The Arctic Angle
Newsletter of the Arctic Network

National Park Service
U.S. Department of the Interior

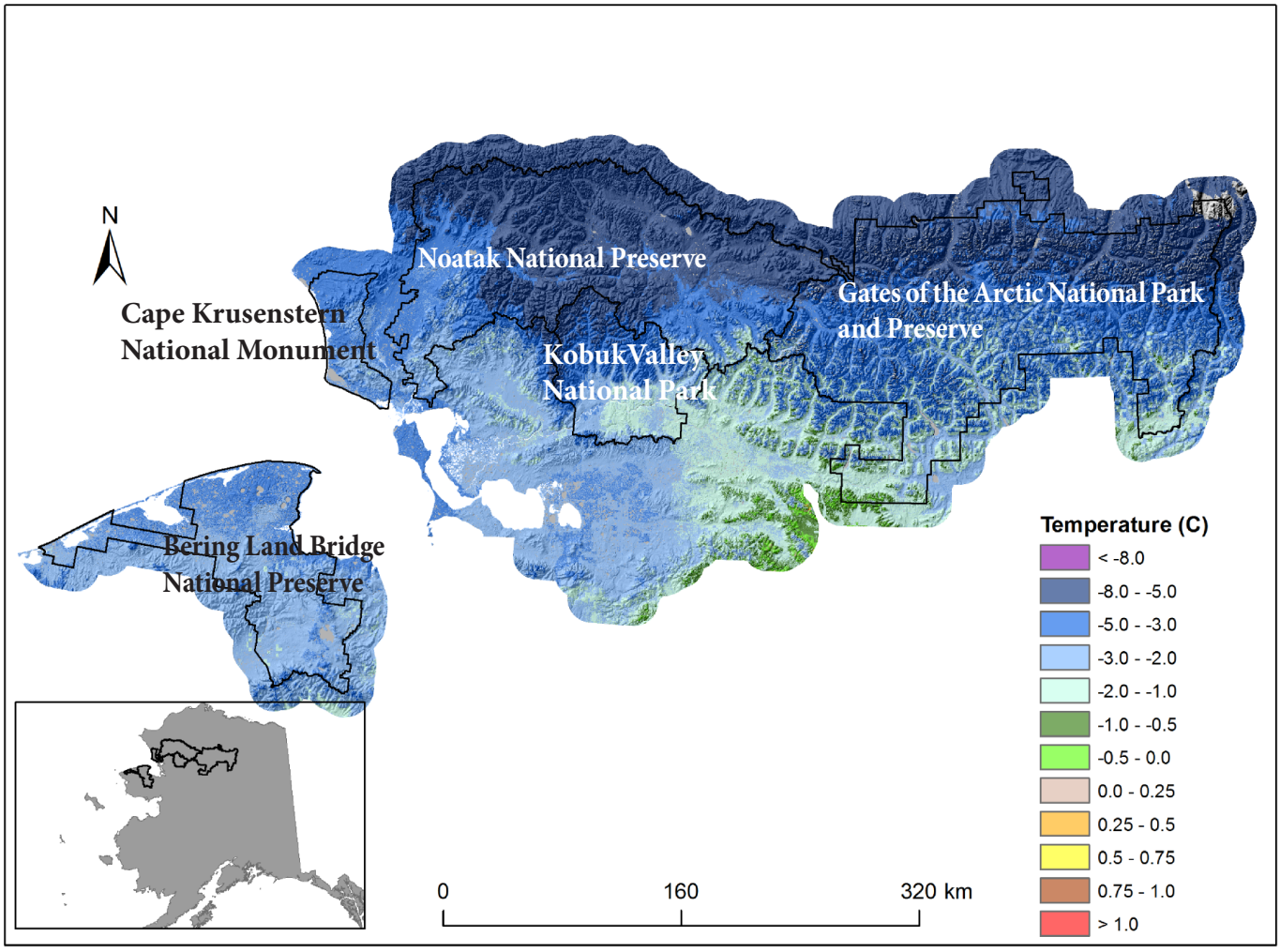
Arctic Network Inventory and Monitoring Program
Spring 2015 Newsletter

