National Park Service
Gaseous Pollutant Monitoring Program

The
Monitor

For National Park Service
Air Quality Station Operators

FALL 2005

NETWORK NEWS

Network update

The third summer season of portable ozone monitoring stations (POMS) was completed on September 30, 2005, with good data capture at all locations. Modifications to the 2B ozone analyzer last winter improved its operation during rapidly changing humidity conditions, resulting in a much more complete data record. Some POMS sites will be relocated prior to the Summer 2006 season.

The Kobuk Valley NP air quality station in Ambler, AK, never became fully operational, and was decommissioned in September. The monitoring equipment will likely be relocated in Spring 2006. Lack of a committed station operator was a concern, and relocating to a site with year-round park staff will be a high priority.

Hurricanes Katrina and Rita caused minimal problems at affected air quality stations, although many received significant rainfall as the storms passed nearby.

Documentation submitted to EPA defines program methods and data processes

Quality assurance documentation detailing all aspects of the GPMP program are now being prepared for submission to EPA for review and approval. The program quality assurance project plan (QAPP) and quality management plan (QMP) describes how the GPMP program is designed and operates to collect and report scientifically defensible data representative of the park units where monitoring is conducted.

GPMP data are routinely submitted to the EPA Air Quality System and are used by states for air quality reporting. The certified data are also used by EPA to decide on which areas are in violation of the ozone NAAQS and which areas should be classified as non-attainment areas. Currently, 106 parks are in non-attainment areas; monitoring data are required to prove to the EPA that an area is below the standard before EPA can grant attainment status. Tennessee and Virginia are now attempting to get park areas redesignated as attainment.

Park air featured in Smithsonian Magazine

The June 2005 issue of Smithsonian Magazine featured "Hazy days in our parks," an article that relays the problems several national parks across the country are facing -- declining visibility and air quality. The article discusses new legislation currently being reviewed by Congress, mainly the Clear Skies Initiative, and whether or not this new legislation is going to improve the air. To read the article online, visit *http://www.smithsonianmag.com/smithsonian/issues05/jun05/haze.html.*

CARB recognizes NPS for quality objectives

The California Air Resources Board, (CARB) recently presented the first Air Monitoring Awards of Excellence to air monitoring entities in California that demonstrated a high degree of proficiency over a three-year period, 2001-2003. Although not a winner of the award, the NPS was among those agencies recognized for their continued ability to exceed the ARB's ambient air monitoring requirements for the quality objectives of precision, accuracy, and data completeness.

***NETWORK NEWS** continued on page 2....*

What's inside:

***NETWORK NEWS** continued from page 1....*

Joshua Tree NP receives solar powered station

ARS will install a solar-powered ozone and particulate monitoring station at Joshua Tree NP, CA, this fall. This one-of-a-kind station includes ozone, particulates (PM_{10}), and meteorological instrumentation. The station will be operated by park personnel with support from California's South Coast Air Pollution Control District.

The park currently operates a standard air quality station at Black Rock Canyon, in the northwest part of the park, fitted with ozone and meteorological instrumentation. Joshua Tree is located in southern California, due east of the Los Angeles area. Because of local air quality concerns, park personnel requested a second monitoring station at Cottonwood, in the southeast part of the park. A solar-powered station was selected because line power is not available in the remote location where monitoring data will be most useful. All instrumentation and support equipment at the solar-powered station will operate on batteries recharged with solar panels. The entire system will operate continuously 24 hours per day, year round, and data will be retrieved via satellite modem.

The power system includes a 24-volt DC system comprised of twelve, 110-watt solar panels and 900 amp-hours of battery storage. The air quality instrumentation will operate in a passively cooled steel shelter, fitted with two, 50-gallon water reservoirs, to moderate and dissipate the heat generated by the instrumentation. The water will be cooled at night via convection flow through a roof-mounted radiator.

