IMPROVE Steering Committee Meeting Summary
September 26-28, 2006
Training Facility; Mammoth Cave National Park, KY
10/20/06 draft by Gloria Mercer, edited by Marc Pitchford

Overview

The Steering Committee met at the Training Facility in Mammoth Cave National Park, KY, on September 26-28, 2006. A copy of the agenda and meeting participants is attached.

Major discussion topics included:

- Network reduction plan
- Optical/scene operation update
- Aerosol operation update
- Ion and carbon analysis
- Quality assurance audits
- IMPROVE and VIEWS Web sites
- Sea salt assessment
- WRAP Technical Support System
- RAINS and ROMANS studies

Major resolutions of the Steering Committee decided at the meeting include:

- The network reduction plan developed in response to public comments on an earlier plan to deal with possible reduced funding from EPA was endorsed by the Steering Committee and will be transmitted to EPA in a letter from the Chair.
- IMPROVE data will be updated monthly and posted to the IMPROVE web site within six months from the end of the sample month (e.g. January's data will be posted by the end of the following July). If complete fully quality assured data are not available in time, all available data, clearly labeled as preliminary, will be posted on this same schedule. This resolution applies retroactively and will be implemented within two months, thus all data from 2005 to May of 2006, will be posted by the end of November 2006.
- IMPROVE web site will implement data version labeling and control, to ensure that all users are aware of the version (identified by date) of the data they are using.
- IMPROVE web site will develop a web page to provide routinely generated quality assurance information to interested users. This will include calibrations, audits, alternate measurements (e.g. same elements on alternate XRF units), lab and field blank values, etc. The goal is to have this implemented by January 2007.
- An IMPROVE data advisory will be used to document and communicate the recently identified calibration issues associated with use of XRF sulfur analyzed prior to 2005. It will recommend that users select sulfate from ion chromatography of the B channel filter as a more accurate measure of the particulate sulfur than the XRF analysis of sulfur on the A channel filter.

The following summarizes meeting discussions in greater detail as shown in the agenda. Presentations material used during the meeting are available on the IMPROVE web site at http://vista.cira.colostate.edu/improve/Activities/activities.htm

Field site tour
Before the meeting began, the group traveled to the air quality monitoring site. Site operators Bob Carson and Johnathan Jernigan explained the purpose of the IMPROVE and other air monitoring instrumentation operating at the site.

Welcome and introductions
The meeting started with Patrick Reed, Park Superintendent, who welcomed the group, and acknowledged that Mammoth Cave was excited to be chosen to host the IMPROVE group. Meeting attendees then introduced themselves.

Plan for reduced EPA 2007 funds
The 2007 EPA budget for the IMPROVE Program is expected to be reduced as much as 15%; final funding is expected to be announced in December. A 15% cut in funding would equal a 30% site reduction to the IMPROVE aerosol network. The IMPROVE plan to deal with the anticipated budget reduction was performed in three steps:

- Step 1 - the Site-Specific Information Committee, with members from the Regional Planning Organization (RPO) representatives, completed their assessment in June 2006.
- Step 2 - the Plan Development/Implementation Committee with members from state and Federal Land Manager (FLM) representatives completed their assessment in July 2006.
- Step 3 - the Plan Review Committee was comprised of the IMPROVE Steering Committee. A public review of the drafted network reduction plan from this step was completed August 2006, and response to the public review was available for IMPROVE Steering Committee consideration in September 2006.

The presentation included an overview of the method and resulting priority ordered list of 35 sites that would be used to reduce cost if funds were insufficient for the current network. The methodology and results of this entire process was widely distributed to states, RPOs, FLMs, the Environmental Protection Agency (EPA), and the public for review in July 2006 for a 30-day comment period.

Comments received were organized by region and became the basis of the IMPROVE Steering Committee Step 3 final reduction plan. A compilation of the comments received from 18 states, 5 RPOs, 4 EPA regions, and numerous FLMs is available at the FTP site: ftp://vista.cira.colostate.edu/Public/IMPROVE/NetworkAssessment (Username: cira\guest and Password: orion).

Prior to the meeting, in a series of conference calls over a three week period Steering Committee members decided to use the IMPROVE goal of generating data that is representative of the visibility protected federal Class I areas as the guiding principle for its plan. Not only was this consistent with many of the comments received, but it simplified the deliberations and facilitated development of the Step 3 final plan that was reviewed and approved at the Mammoth Cave meeting.

