INTERAGENCY MONITORING OF PROTECTED VISUAL ENVIRONMENTS

IMPROVE

4th Quarter 2009 | The IMPROVE Newsletter | Volume 18 / Number 4

Monitoring update

Feature Article: A revised charter for the Western Regional Air Partnership, 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:

- 60 aerosol samplers
- 32 nephelometers
- 2 transmissometers
- 60 Webcamera systems
- 2 digital camera systems
- 5 interpretive displays

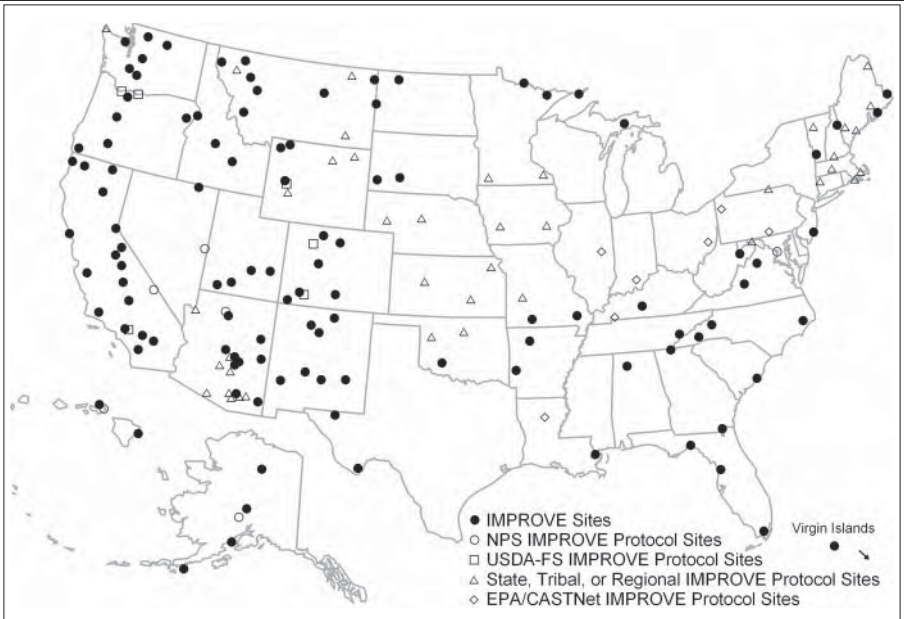
IMPROVE Program participants are listed on page 8. Federal land management agencies, states, tribes, regional air partnerships, and other agencies operate supporting instrumentation at monitoring sites as presented in the map below. Preliminary data collection statistics for the 4th Quarter 2009 (October, November, and December) are:

- Aerosol (channel A only) 95% collection
- Aerosol (all modules) 93% completeness
- Optical (nephelometer) 99% collection
- Optical (transmissometer) 84% collection

The Petersburg, AK, (PETE1) aerosol monitoring site discontinued operations in October due to USDA-Forest Service budget cuts. Also, the Wyoming-sponsored IMPROVE Protocol transmissometer sites at Cloud Peak Wilderness Area and Thunder Basin National Grasslands ended monitoring October 1, 2009, also due to funding issues.

Data availability status

Data and photographic spectrums 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 March 2009. Nephelometer and transmissometer data are available through September 2009 and December 2008, respectively. Webcamera displays that show near real-time images and data are available on agency-supported Web sites:



IMPROVE and IMPROVE Protocol Sites
4th Quarter 2009

- 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 7....*

Visibility news

IMPROVE report underway

Staff at the Cooperative Institute for Research in the Atmosphere (CIRA) are working on the fifth IMPROVE report in a series which started in 1993. The report is scheduled to be released in 2010, and covers spatial and seasonal patterns and temporal variability of haze in the United States, during the years 2007-2009.

When completed, the report will be announced in this newsletter, and will be available on the IMPROVE Web site, under Publications. Look for it this coming fall.

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

Experts Malm and Polkowsky retire

Two leading visibility experts have announced their retirement, which took effect last month.

