Arctic Network Newsletter

Alaska Region Inventory & Monitoring Program

National Park Service

In this issue

"Wetlands are considered the kidneys of the landscape– they clean the water. Wetlands are important rearing grounds for young of all kinds, whether it's birds or fish or insects."
- Amy Larsen on shallow lakes and wetland areas

"Other studies have shown that winter flow or baseflow has increased, presumably in response to permafrost thaw and increasing groundwater circulation. These hydrologic changes can have profound effects on the water quality of streams and rivers."
- Jon O'Donnell on rivers and streams

"When considering the potential impacts from oil spills, our baseline data allows us to build up an idea of which areas need priority protection. Where would we really want to try to keep oil away from and at what times of the year is that most important for fish, birds, marine mammals, and people?" - Martin Robards, on monitoring coastal lagoons



Arctic Network Inventory and Monitoring Program (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).

Our Network is Alaska's 5 northern National Parks

Arctic Network Staff (area code 907)

Jim Lawler	455-0624	Tara Whitesell	455-0663
Dave Swanson	455-0665	Jeremy Mizel	455-0638
Doris Lenahan	455-0668	Stacia Backensto	455-0669
Kumi Rattenbury	455-0673	Jon O'Donnell	455-0663
Pam Sousanes	455-0677	Ken Hill	455-0678
Scott Miller	699-2268		

Contributors to this issue: Jon O'Donnell, Amy Larsen, Martin Robards with Wildlife Conservation Society

Science for the stewardship of Arctic Parklands

To learn more about ARCN and our recent activities visit http://science.nature.nps.gov/im/units/arcn/. Check out our monitoring videos on the AlaskaNPS channel http://www.youtube.com/user/AlaskaNPS.

Shallow Lakes

We are working to understand lake ecosystem dynamics and lake change over time across ARCN. Not all lakes will be impacted by climate warming, but many will, and our monitoring efforts will help us understand the various ways in which lakes will change and affect the lives of the people and animals who depend on them.

This lake is expanding as near shore permafrost melts.

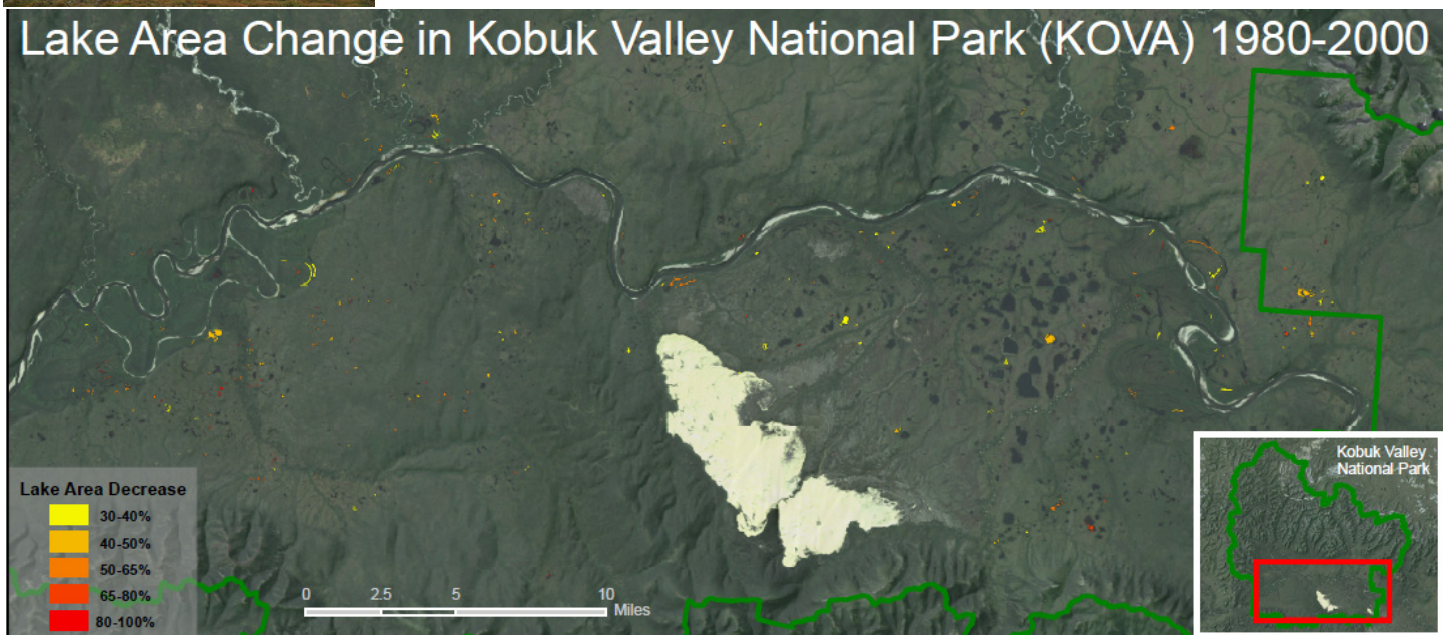
The mechanisms by which lakes and ponds change over time are surprisingly complex. Each year, water level is affected by snow pack, the rate of spring melt, precipitation and ground water inputs, as well as numerous physical factors such as soil composition, permafrost, ice content, and watershed slope and size. Over the last five years, we observed permafrost melting around many lakes and ponds network-wide. Ice melting near the shoreline can affect lakes in several ways: 1) the lake may expand in size or merge with a nearby lake (pictured above), 2) large quantities of trees and sediment may slump into the lake, and 3) ice wedges near the shoreline can melt and allow more water to run out of the lake causing it to drain.

