National Park Service
Gaseous Pollutant Monitoring Program

The
Monitor

For National Park Service
Air Quality Station Operators

SPRING 2006

NETWORK NEWS

Network update

The portable ozone monitoring stations (POMS) are kicking in for another season beginning May 1. Sixteen stations will operate this year. New sites include:

Abraham Lincoln Birthplace National Historic Site
Carlsbad Caverns National Park
Colorado National Monument
Cumberland Gap National Historic Park
Joshua Tree National Park
Natchez Trace Parkway
Yosemite National Park - Merced River

Last year's sites that have been discontinued include:

Mammoth Cave National Park
Black Canyon of the Gunnison National Park
Big South Fork National River & Recreation Area
Cumberland-Piedmont Network #1 and #2
Gulf Islands National Seashore

POMS data are available from the Database Query Web site at *http://ard-aq-request.air-resource.com.*

The Great Smoky Mountains - Look Rock monitoring site was struck by lightning in early April. Many systems were damaged, but with an emergency visit from ARS and quick response from the site operator, all systems were operational within three days.

POMS manual update

The portable ozone monitoring stations (POMS) manuals are being updated this year. In addition to a general overview of the two types of mounting systems (platform-base and tripod-base), the manual guides the operator through weekly station checks and completing the checklist form. New this year is a section explaining installation/assembly and disassembly/removal, with detailed photographs and wiring schematics. Sixteen POMS are scheduled to operate this year. ARS field personnel will install most of them by May 1. If ever your manual turns up lost, ARS can quickly replace it for you.

Webcam pages to include time series data

The NPS ARD will begin a project this spring to add various data charts to the NPS Webcam pages. The most recent 10 days of data will be displayed in time series charts, including 1-hour and 8-hour ozone, 1-hour and 24-hour $PM_{2.5}$, ambient temperature, relative humidity, wind speed, and wind direction. The main NPS Webcam page can be found at *http://www2.nature.nps.gov/air/WebCams/index.cfm.*

ARD staff are developing computer programs that will collect and store the data, and create the data charts. They may also access the EPA AirNow data files to get data from state-operated sites at or near national parks.

One site will be chosen for testing; after it is working correctly, the capability will be added to the remaining NPS Webcam sites. It is unknown at this time when the project will be completed.

ARD staff are also discussing a new Web page that would have annual charts of ozone and other air quality parameters for each park, so visitors could become aware of temporal and spatial trends in the data. This page would be updated annually.

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

What's inside:

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

Ozone spatial distribution study to be performed at Joshua Tree National Park

Joshua Tree National Park, California, will be the center of one researcher's attention this summer. Joel Burley, a researcher from St. Mary's College in California, will be performing an ozone spatial distribution study at the new Cottonwood monitoring site in the park.

Burley will operate custom ozone analyzers alongside a portable ozone monitoring station used by the Gaseous Pollutant Monitoring Program, and the continuous ozone analyzer in operation at the Cottonwood site.

The Cottonwood station was installed last fall, and includes an API model continuous ozone analyzer, and relative humidity, solar radiation, precipitation, and wind speed and wind direction sensors. During the winter months, strong winds blew over the large solar array system at the station, damaging some of the panels. The panels were reinforced and are working well.

Water-cooled and solar powered portable ozone monitoring station at Joshua Tree NP - Cottonwood site.

Have you done your multipoints?