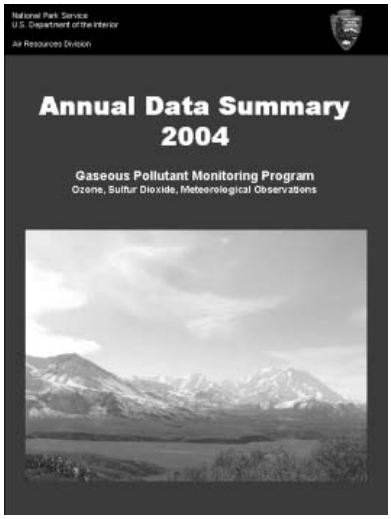
SAR team rescues monitoring equipment in YOSE

The Yosemite - Merced River ambient air quality monitoring site took a beating this spring. In May, due to heavy flooding from warm weather and an unusually large, melting snowpack, many parts of the park were inaccessible. Water levels rose to more than 11 feet on the valley floor, according to Yosemite NP officials.

The GPMP monitoring site needed a little help from the park's search and rescue (SAR) team. Team members rafted to the monitoring shelter to rescue thousands of dollars of monitoring instrumentation before conditions worsened. The monitoring shelter is smaller than most, but it houses ozone, oxides of nitrogen, and meteorology instrumentation. The water receded and the equipment was reinstalled in late June.

Annual data summaries delivered

The Gaseous Pollutant Monitoring Program's 2004 Annual Data Summary was distributed in August. Additional copies are available for download from the GPMP Project Web site. To download, log onto *http://ard-aq-request.air-resource.com/project* and look under Project Reports.



Development of critical loads needed to protect sensitive park resources

Europe and Canada use critical loads, the threshold amounts of pollutants at which harmful effects on sensitive resources begin to occur, as a method for protecting and restoring their resources. The United States is now beginning to engage in the research and study of critical loads, which could be a useful tool in assessing ecosystem conditions and influencing regulatory planning of federal lands. This effort includes collaboration among federal land managers and scientists to identify sensitive resources in each area, define criteria for harmful effects of these resources, and calculate critical loads.

NPS ARD staff in Denver discussed the development of critical loads in an article prepared for the July 2005 issue of BioScience. The article, Protecting Resources on Federal Lands, Implications of Critical Loads for Atmospheric Deposition of Nitrogen and Sulfur, is also available on the NPS Web site, at *http://www2.nature.nps.gov/air/Pubs/pdf/2005CriticalLoadBioSci.pdf.* The article focuses on critical loads of nitrogen and sulfur deposition due to these pollutants' widespread effects on ecosystems. It presents a strategy for developing critical loads, and two case studies (Rocky Mountain National Park, CO, and Shenandoah National Park, VA).

STATION OPERATOR FOCUS

There's no place like home, according to Black Canyon's Myron Chase

Air quality station operator Myron Chase came to Black Canyon of the Gunnison National Park, Colorado, 14 years ago. Back then it was a national monument.

As a resource management specialist for Black Canyon, Myron's primary functions are managing wildlife issues and operating the air quality station. The park currently monitors air quality with a portable ozone monitoring station (POMS), which has operated at the park for the past three ozone seasons. The station is also equipped with meteorological sensors (air temperature, relative humidity, wind speed, wind direction, precipitation, and solar radiation). "Before the POMS, I managed a passive ozone monitoring program in the park," said Myron, "and years ago we also operated a film camera system to monitor visibility." Routine maintenance of the POMS takes only a short period of time once a week. Black Canyon received one of the first POMS in the network. The station has operated trouble-free during the 2005 ozone season, collecting 99.6% of all possible data.

Pertaining to wildlife issues, Myron works on many projects. In September he was involved with moving a prairie dog colony away from a developed area and into a better suited habitat for the critters. "We also monitor peregrine falcons, bighorn sheep, and the Gunnison Sage-Grouse, a species of special concern," said Myron. "The research project we're working on is using radio tracking and habitat mapping of this sage-grouse." The Gunnison Sage-Grouse is a newly-classified, unique species found south of the Colorado River, along the Gunnison Basin and surrounding areas. It is also a candidate for listing under the federal Endangered Species Act, with its primary problem being a loss of habitat. The radio-marked birds are tracked over a period of time, and along with vegetation inventories, they identify preferred habitat types, grouse movements, seasonal habitat requirements, reproductive success, and causes of mortality.

