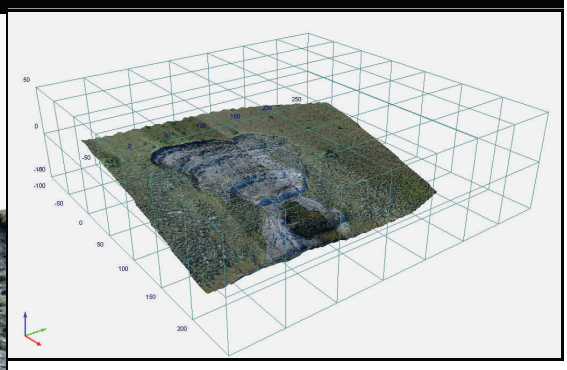
# Arctic Network Newsletter

## Alaska Region Inventory & Monitoring Program

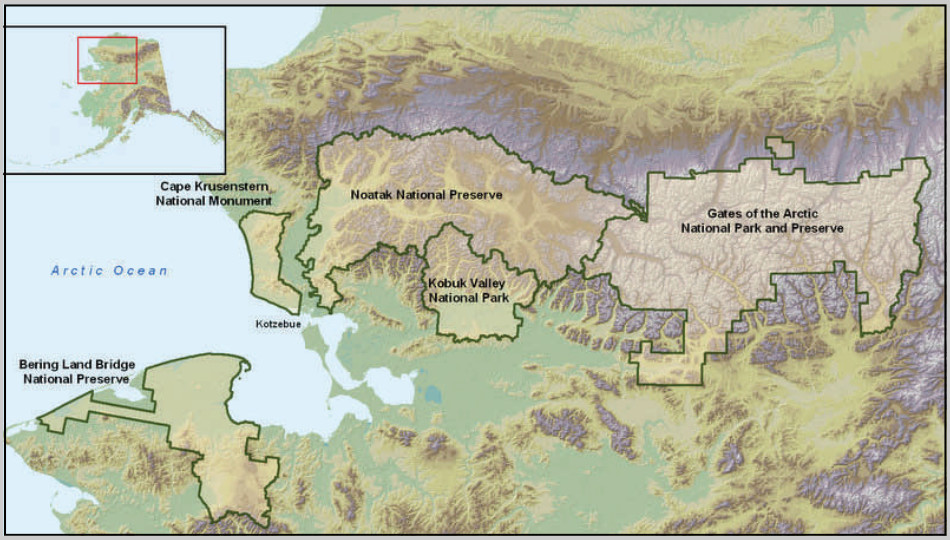
National Park Service
U.S. Department of the Interior



***Aerial photography and computer generated 3D models allow scientists to monitor permafrost in the Arctic Network…pg 3***

## *In this issue*

*Gates of the Arctic National Park and Preserve biologist wins national award for outreach and education ...pg 2*



*More updates on Environmental Vital Signs...pg 4-5*

*Noatak River Landbirds Study successfully completes pilot year ...pg 4*

*ARCN and CAKN survey Dall's sheep across Gates of the Arctic and Wrangell St. Elias National Parks and Preserves...pg 4*

**Science for the stewardship of Arctic Parklands**

# Science education in Alaska's communities: Melanie Flamme receives National Award

*Acronyms can be found on this page*

*Melanie teaches students in Anaktuvuk Pass.*

**Melanie Flamme, biologist for Gates of the Arctic National Park and Preserve (GAAR), received the 2010 National Association for Interpretation Community Interpretive Service Award.**

Melanie earned this recognition for her interest, excellence, and dedication to planning and implementing outreach programs with interpretative rangers Tracie Pendergrast (GAAR) and Gina Hernandez (WEAR). Melanie is a clear example of how park scientists and interpreters can work together to teach others the importance of the National Parks and the environment.

*Melanie tags a Red-backed vole with high school student Julia Brice.*

Her education efforts include:

*The High School Small Mammals Program (CAKN)* teaches high school science students about research methods and encourages students to apply for a summer fieldwork internship. These internships have inspired students to pursue conservation careers.

*AKP students admire Yellow-billed Loon specimen.*

*The Junior High School Bird Species of Concern Program* teaches students how to identify birds by sight and sound, the importance of migratory birds, and encourages conservation of all bird species. This year, ARCN presented its "species of concern" outreach program for the second year in Anaktuvuk Pass and for the first time in Kotzebue.

*The High School Yellow-billed Loon Program* emphasizes yellow-billed loon conservation and the importance of data collection and using the data to draw conclusions. In 2010, ARCN launched this program's second year in Kotzebue and Anaktuvuk Pass.

