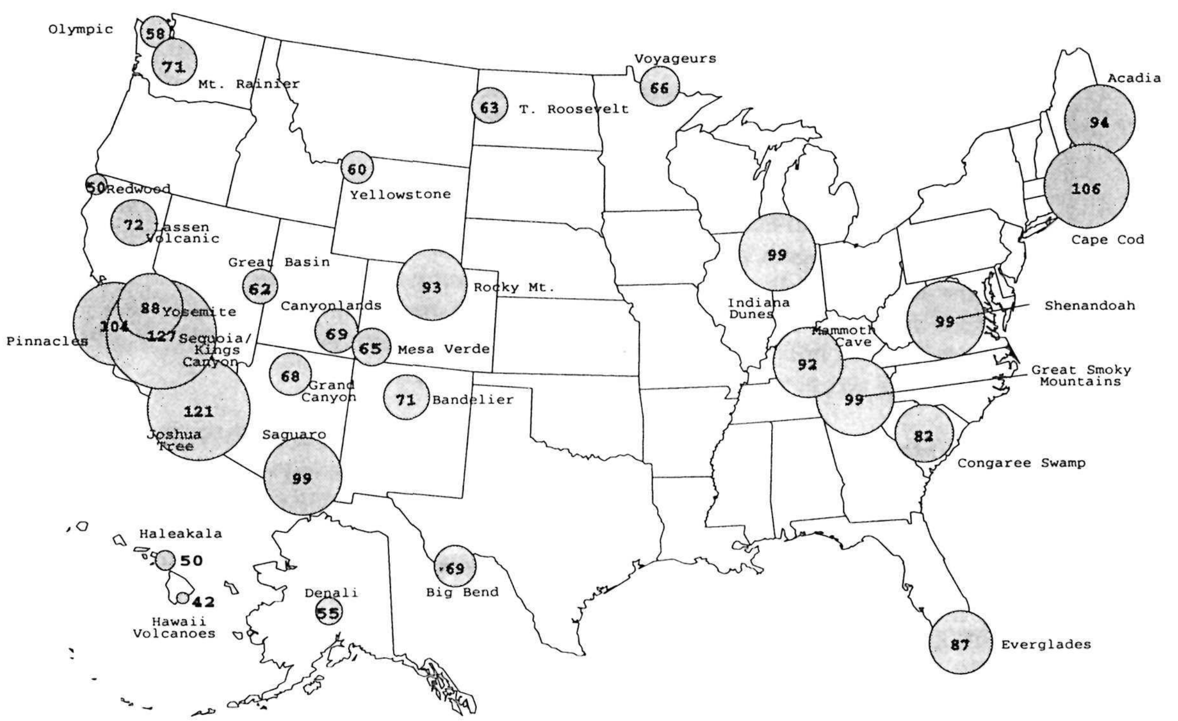
1993 Annual Report

State of the Air Quality Monitoring Network

Natural Resources Report NPS/NRAQD/NRR-94/01
Monitoring and Data Analysis Branch
Air Quality Division
U.S. Department of the Interior
National Park Service

National Park Service Ozone Monitoring Network
1993 2nd Highest 1-hour Ozone Concentrations (ppb)



Contents

• Introduction to MDAB • What we do •
• What was new this year • Our staff •
• Available products •

Printed on Recycled Paper

Introduction

Our mission is to collect, interpret, and provide data and informational summaries of air quality in the national parks to identify the nature of air pollution threats to park resources.

Message from the Branch Chief

This annual report summarizes the activities of the Air Quality Division's Monitoring and Data Analysis Branch for 1993. It represents a snapshot of the types of activities, products, and services in which we are involved and that are available.

The Branch's primary focus is our gaseous-pollutant monitoring program. Since 1984, we have made steady progress in developing an efficient and cost-effective nationwide network of monitoring stations for characterizing ozone and sulfur dioxide levels in National Park Service units, primarily those designated as Class I under the Clean Air Act. In 1991, this network was redesigned along eco-region lines to improve its ability to represent air quality status and trends throughout the national park system. The administration of the NPS wet deposition ("acid rain") monitoring program, as part of the National Atmospheric Deposition Program, complements our other monitoring efforts.

Information management and data analysis is also important to us. In this regard, our mission is to facilitate the acquisition and use of air quality information by NPS resource managers, regardless of who generates the information. As you will learn in the pages that follow, we are presently producing an atlas of air quality information for use by park resource managers. The Branch is also exploring new technologies (such as the Internet, bulletin boards, point-and-click data managers) that are now available to facilitate access to air quality information at the park level.

Many men and women in NPS uniform have assisted us with our monitoring activities. We acknowledge your efforts, as well as those of our many contractors, and extend to you our gratitude. The success of our monitoring program has rested on your shoulders and you have responded to our needs in a highly professional manner. Because of your dedication and sense of mission, we have demonstrated that we can successfully operate a quality nationwide monitoring program that not only meets your needs but also contributes significantly to our knowledge of air pollution effects on our natural resources.