2005 Ozone Standard Exceedances

Final Validation	April	May	June	Jul	Aug	Sept	Oct	2005 Season		
National Park	Count	Count	Count	Count	Count	Count	Count	Total Count	Maximum 8-hr O_3 (ppb)	4th Highest Maximum 8-hr O_3 (ppb)
Acadia NP	0	0	0	0	0	0	0	0	83	74
Assateague Islands	0	0	0	0	1	0	0	1	92	72
Death Valley	0	4	0	0	0	0	0	4	101	85
Grand Canyon	0	0	0	1	0	0	0	1	89	79
Great Smoky Mountains Cades Cove	0	0	0	0	0	0	0	0	75	66
Great Smoky Mountains Clingman's Dome	0	0	0	0	0	1	0	1	86	78
Great Smoky Mountains Cove Mountain	0	0	0	1	0	1	0	2	88	79
Great Smoky Mountains Look Rock	3	0	2	1	0	1	0	7	92	86
Joshua Tree	1	8	3	15	6	2	0	35	112	104
Lake Mead	0	0	2	1	0	0	0	3	123	84
Mammoth Cave	0	0	0	0	0	0	0	0	82	75
Pinnacles	0	0	0	1	0	0	0	1	85	71
Rocky Mountain	0	0	0	0	0	0	0	0	84	75
Sequoia-Kings Canyon Ash Mountain	0	2	6	20	19	6	1	54	112	107
Sequoia-Kings Canyon Lower Kaweah	0	1	2	16	11	2	0	32	102	97
Yosemite	0	0	0	3	1	1	0	5	96	85
Zion	0	0	2	2	0	0	0	4	109	91

http://www2.nature.nps.gov/air/monitoring/exceed.cfm

STATION OPERATOR FOCUS

Caving is the name of the game for Matt Reece at Great Basin National Park

You can't find caves everywhere, but Matt Reece has found quite a few of them -- and he keeps finding them. Matt is currently a physical scientist for Great Basin National Park, Nevada, (near the Utah border) where his main duties revolve around the caves in the region. He has also served as the air quality station operator for the park since he started there in April 2004.

Great Basin has a comprehensive air monitoring station, which includes a collection of instruments sponsored by several agencies and monitoring programs. In addition to ozone and meteorology monitoring (Gaseous Pollutant Monitoring Program), the site includes a filter pack sampler (Clean Air Status and Trends Network), deposition instrumentation (National Atmospheric Deposition Program), and an aerosol sampler and transmissometer (Interagency Monitoring of Protected Visual Environments Program). Matt is responsible for operating all of this important air quality instrumentation.

When not working on air quality issues, Matt's time is spent tracking the status of the resources below ground. He studies cave resource management, and prepares permits for cavers (cave explorers) to venture into wild caves, performs field reconnaissance to find new caves, and maps and inventories caves. "I'm also a defacto geologist for the park," said Matt, who holds BS and MS degrees in geology, from Indiana University and Mississippi State University, respectively.

Physical Scientist Matt Reece studies the resources above and below ground at Great Basin National Park, Nevada.

Matt's NPS career includes time at Wind Cave National Park, Jewel Cave National Monument, and most recently, at Lava Beds National Monument.

In his free time Matt still likes to spend time both underground and above ground. "I also like the outdoors above ground," said Matt, "I often will hike, backpack, snowboard, or cross-country ski." He also likes to travel; if he stumbles upon a new cave discovery, all the better.

DATA COLLECTION SUMMARY

Data collection statistics for July 2005 through December 2005 are listed below.

- Sites with at least 90% collection (final validation of ambient air quality parameters) include:

Acadia
Assateague Island
Badlands
Big Bend
Big South Fork
Black Canyon of the Gunnison
Craters of the Moon
Cumberland-Piedmont #1 *
Cumberland-Piedmont #2 *
Denali
Death Valley
Dinosaur
Glacier
Grand Canyon
Great Basin
Great Smoky Mountains:
  Cades Code
  Clingman's Dome
  Cove Mountain
  Look Rock
Gulf Islands
Hawaii Volcanoes:
  Observatory
  Visitor's Center
Joshua Tree
Kobuk Valley
Lake Mead
Lassen Volcanic
Mammoth Cave:
  BioGarden
  Great Onyx Job Corp
  Great Onyx Meadow
  Houchin Meadow
Mesa Verde
Mount Rainier (portable)
North Cascades
Olympic
Pinnacles
Rocky Mountain
Sequoia-Kings Canyon:
  Ash Mountain
  Lower Kaweah
Shenandoah
Theodore Roosevelt
Voyageurs
Wind Cave
Yellowstone Water Tank
Yosemite:
  Merced River
  Portable
  Turtleback Dome
Zion

* Cumberland-Piedmont Network #1 includes the following portable sites: Abraham Lincoln, Chickamanga/Chatanooga, Fort Donelson, Lincoln Memorial, Mammoth Cave, and Stones River.

