National Park Service
Gaseous Pollutant Monitoring Program

The
Monitor

For National Park Service
Air Quality Station Operators

SPRING 2003

NETWORK NEWS

New sites for Summer 2003

Several new monitoring site deployments are getting final administrative approval and utility installations for installation this summer. Some additional portable monitoring stations are planned for deployment as well. The status of all the new stations is noted below:

Zion National Park, UT
A standard ozone and meteorological station is planned for Zion National Park. The station will be collocated with IMPROVE on neighboring BLM land. Installation has been delayed due to utility construction.

Badlands National Park, SD
Ozone and meteorological monitoring at Badlands National Park will return after being suspended for 10 years. Increased oil and gas development in the region has renewed interest in the air shed of this park. Archeological clearance is proceeding for the proposed site location.

Wind Cave National Park, SD
CASTNet dry deposition and meteorological monitoring equipment will be installed at Wind Cave National Park to complement the existing wet deposition sampling equipment.

Western Arctic, Kobuk Valley National Park, AK
A meteorological, NADP, MDN, IMPROVE aerosol, and CASTNet dry deposition monitoring station has been planned for this park. Land use agreements and utility and building construction subcontractors have been slow to finalize. Station deployment is expected by September 2003.

Portable Ozone Stations
Several portable ozone stations will be deployed this summer. The low-power, portable stations will include continuous ozone and meteorological monitoring. Installations will occur at Black Canyon of the Gunnison, Grand Canyon, Lake Mead, and Big South Fork NRRA. The Isle Royale station was reactivated, and other sites are being considered.

Winter Use Air Quality Monitoring Study draws to an end

Resource managers of both Grand Teton and Yellowstone National Parks commissioned a winter use air quality study to investigate the impact of snowmobiles on the winter air environment in the two parks. Data and information collected during the short study will augment data from a similar study performed a few years ago and used with Yellowstone's adaptive management program.

Monitoring locations for the Winter 2002-2003 study included Flagg Ranch in Grand Teton NP, and at Old Faithful and the West Entrance of Yellowstone NP. The stations operated throughout the entire snowmobile season from December 20, 2002, through March 15, 2003. The stations collected continuous measurements of carbon monoxide, fine particles, meteorological parameters, and hourly camera images at each location. The Old Faithful station also collected light scattering measurements from a nephelometer. Data collection during the study was high, and data analysis is expected to be completed by Summer 2003.

GRTE/YELL monitoring continued on Page 2 ....

What's inside:

GRTE/YELL monitoring *continued from Page 1 ....*

Preliminary data analysis shows diurnal variations in carbon monoxide (CO) and particulate matter ($PM_{2.5}$) levels at each of the three monitoring sites. Throughout the study period, data collected at Flagg Ranch indicate the average CO and $PM_{2.5}$ levels peaked between 0700 and 1000 and again at 1500 to 1900. After the park was closed to winter use, both the average CO and $PM_{2.5}$ levels remained low and constant throughout the day.

Similarly, data collected at the West Entrance site indicate the average CO and $PM_{2.5}$ levels peaked from 0800 to 1000 and again at 1400 to 1800, during the times that the majority of the vehicles enter the park.

The third monitoring site, Old Faithful, collected data that show the average CO was slightly elevated during 0700 and 1700, while the average $PM_{2.5}$ levels remained variable throughout the day. After the winter use period, CO levels remained low and constant and the $PM_{2.5}$ levels remained highly variable.

Issues facing the National Park Service include what type of winter use to allow in these parks, which leads to the controversial questions surrounding snowmobiles. For their size, traditional snowmobiles emit large amounts of carbon monoxide and particulates and are noisy. Tourism and snowmobile industries have made technical improvements to the machines and have encouraged responsible use and organized guided trips, all of which may lessen the impact to the parks. The parks already prohibit modified machines, restrict use to establish roads, and limit the hours of operation.

In addition to snowmobiles, snowcoaches are available to transport visitors into the parks during winter.

Additional proposed restrictions include a maximum number of vehicles per day, guided tours only, and allowing only 4-stroke engines.

