INTERAGENCY MONITORING OF PROTECTED VISUAL ENVIRONMENTS

IMPROVE

3rd Quarter 2011 | The IMPROVE Newsletter | Volume 20 / Number 3

ATTENTION READERS: The IMPROVE Newsletter is going all-electronic!

Effective with the February 2012 issue, the IMPROVE Newsletter will be available only as an electronic .pdf file delivered via e-mail. The advantages? It can be produced economically in full color, and by discontinuing printing and mailing costs we will help reduce overall program costs. To continue receiving the full color newsletter, please e-mail your request to IMPROVENews@air-resource.com. **Readers currently on the hardcopy distribution list that do not respond will be deleted from the distribution.** Site operators will continue to receive a hardcopy of the newsletter in their filter boxes.

Feature Article: Message from the Steering Committee Chair, Page 4

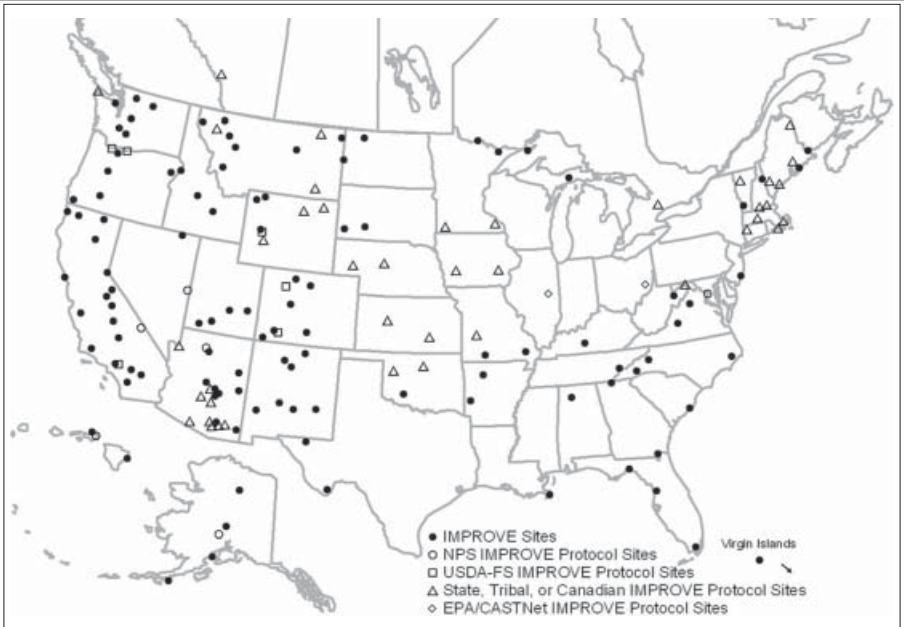
Monitoring update

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 55 additional aerosol samplers, optical instrumentation (nephelometers and transmissometers), scene instrumentation (Webcamera systems), and 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 2011 (July, August, and September) are:

- Aerosol (channel A only) 94% collection
- Aerosol (all modules) 92% completeness
- Optical (nephelometer) 97% collection



IMPROVE and IMPROVE Protocol Sites
3rd Quarter 2011

The Sac and Fox aerosol monitoring site, sponsored by the Sac and Fox Nation, KS, ended monitoring in June due to budget constraints. The site collected filter-based particulate samples since June 2002.

Also, the USDA-Forest Service deactivated the transmissometer at San Gorgonio Wilderness, CA, in August due to budget cuts. The instrument operated since 1988.

Only one transmissometer currently remains in operation in the IMPROVE Protocol optical monitoring network, which supplements the aerosol network. This instrument is located near the Bridger Wilderness, WY, sponsored by the USDA-Forest Service.

Monitoring update continued on page 2....

Visibility news

IMPROVE Steering Committee Chairperson changes after 33 years

Marc Pitchford has been the IMPROVE Steering Committee Chairperson since the inception of the program. Now, after 33 years, the Chair has changed hands as Marc has moved on to a new position with the Desert Research Institute.

The Steering Committee unanimously nominated Scott Copeland, who represents the USDA-Forest Service, as the new Committee Chair. Scott works at Colorado State University's Cooperative Institute for Research in the Atmosphere. He has represented the Forest Service on the committee since 2007, and is actively involved in IMPROVE aerosol operations and data analysis methods.

