Summary of the 1/26 & 1/27/98
IMPROVE Steering Committee Meeting
Prepared by Marc Pitchford 2/9/98

Presentations and discussion topics at the meeting generally followed the agenda (attachment 1) and will be summarized below in the same order. Also attached is a list of attendee's (attachment 2). The text in bold are highlighted to indicate schedules or activities that may require steering committee or contractor activity in the near future.

Organizational interests and news:

EPA's public comment period for the proposed new regional haze rule ended in early December. Several thousand comments were received in total and for the most part those that addressed monitoring generally indicated the need for more monitoring.

NESCAUM is using the IMPROVE data in a trajectory climatology analysis supported by the Forest Service (FS). Contact Rich Poirot for additional information. A progress report is available at the web site capita.wustl.edu/ neardat under the 'Activities' heading.

NESCAUM, WESTAR, and STAPPA states have concerns about additional monitoring by IMPROVE for a number of reasons. The proposed haze regulation makes the monitoring data more important to the states since they are the basis for determining whether additional emission reductions would be needed to meet visibility targets. The states have the responsibility for ensuring the collection and use of the data to determine whether the targets are met. Last but not least, EPA is proposing to use resources to expand the program that would otherwise be available to the states for the fine particle program or to conduct their own visibility monitoring. Because of the increased future importance of visibility data, some states will want to have a significantly greater voice in site selection.

The States of Utah, Arizona and Alaska as well as King County, WA were also represented at the meeting and reinforced these concerns. The cost of establishing and operating sites in Alaska has that states officials concerned that the resources for expanding IMPROVE are inadequate to the task. In Arizona, the state is monitoring at 9 locations. They would like to see resources for expanded monitoring come to the state to be used to support their efforts.

The FWS indicated a settlement was reached with Georgia Pacific that will result in emission reductions at their paper mill near Moosehorn class I area in Maine. Photographic and other data supported by IMPROVE was instrumental in reaching the settlement agreement.

NPS indicated that preliminary results from special studies at Grand Canyon last summer show that the absorption coefficient is a significant fraction of the extinction coefficient (between 5% and 20%) and yet the uncertainty in an absolute sense is high (i.e., measurements have good precision, but absolute values are uncertain). More is being planned to resolve this issue.

The FS is interested in following up on the issue of the IMPROVE quartz filters that were requested by Glen Cass (Cal. Tech.) for separately funded analysis to assess the impact of wood smoke. FS supports the work and would like to expedite the request. (This issue will be resolved as soon as possible.) The FS indicated that the settlement with the operators of the Centralia power plant in Washington that would result in SO_2 controls is being appealed by a person in the Seattle WA area. A concern was also voiced that more emphasis should be placed on methods to assess urban emission impacts with the IMPROVE monitoring data.

Generally the federal land managers (FLM's) are enthusiastic about the opportunity to expand the visibility monitoring to additional class I areas. However, the FLM's also have concerns about the need for field operations support for new sites. For all of the existing IMPROVE sites the FLM's provide the site operators. Another FLM concern is the fate of the monitoring that they conduct outside of the purview of the IMPROVE programs (so called "look-alike" or "protocol" sites). Some of these sites have only IMPROVE aerosol channel A (Teflon filter for mass and elements).

<u>IMPROVE activity review</u>:

IMPROVE nephelometer monitoring was reduced from 9 to 5 locations last fall due to insufficient FS resources for operational support (for data analysis, reporting, calibrations, maintenance, etc.). The sites where nephelometers were discontinued include Boundary Waters, Dolly Sods, Jarbidge, and Upper Baffalo Wilderness areas. Optical data files are being reformatted to accommodate the year 2000 and beyond. The new format also combines and simplifies the data flags for the nephelometer and transmissometer. Nephelometer data now does not include the Rayleigh scattering term (a constant that was added to the data), it only has the particle scattering. Optical data is available and complete through summer of 1997.

The transmissometer lamp brightening issue is becoming better understood through series of tests that show it to be related to the change in polarization of the lamp light with age. This problem is exacerbated by the optical geometry of the transmitter lamp and feedback detector. A modification of the design should greatly reduce the need for a lamp aging correction and reduce the uncertainty of the data. A transmissometer that uses a LED instead of a filament light source is undergoing tests, however, to date it does not perform as well as the current design. John Molenar distributed a paper titled "Analysis of the Real World Performance of the Optec NGN-2 Ambient Nephelometer" presented at the Bartlett, NH visibility conference and submitted for publication in the Journal of the Air and Waste Management Association. The paper uses IMPROVE and other monitoring data to assess the nephelometer used in the network.

The IMPROVE newsletter as well as downloadable copies of the WinHaze program are now available on the Web (www.air-resource.com for WinHaze and www.aqd.nps.gov/natnet/ard/impr/index.htm for the newsletter). The WinHaze program is an easy to use method to see the effects of haze impairment of a scene using computer image processing techniques. Currently there are 27 scenic images that can be used, many of the photographs are from the IMPROVE program. A more sophisticated program called "VisualHaze" (not as user friendly & much slower) that allows greater flexibility in the air pollution and optical conditions simulated is being beta tested. It is available from Yahya Golestani at (970) 491-8692.