* Cumberland-Piedmont Network #2 includes the following portable sites: Carl Sandburg, Mammoth Cave Great Onyx, Ninety-Six, and Shilo.

- Sites with at least 80% collection (final validation of ambient air quality parameters) include:

Canyonlands
Chiricahua
Olympic (portable)
Padre Island
Petrified Forest
Shenandoah

- Sites less than 80% collection (final validation of ambient air quality parameters) include:

Everglades
Mount Rainier
Yellowstone Old Faithful

- The entire network achieved an average of 93.3% final validation of ambient air quality parameters for the July - December period.

FEATURE ARTICLE

Using DataView to review collected data -- it does more than site visit station logs

(reprinted and edited from Fall 2000 issue)

Introduction

All network sites operate with DataView, the system that has brought exciting changes to station operators, the first and foremost of which is increased efficiency.

The DataView system involves little paperwork. From collection of data at the air quality stations to validation of data in the Information Management Center (IMC), most of the collection, processing, and storing of data is performed electronically. Less paperwork saves time and space, and data are obtained quicker so problems are corrected sooner and validation can begin earlier.

The system allows station operators to view plots and tables of current, collected air quality data at their sites. It has a variety of tools that can help you understand the air quality operations at your site.

Station operations

All station operations, checks, and procedures performed are automatically entered by DataView into an electronic station log (see Figure 1). This log can be viewed from the Station Documentation menu.

The air quality and meteorology data are continuously collected by the datalogger. It can store a minimum of 90 days of continuous gas analyzer data (one-minute data) and 3 months of hourly data for all parameters. The IMC at Air Resource Specialists, Inc. (ARS) polls the datalogger daily to retrieve data, and again to retrieve the DataView station log. This is used during data validation; it allows validators to see what occurred at the station that may have affected the data, and may be helpful in troubleshooting station problems. Station operators may view the data or data summaries at any time as described below.

