INTERAGENCY MONITORING OF PROTECTED VISUAL ENVIRONMENTS

IMPROVE

Spring 2001 The IMPROVE Newsletter Volume 10 / Number 2

# Monitoring update

## Network operation status

The IMPROVE network operated 105 aerosol samplers, 15 transmissometers, 8 nephelometers, and 4 camera systems during the Spring 2001 monitoring season (March, April, and May 2001).

Preliminary data collection statistics for the Spring 2001 season are:

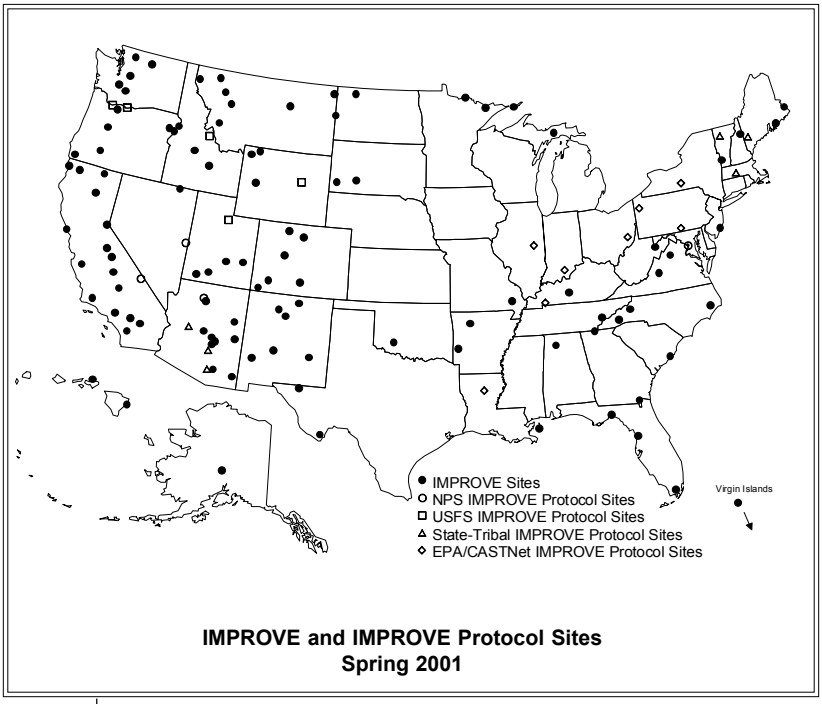
- Aerosol (channel A only) 92% collection
- Aerosol (all modules) 90% completeness
- Optical (transmissometer) 92% collection
- Optical (nephelometer) 98% collection
- Scene (photographic) 94% collection

The following monitoring sites received the Version II IMPROVE aerosol sampler during Spring 2001:

Hercules-Glades W, MO (IMP)
Saguaro NP, AZ (IMP)
Wichita Mtns NWR, OK (IMP)
Addison Pinnacle, NY (Pro)
Arendtsville, PA (Pro)
Bondville, IL (Pro)
Bridgton, ME (Pro)
Cadiz, KY (Pro)
Cape Cod, MA (Pro)
Casco Bay, ME (Pro)
Connecticut Hill, NY (Pro)
Hillside, AZ (Pro)
Livonia, IN (Pro)
MK Goddard, PA (Pro)
Phoenix, AZ (Pro)
Quabbin Reservoir, MA (Pro)
Quaker City, OH (Pro)
Queen Valley, AZ (Pro)
Saguaro West, AZ (Pro)
Sikes, LA (Pro)

The U.S. Forest Service operates 2 transmissometers, 8 nephelometers, and 6 camera systems in Class I areas in support of the IMPROVE aerosol program. Nephelometers at Snoqualmie NF and Three Sisters W were deactivated in May and will be installed at Columbia River Gorge NSA. Digital camera systems now operate at Agua Tibia W, Mount Hood W, Mount Zirkel W, Pasayten W, White River NF, and Columbia River NSA.

The State of Arizona operates 7 nephelometers in Class I areas in support of the IMPROVE aerosol program. A nephelometer was installed at Mount Baldy W this spring.




**IMPROVE and IMPROVE Protocol Sites**
**Spring 2001**

## Data availability status

Aerosol data for all measurements including carbon are available through March 2000 and optical data are available through November 2000 on the IMPROVE Web site, at http://vista.cira.colostate.edu/improve/Data/data.htm.

Photographic slides and digital images are archived but are not routinely analyzed or reported. Complete photographic archives and slide spectrums (if completed) are available at Air Resource Specialists, Inc.