Dr. William Malm of the National Park Service (NPS) has been the leading scientist behind the visibility protection provisions of the 1977 Clean Air Act. Bill has conducted basic research into the causes and human perception of haze and applied research directly leading to the reduction of hundreds of thousands of tons of sulfur emissions from retrofitted coal-fired power plants in the western U.S. He is the intellectual leader responsible for the Interagency Monitoring of PROtected Visual Environments (IMPROVE) network. More than any other individual, Bill is responsible for the body of research leading to the Regional Haze Regulations. From the establishment of the IMPROVE monitoring network to the development of the IMPROVE algorithm (which relates ambient aerosol measurements to visibility reduction) to the very metrics used to characterize visibility, Bill has applied sound science to protecting our nation's most treasured vistas. He is Dr. Visibility in the United States.

After 32 years (11+ with the NPS and 20+ with the Environmental Protection Agency (EPA)) Bruce Polkowsky retired from federal service. Bruce joined the NPS in 1998 as a senior Environmental Protection Specialist in the Air Resources Division, stationed in Lakewood, CO. Bruce is a recognized national expert regarding visibility protection. Throughout his NPS career he maintained a commitment and dedication to improving visibility in our parks. Over the years, Bruce worked on various policy and regulatory issues, many including multi-stakeholder involvement. Bruce led the NPS efforts in helping all 50 state regulatory agencies develop plans for improving visibility in national parks and wilderness areas. Once these plans are implemented, visibility in our parks will be greatly improved. At EPA, Bruce developed air quality regulations to protect the health and welfare of the public, as well as natural resources. Bruce was the primary author of the very important Regional Haze Rule, which EPA promulgated in 1999 as the cornerstone of park visibility protection programs.

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.

Calendars provide insight into network

The 2010 IMPROVE calendars have been distributed and are hanging in monitoring shelters and staff offices throughout the network. We thank all those operators and researchers who contributed biographies, photographs, and articles which allowed us to produce the calendar for another year. A small effort in providing information for a calendar page is seen for an entire month by hundreds of resource staff. All of us involved with managing the IMPROVE network extend our appreciation for all those who contribute to our calendar year to year.

The collected data from sites throughout the network are only as good as the dedicated operators who make it possible. Since 2003, the calendars have proven to be very popular. Some have commented that the calendars provide a snapshot of air quality across the country and are an excellent source of information. Others find the calendar a useful insight into what other monitoring sites are like, and enjoy reading about the research happenings in other regions as well.

To contribute to next year's calendar, contact Jeff Lemke at CIRA. Telephone: 970/491-2209. E-mail: lemke@cira.colostate.edu.

Visibility news continued on page 6....

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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.*

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Aspects of the job

IMPROVE Carbon Analysis at the Desert Research Institute (DRI), Nevada System of Higher Education

Particulate organic and elemental carbon (OC and EC) represent important components of the visibility extinction budget and influence the Earth's radiation balance. DRI's Environmental Analysis Facility (EAF) has developed and applied thermal/optical methods to quantify these parameters since 1985 and analyzed IMPROVE samples since the 1987 program inception. The IMPROVE_A thermal/optical reflectance and transmittance protocol has been adopted by the U.S. EPA's Chemical Speciation Network (CSN) and is widely used in the U.S., Canada, Mexico, France, Germany, Sweden, India, China, Hong Kong, Taiwan, Japan, and Australia.

During 2009, the EAF analyzed nearly 50,000 samples -- 28,200 from IMPROVE; 11,300 from CSN; and more than 10,000 from other programs. Twelve Model 2001 carbon analyzers, developed at DRI to reproduce the more than 20 thermal and optical protocols used for OC and EC sample analyses worldwide, are available to operate 24-hours per day, seven days a week.

The EAF and its carbon laboratory are directed by Dr. Judith C. Chow, an internationally-recognized expert in aerosol sampling and chemical analysis who has published more than 300 peer-reviewed articles and book chapters on air quality science. Dr. Chow interfaces with the sponsors; makes resources available to assure sample throughput; and continually analyzes the measurement process to increase data quality, efficiency, and utility to users.

Dr. John G. Watson provides technical guidance for the analysis methods and problem solving. He examines the causes of failures to attain quality control specifications and institutes procedural changes that maintain consistency with the long-term database while improving sample quality. He defines and directs tests that assist in understanding discrepancies among the different carbon analysis methods applied in various studies.

