

## **IMPROVE Steering Committee Meeting Summary March 21 & 22, 2002**

**Louisiana Dept. of Fisheries & Wildlife Bldg.; 1600 Canal Street; New Orleans, LA**  
03/25/02 Draft by Gloria Mercer, Final edited by Marc Pitchford

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### **Overview**

The steering committee met at the Louisiana Department of Fisheries & Wildlife building in New Orleans, LA, on March 21 and 22, 2002. A copy of the agenda and meeting participants is attached.

Major discussion topics included:

- Status of the Quality Assurance Program Plan (QAPP)
- Aerosol data availability and lag time
- New XRF system
- Special study at the Yosemite site and other studies
- Optical data availability
- New optical instrumentation
- State review of preliminary data and flags
- 10-year spatial/temporal sulfur trends
- RPO Web-based data system
- Future of scene monitoring

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

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### **Welcome and Introductions**

Four news items were mentioned at the start of the meeting: 1) the USFS is close to establishing a new IMPROVE Protocol site in southeast Alaska (near Sitka, Ketchikan, or surrounding area), 2) the OAQPS is working on the WRAP Annex to the Regional Haze Rule, BART, and other regulatory issues, 3) Scott Archer announce that the deadline for submittal of AWMA Bend, OR conference papers for publication was extended because of problem with the BLM email system, and 4) the FWS created and has available a 20-minute videotape titled "Cleaning the Air."

### **Aerosol Network Status**

#### **QAPP**

The Quality Assurance Project Plan (QAPP) has been submitted to EPA. The few minor items that remain to be addressed will be taken care of by the end of March. EPA has stated it will approve the it, but since it is living document it will have continuous revisions to reflect the changes in the monitoring system. Flowcharts were presented that showed the QA organizational structure of the aerosol network, including management, laboratory and field activity, and independent audit responsibilities. Aerosol filters are analyzed by three laboratories (Teflon filters at Research Triangle Institute [RTI], quartz filters at Desert Research Institute [DRI], and nylon filters at University of California-Davis [UCD]). These three laboratories are contracted independently by the NPS. Laboratory audits will be performed by the EPA-Montgomery laboratory. UCD performs Level 1 and some Level 2 validation on the aerosol data, but standard operating procedures are needed for the validation that CIRA performs. CIRA is currently working on documenting these procedures.

The primary purpose of the aerosol network is to obtain the data needed to calculate light extinction from the major aerosol components (i.e. organic and elemental carbon, fine soil, nitrate, sulfate, and coarse mass) at each monitoring site. Its secondary purpose is to quantify trace constituents that are useful for source attribution assessment. Data quality objectives have been developed to meet the primary purpose of the program.

The QAPP focuses on the aerosol network, which is funded by EPA. EPA does not fund, the optical and scene monitoring by IMPROVE, though it appreciates the value of those measurements. States/tribes and other will undoubtedly use optical data in connection with the Regional Haze Rule implementation. The question was raised “should the optical and scene monitoring activities of IMPROVE be included in what is currently the aerosol monitoring QAPP, in a separate QAPP, or not at all. There are detailed standard operating procedure documents already available for these activities, but they are not summarized in a single document, as would be the case if a QAPP were prepared. The discussion considered how important was a QAPP for the optical and scene monitoring activities in terms of the use of those data and the possible increase in their credibility. A decision about whether to commission the preparation of a QAPP for optical and scene monitoring was postponed until more information was available. ARS was asked to provide an estimate of the cost of preparing such a QAPP

→ ARS will determine the effort and costs needed to prepare an optical QAPP.

### **Comparison Study with Speciation Trends Network**

IMPROVE and the National Speciation Trends Network (STN) are conducting a data comparability study that involves collocated sampling at 6 sites in 3 regional areas (Seattle-Mount Rainier, Phoenix-Tonto, and Washington DC-Dolly Sods). Initial data are expected to become available by the end of summer.