IMPROVE data are available to interested parties for use in presentations, management plans, and other projects. All data are validated using IMPROVE protocols, which are documented in standard operating procedures. Procedures are available for site selection; instrument installation, operation, and servicing; and data collection, reduction, validation, reporting, and archive. IMPROVE standard operating procedures are available on the IMPROVE Web site at http://vista.cira.colostate.edu/improve/Publications/publications.htm.

# Visibility news

## CAMNET Web site redesigned with addition of monitoring sites

The CAMNET real-time visibility monitoring camera network, sponsored in part by NESCAUM, is continuing to develop. Sites taking real-time images now include:

- Acadia National Park, Maine
- Boston, Massachusetts
- Mount Washington, New Hampshire
- Newark/New York City, New Jersey/New York

Other sites with images include the Class I areas of:

- Brigantine, New Jersey
- Lye Brook, Vermont

Sites anticipated to be installed and operational this summer include:

- Hartford, Connecticut
- Burlington/Lake Champlain, Vermont

CAMNET's Web site has been redesigned to accommodate additional new monitoring sites. The site now includes all Class I areas in the Northeast. It juxtaposes the real-time view with ideal conditions (for sites that have real-time function), contains more material in the gallery, and provides current air quality conditions as they relate to both visibility and health (i.e., the Air Quality Index) for sites that measure criteria pollutants.

The purpose of CAMNET is to raise public awareness about the effects of air pollution on visibility. This is accomplished, in part, through a network of real-time visibility cameras located at scenic urban and rural locations. CAMNET pictures are updated every 15 minutes. In addition, near real-time air pollution and meteorological data are provided to help distinguish natural from human-made causes of poor visibility, and to provide health-relevant data to the public on current air pollution levels. The air pollution and meteorological data are updated every hour.

The Web site was also featured prominently in "Haze seen as a lingering problem for region," the *Boston Globe*, 29 May 2001. The article is on the Boston Globe's Web site, at http://www.boston.com. The CAMNET Web site received 22,000 hits the day the story was released.

*For more information contact Lee Alter at NESCAUM. Telephone: 617/367-8540. E-mail: lalter@nescaum.org.*

## IMPROVE Newsletter distribution update

The IMPROVE Newsletter is a free, quarterly publication available to anyone interested in the IMPROVE Program and air quality issues. It has a hard copy distribution of nearly 500 individuals and is also available on the Internet at http://vista.cira.colostate.edu/improve/Publications/publications.htm and http://www.aqd.nps.gov/ard/impr/index.htm.

Please take the time now to consider your mailing information. If you need additional copies for other personnel in your office, if you need an address correction, or if you no longer wish to receive the IMPROVE Newsletter, please submit your request to Air Resource Specialists, Inc.

*To request additional newsletters or an address correction contact Air Resource Specialists, Inc. Telephone: 970/484-7941. E-mail: info@air-resource.com.*

## IMPROVE optical monitoring network captures Asian dust event

Every spring, intense wind storms occur over Asia. When these storms pass over the Gobi Desert, they suspend fine, loose sand generating large, yellow dust clouds known as *huangsha* in China. On April 6, 2001, a series of these sandstorm events developed over northern China and inner Mongolia, generating one of the worst *huangsha* storms on record. This dust cloud swept across China and out to the Pacific Ocean. Over the course of four days, the dust cloud was transported across the Pacific reaching North America on April 11. By April 13, the dust cloud extended from southern California to the Midwest (Figure 1) and had begun to impact the near-surface atmosphere.

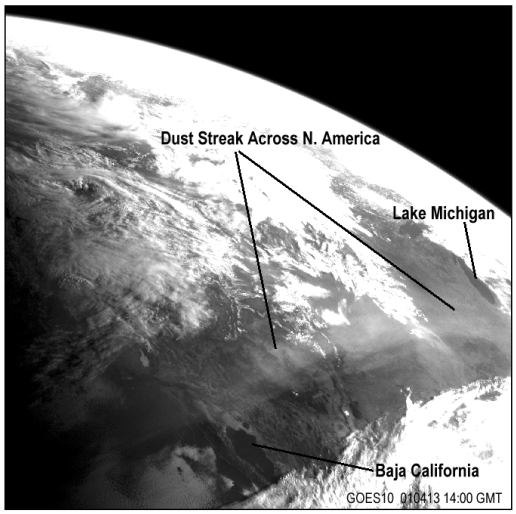



**Figure 1. GOES image of the dust cloud over the U.S. on April 13, 2001. Image by Rudolf Husar.**

The IMPROVE Program and other agencies operate nephelometers and transmissometers to measure light scattering ($b_{sp}$) and extinction ($b_{ext}$), respectively, throughout the western U.S. Air Resource Specialists, Inc., gathered data from many of these sites and provided the information to the Cooperative Institute for Research in the Atmosphere (CIRA) in near real-time, allowing an ad-hoc analysis of the Asian dust event. A time series of the light scattering, extinction, and relative humidity for the dust event at Grand Canyon and Yosemite National Parks is presented in Figure 2.