Lake drying is a serious concern in the Arctic because the climate is cold and dry. When lakes drain (pictured left) the environment becomes drier and habitat is unavailable for wetland animals like waterfowl, muskrats, mink, beaver and many other species. Usually the entire lake doesn't disappear, but it can become considerably smaller. In KOVA, 240 lakes have drained (see figure below) by more than 30% over the past 30 years, and the total lake surface area in the park has decreased by about 14%.

Melting permafrost is partially responsible for these changes. Ice melting near the lake outlet allows more water than normal to flow out, and the lake level drops. Depending on the thickness and size of the ice wedge that melts, changes can range from small to catastrophic. Over 15 lakes in KOVA have drained catastrophically— virtually overnight. These drained lake bottoms are very obvious and look like a lunar landscape.

Melting permafrost can also affect a lake when large ice wedges melt and cause sediment and trees to slump into the lake. The amount of ice in the frozen ground along the lake shore determines how much a lake may be impacted— the larger the ice wedge, the larger the potential impact to the lake. Thaw slumps can grow over several years and become very large, adding considerable amounts of soil and vegetation to the water column. This material increases the nutrient supply to the lake, often increasing animal production. Thaw slumps have occurred on many lakes in BELA, where there are large areas of Yedoma.

Contact Amy Larsen for more information about shallow lakes amy_larsen@nps.gov.



Yedoma: a treasure trove of fossil remains

In the summer of 2012, we sampled lakes and ponds located in BELA. Looking at a USGS topographic map would lead one to view the park is a wasteland of lakes on a relatively flat plain. Upon further examination, one finds that the park is a complex mosaic of inactive volcanoes, lava flows, ancient sand dunes, low rolling hills of silt and a vast coastal plain. Amid these varied lakes live a vibrant waterfowl population, large herds of caribou, grizzly bears and muskox. Trees and shrubs are sparse in the region, and it is easy to imagine large mammals ambling across this open landscape. From the air, we often see animals or melting permafrost—perhaps a big exposed ice wedge—but last summer we stumbled across the ancient remains of several large mammoths! Our crews have sampled hundreds of lakes throughout Alaska, and rarely do we discover something so unique and massive. We found these bones exposed on the lake floor shortly after the lakes had drained.

The bones, from a distance, stuck out of the water just enough for an arctic tern to take a short rest. Our biggest find was a humerus and radius, together with some rib bones, vertebrae and several teeth. These objects were dated at 12,500 years old. This was the third youngest mammoth ever to be found in Alaska. This particular lake was in a large region of Yedoma, a special type of frozen ground where large ice lenses are hidden within a thick silt deposit. This experience has forever changed the way we look at the land. These discoveries have unleashed the treasure hunter in all of us; from the airplane, we excitedly scan the shorelines of lakes and ponds hoping to discover a bit of tusk, teeth or bone sticking out of the mud.

Yedoma is a special type of permafrost that was formed in the Pleistocene, some 12,000 years ago. This type of permafrost is very rich in ice, large ice wedges can often be seen usually in silt, and there are large amounts of ancient plant material and often animal parts preserved in it. This past summer we found several lakes that had drained that contained mammoth and other fossilized bones.