The IMPROVE aerosol data recovery is about 94%. The data for the A, B, and D modules of the sampler is available for Summer 1997. Data for the C module (carbon) lags the other by about 3 to 6 months. Brief updates were also presented on a number of issues that are undergoing further studies. These include: comparisons of the absorption coefficient measurement using the hybrid integrating plate and integrating sphere method to other techniques; the organic artifacts on quartz filters; rare cases where coincident sulfate and sulfur data do not match (seems to be caused in some way by masking the filter which is no longer being done); assessment of the effectiveness of neutralizing static charges on filters prior to weighing them; and the effects of relative humidity in weighing filters. During the aerosol presentation, the question was asked whether it would be possible for the mass data to be available much sooner to aid states in making better use of the data. **In response to a question, the University of California – Davis (UCD) representatives indicated that they thought that preliminary mass data could be made available within a few weeks of the sampling. They also agreed that the relative humidity in the weighing and filter equilibration room would have to be actively controlled or that weighing would be restricted to extended periods of relative humidity between 30% and 40%.**

EPA's plans for IMPROVE:

EPA has proposed integration of the IMPROVE program with the national $PM_{2.5}$ monitoring program in recognition of a number of common technical and policy issues. From a technical perspective the pollutants and majors sources of concern for the $PM_{2.5}$ and regional haze perspective are the same and they operate on the same regional scale. The aerosol monitoring methodology is very similar as well as the interest in chemical speciation for both visibility and PM program needs. Language in the new $PM_{2.5}$ regulation anticipates and promotes the integration of the IMPROVE monitoring program with the national PM monitoring program. One of the reasons that the secondary standard for $PM_{2.5}$ was set to the same level as the primary standard is that the proposed regional haze rule is expected to afford an appropriate level of protection for the most sensitive of the welfare effects, visibility. The new $PM_{2.5}$ standard permits the use of data from the IMPROVE samplers for background and transport sites, in spite of the fact that the IMPROVE sampler is not a federal reference or equivalent method for $PM_{2.5}$.

For the last several years EPA's contribution to the IMPROVE program has been earmarked for supporting the aerosol monitoring at each of the IMPROVE network sites. EPA proposes to expand the resources to IMPROVE in order to increase the coverage of the network to provide monitoring representative of all class I areas that can reasonably be covered by routine monitoring. EPA's plans would also request that the IMPROVE protocol be changed to make it more compatible with the national program. Specifically they are requesting that IMPROVE operate on the national 1 day in 3 schedule for sampling, the past and new data be stored in the new AIRS database, and that a fraction of the IMPROVE sites have collocated $PM_{2.5}$ sampling with gravimetric analysis (precision check). The specific proposal would call for an additional 78 IMPROVE sites to add to the existing 30 sites in class I areas. Twenty new sites would be deployed in 1998 and the remaining 58 new sites would be deployed in the following year. EPA contribution to IMPROVE would be increased to cover the cost of the new sampler, retrofit the 30 existing samplers, and to cover the laboratory analysis, data processing, etc. expenses. As has been the case in the past the FLM's are being asked to provide the field personnel needed to operate the samplers.

It is EPA's desire that the expanded IMPROVE network in combination with other sites run by the FLM's would adequately meet the monitoring requirements of the proposed regional haze regulations to provide representative data for all of the class I areas. EPA recognizes that practical difficulties at a few class I areas (e.g. lack of power anywhere near the area) will prevent any reasonable efforts to routinely monitor aerosol (e.g. Bering Sea). At such locations other provisions to estimate progress towards meeting the visibility goal (short-term periodic monitoring, modeling, or the like) would be permitted to fulfill regulator requirements. It is also anticipated that an expanded IMPROVE network will provide $PM_{2.5}$ data that could be useful at some locations to aid states in the implementation of the new PM regulation.

<u>Organizational concerns about IMPROVE expansion</u>:

Each organization represented at the meeting was asked to comment on the EPA proposal from their organizational perspective. A number of common themes were evident in the comments made. To facilitate summarizing this section of the meeting, the comments are organized into six broad topics of concern that seems to cover all of the comments.

1. Resources: How does EPA propose to fund the expansion? Through states or directly to the FLM, or some other way? Are the resources sufficient to expand to a total of 108 sites? Will the FLM's have sufficient resources in to provide the field operations as anticipated by EPA?
2. Siting: The details siting of monitoring is more critical because of the intent to use the data as the basis for determining progress towards the visibility goal in the newly proposed haze regulation (in a sense its compliance monitoring). How will the decision be made concerning which class I areas receive monitoring? Will any non-class I areas be considered? For class I areas with substantial elevation relief should we

monitor on the mountain tops or valley bottoms or can we monitor at both? We need to review siting criteria used for the original network to insure its adequacy and also check that current sites meet appropriate siting criteria. Some states would like to be involved and have some say in the site selection.

3. Data quality assurance: For most people familiar with the IMPROVE monitoring data, it has a good reputation for quality. However, many people with a future need to use the data are not familiar with it. We need to document quality assurance procedure in a separate report that describes the procedures and performance. As much as possible IMPROVE should adopt procedures that are similar to those required by EPA for state and local agencies for PM monitoring and analysis programs.
4. Haze rule: How will the reconstructed extinction be calculated using aerosol data and how does the deciview scale work? How will the background or current visibility levels be determined from the monitoring data, and who will make these calculations? How will sources be identified (monitoring or modeling) and by whom? How does forest management practices including controlled burning fit into the new haze regulation?
5. Schedule: The schedule seems rather ambitious. Can the proposed expansion be accomplished that rapidly? Will the existing contractors that operate the IMPROVE network be able to accommodate the additional work (both from a contracts and workload perspective)?
6. Organizational changes for IMPROVE: Because of the greater interest and responsibility of states, should they have additional representation on the IMPROVE Steering Committee? Would greater state involvement be better accomplished by having additional multi-state air quality organizations on the committee and if so which ones? Should there be a split in responsibilities for managing IMPROVE whereby separate policy and technical committees co-manage the program? Do we need to establish MOU's or partnerships to formalize the relationships? Does the FACA (Federal Advisory Committee Act) apply to the IMPROVE steering committee and does this effect what can be done with respect to possible changes?