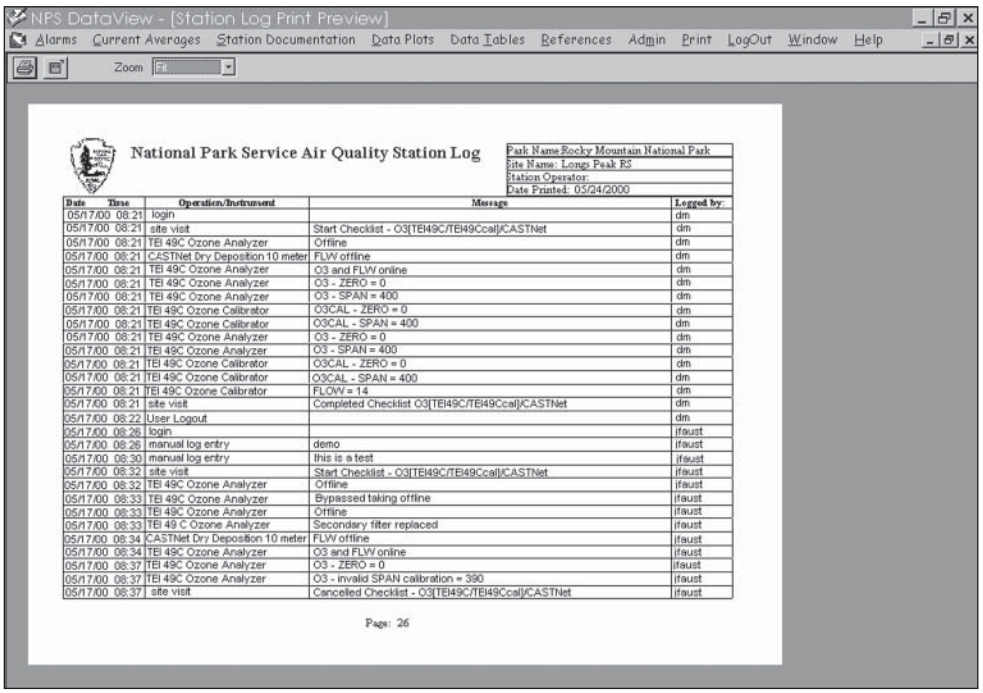
Alarms

The Alarms window is displayed when first logging into DataView or by selecting Alarms from the menu bar. A variety of alarms are presented to quickly pinpoint abnormal data situations. If alarms exist, they will flash in yellow on the Alarms window. An alarm may be viewed and/or printed by single-clicking the flashing button. An alarm record is maintained in the station log for every event resulting in an alarm. An event is time-based and may represent various periods when the alarm condition existed.

After reviewing the alarms and taking appropriate action, the alarm record may be removed from the display. Note that this display only alerts the operator of the existence of an alarm condition. Reviewing and/or dismissing alarms does not correct the problem, they just clear the alarm from the screen. Ozone exceedances may be quickly viewed, as they will appear as an alarm on this window.

Station checklists

Weekly station visits and multipoint calibrations are most efficiently performed by following the Checklist Instructions. The Checklist Instructions are provided in electronic format on the DataView computer, and also as hardcopy in the Site Operator's Manual. The checklists include detailed graphics keyed to individual tasks, and easily guide the operator through each step of the weekly station visit or multipoint calibration.



Date	Time	Operation/Instrument	Message	Logged by:
05/17/00	08:21	login		dm
05/17/00	08:21	site visit	Start Checklist - O3[TEI49C/TEI49Ccal]/CASTNet	dm
05/17/00	08:21	TEI 49C Ozone Analyzer	Offline	dm
05/17/00	08:21	CASTNet Dry Deposition 10 meter	FLW offline	dm
05/17/00	08:21	TEI 49C Ozone Analyzer	O3 and FLW online	dm
05/17/00	08:21	TEI 49C Ozone Analyzer	O3 - ZERO = 0	dm
05/17/00	08:21	TEI 49C Ozone Analyzer	O3 - SPAN = 400	dm
05/17/00	08:21	TEI 49C Ozone Calibrator	O3CAL - ZERO = 0	dm
05/17/00	08:21	TEI 49C Ozone Calibrator	O3CAL - SPAN = 400	dm
05/17/00	08:21	TEI 49C Ozone Analyzer	O3 - ZERO = 0	dm
05/17/00	08:21	TEI 49C Ozone Analyzer	O3 - SPAN = 400	dm
05/17/00	08:21	TEI 49C Ozone Calibrator	O3CAL - ZERO = 0	dm
05/17/00	08:21	TEI 49C Ozone Calibrator	O3CAL - SPAN = 400	dm
05/17/00	08:21	TEI 49C Ozone Calibrator	FLOW = 14	dm
05/17/00	08:21	site visit	Completed Checklist O3[TEI49C/TEI49Ccal]/CASTNet	dm
05/17/00	08:22	User Logout		dm
05/17/00	08:26	login		jfaust
05/17/00	08:26	manual log entry	demo	jfaust
05/17/00	08:30	manual log entry	this is a test	jfaust
05/17/00	08:32	site visit	Start Checklist - O3[TEI49C/TEI49Ccal]/CASTNet	jfaust
05/17/00	08:32	TEI 49C Ozone Analyzer	Offline	jfaust
05/17/00	08:33	TEI 49C Ozone Analyzer	Bypassed taking offline	jfaust
05/17/00	08:33	TEI 49C Ozone Analyzer	Offline	jfaust
05/17/00	08:33	TEI 49 C Ozone Analyzer	Secondary filter replaced	jfaust
05/17/00	08:34	CASTNet Dry Deposition 10 meter	FLW offline	jfaust
05/17/00	08:34	TEI 49C Ozone Analyzer	O3 and FLW online	jfaust
05/17/00	08:37	TEI 49C Ozone Analyzer	O3 - ZERO = 0	jfaust
05/17/00	08:37	TEI 49C Ozone Analyzer	O3 - invalid SPAN calibration = 390	jfaust
05/17/00	08:37	site visit	Cancelled Checklist - O3[TEI49C/TEI49Ccal]/CASTNet	jfaust

Figure 1. The Station Log displays all entries of operations performed at an air quality station.