Contact Scott Copeland at the U.S. Forest Service. Telephone: 307/332-9737. Fax: 307/332-0264. E-mail: copeland@CIRA.colostate.edu.

NOAA appoints new committee member

The National Oceanic and Atmospheric Administration (NOAA) has appointed Dr. Rick D. Saylor to fill the IMPROVE Steering Committee position recently vacated by Marc Pitchford. Dr. Saylor is a Physical Scientist with the NOAA Air Resources Laboratory in Oak Ridge, TN.

Dr. Saylor obtained a Ph.D. in Chemical Engineering at the University of Kentucky and has over 23 years experience as a researcher in atmospheric chemistry and air quality. His expertise includes analysis and interpretation of field measurement data of trace gases and particulate matter and multi-dimensional modeling of atmospheric physics and chemistry across urban to global scales. He has held research positions at the U. S. EPA National Exposure Research Laboratory, Pacific Northwest National Laboratory, Georgia Tech, and at Atmospheric Research & Analysis, Inc. His current research includes improving $PM_{2.5}$ modeling in continental-scale air quality forecast simulations and investigating atmosphere-biosphere chemical interactions and feedbacks.

Dr. Saylor can be contacted at NOAA. Telephone: 865/576-0116. E-mail: rick.saylor@noaa.gov.

IMPROVE accepts International Associate Steering Committee members

The IMPROVE Steering Committee has established International Associate Membership and welcomes Environment Canada and the Republic of Korea Ministry of Environment as members.

Requirements for International Associate Membership are that the agency funds at least one site (operation follows all IMPROVE protocols), agrees to share data in the same manner as the rest of the network, and designates a representative to the Steering Committee who will participate in periodic technical review and oversight of the IMPROVE program. Approval for International Associate Membership is determined by a simple majority vote of the IMPROVE Steering Committee for any candidate that meets the requirements listed above.

For more information contact Scott Copeland at the U.S. Forest Service. Telephone: 307/332-9737. Fax: 307/332-0264. E-mail: copeland@CIRA.colostate.edu.

Monitoring update *continued from page 1*

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 October 2010. Nephelometer and transmissometer data are available through June 2011 and December 2010, respectively.

Webcamera real-time images and data are available on:

- *http://www.nature.nps.gov/air/WebCams/index.htm*
- *http://www.fsvisimages.com*
- *http://www.hazecam.net*
- *http://www.mwhazecam.net*
- *http://www.wyvisnet.com*
- *http://www.phoenixvis.net*

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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.*

Operators of distinction

Have you ever wondered where those woods are, which people travel over the river and through, to get to Grandmother's house? Well those woods may very well be the Pisgah National Forest, in North Carolina. IMPROVE site operator Matt Eldridge has worn several USDA-Forest Service hats while working in the forest. He signed on 15 years ago as a seasonal trail crew member, and now his responsibilities include administering timber sales, overseeing road maintenance contracts, and firefighting, when necessary. In addition, he is the primary operator for the Linville Gorge (LIGO1) IMPROVE aerosol monitoring site.

Linville Gorge is sometimes known as the Grand Canyon of the East. "I enjoy working at the site because it is in a pretty location right off the Blue Ridge Parkway," said Matt, "but it can be a challenge to get to in the wintertime due to snow and ice." Even with his varying responsibilities, Matt makes his aerosol monitoring site a priority. He is quick to notice subtle problems, and will exchange equipment while off-duty if needed. In the event he cannot make a site visit, Linville's backup operators, Matt Keyes and Jonathan Gortney, step in to ensure the aerosol filters are changed according to schedule and shipped to the laboratories for analysis.

Matt Eldridge earned a bachelor's degree in biology from the University of North Carolina – Asheville, was raised in nearby Winston-Salem, and has spent most of his life in the Southeast including some time in Georgia and South Carolina. He is married with two children and relaxes by playing guitar, tennis, hiking, or birdwatching. "There's plenty of things to do in the forest," said Matt. "The views change seasonally with the temperatures and I never tire of it." If he ever does tire of it he can always visit Grandmother's house on the other side of Linville River, which can be seen 2,000 feet below the rim of the gorge.

Matt Eldridge manages several jobs in the Pisgah National Forest, including the Linville Gorge aerosol monitoring site operation.