Attempts to resolve or further discuss concerns related to the haze rule and organizational changes for IMPROVE (#s 4 & 6) were deferred to subsequent meetings due to lack of time. The other concerns were addressed in discussions during the meeting. The Western Regional Air Partnership (WRAP) has an interest in visibility monitoring and would like to see the selection of sites and their operation coordinated more broadly to include their constituent organizations (states, tribes, and other stakeholders). To this end, a draft concept paper prepared by the state of Arizona on behalf of the WRAP was distributed at their request during the steering committee meeting (attachment 5**). Among other things, the paper calls for a monitoring workshop this spring (by mid-April) at which they would like IMPROVE participation. Those present at the meeting agreed that IMPROVE should be**

represented at the workshop.

Process to select new sites:

A list and map of all class I areas with federal visibility protection was distributed to the meeting participants (attachment 3 contains the list). The list shows which sites have monitoring and whether they are IMPROVE or "look-alike" (i.e., those that are not the responsibility of the IMPROVE steering committee but use the same equipment and protocols) sites. The map and table also indicate which sites that currently have no monitoring have been identified for the expansion of the network. The latter designation (requested expansion sites) in fact was generated for use within EPA to determine how many additional monitoring sites would be reasonable. As a result of their exercise, EPA estimated that 108 sites (30 current and 78 new sites) supported by EPA through the IMPROVE program when combined with a number of monitoring sites supported by FLM's should be sufficient to meet the monitoring needs of the proposed regional haze regulation. However, the process was not designed to actually specify which class I areas should have the expanded monitoring, but only to estimate the number of sites that would be reasonable for EPA to fund.

One of the primary purposes of this meeting was to develop and initiate a process to select sites for the expansion of IMPROVE. There was a wide-ranging discussion of how this process was to be done and by whom (many of the concerns are documented in the previous section). These resulted in two unanimously agreed upon resolutions by the IMPROVE Steering Committee (all resolutions are documented in attachment 4). Briefly, these state that the IMPROVE Steering Committee endorses the EPA expansion of the monitoring network, and the Steering Committee working closely with the states will select the class I areas for the expanded network as well as specific sites for monitors within the selected areas.

A process to select sites was agreed to during the meeting. It entails having the FLM's identify within two weeks of the meeting (2/11/98) a priority list of sites for the first 20 additional sites to be deployed this year. This list, which will include 25 to 30 class I areas, will be sent by the steering committee chairman by 2/17/98 to all appropriate state representatives for their comments and suggestions. The letter transmitting the list and asking for input will also invite state representatives to accompany the FLM and IMPROVE contractors to select the specific locations for equipment during field trips (spring 1998) to selected areas in their states or adjoining states. Responses from the states concerning the first 20 class I areas will be requested within three weeks (3/10/98). The same process operated on a somewhat more leisurely schedule will be conducted for the remaining 58 sites to be installed in 1999.

Siting criteria:

Specific siting criteria (where to place monitors in an area) were discussed at the meeting, but no final criteria decided upon. The current sites were selected using siting criteria that should reviewed and if needed they should be modified. The question was asked, should we consider more than one monitor in a class I area if it extends over a wide area or if it includes areas with elevation extremes? The answer seems to be that the first priority is to deploy monitoring that is representative of all of the class I areas that can be accomplished in a cost-effective manner. This may be done by some combination of high elevation and low elevation sites in a region with clusters of nearby class I areas (e.g. along the Cascade or Sierra mountain ranges). **Before the site selection trips in the spring 1998, a subcommittee of FLM, state, and EPA representatives will be constituted to address specific siting issues and develop a strategy and criteria. Those who are interested in participating should contact Marc Pitchford (at 702-895-0432 or e-mail marcp@dri.edu) no latter than 3/1/98.**

Updated IMPROVE sampler:

The currently used version of the IMPROVE sampler was designed over a decade ago and has served well as indicated by 90+% recovery for the aerosol data. However, the anticipated change in sampling protocol from twice weekly to the national schedule of one day in three can not be easily accommodated using the 7-day clocks that control the current samplers. A design team composed of staff from UCD and ARS have been working for several months to design an updated version of the IMPROVE samplers. The constraints they were given include that the new design must be identical to the old for everything that could affect the particles collected. Specifically, all of the plumbing from the inlet to the filter must be the same, as would be the flow control system. To accommodate the change to one day in three, a microprocessor will be used as a controller (turns the unit on and off). Also the number of filters that can be automatically changed will be increased from 2 to 4 so that the operator need only visit the sampler at most once per week to change filters. The microprocessor provides near limitless flexibility in scheduling and also permits continuous monitoring of flow rate information by logging the ambient temperature and pressure at two locations in the system. Currently pressures are measured by gauges that the operator records for each filter before and after sampling and average seasonal temperature is used to estimate flow rate. For the updated sampler data recorded by the samplers can be transmitted to and from the site by a data card (size of a credit card) sent to and from the site with the filters or via phone line. **The design is expected to be final within a few weeks at which time cost can be better estimated.** Rough estimates are that the sampler should be built for less than $15k. EPA budgeted $20k for each sampler, including installation cost.

During the discussion of the sampler updates, the steering committee unanimously agreed to change the sampling schedule to 1 in 3 days, to supply data to EPA's AIRS database and to operate a fraction of the sites with collocated samplers (see attachment 4). These were done to facilitate integration of IMPROVE with the national PM program.

Deployment & training schedule:

To some extent, this topic was discussed during some of the earlier agenda topics (Organizational concerns, Process to select new sites, & Siting criteria). The schedule for deployment of the 20 new sites and to upgrade the existing 30 sites would be in summer and fall of 1998. Training would be during the installation.

