

IMPROVE Steering Committee Meeting Summary
September 6 & 7, 2000
The Inn at Estes Park; 1701 North Lake Avenue; Estes Park, CO
09/11/00 Draft by Gloria Mercer; 09/14/00 Revisions by Marc Pitchford

Overview

The steering committee met at The Inn at Estes Park, in Estes Park, CO, on September 6th and 7th, 2000. A copy of the agenda and meeting participants is attached.

Major discussion topics included:

- Status of the aerosol network expansion (incl. variable stack lengths and inlets)
- Status of the Quality Assurance Program Plan (QAPP)
- Dealing with missing data and appropriate replacement methods
- Data recovery goals (subcommittee formed)
- Status of IMPROVE web site
- New, remote-powered digital camera system

The following summarizes the meeting discussions and resolutions in greater detail as shown in the agenda.

Network Status

Optical: All network sites are operating well except San Gorgonio, which has had problems associated with field operations.

Optical data files are being reformatted with two changes: 1) transmissometer files are being changed to include the instrument number and lamp number used, to assist in analysis, and 2) the naming convention for transmissometer and nephelometer site abbreviation codes is being changed to correspond with aerosol site abbreviations. The new site codes will consist of 4 alpha and 1 numeric value (for example ACAD1 will be the site code for Acadia, and 1 signifies this is the original installation location. ACAD2 would be the second location at Acadia). Transmissometers are also being fitted with a new feedback block to improve the precision of lamp brightening curves used in analysis; tests on the lamp brightening curves will be completed in about six months.

John Molenaar performed some data analysis with optical and aerosol measurements taken during the period of the Bobcat Gulch Fire near Drake, Colorado, this summer. Transmissometers operated along the Colorado Front Range in Fort Collins, Denver, and Rocky Mountain National Park. Although the Front Range showed much smoke impact from the fires, Rocky Mountain National Park appeared to have no impact. Molenaar further investigated the uses of optical data to identify smoke impact from fires. Using 1998 Grand Canyon data, when about 12 fires occurred, rapidly changing visibility was seen from several instruments. These data have been filtered out in the past but Molenaar concluded: 1) optical measurements thought to be "flukes" in the past are real, and 2) rapidly changing visibility is real. Discussion followed regarding filtered and unfiltered data, extremes in data, and mathematical algorithms used. Should

further research be done? This year may be an anomalous year for reconstructed extinctions due to the severity of forest fires throughout the West.

Nephelometer data can be made available quarterly, but transmissometers require annual calibration, so these data are only available once a year. Finally, all of the photo CD-ROMs for the NPS slide spectrums are complete (43 sites).

Aerosol: Currently, 60% of the sites have changed to the 1-in-3 sampling schedule. The remaining sites are expected to change over in the next few weeks.

No aerosol samplers have been lost to fires this year. At Sula, however, fire came over the top of the shelter and sampling halted due to loss of power. All sites have been changed to the Version II sampler except Hawaii Volcanoes and Haleakala, both in Hawaii. The network is comprised of 142 IMPROVE and IMPROVE Protocol aerosol sites at this time. Site abbreviation codes might change to a cluster code to be more representative of the cluster area being monitored. A specific site code, however, will continue to be retained in the database.

→ UCD will provide CIRA with aerosol data for placement on CIRA's FTP site.

A question was raised concerning whether fluoride could be added to the ionic species routinely analyzed? Bob Bachman pointed out that it could be a valuable tracer for Aluminum Smelter emissions, which might be important in the Pacific Northwest.

→ NPS will look into the cost of analyzing for fluoride with the ion analysis contractor.

Bob Eldred demonstrated aerosol filters, cassettes, and cartridges, and explained the operation of each channel. Three weeks worth of filters are delivered to each site in a box for weekly changing on Tuesdays. The filters are pre-weighed for a specific site and day, labeled accordingly, and the information is entered into a database. The boxes are sent back to UCD every three weeks for distribution for analysis, data processing, and validation. Maintenance on the samplers is performed annually. Position 4 in the filter cartridges is a field blank.

