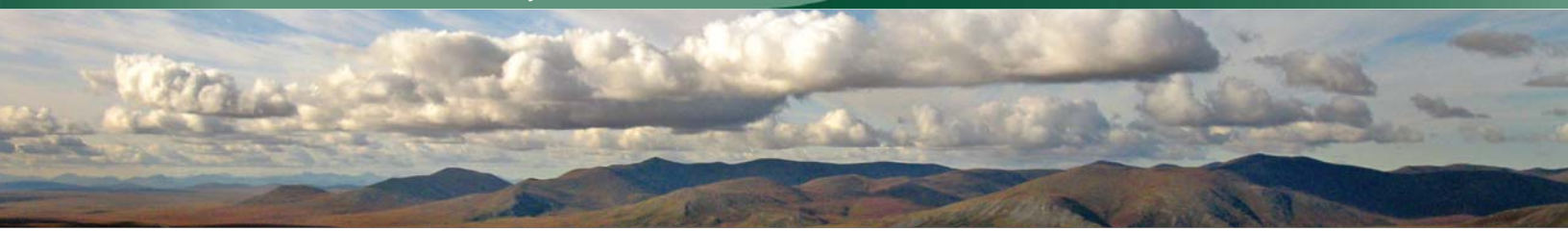
Arctic Network

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

Air Quality Resource Brief

November 2011, no. 80



Status & Trends

Air quality in the Arctic Network

The Arctic Network Vital Signs Monitoring Program (ARCN) operates a National Park Service (NPS) Air Resource Division (ARD) supplied and funded air quality monitoring station in Bettles, Alaska. Although not directly inside of any of the ARCN parks, Bettles was chosen as the best location due to reliable power, year-round staffing, and its location on the south side of the Brooks Range, thought to be representative of the network's airshed. There, wet deposition and regional haze are monitored in collaboration with the National Atmospheric Deposition Program/National Trends Network (NTN), the National Atmospheric Deposition Program/ Mercury Deposition Network (MDN), and the Interagency Monitoring of Protected Visual Environments Network (IMPROVE).

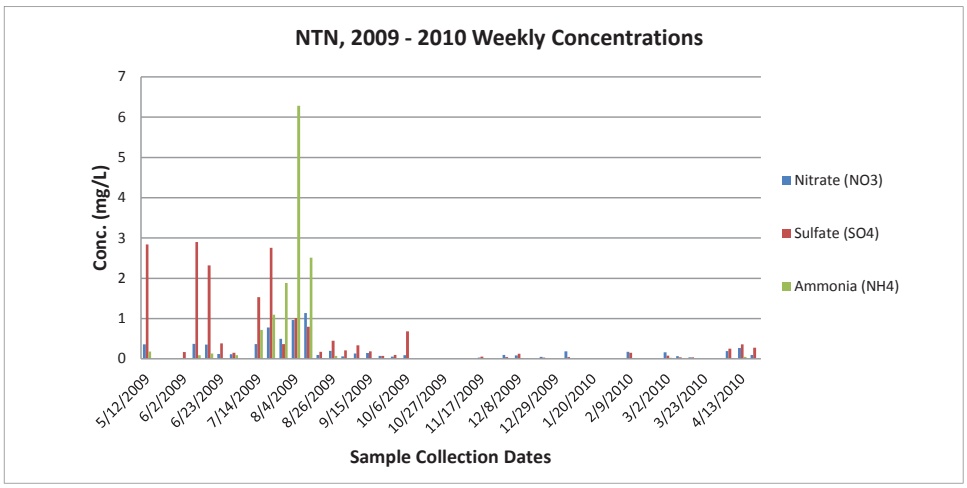
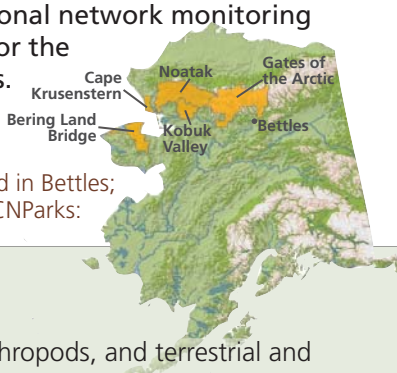


Figure 1. Concentrations in milligrams per liter (mg/L) of ammonium, nitrate, and sulfate in precipitation at Bettles Air Quality Monitoring Station, May12, 2009 – April 20, 2010. *The data from the Bettles station is now available on the national air quality networks web sites. The majority of the trend analysis, for all the networks, is completed on an annual basis. Since Bettles is a new air quality station, it will most likely be 2014 until that data can be analyzed for trends.*

Preliminary Objectives

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

- Determine the main components of air pollution within ARCN parks through participation in the NADP/ NTN, MDN and IMPROVE national networks by monitoring Arctic haze, and weekly precipitation levels of pH, sulfate, nitrate, ammonium, chloride, calcium, magnesium, potassium, sodium, and mercury.
- Determine the status and trends in air quality parameters as established by the national network monitoring protocols for the ARCN Parks.



Air quality is being monitored in Bettles; adjacent to ARCNParks:

Importance

Why is air quality important in the Arctic Network?