Fate of look-alike sites:

The look-alike sites which are run by FLM's and some state and local agencies represent an important resource to the IMPROVE program even though the steering committee has no authority or responsibility for their operation. Look-alike sites at location representative of visibility protected class I areas provide direct benefit by decreasing the number of locations that IMPROVE would otherwise have to monitor at. Look-alike sites at other location produce data that is directly comparable to the IMPROVE data and provide a more complete spatial pattern of aerosol information that increases our understanding of the causes of the aerosol levels that we see in the class I areas.

The sentiment expressed during the discussions was that IMPROVE should encourage the same changes to the operations of the look-alike sites that they are making for the IMPROVE program. **Some of the methods discussed to promote these changes are indicated below. The design of the updated sampler, and in particular of the retrofit to the current samplers should be made as inexpensively as possible consistent with the need for reliable operations and functionality. If the budget for expanding the network permits, IMPROVE could consider purchasing extra retrofit kits to cover all or some of the look-alike sites. These could be loaned on a no cost, indefinite period basis to the look-alike operators in exchange for the continued use of their data.**

Some look-alike sites in class I areas have been operating without the full IMPROVE sampler (e.g. only channel A for mass, elements, optical absorption). The steering committee decided that such site should be considered as candidate class I areas for new sites as part of the expanded IMPROVE network. Presumably any equipment that would be presently at such a site would be contributed to IMPROVE to help lower the cost of setting up the new site.

Review of action items and next meeting:

The chairman will prepare a meeting summary as soon as possible, and will look into the request last year for quartz filters by Glen Cass for assessing the influence of fire on aerosol loading. Since the meeting I have determined that a policy to make archived filters available was drafted as requested by Tom Cahill. Apparently, the steering committee has not yet voiced their opinion on the policy which is documented in a memo attached (attachment 6**). Please read this and respond to me by the end of February 1998 if you object to this policy.** If no objections are received the policy

will be adopted for IMPROVE. With one exception (Bill Malm), there seemed to be enthusiasm at the meeting for providing the requested quartz filters to Glen Cass. In subsequent conversations that I have had with Glen he has agreed to abide by the proposed policy. In a phone conversation with Bill Malm, he has indicated that he does not want to block use of the filters by Glen Cass. **Based upon this information, I have indicated to DRI that they can arrange to provide filter material to Glen Cass in a manner consistent with the proposed policy. This will require several weeks to accomplish. If there is any objection to this please let me know as soon as possible.**

The text in bold in the summary highlights other action items and schedules. The principal activities of the next several months concern site selection, siting criteria review and development, and finalization of the revised sampler.

Sentiment was expressed for another steering committee meeting this summer, but no date or time was selected. **The FLM's offered to identify a convenient location near a class I area for the next meeting**.

Just received (2/9/98) in time to include in the summary from the FLM's is the list of 30 candidate class I areas which is in attachment 7.

IMPROVE 1/26/98 to 1/27/98 Meeting Agenda
Location: Conference Rm. Desert Research Institute
755 East Flamingo Road,
Las Vegas, NV

Time	Topic	Discussion Leaders
	------Monday 1/26/98------	
1:15pm	Welcome, & agenda review	Marc Pitchford
1:30pm	Organizational interests & news	Steering committee & guest
2:15pm	IMPROVE activity review	
	Optical, camera, etc(~30min)	John Molenar
	Aerosol (~45min)	Lowell Ashbaugh
3:30pm	Break	
3:45pm	EPA's plans to integrate IMPROVE into the national PM monitoring program	Marc Pitchford & Neil Frank
4:30pm	Planned expansion of the IMPROVE network	Marc Pitchford
5:15pm	Adjourn for the day	
	------Tuesday 1/27/98------	
8:00am	Organizational concerns about expansion	Steering committee & guests
9:00am	Process to select new sites	Marc Pitchford
10:30am	Break	
10:45am	Siting criteria: representative, power & security considerations, manpower, etc.	Marc Pitchford
12:00pm	Lunch	
1:15pm	Updated IMPROVE sampler	Lowell Ashbaugh & John Molenar
2:00pm	Deployment & training schedules for new unit	Lowell Ashbaugh
2:15pm	Fate of IMPROVE look-a-like (protocol) sites	All FLM representative
3:00pm	Review of action items & next meeting	
3:30pm	Adjourn	

To participate by conference call --- phone 919-541-4427 on Monday from 1pm to 4pm Pacific Standard Time and on Tuesday from 8am to noon Standard Time. Once connected, **please do not put the call on hold or use 3-way calling** since this will prevent anyone else from connecting to the conference line. You can call at anytime during this call in periods, if you can't be on the line continuously. If the lines don't work properly try calling Bruce Polkowsky at 919-541-5532 (he is initiating the call) or the DRI receptionist at 702-895-0400 (I will let her know if we have technical difficulties with the conference call).

IMPROVE 1/26 & 1/27/98 Meeting
List of Meeting Participants

Name	Organization	Phone	E-Mail
Marc Pitchford	NOAA	702-895-0432	marcp@dri.edu
Jim Sisler	CIRA	970-491-3699	sisler@cira.colostate.edu
Neil Frank	EPA	919-541-5560	frank.neil@epamail.epa.gov
Gerry Guay	AK DEQ	907-269-3070	gguay@envi-con.state.ak.us
Sandra Silva	FWS	303-969-2814	sandra_silva@nps.gov
John Molenar	ARS	970-484-7941	jmolenar@air-resource.com
William Malm	NPS	970-491-8292	malm@cira.colostate.edu
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Mike George	AZ DEQ	602-207-2274	george.mike@ev.state.az.us
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John Leary	WGA	303-623-9378	jleary@westgov.org
Bruce Polkowsky[1]	EPA	919-541-5532	polkowsky.bruce@epamail.epa.gov
Rich Damberg[1]	EPA	919-541-5592	damberg.rich@epamail.epa.gov
Naydene Maykut[1]	PS APCA	202-689-4062	
Rich Poirot[1]	VT DEC	802-241-3840	richp@qtm.anr.state.vt.us

[1] Participated by phone.

