INTERAGENCY MONITORING OF PROTECTED VISUAL ENVIRONMENTS

IMPROVE

3rd Quarter 2008 | The IMPROVE Newsletter | Volume 17 / Number 3

Monitoring update

Feature Article: Urban visibility and a more stringent standard, Page 4

Network operation status

The IMPROVE (**I**nteragency **M**onitoring of **Pro**tected **V**isual **E**nvironments) Program consists of 110 aerosol visibility monitoring sites selected to provide regionally representative coverage and data for 155 Class I federally protected areas. Additional instrumentation that operates according to IMPROVE protocols in support of the program includes:

- 58 aerosol samplers
- 34 nephelometers
- 4 transmissometers
- 4 digital camera systems
- 58 Webcamera systems
- 5 interpretive displays

IMPROVE Program participants are listed on page 8. Federal land management agencies, states, tribes, regional air partnerships, and other agencies operate supporting instrumentation at monitoring sites as presented in the map below. Preliminary data collection statistics for the 3rd Quarter 2008 (July, August, and September) are:

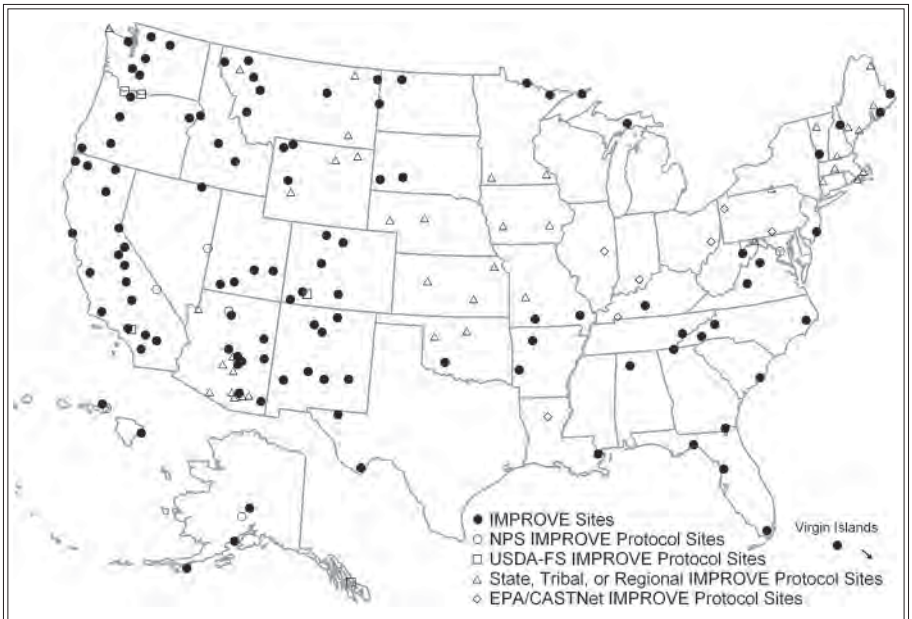
- Aerosol (channel A only) 94% collection
- Aerosol (all modules) 92% completeness
- Optical (nephelometer) 96% collection
- Optical (transmissometer) 95% collection
- Scene (photographic) (does not include Webcameras) 99% collection

The Omaha IMPROVE Protocol site (OMAH1) sponsored by the Omaha Tribe, ended operations in July due to a withdrawal of funding support. The site collected data since August 2003.

Data availability status

Data are available on the IMPROVE Web site at *http://vista.cira.colostate.edu/improve/Data/data.htm* and on the VIEWS Web site at *http://vista.cira.colostate.edu/views*. Aerosol data are available through December 2006. Nephelometer and transmissometer data are available through March 2008 and December 2007 respectively.