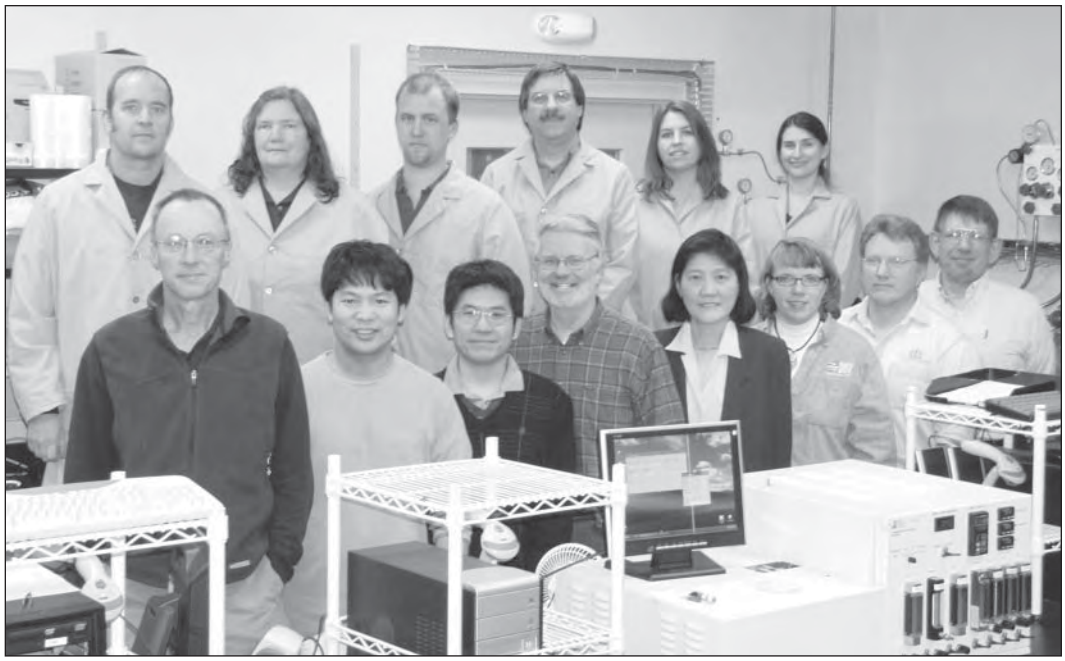
Dr. Richard J. Tropp serves as quality assurance officer. He coordinates independent laboratory audits and intercomparison studies including annual EPA performance evaluations. He also tracks changes in standard operating procedures. He obtained and maintains National Environmental Laboratory Accreditation Conference (NELAC) certification for EAF.

Drs. Lung-Wen Antony Chen, Mark Green, and Xiaoliang Wang initiate laboratory testing, conduct intercomparisons among different carbon measurements, and keep up-to-date on current carbon research. This knowledge is applied to Model 2001 analyzers to optimize data quality.

Ms. Dana Trimble and Mr. Steve Kohl are laboratory supervisors. They coordinate the sample receipt and data deliveries, schedule laboratory personnel to meet data deadlines, review quality control charts for replicates and blanks, assign data validation flags, specify instrument maintenance activities, and report carbon analysis data.

Ms. Brenda Cristani, Laboratory Coordinator/Data Analyst, tracks weekly carbon throughput and the receipt, unloading, and documentation of filter media for analysis. Carbon laboratory operations are led by Ms. Theresa Bohannan, Laboratory Technician II, and Mr. Corey Wilson, Laboratory Aide. They review data and thermograms, train new technicians, and

DRI analysis continued on page 6....



The DRI Carbon Analysis Team for the IMPROVE Module C filters. From left to right, front row: Mark Green, Xiaoliang Wang, Antony Chen, John Watson, Judith Chow, Dana Trimble, Steve Kohl, and Ricky Tropp; back row: Corey Wilson, Brenda Cristani, Cory Owens, Ed Hackett, Theresa Bohannan, and Stephanie Salke.