Current procedures require that site operators change the filters every Tuesday, but some operators prefer other days or have difficulty changing on some Tuesdays. Perhaps a longer period could be used for performing site visits if Tuesday is not possible, but this would vary depending on the day of the sampling days during the week in question. Operators must call UCD beforehand if they cannot change the filters on the standard Tuesday schedule.

The aerosol samplers have memory cards that hold up to one year of collected data, and are changed with the filters every three weeks. Temperature measurements were discussed.

The IMPROVE Program has set a standard stack length for use with the aerosol samplers, but some sites require a different length. EPA has used modeling to show that FRM samplers with different stack lengths will have no detectable difference in mass concentration. Similar results for IMPROVE Samplers would seem to justify allowing stack lengths up to 4 meters without concern for sample integrity. However to be confident, the steering committee would like to see results of collocated ambient monitoring before making a final change in the sampler specification to allow longer stacks.

- UCD will perform testing at field sites that use longer stack lengths. Results will be presented at the next IMPROVE meeting.

The aerosol network uses a variety of PM₁₀ inlets on channel D. A discussion involved whether IMPROVES needs to use a single type of inlet. About 50% of the network uses the new FRM PM₁₀, inlet from Sierra-Anderson. The other 50% uses inlets from Wedding (no longer manufactured) or the original Sierra-Anderson inlet (found to fill with water). Neil Frank contacted EPA by phone prior to the end of the meeting to inquire about EPA testing of the new inlet for PM₁₀ and found that it meets EPA criteria based upon wind tunnel testing.

Costs to upgrade all inlets to the Sierra-Anderson PM₁₀ type will cost \$50,000. Network uniformity will allow for use of the same equations and will better follow the Federal Haze Rule.

Intercomparison tests of Version I and Version II samplers at Point Reyes were performed using Channel A data collected during Winter 2000. Species analyzed included sulfur, iron, sodium, b_{abs}, organic carbon, elemental carbon, and total carbon, PM_{2.5} mass, PM₁₀ mass, and coarse mass. The results looked very good, being similar to what has been seen in the past with collocated similar versions of the IMPROVE Sampler. The worst correlation, which was with coarse mass, may have been caused by use of dissimilar PM₁₀ inlets.

- UCD will investigate the samplers may have used different inlets PM₁₀ (Wedding vs. Sierra-Anderson).

Sampler operation manuals are available and 1999 aerosol data will be available in a few weeks.

Network Expansion

Currently, 96 samplers are installed, 4 are ready (Wichita Mountain, OK; Haleakala, HI; Hawaii Volcanoes, HI; and Pasayten, WA), and 8 are in progress. Those not ready for installation are: 1) Tuxedni, AK [Alaska prefers that the site be installed on Tuxedni Island, but the only location where that is possible, a cannery, is undergoing a change in ownership]; 2) White Mountain, NM; 3) Trapper Creek, AK; 4) Simeonof, AK; 5) Hoover, CA; 6) Hercules-Glades, MO; 7) Saquaro, NM; 8) Sawtooth, ID; 9) Olympic, WA; 10) San Gabriel, CA; and 11) Aqua Tibia, CA.

- IMPROVE will again look into the use of alternative sites in the Tuxedni area.
- Rich Fisher will push for installation of the White Mountain site this fall.

States and IMPROVE need to approve of monitoring locations cooperatively. Rich Fisher indicated that there was an issue with respect to having federal property on private lands, where land lease agreements are needed between the landowner and the federal land manager. The question was how did other FLMs handle this requirement? Several new network monitoring sites are have been delayed due to lease agreements.

- UCD will create a list of aerosol sites that have lease agreements on private lands.
- A regular monthly conference call regarding network expansion will be scheduled for October.

IMPROVE Protocol Site Status

The IMPROVE Protocol network consists of 16 sites, 8 of which have changed to the Version II sampler. CASTNet has 8 particle 2.5 speciation network sites that are scheduled to switch to IMPROVE samplers in December.

Status of the Quality Assurance Program Plan (QAPP)

The aerosol QAPP (150 pages) is expected to be completed by October 1, 2000. IMPROVE needs to submit it for EPA reviewed by January 1, 2001. IMPROVE should review the document prior to submittal to the EPA OAQPS.