Air quality data collected during the winter study, along with entrance station vehicle counts, sound monitoring data, photographic documentation, and meteorological data will help define the impact of snowmobile use on the winter environment in these parks.

Recreationalists prepare for departure after renting a snowmobile at Flagg Ranch, Grand Teton NP.

Panorama photographs document sites

ARS is photographing and producing panoramas of all NPS-operated CASTNet sites. The NPS ARD gave ARS this direction last fall, and field specialists are collecting the photographs during regularly scheduled ambient air quality site visits. All CASTNet sites are being documented with the panoramas.

To create a panorama, ARS field specialists take 16 photographs, at 22-degree intervals, from the monitoring site. The combined photographs complete a 360-degree full circle of the monitoring area. Computer software is then used to combine the photographs into a panorama and generate a computer-animated movie file. In addition to the panorama, a photograph of the station is also taken to document the existing site configuration. All photographs are sent to CASTNet for display on the CASTNet Web site and will soon be available for viewing on the NPS network Web site.

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STATION OPERATOR FOCUS

Elizabeth Maki does more than interpret at Grand Teton National Park

Grand Teton National Park sees over 2.5 million visitors annually, and Elizabeth Maki helps give them what they came for. In addition, she helps out with various projects and studies that the park sponsors, such as the winter use air quality study, performed this past winter.

Elizabeth has been a park ranger/naturalist with the Division of Interpretation since 1995. "Many people think this means I'm fluent in many different languages," said Elizabeth, "in reality, it means I provide interpretation of park resources, whether it be leading guided hikes or canoe trips, explaining the local geology, or developing children's programs." Regular park duties also include serving as an emergency medical technician/ firefighter, which requires ongoing training. Elizabeth also became an air quality station operator during the winter use study. The study trailer was located next to the visitor center, so Elizabeth took on the responsibility to perform daily station checks on the instrumentation. This often meant having to clear deep snow from the roof of the trailer.

Elizabeth has also worked at Yellowstone, Grand Canyon, and Mount Rainier National Parks. "I have spent winters in Yellowstone and Grand Teton for about 12 years now," said Elizabeth, "I lived in the parks during the winters and have seen changes through the years. It is interesting to see and understand how air quality monitoring is performed to keep a check on the resource." During her stay at Yellowstone, the park rangers wore air quality monitors on their belts, which measured particulate levels wherever the ranger traveled in the park.

Park Ranger/ Naturalist Elizabeth Maki services Grand Teton's Flagg Ranch monitoring station during the Grand Teton Winter Use Air Quality Study.

Elizabeth earned a B.S. degree in business, but prefers the outdoor life. She hikes, cross-country skies, backpacks, and does "just about any outdoor activity" she can. All these activities give Elizabeth little free time, but it's something she wouldn't trade. Her park duties are diverse and interesting, and this she gets to share with visitors.

DATA COLLECTION SUMMARY

Data collection statistics for July 2002 through December 2002 are listed below.

- Sites with at least 90% collection (final validation of ambient air quality parameters) include:
  - Acadia
  - Big Bend
  - Canyonlands
  - Denali
  - Death Valley
  - Glacier
  - Grand Canyon
  - Great Smoky Mountains
    - Cades Cove
    - Clingman's Dome
    - Cove Mountain
    - Look Rock
  - Hawaii Volcanoes
    - Observatory
    - Visitor's Center
  - Joshua Tree
  - Mammoth Cave
  - North Cascades
  - Olympic
  - Pinnacles
  - Rocky Mountain
  - Sequoia-Kings Canyon
    - Lower Kaweah
  - Shenandoah
  - Theodore Roosevelt
  - Yellowstone
  - Yosemite
    - Merced River
    - Turtleback Dome
- Sites with at least 80% collection (final validation of ambient air quality parameters) include:
  - Chiricahua
  - Craters of the Moon
  - Lassen Volcanic
  - Mesa Verde
  - Mount Rainier
  - Petrified Forest
  - Sequoia-Kings Canyon
    - Ash Mountain
    - Lookout Point
  - Voyageurs
- Sites less than 80% collection (final validation of ambient air quality parameters) include:
  - Everglades
  - Great Basin
  - Hawaii Volcanoes
    - Thurston Lava Tubes
  - Virgin Islands
- The entire network achieved an average of 89.5% final validation of ambient air quality parameters.