The impact of the Asian dust was clearly evident at Grand Canyon. On April 12 the Canyon experienced $b_{ext}$ near Rayleigh scattering (15 $Mm^{-1}$) with low relative humidity. On April 13 the extinction began to rise, and by the afternoon of April 14, $b_{ext}$ reached 80 $Mm^{-1}$ with relative humidity less than 50%. This increase in $b_{ext}$ coincided with a deviation in $b_{sp}$ and $b_{ext}$ signals, with $b_{ext}$ becoming ~50% larger than $b_{sp}$. By the end of April 16, $b_{sp}$ and $b_{ext}$ decreased to typical levels and began to track each other again, indicating an end of the dust's impact. The light scattering and extinction time series behaved similarly at Yosemite. However, it appears that the dust cloud impacted Yosemite about a day earlier and $b_{ext}$ peaked at ~150 $Mm^{-1}$ early on April 14.

The difference between the $b_{sp}$ and $b_{ext}$ is a clear signal of the dust's impacts. It is known that dust absorbs some radiation; however, the large difference is most likely due to an underestimation of coarse particle (>2.5$\mu$m) scattering by the nephelometers. Asian dust's size distribution peaks between 2-3$\mu$, and the nephelometer underestimates coarse particle scattering by about a factor of 2.

This dust event is a good illustration of additional uses of the IMPROVE continuous monitoring network and the complementary nature of collocated instruments. When the aerosol data become available, they will provide the spatial extent and chemical composition of this dust event for the 1 or 2 days sampled during the event. The continuous light scattering and extinction data "fills in" the rich temporal variability that is lost in the aerosol network. Also, the near real-time availability of these data provides important information for understanding the event as it occurred. Lastly, this event illustrates that transboundary pollutants can impact the upper end of the haze distribution. These events will need to be identified and considered in terms of the regional haze rule.

*For more information contact Bret Schichtel at CIRA. Telephone: 970/491-8581. Fax: 970/491-8598. E-mail: Schichtel@cira.colostate.edu.*

