INTERAGENCY MONITORING OF PROTECTED VISUAL ENVIRONMENTS

IMPROVE

Volume 1, No. 2 **Winter 1992** **April 15, 1992**

IMPROVE MONITORING UPDATE

Preliminary data collection statistics for the Winter 1992 monitoring season (December 1991 - February 1992) are as follows:

Data Type	Collection Percentage
Aerosol Data	96.0%
Optical (transmissometer) Data	92.4%
Scene (photographic) Data	83.9%

Over the next twelve months, two significant changes will be made in the optical monitoring configuration of the IMPROVE network. Air temperature/relative humidity (AT/RH) sensors at all sites will be upgraded with Rotronics MP100F sensors. In both laboratory and operational field tests, Rotronics sensors have demonstrated their ability to more accurately measure relative humidity over the full range than previously implemented systems. Twelve ambient nephelometer monitoring systems, based on the Optec, Inc. NGN nephelometer, will also be added to the network. Ambient nephelometers will replace Belfort-type nephelometers at three sites, and will be installed at nine other sites currently without an optical component or where a change in the monitoring strategy is warranted. The Optec system has performed reliably in operational field tests that included both Shenandoah and Project MOHAVE special studies. The monitoring advantages of both the Rotronics AT/RH sensor and the Optec ambient nephelometer were presented to the IMPROVE Steering Committee on March 26 and are described in a paper submitted to the June AWMA Conference.

Figure 1 is a map of current IMPROVE and IMPROVE Protocol sites. Note that the NPS has reorganized its Protocol network. Great Basin National Park has been designated as a Protocol site, and Arches, Virgin Islands, Isle Royale, and Voyageurs National Parks have been removed from the network.

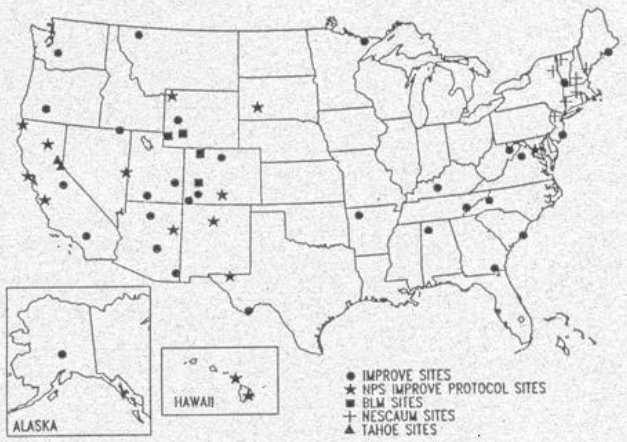

Figure 1. IMPROVE and IMPROVE Protocol Sites April 1992

IMPROVE STEERING COMMITTEE MEETING

The IMPROVE Steering Committee met in Las Vegas on March 26 and 27. All participating agencies and organizations were able to attend except for the Forest Service and Fish and Wildlife Service. The Committee welcomed the participation of the new EPA OAQPS representative Joe Elkins. The items discussed during the meeting included:

- Summaries of the visibility-related activities, issues, and needs of each Committee member;
- A review of overall IMPROVE program objectives;
- Aerosol, optical, and scene monitoring updates by the IMPROVE monitoring contractors with specific discussions on an identified aerosol organic artifact and operational tests of the Optec NGN ambient nephelometer system;
- IMPROVE data issues, including analytical techniques, presentation methods, database management, data availability, and data distribution techniques;
- Network management and budget
- Newsletter purpose, content, and distribution; and
- Future direction and priorities of IMPROVE.

A detailed summary of the meeting is being prepared by Marc Pitchford (US EPA) for distribution to all Committee members.

ORGANIC ARTIFACT IDENTIFIED ON TEFLON FILTERS

UC Davis has identified the source of an inconsistency in Teflon Filters used for aerosol sampling between September 1990 and November 1991, and has implemented procedures to avoid future problems.