Photographic slide spectrums are available on the IMPROVE Web site under *Data*. Real-time Webcamera displays are available on agency-supported Web sites:



IMPROVE and IMPROVE Protocol Sites
3rd Quarter 2008

- National Park Service *http://www.nature.nps.gov/air/WebCams/index.htm*
- USDA-Forest Service *http://www.fsvisimages.com*
- CAMNET (Northeast Camera Network) *http://www.hazecam.net*
- Midwest Haze Camera Network *http://www.mwhazecam.net*
- Wyoming Visibility Network *http://www.wyvisnet.com*
- Phoenix, AZ, Visibility Network *http://www.phoenixvis.net*

The EPA AIRNow Web site *http://airnow.gov* includes many of these as well as additional visibility-related Webcameras. Click on View Other Visibility Webcams.

***Monitoring update** continued on page 3....*

Visibility news

National Park Service and Olympus partner for air quality Webcamera network

The National Park Service (NPS) Air Resources Division in Denver, CO, maintains a digital air quality Webcamera network that provides real-time photographic images and information about current air quality and weather conditions at the following National Park Service areas:

- Acadia National Park, ME
- Big Bend National Park, TX
- Denali National Park, AK
- Grand Canyon National Park, AZ
- Great Smoky Mountains National Park, TN & NC
- Joshua Tree National Park, CA
- Mammoth Cave National Park, KY
- Mount Rainier National Park, WA
- National Capital Mall, Washington, DC
- North Cascades National Park, WA
- Point Reyes National Seashore, CA
- Olympic National Park, WA
- Sequoia National Park, CA
- Theodore Roosevelt National Park, ND
- Yosemite National Park, CA

The air quality Webcamera network is extremely popular with the public. Digital images with current visibility conditions and air quality information are posted on the NPS Web site at *http://www.nature.nps.gov/air/WebCams/index.cfm*. More than one million visitors access the NPS Air Resources Web pages each week – and the vast majority visit the Webcamera pages, often as their first stop. As a result, these Web pages are a powerful draw for virtual visitors to access other information about air quality issues in parks.

In spite of the popularity and educational value of the air quality Webcamera network, the cost of maintaining it is increasing. To help offset these increasing costs and decreasing budget, the NPS has established a three-year partnership with Olympus America, Inc. camera manufacturers to fund technical support and equipment upgrades for the network.

The first year of the partnership include funding to operate the network and upgrade hardware, software, and related supporting communications systems at four of the Webcamera sites. Funding will include the remaining 12 sites at a later date.

The first-year upgrades will include replacing existing cameras with Olympus E-420 digital SLR (single lens reflex) cameras, replacing selected computers, replacing or relocating critical component enclosure parts, replacing existing camera cables where needed, upgrading custom camera software, upgrading selected Internet communications systems, and upgrading FTP server software. All of these services will continue to be performed by Air Resource Specialists, Inc. (ARS) through a contract with the NPS.

For more information contact Dee Morse at the National Park Service. Telephone: 303/969-2817. Fax: 303/969-2822. E-mail: dee_morse@nps.gov.

2009 IMPROVE calendars available

The 2009 IMPROVE calendars are in production and are expected to be delivered to all site operators and others by late-December.

This year's calendar again explains sampler operation and provides operator troubleshooting procedures as a reminder to seasoned operators and good information for new operators. Other topics of interest are also included as well as the popular monthly feature highlighting a site operator from the IMPROVE or IMPROVE Protocol networks.

These popular calendars display sampling days and days when cartridge changes are due. Helpful hints also inform operators to check for any seasonal problems or issues that may occur.

If you received a calendar last year you are on our list to receive one again this year. If you don't receive a calendar by January contact us and we'll send one out to you.

To request a calendar, contact Jeff Lemke at CIRA. Telephone: 970/491-2209. E-mail: lemke@cira.colostate.edu.

