INTERAGENCY MONITORING OF PROTECTED VISUAL ENVIRONMENTS

IMPROVE

4th Quarter 2012 | The IMPROVE Newsletter | Volume 21 / Number 4

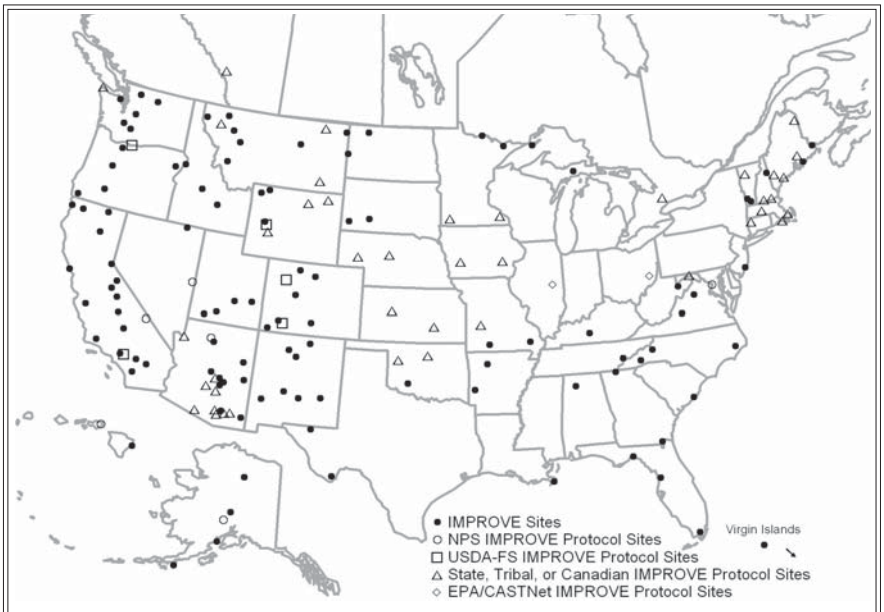
Monitoring update

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. Instrumentation that operates according to IMPROVE protocols in support of the program includes 52 additional aerosol samplers, and optical instrumentation (nephelometers and transmissometers), scene instrumentation (Webcamera systems), and interpretive displays. During 4th Quarter 2012, two collocated sites, LYBR1 and WRIG1, were decomissioned.

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 4th Quarter 2012 (October, November, and December) are:

- Aerosol (channel A only) 94% collection
- Aerosol (all modules) 93% completeness
- Optical (nephelometer) 98% collection



IMPROVE and IMPROVE Protocol Sites
4th Quarter 2012

Feature Article: Deterministic and Empirical Assessment of Fire's Contribution to Ozone and Particulate Matter , Page 4

ATTENTION OPERATORS

Beginning Fall 2012, UC-Davis directed all sites to begin sampling on Local Standard Time. In March 2013, when Daylight Saving Time begins in most areas of the country, UCD will remind operators to NOT change sampler programming to Daylight Saving Time, but to remain on Standard Time.

Data availability status

Aerosol data are available through December 2011. Nephelometer and transmissometer data are available through September 2012 and December 2011, respectively.

Data and photographic spectrums are available on the:

- IMPROVE Web site
  http://vista.cira.colostate.edu/improve/Data/data.htm
- VIEWS Web site
  http://vista.cira.colostate.edu/views
- Federal Environmental Database (FED)
  http://views.cira.colostate.edu/fed/

Webcamera real-time images and associated air quality data are available on agency-supported Web sites:

- National Park Service
  http://www.nature.nps.gov/air/WebCams/
- U.S. 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 Visibility Network
  http://www.phoenixvis.net