- UCD will deliver copies of the draft QAPP to Marc Pitchford, Tom Moore, Kevin Goohs and Jim Sisler for review.

Does the QAPP discuss routine QA reports?

- Bob Eldred to find out if the QAPP discusses routine QA reports.

Update on EPA's Guidance for Tracking Regional Haze Trends

The "20% worst days" monitored needs to be improved upon and the "20% best days" needs to remain at the same level. The "20% days" deciview haze index will be determined each year and then averaged into 5-year means that are the primary index being tracked. These determinations will be explained in a guidance document for the states, which is expected to be drafted by Spring 2001. The document will include equations for aerosol to extinction to deciview conversion, procedures for missing data (and the effects of having missing data), how to use the relative humidity adjustment factor, $f(RH)$, which is developed for each month at each class I area, and guidance concerning the inclusion of "natural" events such as forest fires.

Update on EPA's and WRAP's Approaches for Determining Natural Background

Natural background conditions and their importance in the Regional Haze Rule were discussed. Natural haze levels at each class I area is the long-term goal of the regional haze regulation so the states need to have an estimate of natural conditions in order to determine a reasonable rate of progress towards the goal. Natural conditions for the worst and best days are not constant from year to year so states will need to have a way to determine the effects of unusually large variations in natural conditions (e.g. smoke impact this year) in their efforts to track progress for regional haze.

A natural background guidance document will describe methods to estimate natural background levels. One approach will expand on work by John Trijonis in the NAPAP State of Science Report #24 where he determined one natural background figure for the West and one for the East. A more complex approach would start with aerosol and other data to estimate each aerosol components natural and man-made split to allow an estimate of each sample periods contribution from natural sources.

The WRAP Fire Emissions Forum is working on a methodology to categorize each fire's emissions into natural and man-made contributions. As the first of the 5-year baseline period for the regional haze rule, this year's extreme fire activity could be influential in setting a high haze level for the baseline and it certainly demonstrates the importance of having some methodology to determine natural and man-made smoke.

Visit Rocky Mountain IMPROVE Monitoring Site

Meeting participants carpooled to the monitoring site to view the Version II sampler and its operation. It was a sampling day; UCD explained how the instrument works. Participants also viewed a nearby ambient air monitoring shelter and its instrumentation.

Reconstructed Extinction for Use in the Regional Haze Rule

A presentation was given showing up to 10 years' of reconstructed extinction data from all long-term sites and what species prevail at those sites. Discussion ensued about identification of worst days, what components contributed to the worst days, the seasons that they tend to occur in, inter-annual variability, and the effects of missing data.

There is currently no good way to identify smoke events in the data; a small workshop will be held this winter to identify a research plan to develop monitoring methods to identify smoke using measurements. Researchers currently have to manually examine aerosol speciation data to look for anomalously high organic and elemental carbon periods, compare these with fire activity and wind patterns to identify periods of likely high fire impacts.

Different data replacement methods were discussed. A prospective approach for identifying worst and best days where there are missing species data is to use the 10th percentile species values to fill in for worst day identification and use the 90th percentile species values to fill in for the best days. See Debbie Miller's work on <ftp://ftp.nps.gov/incoming>. Click on "Miller."

Review of Data Recovery Goals

With the use of IMPROVE data for the regional haze rule, the issue of data recovery becomes much more important. IMPROVE currently has no defined goals (other than 100%) but the aerosol QAPP will need to address this question. Historically aerosol recovery has been about 90% - 95% for each of the aerosol channels separately, but this can translate into lower data recovery statistics if the fraction of sample periods with all major aerosol components is considered. Discussion ensued concerning what the minimum completeness goal should be to consider quarterly data complete. A new index of data recovery that counts complete speciation data periods should be reported in the IMPROVE Newsletter.

→ Gloria Mercer will put a data recovery discussion and explanation in the IMPROVE Newsletter.

To ensure the data recovery goal is reached every quarter, perhaps IMPROVE could institute the collection an extra sample every week for sites that historically have had data recovery problems and use this "contingency sample" only when needed. These extra samples could be evenly interspersed throughout the quarter to be representative of the quarter and to optimize for missing data.