Working from the Step 2 list of sites, the Steering Committee made a few minor changes to the sites, conducted additional data analysis for all sites in the modified list and their potential replacement sites, and used the results to distribute the sites into four categories based on the perceived ability of the replacement sites to represent the visibility protected federal class I areas of the listed site.

The modifications to the list all resulted from the decision that IMPROVE Protocol sites shouldn't be counted on as replacement sites, as was done in the Step 2 process. The ultimate affect of this was to remove two sites from the list (Saguaro, AZ and Lostwood, ND) because there were no IMPROVE replacement site with a sufficiently similar data sets. Great Gulf, NH; Dolly Sod, WV; and Medicine Lake, ND, which also had been listed with Protocol site replacements in the Step 2 list did have sufficiently similar IMPROVE replacement sites to stay on the decommissioning list using the methodology of the Step 2 site selection approach.)

The sites from the modified list were distributed into four categories: 1) non-Class I areas sites, 2) replaceable sites, 3) non-replaceable sites, and 4) conditional sites. All eight of the EPA Protocol (formally CASTNET sites) were placed in the non-class I area category since they were never intended to represent Class I areas. Three sites were categorized as replaceable because of the similarity of the data sets of those sites and their replacements. Twenty-five sites were categorized as non-replaceable because of the dissimilarity of the data sets for the sites and their proposed replacement sites. Two sites were categorized as conditional since there was one or fewer complete years of paired data upon which to decide the similarity between the sites and their proposed replacement sites. The four site category lists are attached at the end of the summary.

Additional analyses were used to distinguish which sites had IMPROVE site replacements and which sites did not have suitable replacements. These assessments included:

- Extinction/extinction budget tests (the largest change in annual mean aerosol light extinction between two sites should not exceed 25% on clean days and not exceed 50% on hazy days).
- Seasonality tests (monthly frequencies of haziest days should have an $r^2 > 0.5$ and monthly frequencies of cleanest days $r^2>0.5$).
- Annual trends test (the difference in annual trends should be less than 1 dv).

Failure of any of these tests resulted in a site being listed in the non-replaceable category. The lists of sites in each category (at the end of the summary) are in alphabetical order, not by priority for decommissioning. Once the EPA 2007 funding for IMPROVE is determined, the Steering Committee will convene a meeting to identify which sites from the various lists would be decommissioned.

EPA should determine the fate of the eight EPA protocol sites in the non-Class I area sites category. From the IMPROVE prospective these sites are of lowest priority. The three sites in the replaceable category would be high on the list of sites that would be

decommissioned if budget shortfalls require cutting that deeply. The 2005 data should be available so that sites in the conditional category can be assessed and assigned to the replaceable or non-replaceable category prior to the need to identify sites for decommissioning. Selection of sites for decommissioning from the non-replaceable list will be made using a number of factors, including the number and degree to which the sites failed the three tests, the numbers of Class I areas that would be without representation (some sites represent multiple Class I areas), similarity of source areas, haze sensitivity to additional pollution, modeling results and other technical, logistic, and equity factors.

Next steps in coping with a reduced budget. The IMPROVE Steering Committee endorsed the plan presented during the meeting (summarized above), and authorized the chair to draft a short letter to the EPA that emphasizes the reasons that decommissioning of any IMPROVE sites at this time is ill-advised, and to provide a summary of the plan for downsizing the network as may be required due to funding reductions. The letter will also indicate that the IMPROVE Steering Committee will make the final selection of sites when they know the magnitude of the budget cuts. In the mean time information that can be used to inform the final selection of sites will be organized and an effort to identify possible sponsors for potential decommissioned sites will be undertaken in the hopes that at least some of the IMPROVE sites selected for decommissioning will continue operation as Protocol sites. A number of meeting participants offered to help draft the letter, which will be sent to the Steering Committee prior to being finalized.

Network Operations Updates

Optical. The National Park Service (NPS) program has instituted large budget cuts for the coming year. In 2005, 65 optical instruments operated compared to 53 that will continue to operate next week. Wyoming (due to recent oil/gas production) and Arizona have the largest state-run networks. All optical standard operating procedures (SOPs) are current.

Transmissometer data from 1986 (inception) through 2004 have been reprocessed and the data were delivered to the Cooperative Institute for Research in the Atmosphere (CIRA) in August 2006. Transmissometer data for 2005 were delivered to CIRA in September 2006. Nephelometer data will be delivered this week.

