IMPROVE Website
Status and Great Things to Come

Presented to the IMPROVE Steering Committee Mammoth Cave, KY September 2006
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Interagency Monitoring of Protected Visual Environments

Our national Parks and Wilderness Areas possess many stunning vistas and scenery. Unfortunately, these scenes are diminished by uniform haze causing discoloration and loss of texture and visual range. Layered hazes and plume blight also detract from the scene. Recognizing the importance of visual air quality, congress included legislation in the 1977 Clean Air Act to prevent future and remedy existing visibility impairment in Class I areas. To aid the implementation of this legislation, the IMPROVE program was initiated in 1985. This program implemented an extensive long term monitoring program to establish the current visibility conditions, track changes in visibility and determine causal mechanism for the visibility impairment in the National Parks and Wilderness Areas.

The purpose of this website is to provide access to the IMPROVE monitoring data resources and educational material on the science of visibility and regulations. First time visitors should visit the Overview section which summarizes the IMPROVE network and visibility science and regulations.
The primary purpose of the IMPROVE website is to provide federal, state, and local air quality regulatory agencies as well as the general public access to:

- IMPROVE monitoring data and metadata
  - aerosol, optical and scene
- Processed data graphics, aggregated data values, reports to satisfy some of State’s needs for the regional haze rule

Secondary objectives of the website are:

- Provide access to data analysis tools and algorithms
- Provide access to educational material on visibility issues, science and regulations
- Provide user supported forum
- Feedback mechanism for users to report QA/QC issues
VIEWS’ Vicissitude Vision

- VIEWS to be a source of the most *relevant, up to date and quality assured air quality data* for visibility and other applications
- The VIEWS data management system and web tools have application beyond regional haze
  - potential to link air quality monitoring data, emissions data, modeling results to support environmental science, planning and regulations
  - simplify and coordinate SIP development activities for States and Tribes
- The development of the **WRAP TSS** is realizing this potential
  - VIEWS infrastructure is being leveraged to facilitate the development of the WRAP TSS
  - Applicable WRAP TSS developments are being incorporated back into views

IMPROVE/VIEWS International User Community

- Average 2400 unique visitors a month
- 870 registered users
- Visitors from 150 different countries have accessed the websites include visitors from Bahrain, Iran and Vietnam
  - Got our first visitor from Iraq
- Over 50 other websites Link to IMPROVE
- About 450 queries to the database a month
  - 130 users in last 2 months
- 1000-3000 dynamic images generated a month
IMPROVE Website Activities

- Past year activities
  - Addition of data, documents and analyses
  - Upgraded integrated database, analysis and display tools borrowed from the VIEWS project
  - Addition of a data advisory page
  - Enhancement of all spectrum photos – Jeff Lemke
    - Will add to the website soon

- Coming year activities
  - Addition of CIRA QA documents (Debell)
  - New and upgraded tools based on developments from TSS
  - Continued maintenance and addition of routine products, (i.e. data, documents, notes)
  - Enhancements to the visibility and air quality educational tools (Winchester, Malm, Lemke)
Additions - Data

- IMPROVE aerosol data updated each **QUARTER MONTH**
  - Currently data is available through December 2004
  - Suggestion: submit the available data every month and distribute via the IMPROVE Preliminary data network

- Optical data updates
  - Nephelometer scattering data (quarterly)
    - 1993 through March 2006 data available from online database.
  - Transmissometer extinction data (annually)
    - ASCII files: **1987 – 2005**
    - 1986 - 2004 data were reprocessed and resubmitted
      - Check for completeness and continuity of data
      - Verify that reported RH and AT are within instrument specifications
      - Verify lamp and calibration information

- Special studies aerosol data
  - Monthly speciated coarse mass data
Additions – Data Continued

- Regional Haze Rule Metrics: best and worst 20% haze days
  - RHR data available through 2004
  - Updated the RHR metrics with the 2000-2004 resubmission Network:
    IMPROVE Aerosol (RHR1)
  - Added a second RHR network using the new IMPROVE algorithm
    Network: IMPROVE Aerosol (RHR2, New Algo.)
  - Substitute data for sites not meeting the RHR completeness criteria
    - Data substitution method is decided on by the States

- Best and worst 20% bext flags on daily data
  - Annual summary composition page and Query wizard

- New natural condition estimates using NIA and revised statistical
  approach (available from VIEWS home page)
  - Addressed deficiencies in old default approach
  - Glide slopes by dv and aerosol species
  - NIA values addition to VIEWS forthcoming
Worst 20% Natural Condition dv estimates

Old IMPROVE algorithm & old default approach

New IMPROVE algorithm & new default approach

Rodger Ames, Bill Malm, Marc Pitchford
Additions - Documents

- 2005 IMPROVE Steering Committee Meeting Presentations
- Latest IMPROVE newsletters and meeting minutes
- 2005 and 2006 IMPROVE Calendars
- Final report: The Yosemite Aerosol Characterization Study of 2002
- Carbon Analysis SOPs - Updated November 2005
- Ion Chromatography SOPs - Updated October 2005
Additions - Grey Literature

- Rocky Mountain Atmospheric Nitrogen and Sulfur Study (ROMANS) brochure – NPS ARD
- Re-Submittal of IMPROVE Transmissometer Extinction Data (1986 – 2004) - ARS
- Simulation of the Impact of the SO2 Emissions from the Proposed Sithe Power Plant on the Grand Canyon and other Class I Areas – Schichtel and Malm
- Simulation of the potential impacts of the proposed Sithe power plant in the Four Corners basin using CAMx – Barna and Rodriguez
- Revised IMPROVE Algorithm for Estimating Light Extinction from Particle Speciation Data – IMPROVE Tech Committee
- Redelivery of IMPROVE Data, 2000-2004 – UC Davis
**IMPROVE Data Advisories**

This is an IMPROVE data user community supported page meant to document interesting findings from the IMPROVE database including data anomalies, potential problems, and new uses for the IMPROVE data. These advisories are NOT meant to be comprehensive or complete. In addition, unless explicitly stated the data advisories are not necessarily endorsed by the IMPROVE steering committee, National Park Service, CIRES or others.