Airborne contaminants have the potential to affect biota and degrade visibility. Contaminants deposited to the earth's surface through precipitation (known as wet deposition) can include a wide variety of natural and human-made pollutants including inorganic elements and compounds (e.g., nitrogen, sulfur, basic cations, mercury and other metals) and organic compounds (e.g., pesticides and herbicides). Nitrogen and sulfur compounds, for example, can result in acidification of freshwaters, loss of aquatic species, eutrophication of estuarine and near-coastal waterways, soil nutrient leaching, and vegetation changes.

Nonvascular plants (e.g., lichens, bryophytes, algae), fungi, soil arthropods, and terrestrial and aquatic invertebrates are particularly sensitive to airborne contaminants. Contaminants also have the potential to accumulate (bioaccumulation) and magnify (biomagnification) as they proceed up the food chain with implications for top predators and hunters. Recently, the Western Airborne Contaminants Assessment Project (National Park Service), reported that the average mercury concentration in lake trout (*Salvelinus namaycush*) at Burial Lake in Noatak National Preserve, and some individual fish at Matcharak Lake in Gates of the Arctic National Park & Preserve, were some of the highest concentrations of mercury in fish measured in western parks.

Contact: Zachary Richter, GAAR Interpretive Ranger, Zachary_Richter@nps.gov, (907) 692-5494

Management Applications

How can monitoring air quality help protect parks in ARCN?

The National Park Service (NPS) is responsible for the protection and conservation of the areas it manages to "leave them unimpaired for the enjoyment of future generations" (Organic Act of 1916). NPS also has a responsibility under the Clean Air Act to protect parks and their resources from sources of air pollution, and to participate in national and regional initiatives to control air pollution. Since the late 1970s, the NPS Air Resources Division (ARD) has managed a comprehensive air quality program, emphasizing the collection of credible air quality information. Cooperatively, the NPS and national air quality monitoring networks produce high quality, defensible data to support scientifically sound resource management decisions in parks. Information on NPS air quality monitoring and access to data from individual sites is available at http://www2.nature.nps.gov/air/monitoring/index.cfm.

Long-term Monitoring:

How do we monitor air quality at the Bettles, Alaska, air quality station?

Rain gauge

We sample wet deposition continuously to monitor weekly levels of pH, sulfate, nitrate, ammonium, chloride, calcium, magnesium, potassium, and sodium in precipitation. Every three days, we collect aerosol samples to monitor the chemical composition and mass of coarse and fine particulate matter in the air that contributes to Arctic haze. We also measure precipitation with a rain gauge (ETI NOAH IV).

Data from the Bettles Station can be viewed at the NADP http://nadp.sws.uiuc.edu/ and IMPROVE http://vista.cira.colostate.edu/improve/ websites. It takes approximately 5-6 months to retrieve data from these websites after samples are collected. 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.

MDN collector

Noatak National Preserve

ARCTIC NETWORK

USING SCIENCE TO PROTECT OUR PARKS

THE ARCTIC NETWORK (ARCN) IS A MAJOR COMPONENT OF THE NATIONAL PARK SERVICE'S STRATEGY TO BETTER UNDERSTAND AND MANAGE PARK LANDS USING SCIENTIFIC INFORMATION. IT IS ONE OF FOUR INVENTORY AND MONITORING NETWORKS IN ALASKA AND 32 NATIONWIDE.

The Arctic Network provides scientific support to five parks covering more than 19 million acres. Bering Land Bridge National Preserve and Cape Krusenstern National Monument share similar coastal resources and biogeographic ties to the former land bridge between North America and Asia. Kobuk Valley National Park, Noatak National Preserve and Gates of the Arctic National Park and Preserve span extensive, mountainous terrain at the northern limit of treeline.

The Arctic Network is developing long-term monitoring protocols for 28 'vital signs', or physical, chemical and biological indicators that were selected to represent the overall health of these parklands.

Many of these vital signs are expected to show change due to regional and global stressors including climate change and deposition of industrial contaminants. Many vital signs also have important human values including for subsistence.

ARCN VITAL SIGNS:

- Air Quality
- Brown Bears
- Caribou
- Climate
- Coastal Erosion
- Dall's Sheep
- Fire Extent & Severity
- Fish Assemblages
- Invasive/Exotic Diseases
- Invasive/Exotic Species
- Lagoon Communities & Ecosystems
- Lake Communities & Ecosystems
- Landbird Monitoring
- Moose
- Muskox
- Permafrost
- Point Source Human Effects
- Sea Ice
- Small Mammal Assemblages
- Snow & Ice
- Stream Communities & Ecosystems
- Subsistence/Harvest
- Surface Water Dynamics & Distribution
- Terrestrial Landscape Patterns & Dynamics
- Terrestrial Vegetation & Soils
- Visitor Use
- Western Yellow-billed Loons
- Wet & Dry Deposition

CONTACT US AT: (907) 457-5752, 4175 GEIST ROAD, FAIRBANKS, ALASKA 99709
OR VISIT HTTP://SCIENCE.NATURE.NPS.GOV/IM/UNITS/ARCN