Attachment 3

Federal Class I Areas with visibility protection - status of monitoring as of 9/97

Codes: No monitoring = 0; IMPROVE = 1; Protocol = 2: Requested site =3

Number	Land Manager	State	Name	Code	Comment
1	FWS	AK	Bering Sea	3	
2	NPS	AK	Denali Preserve NP	1	
3	FWS	AK	Simeonof	3	
4	FWS	AK	Tuxedni	3	
5	FS	AL	Sipsey Wilderness	1	
6	FS	AR	Caney Creek Wilderness	3	
7	FS	AR	Upper Buffalo Wilderness	1	
8	NPS	AZ	Chiricahua NM	1	
9	FS	AZ	Chiricahua Wilderness	0	
10	FS	AZ	Galiuro Wilderness	3	
11	NPS	AZ	Grand Canyon NP	1	
12	FS	AZ	Mazatzal Wilderness	3	
13	FS	AZ	Mount Baldy Wilderness	3	
14	NPS	AZ	Petrified Forest NP	2	
15	FS	AZ	Pine Mountain Wilderness	0	
16	NPS	AZ	Saguaro NM	2	
17	FS	AZ	Sierra Ancha Wilderness	3	
18	FS	AZ	Superstition Wilderness	1	Tonto
19	FS	AZ	Sycamore Canyon Wilderness	3	
20	FS	CA	Agua Tibia Wilderness	3	
21	FS	CA	Caribou Wilderness	0	
22	FS	CA	Cucamonga Wilderness	0	
23	FS	CA	Desolation Wilderness	2	Bliss
24	FS	CA	Dome Land Wilderness	2	
25	FS	CA	Emigrant Wilderness	0	
26	FS	CA	Hoover Wilderness	0	
27	FS	CA	John Muir Wilderness	0	
28	NPS	CA	Joshua Tree NM	3	
29	FS	CA	Kaiser Wilderness	0	
30	NPS	CA	Kings Canyon NP	0	
31	NPS	CA	Lassen Volcanic NP	2	
32	NPS	CA	Lava Beds NM	3	
33	FS	CA	Marble Mountain Wilderness	3	
34	FS	CA	Minarets Wilderness	3	
35	FS	CA	Mokelumne Wilderness	3	
36	NPS	CA	Pinnacles NM	2	
37	NPS	CA	Point Reyes NS	2	
38	NPS	CA	Redwood NP	2	
39	FS	CA	San Gabriel Wilderness	3	
40	FS	CA	San Gorgonio Wilderness	1	
41	FS	CA	San Jacinto Wilderness	0	

42	FS	CA	San Rafael Wilderness	3	
43	NPS	CA	Sequoia NP	2	
44	FS	CA	South Warner Wilderness	3	
45	FS	CA	Thousand Lakes Wilderness	0	
46	FS	CA	Ventana Wilderness	3	
47	FS	CA	Yolla Bolly Middle Eel Wilderness	3	
48	NPS	CA	Yosemite NP	1	
49	NPS	CO	Black Canyon of the Gunnison NM	3	
50	FS	CO	Eagles Nest Wilderness	3	
51	FS	CO	Flat Tops Wilderness	3	
52	NPS	CO	Great Sand Dunes NM	2	
53	FS	CO	La Garita Wilderness	3	
54	FS	CO	Maroon Bells-Snowmass Wilderness	3	
55	NPS	CO	Mesa Verde NP	1	
56	FS	CO	Mount Zirkel Wilderness	2	
57	FS	CO	Rawah Wilderness	3	
58	NPS	CO	Rocky Mountain NP	1	
59	FS	CO	Weminuche Wilderness	1	
60	FS	CO	West Elk Wilderness	0	
61	FWS	FL	Chassahowitzka	2	
62	NPS	FL	Everglades NP	2	
63	FWS	FL	St. Marks	3	
64	FS	GA	Cohutta Wilderness	3	
65	FWS	GA	Okefenokee	1	
66	FWS	GA	Wolf Island	3	
67	NPS	HI	Haleakala NP	2	
68	NPS	HI	Hawaii Volcanoes NP	3	
69	NPS	ID	Craters of the Moon NM	2	
70	FS	ID	Hells Canyon Wilderness	3	
71	FS	ID	Sawtooth Wilderness	2	
72	FS	ID	Selway-Bitterroot Wilderness	2	Sula Peak
73	NPS	KY	Mammoth Cave NP	1	
74	FWS	LA	Breton	3	
75	NPS	ME	Acadia NP	1	
76	FWS	ME	Moosehorn	2	
77	NPS	MI	Isle Royale NP	3	
78	FWS	MI	Seney	3	
79	FS	MN	Boundry Waters Canoe Area	1	
80	NPS	MN	Voyageurs NP	2	
81	FS	MO	Hercules-Glades Wilderness	3	
82	FWS	MO	Mingo	3	
83	FS	MT	Anaconda-Pintler Wilderness	3	
84	FS	MT	Bob Marshall Wilderness	3	
85	FS	MT	Cabinet Mountains Wilderness	3	