IMPROVE coarse mass is missing more often than any of the other components, presumably because coarse mass requires data from two sampler modules (A & D). Coarse mass is only an important component to extinction during worst days at a few sites where perhaps it would be worthwhile having another direct measure of coarse mass concentration.

Some site operators don't appear to be getting information concerning the IMPROVE program and data uses that might help to motivate them to better performance. They should be getting the IMPROVE Newsletter, but it may not be filtered down from park superintendents to the operators. Site operators also change frequently and may not know how important their work is to IMPROVE or how the data is valuable to protecting the environment.

→ Gloria Mercer will deliver about 150 newsletters to UCD each quarter. UCD will add a newsletter with each filter shipment to the site operators.

→ Gloria Mercer will work with UCD to put together a mission and goals statement taken from the QAPP. Marc Pitchford will review it as a draft. It should be placed in a prominent location near or on each aerosol sampler.

Perhaps sites that fail the data recovery goals be individually identified in the newsletter to draw attention them and presumably affect more rapid improvements. No decision was made regarding data recovery goals; this agenda item will be placed on the next meeting's agenda for further discussion.

→ Data Recovery Subcommittee formed: M. Pitchford, R. Poirot, L. Ashbaugh, and B. Eldred.

Approaches to Cope with Missing Data

Covered above

Data Availability Subcommittee Report

The IMPROVE web site will be the main Internet location for validated IMPROVE data. The public site will collect e-mail addresses of data requesters; so if data are updated requesters can be notified by the system. The web site will also contain graphic views of data with annual and seasonal patterns (e.g., bar charts, isopleth maps, frequency distributions, etc.). Special study data and IMPROVE Protocol data will also be included.

IMPROVE Web Site Subcommittee Report

The web site is progressing and is expected to be complete early in 2001 and can be viewed by the IMPROVE Steering Committee for review and comment purposes only at <http://yampa.cira.colostate.edu/improve>. **This site is not yet ready for public review so please do not share this address with others.** It is designed to be low maintenance; visitors can expect to click on links no more than five times to minimize navigation. Some information (e.g., SOPs, reports, webcams, etc.) may be on other web sites and linked to the IMPROVE site. A forum section with comments, suggestions and questions from users will be available but material submitted will need to be reviewed frequently for appropriateness of submitted comments, which must be signed by the submitter with a valid e-mail address. The site will also contain an IMPROVE metadata page containing a map, photographs of the monitoring sites, site specifications, etc. Example plots will be posted.

Bret Schichtel of CIRA is developing the web site. Send your comments to Bret at telephone: 970/491-8581 or e-mail: Schichtel@cira.colostate.edu.

The IMPROVE web page is similar to WRAP's, which CIRA is also developing; submit suggestions to Doug Fox.

View Monitoring Subcommittee Report

A view monitoring protocol has been drafted and should be final in about 3 months. A presentation was given of the history of view monitoring and different resolution images each type of photographic film image or graphic electronic file image provides. To enlarge an image to 8"x10" or larger and have adequate resolution, either the original photographic slide or a high-resolution image file must be used.

Next Generation View Monitoring

A remote-powered, digital camera system was displayed, which can provide real-time, Internet capable image display. A data logger interface can also be used to collect and display visibility data; several webcams around the country are already using such a system (e.g., Great Smoky Mountains NP, the CAMNET network, etc.). Components of the system include: a Kodak DC290 digital camera, a custom camera controller (stores camera and site parameters), a palmtop computer (user interface to controller), an AC/solar power regulator, and an enclosure. Memory cards are used instead of

photographic film and can hold 128MB (about 100 images or 2 months of data). Site servicing is recommended every two weeks to minimize possible data loss. The memory cards contain JPEG images and a data file that contains camera diagnostics and image information and camera settings.

Image Archival and Distribution

A presentation was given showing the USFS Weminuche slide spectrum on CD-ROM. This information can be placed on a web server but it is currently undecided what web server will store all the images. At present CD-ROM distribution seems the most practical approach.