Feature article

A revised charter for the Western Regional Air Partnership (by T. Moore, WRAP)

Introduction and purpose

The former Board of Directors for the Western Regional Air Partnership (WRAP) has adopted a revised charter, effective at the end of 2009. The revised charter updates and broadens the purposes of the WRAP, expands the membership, simplifies the organization, and restructures the Board and its responsibilities. Drafting of the revised charter began at a July 2009 meeting attended by state air directors, tribal air program officials, federal land management and U.S. Environmental Protection Agency (EPA) staff, and WRAP staff. The revised charter went through several drafts in the review process before consideration and approval by a two-thirds majority of the former Board, voting in favor of adoption. The revised charter identifies several purposes for the WRAP to serve as a venue for Western states, tribes, local air agencies, federal land managers, and EPA to:

1) Maintain and update the regional haze work that WRAP has developed and continue to make the data and tools available for states and tribes to use as they implement their regional haze implementation plans;

2) Develop a common understanding of current and evolving regional air quality issues in the West, such as regional haze, ozone, fine and coarse particulate matter, nitrogen deposition and critical loads, and mercury and other hazardous air pollutants;

3) Examine and discuss Western regional air quality issues from a multi-pollutant perspective;

4) Develop and maintain regional databases that support regional and sub-regional technical analyses. This includes collection and analysis of data from various sources to produce regionally consistent, comparable, complete, and transparent results, able to be utilized and relied upon by individual jurisdictions and agencies;

5) Collaborate with EPA to ensure that, to the maximum extent possible, WRAP data and analyses are compatible with and leverage work conducted, at the national level. This could include WRAP work to compile data and analyses related to international, off-shore, and other sources of air pollution affecting Western air quality;

6) Evaluate the air quality impacts associated with regionally significant emission sources, such as mobile sources, fire, traditional and alternative energy development/extraction, windblown dust, and electricity generation, and, as warranted, to discuss regional and cross-jurisdictional strategies to improve air quality and mitigate the impacts from such sources;

7) Consult with air quality agencies in other regions to reduce duplication of effort and enhance efficiency and consistency of databases and analyses;

8) Evaluate how the impacts of climate change may affect air quality in the West; and

9) As requested by the membership, formulate and advance consensus positions on Western regional air quality issues.

Membership and Board of Directors

Under the revised charter, membership in the WRAP is open to all states, federally recognized tribes, and local air agencies located in the geographical region encompassed by the states of: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington, and Wyoming. Membership in the WRAP is also open to the U.S. Forest Service, National Park Service, Bureau of Land Management, Fish and Wildlife Service, and EPA. To become a recognized member of the WRAP, eligible states, tribes, local air agencies, and federal agencies should submit an official letter to the WRAP requesting membership and designating primary and secondary contacts for the jurisdiction or agency. Current state and tribal members of the WRAP Board as of January 1, 2009, shall automatically be recognized members of the WRAP under the revised charter, unless otherwise indicated by official letter to the WRAP from that state or tribe.

The WRAP members shall establish a Board of Directors consisting of five state, five tribal, five federal, and two local air agency representatives. The state, tribal, and local directors shall be elected by their respective delegations to staggered two-year terms, with the option for directors to be re-elected to additional terms. The directors representing eligible federal agencies shall be appointed by their agencies to two-year terms with the option of extension at the option of the respective agencies.

In directing the activities of the WRAP, the Board of Directors may:

- Solicit and accept funding;
- Hire staff, or arrange for the provision of staff support, to carry out its activities;
- Approve work plans;
- Approve contracts for support from outside experts and consultants;
- Establish a Technical Steering Committee from the membership to oversee and direct the technical and analytical work of WRAP staff, contractors, and work groups;
- Establish Work Groups from the membership to manage specific elements of the work plan; and
- Call membership meetings.

Former Board of Directors

Prior to the approval of the revised charter, under the former charter, the WRAP Board was composed of the governor of each state in the WRAP region or his/her designee, an equal number of Tribal leaders, and the U.S. Secretary of the Interior and U.S. Secretary of Agriculture or his/her designee as voting members. The Administrator of the U.S. Environmental Protection Agency or his/her designee was a non-voting board member. The Co-Chairs were former Governor Janet Napolitano of Arizona and Councilman Michel Kenmille of the Confederated Tribes of Salish and Kootenai. The board worked by consensus in overseeing the work of several committees and forums, which included stakeholders from all levels of government, businesses, academia, environmental organizations, and other public interest groups.