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

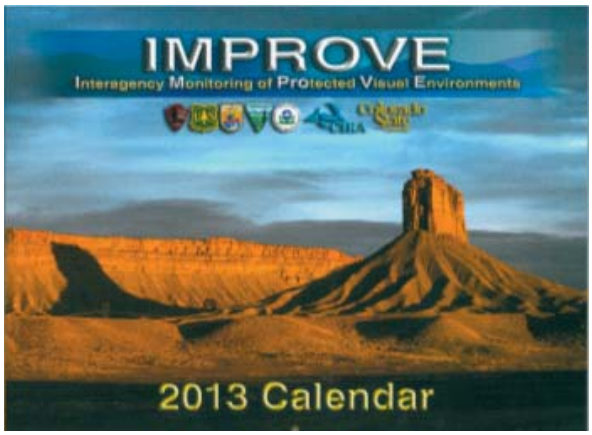
Visibility news

Weigh in on the future of IMPROVE calendars

The 2013 IMPROVE calendars have been distributed again this year. These calendars were originally published in 2003 as a scheduling tool for IMPROVE operators to help with the filter change protocols. But over the years, they have become popular with state, local, and federal managers because of the interesting and educational content and eye catching visuals.

Feature articles in this year's calendar include a description of the catastrophic events that have affected monitoring sites, including fires, lightning, and hurricanes; some helpful information regarding sampler maintenance and troubleshooting; fire and ozone impacts; and data trends. The calendar also again includes short biographies of several of our site operators, their sites, their work, and their special interests.

CIRA staff, who produce each year's calendar, are appreciative to those who contribute technical or research articles, and of course, the site operators who took time out of their busy schedules to send their site descriptions, photos, biographies, and insights.



Cover of the 2013 IMPROVE Calendar; photo by Jeff Lemke, CIRA staff member.

For future calendars and in light of potential budget cuts, CIRA staff are looking for input on whether the calendar meets your expectations and needs. Enclosed with calendars this year was a survey intended to help assess the future of these calendars.

Survey questions included:

1) How do you use the calendar now?

2) Should there be a change in format, e.g. size, digital, etc.?
   - Are operator profiles useful? (Traditionally, it has been difficult to obtain profiles.)
   - Are science related articles too complex for a general audience?

3) Any other thoughts?

If you have any suggestions or feedback regarding the calendars or would like to submit an article or site operator profile for the 2014 calendar, your input is encouraged and appreciated.

For more information contact Julie Winchester, Senior Editor for the IMPROVE calendars, CIRA. Telephone: 970.491.8443. E-mail: Julie.Winchester@colostate.edu.

PDF versions of IMPROVE calendars are also available online at http://vista.cira.colostate.edu/improve/publications/calendars.htm

Sampling protocol changes for quartz field blanks

Effective in 2013, UC-Davis IMPROVE staff has changed the sampling protocol for quartz field blanks. Previously, two back-to-back (double) quartz filters were installed in a sample cartridge. The new protocol has only one quartz filter blank installed in the sample cartridge. The sampling schedule and IMPROVE sites which have quartz field blanks has not changed. A single quartz field blank mimics the single quartz filters used in sampling at all except the 13 sites which have back-up filters for artifact correction. Single blank quartz filters collect about 40% more total organic carbon (TOC) than either the front or back double quartz filter, thus a single quartz field blank is more representative of network samples. The new protocol will also decrease analytical costs because only one blank will be analyzed instead of two.

For more information contact Ann Dillner at the University of California-Davis. Telephone: 530-792-0509. E-mail: amdillner@ucdavis.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.*

Steering Committee Meeting 2012

Last October, the IMPROVE steering committee and program contractors met in Lake Tahoe, NV, to discuss the program's status, current and future operations, and research activities. The annual meeting was attended by nearly 35 staff from various agencies involved with the IMPROVE program. Items presented and discussed included:

- Network operational status
- Field audit program
- Carbon and ion laboratory analyses
- Interlaboratory comparisons
- Operational changes and challenges
- New data processing approaches
- Carbon Artifact Committee findings
- Multiwavelength HIPS analysis
- Trends analyses
- Budget analysis and discussion
- The future of monitoring

Updates from UC-Davis, the operational contractor for the aerosol sampler network, included information regarding many new upgrades over the past year. Future upgrades include developing and upgrading laboratory and data management software, upgrading laboratory equipment, further development of the filter barcode system, and developing a new electronic controller for the aerosol sampler. In addition, UC-Davis technicians are evaluating safety concerns at a few sites where access is difficult, and are developing solutions for these concerns.