Current averages

The Current Averages Summary (see Figure 2) displays current minute and hourly averages (with associated statistics) of all measured parameters.

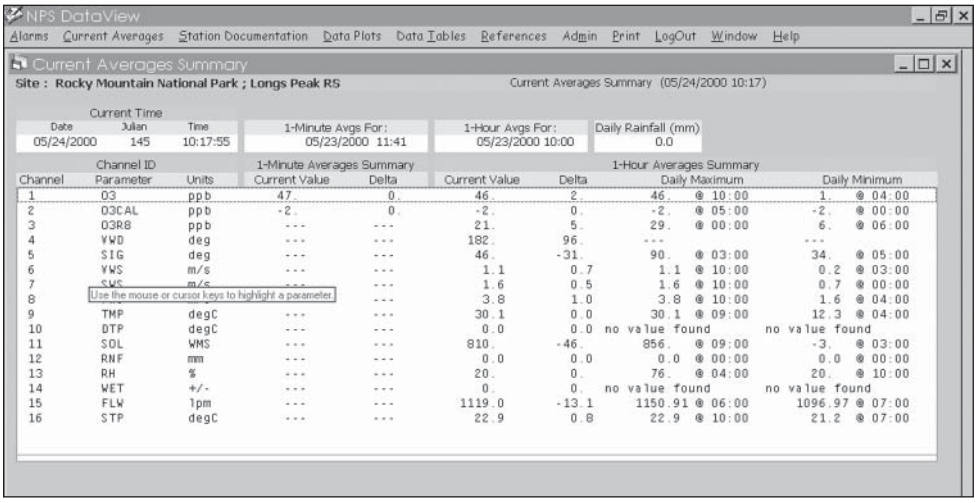


Figure 2. The Current Averages Summary allows you to view current conditions at your station.

The summary provides a quick view of how each sensor and analyzer are working. This allows the user to easily see if the data averages are within reasonable limits and to see which parameters are operating and which are not. If a parameter is not being measured, or if the datalogger is not receiving it, or the value does not appear to be reasonable, telephone ARS. The field technicians at ARS can log onto DataView at individual stations, viewing the exact DataView screens as they appear on your station's computer.

8-Day pollutant summary

The 8-Day Pollutant Summary, available from the Data Tables menu, displays the 1-day and 8-day maximum ozone concentrations and average ozone concentration. The last 8 days of collected ozone data are listed. Viewing this screen may allow the user to determine if the ozone values appear reasonable for actual, observed conditions. It also provides a quick view of day-to-day ozone concentration changes.

Stackplots

Stackplots are plots of hourly data of all collected parameters. They are available from the Data Plots menu and are an effective way to view the relationships among data types over time.

Strip charts

Strip charts are also available from the Data Plots menu. They provide a graphic view of continuous 1-minute or hourly average data for one or more gaseous parameters. Strip charts are ideal for looking at the variations of a parameter over time.

Conclusion

By carefully reviewing current and past data, with a knowledge of local conditions, the operator is in the best position to note data or operational inconsistencies that could influence the quality and quantity of station data.

Take the time to look at each menu option and develop the data display tools that best meet your needs. As always, if you have any questions, ARS Network Operations or Information Management Center staffs are available to help and are just a telephone call away at 1-800-344-5423.

LAB TALK

Temperature/delta temperature systems

Temperature/delta temperature systems are essentially two exact temperature systems; they are just mounted at two different levels on the meteorological tower.