FEATURE ARTICLE

AIRNow program provides tools for preparing air quality advisory programs

Introduction

AIRNow is an EPA-sponsored air quality program that provides near real-time Internet access to ozone and fine particulate data. The Web site provides tools, data, and information that can help you keep on top of air quality conditions in your area.

The NPS' Gaseous Pollutant Monitoring Program submits ozone data collected at its monitoring stations to the AIRNow program. The data from each station are collected on the ESC dataloggers. During the ozone season, May through September, ARS polls these dataloggers and uploads the data every hour to a file server. ARS then transfers these data via FTP to the EPA, where quality control is performed before the data are processed and posted on the AIRNow Web site (*http://www.epa.gov/airnow*). Currently, AIRNow posts ozone information, but in the near future fine particle information will also be available.

Internet users can get daily air quality forecasts, access ozone concentration maps, obtain additional materials to support AIRNow information, and use publications. These four tools are discussed further in this article.

Air quality forecasts

Forecasting the air quality in your area begins with understanding the Air Quality Index (AQI). The EPA developed the AQI as a uniform index that provides general information to the public about air quality and associated health effects. The AQI is a national index, so the values and colors used to show local air quality and the associated level of health concern will be the same everywhere in the United States.

Figure 1 shows an example AQI. Each of the six color-coded categories corresponds to a different level of health concern. Air quality indices are available for ozone, $PM_{2.5}$ and PM_{10}, carbon monoxide, sulfur dioxide, and nitrogen dioxide.

The AQI is a central component of the air quality forecast maps and tables provided on the AIRNow Web site. State and local air quality agencies contribute significantly to data and forecasting methods in the AIRNow program. Forecasts are now available 48 hours in advance thanks to improved modeling and information.

Air Quality Index (AQI) Categories

Air Quality Index (AQI) Values	Levels of Health Concern	Colors
When the AQI is in this range:	*...air quality conditions are:*	*...as symbolized by this color:*
0 to 50	Good	Green
51 to 100	Moderate	Yellow
101 to 150	Unhealthy for Sensitive Groups	Orange
151 to 200	Unhealthy	Red
201 to 300	Very Unhealthy	Purple
301 to 500	Hazardous	Maroon

Air Quality Index (AQI): Ozone

Index Values	Levels of Health Concern	Cautionary Statements
0-50	Good	None
51-100*	Moderate	Unusually sensitive people should consider limiting prolonged outdoor exertion.
101-150	Unhealthy for Sensitive Groups	Active children and adults, and people with respiratory disease, such as asthma, should limit prolonged outdoor exertion.
151-200	Unhealthy	Active children and adults, and people with respiratory disease, such as asthma, should avoid prolonged outdoor exertion; everyone else, especially children, should limit prolonged outdoor exertion.
201 - 300	Very Unhealthy	Active children and adults, and people with respiratory disease, such as asthma, should avoid all outdoor exertion; everyone else, especially children, should limit outdoor exertion.
301 - 500	Hazardous	Everyone should avoid all outdoor exertion.

Figure 1. The Air Quality Index (AQI), shown above, was developed by the EPA and is includes six air quality categories. The AQI for ozone is shown at right. The Index Values (measured ozone values) correspond to a health category. The Cautionary Statements are commonly used in ozone advisory notices to the public.

Visit the AIRNow Web site and click on *air quality forecast* to get started. Click on *forecast table* for a tabular, detailed listing of air quality forecasts for many metropolitan areas across the U.S. Forecasts are determined by local air quality experts using air quality models, weather data, and local experience. Read on to see examples of what you may find on the Web site and how this information can help you plan your advisories.