At the conclusion of the meeting, attendees toured the carbon analysis laboratory at the Desert Research Institute, in Reno.

Judy Chow gives a tour of the DRI Labs.

Meeting minutes and presentations from this and all past meetings can be found on the IMPROVE Web site at http://vista.cira.improve/Activities/activities.htm.

ADEQ Webcamera upgrades

The Arizona Department of Environmental Quality (ADEQ) visibility Webcamera network has been recording scenic vistas in the Phoenix, Arizona region for nearly ten years, and recently the network has seen some upgrades. The standard point and shoot digital cameras have been replaced with higher quality digital single lens reflex (SLR) cameras, which provide much higher resolution. The higher resolution pictures allow the image content to be used more creatively, including cropping foreground while capturing a wide image. The ADEQ Web site (*www.phoenixvis.net)* has also been updated to better present images, which are cropped to best represent the scenic vista they are documenting. Images on the Web site are updated every 15 minutes, and archived for future use in investigating and documenting events that affect visibility impairment in the region.

For more information contact Scott Cismoski at Air Resource Specialists. Telephone: 970-484-7941. E-mail: scismoski@air-resources.com

New digital SLR Image for White Tank Mountains, which lie to the west of metropolitan Phoenix. The camera view looks west from Avondale.

Visibility news continued on page 8....

Feature article

Deterministic and empirical assessment of fire's contribution to ozone and particulate matter

(by T. Moore, Western Governors' Association – Air Quality Program Manager, CIRA, Fort Collins, CO)

Fire emissions in the form of smoke, volatile organic hydrocarbons (VOCs) and nitrogen oxides (NO_X) can contribute to ambient ozone (O_3) and particulate matter (PM) concentrations. Based on the research literature predicting a longer fire season, increased fire severity, and a larger number of wildland fires in the future, Federal Land Managers (FLMs) will have an ever-growing stake in how fire emissions are addressed in air quality planning efforts.

The Deterministic and Empirical Assessment of Smoke's Contribution to Ozone ($DEASCO_3$) and Particulate Matter Deterministic and Empirical Tagging and Assessment of Impacts on Levels (PMDETAIL) projects are new studies funded by the Joint Fire Sciences Program (JFSP) to produce analytical results and a dynamic and accessible technical tool that enables Federal Land Managers (FLMs) to participate more fully in ozone and PM air quality planning efforts.

These separate projects, each leveraged against the other, will turn complex technical analyses of a series of well-chosen historic events (Case Studies) into accessible and instructive tables, charts, and maps that describe how and to what extent fires contribute to ambient ozone and PM concentrations.

Table 1 outlines the technical and policy hypotheses association with these two projects. Each effort will consist of about 20 Case Studies, which will be developed to characterize the relationship of emissions from fire to ozone and PM concentrations across a broad range of circumstances including geographic locations, fuel conditions, time of year, fire types, and contributions to elevated background levels and levels in excess of various existing and potential Ozone and PM National Ambient Air Quality Standards (NAAQS). The suites of Case Studies will be designed to characterize situations analogous to those that FLMs may face with current conditions and in the future. The projects will also develop and publish new fire emissions inventories and computational modules for chemical transport models to simulate the atmospheric transformations of these emissions.

Table 1. Technical and Policy hypotheses associated with $DEASCO_3$ and PMDETAIL projects.

$DEASCO_3$ Hypotheses	
Technical	Policy
• Smoke from fire contributes to background concentrations of O_3 in large areas of the U.S. • Fire/smoke management can affect formation of O_3. • Fire(s) cause/contribute to O_3 exceedances.	• Better quantitation information will help FLMs to assess the use of smoke management techniques to address nonattainment issues. • The rank order(s) in the online tool will help FLMs to be more effective in the air quality planning process.
PMDETAIL Hypotheses	
Technical	Policy
• Accounting for gas-particle partitioning of primary organic aerosol will reduce the contribution of primary PM emissions from fires and will reduce the predicted near fire (within 25 km) PM levels. • The major contribution of fires to ambient PM will be secondary organic aerosol. • Oxidation of levoglucosan creates biases greater than a factor of 2 in existing chemical receptor model estimates of the contribution of fires to ambient PM levels. • The updated regulatory and research CTMs (CAMx and PMCAMx) treating the fire PM emissions as semivolatile and reactive can simulate accurately the fire impacts on regional PM levels.	• Improved quantitative information about fire emissions' contribution to PM levels will allow fire managers to demonstrate the change in air quality resulting from smoke management programs (e.g., individual fire management methods, cumulative fires, emissions reduction techniques), and more effectively participate in air quality planning efforts to address PM nonattainment areas. • Improved quantitative information will increase FLMs' understanding of spatial and temporal variation in fire emissions' contribution to elevated PM and accommodate more effective and timely involvement of FLMs in air quality planning processes.