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IMPROVE Newsletters are also available on the IMPROVE Web site at *http://vista.cira.colostate.edu/improve/Publications/news_letters.htm.*

IMPROVE Program budget for FY2009

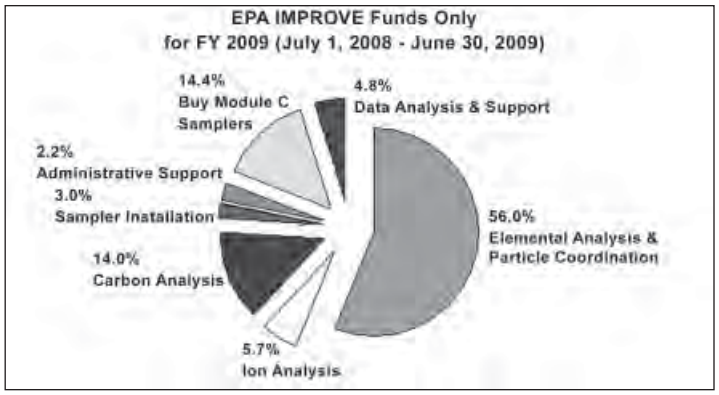
The IMPROVE aerosol monitoring program (168 full-year monitoring sites) is funded primarily by the Environmental Protection Agency (EPA). Federal Land Managers including the National Park Service and USDA-Forest Service, also contribute to the operation of the program.

The IMPROVE Fiscal Year 2009 budget (July 1, 2008 through June 30, 2009) is $8.7 million, with $6.7 million of this total coming from the EPA. A breakdown of operational categories for the EPA portion of the funding is provided in the chart to the right.

Operational categories include analysis of the samples, technical support and maintenance, purchase of additional equipment (as needed), special research studies, and administrative support of the program.

Site operator salaries, optical and scene monitoring equipment, and Webcameras are funded separately from the IMPROVE aerosol monitoring program.

For more information contact David Maxwell at the National Park Service Air Resources Division. Telephone: 303/969-2810. Fax: 303/969-2822. E-mail: david_maxwell@nps.gov.



Visibility news continued on page 6....

Monitoring update *continued from page 1 ....*

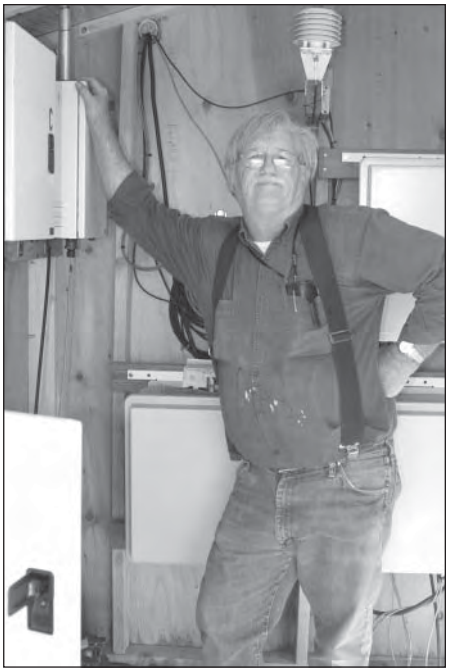
Operators of distinction

If you ever need something fixed, IMPROVE site operator Elmer Alston is your man. Elmer looks after the Ike's Backbone monitoring site in central Arizona. He works full-time for Arizona Public Service as an electrician/communications technician, so maintaining the aerosol sampler on the side comes with little effort for him.

The Ike's Backbone IMPROVE site is sponsored by the USDA-Forest Service, as it represents both the Mazatzal and Pine Mountain Wildernesses. The Arizona Department of Environmental Quality supplements aerosol data at Ike's Backbone with an ambient nephelometer. Elmer visits the aerosol shelter weekly, twice weekly if necessary, for routine maintenance and filter changing. As keeper of the station, he ensures it runs continually, 24/7. His dedication is reflected in the collection statistics for the site -- it consistently achieves 100% collection quarter after quarter.

Elmer services and maintains the high-voltage lines and equipment for Public Service, as well as a variety of communications equipment. He also has plenty of experience as a machinist, so if something is off-kilter with the aerosol sampler he can quickly identify and correct it. "Once, I could hear the sampler pump had changed pitch. I knew the bearings were going bad, so I changed them before the pump actually failed, preventing downtime and data loss," said Elmer. He is a lifelong resident of Arizona and understands the importance of this air quality station, so having the station operate continually without problems results in a more complete database for researchers to study. He showed equal enthusiasm with his prior experience maintaining 12 sulfur dioxide monitoring sites near Tucson.