Resource Management Specialist Myron Chase operates the Portable Ozone Monitoring Station at Black Canyon of the Gunnison NP, Colorado.

The park projects Myron works on complements his B.S. degree in wildlife biology, which he earned from Colorado State University. Before coming to the Black Canyon, he worked at nearby Dinosaur National Monument in northwest Colorado. While he prefers to stay close to home in Colorado, he's traveled on occasional trips to other areas of the country.

In his free time, Myron enjoys taking his border collie along on fishing trips, hunting trips, and other outdoor activities in nearby areas of Colorado. To Myron, there's no place like home.

DATA COLLECTION SUMMARY

Data collection statistics for January 2005 through June 2005 are listed below.

- Sites with at least 90% collection (final validation of ambient air quality parameters) include:
  - Acadia
  - Assateague Island
  - Badlands
  - Big South Fork
  - Black Canyon of the Gunnison
  - Canyonlands
  - Chiricahua
  - Craters of the Moon
  - Denali
  - Dinosaur
  - Everglades
  - Grand Canyon
  - Great Basin
  - Great Smoky Mountains:
    - Cades Code
    - Clingman's Dome
    - Cove Mountain
    - Look Rock
  - Hawaii Volcanoes:
    - Observatory
    - Visitor's Center
  - Joshua Tree
  - Kobuk Valley
  - Lake Mead
  - Lassen Volcanic
  - Mammoth Cave
  - Mesa Verde
  - Mount Rainier (portable)
  - Olympic
  - Pinnacles
  - Sequoia-Kings Canyon:
    - Ash Mountain
    - Lower Kaweah
  - Shenandoah
  - Theodore Roosevelt
  - Voyageurs
  - Wind Cave
  - Yellowstone:
    - Old Faithful
    - Water Tank
  - Yosemite:
    - Merced River
    - Turtleback Dome
  - Zion
- Sites with at least 80% collection (final validation of ambient air quality parameters) include:
  - Big Bend
  - Death Valley
  - Glacier
  - Gulf Islands
  - Petrified Forest
  - Rocky Mountain
- Sites less than 80% collection (final validation of ambient air quality parameters) include:
  - Mount Rainier (continuous)
  - North Cascades
- The entire network achieved an average of 94.2% final validation of ambient air quality parameters for the January - June 2005 period.

FEATURE ARTICLE

Yellowstone winter study shows decrease in pollutants due to fewer snowmobiles

Introduction

Winter use of snowmobiles in Yellowstone National Park, WY, has been hotly contested in recent years, which led to the development of a Winter Use Plan designed to manage winter recreational use so park resources are not impaired. The plan involves reductions in the number of snowmobiles allowed into the park each day, requires guides accompany the snowmobiles, and requires "best available technology" be used by the snowmobiles.