Figure 1 presents an example of modeling results based on the WRAP Regional Modeling Center platform, for fires that burned in northern California and Southern Oregon in July and August, 2002. The figure shows modeled O_3 levels on the order of 135 ppb on August 1, 2002, with an

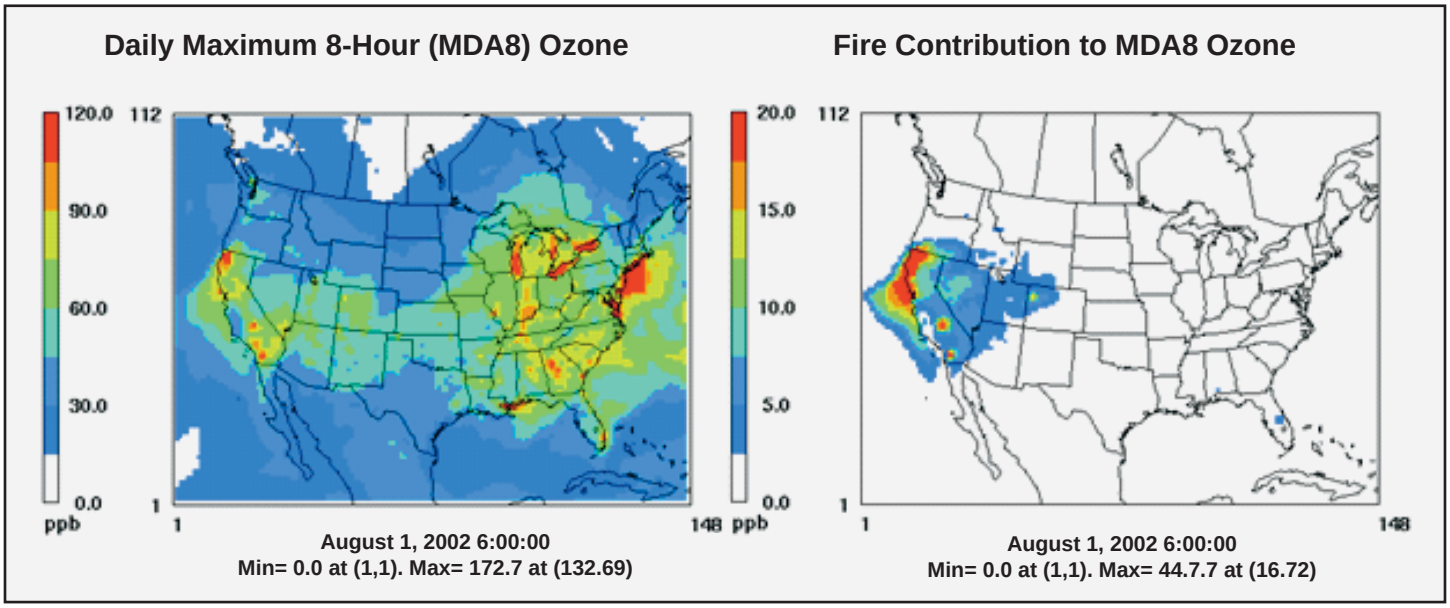

Figure 1. Chemical transport model estimate of ambient ozone (left) and modeled contribution of fire to those levels (right).

estimated maximum of 45 ppb related to fire impacts. Also, the figures depict ozone levels in the Midwest and East that are elevated due to completely different sources than the multi-state impacts from the California and Oregon fires.