In preparing this report, we have attempted to summarize not only the projects themselves but also some of the data collected. As you read through this report, we hope that you will gain insight into air resource management for your park, and how we can be of better service in meeting your needs. We welcome your comments on our activities and on ways to better serve you–*our customers.*

Miguel Flores

State of the Air Quality Monitoring Network, Annual Report, is an annual publication of the National Park Service's Monitoring and Data Analysis Branch (MDAB). Mention of trade names or commercial products does not constitute an endorsement or recommendation for use.

Editor: John D. Ray
Layout: Jeff Selleck

What We Do and Why

What's Up In Gaseous Pollutant Monitoring

In 1991, we redesigned our gaseous pollutant monitoring network along eco-region boundaries, to include two types of monitoring sites that we call trend and baseline. Trend sites are those that will be maintained indefinitely and serve as the primary sites to determine long-range trends in ozone and sulfur dioxide levels throughout the national park system. Baseline sites are those from which we document existing pollutant levels in all Class I areas not already part of the trends network. We would like to document air pollutant levels in all Class I areas by the year 2000. Twenty-nine NPS units comprise the trends network, with NPS operating 24 of these sites and the U.S. Environmental Protection Agency (EPA) or states operating another five sites.

As of December 1993, the network consisted of 36 NPS-operated sites. An additional 11 sites are operated by state and local agencies and the EPA in NPS units. This network includes two colocated NPS and EPA National Dry Deposition Network (NDDN) sites in Shenandoah and Grand Canyon NPs.

We added trend sites at Mesa Verde NP (April), Great Basin NP (August), and Death Valley NM (December). Only the installation of two trend sites in Alaska (Noatak NP/Gates of the Arctic NP&P Wrangell-St. Elias NP&Preserve) remain to complete our trends network. The installation of the Alaskan sites has been delayed until we can determine the most appropriate equipment to use in these harsh environments where conventional equipment will likely not work well.

A solar-powered ozone and meteorological station was installed near the top of Clingman's Dome in Great Smoky Mountains NP with funding assistance from the park, EPA, and the state of Tennessee. Data are accessible via cellular telephone. This site is the second highest monitoring site in the Eastern U.S.

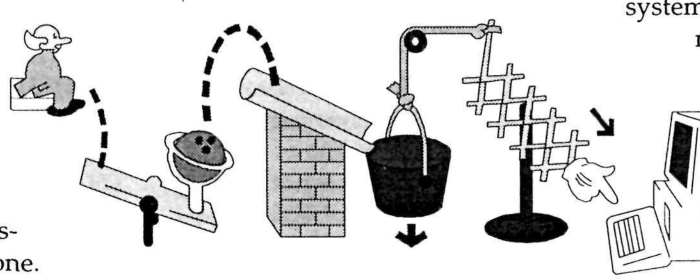
To reduce our operation and maintenance costs, we turned over monitoring operations at Acadia NP and Saguaro NM to the State of Maine and Pima County, Arizona, respectively. Operations at Everglades National Park were restored following damage from Hurricane Andrew.

The ozone monitoring site in Rocky Mountain NP, near the base of Long's Peak, recorded its first exceedance of the National Ambient Air Quality Standard for ozone on July 2, 1993 with an hourly average ozone concentration of 0.127 ppm. This was Colorado's second highest ozone concentration for the year. As a result, the AQD staff met with Superintendent Rouse, his staff, and representatives from the state of Colorado Department of Health to brief the park staff on ozone formation and transport and on the possible health effects of high ozone concentrations at high elevation. ❖

The Flow of Monitoring Data

We are often asked what happens to data collected at the monitoring sites and how we process the data. Below we describe the process, which involves a number of different people and several different computer systems along the route from raw data to final data.

Monitoring programs are incomplete if they cannot handle all of the data being generated or make the data available to users. Equally as important is that they possess a good quality assurance program that validates the data against standards to ensure that the data accurately portray the system being monitored--in our case, ozone and sulfur dioxide levels and meteorological conditions in our parks. Inaccurate and unsupported data due to lack of proper documentation and poor quality assurance can damage an organization's reputation and credibility. Because of this, we instituted checks and balances that ensure that our data meet all applicable



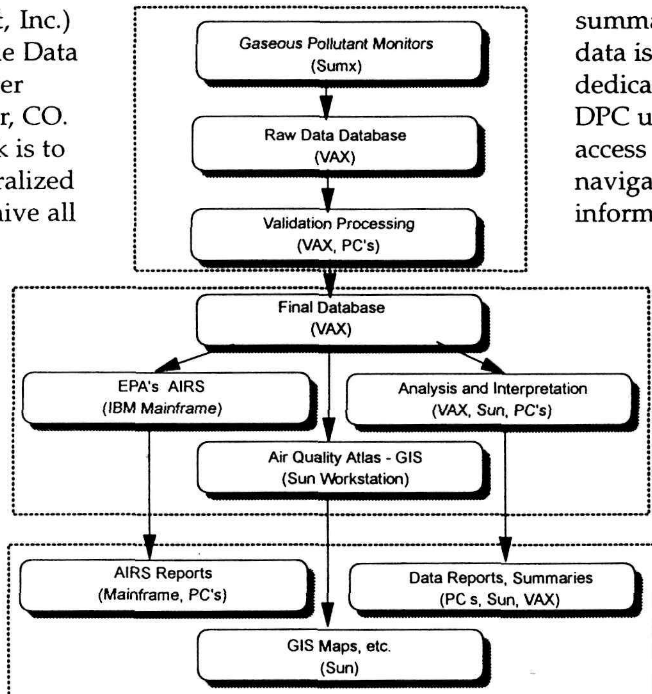
Continued on page 4

"The process begins nightly when the... central computer... polls each monitoring site across the country to upload the previous day's... data via modem."