### **Field & Lab Audits**

IMPROVE aerosol monitoring will be subject of an independent audit of field and laboratory activities conducted by EPA. The EPA laboratory in Las Vegas, NV is responsible for the field audits, while the EPA laboratory in Montgomery, AL will conduct the laboratory audits. EPA has already begun a similar effort to audit the STN. Some results were shown of the laboratory performance when analyzing unknown samples provided by EPA to the STN sample analysis contractor (Research Triangle Institute) compared to analysis of replicate samples by EPA. Audit plans for the IMPROVE program have not yet been finalized.

### **Site Deployment**

Maps showing the growth of the IMPROVE Program since 1978 depict an increasing number of monitoring locations throughout the U.S. All 110 IMPROVE sites selected to provided Class I Area representative data were deployed by January 2002. However, a large gap still exists in the middle of the country, due to a lack of Class I areas in that region. An additional 18 IMPROVE Protocol sites sponsored by a number of the states and tribes in the region will be deployed by mid-May and should go a long way toward filling the gap.

## **New Samplers**

URG has the contract from UCD to manufacture IMPROVE aerosol samplers made to the same specifications as the already deployed ~140 samplers. URG uses the same CNC machine shop to fabricate the cyclones as UCD did. The cost for a four-module IMPROVE aerosol sampler is about \$16,000 each. The URG contract is for 40 samplers of which five have been delivered to date and were found to be of good quality.

## **Site Documentation**

Aerosols monitoring site photographs and site descriptions have been compiled. UCD has been sending this information to CIRA for inclusion in the site metadata section of the IMPROVE web page to make these publicly available. Topographic maps for each site will be included on the IMPROVE web page by a link to a map web site.

## **Data Recovery & Lags**

A handout was provided showing percentages of 2001 data completion and summary explanations of the reasons for data losses. The overall average completeness (i.e. to be complete all four filters must be good for each sample period) for the network for the period Summer 2000 to Winter 2001 is 89%. This compares to 84% for the period 1992 to 1998. While the network-averaged completeness is acceptable about 14 of the sites failed to meet the EPA draft guidance for completeness (75% for the year, 50% for each quarter and no more than 10 in sequence missing). Most often these sites have personnel and/or technological related issues contributing to their performance problems.

The steering committee is committed to improving the data completeness statistics for all of the poorly performing sites and to maintaining the good performance of the majority of the sites.

The discussion concerning personnel issues contributing to poor data completeness at some sites included: the need for prompt feedback to the responsible field operator organizations so that corrective action can be taken; these organizations should also routinely receive data recovery statistics so that they can acknowledge good work by successful operators. We need to motivate sites operators by making them feel apart of this important program. Ideas discussed included feature articles in the IMPROVE Newsletter or web site to acknowledge the excellent operators, creating an operator calendar with the sampling days marked, and provide a certificate showing the operator was trained and is certified in operating the equipment.

- ➔ A committee was formed to take action to improve operator performance (K. Morris, B. Bachman, R. Bishop, D. Maxwell, M. Pitchford).
- ➔ ARS will add in the newsletter the site names and operators to acknowledge outstanding performance at top sites.

Regarding technological issues, most stem from power, weather, or equipment problems. Some sites are located at the end of power lines, other sites are susceptible

to lightning. One solution to power problems at a few sites may be to equip them with alternate power systems (solar, wind, etc). The Tuxedni site operates using wind and diesel generators, but could be supplemented with a solar system. The optical network sees lightning hits all the time; these sites can be reconfigured so the instrument won't be knocked out. Some sites are also slow in installing replacement equipment, which may be a personnel problem either at UCD or the monitoring sites.

A schedule of data availability for the 2000 and 2001 data was published on the first page of the most recent IMPROVE Newsletter. Minor revisions to that schedule including the time required for CIRA to do quality assurance review are already apparent however the current plan continues to reflect that all of the aerosol data will be caught up to the end of 2001 by the end of this summer and in future each quarter's data will be available within 4 to 6 months of the end of the quarter.

→ UCD and CIRA will revise the schedule of data availability.

→ ARS will publish a revised data availability chart in the next newsletter.