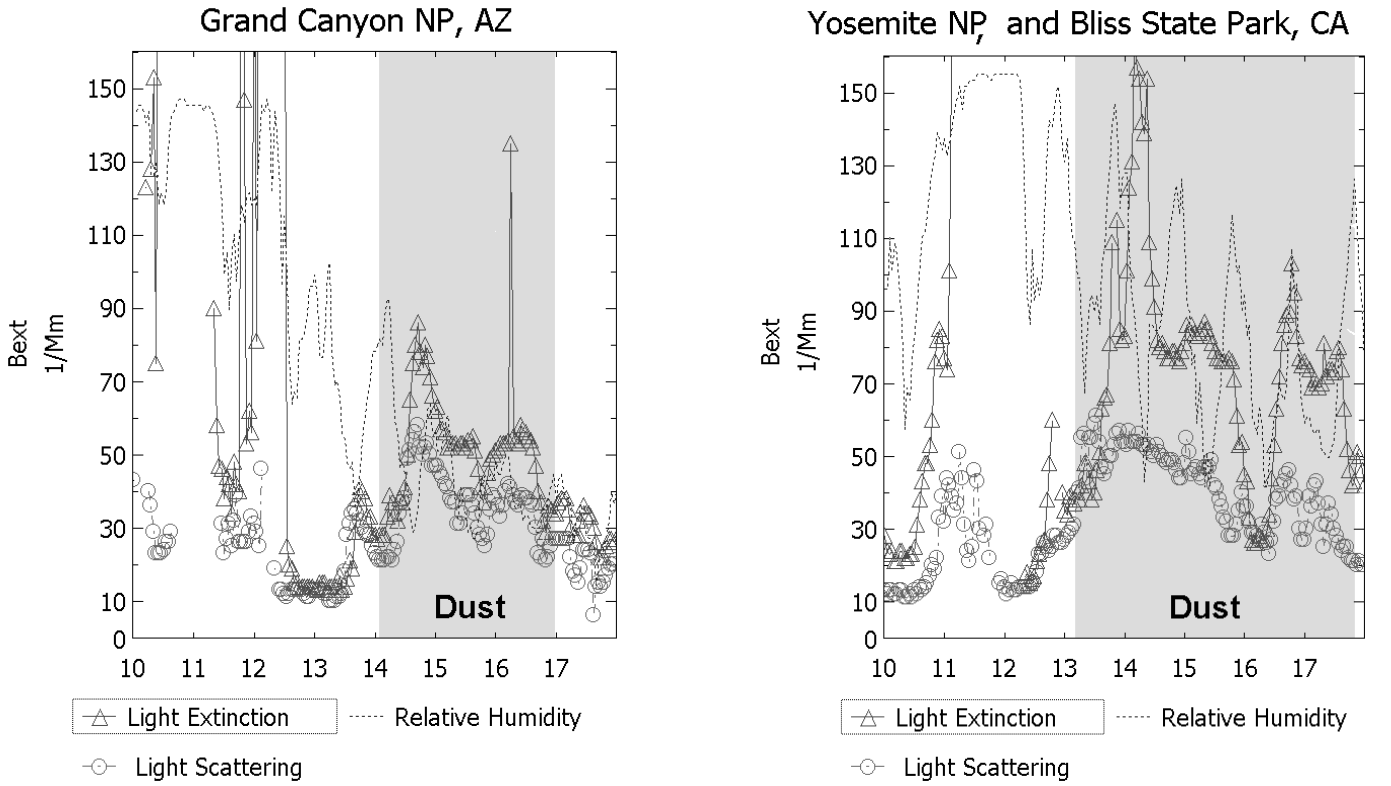



**Figure 2. The light scatter, extinction, and relative humidity at Grand Canyon and Yosemite National Parks. Note the light scattering and relative humidity data in the Yosemite plot came from Bliss State Park, located ~100 km northwest of Yosemite. The $b_{ext}$ and $b_{sp}$ were filtered to remove weather events and Rayleigh scatter has been added to the $b_{sp}$.**

***Visibility news** continued on page 6....*

# Feature article

## Acadia National Park visitor center receives real-time air quality interpretive display

### Introduction

Acadia National Park, Maine, monitors visibility and air quality using a full range of instrumentation (optical, scene, ozone, and meteorological). Data and photographic images are currently uploaded for real-time presentation on the Internet through the CAMNET program; Acadia staff are now working to present these same data and images to park visitors through an interpretive display. The display became operational in July and is located in Acadia's visitor center, which receives approximately 700,000 visitors annually. The display is in many ways similar to that developed at Great Smoky Mountains National Park, North Carolina/Tennessee. (For a related article discussing the Great Smoky Mountains interpretive display, see *The IMPROVE Newsletter*, Spring 1998, Volume 7, No. 2).

### Current Web Display

Data and images at Acadia are collected by a datalogger and uploaded to the CAMNET Web server every 15 minutes for posting on the Internet. The CAMNET Web page that displays Acadia's information is shown in Figure 1. CAMNET, a real-time air pollution and visibility monitoring network sponsored in part by NESCAUM (Northeast States for Coordinated Air Use Management), became operational in late 1999. *(See related article on the CAMNET program, on page 2 of this newsletter).*

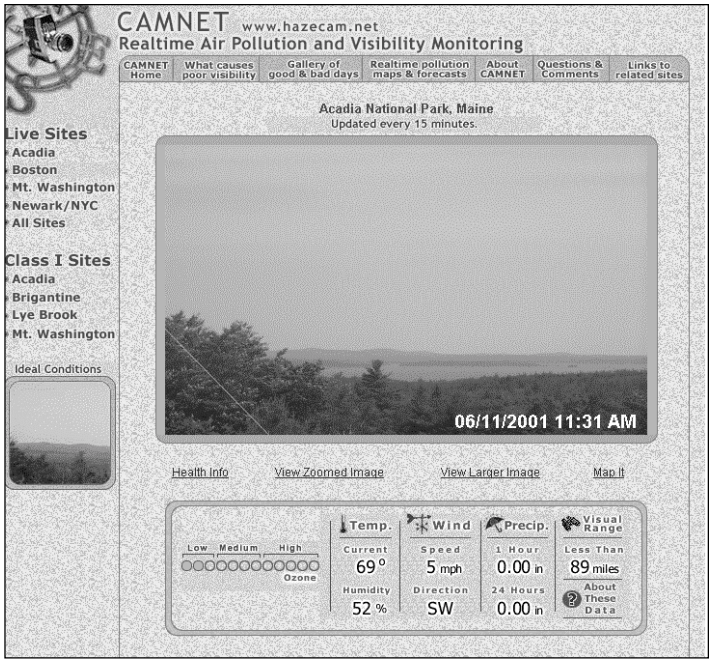



**Figure 1. CAMNET Web page showing current visibility and air quality conditions at Acadia National Park.**

### Visitor Center Display

The main component of the new visitor center display is a high-definition 36" television screen. The television is connected to a personal computer that runs a custom Microsoft PowerPoint presentation. As shown in Figure 2, the television