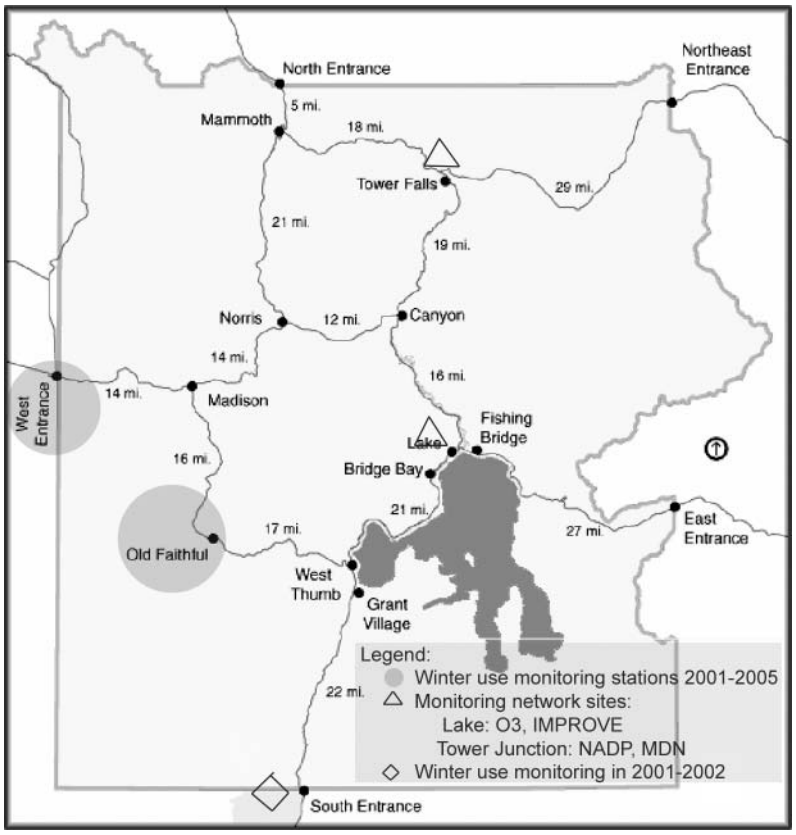


Figure 1. Two locations in Yellowstone NP provided air quality data during the 2004-2005 winter period: the West Entrance and the Old Faithful monitoring sites. Our regular network monitoring stations are well away from the winter vehicle high activity areas.

The NPS ARD and Montana Department of Environmental Quality continued air quality monitoring at two locations in the park during Winter 2004-2005 (Figure 1). The objective was to determine the impact on air quality by implementation of the Yellowstone Winter Use Plan. The NPS approved a temporary winter use plan in November 2004, to be in effect for three winters, which allows up to 720 snowmobiles per day to enter Yellowstone National Park with a commercial guide. The final use plan will be prepared using information derived from the 2004-2005 winter study and other sources. During this study, a markedly lower number of snowmobiles entered the park than in previous years (an average of 260 snowmobiles daily). Most of these snowmobiles were equipped with cleaner, quieter 4-stroke engines.

Study design

Air quality was monitored at two locations in the park during the 2004-2005 winter study. The Old Faithful monitoring site included a beta attenuation monitor (BAM) for collecting $PM_{2.5}$; a carbon monoxide (CO) analyzer; and wind speed/wind direction, ambient temperature, and relative humidity sensors. Hourly averages of all parameters were collected. A digital camera overlooked the main vehicle parking lot to document vehicle activity every 15 minutes. The second location was at the West Entrance of the park. The station collected hourly average carbon monoxide, $PM_{2.5}$, and meteorological data, and was operated cooperatively by the NPS and the state of Montana. Heavy snowmobile activity is present in the vicinity of both monitoring sites.

Study results

The winter study data show that both CO and $PM_{2.5}$ have decreased considerably at both monitoring locations during recent years. The maximum hourly CO concentrations correlate well (Figure 2) with lower traffic counts. Compared to the peak snowmobile traffic year (2000-2001) the traffic was down 70% in Winter 2004-2005 while the 8-hr average CO pollution decreased by 78%.

Snowmobile traffic counts were down considerably in the last three winters because of uncertainties associated with the Yellowstone Winter Use Plan and the court orders that interrupted the seasons. West Entrance snowmobile counts were down about 70%, which was reflected in the 2nd highest hourly CO (down 77%) and the 2nd highest 8-hr CO concentration (down 79%). The short-term peak in CO corresponds with the large number of snowmobiles that enter the park in the mornings at nearly the same time.