Visiting the Ike's Backbone site "requires 4-wheel drive and can be a monster to get to, with mud, snow, and the like," said Elmer. "Driving two miles takes 20 minutes each way, but it is an excellent location for an air quality monitoring site with breathtaking, expansive views in all four directions."



Elmer lives with wife Tana and has a small machine shop at his residence. He tinkers with tube-type amplifiers and other such electric/electronic instrumentation in his spare time.

IMPROVE site operator Elmer Alston, a life-long Arizonan, takes his work seriously and can fix anything from a high-voltage power line to an IMPROVE sampler pump.

Monitoring update continued on page 7....

Feature article

Is urban visibility important enough to justify a more stringent secondary particulate matter standard? (by M. Pitchford, National Oceanic and Atmospheric Administration)

Introduction

The U.S. Environmental Protection Agency (EPA) is required by the Clean Air Act to periodically review, and if warranted, revise the primary (health-based) and secondary (welfare-based) National Ambient Air Quality Standards (NAAQS). The Particulate Matter (PM) NAAQS has been reviewed and revised three times since it was originally established in 1971. Except for the original version, the level of the secondary PM standard has been set at the same concentration as for the primary standard (see Table 1), implying that the level of protection for health effects provides adequate protection of the welfare effects of PM.

In the 1977 amendments to the Clean Air Act, Congress recognized the need to afford greater protection of the welfare effects of air pollution, specifically the effects of visibility impairment in certain areas including national parks and wilderness areas that were designated Class I. In part, this was justified by the high value the public places on visibility in these remote scenic areas. As part of the next revision of the PM NAAQS, EPA wants to better understand the public's preferences for, and value of, visibility improvement in urban areas. Such information would help provide information to make a decision regarding the need for a separate and distinct secondary standard based on urban visibility protection.

Previous urban visibility studies

During the previous PM NAAQS review, EPA staff proposed consideration of a more stringent short-term fine particle ($PM_{2.5}$) secondary standard to provide protection from visibility impairment ,principally in urban areas. Results of studies to determine publicly acceptable visibility levels were cited as evidence of the public's desire for urban visibility at levels below those corresponding to the primary PM standard. The studies were conducted in Phoenix, AZ; Denver, CO; two cities in British Columbia, Canada; as well as a small pilot study in Washington, D.C. These urban visibility studies examined individuals' visibility preference by investigating the basic question, "What level of visibility degradation is unacceptable?" Though they had some design similarities, each of the three urban visibility preference studies were conducted independently to gather information to help local officials develop local visibility policy. One notable finding of the three visibility preference studies and the one pilot study is the general degree of consistency in the median preferences for an acceptable level of visibility degradation. The range of median acceptable preference levels from the four studies is 19 to 25 deciviews (DV). Deciviews is the preferred measure of visibility impairment.

Table 1. History of the PM National Ambient Air Quality Standard.

Final Rule	Indicator	Ave. Time	Level	Form
1971	TSP - Total Suspended Particles	24-hour	260 µg/m^3 (primary) 150 µg/m^3 (secondary)	Not to be exceeded more than once per year
		Annual	75 µg/m^3 (primary)	Annual average
1987	PM_{10}	24-hour	150 µg/m^3 *	Not to be exceeded more than once per year
		Annual	50 µg/m^3	Annual average
1997	$PM_{2.5}$	24-hour	65 µg/m^3	98th percentile
		Annual	15 µg/m^3	Annual arithmetic mean, average over 3 years
	PM_{10}	24-hour	150 µg/m^3	Initially promulgated 99th percentile form; when 1997 standards were vacated, form of 1987 standards remained in place (not to be exceeded more than once per year on average over a 3-year period)
		Annual	50 µg/m^3	Annual arithmetic mean, average over 3 years
2006	$PM_{2.5}$	24-hour	35 µg/m^3	98th percentile, average over 3 years
		Annual	15 µg/m^3	Annual arithmetic mean, average over 3 years
	PM_{10}	24-hour	150 µg/m^3	Not to be exceeded more than once per year on average over a 3-year period

* When not specified, primary and secondary standards are identical.