Predicting permafrost

Scientists from the Permafrost Laboratory at the University of Alaska Geophysical Institute are mapping present-day and predicted future permafrost in ARCN using NPS data on soils and vegetation, plus climate data from global models of future warming. Permafrost is ground that stays below freezing year-round, and at the present time it is underlies most of ARCN. If mean annual air temperatures in ARCN increase about 2 °C (about 2 °F) by the year 2050 as expected, the permafrost model predicts that the thickness of the seasonal thaw layer will increase and permafrost will get warmer, but most of the permafrost present today in ARCN will remain frozen. This differs from what we expect for Denali and Wrangell-St. Elias National Parks and Preserves— the model showed widespread permafrost thaw by 2050. But if an additional 2 °C of warming occurs between 2050 and 2100 as expected, the model predicts that much of the permafrost in ARCN will start to thaw. Thaw at that extent would have profound effects on vegetation and wildlife. For more information contact Dave Swanson, david_k_swanson@nps.gov, 907-455-0665.

The map below shows current average ground temperature above permafrost across ARCN, based on models. On the back page, the map depicts the same for the years 2091-2100. For both maps, blue and green areas have ground temperatures below freezing, and permafrost is stable. Currently most of ARCN has stable permafrost.

Present-day predicted average ground temperature above permafrost across Arctic Parks.



Summer 2015 Resource Monitoring Activities

Bering Land Bridge National Preserve (BELA) | Cape Krusenstern National Monument (CAKR)
Gates of the Arctic National Park and Preserve (GAAR) | Kobuk Valley National Park (KOVA)
Noatak National Preserve (NOAT)

Brown Bears

Counts of brown bears to estimate abundance and occupancy to determine long-term trends in populations.
May 18-June 5 in BELA and central Seward Peninsula
Kumi Rattenbury 907-455-0673

Landbirds

Counts of montane bird species to estimate abundance and occupancy and determine long-term trends in breeding populations.
May 22-July 1 in GAAR near Anaktuvuk Pass
Contact: Jeremy Mizel 907-455-0638

Climate

Maintenance on 17 climate stations that record temperature, wind speed and direction, precipitation, snow depth, relative humidity, soil temperature, and solar radiation on an hourly basis. Data is transmitted by satellite, and disseminated and archived through the Western Regional Climate Center.
June 1-7 in BELA, CAKR, and NOAT, June 15-26 in GAAR and July 20-24 in NOAT and KOVA
Contact Pam Sousanes 907-455-0677

Permafrost Degradation in Arctic Streams

A new 5-year project aimed at assessing the effects of thaw on watershed hydrology, water quality, and fish habitat and productivity.
June 8-15 in NOAT and Agashashok Watershed and August 7-15 in BELA and KOVA
Contact: Jon O'Donnell, 907-644-3696

Shallow Lakes

Deployment of instruments to measure water chemistry in shallow lakes and ponds to identify long-term trends in water quality.
June 10-15 and September 20-25 in BELA, KOVA and NOAT
Contact: Amy Larsen
See our shallow lakes video https://youtu.be/_9C3fLF_Xsk

Dall's Sheep

Counts of Dall's sheep to estimate abundance and sex-age composition to determine long-term trends in populations.
July 1-31 in NOAT and western Baird Mountains
July 5-17 in GAAR
Contact: Kumi Rattenbury 907-455-0673
See how surveys are done https://youtu.be/y1dfoiyQxwE

Lagoons

Assessing the health and condition of fish and coastal waters in the coastal lagoons during their open-water season.
July 1 to September 30 in BELA and CAKR
Contact: Trevor Haynes, thaynes9@alaska.edu

Lakes and Rivers

Installation of instruments to profile and monitor temperature at large lakes remotely through the Iridium satellite network. Testing of temperature probes for continuous monitoring of water quality in ARCN rivers.
July 12-18 in BELA, KOVA and NOAT
Contact: Jon O'Donnell, 907-644-3696

Shorebirds

Counts of shorebirds during fall migration to estimate abundance and density in coastal habitats.
July 22-Aug 18 in BELA
Contact: Jeremy Mizel 907-455-0638

Caribou

Retrieval of dropped caribou satellite collars
Mid-July at Red Dog Mine.
Capture and fit caribou with satellite collars to track movements of the Western Arctic Caribou Herd
Mid -September at Onion Portage in KOVA
Contact: Kyle Joly 907-455-0626

We monitor physical, chemical and biological indicators that represent the overall health of Arctic Parks.