Contact Amy Larsen for more information about shallow lakes amy_larsen@nps.gov

How we do it: Documenting lake change

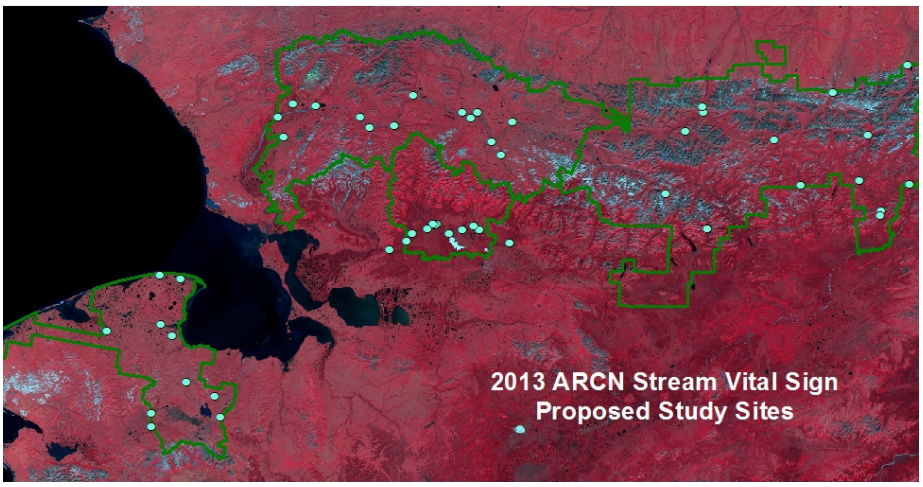
We use satellite photographs to measure changes in the size of lakes over time, and we visit a small portion of the lakes to record lake depth, the shape of the lake bottom, and basic soil features such as particle size and type (e.g., sand, silt, or gravel). We also sample the water to measure nutrients available for plants and animals. So far, the network has sampled 100 lakes in KOVA and 114 lakes in BELA. This summer we are planning to sample 100 lakes in NOAT.

Stream and River Ecosystems

Recent climate change at high-latitudes is altering the hydrology, thermal characteristics, chemical composition, and ecology of streams and rivers. For instance, mean annual discharge in large arctic rivers has increased in recent decades in response to warming air temperatures. Other studies have shown that winter flow or baseflow has increased, presumably in response to permafrost thaw and increasing groundwater circulation. These hydrologic changes can have profound effects on the water quality of streams and rivers.

Still, very little is known about how stream ecosystems will respond to projected climate change in ARCN parks. Large uncertainties exist regarding the magnitude and nature of climate-driven impacts across space and time. To better understand stream and river dynamics in ARCN parks, we are developing protocols to detect changes in water quality over space and time. This summer, we will conduct a synoptic survey to provide a "snapshot" of current conditions. Streamwater samples will be analyzed for dissolved organic carbon (DOC) chemical composition (see sidebar) and a suite of other parameters. These tools will be used to "fingerprint" streams based on source-water type and watershed characteristics. Data from this pilot season will be used to guide and refine future protocol development and site selection for long-term inventory and monitoring efforts.

For more information contact Jon O'Donnell, jaodonnell@nps.gov.



Seven of NPS Wild and Scenic Rivers flow through ARCN parks: Noatak, Alatna, John, Kobuk, Salmon, and Tinayguk. The Noatak is an International Biopreserve.

Assessing Water Quality

Measures and Techniques

DOC – organic matter in aquatic system that can pass through a 0.45-micron filter. DOC functions as a source of nutrients, regulator of pH, and mediator of microbial reactions.

UV-visible absorbance – provides information on DOC chemical structure and molecular weight.

Fluorescence – provides information on DOC origin (terrestrial vs. aquatic) and presence of different compounds (e.g. proteins, organic acids).

Chemical fractionation – a technique used to separate DOC into function groups (e.g. water-loving vs. water-fearing compounds).

Learning from other watersheds in Alaska

Studies from interior and southeastern Alaska—where climatic conditions are substantially warmer than in ARCN—may serve as a proxy for what future conditions may hold. For example, in the Yukon River basin, the concentration of DOC has declined with recent warming and thawing of permafrost. Also, the molecular composition of DOC has shifted, reflecting changing permafrost extent and watershed hydrology. In southeast Alaska, shrinking glacial coverage in watersheds is driving higher concentrations of DOC and nitrogen in rivers, but lower phosphorous concentrations. These chemical shifts will likely modify growth rates of aquatic algae and mosses, which ultimately affect other organisms in the aquatic food-web, like fish and birds.