The three urban visibility preference studies were done in western urban areas using images with various levels of haze superimposed on local urban scenes that included distant mountains in the background. While appropriate for the West, this was seen as a serious limitation since urban areas in other regions of the U.S. don't generally include distant mountains. Without a distant scenic element, perceived visibility changes may be less sensitive to PM changes and/or the public's value of urban visibility may be different. Such concerns ultimately prompted EPA to set the secondary standard to the same level as the primary standard for the 2006 PM NAAQS revisions.

Another type of study (i.e., urban visibility valuation), was not conducted as part of the three urban studies cited by EPA. Since the mid-1990s, little new information has become available regarding urban visibility valuation. In this next PM NAAQS review, EPA may wish to know "How much would the public be willing to pay to improve urban visibility?"

Urban visibility workshop

EPA recently began the next PM NAAQS review, which is scheduled to be completed by 2012. It is interested in generating the information missing in the last review with respect to the public's preferences and value of urban visibility. As a first step in obtaining this new information, EPA sponsored a workshop with experts in all phases of visibility preference and valuation investigations, conducted at the National Park Service Air Resources Division offices in Lakewood, CO, from October 6 through October 8, 2008.

The purpose of the urban visibility workshop was to identify and discuss methods and materials that could be used in "next step" projects to develop additional information about people's preferences for reducing existing impairment of urban visibility, and about the value of improving urban visibility. Similar to the limited existing research on urban visibility preferences, the potential new projects would likely involve focus groups and survey methods to elicit information from individuals about their preferences and values. The workshop explored a set of eight specific issues (introduced in a white paper distributed prior to the workshop) about topics that could be considered in designing additional projects to better understand urban visibility preferences and valuation.

Prior to the workshop, the participants were also provided a background paper reviewing previous urban visibility valuation and preference studies. A summary of the workshop including the white paper, literature review, and a list of participants is available on the gray literature page of the IMPROVE Web site at *http://vista.cira.colostate.edu/improve/Publications/GrayLit/gray_literature.htm.*

One of the topics discussed at the workshop concerned selection of scenes to display various urban visibility levels. Urban scenes like the Arch in St. Louis or the Washington Monument might elicit different haze level preferences by residents of those urban areas than those rated by residents of other urban areas. However, the use of such "iconic scenes" specific to each surveyed urban area runs the risk of having scenes of differing haze sensitivity to changes in PM. Alternately, the use of a single "generic" urban scene, such as an urban park, might be sufficiently familiar to residents of most urban areas. An urban park may evoke a sense of home town recognition, yet have identical sensitivity to changes in PM for studies anywhere in the country. Workshop participants recommended testing the use sensitive iconic and generic scenes in focus studies.

Sky color becomes more milky near the horizon and clouds lose detail and can disappear with increases in PM levels. Sky color and cloud appearance may be the most sensitive indicators of haze levels in urban areas without distant scenic elements (e.g., mountains). The WinHaze system that superimposes any level of haze on scenic photographs has been the standard approach to display visibility conditions used in most of the recent haze preference and valuation studies. EPA is sponsoring modifications to WinHaze to improve its ability to accurately display sky color and to deal with the changing appearance of clouds for various haze levels.

Next steps

Using input from the urban visibility workshop, EPA will develop and consider funding a plan to conduct studies needed to better understand the preferences and value of urban visibility. For application to the current review of the PM NAAQS, study results will be needed by Spring 2010. While this schedule doesn't allow much time to develop new information for the current review, another PM NAAQS review cycle starts in 2012.

For more information contact Marc Pitchford at the National Oceanic and Atmospheric Administration. Telephone: 702/862-5432. Fax: 702/862-5507. E-mail: marc.pitchford@noaa.gov.