Ozone concentration maps

The same colors used in the AQI appear in ozone concentration maps. Figure 2 below shows an ozone concentration map for national parks and monuments across the U.S. for August 22, 2002. Users can also access archived ozone maps. These maps provide more regional and local detail than the map shown in Figure 2. An example archived map is shown in Figure 3. The top portion of the archived map displays an animation of ozone levels throughout the day. The middle portion displays an 8-hour average peak concentration, and the bottom portion displays a 1-hour average peak concentration of ozone levels.

Additional materials

In addition to the daily maps provided by AIRNow, the National Park Service provides tables listing ozone exceedences (reported by number of counts per month) for each ozone monitoring site in the Gaseous Pollutant Monitoring Program. For these historical tables, visit *http://www2.nature.nps.gov/ard/gas/exceed.htm*. Tables are currently available for 1998 through 2002.

Publications

In addition to the air quality forecasting data and information provided by AIRNow, the National Park Service provides Web pages that may help you with forecasting tools and preparing an air quality advisory plan in your park. These Web pages provide various forecasting tools, including links to weather forecasts, wind streamlines, and guidance documents to help with ozone forecasting. Access the NPS Web pages from *http://www2.nature.nps.gov/ard/gas/advisory/ozone.htm* for links and more information about creating an ozone advisory program to meet your specific needs.

***AIRNow program** continued on Page 6 ....*

8-hour Average Concentrations in National Parks/Monuments

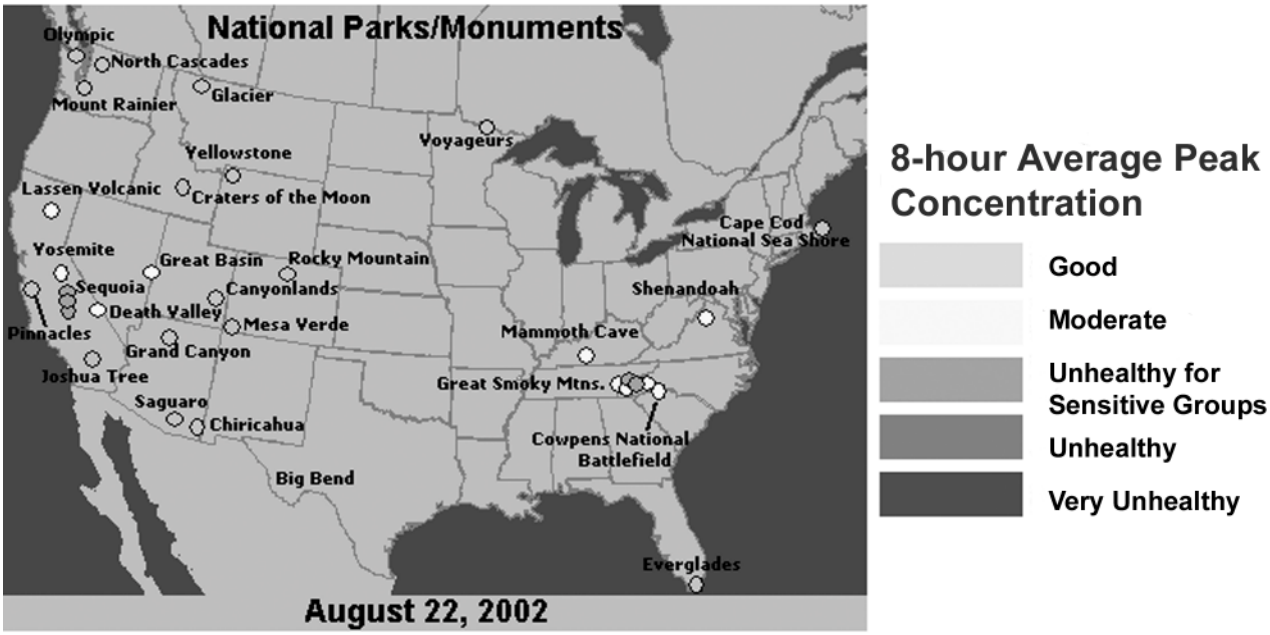

Figure 2. AIRNow's 8-hour average ozone concentration maps are color coded and are provided on a daily basis. This map shows a general view of ozone concentrations for the national parks across the United States for August 22, 2002.