Coastal lagoons are critically important ecosystems for wildlife and subsistence practices in northwestern Alaska, and are vulnerable to both climatic change and industrial development. In order to understand the status of Park resources in a rapidly changing environment and to mitigate threats of climate change and industrial development, we collaborate with the Wildlife Conservation Society (WCS) to gather baseline information and monitor lagoons in BELA and CAKR. Currently, our focal lagoons are Ikpek and Cowpack in BELA, and Aqulaaq, Krusenstern, and Kotlik in CAKR.

Our efforts will benefit not only NPS land managers but land management agencies elsewhere in Alaska. For example, we have already established that some lagoons (e.g., Krusenstern) are much more productive and of greater importance for subsistence fish.

We are also working with local residents to ensure that the information we collect is presented in a manner that is useful to them. This includes plans to portray "the story of the lagoons" in collaboration with the Native Village of Kotzebue.

We use high-tech digital equipment to monitor water quality, lab analyses to assess phytoplankton, and a range of nets to catch fish. Birds are monitored opportunistically as we travel around lagoons in a 4-person inflatable boat to our different sites. All of this equipment and the provisions for camping for a few days at each lagoon are carried in a Cessna 185. The logistics of visiting multiple coastal lagoons, the distances that must be traveled, and the challenges of collecting quality information in a diverse set of lagoons that change throughout the seasons make monitoring these water bodies very difficult. For more information contact Martin Robards, mrobards@wcs.org

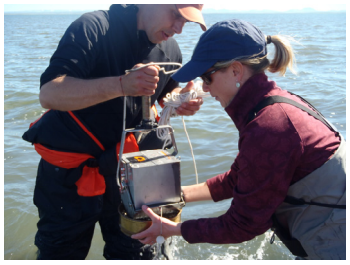
The information we gather continues to inform us about the baseline conditions in lagoons, the most recent sampling being in July of 2012.

Alaska Plaice (*Plueronectes quadrituberculatus*)

Pacific Herring (*Clupea pallasii*) and Humpback Whitefish (*Coregonus pidschian*)

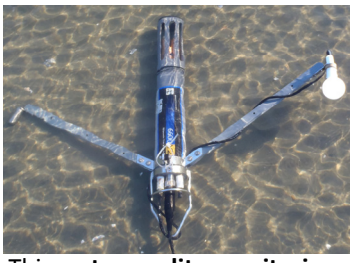
Northern Sand Shrimp (*Pandalus borealis)*

Tools of the trade



We use a **ponar grab** to sample invertebrates from the lagoon floor.

We use **beach seine** and **gill nets** to sample the fish community.



This **water quality monitoring meter** measures water salinity, temperature, and turbidity.

courtesy USFWS

Birds are also indicators of lagoon productivity because they feed in these areas to fuel up before and after migrating. Last summer, we observed thousands of Dunlin (*Calidris alpina,* pictured here) preparing for their southward journey at Cowpak lagoon.

This summer, NPS biologists and University of Alaska Anchorage will begin investigating shorebird use of BELA and CAKR lagoons during fall migration. Each summer, breeding shorebirds are monitored at Krusenstern lagoon by the Arctic Shorebird Demographic Network– a community of scientists working together to monitor shorebird populations across the North American Arctic from Nome to Churchill, Canada. Krusenstern lagoon is a sister site to neighboring Chukotka in the Russian Federation where the NPS Shared Heritage Beringia Program is active.

Arctic Network 2013 Summer Field Activities

Streams and Large Lakes

Jon O'Donnell will be in BELA June 20 - 23 and NOAT June 24 - 30 to characterize stream and lake habitats and to collect water samples for chemical analysis. Later in KOVA, August 18 - 25, he will sample streams along the Kobuk river between Ambler and Kiana. *jaodonnell@nps.gov/907-455-0631*

Shallow Lakes

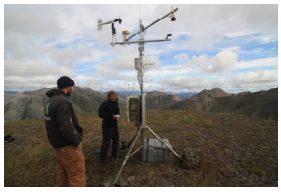
In NOAT, from July 5 - 19, Amy Larsen, Heidi Kristenson and crew will collect information on water quality, shoreline vegetation and permafrost characteristics for 100 lakes in the Preserve. *amy_larsen@nps.gov/ 907-455-0622*