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

Data advisories released

Scientists have posted two data advisories to the IMPROVE Web site this quarter:

Mis-reporting of light-absorption on masked filters

- Affects: Module A - f_{abs}
- Period: 2005-2006

The 22 sites listed below operated throughout 2005-2006 with masks that reduced the effective diameter of Module A filters from 3.53 cm^2 to 2.20 cm^2. Reported light-absorption coefficients for 2005-2006 incorrectly overlooked the reduced deposit area of these samples, and were thus high by the factor (3.53 cm^2)/(2.20 cm^2) = 1.6. It is recommended that the 2005-2006 values be multiplied by (2.20 cm^2)/(3.53 cm^2) at these sites:

BRID1	MEVE1	PETE1	TUXE1	WHPA1
DENA1	MORA1	SIME1	VIIS1	WHPE1
HALE1	NOAB1	SNPA1	WEMI1	WHRI1
HANC1	NOCA1	TRCR1	WHIT1	ZICA1
HAVO1	OLYM1			

Invalid data for collocated (POC = 2) samples

- Affects: Module A - H, Na, Mg, Al, Si, P, S, Cl, K, Ca, Ti, V, Cr, Mn, Fe
- Period: January - July 2005

Seventy-one collocated filter samples from six sites (MEVE1, OLYM1, PMRF1, SAFO1, SAMA1, and TRCR1) collected from January through July 2005 were set aside in early 2006 for recurring reanalyses as part of the XRF quality assurance program. The samples were removed from the normal analysis queue after analysis for Ni, Cu, Zn, As, Se, Br, Rb, Sr, Zr, and Pb on the molybdenum-anode XRF system, but before analysis for H on the cyclotron and Na-Fe on the copper-anode XRF system. Faulty internal sample tracking led to reporting of zero or near-zero values for the light elements from analyses that were not actually performed on several samples (as listed on the IMPROVE Web site under this advisory). Scientists recommend data users treat light-element data from these specific samples as "missing."

Complete discussions of this and all other data advisories can be found on the IMPROVE Web site at *http://vista.cira.colostate.edu/improve/Data/QA_QC/Advisory.htm.*

For more information or to submit an advisory, contact Bret Schichtel at CIRA. Telephone: 970/491-8581. Fax: 970/491-8598. E-mail: schichtel@cira.colostate.edu.

CSN carbon sampling update

The Environmental Protection Agency's (EPA's) Chemical Speciation Network (CSN) and supplemental sites began modifying their carbon sampling methods and changing to a new system to be more comparable with the IMPROVE network's methods in early 2007 (see The IMPROVE Newsletter, 2nd Qtr 2006). The new carbon sampling instrument, the URG-3000N manufactured by URG in North Carolina, is based on the IMPROVE Version II sampler C-module.

The first phase of the conversion effort included 55 sites and was completed in Spring 2007. Phase II is now beginning, which is expected to include 62 sites and occur during early 2009. The third and final phase of the conversion effort of carbon samplers for the network will include up to 90 remaining sites and occur soon after Phase II is complete.

EPA's Chemical Speciation Network consists of nearly 200 carbon monitoring sites. Open circles on the map depict the location of these sites. Black circles are the monitoring locations that received the new URG-3000N carbon sampler during Phase I of the conversion effort.

Air Resource Specialists, Inc. (ARS) is performing the sampler installations, calibrations, and operator training. Field specialists will travel to regional areas and install several new samplers during each trip. This cost-effective, systematic method of instrument installation allows the CSN to convert its entire network in only three phases.

For more information contact Mark Tigges at Air Resource Specialists, Inc. Telephone: 970/484-7941. Fax: 970/484-3423. E-mail: mtigges@air-resource.com.