Continued

requirements imposed by EPA and state agencies for the collection of air quality data. The key to this is our efforts to carefully scrutinize the data, review site log book entries, and perform quality control checks before disseminating the final data to parks, researchers, and the general public.

Data processing, validation, and reporting are the responsibilities of our contractor (AeroVironment, Inc.) who operates the Data Processing Center (DPC) in Denver, CO. Part of their task is to maintain a centralized database to archive all gaseous pollutant and meteorological data collected in NPS units. Most of the efforts of the DPC staff go into validating data that goes into the database.



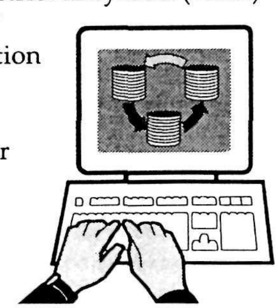
Flowchart of monitoring data path

The process begins nightly when the DPC's central computer, a MicroVax 3100, polls each monitoring site across the country to upload the previous day's gaseous pollutant and meteorological (GPM) data via modems. The raw GPM data are automatically loaded into an ORACLE database and are subjected to an automatic anomaly screening program to detect any inconsistencies in the data or exceedance of quality control limits. All sites not passing this screening are flagged for immediate corrective action. Sites that were unsuccessfully polled at night are manually polled by DPC staff in the morning. Over the next four weeks the data are rigorously reviewed by DPC and AQD staff and are compared to all site documentation records mailed in to the DPC by NPS site personnel biweekly. Once the data have passed all quality control checks, the data are considered "preliminary" and a monthly report is prepared. The report is submitted to each site operator requesting him/her to identify any changes that should be made. Before the data are considered "final," AQD staff re-examine all site records and changes made to the data. If even one error is found during this last step, the DPC must revalidate the entire month's data before it is accepted as final.

Final data reside on the DPC's MicroVax in an ORACLE-based environmental database management system (EDMS). Final data are archived periodically to EPA's AIRS system and are used to complete annual data reports for each site (see article on annual summary reports on page 11). Our access to the data is either through dial-up modems or via a dedicated leased line between the AQD and the DPC using a high speed link. NPS personnel have access to our EDMS on the MicroVax and can navigate through a series of menus to acquire any information needed. Because of the relatively slow speed of most modems attached to the MicroVax and available to parks, this option is not feasible for park personnel at the moment. They can, however, call us with specific data requests and data can be mailed on diskette or transmitted using cc:Mail to requesters. ❖

AIRS Database: Sharing the Data

We have mentioned EPA's AIRS database as one means by which we store and provide access to air quality data. Users may access AIRS directly or request outputs from us. Some additional information about AIRS may thus be helpful.



The Aerometric Information Retrieval System (AIRS) is a computer-based repository of information about airborne pollution in the U.S. AIRS was developed primarily to allow state and local agencies to submit and retrieve air pollution data. It is administered by the EPA Office of Air Quality Planning and Standards (OAQPS), Technical Support Division, National Air Data Branch, located in Durham, NC. ❖ **Continued on page 5**

Continued

AIRS' Air Quality Subsystem (AQS) contains air quality information such as ambient pollutant concentrations and meteorological conditions reported by thousands of monitoring stations operated by federal, state, and local agencies. The subsystem also contains summary statistics for each monitoring station, such as the annual arithmetic mean and number of times the measured concentration exceeded a national ambient air quality standard. The AQS also contains descriptions of each monitoring station, including geographic location and who operates it. This subsystem is what one would query to find data collected at NPS monitoring sites or if nearby state monitoring data were desired.

AIRS' Facility Subsystem contains point source emissions data, compliance and enforcement data, and descriptions of emissions sources. When that subsystem is combined with AIRS Graphics, one can display on a map the location of emission sources near an NPS unit or any other area of interest. This information is quite handy for understanding the pollutant sources near parks. We often fill requests from parks or the Denver Service Center for point source graphics to use in Resource Management Plans and other planning documents.

AIRS' Area Source Subsystem also contains area source emissions data. This includes emissions from small stationary sources and mobile sources (automobiles, trucks, trains, airplanes, etc.), forest fires, and natural sources. This data is typically used by states and EPA for the preparation of state implementation plans and other air regulatory program requirements. Graphics similar to that for point sources can be produced.

AIRS' Graphics Subsystem allows users to create maps to display information contained in AIRS. This tool is usually combined with the data from the other subsystems.