One temperature sensor is usually mounted at 10 meters above ground, and the other sensor (known as the delta temperature sensor) is mounted at 2 meters above ground. The temperature at 2 meters is subtracted from the temperature at 10 meters to obtain the delta temperature. This is always stated in degrees Celsius.

This measurement is useful in determining the amount of vertical air movement, in conjunction with a solar radiation sensor. Positive values indicate a temperature inversion and very stable air. Values near zero means the atmosphere is stable with little air movement. The more negative the value the more unstable the atmosphere. These measurements are often used in air quality models to predict how well pollutants will disperse as they are transported downwind from the pollution source.

The delta temperature is invalid if maintenance is being performed on either sensor, or if either sensor is out of specifications (this is a rare condition). A common problem is that the wiring got wet, causing the sensors to max-out or overrange.

ARTICLES OF INTEREST

EPA proposes stronger standards for particulate matter

The EPA has proposed new, stronger National Ambient Air Quality Standards for particulate matter in December 2005. The proposed standards are presented in four basic areas:

Fine Particles

For fine particles ($PM_{2.5}$), the EPA proposes to revise the level of the 24-hour standard from 65 micrograms per cubic meter ($\mu g/m^3$) to 35 $\mu g/m^3$, and to retain the level of the annual standard at 15 $\mu g/m^3$.

Coarse Particles

For coarse particles, the EPA proposes to revise the 24-hour PM_{10} standard, in part by establishing a new indicator for thoracic coarse particles - generally between 2.5 and 10 μm in diameter, called the $PM_{10-2.5}$ standard.

Sources Included/Excluded

The new $PM_{10-2.5}$ standard will include any ambient mix of particles that are dominated by resuspended dust from high-density traffic and by industrial/construction sources, and exclude any ambient mix of particles that are dominated by rural windblown dust/soils and generated by agricultural/mining sources. (Currently only urban areas with populations >100,000 have sufficient collected data, so sources from urban areas are included). The proposed $PM_{10-2.5}$ standard is 70 $\mu m/m^3$. If accepted, the current 24-hour PM_{10} standard will be revoked.

Visibility Protection

To protect visibility, EPA proposes to rely on the 24-hour $PM_{2.5}$ primary standard of 35 $\mu g/m^3$ as a surrogate, due in part to limitations in the science and in the available hourly air quality data required for a sub-daily standard. EPA proposes to revise the current secondary standards by making them identical to proposed primary standards for fine and coarse particles, providing protection against visibility impairment. They may also ad a new sub-daily $PM_{2.5}$ standard to address visibility impairment.

Work has begun to include $PM_{2.5}$ and PM_{10} data in the Gaseous Pollutant Monitoring Program's annual reports. As of this printing, data collected by state air quality agencies at 10 monitoring sites are to be included in the report: Acadia, Badlands, Great Smoky Mountains, Joshua Tree, Mammoth Cave, Shenandoah, Theodore Roosevelt, Wind Cave, Yellowstone, and Yosemite National Parks.

For additional information, visit EPA's Web site at *http://www.epa.gov/air/particles/actions.html*. If passed, the effective date of the revised standards is expected by September 2006.

Emissions study shows Yellowstone needs more modern snowcoaches

In 1872, President Ulysses S. Grant signed a law declaring that Yellowstone would forever be "dedicated and set apart as a public park or pleasuring ground for the benefit and enjoyment of the people."

For many years, Yellowstone National Park has balanced tourism demand and ecosystem protection. In recent years, it has become a court-ordered battleground over snowmobile usage. Less than 5 percent of its 3 million annual visitors enter the park in winter, but these numbers have caused a series of lawsuits and headaches for the National Park Service, area tourism businesses, and federal judges.

Results of a new emissions study was released in April, which shows that snowmobile emissions in Yellowstone are on the decrease. During the last decade, the numbers of unregulated 2-stroke snowmobiles and vintage snowcoaches has transitioned to guided groups of modern 4-stroke snowmobiles and newer snowcoaches. Because of this, winter on-road emissions and air quality have improved.