### **New XRF System**

UCD plans to stop using PIXE and instead use a new XRF system consisting of a copper anode run in a vacuum. Advantages of the XRF system are: 1) better detection limits, 2) less filter damage, 3) not subject to shutdowns related to western electrical energy shortages, and 4) provides flexibility to the analysis schedule. A disadvantage is longer per sample analysis time. A molybdenum anode XRF has been used for a number of years to improve sensitivity for some of the heavier elements. The copper anode system provides significantly improved performance for the lighter elements. Two copper and two molybdenum XRF systems are planned to improve sample analysis throughput for the IMPROVE program. UCD will fund the \$75,000 systems; a date of operation is unknown at this time.

### **Carbon Analysis – Carbonate Issue**

The IMPROVE carbon analysis method does not explicitly account for carbonate carbon when it apportions the carbon into the various organic and elemental carbon fractions. This could represent a source of uncertainty if the fraction of PM<sub>2.5</sub> carbon that is carbonate is large. The National Speciation Trends Network attempts to separate carbonate with a high temperature fraction prior to adding oxygen to the analysis system. To explore the magnitude of the issue for IMPROVE, DRI conducted an investigation using IMPROVE data and some of the unused portions of the quartz filters. Carbonate was removed by an acid wash from unused portions of IMPROVE samples that were selected as likely to have the highest carbonate concentrations as inferred by high fine calcium measured on the coincident Teflon filters. The results are that carbonate carbon was an infrequent and small contributor to both organic carbon and elemental carbon for nearly all IMPROVE samples tested. Therefore carbonate carbon analysis is not needed because the values are probably too low to affect the quantification of organic and elemental carbon.

## Special Studies Proposal

Several proposals for special studies designed to aid in meeting the IMPROVE goals or to help resolve issues concerning the adequacy of IMPROVE measurements were presented for consideration by the steering committee. These include smoke attribution studies, smoke physio-chemical characterization, further characterization of fine particle ions, coarse particle concentration, nitrate issues, and scattering efficiency issues. IMPROVE currently has some excess funds due to a slower than planned deployment of the expanded aerosol network. The steering committee has been asked to advise EPA concerning the use of these one-time only available funds.

This year, an NPS sponsored smoke attribution study will take place in Yosemite National Park. It is estimated that 50% - 90% of organic carbon at remote area monitoring sites is due to fire, and that emissions in the western US from prescribed fire programs are expected to increase by a factor of 10 in the coming years. NPS would like IMPROVE to supplement their special studies with daily 24-hour coarse and fine speciation for one site. UCD estimates the additional analyses for the 3-month study will cost about \$38,000. The Yosemite study's purpose is to: 1) develop unambiguous and routine biomass smoke apportioning methodologies, and 2) characterize the biomass smoke physical, chemical, and optical properties. Another component of the study that could be funded by IMPROVE would measure water-soluble potassium and/or coarse particle PIXE potassium at 10 sites for 6 months with an estimated cost of about \$20,000.

A study proposed for 2003 involves measuring all ions on the nylon filter for one year to better understand sulfate ammoniation, as well as other ionic species for about 100 of the IMPROVE sites at a cost of about \$300,000. The purpose of this study would be to develop the data needed to determine whether ammonium ion data should be routinely analyzed for at some or all sites, year-around or seasonally in order to do a better job of determining the contribution to light extinction by sulfate.

Mass and extinction budgets determined at Big Bend based upon sophisticated measurements during the BRAVO Study show variations in the sulfate mass scattering efficiency and the importance of coarse particle nitrate. The coarse mass nitrate is thought to be from sea salt that has been changed in the atmosphere to sodium nitrate. One of the proposals is to do PM<sub>10</sub> speciation at some or most sites for a year to assess the extent and importance of this type of information for credible aerosol reconstructed extinction using IMPROVE data.

The decision concerning which special study proposals would be included in the steering committee recommendations to EPA was postponed until next month due to a lack of sufficient time to fully consider the merits and cost of the various proposals and to allow time for refinement of the proposals. The chairman will compile and forward brief written descriptions of the special studies presented during the meeting, as well as others that may be generated by steering committee members to the steering committee for their comments in April. By some combination of email and/or conference calls the chairman will poll the steering committee to determine its recommendation to EPA.