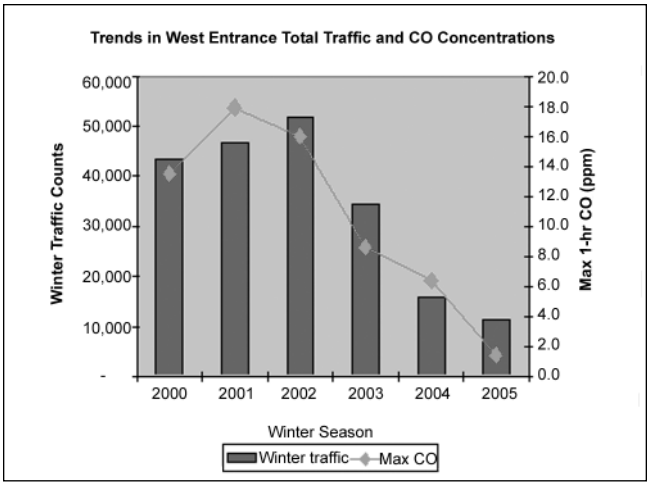


Figure 2. The highest observed hourly CO concentration for the West Entrance are compared to the winter season snowmobile traffic counts.

Snowmobile usage observed by a digital camera in the Old Faithful area during Winter 2004-2005 was seen to be greatly decreased compared to the winter before. The 2nd maximum 1-hr and 8-hr CO concentrations decreased by 30% and 50% since monitoring began in 2002 (Table 1).

Table 1. Comparison of winter snowmobile CO pollutant concentrations.

Location	Winter Period Years	1-hr CO (ppm)		8-hr CO (ppm)	
		1st Max	2nd Max	1st Max	2nd Max
West Entrance	1998-1999	18.2	11.1	8.9	4.3
	1999-2000	13.5	11.3	5.4	4.7
	2000-2001	17.9	17.4	6.1	6.0
	2001-2002	16.0	12.5	5.4	4.9
	2002-2003	8.6	8.4	3.3	2.1
	2003-2004	6.4	3.1	1.3	0.8
	2004-2005	2.8	2.6	1.0	0.9
Old Faithful	2002-2003	2.9	2.0	1.2	1.0
	2003-2004	2.2	1.7	0.9	0.9
	2004-2005	1.4	1.4	0.6	0.5
Flagg Ranch	2002-2003	4.7	3.1	1.7	1.1

$PM_{2.5}$ was also shown to be related to snowmobile activity. Since 2002 at the West Entrance, the decrease in maximum 24-hr $PM_{2.5}$ (down 68%) and the 98th percentile were similar (down 64%). At Old Faithful, the maximum 24-hr and 98th percentile $PM_{2.5}$ decreased by about 88% and 75%. (Table 2). There are clear indications at Old Faithful that local stationary sources are contributing to PM concentrations since the high concentration peaks occur at night when snowmobile activity is nearly zero. Still, the much lower hydrocarbon emissions by the 4-stroke snowmobiles (down more than 95%) are easily observable by park visitors as reduced odor and less visible exhaust plumes.

Table 2. Comparison of winter snowmobile $PM_{2.5}$ concentrations.

Location	Winter Period Years	24-hr $PM_{2.5}$ ($\mu g/m^3$)	
		1st Max	98th% Conc.
West Entrance	2002-2003	18.6	16.9
	2003-2004	8.0	7.0
	2004-2005	6.0	6.0
Old Faithful	2002-2003	32.1	21.3
	2003-2004	16.5	14.5
	2004-2005	4.0	5.4
Flagg Ranch	2002-2003	16.4	10.7

Some caution is needed in interpreting the $PM_{2.5}$ changes because wood smoke would also be easily measured by the beta attenuation monitor. Sources of wood smoke are near both monitoring locations and the timing of many $PM_{2.5}$ events strongly suggests additional sources besides snowmobiles or snowcoaches. The poor correlation between observed CO and $PM_{2.5}$ further indicates that snowmobiles may not be the principal factor in $PM_{2.5}$ concentrations at Old Faithful.

People often ask if the air quality is poorer in the summer since there are many more vehicles and visitors entering the park in summer compared to winter. Figure 3 answers that question for the West Entrance area; summer air quality is actually better than during the winter.