A new ambient $PM_{2.5}$ nephelometer has been developed, called the “NGN-hybrid”. The new instrument is a modified NGN-2 with a new chamber and pump, and an LED light source that does not radiate heat or dry particles. The instrument costs $3,000. The NGN-3 is a $PM_{2.5}$ nephelometer, but it is not an ambient instrument; it must be operated indoors. ARS is also testing the new LED light source in the regular NGN-2 instruments as well. The cost to operate an NGN-2 is $17,000-$20,000/year, so no cost benefit would occur to replace an IMPROVE aerosol sampler with a nephelometer system.

URG and Air Resource Specialists (ARS) are developing a project using modified Channel C aerosol samplers, to be installed at Speciation Trends Network (STN) sites this winter. A total of 50 instruments will be installed during a three-month period. URG has named the new instrument the URG3000N sampler. Research Triangle Institute (RTI) will perform the filter handling and Desert Research Institute (DRI) will perform the carbon analysis for the project. ARS is developing the software to run the instrument.

Scene. The Webcam network is the same as it was in 2005. The cost of Webcam systems has increased while the size of the cameras has decreased, but with better resolution. All scene SOPs are current.

Aerosol. Sites decommissioned during the past year include:
- Ambler, AK
- Hillside, AZ
- Walker River Paiute Indian Tribe, NV
- Spokane Tribe, WA
- Connecticut Hill, NY.

Sites added include:
- Egbert, Ontario, Canada
- Makah, WA (began operation in August 2006 for a 1-year period to evaluate shipping effects).
- Penobscot, MA, has replaced the Old Town site.

Urban sites currently operating include:
- Puget Sound, WA
- Phoenix, AZ
- Washington, DC
- Fresno, CA
- Birmingham, AL
- New York, NY
- Detroit, MI (Module C only)
- Pittsburgh, PA (Module C only)
- Atlanta, GA (Module C only)

Urban sites decommissioned include:
- Rubidoux, CA
- Houston, TX
- Chicago, IL

Year 2005 data recovery for Channel A is 95%, and for each of the calendar quarters is 94%, 96%, 96%, and 96%. Data recovery for all channels for the year is 93%, and for each of the calendar quarters is 92%, 94%, 92%, and 94%. These statistics are comparable to years 2003 and 2004. Six sites failed collection criteria in 2005: Breton Island, LA; Domeland, CA; Fort Peck, MT; Indian Gardens, AZ; San Pedro Parks, NM, and Trinity, CA. This compares to 2003 and 2004 also. Filter shipping to and from the

field was switched from the Postal Service to FedEx last year, to avoid lost or delayed packages and provide tracking capabilities at an additional cost of about $50,000.

Data delivery: UC-Davis (UCD) is continuing to develop a new database that significantly enhances their ability to track data and provide a historical record for the data. Aerosol data have been delivered to CIRA through December 2004. Delays in delivering data are due to the transition to a new XRF system, conversion to the new database, and recent calibration questions. 2005 data are expected to be completed in early 2007. UCD's goal is to catch up to a 6-month data submittal lag time. Note that the Steering Committee with the concurrence of UCD resolved that the 6-month lag should be implemented for all aerosol data retroactively. Even incomplete or not fully quality assured data will be made available on this schedule by the end of November 2006 and will be placed in the preliminary data location and clearly labeled as such. (See the resolutions on the first page of this summary.)

Special studies: UCD has developed a new approach for ion artifact corrections. In the past the artifact correction was determined by the median field blank value during the month or quarter of data to be delivered. But blank levels tend to change by filter lot, not by month or quarter. Beginning in spring 2006, a blank is sent to every site at the beginning of each new filter lot (approximately annually), and the median value of these blanks is used as the artifact correction throughout the lifetime of that lot.

The IMPROVE sampler temperature probe has been redesigned. The existing probe has used a ±10°C temperature tolerance to match the flowrate tolerance, but the STN prefers ±2°C, and they will be using an adaptation of the IMPROVE sampler beginning in a few months. The new probe uses a temperature-stable diode, and all tests have shown a tolerance of less than ±2°C.

Inlet clogging due to insects still occurs at a few sites. A new inlet was designed and is easier to clean, but it still clogs on occasion. All sites have this new filter inlet. A newer fine mesh screen to keep insects out has been developed and is being tested – the new screen design will be installed at monitoring sites next summer.

Nitric acid denuder tests: Tests by Colorado State University staff have demonstrated the high efficiency (approaching 100%) of the denuder plus the sampler inlet. Nylon filter efficiency for capture of nitric acid was determined to be near 100% and should be expected to remain high throughout the 24-hour sampling period under the conditions typically encountered in the IMPROVE network.

