

Protocol Development Summary

December 7, 2007

Protocol: Air Quality

Parks Where Protocol will be Implemented: Bettles, AK as representative for BELA, CAKR, GAAR, KOVA, NOAT,

Justification/Issues being addressed:

Asiatic and global long-range pollutants deliver significant amounts of air contaminants each year to the North American Arctic. Much of this pollution comes in the form of Arctic Haze, a combination of particulate matter, sulfates and semi-volatile organic compounds. Other global pollutants include Hg, other trace metals and nitrogen. There are currently no instrumented air quality monitoring stations in arctic Alaska.

Airborne contaminants in ARCN parks have the potential to affect biota and degrade visibility. Nonvascular plants (e.g., lichens, bryophytes, algae), fungi, soil arthropods and terrestrial and aquatic invertebrates are particularly sensitive to airborne contaminants. In addition, ecosystems with low buffering capacity or areas with high pollution loads are at increased risk for damage. Generally speaking, forest ecosystems, high altitude environments, freshwater ecosystems, peatlands, barrens and areas dominated by lichen cover are highly susceptible to the numerous forms of air contaminants listed above. Air pollution also has the potential to contribute bioconcentrating toxins into the food chain with implications for top predators and subsistence hunters.

Within the NPS, air quality monitoring is managed nationally through participation in several established programs run by the Air Resources Division, each targeting a specific aspect of air quality. ARCN will use a new ARD supplied and funded site in Bettles, Alaska to monitor air quality in the network. Although Bettles is not directly inside of any of the 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 representative of the bulk of the network's airshed. The network will monitor concentrations of compounds known to be generated by industrial activities that act as pollutants (e.g., sulfate), in both wet and dry deposition. The network will also monitor composition and concentrations of particulates that affect visibility.

Specific Monitoring Questions and Monitoring Objectives to be Addressed by the Protocol:

ARCN's primary air quality monitoring questions are:

1. What are the main components of air pollution in ARCN parks?
2. Is air quality changing over time in ARCN Parks?

Objectives of the nationwide NPS Air Quality Monitoring Program are:

1. Determine levels of air pollutants in parks and correlate to observed effects.
2. Identify and assess trends in air quality.
3. Determine compliance with National Ambient Air Quality Standards.
4. Provide data for the development and revision of national and regional air pollution control policies.
5. Provide data for atmospheric model development and evaluation.
6. Use information to inform the public about conditions/trends in national parks.
7. Determine which air pollutants in parks contribute to visibility impairment.

Basic Approach

ARCN's air quality monitoring will be administered and guided by ARD as part of its national sampling protocol.

The specific air quality monitoring methods for ARCN's ARD station in Bettles will be:

1. Monitor weekly levels of pH, sulfate, nitrate, ammonium, chloride, calcium, magnesium, potassium, and sodium in precipitation falling at DENA headquarters through participation in the National Atmospheric Deposition Program (NADP).
2. Monitor the chemical composition and mass of coarse and fine particulate matter in the air that contributes to Arctic Haze using the Interagency Monitoring of Protected Visual Environments (IMPROVE) protocols.
3. Monitor hourly levels of ground level ozone, in concert with meteorological attributes necessary to interpret the ozone data (wind speed and direction, temperature, Δ temperature, relative humidity, solar radiation, and precipitation) through participation in the NPS Air Resources Division Gaseous Pollutant Monitoring network.
4. Monitor the weekly levels of sulfate, sulfur dioxide, nitrate, ammonium, and nitric acid falling as dry deposition through participation in the Clean Air Status and Trends Network (CASTNet) program.
5. Integrate air quality data from the Bettles site with data from other ARCN Vital Signs to monitor the ecological condition of ARCN parks.

ARD will provide funding for a biotechnician to collect and mail the samples collected in the site and provide basic data gathering and service. ARD will analyze all samples and data and will report the data on its website and vehicles of data communication.

Principal Investigators and NPS Lead:

ARD will be the PI on this project. NPS coordination will be done by an NPS group including: Jim Lawler, Peter Neitlich, Bud Rice (NPS AK Regional Office Air Coordinator) and Andrea Blakesley (Air Coordinator at DENA, Alaska's only Clean Air Act Class I park).

Development Schedule, Budget, and Expected Interim Products:

The ARCN air quality monitoring protocol consists of the standard operating procedures established by ARD for the national air monitoring network. These procedures are defined by the respective monitoring network steering committees. We will adapt these to ARCN-specific needs and I&M protocol guidance where appropriate.

One significant aspect of air quality monitoring in ARCN that needs development for incorporation into the ARCN Vital Signs monitoring program concerns data reporting. Currently, all data are managed at the national level and reported at the national scale (i.e., Bettles in comparison to other sites). Mechanisms to facilitate the integration of the air quality data into Arctic Network reporting and data analysis schemes at the network scale will be developed through consultation with the network Data Manager.

The protocol will be developed on the following schedule:

May 2008	Build station shed at the Bettles BLM Lightning Detection Monitoring Site (permission and building materials have already been secured)
June 2008	Begin operation
December 2008	Submit final protocols adapted for I&M and ARCN specific needs

Most of the funding for this vital sign will be covered by ARD. ARD will cover in full: utilities for site operation, salary for data collection, sample shipping and analysis, data analysis and reporting on national level, data publishing to a data portal. Data reporting and analysis on the ARCN side, especially as concerning the relationship between air quality and other related vital signs will be ARCN's responsibility.