Networks achieve 93% completeness for calendar year 2010

Aerosol completeness for the IMPROVE and Protocol aerosol networks was 93% for 2010. Data from modules A, B, C, and D must all be present for a sample day to be considered complete. After being collected, data are validated using specific criteria stipulated by the Regional Haze Rule. For these data to be used to track progress in improving visibility and be included in preparing state implementation plans, monitoring sites must achieve:

- At least 75% annual completeness.
- At least 50% completeness in each calendar quarter.
- Have no more than 10 consecutive missed samples.

Out of 163 sites in the IMPROVE and Protocol networks, 9 failed to meet these criteria. Generally, sites that failed did so because of unique situations. Additionally, 16 sites realized an impressive 100% collection for the year! Collection statistics for each site for 2010 are provided in the following listing.

	Percent Valid Data					
Site	% Year	% 1stQtr	% 2ndQtr	% 3rdQtr	% 4thQtr	# Mis.
Acadia	93	100	80	90	100	9
Agua Tibia	84	90	87	81	77	3
Arendtsville	99	97	100	100	100	1
Badlands	99	100	100	97	100	1
Bandelier	93	93	90	97	90	3
Big Bend	92	97	87	84	100	4
Birmingham	96	90	93	100	100	2
Bliss	**100**	**100**	**100**	**100**	**100**	**0**
Blue Mounds	89	97	87	77	97	2
Bondville	95	97	97	87	100	2
Bosque del Apache	88	90	90	77	94	4
Boulder Lake	98	100	93	97	100	2
Boundary Waters	99	97	100	100	100	1
Breton	90	93	93	94	81	5
Bridger	93	100	87	87	100	2
Bridgton	96	100	100	97	87	4
Brigantine	99	100	100	100	97	1
Bryce Canyon	95	100	90	94	97	3
Cabinet Mountains	98	100	97	100	94	2
Cadiz	93	97	100	74	100	8
Caney Creek	93	100	100	74	97	6
Canyonlands	96	97	97	90	100	2
Cape Cod	99	97	100	100	100	1
Cape Romain	99	97	100	100	100	1
Capitol Reef	93	100	93	77	100	5
Casco Bay	92	100	90	84	94	3
Cedar Bluff	96	97	100	97	90	3
Chassahowitzka	99	100	97	100	100	1
Cherokee	98	100	97	97	100	1
Chiricahua	94	100	93	97	87	3
Cloud Peak	89	67	93	100	97	9
Cohutta	83	97	90	84	61	6
Columbia Gorge E.	**100**	**100**	**100**	**100**	**100**	**0**
Columbia Gorge W.	80	83	100	48	90	14

Networks achieve continued on page 6....

Feature article

Message from the IMPROVE Steering Committee Chair, Retired (October 31, 2011)

(by Marc Pitchford)

My role in IMPROVE

I began doing remote area visibility research and monitoring in 1976 as part of an Environmental Protection Agency (EPA) project to assess the air quality impacts of major energy development in eight western states. This program included optical monitoring at a number of locations using telephotometers developed by Professor William Malm at Northern Arizona University, and particle samplers called stacked filter units (SFUs) that were designed to be compatible with Particle-Induced X-ray Emission (PIXE) elemental analysis by Professor Thomas Cahill at the University of California at Davis (UCD). The program expanded with the 1977 Clean Air Act Amendments that call for visibility protection for certain national parks and wilderness areas, referred to as federal Class I areas. To accommodate this larger program, the visibility staff at EPA's Las Vegas laboratory where I worked expanded, and added Dr. Malm as our scientific lead.

The National Park Service (NPS) started their air quality/visibility program in 1981 and asked Malm to join them as their technical lead. In the meantime, the EPA visibility program, which had been operational for several years in the western U.S., was all but killed by the Reagan Administration. Instead of mothballing the monitoring equipment from EPA's 40+ sites, we transferred the equipment to the NPS program.

In 1984, I was asked by EPA's Office of Air Quality Planning and Standards to prepare a plan for a national monitoring network for visibility-protected federal Class I areas, as required by the settlement of a lawsuit over EPA's failure to implement the phase I visibility regulations. To stretch EPA's limited resources, Malm and I approached other federal land management (FLM) organizations with responsibilities for preserving air quality in Class I areas to create an interagency-sponsored monitoring program. At the first joint meeting, the name and acronym I proposed for this program was approved and the IMPROVE Program and steering committee were born. I was nominated and elected as the chair of the steering committee, a post that I have held with great pride and pleasure until my retirement in October 2011.