Associated WRAP Web links

Western Regional Air Partnership home page
http://www.wrapair.org/

About the WRAP Board
http://www.wrapair.org/WRAP/index.html

New WRAP Charter
http://www.wrapair.org/forums/amc/meetings/091111_Nox/Revised_WRAP_Charter_approved_December_2009.pdf

Former WRAP Charter
http://www.wrapair.org/WRAP/charter/charter.html

WRAP Region
http://wrapair.org/about/0309wrapmap.pdf

Committees and Forums
http://www.wrapair.org/commforum.html

Western Governors' Association
http://www.westgov.org/

For more information contact Tom Moore at the Western Governors' Association/Western Regional Air Partnership. Telephone: 970/491-8837. Fax: 970/491-8598. E-mail: mooret@cira.colostate.edu.

Special studies

Ammonia filter study planned

Ammonia (NH_3) is an important atmospheric trace constituent affecting particulate matter concentrations and properties, and contributing to haze as well as nitrogen deposition, which can adversely affect sensitive ecosystems. However, NH_3 concentrations have not been widely measured, particularly in the Rocky Mountains. To begin to address this, the IMPROVE $PM_{2.5}$ sampling module was modified to measure NH_X, the sum of gaseous NH_3 and particulate ammonium (NH_4).

During 2010, modified IMPROVE sampling modules will be operated alongside existing IMPROVE monitors at 8 to 10 sites for a year. NH_4 concentrations will be estimated from the samples collected by the IMPROVE module B and NH_3 concentrations will be estimated by the difference of the NH_X and NH_4. Monitoring sites will be located throughout the Rocky Mountains, including Rocky Mountain National Park. Sites will also be located at Cedar Bluff, KS, and Bondville, IL. Both sites are in intensive agricultural areas and are expected to have higher NH_3 concentrations than in the Rocky Mountains.

Most of the monitoring sites will have collocated Clean Air Status and Trends Network (CASTNET) ambient and National Atmospheric Deposition Program (NADP) wet deposition monitors that collect additional nitrogen and other compounds. These data will be used to assess the spatial and seasonal NH_3 patterns in the Rocky Mountains. In addition, the data will be combined with the CASTNET and NADP data to develop more complete nitrogen deposition budgets and used in modeling assessments to better understand the source types and source regions contributing to ammonia throughout the Rocky Mountains.

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

Visibility news continued from page 2 ....

CSN carbon sampler conversion complete

The U.S. EPA's Carbon Speciation Network (CSN) has completed its carbon sampler conversion, from the Met One SASS instrument to a URG-manufactured, modified IMPROVE Module C aerosol sampler (URG-3000N. EPA converted 195 monitoring sites to the URG-3000N sampler in three phases over the past three years.

EPA changed samplers and analysis methods to be more comparable with data from the IMPROVE network, as data from both networks are often used in conjunction to increase spatial coverage of a region. While CSN sites are generally located in urban areas, their carbon data are now analyzed using the same IMPROVE_A Thermal Optical Reflectance filter analysis method, as IMPROVE.

Figure 1 below shows the locations of the converted CSN sites, as well as IMPROVE carbon sampling sites.

For more information contact David Shelow at EPA. Telephone: 919/541-3776. Fax: 919/541-1903. E-mail: shelow.david@epamail.epa.gov.

DRI analysis continued from page 3....

conduct quality control tests. Technicians are instructed to take a unit off-line when quality control specifications are not met until Ms. Bohannan can identify anomalies and institute fixes. Ms. Stephanie Salke, Laboratory Technician II, performs scheduled oxygen tests on the carbon analyzers using a GC/MS, and assists with sample media testing, preparation, and shipping of unexposed filters for IMPROVE. Analysis technicians include Dan Freeman, Abigail Lupena, Mark Morrison, Erin Szelagowski, and Keith Szelagowski.