IMPROVE sampler cyclone characterization tests: The IMPROVE sampler uses passive flow control and the flowrate can decrease with filter loading. Tests in 1990 found a strong dependence of cutpoint on flowrate. These older UCD tests relied on limited data, but more recent tests used additional data. The recent tests indicated significantly less sensitivity of the cutpoint to the flowrate compared with the 1990 tests, confirming test results obtained by Walter John when he designed the cyclone in 1980. To account for this different relationship, the flowrate will be reduced to approximately 22 lpm when sampler calibrations are performed next spring and summer.

Sulfur and sulfate trends: Background was presented on the new, vacuum XRF system and quality assurance of its operations. Concerns with calibration of elemental sulfur analysis may have implications in XRF analysis prior to 2005. Recommendations made to the IMPROVE Steering Committee are: 1) Use ion chromatography (IC) as the preferred sulfate measurement, 2) temporarily withdraw all XRF sulfur from the database, and 3) highlight the change on the Web site and issue a data advisory.

An assessment of the impacts of using sulfate ion instead of elemental sulfur for the baseline period in the RHR was conducted. On the worst haze days the 3*sulfur/sulfate ratio varied from 0.9 to 1.1. In the west sulfur was typically a few percent greater than sulfate, but in the east sulfate was typically a few percent greater than sulfur. On the best haze days sulfur was greater than sulfate at 140 out of 160 sites and 5% greater averaged across all sites. Ammonium sulfate is a small contributor to natural background light extinction, so changing sulfur to sulfate would have a negligible effect on natural background conditions. Using a simple roll back model it was found that substituting sulfate for sulfur in the regional haze rule would have little effect on control strategies to meet the new 2018 progress goal. The substitution would require additional SO_2 emissions reductions of 0 – 0.8% at about 60 sites and 0 – 0.3% less SO_2 emission reductions at about 50 sites.

During discussions of these recommendations the Steering Committee decided to accept recommendations 1 and 3. For recommendation 2, it was decided that the XRF sulfur values wouldn't be withdrawn from the web site; additional work will be done to better understand the extent of the calibration issue and a new version of the raw data will be added to the web site with appropriately applied calibrations. Also, it was decided that the RHR version of the five-year baseline data set will not be changed (i.e. by the use of sulfate ion in place of elemental sulfur) to avoid the disruptions to the use of baseline data for SIP application, since the differences for the RHR are minor. This issue and all changes will be fully described in prominent locations on the IMPROVE and VIEWS web sites to inform data users.

Ion analysis. RTI's Environmental Chemistry Department staff provided an overview of laboratory operations. For IMPROVE's ion analysis, 7 people work on RTI's team, using 10 Dionexion chromatographs and other instrumentation. Each year, RTI prepares approximately 22,000 IMPROVE filters for ion analysis, approximately 250 SO_2 filters, and 1,200 passive O_3 filters. Approximately 400 nylon filters are received every 7-10 days. These filters are stored in a freezer in a locked custody room until they undergo the extraction process. Nylon, quartz, and passive O_3 filter preparation was discussed as well as their extraction procedures.

NAREL, the National Air and Radiological Environmental Laboratory, checks RTIs filter extraction procedures and has found excellent comparability between the two laboratories.

Carbon analysis. Desert Research Institute (DRI) changed from IMPROVE Protocols to IMPROVE_A Protocols in October 2005, using Model 2001 analyzers. Comparative study of the two protocols shows little differences in the total carbon (TC) and the

organic and elemental carbon fractions (OC and EC). DRI analyzed 30,000+ samples on the IMPROVE_A Protocols so far, beginning January 1, 2005 through March 31, 2006. Differences between the Model 2001 and the DRI/OGC analyzers might affect comparability. The percent occurrence of negative charring (OP) was determined to have a minimal effect on visibility (using 11,450 measurements from January 2000-December 2004). The IMPROVE_A Protocols correct for temperature differences.

Comparisons of the Model 2001 and DRI/OGC samplers are consistent with each other, except at the OC4-EC2 levels, most likely due to deterioration of the DRI/OGC analyzers. Higher uncertainty should be assigned to these levels for trend analysis. The DRI/OGC analyzers are over 20 years old and as they age, future comparison data have are expected to show more disparities that are of limited value. DRI indicated that they would develop trends information showing the effects of the old analyzer deterioration which could then be cited as the rationale for discontinuing further analyses using the DRI/OGC analyzer at the end of sample year 2006.