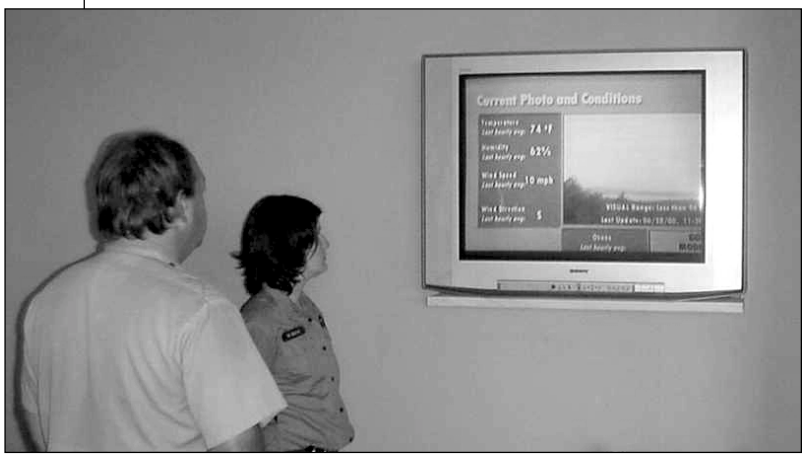



**Figure 2. Visitor center display showing the large screen television and PowerPoint presentation.**

is recessed into a wall near the front desk of the visitor center and the personal computer is located in an office about 20' away. The computer also includes a network interface card for Internet connectivity (to access the same data and images that are displayed on the CAMNET Web site) and a conversion accessory to display high quality images on the television. The large screen allows several visitors to simultaneously view the display.

Custom software that acquires the data and image from the CAMNET server was developed by Air Resource Specialists, Inc. PowerPoint software integrates the data and image into the presentation on the fly. The PowerPoint presentation was developed by Acadia staff and Air Resource Specialists, Inc., and can be modified easily on site.

Data and high-resolution images are collected from:

- An ambient nephelometer (NGN-2)
- A digital camera (Kodak DC265)
- An ozone monitor
- Meteorological sensors:
  - Air Temperature
  - Relative Humidity
  - Wind Speed
  - Wind Direction

Park staff will use a two to three minute PowerPoint program to inform visitors of the air quality issues at Acadia. The presentation consists of a series of 8 slides that cycle continuously every 3 minutes. In addition to the current visibility image and associated air monitoring data screen, other screens depict the Acadia monitoring site, information on air pollutants, the Air Quality Index and health impacts, and actions people can take to help reduce air pollution both in the park and at home (see Figures 3 - 7). The in-park message includes information on the free public transportation system at Acadia.

Each screen is displayed for approximately 20 seconds, similar to the interpretive display at Great Smoky Mountains National Park. Park staff will also incorporate additional screens or programs that highlight other resource, interpretive, or management information.

