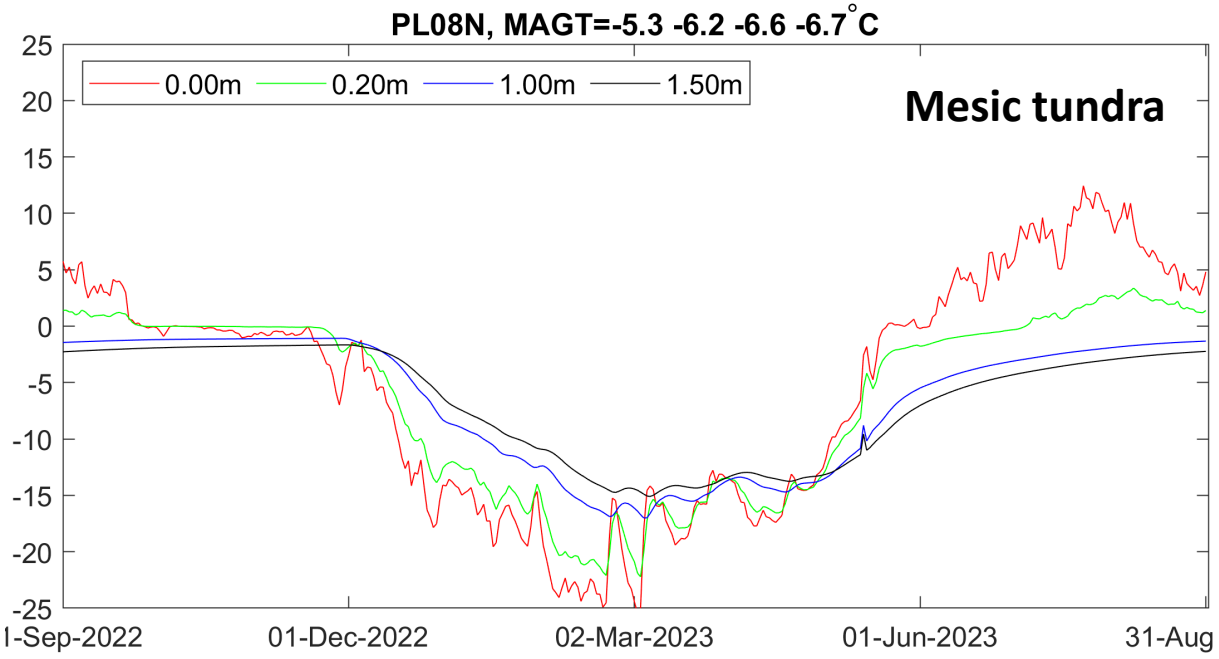


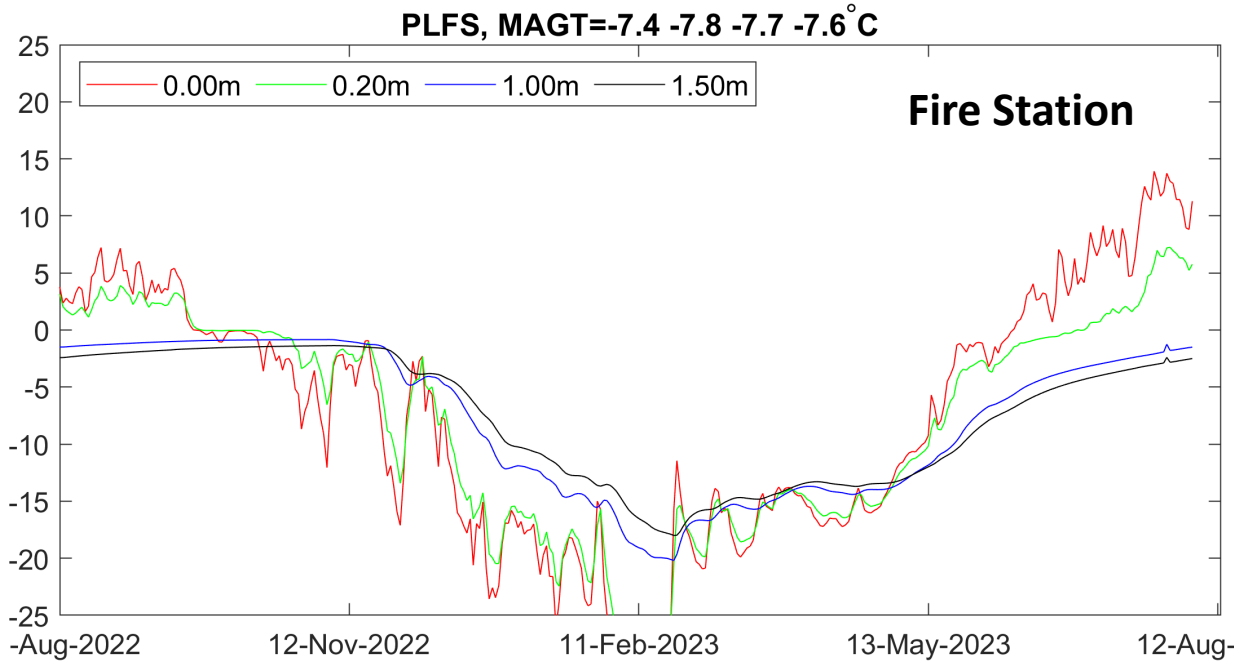


Ming Xiao[2], Dmitry Nicolsky[1], Vladimir Romanovsky[1], Louise Farquharson[1], Thomas Wright[1], Anne Jensen[1]