The IMPROVE modular aerosol sampler collects fine particles on Teflon, nylon and quartz filters. Teflon filters are analyzed for mass, optical absorption, hydrogen, and elements Na to Pb, including S. The nylon filters are analyzed for $SO_4^=$ and NO_3^-. The quartz filters are analyzed for organic and elemental carbon.

Organic concentrations are calculated in two ways: 1) from the hydrogen and sulfur on the Teflon filters, and 2) from the organic carbon on the quartz filters. From March 1988 to September 1990, there had been excellent agreement between the two organic measurements. However, since September 1990, the Teflon-based organic measurements have shown an occasional, but large, positive offset relative to the quartz organic measurements. Approximately 7% of the samples have differences exceeding 4 times the precision of the difference; 4% also have differences exceeding 2.5 ug/m^3. During this period, the sulfur concentrations on Teflon maintained excellent agreement with the sulfate from corresponding nylon filters. Others data also indicate that the artifact is strictly organic and affects only the hydrogen and mass measurements.

This inconsistency in organic measurements prompted tests of the carbon analyses procedures at Desert Research Institute and of the hydrogen analysis procedures at UC Davis. The results of both tests indicated that the problem is not analytical. A thorough review of the processing of the filters also ruled out any preferential contamination of the Teflon filters during handling.

The differences coincided with the shipment of Gelman Teflon filters that were used between September 1990 and November 1991. Filter batches were always visually screened for consistency before being accepted. For example, a batch of filters received in April 1990 was returned to Gelman because problems were noted, including filter bowing, small holes, debris and shiny flecks. No visual inconsistencies were apparent in the batch of clean filters that exhibit the organic artifact; however, after the filters interacted with air in the IMPROVE samplers, a visually-apparent, splotchy pattern existed on a small fraction of the filters. The organic artifact problem appears to be associated with the manufacturing of the support-ringed filters, although problems with the Teflon material cannot be completely ruled out.

To identify and avoid future problems, UC Davis has implemented a series of additional acceptance protocols to test each new filter batch prior to use in the network. Approximately 2% of the filters (1 per box) in a batch of 10,000 will be involved. Some will be analyzed as blanks (not run in an IMPROVE sampler). Most will be analyzed after being operated on collocated IMPROVE samplers with Teflon, nylon, and quartz filters. The results of these tests will be independently reviewed.

The filters currently being used in the IMPROVE network and in Project MOHAVE are from a batch received in September 1991. This batch has undergone a series of tests; because of time constraints, these tests were less complete than the planned acceptance protocols. UC Davis has analyzed numerous blanks and found them to be clean. A few filters from this batch that collected network samples have also been analyzed for hydrogen. Organic carbon measurements from the same filters should be available soon for comparison. None of the filters exhibit the splotchy appearance occasionally observed on field samples from the bad batch.

The hydrogen and mass data for the period September 1990 to November 1991 have been corrected for the organic artifact. The protocol involved discarding the hydrogen and fine mass concentrations for those samples where the difference between the two organic measurements exceeded four times the precision of the difference. Less than 7% of the samples were affected. The agreement between the two organic concentrations and the agreement between fine and reconstructed masses for the remaining 93% of the data are good.

For further information, contact Dr. Robert Eldred, UC Davis (916-752-1124).

IMPROVE DATA AVAILABILITY

The IMPROVE Steering Committee is continuing to finalize a strategy to better present and disseminate IMPROVE data. Aerosol, optical, and scene requests are currently being fulfilled by the National Park Service and the IMPROVE contractors. Quality-assured IMPROVE data are now available for the following periods:

- **Aerosol** - March 1988 through November 1991
- **Optical** - December 1986 through May 1991
- **Scene** - March 1986 through February 1992

Aerosol, optical, and scene data from other monitoring networks are available for earlier dates, in some cases extending back to 1979.