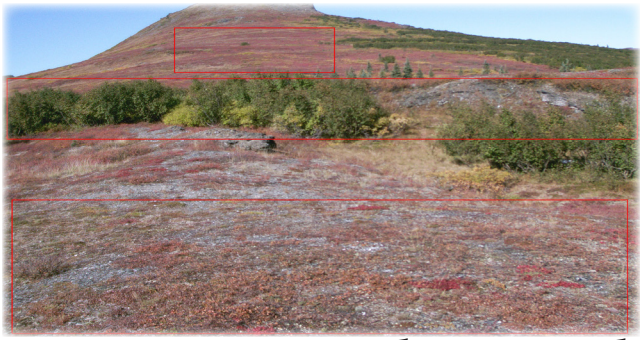
New study aims to understand the effects of permafrost thaw on arctic streams

Recent warming in the Arctic has accelerated permafrost thaw, which can considerably alter the structure and function of terrestrial and aquatic ecosystems. Several new studies have documented impacts of thaw on watershed hydrology, including effects on groundwater flow, erosion and sedimentation, and surface water chemistry. Despite recent advances in our understanding of thaw effects on aquatic ecosystems, little is known about the effects on fish habitat, behavior, and productivity.

To address this uncertainty, scientists from the US Geological Survey and ARCN are beginning a new five-year study in the Agashashok River basin of Noatak National Preserve titled *Hydro-ecological responses to permafrost degradation in Arctic streams* funded by the USGS Changing Arctic Ecosystems program. The Agashashok is located in the boreal-arctic transition zone, and remote sensing observations indicate that permafrost is actively thawing in portions of the watershed. An important goal of this study is to link hydrological processes, biogeochemistry, and fish ecology in a landscape undergoing dramatic change. This interdisciplinary project will be led by USGS hydrologist Josh Koch, USGS fish ecologists Michael Carey and Chris Zimmerman, and ARCN Aquatic Ecologist Jon O'Donnell.

Researchers will integrate a variety of methods to better understand the effects of thaw on aquatic ecosystems and fish, including field observations and measurements, hydrologic modeling, and a fish energetics model. By combining these approaches, they hope to quantify thaw effects on fish metabolism in species such as Arctic Grayling and Dolly Varden. Model forecasting will help researchers to assess the vulnerability of aquatic resources under future climate warming scenarios. Findings from this research could be used to guide watershed management decisions. The projects kicks off this summer, with fieldwork scheduled for June, August, and September.

Contact Jon O'Donnell jonathan_a_o'donnell@nps.gov for more information, 907-644-3696.