Figure 2 is an example of a prototype graphic that integrates modeled ozone predictions from Figure 1 with monitored ozone values for measurements during the same fire period on July 31, 2002. The figure shows the location and fuel consumption for fire impact areas (red dots and grey perimeters), and lists CAMx OSAT model performance results along with monitored ozone for a monitoring site in southern Oregon and another nearby monitoring site in northern California (stars). Also depicted are HYSPLIT modeled trajectory results showing air mass transport paths (grey lines) from fire impact areas towards the monitoring sites. Comparisons indicate excellent model performance for total ozone at these sites, where the Oregon site measured 78 ppb O_3, with modeled results of 83 ppb and 21 ppb due to fire impacts and the California site measuring 64 ppb, with modeled 67 ppb and 17 ppb due to fire impacts. These comparison results for remote areas in southwest Oregon and northwest California highlight the fact that elevated ozone can be caused by different fires coincident in time and relatively near each other, at monitoring sites relatively close together.

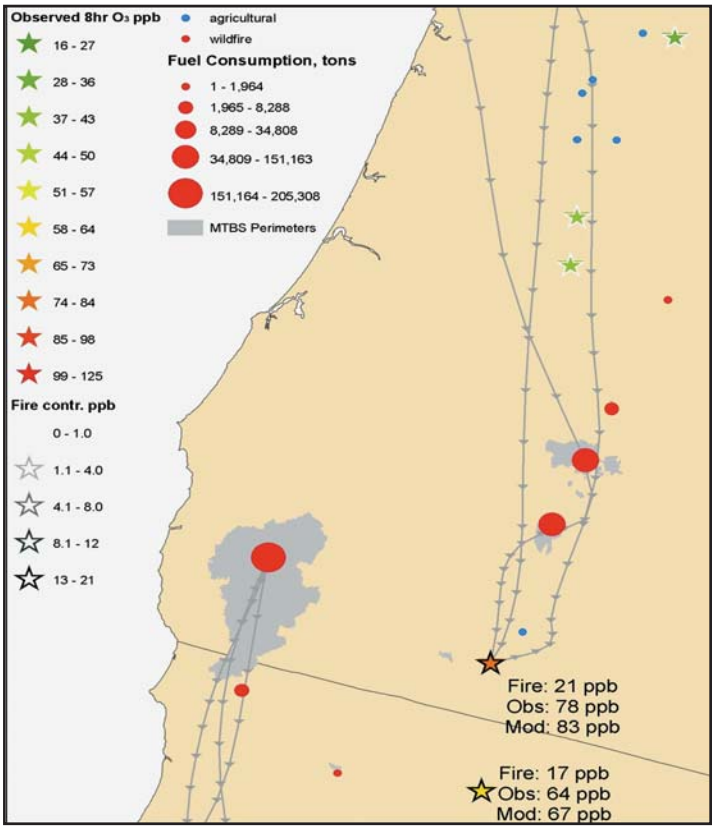

Figure 2. Graphic integrating empirical (HYSPLIT trajectory) results with CAMx OSAT model performance results and monitored on July 31, 2002 for fire impact areas and monitoring sites in southwest Oregon and northwest California.

These DEASCO$_3$ and PMDETAIL projects are anticipated to provide policy-relevant products that will contribute to improved decisions in PM and ozone air quality planning. Final products will include an online tool which will allow FLMs to survey, review, and grab the technical results and findings of the most analogous Case Studies to effectively contribute to the state and EPA processes of State Implementation Plan (SIP) development, declaration

Deterministic and empirical assessment continued on page 6....

***Deterministic and empirical assessment** continued from page 5....*

of Exceptional Events, non-attainment area designations, establishing background and transport levels of ozone, and others. These products will increase the effectiveness of FLMs to manage lands (including the application of prescribed fire) and address important PM and ozone matters, including exceedances of the ozone and PM NAAQS.

For more information contact Tom Moore. Telephone:970-491-8837. E-mail: tmoore@westgov.org.
Or visit the project Websites:
PMDETAIL (http://www.wrapfets.org/pmdetail.cfm) and
DEASCO3 (http://www.wrapfets.org/deasco3.cfm).
Information about the Joint Fire Sciences Program is at:
https://www.firescience.gov/index.cfm.