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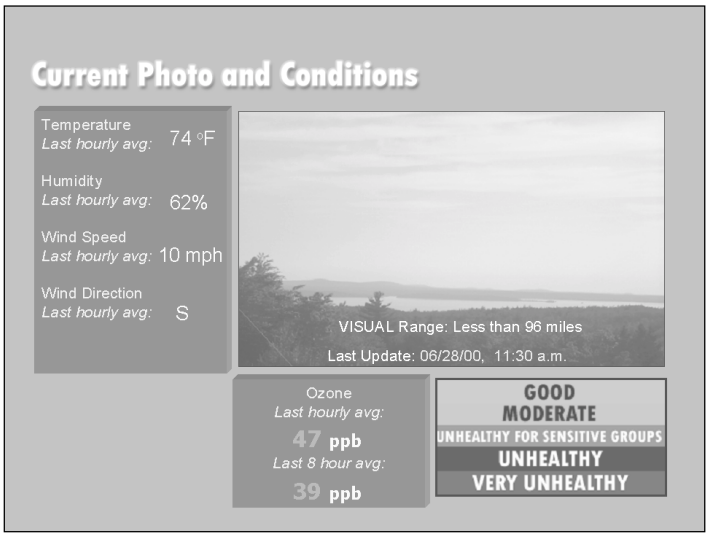
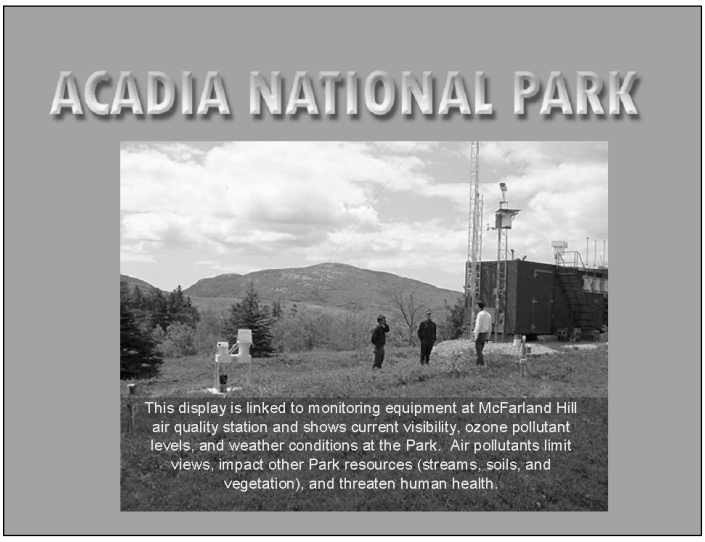
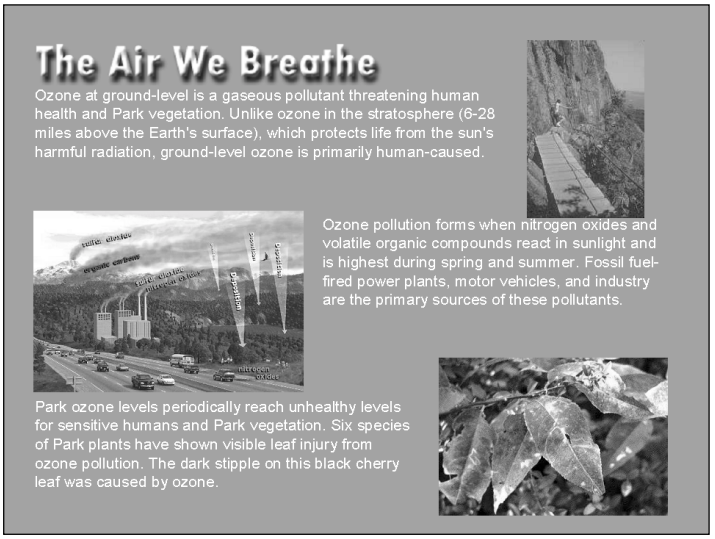
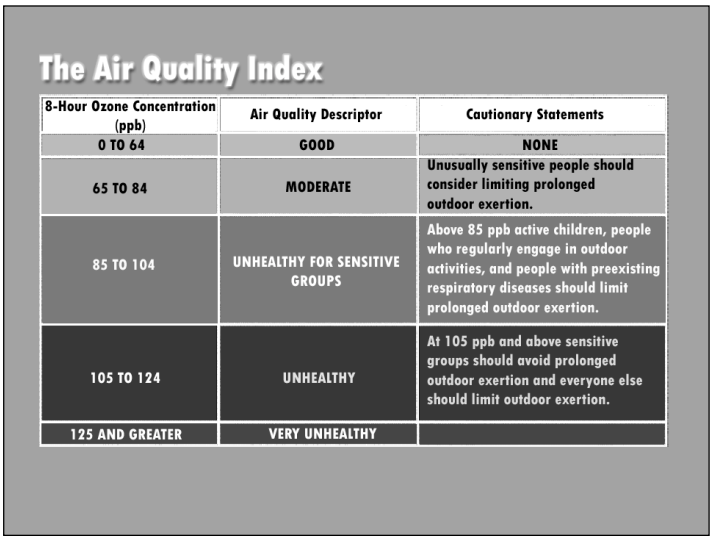
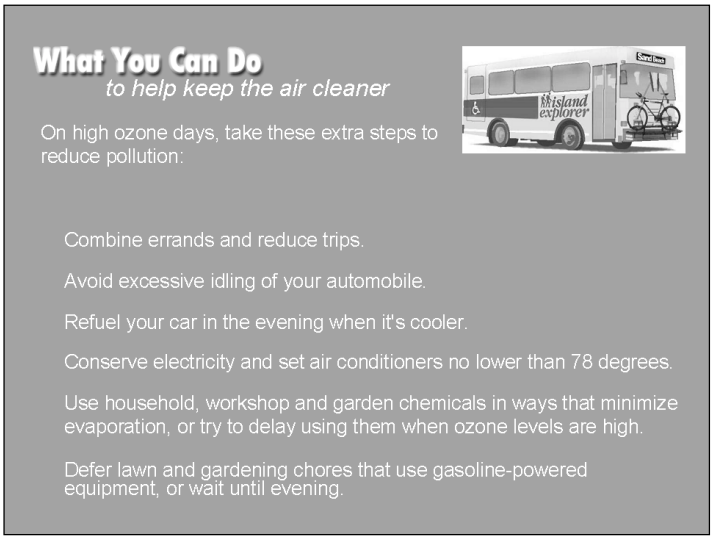
*For more information contact Bill Gawley at Acadia National Park. Telephone: 207/288-5463. Fax: 207/288-5507. E-mail: bill_gawley@nps.gov.*