86	FS	MT	Gates of the Mountains Wilderness	3
87	NPS	MT	Glacier NP	1
88	FWS	MT	Medicine Lake	3
89	FS	MT	Mission Mountains Wilderness	3
90	FWS	MT	Red Rock Lakes	3
91	FS	MT	Scapegoat Wilderness	3
92	FWS	MT	UL Bend	3
93	FS	NC	Joyce-Kilmer-Slickrock Wilderness	3
94	FS	NC	Linville Gorge Wilderness	3
95	FS	NC	Shining Rock Wilderness	1
96	FWS	NC	Swanquarter	3
97	FWS	ND	Lostwood	3
98	NPS	ND	Theodore Roosevelt NP	3
99	FS	NH	Great Gulf Wilderness	2
100	FS	NH	Presidential Range-Dry River Wilderness	0
101	FWS	NJ	Brigantine	1
102	NPS	NM	Bandelier NM	2
103	FWS	NM	Bosque del Apache	3
104	NPS	NM	Carlsbad Caverns NP	0
105	FS	NM	Gila Wilderness	2
106	FS	NM	Pecos Wilderness	3
107	FWS	NM	Salt Creek	3
108	FS	NM	San Pedro Parks Wilderness	3
109	FS	NM	Wheeler Peak Wilderness	3
110	FS	NM	White Mountain Wilderness	3
111	FS	NV	Jarbridge Wilderness	1
112	FWS	OK	Wichita Mountains	3
113	NPS	OR	Crater Lake NP	1
114	FS	OR	Diamond Peak Wilderness	3
115	FS	OR	Eagle Cap Wilderness	3
116	FS	OR	Gearhart Mountain Wilderness	3
117	FS	OR	Kalmiopsis Wilderness	3
118	FS	OR	Mount Hood Wilderness	3
119	FS	OR	Mount Jefferson Wilderness	0
120	FS	OR	Mount Washington Wilderness	0
121	FS	OR	Mountain Lakes Wilderness	3
122	FS	OR	Strawberry Mountain Wilderness	3
123	FS	OR	Three Sisters Wilderness	2
124	FWS	SC	Cape Romain	1
125	NPS	SD	Badlands NP	2
126	NPS	SD	Wind Cave NP	3
127	NPS	TN	Great Smoky Mountains NP	1
128	NPS	TX	Big Bend NP	1

129	NPS	TX	Guadalupe Mountains NP	2	
130	NPS	UT	Arches NP	0	
131	NPS	UT	Bryce Canyon NP	1	
132	NPS	UT	Capitol Reef NP	3	
133	NPS	UT	Canyonlands NP	1	
134	NPS	UT	Zion NP	3	
135	FS	VA	James River Face Wilderness	2	Jefferson NF
136	NPS	VA	Shenandoah NP	1	
137	NPS	VI	Virgin Islands NP	2	
138	FS	VT	Lye Brook Wilderness	1	
139	FS	WA	Alpine Lake Wilderness	3	
140	FS	WA	Glacier Peak Wilderness	3	
141	FS	WA	Goat Rocks Wilderness	0	
142	FS	WA	Mount Adams Wilderness	3	
143	NPS	WA	Mount Rainier NP	1	
144	NPS	WA	North Cascades NP	3	
145	NPS	WA	Olympic NP	3	
146	FS	WA	Pasayten Wilderness	3	
147	FS	WV	Dolly Sods Wilderness	1	
148	FS	WV	Otter Creek Wilderness	0	
149	FS	WY	Bridger Wilderness	1	
150	FS	WY	Fitzpatrick Wilderness	3	
151	NPS	WY	Grand Teton NP	3	
152	FS	WY	North Absaroka Wilderness	3	
153	FS	WY	Teton Wilderness	0	
154	FS	WY	Washakie Wilderness	3	
155	NPS	WY	Yellowstone NP	2	
156	Canada/US		Roosevelt Campobello	3	

Totals by code	
No site	20
IMPROVE	30
Protocol	28
Requested	78

January 27, 1997 IMPROVE Steering Committee Resolutions

The IMPROVE Steering committee unanimously supported the following resolutions:

1. The IMPROVE Steering Committee agrees to select additional sites in close consultation and full partnership with affected states for an expanded IMPROVE network in visibility-protected class I areas that can be monitored routinely in a cost-effective manner.

2. The IMPROVE Steering Committee endorses a continued and expanded state-FLM partnership to provide for the upgrade, continued operation and analytical support of aerosol monitoring at the 30 existing IMPROVE monitoring sites and the expansion of this network from 30 to 108 sites. The committee will seek recommendations from the States and FLMs for selection of areas and sites for representative visibility monitoring and will strive for consensus in development of the new national network. The purpose of this expansion is to track visibility in 156 mandatory class I areas and to provide information about Regiional transport of fine particles that will support PM2.5 SIPs. The State's contribution of 103 and 105 grant dollars [1] will pay for new or upgraded monitors, QA and analytical support. The FLMs will coordinate and arrange for all operational support for the collection of aerosol samples.

The IMPROVE Steering Committee agrees to the following in order to promote integration of the IMPROVE aerosol monitoring with the national PM monitoring program: the sampling schedule will be changed to the national 1 day in 3 monitoring schedule starting in 1998; that all past and new data will be provided to EPA for storage in the new AIRS database; and that a fraction of the monitoring sites will include routine collocated sampling to allow precision and comparability assessments.

[1] $1.25M in 105 grant dollars and $1.22 M in 103 grant dollars for FY-98; an estimate of $4.5 M total grant dollars in FY-99; and needed money in all future years to ensure its continued operation.