AIRNow program ***continued from page 5....***

Other guidance documents are recent samples of park procedures implemented by selected parks. These tools and more may get you well on your way to making your park a safe environment for the health of visitors and park employees alike. Better yet, this information, provided on a daily basis, may help you create an interactive display in your visitor's center, to assist the National Park Service in their goal of educating the public and park visitors about air quality in your area, and how monitoring programs help to make parks a better place for all.

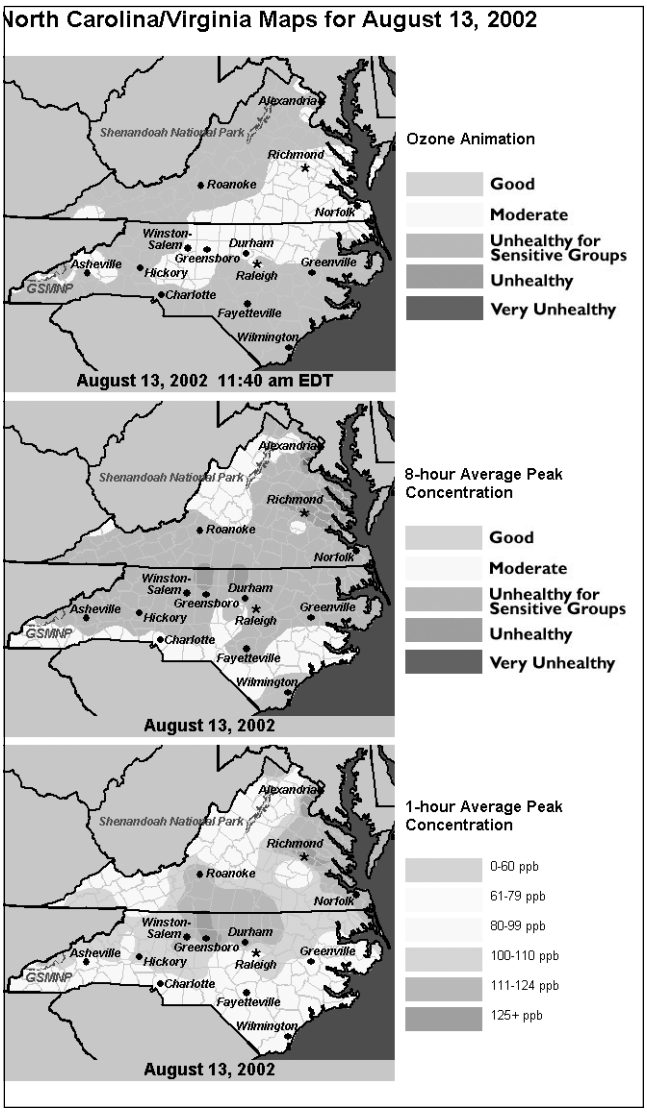

Figure 3. Detailed archived maps of North Carolina/Virginia for August 13, 2002, show an ozone animation at 20-minute intervals, daily 8-hour and daily 1-hour average ozone concentrations.

HOW DOES THAT WORK?
Precipitation sensors

One of the measurements of interest to most everyone is precipitation. Did it rain last night? How much did we get in that storm yesterday afternoon? The precipitation gauge at your station should accurately measure the water content of all types of precipitation. Whether it is rain, snow, hail, or a combination of precipitation types, the gauges used in the NPS network are equipped with heaters to melt frozen precipitation. Local interference, such as vegetation, buildings, and strong winds, however, can affect the "catch" of precipitation.

Manufacturers use a number of measurement principles in designing and building precipitation gauges. Those of you with NADP sampling stations are familiar with the Belfort gauges that use a weighing mechanism for measuring precipitation. As most of you are familiar, the precipitation gauges in the NPS network use a tipping bucket mechanism. The top of the gauge acts as a funnel to direct the collected precipitation into one half of a see-saw tipping bucket. When the bucket is full, it tips, empties, presents the other bucket for filling, and activates a switch that sends a signal to the datalogger. That signal represents 0.1 mm of precipitation has been collected and fallen through the gauge. Weekly, when you manually tip the bucket mechanism, you are testing the switch, signal wiring, and datalogger interpretation of the signal. When you replace the funnel you need to carefully route the funnel heater wiring away from the buckets so it does not interfere with the tipping action.