## 2010/2011 Winter Activities

| *November* | *December* | *January* | *February* |
|---|---|---|---|
| 9-10<br>ARCN Technical Committee Meeting | 13-15<br>Western Arctic Caribou Herd Meeting | 19-20<br>ARCN 3rd Year Program Review | 15-16, 18<br>Seward Peninsula and Northwest Arctic Regional Advisory Council Meetings |

### About the Arctic Network (ARCN)

Our mission is to collect scientifically sound information through natural resource monitoring to 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).

**More Acronyms**

WEAR: Western Arctic Parklands (BELA, CAKR, KOVA, NOAT)
YUGA: Yukon-Charley Rivers/Gates of the Arctic
DENA: Denali National Park and Preserve
CAKN: Central Alaska Network
WRST: Wrangell St. Elias National Park
AKP: Anaktuvuk Pass

**Photographs**

**Front Cover**

*Top Left*: Dave Swanson examines permafrost exposed in a large thermokarst slump in NOAT.

*Top Right*: 3D simulated model of thermokarst.

*Middle Left*: Melanie Flamme works with AKP junior high students.

*Bottom Left*: Moss and lichen in WEAR.

*Middle*: Kristin DeGroot on the Noatak River, GAAR.

*Middle Right*: Dall's sheep survey crew at Devil's Mt., WRST.

**Back Cover**

*Left*: Chandalar lake ice, GAAR.

*Right*: Female Smith's Longspur, NOAT.

**Left (This Page)**

Michael Letzring, GAAR videographer, collects footage for podcasts about public lands along the Dalton Highway.

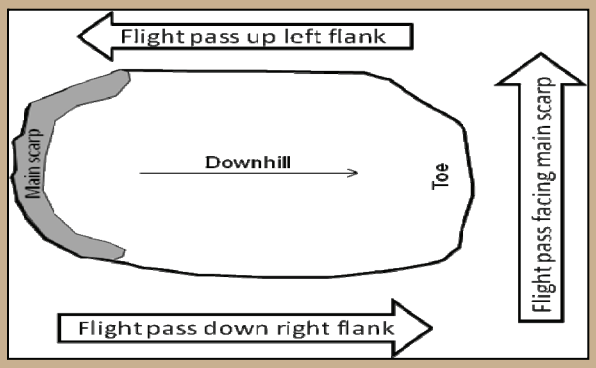
# Featured Vital Sign – Permafrost

***Vital signs are a subset of physical, chemical, and biological elements and processes of park ecosystems that are selected to represent the overall health or condition of park resources, known or hypothesized effects of stressors, or elements that have important human values.***

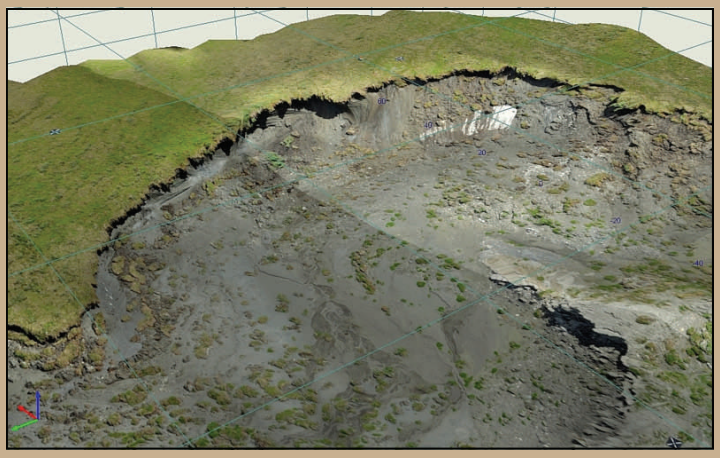
*Acronyms can be found on pg 2*

***Retrogressive thaw slumps (slumps)*** are dramatic features of the arctic landscape caused by thaw of permafrost. Retrogressive thaw slumps are one of many phenomena produced by the action of thermokarst—subsidence caused by the thaw of ground ice. While localized thaw and refreezing of permafrost occurs under a stable cold arctic climate, climate change has been cited as a cause of recent increased thaw of permafrost in Alaska. Thaw-related slumping and associated soil erosion may have increased in the Arctic Network in recent years. ARCN scientists monitor the area occupied by slumps and landslides caused by thaw of permafrost by mapping these features on satellite images and comparing them to older aerial photographs.
We are also measuring ground temperatures at strategically chosen locations in ARCN parklands (to be co-located with air climate monitoring stations), to determine if ground temperatures are rising and if so, how much and how fast.