In the early years of the IMPROVE Program the data were used principally by those of us who developed and managed the program, to better characterize and understand the causes of remote-area visibility impairment. The numbers and diversity of data users, however, increased as a result of the regional haze language in the 1990 Clean Air Act Amendments (which established the Grand Canyon Visibility Transport Commission) followed later by the promulgation of the Regional Haze Rule (1999) and the initiation of the five Regional Planning Organizations in the early 2000s. In the 1980s, journal articles and conference papers were the principal means of describing the monitoring systems and data analysis methods, and data were distributed by mailing ASCII-formatted data tapes or floppy disks. Now, a Web site contains detailed operational protocols for all aspects of monitoring, laboratory analysis, data processing, numerous documents, etc. that describe the operations and management of the network, and a data browser that provides site-specific metadata and data displays, and allows custom-selected data downloads. Regional Haze Rule mandates to use IMPROVE (or equivalent) data to document long-term Class I area visibility trends have prompted much greater emphasis on data quality, availability, and documentation of methods.

More information on the history of the network was published as feature articles in four consecutive issues of *The IMPROVE Newsletter* (Volume 16, #3 and #4, and Volume 17, #1 and #2) and last year in the feature article on the 25th anniversary of IMPROVE (Volume, 19, #3).

A vision for IMPROVE

As IMPROVE has evolved and expanded over the years, I have been guided by a vision of what it should be. While IMPROVE's goals and objectives are well documented and I have articulated aspects of my vision in conversations with others, I have never attempted to succinctly write out a vision statement, until now. ***Vision: IMPROVE enhances its reputation for the generation and dissemination of consistent, high quality atmospheric data needed to implement federal visibility protection for Class I areas now and in the future.***

Given the cost often associated with large-scale emission reductions, visibility protection is a high stakes activity that is appropriately scrutinized by diverse interest groups. The IMPROVE Program contributes to the credibility of the visibility protection process by maintaining its well-earned reputation for generating quality data by an open and well documented process.

Maintaining data consistency across the network and over multi-year periods, as required to implement the Regional Haze Rule, are reoccurring challenges in the face of both planned and inadvertent changes in the monitoring process. One might think that after 20+ years of operations, IMPROVE should be able to collect consistent data by merely freezing our operational protocols and applying them rigorously. However, samplers and analytical equipment deteriorate or malfunction, and are no longer supported by vendors or too costly to maintain, so

they need to be replaced by newer models. Also, suppliers of filters and other required materials make changes to their manufacturing processes without notifying us, resulting in differences that are not apparent until we notice a jump in the data that we then attempt to understand. Numerous examples of such seemingly benign changes exist in procedures, equipment, or supplies that we have determined to be responsible for noticeable and occasionally significant changes in the data.

Preserving IMPROVE's reputation for developing high quality data is the reason that we devote significant time and resources to evaluation of data quality and consistency. It is also the reason that when we detect data issues or deficiencies, we highlight our concerns on the IMPROVE Web site by providing advice to data users, as well as take measures to correct the defects. This commitment to understanding and improving the quality of the data requires a vigorous, ongoing quality assurance research effort that sometimes results in delays in posting data and occasionally results in the embarrassment of identifying problem data. However, IMPROVE's policy to communicate our understanding of the quality of our data and the processes used to generate them are a professional responsibility, as well as a substantial reason for the confidence data users have in the information we provide.

Future challenges

I expect that the recurring challenges of the past will continue into the future. These tend to fall into several categories that include coping with resource limitations, balancing data continuity against implementation of improved methods, and maintaining a top-notch program team.