ARS plans to refurbish and upgrade the precipitation gauges in the network in the near future. Many of the gauge heating elements and wiring are in poor condition, and some of the funnels are misshaped or dented. All of the precipitation gauges will be converted to the large (9.66-inch) funnel and those in northern latitudes will be equipped with additional heating capability.

Precipitation gauges in the network will be replaced in the near future. They will be replaced with larger funnels, shown at left, and stations in the northern latitudes will be equipped with enhanced heating capability.

OPERATOR'S TOOLBOX

Restarting DataView in event of power failure or closure

DataView has been a key component of the Gaseous Pollutant Monitoring Program for nearly three years. At times, operators have reported finding this interface software closed or shut down when they enter the station. When DataView is shut down it cannot collect data from the datalogger. Once restarted, DataView will interrogate the datalogger to back poll the data that it has missed since the shutdown. Several conditions of shutdown have been documented and the question at hand is: "How do I get DataView running again?" and once it is restarted, "Do I have to wait for the backpolling to complete before I can access the checklists?"

DataView consists of two modules, and when operating properly, you will see both in the taskbar at the bottom of the laptop display (see Figure 1). The two modules are labeled *DvDAS* and *DataView Logon*. DvDAS is the module that actively polls data from the datalogger every minute and DataView Logon is the interface to the database that resides on the laptop. Also, PCAnywhere, which is the communication software that allows ARS to poll the laptop for the electronic log notes, should always be found in the lower right-hand corner of the screen in the area called the system tray. If either one of these modules is not present in the taskbar or if the system tray does not contain the PCAnywhere icon, then the computer should be restarted. The DvDAS and DataView Logon modules, along with PCAnywhere, reside in the startup folder and will automatically activate upon restarting the laptop.

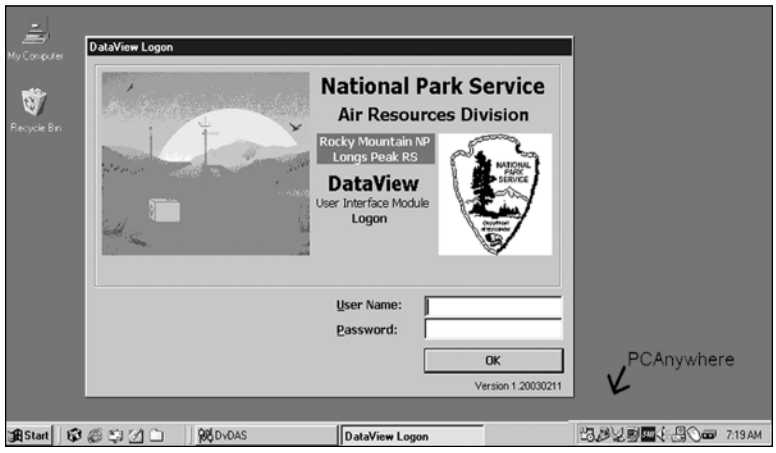

Figure 1. DataView Logon screen.

An extended power failure, two or more hours, can cause the laptop battery to discharge and subsequently the laptop will shut down. If this is the case, again simply restart the laptop once power is restored.

Okay, you've discovered one or all of the above conditions exist. You restart the laptop and sure enough, DvDAS is restored and PCAnywhere is running minimized in the system tray area. The message on the screen, however, is telling you that the DvDAS has determined a need to back poll to an hour and date that is 4 days ago. The message asks you if you want to change the start date (see Figure 2). In most cases you do not want to change the start date. You can expedite the back polling by clicking on the **No** button or DvDAS will default to the suggested back polling date in 60 seconds. Once the backpolling is complete, the DataView Logon screen will appear. But you don't have time to wait; the wait can be up to 10 minutes per day of missing data. With the DvDAS module busy backpolling data, you can activate the DataView Logon module manually by selecting it in the DataView program group. Do this by clicking **Start**, and move your mouse up to **Programs**, **DataView**, and select **DataView** from the group. The DataView Logon screen will appear, allowing you to log on and use the checklists. You will not have current data to view in the Data Plots or Data Tables menus until the DvDAS module has finished backpolling.