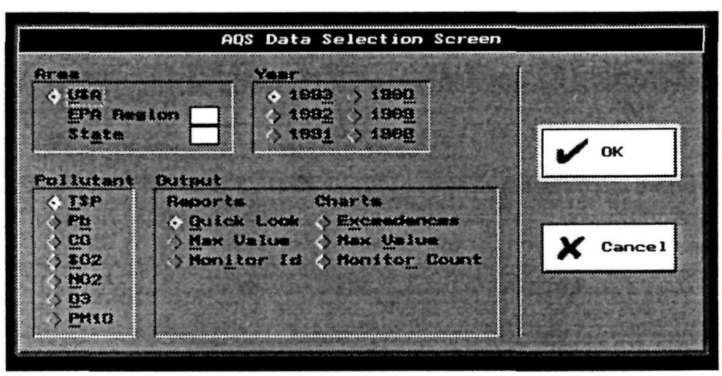
Access to the AIRS system requires an account on EPA's mainframe computer in Research Triangle Park, NC. Presently, most MDAB staff members have access to the AIRS system via the Internet and dial-up modems. It is unlikely that park staff would have a continuing need for access to AIRS directly. However, MDAB staff members are readily available to meet your AIRS data needs as they arise. Bob Carson is the primary contact for this service or for additional information on AIRS. ❖

AIRS Executive: Easy Access to Air Quality Information

Another program available for access to air quality information is AIRS Executive, a computer database that runs on a PC and contains a select subset of data extracted from the AIRS database. Its user-friendly interface guides you quickly to air pollution information on ambient air, emissions sources, and mobile sources. We provide AIRS Executive to NPS users through our computer network. The menu driven program has a point-and-click graphical interface and was designed to give users quick access to a subset of air pollution information. The following subsystems make up Airs Executive:

INFORMATION--contains general information about AIRS and each of its five subsystems.

MAPS--provides a sampling of maps from the AIRS graphics subsystem. For example, you can see maps of U.S. monitoring sites or nonattainment areas for six criteria pollutants. You can also see the locations of operating facilities throughout the country, based on the pollutant you select.



Data selection computer screen from AIRS Executive

DATA--provides information on air quality and plant emissions on a national, regional, or state level. You narrow your search by selecting a year and a pollutant.

TOOLS--provides procedures and hints on using other software programs, such as Lotus 1-2-3, with AIRS Executive.

Although handy for some purposes, AIRS Executive contains only summaries of the air monitoring data and the MAPS section currently has sample maps only. We have discussed with EPA how to put NPS air quality data within AIRS Executive in the future. Copies of AIRS Executive are available from the EPA bulletin board, the AQD computer network, or Bobby Carson. ❖

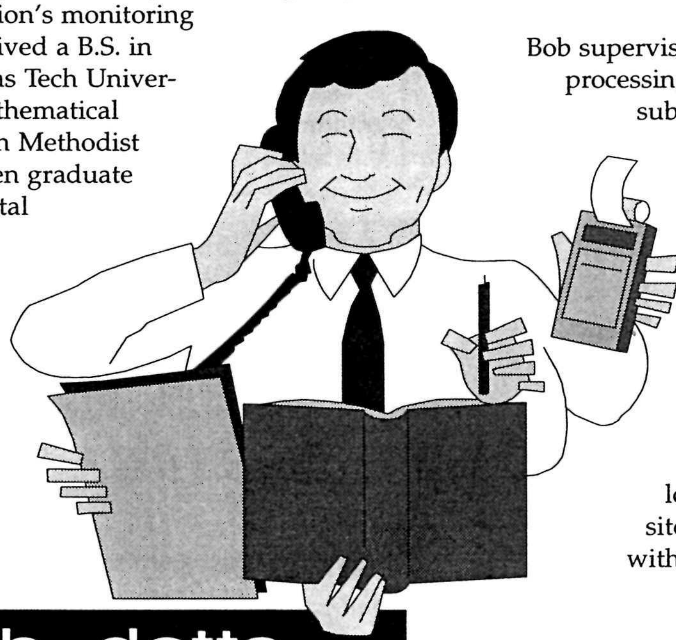
People in the Monitoring and Data Analysis Branch

The Monitoring and Data Analysis Branch (MDAB) is one of three branches within the NPS Air Quality Division. Below are listed the people in the branch that are dedicated to the collection and interpretation of the air quality data:

miguel i. flores

CHIEF, MDAB

Miguel has overall responsibility for the NPS gaseous pollutant monitoring network, dissemination of air quality information to parks and regions, and quality assurance for the division's monitoring programs. Miguel received a B.S. in mathematics from Texas Tech University and an M.S. in mathematical statistics from Southern Methodist University. He has taken graduate courses in environmental sciences and computer science at the University of Texas at Dallas. Contact Miguel if you have any general questions about air quality monitoring, program plans, or funding issues.



bobby c. carson

AIR QUALITY MONITORING SYSTEMS SPECIALIST

Bob supervises the operation of the AQD's data-processing center and coordinates data submissions and retrievals to EPA's AIRS database. He also assists in supervising the gaseous pollutant monitoring network. Bob received a B.S. in geography and earth sciences and an A.S. in meteorological technology from Western Kentucky University. Contact Bob if you have questions about data validation and need air quality data in a form not provided by the annual summaries. Bob can download data from NPS sites and other sites from AIRS and can generate maps with selected data from AIRS graphics.