Monitoring update *continued from page 3 ....*

Outstanding sites

Data collection begins with those who operate, service, and maintain monitoring instrumentation. IMPROVE managers and contractors thank all site operators for their efforts in caring for IMPROVE and IMPROVE Protocol networks. Sites that achieved 100% data collection for 3rd Quarter 2008 are:

Aerosol (Channel A)

Acadia	Great Sand Dunes	San Gabriel
Agua Tibia	Great Smoky Mtns	San Gorgonio
Badlands	Guadalupe Mountains	San Pedro Parks
Blue Mounds	Haleakala	San Rafael
Bondville	Haleakala Crater	Seney
Boundary Waters	Hoover	Sequoia
Cabinet Mountains	Ike's Backbone	Shamrock Mines
Cape Romain	Lake Sugema	Shenandoah
Casco Bay	Lava Beds	Shining Rock
Cedar Bluff	Makah	Snoqualmie Pass
Cherokee	Medicine Lake	Starkey
Chiricahua	Mesa Verde	Sula
Columbia Gorge East	MK Goddard	Tallgrass
Crescent Lake	Mohawk Mountain	Theodore Roosevelt
Death Valley	Mount Hood	Trapper Creek-Denali
Denali	Mount Rainier	Viking Lake
Dolly Sods	Mount Zirkel	Washington DC
Egbert	Nebraska	Weminuche
El Dorado Springs	Pinnacles	White Pass
Fresno	Presque Isle	Wichita Mountain
Frostburg Reservoir	Proctor Research Ctr	Wind Cave
Glacier	Puget Sound	Yellowstone
Great Basin	Redwood	Zion Canyon
Great Gulf	Salt Creek	

Nephelometer

Glacier	Ike's Backbone	Petrified Forest
Great Basin	Mount Rainier	Rocky Mountain
Greer	Organ Pipe	Sierra Ancha

Transmissometer

-- none --

Photographic

Shamrock Mines

Monitoring Site Assistance:

Aerosol sites: contact University of California-Davis telephone: 530/752-7119 (Pacific time)

Optical/Scene sites: contact Air Resource Specialists, Inc. telephone: 970/484-7941 (Mountain time)

Sites that achieved at least 95% data collection for 3rd Quarter 2008 are:

Aerosol (Channel A)

Addison Pinnacle	Livonia	Penobscot
Bridgton	Lye Brook	Petersburg
Douglas	Martha's Vineyard	Quaker City
Ellis	Mingo	Queen Valley
Grand Canyon	Moosehorn	St. Marks
Hawaii Volcanoes	Mount Baldy	Tonto
Hells Canyon	Okefenokee	Tuxedni
Indian Gardens	Olympic	Upper Buffalo
Lassen Volcanic	Pack Monadnock	White Mountain

Nephelometer

Acadia	Hance	Shenandoah
Big Bend	Indian Gardens	Sycamore Canyon
Craycroft	Mammoth Cave	Tucson
Chiricahua	Mount Zirkel	Tucson Mountain
Dysart	Phoenix	Vehicle Emissions
Estrella		

Transmissometer

Bridger
Cloud Peak
San Gorgonio

Photographic

Agua Tibia
Gates of the Mountains
Monture

Sites that achieved at least 90% data collection for 3rd Quarter 2008 are:

Aerosol (Channel A)

Big Bend	Jarbidge	Point Reyes
Birmingham	Joshua Tree	Quabbin Reservoir
Bliss	Kaiser	Rocky Mountain
Brigantine	Kalmiopsis	Sac and Fox
Caney Creek	Linville Gorge	Saguaro
Cape Cod	Mammoth Cave	Sikes
Columbia Gorge West	Monture	Sipsey
Flathead	New York	Sycamore Canyon
Fort Peck	North Cascades	Three Sisters
Great River Bluffs	Northern Cheyenne	Trinity
Hercules-Glades	Organ Pipe	UL Bend
Isle Royale	Petrified Forest	Virgin Islands
James River	Phoenix	

Nephelometer

Cape Romain	Great Smoky Mountains	Queen Valley
Cloud Peak		

Transmissometer

-- none --

Photographic

-- none --

IMPROVE

The IMPROVE Newsletter

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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.

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* Steering Committee chair

ASSOCIATE MEMBERS
Associate Membership in the IMPROVE Steering Committee is designed to foster additional comparable 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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