***Selecting and monitoring slumps***
Slumps were selected from previous mapping and photographic monitoring based on 1) size, 2) potential for siltation of adjacent water bodies, 3) potential for encroachment on archeological sites, 4) visual impact, and 5) proximity to other slumps (for economy of access). Twenty-four slumps were photographed from the air in 2010 and will be re-photographed at an interval of 1 to 5 years. Ground surveys were made at 14 slumps to determine the scale and orientation of the photos. Other slumps will be surveyed in the future. ARCN plans to monitor roughly 25-30 slumps.



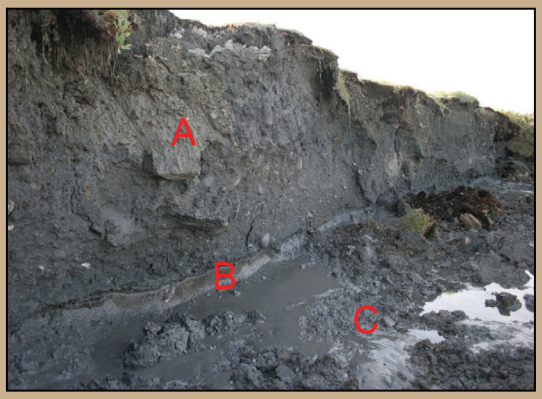

*Configuration of typical flight paths for slump photography.*



*Synthetic 3D view of headwall region of a slump in NOAT.*

***Creating 3D models of slumps***
Aerial photographs were used to create high-resolution 3D topographic models that will be used to monitor the growth and revegetation of thaw slumps. With Topcon Image Master software, common points on pairs of adjacent photos (pass points) and aerial markers were used to determine the location and orientation of the camera when each photo was taken. The software then uses the shift in landmarks between photos to create a realistic 3D model for calculating the area, slope, and volume of the slumps and produce orthophotographs (pictured left).

***Characteristics of slumps***
The height of the main scarp (pictured right) and volume of the slump depression are related to the type of ground ice present, which is in turn related to the age of the material that the slump forms in. Main scarps range from 1 m to 10 m (33 ft) high. Most of these slumps expose glacial deposits over a layer of dirty ice that is probably Pleistocene glacial ice, preserved underground for over 14,000 years. The deepest slumps are in older deposits—large Pleistocene ice wedges that formed when wooly mammoths roamed the landscape.




*Close-up of main scarp of slump NOAT161. The scarp exposes about 1.5 m of glacial till (A), over glacial ice (B) that is melting to produce a liquefied mud zone (C).*

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

# Monitoring Vital Signs in the Arctic Network

*Acronyms can be found on pg 2*

*Landbirds* Melanie_Flamme@nps.gov
In June this past summer, we tested new methods for conducting riparian-based avian point counts along the Noatak River in GAAR and NOAT to improve estimates of bird relative abundance and to facilitate collaboration with CAKN for a shared avian monitoring program. Over a 22-day period, 3 crews, spaced 2 days apart, traveled 16 routes (171 points) along the river. The repeated counts conducted along these routes will be used to compare observers' detection probabilities and relative abundance estimates for bird species.

*Caribou* Kyle_Joly@nps.gov
Over 35,000 GPS locations were collected from 39 caribou GPS collars that were deployed in collaboration with Western Arctic Herd collaborators at the end of 2009. Fifteen more collars were deployed at Onion Portage, KOVA, in September this year.

*Sheep* Kumi_Rattenbury@nps.gov
In July 2010, ARCN and CAKN surveyed Dall's sheep using distance sampling methods in GAAR and WRST. We are testing these methods to estimate park-wide and regional abundance of Dall's sheep. In GAAR, 5 pilot-observer teams flew 318 of the 321 transects generated across all potential habitat (sampling 11% of a 27,000 km$^2$ survey area), and observed 217 groups, averaging 2.5 sheep. In WRST, only the northern portion of the park and preserve was surveyed due to inclement weather. Four pilot-observer teams flew 129 20-km transects and observed over 200 groups, averaging 4.4 sheep. We are currently analyzing the data to produce 2010 abundance estimates for GAAR and northern WRST and a revised 2009 estimate for GAAR taking into consideration variables such as elevation, weather, pilot-observer team and group size that affect the sightability of sheep and the abundance estimates.