Resource limitations manifest themselves in two distinct ways. The cost of labor, supplies, and equipment increases every year, yet the price paid per site has been constant for over a decade. Given recent and likely future federal budgets problems, there isn't likely to be relief anytime soon. IMPROVE has coped with gradually tightening funding by employing innovations that reduce labor, and, often in the process, increase data quality. For example, analytical efforts at UCD are being streamlined with the use of filter barcodes and automatic handling, with elemental composition and optical absorption measurements being transmitted directly to the relational database from the laboratory equipment. Expanding the network is another way to control the cost per site, because the incremental cost for adding a site is less than the total cost divided by the number of sites (which is the price we assess to operate the site). This is one of the motivations for our recent interest in expanding the IMPROVE network with monitoring sites in other countries (new International Associate Committee members are Canada and South Korea). A substantial reduction in funds is the second category of resource limitations challenges. A number of years ago, EPA notified the IMPROVE Steering Committee that their support may be reduced by 15%, part of an across-the-board reduction that would have required decommissioning of nearly 30% of the IMPROVE sites. The Steering Committee responded by ranking the priority of the sites based on the uniqueness of the data they generated compared with data from neighboring sites. States and regional air quality organizations sent letters of support to the EPA requesting full funding. Fortunately, these across-the-board cuts never materialized.

The primary purpose of IMPROVE data is long-term trends assessment for Class I areas. This requires stable measurements conducted with great care to avoid or minimize unintended methodologically induced distortion to the trend. I've been asked, "Does this mean that IMPROVE will always use virtually the same filter-based sampling with subsequent laboratory analysis as the basis for its measured aerosol speciation and derived light extinction datasets?" The answer is no, but to make changes, the IMPROVE Program needs to demonstrate that the replacement techniques will generate comparable or relatable data so that credible long-term trends assessments can continue through the transition. IMPROVE has faced this challenge a number of times. For example, the change to a newer Thermal Optical Reflectance carbon analyzer required a substantial effort over nearly a two-year period, including running paired analysis with the old and new analyzers on hundreds of samples and conducting experiments to more fully understand and adjust for differences in the paired data. Conducting these assessments can be expensive, which works to discourage all but necessary or potentially big payoff methodological changes. I am confident that IMPROVE's monitoring approaches will continue to evolve, but only changes worth the required effort should be attempted.

Maintaining top-notch management and technical teams are continuing challenges for any long-term program. IMPROVE has been blessed by a great deal of stability among its staff, but that has the downside of not making vacancies for the next generation. Steering Committee members and project leads among the contractor organizations need to actively seek and involve young scientists and project managers to replace us as we near retirement. A number of us have done this throughout the history of the IMPROVE program with good results.

My future

With my retirement from federal service, I could no longer represent the National Oceanic and Atmospheric Administration (NOAA) on the IMPROVE Steering Committee. However, my new job as Executive Director of the Desert Research Institute (DRI) Division of Atmospheric Sciences provides ample justification for my continued interest and future involvement in this program that has been such a large part of my professional career. I leave the Steering Committee in good hands with the election of Scott Copeland as the new chair and with Rick Saylor the new NOAA representative. I hope to attend future meetings as one of the DRI representatives and I invite you to involve me whenever doing so could be helpful.

Monitoring update continued from page 3 ....

Networks achieve continued from page 3....