State/Tribal/Federal Land Manager Visibility Monitoring Scoping Workshop

Concept Paper

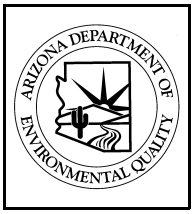
for the

Technical Oversight Committee - Western Regional Air Partnership

prepared by:

Mike George & Tom Moore - Arizona DEQ Air Quality Division

April 13, 1998



Arizona Department of Environmental Quality

Background

The domain of visibility regulation is expanding where states will be responsible for demonstrating reasonable progress toward the target, the National Visibility Goal, as part of individual State Implementation Plans (SIPs). A part of that process is to be the implementation of monitoring to represent visibility in each Class I area. Based on the metric in the proposed Regional Haze Rule, by early 1999, each state is to submit a plan that explains how a monitoring network and the resulting data will demonstrate whether or not reasonable progress is being made.

When the initial visibility regulations that only dealt with plume blight for reasonably attributable sources were promulgated in 1977, few states submitted approvable SIPs as required. To settle the resulting lawsuit, EPA promulgated a Federal Implementation Plan (FIP), part of which covered visibility monitoring. As a result of the FIP, the IMPROVE (Interagency Monitoring of PROtected Visual Environments) program was created, and funded with Clean Air Act Section 105 monies normally passed on directly to each state. IMPROVE presently operates official monitoring sites in about 30 Class I areas or nearby surrogate locations around the country. There are also a number of other visibility monitoring sites and networks that adhere to IMPROVE technical protocols; these have been or are operated, among others, by the Tahoe Regional Planning Agency, Arizona DEQ, NESCAUM, and some Federal Land Managers (FLM). The total of official IMPROVE and ?look-a-like? Class I Area sites is currently about 50. The official program is administered by the IMPROVE Steering Committee, which is comprised of staff from federal agencies (National Park Service, US Forest Service, US Fish & Wildlife Service, Bureau of Land Management, US EPA), and representatives of state air quality membership organizations (NESCAUM, STAPPA/ALAPCO, WESTAR) . To date, the IMPROVE Steering Committee has conducted research into various measurement methods; established recommended procedures for visibility monitoring; archived data; and acted as a vehicle for EPA to fund the program.

Unlike the 1977 rule, the changes proposed in 1997 deal with regional haze including substantive visibility targets. States are much more likely to feel a need to develop their own monitoring plans rather than deferring to the federal government. Therefore, a different approach to conducting visibility monitoring will be necessary in order to best implement the proposed regulations. The IMPROVE program strove to establish a long term record of broad-brush regional conditions, and has been successful at that. The consistency and simplicity of the IMPROVE technical protocols and data are well understood by the environmental and regulated communities, and by air quality agencies currently involved in visibility monitoring. Each state will now be ultimately responsible for the results of visibility monitoring, to demonstrate progress for each Class I Area in its jurisdiction. The recommendations of the GCVTC for the regional tracking of visual air quality at Class I Area receptors will need to fit into a future monitoring network design. It will also be desirable for states to integrate their visibility monitoring with the EPA requirements for $PM_{2.5}$. In particular, locations that capture upwind and downwind effects for fine particulate may also be used for regional haze purposes.

In this environment of changes in regulatory requirements, considerable planning and cooperation will be needed to most efficiently and effectively conduct the monitoring necessary to track reasonable progress, as well as accommodating associated goals for fine particulate. In order to start a process that will facilitate this planning and cooperation, a scoping workshop is proposed.

The suggested goals, objectives, participants, format, and work products of the bulk of the workshop are defined below.

Goals

The intent of the proposed workshop is to initiate a new era of better coordinated, more spatially and temporally representative Class I Area visibility monitoring in the West. As a starting point, a good bit of time would be spent educating the participants as to the history of visibility monitoring. More specifically, the workshop is to start dialogue on:

1. Planning and administrative issues, such as funding, areas of responsibility, accountability, integration with other monitoring efforts, and overall monitoring plan development.

2. Technical questions, such as sampler comparability, network(s) design and representativeness, data from Class I Area sites as $PM_{2.5}$ background/transport, sampling protocol, and data analysis methods, including meteorological, emissions and air quality modeling.

3. Facilitate the definition of a WRAP forum on visibility monitoring, identifying technical workplan elements and interested participants.

Discussion Topics

More specific topics for discussion associated with these general goals would include:

Planning/Administrative

1. Funding
   - Federal 103 monies for $PM_{2.5}$.
   - Federal 105 funds, off-the-top.
   - Federal 105 monies for ongoing costs.
   - Plans to fund complementary ambient data collection programs.
   - Coordination of above.
2. Areas of responsibility
   - Development of monitoring strategy.
   - Establishment of guidelines for monitoring operations.

3. Integration of related monitoring efforts.
    - $PM_{2.5}$ background and transport measurements.
    - IMPROVE.
    - Non-IMPROVE federal monitoring.
    - State data collection.
    - Other monitoring, e.g. industry, environmental groups.

4. Monitoring plan development
    - Components of said plan.
    - Regional plan vs. facilitation of individual state plans.
    - Link to technical data needs.

Technical

1. Measurement comparability
    - Particulate measurements, e.g. IMPROVE to Federal Reference Method.
    - Optical measurements, e.g. transmissometer vs. reconstructed.
    - Meteorology from various networks.

2. Network design and representativeness
    - Macroscale considerations.
    - Regional haze questions.
    - Urban impacts.
    - Emissions sources**?** temporal and spatial distributions.
    - Representation of multiple Class I areas.
    - Need for multiple sites in or near Class I areas.

3. Measurement technology and protocols
    - IMPROVE.
    - Other possibilities that might lead to greater efficiencies.

4. Data analysis methods
    - Defining natural/background visibility.
    - Establishing the baseline.
    - Modeling for sampler placement.