tom b. dotts

RESEARCH ASSOCIATE

Tom is a Colorado State University employee who oversees development and production of the air quality atlas on the division's GIS database. He is system administrator for the Sun workstation, the ARC/INFO GIS, and the Wide Area Network. Tom received a B.A. in geography with minors in psychology and sociology from Virginia Polytechnic Institute and State University. Contact Tom with questions regarding the air quality atlas and our GIS capabilities. He can produce maps with air quality data and other information like sources, other monitoring sites, park boundaries, etc., on request.

shirley vaninger

BRANCH SECRETARY

Shirley provided much support for the branch as secretary from 1986 until her early retirement in April, 1994. In addition to her secretarial duties, she pitched-in on special assignments like data polling of the monitoring sites, downloading data from EPA's AIRS system, and preparing and distributing the annual data summary reports. We miss her and wish her the best in her retirement.

douglas b. garnand

COMPUTER SYSTEMS ANALYST

Doug administers the division's local area network, provides technical and user support for the division's stand-alone PCs, and develops computerized applications in support of other division projects. Doug received a B.A. in mathematics from the University of Denver and an M.S. in environmental psychology from Colorado State University. Contact Doug with your questions and suggestions on how to access information through the AQD computer network.

henry b. "chip" harvey

STATISTICIAN

Chip designs optimal sampling procedures for studying air quality and biological effects, geostatistical estimation of pollutant concentrations, environmental data analysis, and integration of Geographic Information Systems (GIS) with geostatistics. Chip received a B.S, in wildlife ecology from Penn State and an M.S. in statistics from University of Wyoming. Contact Chip for information about Internet and statistical methods for the analysis of air quality data, including geostatistical and spatial estimation methods.

ron lawler heavner

AIR QUALITY MONITORING SYSTEMS SPECIALIST

Ron supervises the operation and maintenance of the NPS gaseous pollutant monitoring network and coordinates the monitoring activities performed by contractors and park personnel. Ron received a B.S. in environmental science from California University of Pennsylvania and has taken management and environmental law courses at the University of Cincinnati. He is currently working toward an M.S. in environmental science at the University of Colorado. Contact Ron about equipment, operational questions, siting requirements, fund transfers, quality control, or coordinating monitoring activities with EPA, states, local agencies, or contractors.

david b. joseph

PHYSICAL SCIENTIST

David provides data summaries and analysis, and is developing the NPS air quality atlas. He is proficient in the use and interpretation of air quality and visibility predictive models. David has a B.S. in physics from The Cooper Union and a M.S. in physics from the University of Colorado. Contact David to request information, data summaries, or the air quality atlas.

john d. ray

ATMOSPHERIC CHEMIST

John provides quality assurance for the gaseous pollutant monitoring, develops alternate methods of monitoring, coordinates NPS monitoring with broader regional programs, and analyzes and interprets air pollutant data. He has recently completed studies on low-cost passive samplers for ozone monitoring. John received a B.S. in chemistry from the University of Illinois and a Ph.D. in inorganic chemistry from Michigan State University. Contact John about quality assurance issues, special monitoring programs and equipment needs, or about using passive ozone samplers. John can also assist in interpreting data and answering questions about air pollutant chemistry. ❖

What Was New This Year

Participation in Regional Air Pollution Studies

The sources of air pollution affecting national parks are most often outside of the national parks and distributed over wide regions. Control of these sources is usually the responsibility of the states, yet the areas involved for a single park often include several states. Several regional ozone studies have been organized by state and other federal agencies to study the chemical reactions and transport of ozone and its precursors to nonattainment areas. NPS has participated in these studies by providing routine data from our monitoring sites and by occasionally augmenting measurements at its monitoring sites.

In 1993, additional measurements of nitrogen oxides (NOy and NO) and volatile organic compounds (VOC) were made at Acadia NP in cooperation with the North Atlantic Regional Experiment (NARE) and the Gulf of Maine Oxidant Study (GOMOS). These studies were designed to improve the understanding of how ozone is formed and how it is transported to the coastal Northeast region and on out over the Atlantic Ocean.

During the August field study, ozone concentrations of 80-112 ppb (parts per billion) were observed on three days. NOy concentrations (NOy is the sum of all oxidized nitrogen species) peaked at about 10 ppb at the same time as did ozone, but otherwise did not always correlate with ozone. VOC concentrations were far in excess of the observed NOy, which implies that during this late summer period the formation of ozone may have been limited by the amount of NO and NO_2 present. Better understanding of the episodes that occurred during the study period is expected as the data collected from over 40 ground sites, 3 aircraft, and 2 ships are assembled and analyzed.