## **Optical, Scene, and Meteorological Network Status**

### **Status of Network**

The optical network is operating well, without significant problems. All historical data has been reprocessed into calendar quarters.

### **Data Recovery & Lags**

Nephelometer data are complete through December 2001 and have been delivered to CIRA. Transmissometer data are complete through December 2001 and will be delivered to CIRA by May 2002. Standard delivery occurs annually, each spring, but can be delivered quarterly, or in real-time if IMPROVE desires (real-time requires additional funds). NPS digital cameras and exhibits using real-time are being installed at several locations (e.g., Seney NWR), but require additional equipment and cost more. Examples of real-time data displays include the Grand Canyon Web site (includes a digital image and air quality/meteorological values), the visitor exhibit display at Big Bend, the SO<sub>2</sub> alert system at Hawaii Volcanoes, and the Acadia Web site, CAMNET Web site, and MWHazecam Web site.

Discussion followed regarding how often and how soon the IMPROVE steering committee wants to have data available. The consensus was that it should be more often than annually updated, but didn't need to be more frequently than monthly to avoid additional costs. Quarterly updates seems appropriate. Nephelometer data can easily be available quarterly but transmissometer data requires additional effort to be distributed more often than annually. Nephelometer data will be available on a quarterly basis from now on. ARS will implement the change in the next few months.

This prompted a discussion regarding the trade-off between fast access to data that is preliminary and may change with additional validation or waiting for the fully validated data and avoiding having to either redo analysis or having decisions made on not yet fully validated data. Validation flags were discussed. Additional discussion of this topic is summarized below in the Proposals for State Review of Preliminary Data.

### **New Instrumentation**

The Optec NGN-3 is an enclosed 2.5-micron size-cut nephelometer that heats the sample by approximately 15-degrees C. A relative humidity feedback system could be designed for the instrument so that a constant low relative humidity would be maintained. This would minimize excess heating that affects other volatile species such as nitrates and organics.

A newly designed transmitter for the transmissometer is being tested in hopes to correct the lamp-brightening problem.

WinHaze is being updated and should be available in about 1 week. The new version, WinHaze 2.8.5 (approx. 100mb), includes over 60 scenes. The cost to include additional scenes is \$2,500 per scene. Work is being done to combine WinHaze, VisualHaze, and aerosol calculations. This work should be complete in about 6-12 months.

## General Topics

### **Proposals for State Reviews of Preliminary Data**

States and Tribes want to be able to review data prior to public release, to afford an opportunity to flag non-typical, local air quality events (e.g., grass fires, high winds, dust storms) and identify other problems that they may see with the data. They propose two options. Option 1 includes making data available to State and Tribes for 30 days via a password. Option 2 includes releasing preliminary data to the public in a way that makes it clear that it is only preliminary. It would then be transferred to a final data file upon review. Descriptive terms such as “final,” “certified,” and “reviewed” were discussed. The review period for states and tribes would be from 1 to 2 months, but under option 2 the data in preliminary form is available to the public during this period of time. The steering committee concluded that IMPROVE should use Option 2.

- ➔ Marc Pitchford with the assistance of Bret Schichtel and Ray Bishop will draft the data review and availability policy.

### **Plans for RPO Web-based Data System**

The steering committee was briefed at the last meeting on the WRAP data archive and analysis system that will provide access to all regional haze related data, data products and data analysis tools for the western US. Recently the other Regional Planning Organizations responded positively to an invitation to partner in a national scale system with the same goals. Such a system is expected to enhance technological knowledge, skills, and resources of users; promote use of quality-controlled data; and reduce costs, increase efficiency, and minimize conflicting data analysis results. The archive will include all ambient air quality, meteorological, and summary emissions data useful for regional haze implementation plans. The system will provide user-defined data retrieval, be searchable for annual data summaries, and include data analysis tools and descriptive documentation. The scope of work for this system should be released in about one month. The proposed name for it is the Visibility Information Exchange Web System (VIEWS).