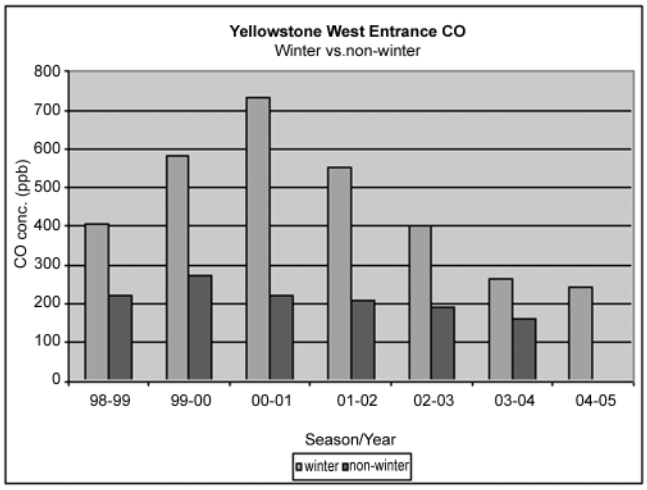


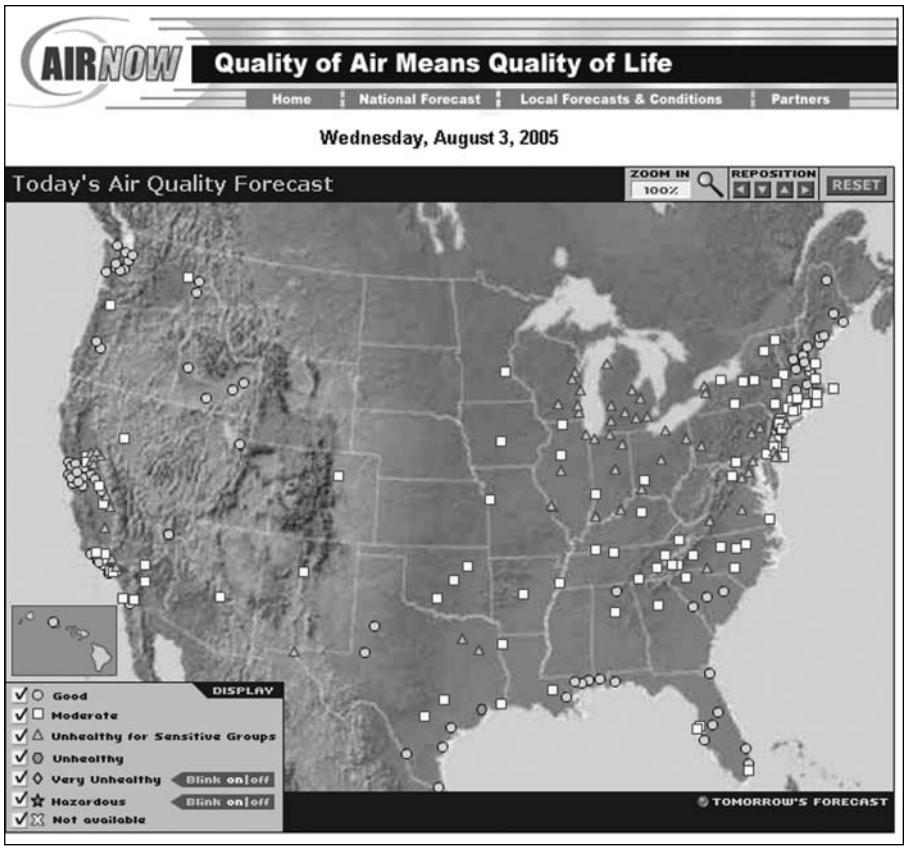
Figure 3. Although winter traffic is less than 1% of the summer volume, the mean CO concentrations are higher in winter.

***YELLOWSTONE STUDY** continued on page 7....*

ARTICLES OF INTEREST

Air quality forecasts and advisories are more available than ever before

The Environmental Protection Agency (EPA) is encouraging Americans to check their local air quality forecasts, which have become easier and more obtainable than ever before. A variety of tools and graphics are available to view current conditions or expected forecasts up to 48 hours in advance.