Remember to always call ARS to report anything out of the ordinary including the scenarios described above.

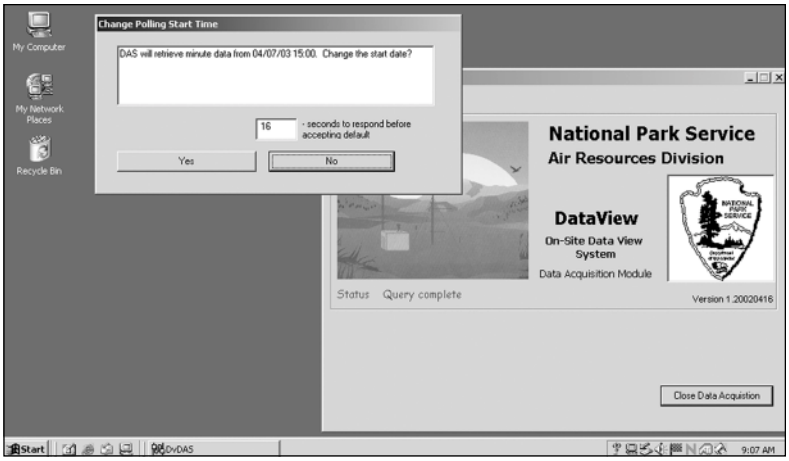

Figure 2. DataView backpolling screen.

***NETWORK NEWS** continued from page 2....*

SEKI developing interpretive exhibit

Sequoia-Kings Canyon National Parks are the latest parks to join the National Park Service's network of Web cameras. Similar to other parks in the network, the SEKI Web page displays a digital image of a scenic view every 15 minutes, and associated hourly ozone and meteorological parameters every hour. The associated data are collected from the Lower Kaweah air quality monitoring station. The National Park Service is now developing an interpretive air quality exhibit for park visitors, which will include the Web camera and air quality data.

The exhibit will be housed at the visitor's center, where visitors can view a PowerPoint presentation on a 19-inch color monitor. The presentation will display a real-time image from the high-resolution digital camera system, and real-time air quality parameters (ozone levels, air temperature, relative humidity, and wind speed and wind direction). The presentation will also display information regarding the formation of haze and how it affects visibility, health aspects of air quality, and current Air Quality Index values.

The Web address for Sequoia's Web camera is *http://www2.nature.nps.gov/ard/parks/seki/sekicam/sekicam.htm.* The interpretive display is scheduled to be operational later this summer.

Great Smokies focus site participates in VISTAS measurements

Visibility Improvement State and Tribal Association of the Southeast (VISTAS) has added several continuous fine particulate instruments at Great Smoky Mountains National Park, Look Rock air monitoring site. Rupprecht and Patashnick (R&P) analyzers have been installed to monitor continuous sulfate (8400S); continuous nitrate (8400N); total carbon, and elemental carbon (5400). A TEI/Magee aethalometer is measuring black carbon. Results are reported hourly and will be used by VISTAS to assess atmospheric model performance. The Tennessee Valley Authority is currently under contract by VISTAS to collect the data.

The Look Rock focus site is one of four VISTAS focus sites in the southeast, adding to the suite of measurements already made by the National Park Service at Look Rock. Current measurements include ozone, light scattering (nephelometer), continuous $PM_{2.5}$ mass (TEOM), $PM_{2.5}$ mass and speciation (IMPROVE), PM_{10} (IMPROVE), dry deposition (CASTNet), surface meteorology, and visibility (digital camera). Some of the data can be viewed on the Web at *http://www2.nature.nps.gov/ard/parks/grsm/grsmcam/grsmcam.htm*. Information about VISTAS can be found at *http://www.vistas-sesarm.org.*

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Gaseous Pollutant Monitoring Program

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