The appropriateness of associating air quality values from aerosol data with specific photographs was raised and the authoritative response was that it was inappropriate and ill advised. Doing so will result in misinterpretation and may result in unexplained discrepancies in measured aerosol concentrations vs. visual perception for a number of reasons. Perceived visibility as in a photo is instantaneous related to path-averaged aerosol and humidity conditions as well as lighting and other scene related characteristics, while aerosol data are 24-hour averaged-point measurements that don't depend on humidity, lighting, or scenic characteristics. The correct way to show the public aerosol levels associated with images is to use WinHaze. WinHaze is an air quality modeling program used to apply different levels of visual air quality to images for simulation purposes. It is currently available from ARS and will be available on the IMPROVE web site.

Review Action Items

The minutes are expected to be completed in about one week.

An AWMA 2001 Specialty Conference will be held in Bend, Oregon in October. It's time to begin thinking of papers to write for this conference.

The next IMPROVE Steering Committee Meeting will be in 6 to 12 months; UCD has requested to host the next meeting. Network expansion conference calls will continue monthly until the network expansion is completed.

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IMPROVE Steering Committee Meeting Agenda
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Wednesday, September 6

8:30am	Welcome and introductions	Marc Pitchford
8:45am	Agenda review and revisions	Marc Pitchford
9:00am	Network status (data recovery, technical issues, etc)	
	Optical	John Molenaar
	Particle	Lowell Ashbaugh
10:00am	Break	
10:15am	Network expansion – progress, problems & plans (sites yet to be installed, sampler performance, flow & temperature data, 1 day in 3, site documentation, etc)	Lowell Ashbaugh & Bob Eldred
11:15am	IMPROVE Protocol site status (9 FLM, 16 state/tribal, 8 CASTNET)	Lowell Ashbaugh
11:30am	Status of Quality Assurance Program Plan	Bob Eldred
12:00pm	Lunch	
1:30pm	Update on EPA's guidance for tracking regional haze trends	Marc Pitchford
2:00pm	Update on EPA's & WRAP's approaches for determining natural background	Marc Pitchford
3:00pm	Visit Rocky Mountain IMPROVE monitoring site Carpool to site	
5:00pm	Carpool to dinner for those interested	

Thursday, September 7

8:00am	Reconstructed extinction for use in the Regional Haze Rule	Mark Scruggs
8:30am	Review of data recovery goals	Marc Pitchford
8:50am	Approaches to cope with missing data	Marc Pitchford
9:20am	Break	
	Reports by subcommittees:	
9:45am	Data availability	Scott Archer, Bill Malm, & Rich Poirot
10:00am	IMPROVE web site	Mark Scruggs, Scott Archer, & Bill Malm
10:15am	View monitoring	Mark Scruggs, Sandra Silva, & Bill Malm
10:30am	Next generation view monitoring	John Molenaar
11:00am	Image archival & distribution	Bob Bachman
11:30am	Review action items & next meeting	Marc Pitchford
12:00pm	Adjourn	

IMPROVE Steering Committee Meeting Participants
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Joe Adlhoch	ARS
Lee Alter	NESCAUM
Scott Archer	BLM
Lowell Ashbaugh	UCD
Bob Bachman	USFS R6
Scott Cismoski	ARS (9/7)
Rob Crump	USFS / NRIS / Air Module
Dave Dietrich	ARS
Bob Eldred	UCD
Dan Ely	STAPPA / ALAPCO / Colorado Air Division
Rich Fisher	USFS
Neil Frank	EPA - OAQPS
Doug Fox	CIRA
Kevin Goohs	Colorado Dept. of Public Health & Environment / APCD-QA
David Joseph	NPS
Bob Lebens	WESTAR
Debbie Miller	NPS
Gloria Mercer	ARS
John Molenar	ARS
Kristi Morris	FWS
Dave Maxwell	NPS
Rich Poirot	NESCAUM / Vermont DEC
Marc Pitchford	NOAA
Ivar Rennat	ARS (9/6)
Kristi Savig	ARS (9/7)
Mark Scruggs	NPS
Sandra Silva	FWS
Jim Sisler	NPS / CIRA / CSU
Jim Wagner	ARS (9/6)