Site	% Year	Percent Valid Data % 1stQtr	% 2ndQtr	% 3rdQtr	% 4thQtr	# Mis.
Crater Lake	92	100	97	87	84	4
Craters of Moon	94	90	100	90	97	3
Crescent Lake	93	93	100	77	100	3
Death Valley	98	100	100	97	94	1
Denali	97	97	100	100	90	3
Dolly Sods	99	100	100	100	97	1
Dome Land	83	97	87	68	81	8
Douglas	**100**	**100**	**100**	**100**	**100**	**0**
Egbert	94	93	100	90	94	3
El Dorado Springs	95	90	93	100	97	3
Ellis	98	93	100	100	97	2
Everglades	99	100	97	100	100	1
Flathead	**100**	**100**	**100**	**100**	**100**	**0**
Fort Peck	81	67	87	94	77	6
Fresno	99	97	100	100	100	1
Frostburg Reservoir	99	97	100	100	100	1
Gates of the Arctic	93	97	87	94	97	4
Gates of the Mtns.	71	93	67	77	48	5
Gila	92	100	87	84	97	2
Glacier	94	100	90	100	87	3
Grand Canyon	91	97	83	84	100	5
Great Basin	94	97	100	84	97	5
Great Gulf	61	63	83	71	26	11
Great River Bluffs	98	100	93	100	100	2
Great Sand Dunes	93	100	73	100	100	8
Great Smoky Mtns.	96	90	100	100	94	3
Guadalupe Mtns.	93	90	93	90	100	3
Haleakala	98	97	100	97	100	1
Haleakala Crater	95	93	100	100	87	2
Hawaii Volcanoes	99	100	100	100	97	1
Hells Canyon	95	93	97	94	97	2
Hercules-Glades	98	93	97	100	100	2
Hoover	82	63	83	81	100	4
Ike's Backbone	97	97	93	97	100	2
Indian Gardens	90	77	100	87	97	3
Isle Royale	93	77	93	100	100	2
James River	99	97	100	100	100	1
Jarbidge	98	100	100	100	94	2
Joshua Tree	91	83	90	97	94	3
Kaiser	89	87	90	94	84	2
Kalmiopsis	93	97	83	90	100	5
Lake Sugema	**100**	**100**	**100**	**100**	**100**	**0**
Lassen Volcanic	99	100	100	100	97	1
Lava Beds	97	100	90	100	97	3
Linville Gorge	98	93	100	100	97	2
Livonia	**100**	**100**	**100**	**100**	**100**	**0**
Lostwood	94	97	100	97	84	3
Lye Brook	93	100	87	94	94	2
Makah	84	87	100	97	52	13
Mammoth Cave	94	93	87	97	100	3
Martha's Vineyard	99	100	100	100	97	1
Meadview	93	90	100	94	90	3
Medicine Lake	95	87	100	97	97	2
Mesa Verde	96	97	100	97	90	3
Mingo	89	97	90	100	71	5
MK Goddard	97	100	93	94	100	2
Mohawk Mountain	97	100	93	97	97	2
Monture	92	90	100	87	90	3
Moosehorn	97	97	100	100	90	3
Mount Baldy	89	83	93	94	87	2
Mount Hood	98	100	100	100	94	3
Mount Rainier	98	100	100	90	100	1
Mount Zirkel	92	97	93	100	77	2
Nebraska	88	90	90	100	71	5
North Absaroka	89	97	83	100	74	6
North Cascades	**100**	**100**	**100**	**100**	**100**	**0**
Northern Cheyenne	98	100	90	100	100	3
Okefenokee	98	100	93	100	100	2
Olympic	98	100	100	100	94	2
Organ Pipe	96	93	100	97	94	1
Pack Monadnock	99	100	100	100	97	1
Pasayten	93	100	83	97	90	3
Penobscot	93	93	90	94	94	4
Petrified Forest	93	93	100	87	90	3
Phoenix	96	100	93	94	97	4
Pinnacles	97	100	93	100	94	2
Point Reyes	94	97	100	100	81	3
Presque Isle	98	93	100	100	100	2
Proctor Research Ctr.	93	100	90	94	87	3
Puget Sound	93	97	100	90	84	3
Quabbin Reservoir	99	100	100	97	100	1
Quaker City	96	100	97	97	90	2
Queen Valley	94	87	100	97	94	2
Redwood	82	93	80	58	87	4
Rocky Mountain	**100**	**100**	**100**	**100**	**100**	**0**
Sac and Fox	93	87	90	97	100	2
Saguaro	94	93	100	94	90	3
Saguaro West	93	83	90	100	97	5
Salt Creek	96	100	97	100	87	2
San Gorgonio	93	87	100	94	90	4
San Pedro Parks	80	73	87	81	77	6
San Rafael	93	97	87	94	97	2
Sawtooth	83	93	90	68	81	14
Seney	99	97	100	100	100	1
Sequoia	**100**	**100**	**100**	**100**	**100**	**0**
Shamrock Mines	97	93	100	94	100	2
Shenandoah	94	87	100	90	100	3
Shining Rock	82	80	87	94	68	4
Sierra Ancha	81	77	83	84	81	4
Sikes	97	100	87	100	100	2
Simeonof	74	97	70	58	71	6
Sipsey	92	93	93	90	90	2
Snoqualmie Pass	97	100	100	90	97	3
St. Marks	93	87	97	94	97	3
Starkey	**100**	**100**	**100**	**100**	**100**	**0**
Sula	93	90	90	97	97	6
Swanquarter	97	93	97	100	97	1
Sycamore Canyon	95	97	100	84	100	4
Tallgrass	**100**	**100**	**100**	**100**	**100**	**0**
Theodore Roosevelt	97	87	100	100	100	4
Three Sisters	99	100	100	97	100	1
Thunder Basin	69	43	70	61	100	10
Tonto	83	80	97	94	61	6
Trapper Creek	98	97	100	97	100	1
Trinity	92	87	90	90	100	3
Tuxedni	99	100	100	97	100	1
UL Bend	99	100	100	97	100	1
Upper Buffalo	83	93	77	61	100	6
Viking Lake	94	100	83	100	94	5
Virgin Islands	98	100	100	97	97	1
Voyageurs	92	100	100	94	74	3
Washington DC	66	70	87	48	58	7
Weminuche	93	100	90	84	97	3
Wheeler Peak	81	77	87	77	84	3
White Mountain	85	80	87	90	84	4
White Pass	92	97	97	87	87	2
White River	**100**	**100**	**100**	**100**	**100**	**0**
Wichita Mountains	95	90	97	94	100	3
Wind Cave	95	100	80	100	100	3
Wrightwood	93	87	97	97	94	4
Yellowstone	98	97	93	100	100	1
Yosemite	97	93	100	100	94	2
Zion Canyon	82	93	90	55	90	14