Another study involved filter backs and backups, to determine how similar they are. Laboratory-generated source emissions were used to better understand carbon fractions and different analysis methods. Wood smoke EC/TC ratios varied by thermal methods used. Different sources studied included diesel, acetylene flame, electric arc, graphite, wood smoke, and carbon black. Methods used for study included IMPROVE_A Protocol, STN Protocol, and the French 2-step method. Results found increased NaCl concentration in the sample matrix shifts the results with more of the EC2 showing up as EC1. The presence of ammonium sulfate suppresses pyrolysis; charring is minimized in the presence of ammonium sulfate, but not for sodium sulfate. The presence of NaCl increases the oxidation rate of EC at lower temperatures, thereby shifting thermal carbon fraction to lower levels; this leads to negative OP in the DRI/OGC analyzers. Carbon aerosol can be generated in the laboratory within ±15% for diesel exhaust, acetylene, and 50% for wood smoke.

Carbon analysis goals for the next five-years include: to better understand the composition of blanks and minimize/correct for its effects, to provide more specific and useful carbon fractions, to analyze more specific optical properties of the filters, and add additional detectors for more specific information (could PMF be useful?).

Quality assurance audits. Audits are not covered by the IMPROVE Program funds, but are covered as part of a broader EPA quality assurance effort for the particle monitoring programs. A total of 34 IMPROVE samplers at 35 sites were audited last year. This is 21% of the network, just short of the program's goal of 25%. Generally, the samplers are doing well. Some findings are already being addressed by UCD. For example, as a temporary fix, UCD has advised operators to duct tape calibration adapter plugs that have fallen out of several samplers. They are resolving an issue with the temperature sensor (a diode issue). Operators are being trained to reset clocks and temperature. A procedure to track follow-up actions is needed and is under development. A comparison of actual flowrate measured by a reference standard and the design values is needed and has been implemented.

In 2006 eight training courses were held across the U.S. to train auditors. A total of 30 people representing states, RPOs, and Tribes received certifications as auditors. The success of the training has created a need to facilitate better coordination between state and regional auditors. OAQPS is considering using EPA regional staff to recertify and audit the auditors.

Changes for 2006 include:

- A revised training course and field manual,
- Audit SOPs are now available on CD.
- The routine sampling event cartridge is used to perform audits (uses an unexposed onsite filter). Worksheets have been revised to record the audit position.
- Worksheets use site coefficients and site data that are cut and pasted from UCD Excel spreadsheets (eliminates transcription errors).
- A revised worksheet is used to reflect a temperature MQO acceptance value of ±10°C (a 10°C change results in a calculated flowrate change slightly > 2%).
- The sampler's represented sampling event date and time have been added to the worksheet.
- Site conditions are evaluated against the siting criteria in the IMPROVE QAPP.
- The reference flowrate is compared to the theoretical (design) flowrate.

Challenges for 2007 include: work with UCD to add specific MQOs to the Technical Systems Audit forms and critical findings. UCD OAQPS/ORIA and CIRRRA will develop better procedures for providing auditors with site-specific flow coefficient data. The OAQPS/ORIA will revise the training manual and SOPs in 2007. Future plans are to streamline electronic reporting of audits and to develop an electronic recertification system.

Independent laboratory QA support is provided through NAREL in Montgomery, AL. Support includes: PT samples (single-blind samples analyzed at different laboratories), laboratory TSA (onsite inspection and interviews with lab staff), and special studies (experimental investigations). Experimental comparison of labs includes gravimetric mass analysis, ion chemistry, total optical carbon, and XRF analysis. Seven labs are participating (California Air Resource Board, DRI, Oregon DEQ, RTI, UCD, NERL, and NAREL – National Air and Radiation Environmental Laboratory). Each lab is sent samples collected by a set of collocated samplers at NAREL to be analyzed. EPA also analyzed these nominally identical samples. UCD's analytical performance was good, with results that are comparable to those of the other laboratories including EPA's. An interesting problem was discovered with nickel concentrations being different from different samplers used to collect the PT samples. The problem was traced to corrosion of the nickel plating on some of the $PM_{2.5}$ cyclones. A final report on the laboratory audits will be prepared later this year. The 2005 report is available at www.epa.gov/ttn/amtic/files/ambient/pm25/ spec/multilab06.pdf.

Data Processing & Dissemination

Guidance in aerosol data interpretation. IMPROVE began making collocated measurements in 2003. For each of the four types of modules, there are now seven duplicates in routine operation. At Phoenix all four modules are duplicated; at other sites only one module is duplicated, so there are 25 different sites with at least one collocation. Plots were shown comparing collocated data for various parameters; estimated and observed precisions were tabulated. Higher-than-predicted imprecision is observed for the crustal elements and the thermal fractions of carbon. The formulas used to estimate uncertainties and MDLs are under review and will be updated to be more realistic.