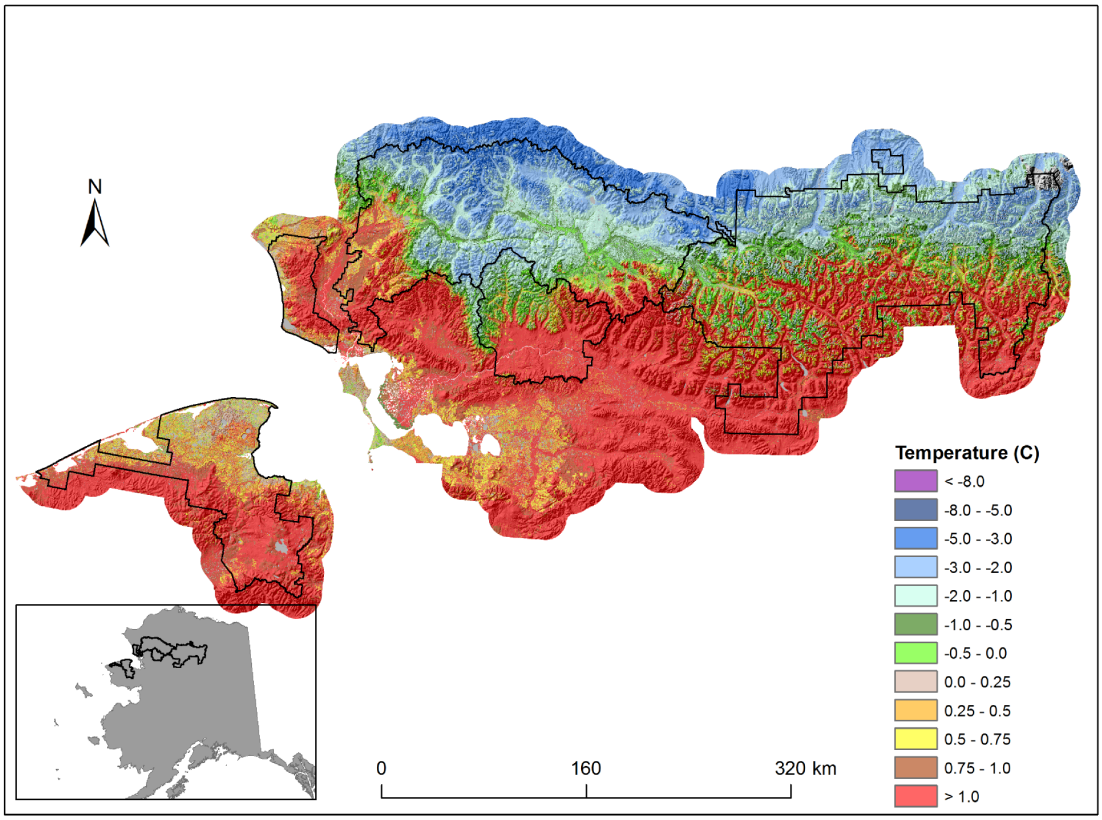


Left: Three phenology monitoring windows (in red) at Salmon River Station, September 1st, 2013. The upper window is the "tundra" window, the middle is "alder", and the lower is "foreground". This image was captured two days before maximum redness in 2013 for the "tundra" and the day of maximum rate of change for "alder" .

Monitoring seasonality remotely

We installed automated cameras at four climate monitoring stations, with a fifth planned for this summer. The cameras take five photos per day which we will use to monitor phenology, the timing of important seasonal events like the spring greening of vegetation, fall colors and senescence, arrival of the snow cover in the fall, and disappearance of the snow cover in the spring. Time-lapse videos will be produced from daily images to show passing of the seasons. The digital data associated with the images will be analyzed to determine the exact midpoint day and rate of spring snowmelt, green-up, and fall senescence. This information will allow us to examine differences between years to identify trends and unusual years. In 2013, soon after installation, the cameras recorded an unusual mid-October thaw– the snow disappeared from three of four camera sites. While the snow returned before October's end at two sites, the camera near Serpentine Hot Springs in BELA revealed bare ground all through mid-winter, until the first of March when the tardy snowpack finally developed and then persisted until the end of April. For more information contact Dave Swanson, david_k_swanson@nps.gov, 907-455-0665.

Predicted average ground temperatures above permafrost in arctic parks from years 2091-2100 (cont. from front page). The blue and green areas have ground temperatures below freezing, and permafrost is stable. By the year 2100 about two-thirds of ARCN's permafrost is expected to be unstable and thawing. Thanks to Dr. Santosh Panda of the UAF Geophysical Institute Permafrost Laboratory for maps of permafrost extent in ARCN.



Arctic Network Inventory and Monitoring Program
National Park Service
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Fairbanks, Alaska 99709
http://science.nature.nps.gov/im/units/arcn/

Our mission is to collect scientifically sound information through natural resource monitoring. In this way we contribute to park management and facilitate park preservation for future generations. We work in Bering Land Bridge National Preserve (BELA), Cape Krusenstern National Monument (CAKR), Gates of the Arctic National Park and Preserve (GAAR), Kobuk Valley National Park (KOVA), and Noatak National Preserve (NOAT).

Science for the stewardship of Arctic Parklands

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