**Figures 3 through 7. Sample PowerPoint presentation screens that are part of the interpretive display at the Acadia National Park visitor center. These and additional screens are cycled every 20 second through a 2 to 3 minute presentation.**

# Visibility news *continued from page 3 ....*

## Recent changes to the IMPROVE Web site

The IMPROVE Web site officially opened in January and remains a work in progress. Content continues to be added and new features incorporated, including:

- **Ad-hoc IMPROVE Database Querying Tool.**
  The IMPROVE aerosol data have been added to a relational database, and a Web-based data access tool has been created. This tool allows a user to query the database by selecting a subset of the available monitoring sites, species, and time range. In addition, the data points attributes, (e.g., error and validity flag) can be retrieved. The data and their metadata are returned either to the screen for immediate browsing or to a file to be downloaded from the FTP site.

- **Gray Literature Page.**
  A collection of analyses, reports, and presentations conducted by members of the IMPROVE Program and others. These documents contain important information concerning the monitoring, filter analysis, and data analysis that have not been formally published elsewhere.

- **QA/QC Issues Page.**
  This page documents issues and potential problems with the IMPROVE data that can impact its interpretation. When possible, recommendations are provided for minimizing the influence of these issues on data analysis. The first series of documents discuss changes in the sulfur/sulfate and nitrate sampling on long-term trends.

- **User Registration.**
  Registration capabilities for tracking user access to material that can change over time. This currently includes the IMPROVE data and standard operating procedures. Registration information will only be used to contact users if the data or information they previously downloaded have changed.

The next major additions to the Web site will include the IMPROVE photographic spectrum CDs.

*For more information or questions regarding the IMPROVE Web site, contact Bret Schichtel at CIRA. Telephone: 970/491-8581. Fax: 970/491-8598. E-mail: Schichtel@cira.colostate.edu.*

## Steering committee representative from Arizona DEQ changes

After 11 years of service at the Arizona Department of Environmental Quality, 7 of which were directly involved in urban and Class I visibility monitoring and data analysis, Tom Moore has changed jobs He is now working to develop and implement an air quality program for the City of Tempe, Arizona. Tom says the decision was difficult because of his interest in air quality and visibility, but the new job allows him to spend more time with his family and focus on air quality program management issues which are more within his control.

In regard to visibility monitoring, Tom says he felt privileged to participate on the Aerosols and Visibility Subcommittee of the Technical Committee of the Grand Canyon Visibility Transport Commission, the Ambient Monitoring and Reporting Forum of the Western Regional Air Partnership, and the IMPROVE Steering Committee. He says it has been challenging and very enjoyable to meet, know, and work with the scientists, contractors, agency program managers, and policymakers affiliated with these groups. Tom and his colleagues in the visibility community hope to continue these professional and personal relationships. He can be contacted at:

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Darcy Anderson of Arizona DEQ replaces Tom as the Arizona representative on the IMPROVE Steering Committee. She is presently working in the Air Assessment Section of Arizona DEQ, developing technical plans, and implementing programs for photochemical and visibility monitoring. Ms. Anderson has master's degrees in both meteorology and engineering, and has extensive experience in data analysis and regulatory agency activities.

*For more information contact Darcy Anderson at Arizona DEQ. Telephone: 602/207-7665. E-mail: anderson.darcy@ev.state.az.us.*

## Regional planning organizations Part 2: Midwest Regional Planning Organization

### Overview

The Midwest Regional Planning Organization (RPO) was formed in 2000 to facilitate regional planning to address the regional haze regulations adopted by the U.S. Environmental Protection Agency (EPA) in 1999. It consists of the four member states of the Lake Michigan Air Director's Consortium (LADCO) (Illinois, Indiana, Michigan, and Wisconsin) and Ohio, tribes in the five states, the U.S. National Park Service, the U.S. Fish and Wildlife Service, and the U.S. EPA. The primary objective of the Midwest RPO is to assess visibility impairment due to regional haze in the two mandatory federal Class I areas located inside the borders of the five states, and the impact of emissions from the five states on Class I areas located outside the five-state region. The two Class I areas within the region are the Seney National Wildlife Refuge and Isle Royale National Park, both in northern Michigan. In addition, several Class I areas outside the five-state region may be impacted by emissions from within the Midwest RPO region.

### Initial Assessment

In December 2000, the Midwest RPO released *Regional Haze and Visibility in the Upper Midwest*, an initial assessment of the regional haze problem. This report, newsletters, and other information are available on its Web site at http://www.ladco.org. The assessment was performed by reviewing existing reports and analyzing available air quality data.

