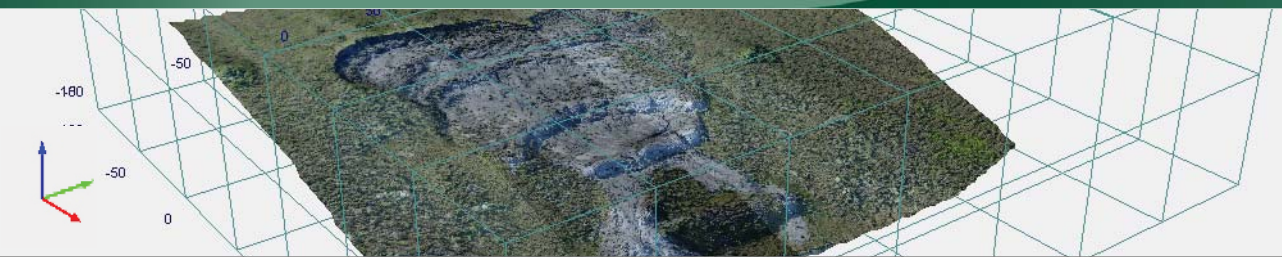
Arctic Network

Bering Land Bridge N Pres. • Cape Krusenstern NM
Gates of the Arctic NP & Pres. • Kobuk Valley NP • Noatak N Pres.

Permafrost Resource Brief

October 2010, no. 09

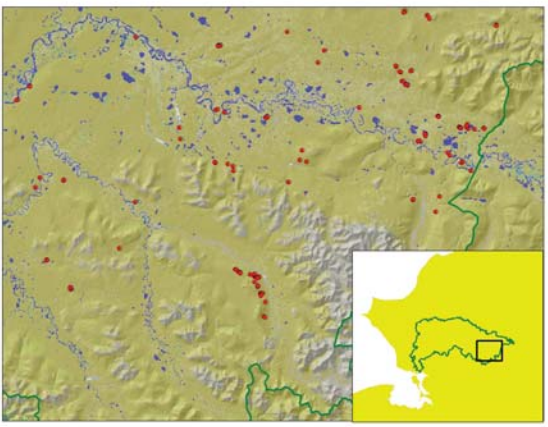


The shape and size of slumps can be modeled and monitored using aerial photography and special software.

Long-term Monitoring:

How will we monitor permafrost in the Arctic Network?

- Monitor ground temperatures at strategically chosen locations around the Arctic Network, to determine if ground temperatures are rising and if so, how much and how fast. Ground temperature monitoring will be co-located with air climate monitoring stations.
- Monitor the area occupied by slumps and landslides caused by thaw of permafrost. Map these features on satellite images, compare them to old aerial photographs, and track changes in the future on satellite images.
- Create 3-dimensional models of selected high-impact slumps caused by thaw of permafrost and track their growth over time. 3D models are made with special computer software, using aerial photographs taken with a hand-held camera. Repeat the photos every few years to track the rapid growth of slumps.
- Create detailed topographic maps, using LIDAR (laser scanner) technology, of areas most likely to change over the next century if permafrost thaws. Repeat the topographic mapping decades in the future to determine how topography has changed.



Numerous slumps and small landslides caused by thaw of permafrost have been identified in this part of the Noatak National Preserve and elsewhere in the Arctic Network.

Management Applications

How can monitoring permafrost help ARCN parks?

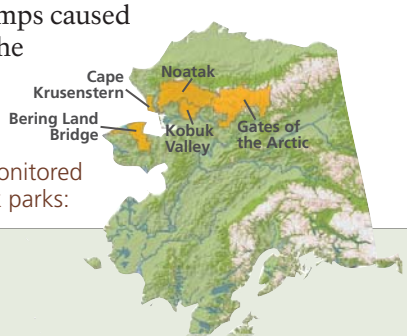
Results of permafrost monitoring will help us understand broad changes in ecosystems that could occur as a result of climate change, such as changes in the area of ponds and lakes, the turbidity of streams, and the density of vegetation. This in turn could affect decisions in management of wildlife, fish, and fire. Knowledge of permafrost stability could inform decisions about road corridors and engineering. Mapping of erosion features from permafrost thaw could be used to protect cultural sites. Interpretive products from permafrost monitoring will educate the public about how climate change is affecting arctic ecosystems.

The horizontal lines on this mountainside are solifluction lobes, caused by the slow flow of soil over permafrost.

Preliminary Objectives

What do we want to know about permafrost in the Arctic Network?

- Trends through time in ground temperatures at representative sites in the Arctic Network. This will indicate whether the permafrost is stable or likely to thaw.
- The area covered by slumps and landslides due to thaw of permafrost and changes over time.
- The growth rate of large slumps caused by thaw of permafrost and the rate of sediment loss from slumps.



Permafrost is being monitored in all 5 Arctic Network parks:

Importance

Why is permafost important in the Arctic Network?

Permafrost underlies most of the Arctic Network and affects nearly everything in the arctic ecosystem, from soils and vegetation to water and wildlife. Permafrost is ground that doesn't thaw in the summer due to a cold climate. Permafrost perches water near the surface, making soils wet and runoff fast. The striking polygonal patterned ground so characteristic of the arctic is due to permafrost. Ice can build up in the ground and then thaw, producing pits, ponds, lakes, and landslides. Many scientists believe that our climate is warming and permafrost will thaw; some think that permafrost thaw has already started. Thaw of permafrost could have many consequences, such as drainage of lakes, creation of new ponds, soil erosion, slumps, siltation of streams and lakes, release of greenhouse gasses, and changes in soil wetness and nutrient supplies.

Contact: David Swanson, ARCN Ecologist, David_K_Swanson@nps.gov (907) 455-0665