Several data advisories have been posted on the IMPROVE web site to give guidance on specific issues of sampling and analysis. Two of general interest concern one-in-six-day copper artifacts from non-IMPROVE hi-vols and sporadic zinc contamination by filter labels. Plots were shown that demonstrate changes over time in the calibrations of sulfur and other light elements, and the systematic underestimation of aluminum detection levels. Data advisories on these two issues are in preparation.

IMPROVE & VIEWS Web sites. The IMPROVE Web site contains monitoring data metadata, publications, quality assurance documentation, etc. The VIEWS Web site contains current, quality assured data to be used for regional haze plans. VIEWS is funded by the RPOs. The site sees approximately 2,400 visitors per month and has 870 registered data users from 150 countries. There are about 450 data queries per month. Future additions to the sites include adding more data, more quality assurance documentation, data advisories, new tools and enhancements of existing tools, and the educational section. Also the VIEWS site has the regional haze rule metrics (best/worst 20% days), the best/worst 20% bext flags on daily data, and new natural conditions estimates using the revised statistical approach. The regional haze rule metrics are provided using both the old and new reconstructed light extinction equations. Aerosol data are added monthly, nephelometer data are added quarterly, and transmissometer data are added annually. CIRA has a written policy on changing/posting of data and is available on the VIEWS site (data changes are applied once per year if necessary).

It was suggested that the IMPROVE/VIEWS websites need to do a better job at version control for the IMPROVE data. Suggestions included stamping each downloaded dataset with a version number and linking to documents describing the changes in the different version of the data. In addition, request users to include a standard reference in reports and publication which use IMPROVE data. The reference would include the data version number and date the data were downloaded from the websites. A committee is to be formed and headed by Bret Schichtel to explore these ideas and others and facilitate the implementation of enhanced data version control.

Some have suggested that the IMPROVE and VIEWS Web sites be combined at a future date, since they both provided IMPROVE data. However, the IMPROVE website more completely documents the IMPROVE Program than VIEWS, while VIEWS contains dataset from other programs and data analysis tools not available on

IMPROVE. Because both websites are operated in a cooperative way at CIRA, there is very little inefficiency associated with having both. For functions of VIEWS to be added to the IMPROVE website, additional funding would be needed to cover the staff required to continue to ingest the other datasets and maintain the other unique VIEWS functions.

New IMPROVE Report. The new IMPROVE report, expected to be completed within one month, will be the last version of the report as we know it. It includes data for IMPROVE and STN networks for better U.S. coverage of measurements. Clear and hazy day dv trends include data from 1995-2004.The outline is as follows:

- Section 1 – Data summary.
- Section 2 – Special study summaries.
- Section 3 – Quality assurance studies.

Interpretive Displays. Youth today use a lot of digital communications, including graphics, animation, video, and sound, with interactivity and expectations of results of usage. The interpretive air quality exhibit at Sequoia NP, CA, was designed to appeal to a younger audience with touch screens to change behavior of users and give them an understanding of air quality. It uses state-of-the-art technology, is maintenance-free, and includes bilingual communications. The system was designed with Flash Macromedia in a modular design for easy upgrade. The system was installed April 2006 and upgrades are performed via FTP from CIRA.

Data Uses & Interpretation

Sea Salt Assessment. Sodium is a good indicator for sea salt but is not reliably determined by XRF, which replaced the PIXE measurement in December 2001. Since the change to a larger filter in 2000, the IMPROVE measurement of chloride ion on Nylon behind a denuder provides a satisfactory tracer for unreacted (fresh) sea salt. Point Reyes (CA), Redwood (CA), Simeonof (AK), Cape Cod NS (MA), Martha's Vineyard (MA), and Virgin Islands NP often have fresh sea salt concentrations exceeding 1 ug/m^3. Other indicators of sea salt include: potassium, strontium, and calcium (all non-crustal).

WRAP Technical Support System (TSS). The 2003-2008 plan included analysis and emissions inventories for all western Class I areas. The TSS was designed to help states complete their SIPs. Five major points of the TSS are:

- Year 2018 is the baseline for visibility under the Regional Haze Rule progress goals. The most uncontrollable $PM_{2.5}$ emissions are wildfires.
- WRAP EGU SO_2 emissions are declining.
- Mobile source NO_2 emissions are declining.
- Source apportionment options for regional haze are: the weighted emission potential method (multiplied by inflow patterns) and CAMx and CMAQ. It takes 16-17 hours of computer time to model one day of data on the CAMx PSAT.