### **IMPROVE Web Page**

During the past year, the IMPROVE Web page has been continuously upgraded. It now includes: raw data, IMPROVE activities documents (e.g., meeting minutes, newsletters), guidance documents, educational materials (Introduction to Visibility has been animated), aggregated data and graphics, gray literature, new glossary terms, scene monitoring images and site specifications, special study data, aerosol metadata, standardized site codes, and topographical maps (which might link to TopoZone.com in the future). USFS information is located on the USFS Web site, which the IMPROVE Web site will link to. Later this year, a QA/QC section will include the QAPP and QA/QC analysis results. Future upgrades include: adding optical data, creating html-based educational programs, linking to the WRAP annual report (which is due to change to the proposed VIEWS Web site), adding additional QA/QC documents, etc.

The proposed VIEWS Web site will house the integrated haze database, data analysis products, and data analysis tools

## **10-Year Spatial/Temporal Sulfur Trends**

An assessment of particulate sulfur and SO<sub>2</sub> trend for four regions of the country was presented to the steering committee. Scatterplots using 10-15 IMPROVE and CASTNet collocated sites shows good comparison of results between the two programs with a mean relative difference of 0%, thus justifying the use of their data together in sulfur trends analysis. 90<sup>th</sup> percentile sulfate concentrations are lower during Summer 1995-1999 than during Summer 1990-1994 at many locations. The Ohio River Valley and the Southwest showed decreasing sulfate, but the West did not change much. The winter periods of 1995-1999 also showed much less sulfate than during the winter periods of 1990-1994. Net SO<sub>2</sub> emission trends from 1990-1999 showed the Northeast and the West with decreasing concentrations, while increases were found in states in the center of the country (ND, WY, CO, TX, NM, LA, AR, MN, and NC). Sulfate and SO<sub>2</sub> annual trend lines are very similar in each region of the country examined.

## **Plans for a Critical Review of Visibility: Science & Regulation**

A review will be completed and published in the September issue of the AWMA journal, following the AWMA conference in Baltimore in June 2002. Objectives of the review are: 1) to summarize laws, rules, and guidance related to regional haze, 2) examine science that supports visibility implementation, 3) identify discussion points for guidance, and 4) predict changes likely to occur in the 65-year quest for natural visibility conditions.

Conclusions: 1) much of the current knowledge of regional haze comes from the IMPROVE network and special studies, 2) current knowledge of poor visibility and its causes is inconsistently contemporary, summarized, evaluated, interpolated, qualified, and perceived, 3) guidance provides a good start, but needs to have a revision process built in, 4) the deciview is an imperfect, but objective measure of visibility that is appropriate for measuring reasonable progress, 5) each of the aerosol components can be quantified reasonably accurately, with the exception of organic and elemental carbon, 6) scientific justification for natural conditions, extinction efficiencies, 24-hour extinction, and humidity growth is unconvincing in guidance, 7) spatial and temporal data needed for planning are abundant, but are poorly assembled and disseminated, 8) emission factors and chemical profiles used for emissions inventories do not represent contemporary or future emitters, 9) a complex source apportionment model is usually not a sophisticated model, 10) models will never demonstrate attainment, measurement of good air quality will, 11) applying a single model will provide a number, applying several models will supply doubt, but weight of evidence is the only way to make a decision, 12) regional emissions reductions will be more efficient and effective than single source approaches once the region is defined, and 13) interpollutant trading is feasible with better knowledge of emissions and limiting precursors.

Predictions for 2065: 1) guidance will need to be modified at 5-year intervals, 2) reasonable progress goals will be detectable by 2018 and more difficult to detect thereafter, 3) some of the worst and best visibility will be found to be dominated by non-anthropogenic sources (e.g., wildfire), 4) global background from non-US anthropogenic emissions will set the effective baseline in excess of natural conditions, 5) filters will be replaced by in-situ measurements at IMPROVE sites, 6) carbon wars will still be fought, 7) models will still be imperfect representations of reality, and 8) visibility will be better in cities and parks.