Serpentine Hot Springs

Linda Hasselbach and crew will study hydrology and monitor water quality at Serpentine Hot Springs in BELA, June 27 - 30. *linda_hasselbach@nps.gov/509-996-8031*

Climate Station Maintenance

Pam Sousanes and Ken Hill will maintain climate stations across ARCN. They will visit stations in GAAR, May 27 - 31; CAKR and NOAT, June 25 - 29; KOVA/ NOAT, July 15 - 19; and BELA, August 5 - 9. The stations provide real-time and archived information on temperature and precipitation gradients, climate variability and extreme events.



pam_sousanes@nps.gov/ 907-455-0677

Exclosures

From July 21 - 23, Peter Neitlich will revisit 12 grazing exclosures installed in 2012 in BELA to monitor impacts of grazing on lichen communities. *peter_neitlich@nps.gov/ 509-996-3917*

Vegetation Nodes Dave Swanson and crew will sample vegetation plots from July 3 - August 13 in: BELA near Cowpack Lagoon and Devil Mountain Lake; NOAT near Radio Hill and Lower Noatak Lowlands; and in CAKR.

dave_swanson@nps.gov/ 907-455-0665

Fire

Jennifer Barnes will be in NOAT, June 24-30, monitoring fire plots, mapping fires, and reducing vegetation at the Kelly Ranger Station. *jennifer_barnes@nps.gov/ 907-455-0652*

Brown Bears

From June 1 - 10 Brad Shults, in cooperation with ADF&G, will conduct aerial surveys across BELA for brown bears in order to estimate their abundance and occupancy.

brad_shults@nps.gov, 907-455-0674

Dall's Sheep

Marci Johnson and Kumi Rattenbury will conduct aerial surveys for Dall's sheep in the western Baird Mountains in NOAT, June 29 - July 3 and in the Itkillik preserve area in GAAR, July 8 - 13.

The surveys provide data to estimate abundance, and sex and age composition. *kumi_rattenbury@nps.gov 907-455-0673*

Yellow-billed loons

Melanie Flamme and Stacia Backensto will sample forage fish and yellow-billed loon eggs for contaminants in BELA, June 13 - 16—during which time two high school students (Max Dan from Anchorage and Sam Tocktoo from Shishmaref) will video document the field effort and loon nesting ecology. Aerial surveys with USFWS for nest occupancy will be conducted, June 18 - 28 in BELA and CAKR. *melanie_flamme@nps.gov, 907-455-0627*

Shorebirds

Jeremy Mizel and crew will assess shorebird abundance at Ikpek Lagoon in BELA from July 24 - August 30 to better understand lagoon use during fall migration. To complement this effort, Audrey Taylor (UAA) will conduct aerial surveys for shorebirds along BELA and CAKR coasts, July 27– August 4. *jeremy_mizel@nps.gov/907-455-0638 and artaylor@uaa.alaska.edu/907-786-6854*

COMMUNICATIONS and MEDIA

Reports and Publications

Soil and Carbon Storage: Hugelius G, Tarnocai C, Kuhry P, Harden J, Ping C-L, Schuur EAG, Schirrmeister L, **O'Donnell JA**, Mishra U, Palmtag J, Grosse G, Camill P, Michaelson G, Strauss J, Eberling B, Jorgenson T, Johnson K, Yu Z, Bockheim JG. 2013 (in press). Spatially distributed estimates of soil organic carbon storage between 1 to 3 m depth in the northern circumpolar permafrost region (an extension of the Northern Circumpolar Soil Carbon Database). Submitted to *Earth System Science Data*.

Caribou: 1) Joly, Kyle. 2012. Sea ice crossing by migrating Caribou, *Rangifer tarandus*, in northwestern Alaska. Canadian Field-Naturalist 126(3): 217–220.
2) Joly, K. 2012. Caribou Vital Sign Annual Report for the Arctic Network Inventory and Monitoring Program.

Dall's Sheep: Schmidt and Rattenbury. In press. Reducing effort while improving inference: Estimating Dall's sheep abundance and composition in smalls areas. Journal of Wildlife Management.