- The technical support system was developed and includes a summary of data, documents methods and resources, and includes interactive displays. A new version will be available in three weeks.

Administration & Communications

Budget & Contract Administration. Contracts issued in 2006 include: DRI, RTI, UCD, and ARS. The IMPROVE interagency agreement expires April 2007. The contract proposal process and review was presented.

The IMPROVE budget for July 2006-June 2007, for the IMPROVE and protocol sites is

- UCD $3,600,000
- DRI $850,000
- RTI $375,000
- ARS $100,000
- CSU $430,000
- Overhead $50,000

to cover the cost of the IMPROVE and IMPROVE Protocol aerosol monitoring sites.

IMPROVE Quarterly Newsletter. The newsletter has been produced quarterly since 1982. ARS is responsible for production and distribution of the publication, and receives very little input from IMPROVE participants. The newsletter is distributed to approximately 400 individuals and 180 site operators (who receive their newsletter in a filter shipment). Cost to print and mail is $950 per quarter. An e-mail delivery of the newsletter is available and 9 individuals have opted for this delivery.

Special Studies

MANE-VU Regional Aerosol Intensive Network (RAIN). The study includes three sites oriented along the direction of transport to the Northeastern U.S., including Frostburg, MD; Mohawk Mountain, CT; and Acadia NP, ME. Analyses of preliminary data including hourly aerosol composition data and visibility conditions were shown. All sites monitor hourly $PM_{2.5}$, SO_2, O_3, meteorology, continuous sulfate, 2-hour EC/OC, wet nephelometer data for b_{scat} visual range, and a high-resolution Webcam. Some sites also monitor trace CO and NO/NO_y.

A report was released in May 2006, which summarizes the first three quarters of data, and reviews data quality and consistency. The report is available on the NESCAUM Web site. It appears that from 1995-2006, substantial amounts of EC and OC are transported into the northeast U.S. from southern Canada to the west, probably from wildfires. Sulfate is generally from the principal source region in the Ohio River Valley.

Future plans include adding sites at Pinnacle State Park, NY, a New Hampshire site, and perhaps other sites.

NPS ROMANS. The study is the Rocky Mountain Atmospheric Nitrogen and Sulfur Study, which measured visibility reduction and ecosystem effects, and assessed the sources of nitrogen and sulfur contributions across the Colorado Front Range and statewide. Effects are more pronounced on the eastern side of the Continental Divide than on the western side. The study included gaseous monitoring (NH_3, NO_x, NO_y), particle monitoring (NH_4, NO_3, organics) and cloud and wet deposition monitoring (NH_4, NO_3, organics).

Algae growth was also noticeable in lakes in the study area due to nitrogen deposition. Total deposition appears to peak in March and in July-August. Wet deposition is 70% of the total deposition. Wet ammonia trends also shows an approximate 60% increase in the Rocky Mountain region. The area often sees pollutant trapping in the winter months due to temperature inversion layers.

Preliminary results from the spring portion of the study showed that the composition of the pollution mix (sulfate, nitrate, ammonium) varied among episodes. Nitrate episodes were usually associated with air flow from the east. Sources of nitrogen appear to be dominated by ammonia emissions from agriculture operations and NO emissions from power plants and automobiles.

Next meeting. The group thought the next meeting should be hosted at a USFS facility next year, between May and October. The next meeting should be held in the West if possible.

Bob Carson thanked the group for coming to Mammoth Cave.

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IMPROVE Steering Committee Meeting Agenda
September 26-28, 2006
Training Facility; Mammoth Cave National Park, KY