Data requests must be submitted in writing to:
William C. Malm, Ph.D.
Colorado State University, NPS-AIR
CIRA-Foothills Campus
Fort Collins, CO 80523

A duplicate of the written request should also be forwarded to the appropriate IMPROVE contractor:

Aerosol
Crocker Nuclear Lab
University of California
Attn: Dr. Robert Eldred
Davis, CA 95616

Optical and Scene
Air Resource Specialists, Inc.
Attn: Betsy Davis
1901 Sharp Point Dr., Suite E
Fort Collins, CO 80525

Aerosol data are provided as ASCII files on 9-track tape. Optical transmissometer data are provided as ASCII files on PC-compatible diskettes. Scene (photographic) requests are individually addressed.

The IMPROVE Steering Committee recognizes the need to make collected data available, and is investigating a number of data presentation and dissemination alternatives.

IMPROVE-RELATED PAPERS TO BE PRESENTED AT THE 85TH ANNUAL AWMA MEETING

IMPROVE Steering Committee organizations, agencies, and contractors have submitted the following papers to the 85th Annual Air and Waste Management Association meeting:

Cahill, T.A., P. Wakabayashi,, O. Rabbe, S. Teague, M, van Waters. "A New Inertial Impactor for Visibility-Reducing Aerosols."

Gebhart, K.A. and W.C. Malm. "Spatial and Temporal Patterns of Several Particulate Species in Washington State During the Summer of 1990."

Husar, R.B. and R.L. Poirot. "Weekly Cycle of Primary and Secondary Air Pollutants."

Malm, W.C. "Apportionment of Visibility Using Receptor Modeling Techniques."

Malm, W.C. and K.A. Gebhart. "Apportionment of Aerosol Extinction at Mount Rainier and North Cascades National Parks."

Molenar, J.V., D.S. Cismoski, R.M. Tree. "Intercomparison of Ambient Optical Monitoring Techniques."

Schichtel, B.A., R.B. Husar, R.L. Poirot. "Composition of Aerosols over the Continental U.S."

Schichtel, B.A., R.B. Husar, W. Wilson, W.C. Malm and R.L. Poirot. "Apportionment of Light Extinction by Aerosol Types over the U.S."

Sisler, J.F. and W.C. Malm. "The Effect of Relative Humidity on Visibility - Continental Distributions."

This year's AWMA meeting is being held in Kansas City from June 21 to 26. Look for these and other visibility-related papers in the technical sessions and for instrument displays in the exhibition hall.

PROJECT MOHAVE SPECIAL STUDY UPDATE

The winter intensive monitoring period for Project MOHAVE was conducted between January 11 and February 22, 1992. Aerosol, optical, scene, meteorological, tracer, and other data were collected by a monitoring network distributed throughout southern Nevada, southern California, and western Arizona. The data from the intensive period are now being compiled by the participating agencies and contractors. All data will be submitted to the Project MOHAVE database to be administered by the Desert Research Institute. A meeting among all project participants was held in Las Vegas on March 24 and 25. Meeting highlights included a thorough review of the winter intensive and planning for the summer intensive scheduled for July 13 to August 31, 1992.

IMPROVE STEERING COMMITTEE

IMPROVE Steering Committee members represent their respective agencies and meet periodically to establish and evaluate program goals and actions. IMPROVE-related questions within agencies should be directed to the agency's Steering Committee representative. Steering Committee representatives are:

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PREVIEW OF UPCOMING ISSUE . . . .

The next IMPROVE Newsletter will be published on July 15, 1992, and will include:

- Network Status for the Spring 1992 Season
- ***FEATURE ARTICLE:*** Optec NGN Ambient Nephelometer

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Your input to the IMPROVE Newsletter is always welcome. For more information, address corrections, or to receive the IMPROVE Newsletter, contact:

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IMPROVE Newsletter text is also available on the **EPA's AMTIC Electronic Bulletin Board.:**

919-541-5742
(1200 or 2400 baud)

919-541-1447
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