Vegetation: Swanson, D. 2012. Vegetation sampling in the Arctic Inventory and Monitoring Network, 2009-2012. http://science.nature.nps.gov/im/units/arcn/index.cfm?rq=12&vsid=24

Landscape Change: Swanson, D. 2012. Three decades of landscape change in Alaska's Arctic National Parks: Analysis of aerial photographs, c. 1980-2010. http://science.nature.nps.gov/im/units/arcn/index.cfm?rq=12&vsid=28

Weather: Wilson, Ryan R., Annett Bartsch, **Kyle Joly**, Joel H. Reynolds, Anne Orlando, and Wendy M. Loya. 2013. Frequency, timing, extent, and size of winter thaw-refreeze events in Alaska 2001–2008 detected by remotely sensed microwave backscatter data. Polar Biology 36: 419–426.

Outreach and Education

Fly ARCN parks with the new Interactive Web-Feature: Satellite images and aerial photographs are combined with topography to simulate a 3D view from above! Fly to points of interest by selecting them from a menu that also provides a written narrative, and use interactive pan, zoom, and tilt to really investigate the landscape. Anyone with a WebGL-enabled browser, such as Google Chrome or Mozilla Firefox, and a reasonably fast Internet connection can use it. http://science.nature.nps.gov/im/units/arcn/owg/ For more information Contact: Dave Swanson, dave_swanson@nps.gov

Yellow-billed Loon Youth Videography Project– Connecting Youth with Science through Art

This June, two high school students– Sam Tocktoo from Shishmaref and Maxwell Dan from Anchorage–will join the yellow-billed loon monitoring team to video contaminants sampling and related field activities in BELA. After filming on location, both students will head to Alaska Teen Media Institute in Anchorage (ATMI) and work together to produce videos about yellow-billed loons, their conservation, and the ongoing monitoring efforts of breeding yellow-billed loons in BELA and CAKR. The videos are part of a larger effort to increase awareness about conservation issues facing the birds in light of the 2014 listing decision (when yellow-billed loons will considered for federal listing priority under the Endangered Species Act).

This collaboration with the students, ATMI and Alaska Geographic is possible from additional support provided by the Murie Science and Learning Center, NPS Biological Resource Management Division , and Wildlife Conservation Society. For more information contact: Melanie Flamme, Melanie_flamme@nps.gov or Stacia Backensto, stacia_backensto@nps.gov

We plan to monitor wood frogs in tandem with the Shallow Lake Monitoring Program by recording their vocalizations— all part of a larger collaboration with the Terrestrial Wetland Global Change Research Network (TWGCRN) and the Alaska Department of Fish and Game (ADF&G). TWGCRN developed an innovative technique using digital sound recorders to capture frog calls in lieu of ground surveys. Wood frogs call during a short breeding season, which depends on the timing of spring break up and is often less than two weeks. This makes surveying for frogs very difficult. By using sound recorders, we can collect around-the-clock data collection so we won't miss frogs that might begin calling early in the day or night.

Frogs are a vital part of the wetland food chain and are excellent indicators of environmental health. Frogs eat large quantities of insects, and in turn are eaten by fish, cranes, and waterfowl. By breathing through their skin, frogs readily absorb chemicals and gasses from the environment, making them highly susceptible to chemicals dissolved in water. Minor changes in temperature or water level directly affect the timing and duration of the breeding season, making frogs excellent indicators of climate change.

Scientists everywhere are concerned about the health of frogs because their populations are declining worldwide. These declines are linked to a variety of causes: habitat fragmentation and loss, chemical contamination, and increased ultraviolet radiation. Despite the fact that much of Alaska is remote and relatively pristine, frog populations in Alaska are at risk. ADF&G and U.S. Fish and Wildlife Service have observed unusually high numbers of deformed frogs throughout Alaska. What is causing the deformities is unknown. Environmental contaminants, genetic defects, infections and predation are all potential causes.

If you have observed wood frogs in your area, please let us know by contacting Amy Larsen, amy_larsen@nps.gov, 907-455-0662 or visit http://aknhp.uaa.alaska.edu/zoology/citizen-science/alaska-wood-frog-monitoring/.

Arctic Network
National Park Service
4175 Geist Road
Fairbanks, Alaska 99709
http://science.nature.nps.gov/im/units/arcn/

Science for the stewardship of Arctic Parklands

Arctic Network Newsletter, June - September 2013

Check us out on youtube, facebook, and twitter