A national air quality forecast is available on http://www.epa.gov/airnow. Forecasts are provided for site locations that monitor either ozone or $PM_{2.5}$. This map displays the forecast for August 3, 2005. Note the Great Lakes region is expected to have levels that are "unhealthy for sensitive groups" this day.

Ozone awareness is becoming more obtainable to the general public via the Internet. People should know that even healthy individuals can have symptoms related to ozone exposure. "Improving air quality forecasting abilities helps cities across the country provide their citizens the most accurate, up-to-date air quality predications available," said Brig. Gen. David L. Johnson, U.S. Air Force (Ret.), director of the National Oceanic and Atmospheric Administration's National Weather Service (NOAA). "These forecasts help millions of people protect their health on days when ozone levels are high." Ozone forecasts can also help park staff alert workers and visitors of possible unhealthy ozone levels.

State and local air quality agencies issue next-day air quality forecasts for more than 300 communities across the U.S. These forecasts are available on EPA's AIRNow Web site, at *http://www.epa.gov/airnow*, and on NOAA's Web site, at *http://www.nws.noaa.gov/aq*. The forecasts are generated with NOAA's models that drive simulations of atmospheric chemical conditions, using pollutant emissions and monitoring data provided by the EPA and air quality monitoring and regulatory agencies throughout the U.S., including the National Park Service. Four basic maps are obtainable from the AIRNow page: a National Outlook, Today's Forecast, Ozone Now, and Particle Now. Many of the monitoring agencies only provide ozone data during the ozone season, generally May 1 through September 30.

The air quality data used to generate the forecasts are generally collected using federal reference or equivalent monitoring techniques. Although some preliminary data quality assessments are performed, the data displayed in the forecasts are not fully verified and validated.

In addition, the National Park Service provides daily ozone health advisories with one quick click of a computer mouse. At the NPS page *http://www2.nature.nps.gov/air*, click on Ozone Health Advisories. The page contains a list of national parks issuing advisories based on ozone data. This information may be useful to people planning their summer vacation trips to national parks, and to park personnel who must make visitors aware of potentially unhealthy air quality conditions. Grand Canyon National Park, AZ, had such unhealthy air this summer because of local wildfires, that park personnel had to notify visitors of the potential dangers in hiking or other strenuous activities in certain areas of the park.

OPERATOR'S TOOLBOX

Proper station temperature

As most of you know, the air quality shelter must maintain an internal temperature of between 20°C and 30°C (68°F and 86°F). We didn't just make that up, it's a requirement of the U.S. Environmental Protection Agency (EPA). Each analyzer used for state, local, or national air quality surveillance must be certified as either a "reference" or an "equivalent" method by the EPA. Every instrument manufacturer who wants their instruments certified for use in these networks must submit them to EPA for evaluation. The EPA then defines the physical parameters and instrument settings required to satisfy instrument accuracy and stability requirements.

Anytime the instrument is operated out of the stated physical parameters, or in other than certified ranges, the data may not be used for regulatory or compliance reasons as stated in 40 CFR Part 58. The entire designation list for each criteria pollutant may be accessed at *http://www.epa.gov/ttn/amtic/files/ambient/criteria/ref805.pdf*. The majority of the NPS ozone analyzers must be maintained in an environment between 20°C and 30°C. Our few API ozone analyzers may be operated from 5°C to 40°C and the TECO 42C oxides of nitrogen analyzer is a certified reference method when operated between 15°C and 35°C, but data from all the other analyzers are only valid when operated in an environment between 20°C and 30°C.

When working properly, the stations automatically maintain a temperature within this range. Shelter temperature (STP) is one of the datalogger-measured parameters that ARS reviews on a daily basis. Problems do arise, however, such as an air conditioner failures, relay module failures, and just poor placement of thermostat and STP sensors. Most shelters (all the pre-fabricated EKTO buildings) have an internal auto-switching (heat to cool to heat) thermostat, so there should be no need to make adjustments in the spring or fall. Keep in mind, when the wall thermostat calls for cool, it energizes the outlet the air conditioner is plugged into. The air conditioner needs to already be set to On, High, or Cool (or similar setting) with the air conditioner thermostat adjusted to maximum cool. This way the air conditioner fan and the air conditioner compressor (which activates cooling) should come on whenever the wall thermostat calls for cooling and turn off when the desired cooling is achieved. Some shelters or buildings that have unique systems may require additional adjustments.