Monitoring update

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Operators of distinction

Ensuring consistent quality is not always a one person job, especially for complex air quality monitoring sites. The teamwork of Brant A. Englund and Greg Kendall is evidence of this. The two work together to ensure their monitoring sites yield high quality data on an ongoing basis.

Brant, an Environmental Program Specialist, and Greg, an Environmental Health Specialist II, both with the Arizona Department of Environmental Quality (ADEQ), are involved with many air quality monitoring initiatives, including the operation of the Phoenix Supersite (PHOE1 and PHOE5) and the Queen Valley (QUVA1) IMPROVE stations. Other monitoring efforts related to these sites include the National Air Toxics Trends Station (NATTS) Program, the Photochemical Air Monitoring Station (PAMS), the Urban Air Toxics Monitoring Program, and the NCore Multi-Pollutant Monitoring Network. Additionally, Brant and Greg work on other statewide air quality programs, including lead monitoring and visibility monitoring through the use of digital cameras, nephelometers, and transmissometers. With all these monitoring efforts, collaborative teamwork is essential. Other members of the Air Monitoring Unit include Richard Montenegro and Craig Pearson.

IMPROVE Site Operators Brant A. Englund (left) and Greg Kendall (right) at the Queen Valley (QUVA1) Aerosol Site.

Greg, with six years at ADEQ, became quickly proficient in troubleshooting instrument problems during his first year. With the extremely high temperatures of the Southwest, pumps would burn out quickly in their metal housings. Housings were later switched to wooden ones, which eliminated the pump issues. Brant, with ten years at ADEQ, initially performed stacked test observations as an Air Quality Compliance Inspector during his first three years; he has worked in the Air Monitoring Unit for the last seven years.

Greg has lived in Arizona since age 13, when he emigrated from Canada. He has a Bachelor's of Science degree in Environmental Sciences with a Biology Emphasis from Northern Arizona University. Outside work, he is involved in a competitive, traveling coed Ultimate Frisbee team. While it takes up most of his time in practicing for tournaments, Greg says, "It is a fun crowd to be with on and off the field."

Brant, originally from Brookfield, Wisconsin, has a Bachelor's of Science degree in Natural Resource Management from the University of Wisconsin at Stevens Point. Prior to his work at ADEQ, he worked in the environmental consulting field, specializing in soil and groundwater assessment and cleanup. In his spare time, he enjoys running and sporting events in general. During the hot summer months, he heads up to the Arizona high country for camping and hiking. Brant also adds, "I can't wait until the 2013 MLB spring training starts."

***Monitoring update** continued on page 7....*

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 4th Quarter 2012 are:

Aerosol (Channel A) - 35% of all sites

Bandelier
Barrier Lake
Blue Mounds
Bondville
Bridgton
Caney Creek
Chiricahua
Columbia Gorge East
Crescent Lake
Death Valley
Denali
Egbert
Flathead
Gila
Glacier
Grand Canyon
Great Basin
Great Sand Dunes
Great Smoky Mtns
Hawaii Volcanoes
Hells Canyon
Hercules-Glades
Ike's Backbone
Isle Royale
Lake Sugema
Lava Beds
Londonderry
Makah
Mammoth Cave
Mesa Verde
Monture
Nebraska
Okefenokee
Olympic
Organ Pipe
Pack Monadnock
Pasayten
Phoenix
Pinnacles
Proctor Research Ctr
Quabbin Reservoir
Quaker City
Queen Valley
Rocky Mountain
Saguaro West
Seney
Sycamore Canyon
Tallgrass
Three Sisters
Tonto
Trapper Creek-Denali
Upper Buffalo
Viking Lake
Virgin Islands
Weminuche
Wichita Mountain
Wind Cave
Yosemite

Nephelometer - 53% of all sites

Big Bend
Dysart
Great Basin
Hance
Indian Gardens
Mount Rainier
National Capital
Rocky Mountain
Vehicle Emissions

Sites that achieved at least 95% data collection for 4th Quarter 2012 are:

Aerosol (Channel A) - 23% of all sites

Boulder Lake
Bryce Canyon
Cape Romain
Capitol Reef
Cedar Bluff
Crater Lake
Craters of the Moon
Dome Land
Douglas
El Dorado Springs
Ellis
Everglades
Great River Bluffs
Indian Gardens
Jarbidge
Joshua Tree
Kaiser
Kalmiopsis
Mingo
Mohawk Mountain
Mount Hood
Point Reyes
Presque Isle
Redwood
Salt Creek
San Rafael
Shamrock Mine
Shining Rock
Sipsey
Snoqualamie Pass
St. Marks
Stilwell
Theodore Roosevelt
White Mountain
White River
Yellowstone
Zion Canyon

Nephelometer - 35% of all sites

Acadia
Estrella
Glacier
Grand Teton
Great Smoky Mtns.
Shenandoah

Transmissometer - 100% of all sites

Bridger

Sites that achieved at least 90% data collection for 4th Quarter 2012 are:

Aerosol (Channel A) - 22% of all sites

Agua Tibia
Badlands
Big Bend
Birmingham
Bliss
Boundary Waters
Bridger
Brigantine
Cabinet Mountains
Canyonlands
Cape Cod Natl Seashore
Chassahowitzka
Dolly Sods
Flat Tops
Frostburg Reservoir
Great Gulf
Guadalupe Mtns.
Lassen Volcanic
Linville Gorge
Lostwood
Meadview
Mount Zirkel
North Absaroka
North Cascades
Northern Cheyenne
Saguaro
San Gabriel
San Gorgonio
Sawtooth
Shenandoah
Swanquarter
Trinity
Tuxedni
UL Bend
Wheeler Peak
White Pass

Monitoring Site Assistance:
Aerosol sites: contact University of California-Davis
telephone: 530/752-1123 (Pacific time)
Optical/Scene sites: contact Air Resource Specialists, Inc.
telephone: 970/484-7941 (Mountain time)

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IMPROVE Newsletter editor takes leave

After producing over 80 newsletters, the IMPROVE Newsletter Editor and IMPROVE Program Support Coordinator, Gloria Mercer, is handing the reins to another. Gloria had been with Air Resource Specialists, Inc., the IMPROVE Program's optical and scene networks contractor, for the past 27 years and has recently moved on to pursue other interests. The IMPROVE Steering committee and the broader IMPROVE community would like to thank Gloria for her years of service and dedication. Below is a farewell letter from Gloria.

For about the past 22 years I've been the company's technical writer, developing numerous and varied types of informational products, including the IMPROVE Newsletter. I began my tenure at ARS in 1985, collecting and validating teleradiometer data. When the network was decommissioned I moved to collecting and scanning 35mm photographic slides — measuring target/sky contrasts and calculating visual ranges for each view. I also collected transmissometer data during its development phase in 1988. Later I moved onto other projects including developing and maintaining standard operating procedures for the scene, optical, and ARS' ambient air quality monitoring networks.

Through my work I obtained a good background into various types of visibility instrumentation and their monitoring and measuring methodologies. After some time, however, my efforts were needed elsewhere. I enrolled in Colorado State University's graduate school and earned a degree in technical communication as my work focus shifted in that direction.

I was brought onboard to help coordinate the IMPROVE Steering Committee meetings in 2000. It was this meeting preparation that allowed me to mingle among the various factions of the program and become more independent with newsletter preparation and development as I learned about the aerosol network, its filter analyses, and visibility trends.

Now as I leave my post for another new and interesting chapter of my life I see the IMPROVE Program is embarking on new sampler and analysis technologies. It has been an honor working with, and occasionally meeting, all the developers, researchers, and scientists that together constitute the IMPROVE program. I will look back fondly of my involvement with the program and hope my efforts helped in improving our protected visual environments.

Gloria Mercer

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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Associate Membership in the IMPROVE Steering Committee requires operation of at least one IMPROVE protocol site, openly share data, and participate in technical review and oversight of the IMPROVE Program. Associate and International Associate Member representatives are:

STATE OF ARIZONA

ENVIRONMENT CANADA

REPUBLIC OF KOREA
MINISTRY OF ENVIRONMENT