1. University of Alaska Fairbanks
2. Pennsylvania State University

- **August:** downloaded ground temperature data at the natural environment sites, next to the infrastructure, and at shallow thaw ponds; took aerial imagery at the village and next to the coast
- **August:** Installed additional ground surface temperature sensors in deep troughs to understand the warming effect of snow
- **September**: initiated the Permafrost Thaw Remediation Project, aka filling up of the Thaw Pond and monitoring temperature dynamics; repeat aerial survey near the coast
- **April 2024**: plan to visit the Kali School for a science lecture, e.g. on snow, and conduct the snow depth survey with a drone





Mean annual ground temperature at the natural sites and next to building piles

Permafrost temperature next to the infrastructure sites is ‘cold’

Ground temperature in troughs have a warmer temperature

Temperature at the bottom of some ‘deep’ thaw ponds in the natural environment promotes further thawing of sediments

Temperature at bottom of ponds under buildings, with snow scouring’, is cold

Permafrost Thaw Remediation Project

Permafrost Thaw Remediation Project

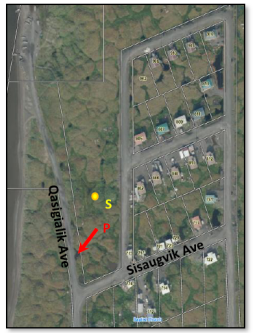
PEOPLE INFRASTRUCTURE PERMAFROST RESILIENCE

UAF UNIVERSITY OF ALASKA FAIRBANKS

Motivations: The community of Point Lay has been experiencing a rapid ground surface settlement due to melting of massive ice located below the ground surface. The melting ice i) threatens stability of piles, on which residential houses sit, and ii) causes development of deep ponds that create a drowning hazard.

Standing Recommendation: Over the last several years, a recommendation was made to fill in permafrost depressions with fine-grained material, e.g., silt, to insulate the buried ice from the summer warmth and thus to stabilize the pile foundations.

Proposition: Instead of experimenting on structures occupied by residents, we suggest testing the above-mentioned recommendation on a stand-alone pond and checking how well the permafrost can heal itself. This significantly simplifies the task and lowers a risk of mishap.



In the summer of 2022, we installed several ground temperature sensors around the community (one of the monitoring sites is shown by a yellow dot) and a few sensors at the bottom of ponds. One of the ponds with sensors (163°0'41"W, 69°44'46"N) is marked by the red arrow. The water depth and temperature data are collected six times per day and will help to understand how the pond warms the ground underneath relative to the natural site.

The pond has an irregular shape and is adjacent to the road. We expect that in the future the pond will widen and will require some filling anyway. The current pond area is 540 ft^2 and the volume is estimated at 60 yd^3.

Experiment details: We recommend the following approach:

- drain water from the marked pond;
- install additional temperature probes pond's bottom, side slope and below the pond bottom;
- fill the pond with fine-grained material and install additional temperature probes into the fill;
- monitor temperature dynamics over a few years to determine how well the permafrost heals.

Help from the community: First and foremost, we look forward to hearing your thoughts. If you find this experiment useful, we would greatly appreciate your help with locating the silt or other fine-grained sediment and helping to fill the depression. All sensor installations and analysis will be provided by our research team.

Contact:
Dmitry Nicolsky, Research Associate Professor, University of Alaska, djnicolsky@alaska.edu, or (907) 474-7397

Instrumented the thaw pond, filled up with silty material, need help to clear snow

JOIN US FOR A NORTH SLOPE RISKS AND HAZARDS RESEARCH AND ADVISORY GROUP

Purpose: North Slope Borough open advisory group to:

- Provide a forum to share updates on research and infrastructure projects,
- Discuss issues related to permafrost thaw, erosion, surges, and flooding,
- Assist with adaptation and mitigation strategies.

Who:

- ***Local and Regional Residents as Advisors, Practitioners, and Researchers***
- Resilience and Adaptation to the Effects of Permafrost Degradation-Induced Coastal Erosion People-Infrastructure-PErmafrost-Resilience (PIPER) UAF
- Understanding the Changing Natural-Built Landscape in an Arctic Community: An Integrated Sensor Network in Utqiagvik, Alaska UVA
- Arctic Impacts and Reverberations of Expanding Global Maritime Trade Routes GMU
- Landscape evolution and adapting to change in ice-rich permafrost systems (NNA-IRPS) UAF
- **Other research projects studying risks and hazards to assist local and regional decisions**

When: Quarterly Forums starting May 2023

Phone, Virtual, Hybrid, In Person, Social Media

Contacts for details:

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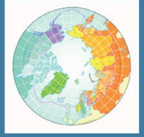
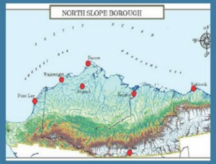
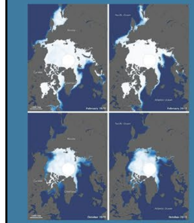
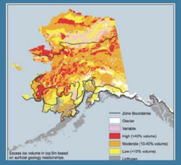





Hazard Mitigation Plan 2004



Anne Garland ARIES, Dmitry Nicolsky UAF, Howard Epstein & Hannah Bradley UVA

Goals:

- Organize a similar Research & Advisory for the North Slope Borough or more focused on Utqiaġvik
- Provide a forum to share updates on research and infrastructure projects
- Discuss issues related to permafrost thaw, erosion, surges, and flooding

When: Quarterly Forums

At least three known research groups and probably very many others.

Looking for your thoughts!!