Time	Topic	Discussion Leader
	Tuesday, September 26	
8:00am	*Site tour – bus leaves from the training center*	*Bob Carson (NPS)*
10:00am	Meeting called to order at the Training Center	Marc Pitchford
10:05am	Welcome to Mammoth Cave	Patrick Reed, Superintendent
10:15am	Introductions and agenda review	Marc Pitchford
10:45am	Current status of IMPROVE planning for reduced EPA 2007 funds for IMPROVE	Marc Pitchford
12:15pm	Lunch	
	Network Operations (status of sites, data & SOPs)	
1:45pm	Optical & Scene monitoring	John Molenar
2:30pm	Aerosol monitoring	Chuck McDade
3:30pm	Break	
3:45pm	Aerosol monitoring (continued)	Warren White
4:15pm	Ion analysis	Eva Hardison
5:00pm	Meeting adjourned for the day	
6:30pm	*Mammoth Cave Star Chamber Tour (2+ hours) Assemble at the Mammoth Cave Hotel*	*Bob Carson*
	Wednesday September 27	
8:00am	Carbon analysis	Judy Chow
9:00am	Independent quality assurance	Jeff Lance, Dennis Crumpler & Jewell Smiley
	Data Processing & Dissemination	
9:45am	Guidance in aerosol data interpretation	Warren White & Bret Schichtel
10:30am	Break	
10:45am	IMPROVE & VIEWS Web sites	Bret Schichtel
11:10am	New IMPROVE Report	Bret Schichtel
11:40am	Interpretive displays	Julie Winchester
12:10pm	Lunch	
	Data Uses & Interpretation	
1:30pm	Sea salt assessment	Warren White
2:15pm	Natural levels for the Regional Haze Rule using the new IMPROVE algorithm	Marc Pitchford
3:00pm	Break	
3:15pm	WRAP Technical Support System (TSS)	Tom Moore

Time	Topic	Discussion Leader
	Administration & Communications	
4:00pm	Budget & contract administration	David Maxwell
4:20pm	IMPROVE Quarterly Newsletter	Gloria Mercer
4:40pm	Open discussion or schedule catch-up	Marc Pitchford
5:00pm	Meeting adjourned for the day	
	Thursday September 28	
	Data Processing & Dissemination	
8:00am	MANE-VU Regional Aerosol Intensive Network (RAIN)	George Allen
9:00am	NPS ROMANS	Bill Malm
10:00am	Break	
	Discussion of Future Issues	
10:15am	Next steps in the process for coping with a reduced budget	Marc Pitchford
11:30am	Next meeting (time of year & location)	Marc Pitchford
11:45am	Meeting adjourned	

IMPROVE Steering Committee Meeting Participants
September 26-28, 2006
Training Facility; Mammoth Cave National Park, KY

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Site Categorizations from Step 3 of the Network Downsizing Plan

List of eight non-class I area sites.

AREN1	Arendtsville	PA	EPA
BOND1	Bondville	IL	EPA
CADI1	Cadiz	KY	EPA
COHI1	Connecticut Hill	NY	EPA
LIVO1	Livonia	IN	EPA
MKGO1	MK Goddard	PA	EPA
QUCI1	Quaker City	OH	EPA
SIKE1	Sikes	LA	EPA

List of three replaceable monitoring sites and their replacement IMPROVE sites

CACR1	Caney Creek	AR	FS	UPBU1
COHU1	Cohutta	GA	FS	GRSM1
VOYA2	Voyageurs	MN	NPS	BOWA1

List of two conditional sites that have one year of common data with the replacement site.

KAIS1	Kaiser	CA	FS	YOSE1/SEQU1/HOOV1
ZICA1	Zion Canyon	UT	NPS	BRCA1

List of twenty five non-replaceable sites and their replacement IMPROVE sites.

CAPI1	Capitol Reef	UT	NPS	CANY1
DOSO1	Dolly Sods	WV	FS	SHEN1
GRGU1	Great Gulf	NH	FS	LYBR1
HAVO1	Hawaii Volcanoes	HI	NPS	HALE1
HECA1	Hells Canyon	OR	FS	STAR1
HEGL1	Hercules-Glades	MO	FS	UPBU1
HOOV1	Hoover	CA	FS	BLIS1
ISLE1	Isle Royale	MI	NPS	SENE1
KALM1	Kalmiopsis	OR	FS	REDW1
LABE1	Lava Beds	CA	NPS	LAVO1
LIGO1	Linville Gorge	NC	FS	SHRO1
MELA1	Medicine Lake	MT	FWS	LOST1
MOHO1	Mount Hood	OR	FS	THSI1
MOOS1	Moosehorn	ME	FWS	ACAD1
NOAB1	North Absaroka	WY	FS	YELL2
SAGA1	San Gabriel	CA	FS	SAGO1
SAMA1	St. Marks	FL	FWS	OKEF1
SAPE1	San Pedro Parks	NM	FS	BAND1
SIAN1	Sierra Ancha	AZ	FS	TONT1
SYCA1	Sycamore Canyon	AZ	FS	GRCA1
THRO1	Theodore Roosevelt	ND	NPS	LOST1
TRIN1	Trinity	CA	FS	REDW1/LAVO1
WHPA1	White Pass	NM	FS	MORA1
WHRI1	White River	CO	FS	MOZI1/WEMI1
WICA1	Wind Cave	SD	NPS	BADL1