Study shows that snowcoaches in Yellowstone National Park now pollute more than snowmobiles.

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

***YELLOWSTONE** continued from page 6....*

Because of the legal battles, the National Park Service instituted a program of reducing the number of snowmobiles in the park. In 1999, 62,878 snowmobiles entered the park with 76,271 passengers. In 2005, 18,364 snowmobiles entered with 24,049 passengers.

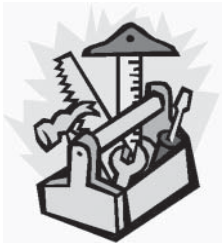
According to the new study, modern snowmobile hydrocarbon emissions are down by a factor of more than 12 per vehicle and carbon monoxide emissions are down by a factor of greater than 2. Measured snowcoaches emit significantly more emissions per mile than the snowmobiles. Researchers found that measured snowcoach emissions of carbon monoxide, even when calculated per passenger mile, now exceed modern snowmobile emissions. If lower emissions are needed, both the snowmobile's and snowcoach's emissions could be further reduced by forcing snowcoach retirement or upgrades and by requiring snowmobiles to comply with current on-road vehicle emissions standards.

The complete article presenting the study's results is available at *http://pubs.acs.org/journals/esthag/index.html*.

Reference:

Bishop, G.A., D.A. Burgard, T.R. Dalton, D.H. Stedman, and J.D. Ray, 2006, Winter Motor-Vehicle Emissions in Yellowstone National Park, Environmental Science & Technology, 40(8): 2505-2510, April.

OPERATOR'S TOOLBOX



Automated and manual instrument checks

Automated precision, span, and zero checks occur nightly at all the NPS-operated ozone and sulfur dioxide monitoring stations, but multipoint checks must be performed manually by the station operators once every month.

Precision check data are statistically analyzed to assess the precision, or repeatability of the measurement in question. Precision does not assess accuracy (audits do this), rather, it provides an understanding on how precise an individual measurement is.

Span and zero checks assess an analyzer's ability to stay within a prescribed set of conditions. If a response falls out of prescribed limits, the data are considered suspect, and investigation into the cause and possible instrument repair or maintenance is warranted. ARS retrieves and reviews these data daily to assess the operational status of every analyzer in the network.

Retrieving and viewing precision, span, and zero data on site is most conveniently done through the DataView system. From within DataView, click **Data Plots**, then **StackPlots**. Select **Calibration Stackplot** and **8-Day** or **15-Day**. Then choose your start date and select **Draw**. A printable graph of recent precision span and zero data will appear.

Multipoint calibration checks test the analyses throughout their range of operation and are required by EPA monthly. NPS guidelines specify operators must perform these multipoint checks monthly. ARS recommends performing them on the first Tuesday of each month.

With the development of DataView, many equipment status checks that were required weekly were deferred to the monthly multipoints. When multipoints are not completed, these routine analyzer/calibrator status checks are not completed either. The potential for invalidating large blocks of critical ozone data increases without routine multipoint checks; therefore, monthly multipoint checks must be performed by every site operator.

If you have questions about multipoint procedures, remember that all configurations of ozone analyzer/calibrator combinations are well documented in DataView. Go to **Station Documentation** and then **Multipoint Checklist** to open the checklist specific to your site configuration. The checklist instructions may be immediately accessed from the checklist form if needed. These instructions are very detailed and contain illustrations to help guide the multipoint. Here are a few general guidelines:

- Multipoints should take less than an hour to complete and must be done monthly.
- You may need to extend the time length of the "Diagspan" if it is scheduled for less than 30 minutes.
- Call ARS for assistance with this or any other difficulty with the multipoint check.
- Upon completion of the multipoint, review the results immediately by selecting the Results page.
- Call ARS from the station to report any failed multipoints.

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The Monitor

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

The Gaseous Pollutant Monitoring Program (GPMP) network monitors gaseous and meteorological parameters at air quality sites in the national parks and other National Park System areas. 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