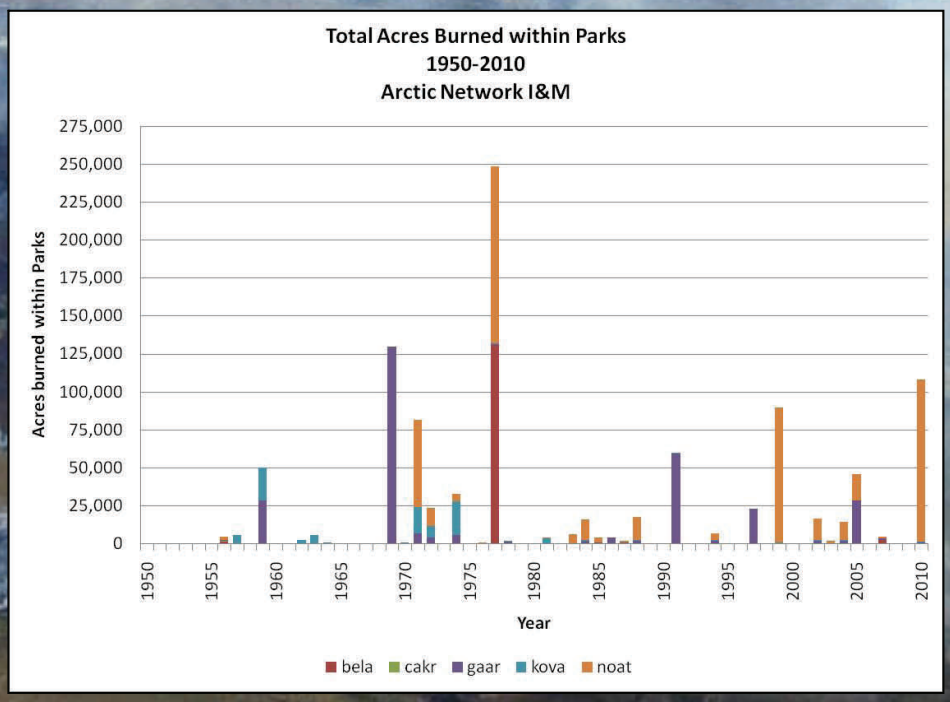
*Brown Bears* Brad_Shults@nps.gov
In May 2010, we completed an aerial survey to determine the abundance of brown bears in the eastern half of GAAR. In tandem-seat aircraft, 5 pilot-observer teams searched approximately 1,890 mi$^2$ during 126 hours. Preliminary results were 66 adult bears and 26 cubs (≤ 2 years old). These observations will be used to estimate abundance and density of bears within the larger 6,684mi$^2$ study area. Surveys will be completed every 4 years in this area as part of the ARCN Vital Signs Monitoring Program.

*Terrestrial Landscape Patterns and Dynamics*
Dave_K_Swanson@nps.gov
This year we analyzed available historical satellite landscape "greenness" data (NDVI) for the period 1990-2009 for ARCN. A NPS technical report is now complete and currently out for independent peer review.

*Terrestrial Vegetation and Soils* Peter_Neitlich@nps.gov
Reindeer grazing is a permitted use in BELA, much like cattle grazing on Lower 48 federal lands. We are planning to erect 18 grazing exclosures in BELA to accompany the long-term lichen winter range monitoring plots established there. In these exclosures, we will be monitoring percent cover and height of lichens in order to portray available winter habitat for ungulates.

*Wet and Dry Deposition* Peter_Neitlich@nps.gov
In 2006, we conducted vegetation sampling to determine the effects of heavy metals on tundra vegetation, especially sensitive lichen communities. As part of this sampling, collections of moss were taken for elemental concentration analysis. This year, we collected 8 samples of the moss *Hylocomium splendens* from a subset of the Terrestrial Vegetation and Soils Plots. Samples will be analyzed for elemental composition of a number of elements associated with contamination. *Cont. on pg 5*

*Fire Extent and Severity*
In 2007 we began a study funded by the Joint Fire Science Program to document fire history and vegetation in areas of NOAT over the past 6,000 years. The goals of the study were to understand how and why fire regimes in the region varied in relation to climate and vegetation. This study capitalized on the ability to reconstruct both vegetation and fire history using lake sediment records, a tool particularly well-suited for studying fire history in treeless tundra ecosystems. For the past 2000 years the median fire return intervals varied from a 113 year interval at Uchugrak Lake to a 240 year interval at Little Isac Lake.
Jennifer_Barnes@nps.gov

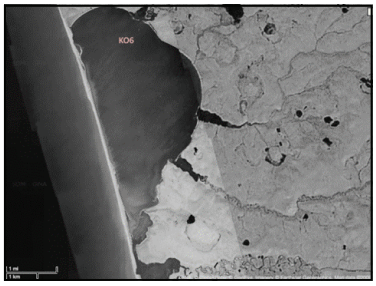


*Acronyms can be found on pg 2*

*Wet and Dry Deposition*
*Continued from pg 4*
With the help of the U.S. Geological Survey-Columbia Environmental Research Center we will develop a predictive model relating the deposition of nitrogen, sulfur, and selected metals in the moss *Hylocomium splendens* with deposition measured in passive sampling devices and instrumented monitors.