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 2011 are:

Aerosol (Channel A) - 49% of all sites

Acadia	Great Basin	Puget Sound
Badlands	Great Sand Dunes	Quabbin Reservoir
Big Bend	Great Smoky Mtns.	Quaker City
Bliss	Guadalupe Mtns.	Queen Valley
Bondville	Hawaii Volcanoes	Rocky Mountain
Boulder Lake	Hoover	Saguaro West
Bridgton	Isle Royale	Salt Creek
Cabinet Mountains	James River	San Pedro Parks
Canyonlands	Jarbidge	Seney
Cape Cod	Joshua Tree	Sequoia
Cape Romain	Kaiser	Shamrock Mines
Capitol Reef	Kalmiopsis	Shenandoah
Cedar Bluff	Lake Sugema	Shining Rock
Chiricahua	Londonderry	Starkey
Cloud Peak	Lostwood	Sycamore Canyon
Crescent Lake	Mammoth Cave	Tallgrass
Denali	Medicine Lake	Theodore Roosevelt
Dolly Sods	Mesa Verde	Three Sisters
Dome Land	Monture	Tonto
Egbert	Mount Hood	Trapper Creek
Ellis	Northern Cheyenne	Trinity
Everglades	Okefenokee	Viking Lake
Flathead	Olympic	Weminuche
Fresno	Pack Monadnock	Wheeler Peak
Gates of the Arctic	Phoenix	White Pass
Glacier	Pinnacles	Wichita Mountain
Grand Canyon	Presque Isle	

Nephelometer - 41% of all sites

Dysart	Mammoth Cave	Thunder Basin
Estrella	Rocky Mountain	Vehicle Emissions
Indian Gardens		

Sites that achieved at least 95% data collection for 3rd Quarter 2011 are:

Aerosol (Channel A) - 10% of all sites

Birmingham	Ike's Backbone	Redwood
Bryce Canyon	Martha's Vineyard	Tuxedni
Columbia Gorge West	Mohawk Mountain	Wrightwood
Fort Peak	Mount Rainier	Yosemite
Great River Bluffs	Mount Zirkel	Zion Canyon
Hercules-Glades	Organ Pipe	

Nephelometer - 41% of all sites

Acadia	Great Basin	Shenandoah
Cloud Peak	National Capital	South Pass

Transmissometer - 100% of all sites

Bridger

Sites that achieved at least 90% data collection for 3rd Quarter 2011 are:

Aerosol (Channel A) - 19% of all sites

Agua Tibia	Douglas	Penobscot
Bandelier	El Dorado Springs	Petrified Forest
Boundary Waters	Frostburg Reservoir	Proctor Res. Ctr.
Brigantine	Gates of the Mtns.	Sawtooth
Caney Creek	Hells Canyon	Snoqualmie Pass
Chassahowitzka	Lassen Volcanic	St. Marks
Cherokee	Makah	Thunder Basin
Columbia Gorge East	Moosehorn	Upper Buffalo
Crater Lake	Nebraska	Virgin Islands
Death Valley	Pasayten	White River
		Yellowstone

Nephelometer - 24% of all sites

Cape Romain	Great Smoky Mtns.	Mount Rainier
Glacier		

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)

IMPROVE

The IMPROVE Newsletter

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TO:

First Class Mail

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 MEMBERS
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