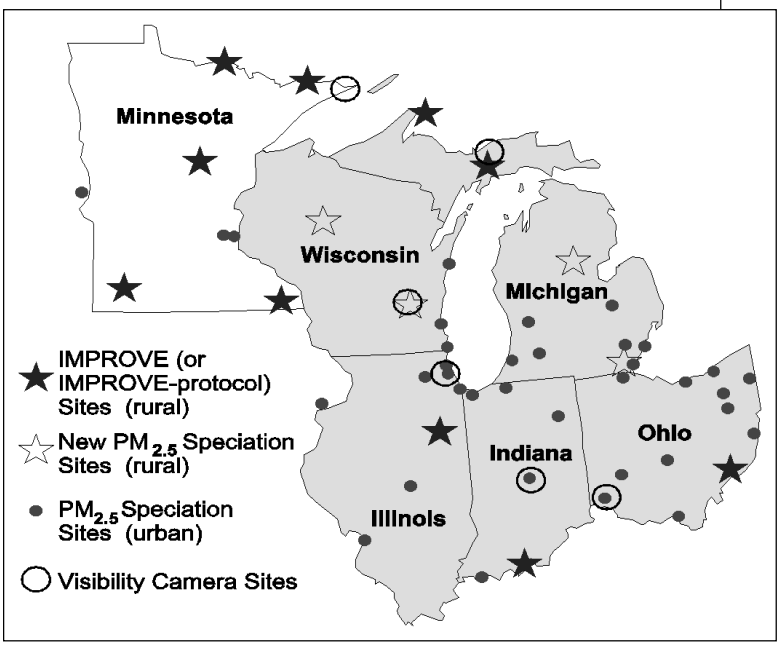


**Figure 1. Draft final visibility / $PM_{2.5}$ speciation monitoring network.**

### Key Findings

Key findings of the initial assessment are:

- Visibility impairment due to regional haze is a problem. Visibility impairment exists in the two Class I areas in the Midwest RPO region, in downwind Class I areas in the eastern U.S., and in other areas (e.g., major urban areas in the five-state region). Fine particles, which play a major role in visibility impairment, also reach unhealthy levels across a large portion of the five-state region.
- Visibility levels (and $PM_{2.5}$ concentrations) vary...
  - spatially, with best visibility and lower $PM_{2.5}$ concentrations to the north (near the Class I areas in the Midwest RPO region), and worst visibility levels and higher $PM_{2.5}$ concentrations to the south near the Ohio River Valley.
  - seasonally, with worst and best visibility days occurring throughout the year in the Class I areas in the Midwest RPO region, whereas worst visibility days tend to occur during the summer and best visibility days tend to occur during the winter elsewhere in the eastern U.S.
  - chemically, with sulfates dominating worst visibility days during the summer (and organics a distant second), and nitrates being important on worst visibility days during winter/fall.
- Visibility conditions in the upper Midwest and the eastern U.S. have generally deteriorated over the past half century, but have improved in recent years due apparently to the Title IV $SO_2$ emission reductions.
- High pollution/poor visibility days are generally associated with S-SW flow, while low pollution/good visibility days are associated with N-NW flow.

A major shortcoming of this assessment is the lack of visibility-related measurements in and near the Midwest RPO region. In view of this deficiency, the results are considered to be preliminary. Further data collection and analyses should provide a more complete and detailed understanding of the regional haze problem in the upper Midwest. To this end, a draft final visibility monitoring network for the region was developed, as shown in Figure 1.

A draft plan for technical assessment phase of the regional planning process is undergoing review. It identifies specific near-term projects and general long-term activities, which will be discussed in the RPO's next quarterly newsletter.

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*For more information, contact Michael Koerber at LADCO. Telephone: 847/296-2181. Fax: 847/296-2958. E-mail: koerber@ladco.org.*

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## IMPROVE STEERING COMMITTEE

IMPROVE Steering Committee members represent their respective agencies and meet periodically to establish and evaluate program goals and actions. IMPROVE-related questions within agencies should be directed to the agency's Steering Committee representative. Steering Committee representatives are:

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## ASSOCIATE MEMBERS

Associate Membership in the IMPROVE Steering Committee is designed to foster additional IMPROVE-comparable visibility monitoring that will aid in understanding Class I area visibility, without upsetting the balance of organizational interests obtained by the steering committee participants. Associate Member representatives are:

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Government organizations interested in becoming Associate Members may contact any Steering Committee member for information.

PUBLISHED BY:

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

The IMPROVE Newsletter is published four times a year (April, July, October, & January) under National Park Service Contract CX-1270-96-006.

The IMPROVE Program was designed in response to the visibility provisions of the Clean Air Act of 1977, which affords visibility protection to 156 federal Class I areas. The program objectives are to provide data needed to: assess the impacts of new emission sources, identify existing human-made visibility impairments, and assess progress toward the national visibility goals as established by Congress.

To submit an article, to receive the IMPROVE Newsletter, or for address corrections, contact:

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