Mr. Corey Owens, Electro Mechanical Technician, and Mr. Ed Hackett, Senior Research Technician, keep the instruments maintained and operating. The Model 2001, like all thermal analysis systems, experiences extreme temperature changes that wear out components when they are operating around the clock as at EAF. Mr. Owens identifies and refines preventative maintenance schedules, re-calibrates the instruments at regular intervals, and troubleshoots problems identified by routine quality control checks.

Although hundreds of filters are analyzed each week, this dedicated team treats each sample as a valued individual, recognizing the importance of these analyses to research and decision-making related to visibility and climate change.

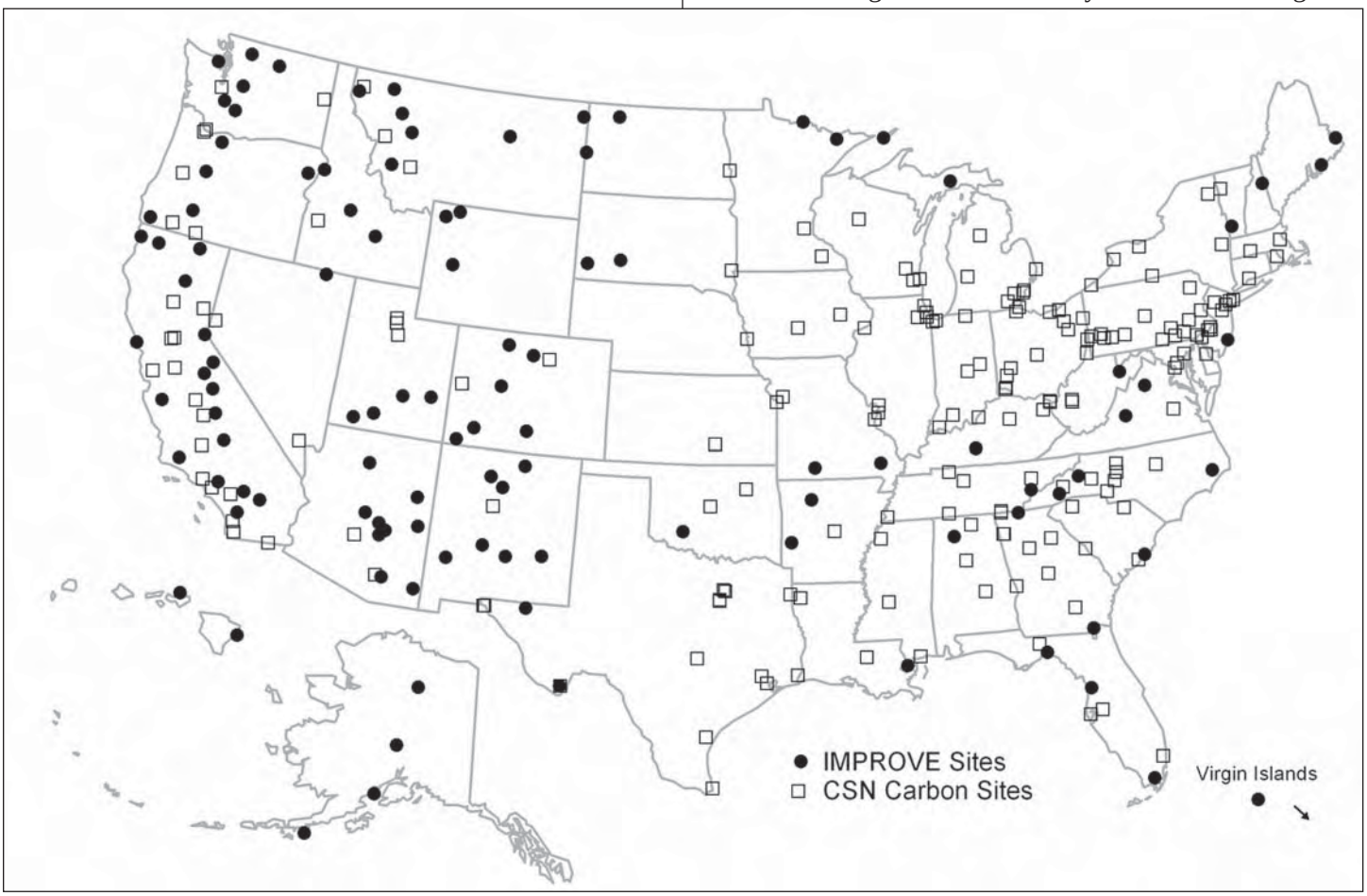


Figure 1. Map of the 195 CSN sites operating the URG-3000N carbon sampler, and the location of IMPROVE sites operating the carbon module.