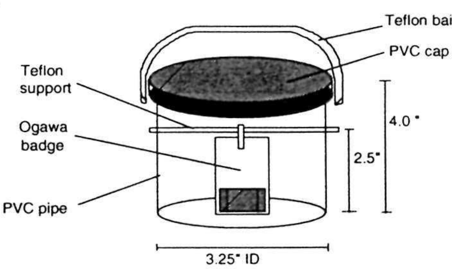
The NARE program is expected to conduct field experiments again in 1996. Meanwhile, the MDAB expects to work with the Southern Oxidant Study (SOS) in their summer programs in 1994 and 1995. Additional monitoring for ozone precursor gases (organic compounds and nitrogen oxides) will be performed at Mammoth Cave NP and Great Smoky Mountains NP as part of these studies. Improved understanding of ozone transport to these areas is expected to lead to more effective control strategies for the ozone precursors.

For more information, summaries, reports, or details on future NARE programs, contact John Ray. ❖

Ozone Monitors for Remote Areas

A second study to test passive samplers for ozone monitoring was conducted during August 1993 in Great Smoky Mountains NP and Sequoia-Kings Canyon NP. These passive samplers are simple devices that require no power and can be used in remote areas to monitor ozone exposures. They depend on the reaction of potassium nitrite with ozone to form nitrate ions. Because the devices are relatively new, we wanted to test them under field conditions. These devices sum the ozone exposure over a period of time, typically one week, with an accuracy of better than ±20%. Their projected uses include monitoring biological exposures on site, spatial and temporal studies of ozone exposure, and determining ozone exposures in locations or parks without continuous monitors.

The passive ozone sampler consists of a badge holder and a filter holder. Within the filter holder are two nitrite-coated filter pads held behind diffusion caps. To expose the samplers, field personnel take the devices out of their air-tight protective container and clip them inside a PVC rainshield. After the exposure period, personnel return the badges to a lab for analysis of nitrate by ion chromatography. Ozone exposure is calculated from the weight of the nitrate and the exposure time.



The passive ozone samplers, at $40-50 each, provide an inexpensive and easy-to-use means to obtain integrated ozone exposures. We believe that these devices can be used to enhance our knowledge of the spatial distribution of ozone and of the ozone exposures to individual plants. We hope to use the passive samplers in some of the on-going biological effects studies during 1994. For more information, contact John Ray. ❖

Mexican Power Plants Pose Threat to Big Bend Air Quality

In May 1993, the Air Quality Division learned about the existence of two uncontrolled, coal-fired power plants in the state of Coahuila, Mexico, just south of the U.S.-Mexico border. The Carbon I plant has been in full operation since 1986 and has an operating capacity of 1200 megawatts (MW). The Carbon II plant, with a capacity of 1400 MW, is currently under construction. Two of its four 350-MW units began operation in late 1993, with the remaining two units scheduled to come on-line by January 1996.

MDAB Chief Miguel Flores worked with EPA Region VI (Dallas) staff to estimate the emissions from these power plants and the air quality impacts on NPS areas near the power plants. We found that the power plants could possibly violate the Prevention of Significant Deterioration (PSD) Class I area increment for sulfur dioxide and cause significant visibility impairment at Big Bend NP. Our preliminary estimates indicated that visibility could be reduced by as much as 60% on some days at the park. Miguel has been heavily involved in this issue with EPA, Mexico's environmental agency, NPS, and DOI personnel in efforts to mitigate the impacts of these power plants. For additional information, contact Miguel Flores. ❖

NPS and EPA to Operate Joint Monitoring Sites

The MDAB staff successfully negotiated an agreement with the EPA to include 17 NPS gaseous-pollutant monitoring sites into EPA's National Dry Deposition Network (NDDN). This will require some reconfiguring of the NPS sites to include dry deposition monitoring as well as monitoring of additional meteorological parameters. The most noticeable visible change at a monitoring site will be the installation of a 10-meter tower to house the dry deposition filter packs. Sites that do not currently have meteorological parameter monitoring will have a new 10-meter tower installed to support meteorological sensors. Parks that have multiple monitoring sites will have only one of those sites reconfigured. In the event that the sites do not meet EPA's NDDN siting criteria, we will either consider relocating an existing site to a new location that meets siting criteria or choose not to convert the site to dry deposition monitoring.

This agreement between the EPA and NPS offers clear advantages to both agencies. With minimal cost, the EPA NDDN program increases its size and geographical coverage with the inclusion of the NPS sites. The NPS will have the added capability of determining estimates of dry deposition rates in the 17 park units. These data will be comparable to data collected from the existing network of NDDN sites. Site conversions will begin in 1994 and all sites will be fully operational in 1995. For additional information, contact Ron Heavner. ❖

Participation in the National Atmospheric Deposition Program (NADP)

Historically, NPS has funded 18 wet deposition, or "acid rain," sites that are part of the NADP network. This network is comprised of approximately 200 stations located in nonurban areas across the country. The network provided much of the data used to characterize the acid rain problem in the U.S. under the National Acid Precipitation Assessment Program (NAPAP). In addition to the 18 sites funded by NPS, states and other federal agencies fund 11 sites located in NPS units. In 1993, the AQD decided to fund four of these sites when we were informed by the Bureau of Land Management and by the State of Maine that they could no longer support them. Many of our NADP sites have been operating for more than 10 years and, as such, have some of the longest data records for air quality in parks. We felt that it would be a shame to lose these long data records at these four sites.