*Hylocomium splendens.*

*Coastal Lagoons* Melinda_Reynolds@nps.gov
In 2009, we assessed the feasibility of sampling water quality and biotic communities for seven coastal lagoons in CAKR. Logistical challenges of accessing these remote lagoons hindered data collection for some locations. Water quality was sampled in Akullaq, Krusenstern and Kotlik lagoons. Benthic, planktonic, and fish communities were sampled in Krusenstern, Kotlik, and Sisualik Lagoons. Analysis of lagoon samples is currently underway.




*Satellite image of Kotlik Lagoon*

*Air Quality and Monitoring*
Zac_Richter@nps.gov
ARCN has been operating a NPS, Air Resource Division (ARD) air quality monitoring station in Bettles, Alaska since June 2009. Although Bettles is not directly within any ARCN parks, it was chosen as the best location due to reliable power, year-round staffing and its location on the south side of the Brooks Range, which is thought to be representative of the bulk of ARCN's airshed. Monitoring of wet deposition and regional haze is conducted in collaboration with the National Atmospheric Deposition Program/National Trends Network (NADP/NTN), the National Atmospheric Deposition Program/Mercury Deposition Network (MDN), and the Interagency Monitoring of Protected Visual Environments Network (IMPROVE). In addition to providing access to raw data, the NADP and IMPROVE websites provide reports, publications and a variety of data products that support the national program's objectives. The previous year of data from the Bettles station is now available on these web sites. The majority of the trend analysis is completed on an annual basis and therefore it will be another year before enough data have been collected at the Bettles station for reporting and most likely another 3 to 5 years until that data can be meaningfully utilized to identify trends.

*Ranger Nina Valadez downloads rain gauge data.*

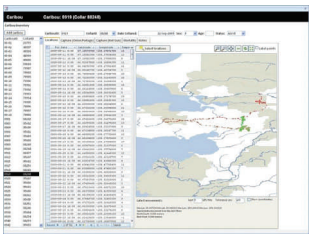
*ARCN Air Quality Monitoring Station in Bettles, Alaska.*

*Weather and Climate Stations*
Ken_Hill@nps.gov, Pam_Sousanes@nps.gov
Climate stations have been tested, modified, and improved in preparation for deployment. The Snotel site at Kelly Ranger station, NOAT was rehabilitated in August with the help of the National Resource Conservation Service. The site is now running and measuring basic climate parameters. The cultural resources assessment at potential climate station sites in BELA was completed in August with WEAR archeologist Bob Gale.

*Ken Hill, physical scientist, repairs climate station in WRST.*

## Scott's Corner

## Data Management



We recently developed a caribou monitoring database to handle GPS fixes from collared caribou in the Western Arctic Herd. This database stores and retrieves information about caribou and automates many of the data quality control processes. We developed tools to gather the GPS fixes, convert them into a readable format, remove duplicates, fix missing or redundant values and insert the records into our database. Once these quality control processes are complete the principal investigator can then analyze the data using GIS and analytical software extensions.

Brown bear surveys collect relatively simple data but present special challenges for data management. Bear group data may contain numbers of adults and cubs and their activities, information that can be stored in a database, but these data must be associated with networked data files such as waypoint and tracklog files and most importantly, photos of bear groups for the full meaning of the survey to be preserved. Managing and synchronizing the data with the files by hand has proven to be extremely difficult. We recently built a database application to handle this problem. The database stores and retrieves the composition count data and keeps related files synchronized on the filesystem. We anticipate expanding this database for use in our Dall's sheep and muskox surveys.
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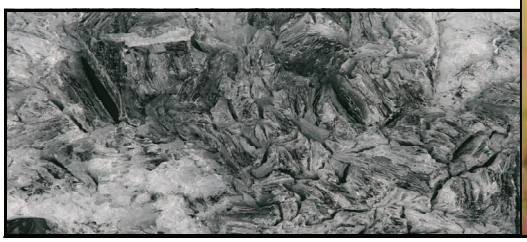

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Marci Johnson, WEAR biologist

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