Monitoring update continued from page 1 ....

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 2009 are:

Aerosol (Channel A)

Acadia
Badlands
Big Bend
Birmingham
Boulder Lake
Boundary Waters

Bridger
Brigantine
Cadiz
Cape Romain
Capitol Reef
Casco Bay

Chiricahua
Cloud Peak
Columbia Gorge East
Columbia Gorge West
Crater lake
Craters of the Moon

Crescent Lake
Denali
Dolly Sods
Douglas
El Dorado Springs
Everglades

Flathead
Frostburg Reservoir
Gates of the Arctic

Glacier
Great Basin
Great Smoky Mtns.
Haleakala
Haleakala Crater
Hawaii Volcanoes

Hercules-Glades
Ike's Backbone
James River
Joshua Tree
Kaiser
Kalmiopsis

Lassen Volcanic
Makah
Mammoth Cave
Mohawk Mountain
Monture
Moosehorn

Mount Rainier
North Cascades
Northern Cheyenne
Okefenokee
Olympic
Organ Pipe

Pack Monadnock
Pasayten
Phoenix

Proctor Research Cntr
Quaker City
Queen Valley
Rocky Mountain
Saguaro
Saguaro West

San Gorgonio
Seney
Sequoia
Shenandoah
Sikes
Snoqualmie Pass

St. Marks
Starkey
Sycamore Canyon
Theodore Roosevelt
Three Sisters
Tonto

Trapper Creek-Denali
Tuxedni
Virgin Islands
Voyageurs
Weminuche
White Pass

White River
Yellowstone
Yosemite

Nephelometer

Children's Park
Craycroft
Dysart
Glacier
Greer

Indian Gardens
Organ Pipe
Petrified Forest
Queen Valley

Shenandoah
Sycamore Canyon
Tucson Mountain
Vehicle Emissions

Transmissometer

-- none --

Photographic

Gates of the Mountains

Sites that achieved at least 95% data collection for 4th Quarter 2009 are:

Aerosol (Channel A)

Agua Tibia
Bondville
Bridgton
Bryce Canyon
Cohutta
Death Valley

Fresno
Gila
Great River Bluffs
Hoover

Lake Sugema
Lava Beds
Martha's Vineyard
Medicine Lake
MK Goddard
Mount Baldy

Mount Hood
Mount Zirkel
North Absaroka

Presque Isle
Puget Sound
San Pedro Parks
Simeonof
Sula
Tallgrass

UL Bend
Upper Buffalo
Wheeler Peak

Nephelometer

Acadia
Big Bend
Chiricahua
Cloud Peak
Estrella

Great Basin
Hance
Mammoth Cave
Mount Rainier

National Capital
Rocky Mountain
Sierra Ancha
Thunder Basin

Transmissometer

Bridger

Photographic

-- none --

Sites that achieved at least 90% data collection for 4th Quarter 2009 are:

Aerosol (Channel A)

Addison Pinnacle
Bandelier
Bosque del Apache
Breton
Cabinet Mountains
Canyonlands

Cape Cod
Cedar Bluff
Cherokee
Egbert
Ellis
Fort Peck

Grand Canyon
Great Sand Dunes
Guadalupe Mtns.
Hells Canyon
Indian Gardens
Jarbidge

Livonia
Lostwood
Mesa Verde
Nebraska
New York
Penobscot

Petrified Forest
Pinnacles
Quabbin Reservoir
Redwood
Salt Creek
San Rafael

Sawtooth
Shining Rock
Sipsey
Swanquarter
Wichita Mountains
Zion Canyon

Nephelometer

Ike's Backbone
Great Smoky Mtns.

Transmissometer

-- none --

Photographic

-- none --

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)

IMPROVE

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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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