MDAB staff (Harvey and Flores) undertook an analysis to determine the importance of NPS sites to the total NADP network. This analysis relied heavily on a geostatistical technique known as *kriging*. Results showed that as a group, NPS sites were extremely important in characterizing spatial trends in pH and in sulfate and nitrate deposition across the U.S. Among the reasons for this are that NPS sites are the only sites in some regions of the country (such as the Great Basin) and numerous NPS sites are located along the boundaries of the continental U.S. (such as Big Bend, Glacier, North Cascades, Acadia, Olympic, and Everglades). With the AQD facing budget uncertainties, however, it is difficult to predict how long we will be able to maintain the current NADP network. For additional information, contact Miguel Flores. ❖

What Products Are Available

Statistical Summaries of Ozone in the Parks

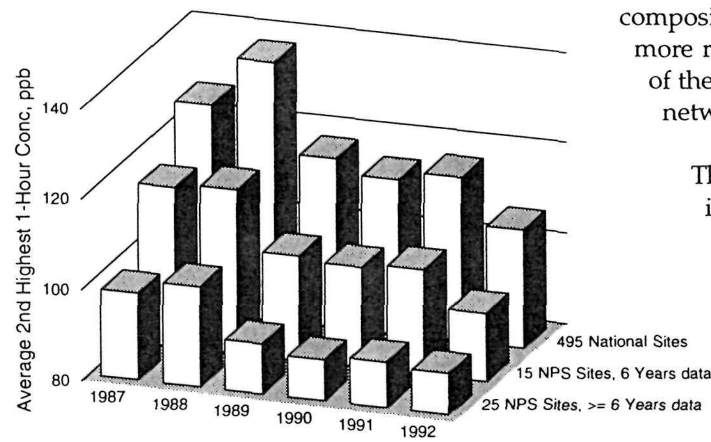
In an effort to summarize over 200 site-years of ozone data collected at more than 40 NPS sites since the early 1980s, the Monitoring and Data Analysis Branch developed a computer program using the SAS statistical software system to analyze 1-hour ozone averages and generate longer-term summary statistics. This computer program was used to summarize ozone data collected at all NPS monitoring sites from 1981 to 1991. These summaries, two pages for each site and year of data, form the basis of the publication "Statistical Summary of Ozone Measurements in the National Park System, 1981-1991, Volumes I and II" (report number NPS D-814). The two volumes tabulate data on an hourly, daily, monthly, growing season, and annual basis for the years of interest. (The growing season was generically defined here for all parks to be May 1 through September 30).

Volume I of this report includes maps and graphs of ozone statistics accompanied by a discussion of the NPS spatial, diurnal, seasonal, and yearly temporal trends. NPS sites in southern/central California, the Great Lakes region, and the northeast and east-central U.S. generally record the highest ozone concentrations in the NPS network. Ozone monitors in northern California, Washington, the Rocky Mountain/Colorado Plateau region, the Northern Great Plains, Alaska, and Hawaii generally report the lowest concentrations in the NPS network.

A sample map of ozone measured in 1993 is illustrated on the cover of this report. On this map the shaded circles are proportional to the second highest ozone concentration observed at the listed park. The number inside the circle is the actual ozone concentration. It is easy to see from this map what areas have significant pollution problems. Compare the second highest values to the national ozone standard of 120 ppb as a reference. Only Sequoia/Kings Canyon NP recorded a second highest 1-hour concentration above the national standard in 1993. Contact David Joseph for further information. ❖

Ozone Trends for the NPS Network

The NPS six-year trend in maximum ozone concentrations closely resembles the corresponding trend for the entire nation. The figure below compares NPS and national trends in the annual second highest daily maximum 1-hour ozone concentration. The national averages plotted in the figure are composite averages of the second highest 1-hour concentration at 495 sites throughout the U.S. Two series of NPS composite 1-hour averages are plotted in this figure. One uses the composite averages based on 15 NPS sites that had a data collection rate of at least 75 percent during the growing season in each of the six years 1987-1992. The second consists of the composite averages based on 25 NPS sites with a data collection rate of at least 75 percent during the growing season in at least 5 of the 6 years. This second series was included because many new NPS sites commenced operation after 1987 and these 25 sites may provide a composite average more representative of the entire NPS network.



Comparison of national and NPS ozone trends
Annual 2nd highest daily maximum 1-hr concentrations

The figure illustrates that the variability and trend in annual second maximum ozone concentrations observed within the NPS network is very similar to the nationwide urban trend. 1988 average concentrations for both the NPS and national composites are significantly greater than in other years, particularly 1989-1992. The lowest composite average in the six-year period occurred in 1992.