Anticipated Participants

The potential audience would be any parties interested in visibility monitoring. However, there are certain parties that would be of specific interest through invitation:

- State technical/planning staff from each air quality agency;
- Tribal representatives intending to pursue visibility monitoring;
- IMPROVE Steering Committee members;
- National federal land management air quality program staff;
- EPA visibility program personnel, as well as regional offices' staff;
- Technical participants in the GCVTC process.

Proposed Format

The workshop would likely last three (3) or more days, and might roughly consist of the following parts:

- Presentations designed to educate the group. Most of the presenters would be drawn from the list in the previous section;
- Group discussions that might consist of break-outs depending on the number of participants;
- Question and answer sessions for the larger assemblage;
- Development of criteria and strategy for a working group.

Timing

The $PM_{2.5}$ schedule calls for a monitoring plan to be submitted by each state air agency on July 1, 1998, while the plan for regional haze data collection will probably be due March 1999. Certainly, the later date is of most pertinence for the workshop, but consideration of and accommodation of the former is necessary. Therefore, some of the discussion at the workshop should assist in dealing with integration of the states' plans to implement the NAAQS measurement program, while it should also serve as a kickoff for the development of whatever is needed to develop visibility monitoring plans. The EPA has also indicated that the IMPROVE Steering Committee might be the preferred vehicle to translate transport/background $PM_{2.5}$ NAAQS monitoring sites' monies into field monitoring efforts. In light of these considerations, this workshop should be held no later than mid-April 1998.

Expected Work Products

The output from this workshop should include:

- A discussion summary;
- A record of any consensus recommendations;
- Proposed work plan items for a WRAP working group;
- Suggested criteria for a monitoring plan; and

Identification of interested participants and their qualifications, and likely technical workplan elements, for a WRAP forum on visibility monitoring.

Subject: IMPROVE filters
Date: Tue, 03 Feb 1998 15:41:38 -0800
From: Thomas Cahill <Cahill@crocker.ucdavis.edu>
To: marcp@dri.edu

August 19, 1997 DRAFT

Proposal to IMPROVE:

Post-Analysis Compositional Studies on IMPROVE Filters

Thomas A. Cahill, UC Davis
After consultation with Glenn Cass, Judy Chow

Introduction

One of the major goals of the IMPROVE program is the generation of compositional data on fine particle filters. These data allow better evaluation of the effect of these fine particles on visibility and aid in tracking ambient aerosols to their sources. While a great many data are generated in the course of routine operations, this does not in any way exhaust the possibilities for further analysis. One such method is to make archived IMPROVE filters available for additional analyses. This proposal examines these possibilities and makes suggestions as to how IMPROVE should handle such requests.

Background

After standard analyses have been completed, all the fitters except channel B (ions) are archived.

			Comment
Channel A	stretched Teflon	UCD	boxed, ambient post vacuum
Channel B	destroyed - IC		
Channel C	quartz	DRI	Petris, freezer punched out
Channel D	stretched Teflon	UCD	boxed, ambient

The Channel A filters have been exposed to vacuum and an intense ion beam. This makes the Teflon more fragile, and after a number of days, damage will appear in some filters. This damage appears to be tied to acidic attack on the damaged Teflon, and thus depend on the materials collected on the filters. Any attempt to cut stretched Teflon filters destroys their structural integrity (they roll up into a ball but, we have done successful IC extractions from previously analyzed Teflon filters.

Channel D filters are the same in all ways as Channel A, but were never exposed to vacuum or ion beams.
Channel C filters are fired quartz, prepared by DRI. After analysis, they are transported at ambient temperature to DRI, where between 1 (almost all), 2 (perhaps 10%), and 3 (rarely needed) 0.5 cm2 circular punches are taken out of each 3.8 cm2 filter. They are then stored in individual Petri dishes in a freezer at DRI.

Proposal

I would like to propose as IMPROVE policy three statements:

1. It is the will of IMPROVE that as much useful information as possible be gained from IMPROVE filters as long as the tests generate data useful to IMPROVE'S mission and do not preclude future measurements.

2. IMPROVE will entertain requests for access to the archived filters for compositional analyses, with the proviso that the techniques proposed be well established and the results delivered to IMPROVE in a timely and user friendly fashion prior to any publication.

3. The proposal must use as little of the filter as possible, and in no case take more than 50% of what is available ("Rule of the Half"). Good laboratory practices will be followed in all cases so that the filter does not get contaminated, and the remainder will be returned to archive.

List of 30 Candidate Class I Areas for 1998 IMPROVE Deployment

The following list is the result of a selection process by the Forest Service, National Park Service, and Fish and Wildlife Service which met on January 29th to review sites for consideration for the expanded IMPROVE monitoring in scheduled for 1998. One of the primary basis for selecting the sites listed below was to fill geographic gaps in the current aerosol monitoring program. Sites are organized by FLM and represent each FLM's top 10 priority list.

FWS	NPS	FS
Breton, LA	Theodore Roosevelt, ND	Eagle Cap, OR
St Marks, FL	North Cascades, WA	Sawtooth, WA
Mingo, MO	Joshua Tree, CA	Cohutta, GA
Witchita Mountains, OK	Guadalupe Mountains, TX	Great Gulf, NH
Bosque del Apache, NM	Capital Reef, UT	San Gabrial, CA
Seney, MI	Bad Lands, SD	Sula Peak, MT
Tuxedni, AK	Grand Tetons, WY	South Pass, MT
Swanquarter, NC	Petrified Forest, AZ	Wheeler Peak, NM
UL Bend, MT	Zion, UT	Mt. Hood, OR
Salt Creek, NM	Olympic, WA	Sycamore Canyon, AZ