## **Future of Scene Monitoring**

Scene monitoring, as documented in the Scene Monitoring Criteria Document (July 2001), is an important part of the IMPROVE program. Of the 110 Class I area sites in the expanded network most have not had any scene monitoring. The FWS has 21 sites total. It will operate 3 more digital cameras this year to document visibility conditions, but monitoring at additional sites will take more time. Could IMPROVE provide additional funding? Option 1 is that IMPROVE would purchase the equipment and the FLMs would pay for operation and processing. Option 2 is that IMPROVE would fund both the equipment and the operation of additional scene monitoring sites. Costs to install and operate one camera site for one year are \$10,000. A proposal will be submitted to IMPROVE the chairman in April to be combined with the special study proposals for funding recommendation.

- M. Pitchford will e-mail proposal topics discussed throughout the meeting for response and action, by the end of April. Persons submitting proposals should provide options and bring forward ideas during April.
- S. Silva will write a proposal for photographic needs.
- B. Malm will write a proposal for an ammonia/coarse mass study.
- R. Poirot will write a proposal for the development of an NGN-3 RH feedback system.
- D. Anderson will write a proposal for laboratory comparison (UCD and NAREL) of collocated IMPROVE samplers at Organ Pipe NM.

## **Quarterly Newsletter**

Ideas for upcoming feature articles include: 1) a summary of the Critical Review of Visibility: Science & Regulation (J. Watson), 2) sulfur trends analysis (B. Malm), 3) the Tuxedni site configuration (K. Morris), 4) a regular feature focusing on site operators who give extra effort to monitoring, and what the challenges they encounter to service their sites, and 5) a regular feature "operator's corner" informing site operators about potential problems and how to avoid common mistakes.

A brochure providing an overview of the IMPROVE Program would be beneficial to the general public and site operators. This could be an additional feature in the IMPROVE Newsletter.

## **Other Topics**

None.

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**IMPROVE Steering Committee Meeting Agenda  
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Wednesday, March 20

Breton Island Site Visit (advanced reservations required): 6:30am meet at Holiday Inn Express East hotel for a ride to the Fish & Wildlife Service dock for the boat trip to the Breton Island monitoring site. Recommended clothing includes rainproof outerwear since the boats are open to the elements. We'll find a place for participants to purchase bag lunches for the day. Return to the hotel is anticipated by 5:00pm.

Thursday, March 21

<u>Time</u>	<u>Topic</u>	<u>Discussion Leader</u>
8:00am	Welcome, Introductions, & Agenda review Status of aerosol network:	Marc Pitchford
8:30am	QAPP, comparison study with Speciation Trends Network, field & lab audits	Bob Eldred & Jewell Smiley
9:15am	Site deployment, new samplers, & site documentation (e.g., photos, maps, etc.)	Lowell Ashbaugh
9:40am	Data recovery & data lags	Bob Eldred
10:00am	New XRF system	Lowell Ashbaugh
10:30am	Break	
10:45am	Carbon analysis – carbonate issue	Judy Chow
11:15am	Aerosol special studies proposal	Bill Malm
12:00am	Lunch	
	Status of optical, scene, & met network:	
1:15pm	Status of network	John Molenaar
1:45pm	Data recovery & lags	John Molenaar
2:00pm	New optical instrumentation General topics:	John Molenaar
2:30pm	IMPROVE Web page	Bret Schichtel
3:00pm	Proposals for state reviews of preliminary data	Ray Bishop
3:30pm	Break	
3:45pm	Plans for RPO Web-based data system	Marc Pitchford
4:15pm	10-year spatial/temporal sulfur trends	Bill Malm
5:00pm	Adjourn for the day	

Friday, March 22

8:00am	Plans for a critical review of Visibility: Science & Regulation	John Watson
8:30am	Future of scene monitoring (photography)	Sandra Silva
9:00am	Quarterly newsletter – ideas for future articles	Gloria Mercer
9:30am	Other topics	
10:30am	Adjourn	

## IMPROVE Steering Committee Meeting Participants

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