The 15-site and 25-site NPS composite averages are lower than the corresponding national averages, although some sites experience high concentrations of ozone. The 25-site NPS composite averages are lower than the 15-site averages because the additional 10 sites include parks with relatively low ambient ozone concentrations such as Badlands, Olympic, Redwoods, and Theodore Roosevelt NPs. Contact David Joseph for more information. ❖

Annual Data Summary Reports

Monitoring methods and quality assurance procedures used in the NPS gaseous-pollutant monitoring network generally meet EPA requirements specified in 40 CFR Part 58. This allows for direct comparison of NPS-collected data with that collected by the EPA and state and local air pollution control agencies. The MDAB publishes an annual data report for each site in the NPS network where ozone, sulfur dioxide, or meteorological monitoring occurred. These annual reports provide closure to the quality control process; the year's data included are then designated as "final" data. This distinguishes the data from earlier stages in the review process when they may be considered "raw" or "preliminary."

The annual gaseous-pollutant and meteorological monitoring annual reports include tables of all the hourly averages of ozone, sulfur dioxide, and meteorological parameters such as wind speed and direction, temperature, dew point, solar radiation, and precipitation. (Not all of these parameters are measured at every NPS monitoring site). There are also annual and quarterly graphical and tabular summaries of the data. Forty-four annual data reports were prepared in 1993. Generally, MDAB releases only final data to parks and the general public. Contact David Joseph for more information about these reports. ❖

Regional Haze Videos

The Air Quality Division, in conjunction with the Cooperative Institute for Research in the Atmosphere (CIRA) of Colorado State University, produced two 20-minute videos on haze caused by air pollution. "Looking Through the Atmosphere" introduces some of the basics of how air pollution can affect light transmission in the air and impair a national park's visibility. Light scattering and absorption are explained as well as the role that chemical species such as sulfate, nitrate, and organic particles have in diminishing visibility. The second video, "Sights Unseen," describes the spatial and temporal trends in regional haze in national parks and is based on the data collected from the NPS visibility monitoring network.

Copies of these VHS-format videos are available to parks and interested groups. Contact David Joseph for further information. ❖

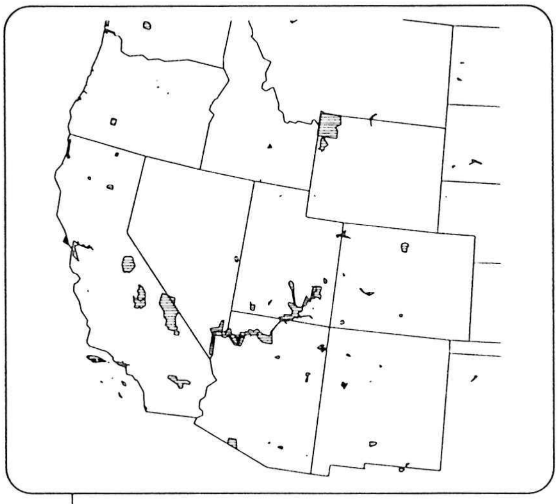
Air Quality Atlas

In 1993, the Monitoring and Data Analysis Branch began work on an atlas of air quality data to make air pollution data more accessible to NPS resource managers. When completed, the atlas will contain information relevant to the 240 units identified as having significant natural areas as part of the NPS Inventory and Monitoring initiative.

A prototype of the atlas, focusing on Great Smoky Mountains NP, is expected to be completed in the summer of 1994. This prototype will contain maps and tables illustrating the location and magnitude of point and area pollution sources, multiyear summaries of ambient gaseous and particulate matter concentrations, and visibility, precipitation chemistry, and deposition data. Contact David Joseph for information about the atlas. ❖

GIS Capabilities

MDAB now has a number of GIS databases to support analysis and interpretation of air quality data. This includes network maps showing the location of each site in the networks for NADP, NDDN, IMPROVE, and NPS gaseous monitoring. We have developed a GIS database containing digitized park boundaries; an example is shown here for just the western states.



Our GIS, Arc/Info, is used extensively in the development of the Air Quality Atlas. The software currently operates on a Sun workstation. For information or copies of GIS outputs, contact Tom Dotts. ❖

Products, cont'd

Support to Air Pollution Research

MDAB staff assisted scientists in research on the biological effects of air pollution on plant species at Great Smoky Mountains and Shenandoah NPs by providing summaries of ozone concentration data. Six sites at Shenandoah were analyzed and the results forwarded to researchers at Auburn University, Appalachian State University, and Pennsylvania State University. Biologists there are using the data to correlate observed plant injury in the field with ambient ozone levels. For further information, contact David Joseph. ❖

Contacting Us

Air Quality Division

National Park Service--AIR
Monitoring and Data Analysis Branch
12795 W. Alameda Parkway
P.O. Box 25287
Denver, CO 80225-0287
Phone: (303) 969-2070; Fax: (303) 969-2822
cc:Mail: Use names of individuals
Internet: Use initials of individuals @aqd.nps.gov
(for example, mif@aqd.nps.gov)

Cut out this card and place it in your Rolodex....

NPS D-989

National Park Service
Air Quality Division–AIR
Monitoring and Data Analysis Branch
P.O. Box 25287
Denver, CO 80225

BULK RATE
POSTAGE AND FEES PAID
U.S. DEPARTMENT OF THE INTERIOR
PERMIT NO. G-83

☆U.S. GOVERNMENT PRINTING OFFICE: 1994—841-118