If you notice both the baseboard heater and air conditioner on at the same time, something is wrong. Typically, a heater or air conditioner relay has failed. Please give ARS a call, and we can send replacments that a park electrician can install.

YELLOWSTONE STUDY ***continued from page 5....***

The biggest factor is winter vehicles (snowmobiles and snowcoaches) emit more air pollutants per vehicle. Lower boundary layer heights from cold temperatures and days of lower wind speed in winter contribute to the higher observed CO concentrations as well. Winter CO concentrations are decreasing as the traffic volume goes down and cleaner snowmobiles are used. The summer CO concentrations are also decreasing as the vehicle fleet has larger numbers of newer cars and trucks that meet cleaner pollution standards.

Conclusions

The air quality in Yellowstone National Park during the winter is determined primarily by proximity to the roads, parking areas, and visitor buildings. Neither the CO or the $PM_{2.5}$ are exceeding the National Ambient Air Quality Standards. High concentrations of CO are only seen in areas with concentrated winter vehicle activity and only when they are present. $PM_{2.5}$ is also concentrated near areas of vehicle activity, but it also has a stationary-source component primarily from wood smoke originating from the town of West Yellowstone and from the visitor building units at Old Faithful. Since 2000, snowmobile activity has decreased and cleaner snowmobiles are in common use. The maximum and mean concentration levels of air pollutants have decreased in accordance with these use and technology trends.

Based on the monitoring of pre-season and nighttime pollutant concentrations, Yellowstone National Park is mostly a very clean airshed in the winter. The reduction in the number of snowmobiles and in their emission levels has improved the air quality at the high activity areas within the park, but the current levels are still above the background of the rest of the park. Implementation of the Winter Use Plan has clearly improved the air quality in the areas most affected by snowmobile activity.

Special monitoring at Yellowstone is funded by the park. To read the entire Winter Monitoring Report for 2004-2005, visit the ARD Web site at http://www2.nature.nps.gov/air/Pubs/index.cfm.

Air Resource Specialists, Inc.
1901 Sharp Point Drive, Suite E
Fort Collins, CO 80525

TO:

First Class Mail

National Park Service
Gaseous Pollutant Monitoring Program

The Monitor

is published biannually (Spring and Fall) by Air Resource Specialists, Inc. under Contract C2350010840, for ambient air quality site operators in the National Park Service. For address corrections relating to this newsletter, or for assistance with operational site problems, contact:

Air Resource Specialists, Inc.
1901 Sharp Point Drive, Suite E
Fort Collins, CO 80525
Telephone: 970/484-7941
Toll Free: 1-800/344-5423
Fax: 970/484-3423
E-mail: info@air-resource.com

The Monitor is also available on the Internet at http://www2.nature.nps.gov/air/Pubs/theMonitor.htm

Newsletter production consultant:
John D. Ray - Program Manager, NPS ARD
Telephone: 303/969-2820

Editor:
Gloria S. Mercer
Air Resource Specialists, Inc.
Telephone: 970/484-7941 ext. 221

NPS Gaseous Pollutant Monitoring Program Network
http://www2.nature.nps.gov/air/monitoring/index.cfm

The Gaseous Pollutant Monitoring Program network currently consists of 60 air quality sites that monitor gaseous and meteorological parameters in 49 parks. The network was established as part of a comprehensive NPS air quality program. Data from the program are used to:

- Establish existing or baseline concentrations
- Assess trends in air quality
- Judge compliance with national air quality standards
- Assist in the development of national and regional air pollution control policies
- Provide data for atmospheric research and model development
- Identify and monitor pollutants that have the potential to damage park resources