Contact [Bret Schichtel](mailto:bret.schichtel@gmail.com) to submit a data advisory.

<table>
<thead>
<tr>
<th>Data Advisory</th>
<th>Submitted by:</th>
<th>Date:</th>
<th>Doc #:</th>
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<tr>
<td>1-in-6-day Cu contamination from foreign samplers</td>
<td>W.H. White</td>
<td>9/2008</td>
<td>da0007</td>
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<td>Sites: ATLA, BAOL, ERMA, PMRF, ROMA, others</td>
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<td><strong>High concentrations attributable to documented wildfire</strong></td>
<td>W.H. White</td>
<td>9/2008</td>
<td>da0008</td>
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<td>Sites: PORE</td>
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<td><strong>Sporadic contamination by Zn</strong></td>
<td>W.H. White</td>
<td>9/2008</td>
<td>da0005</td>
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<td>Underestimation of Sulfur Concentrations During High Loadings and Humidity Conditions in the Eastern US</td>
<td>B.A. Schichtel</td>
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<td>Sites: Sites in the Eastern United States</td>
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<td><strong>A Discontinuity in the Nitrate Ion Time Series at June 1996</strong></td>
<td>B.A. Schichtel</td>
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<td>Significant Loss of Ion Concentrations in 1998 Due to Clogging of Module B Nylon Filters</td>
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<td>Sites: Entire network</td>
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New Tools

- Upgrade VIEWS tools for data analysis, display and delivery tools
  - The draft tools presented last year are in production
  - Snappier data query wizard to access IMPROVE data and data from other networks
  - True GIS capabilities
  - Enhanced tools to deliver and explore graphical and tabular Summaries of IMPROVE data relevant to RPO’s
  - Tools to access and visualize data from other networks
New features that will be part of VIEWS by 2007

- Dynamic contour mapping
- An expanded range of report types and queries for the Query Wizard
- More chart types and configuration features
- An ad hoc SQL query tool
- The Integrated Mapping and Analysis Tool (IMAT) for spatial data display and analysis
- Automated Analysis Browser tool for browsing static images and documents
- Acquired the full suite of ESRI Geographical Information System software
- New 64-bit GIS server for spatial data analysis and contour mapping
- New 64-bit web server
Online IMPROVE Data Analysis Results – Visit VIEWS

Visibility Information Exchange Web System

NATIONAL (UNITED STATES) aerosol and optical data integration, analysis and delivery system supporting the better understanding and analysis of haze and the implementation of the U.S. Regional Haze Regulation.

Designed to acquire, manage, and provide access to data and metadata from multiple monitoring networks in a uniform format.

http://vista.cira.colostate.edu/VIEWS/
Sites with data completeness issues during the 2000-2004 baseline period
Composition view of substitute data (see method in figure caption) and method selection option in control panel.
Substitute baseline values on Trends Page: RHR and substitute methods selected, baseline shown for substitute data.
Development of a new data management system for the IMPROVE Air Quality Group at CNL

- Data flow and process analysis
- Relational database design
- Data import system
- Data access and retrieval mechanisms
- Online presentation and analysis tools
- XRF data management system design
- Data input, validation, and quality assurance procedures
- Change tracking and auditing policies
Progress on the web site (fy’06)

- Ongoing maintenance (45%)
  - Site operations
  - Acquire, import & manage data (existing & new)
  - Develop data repository
  - Integration/partnership with data providers

- Accomplishments
  - Updated all major data sets
  - Incorporated the resubmitted 2000-2004 IMPROVE data
  - Added raw data and Regional Haze metrics calculated by Old and New IMPROVE algorithms
  - Fixed various web tool bugs/issues
  - Responded to user feedback and questions
  - Worked with EPA to update the AQS IMPROVE data
Progress on the web site (fy’06)

- New development activities (55%)
  - Improve readability & usability of tools
  - Integrate existing tools
  - Expand aggregation tools
  - Improve data selection & management
  - Improve visualization tools
  - Improve reporting tools
  - Integrate other RPO air quality tools

- Accomplishments:
  - Links for Regional Haze SIP writers to get direct access to RHR data products (baseline values, natural condition estimates, glide slopes)
  - New Data Query Wizard (by October 2006)
  - Dynamic Contour Maps (by October 2006)
Addition of RHR datasets
- UCD 2000 -2004 resubmission, old and new IMPROVE algorithm, state substitute datasets

Best and worst 20% bext flags on daily data
- Annual summary composition page and Query wizard

Figure captions on trends and composition pages
- reduce all queried database dimensions to descriptive text

Generated natural condition estimates using NIA and revised statistical approach
- Addressed deficiencies in old default approach
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Major revisions to Annual summary GUI
- List or map based site selection
- System & user defined presets
- Dynamic parameter sorting option on composition page
- Component architecture: charts, control panel, & map component are reused in other pages (e.g. in the WRAP TSS)
Substitute data

- Substitute data complete baseline record at *problem sites* (sites with less than 3 years of baseline data).
- Data added to VIEWS at request of CENRAP. Submissions for VISTAS and WRAP pending.
- Allow calculation of natural conditions based on longer ‘substitute’ data record
- Substitute dataset descriptions are on the VIEWS Documents page
  - List of problem sites (12 all together under current protocols)
  - Explanation of identified issues at BOWA, MING, BRET
  - Data retrieval and submission descriptions
- Substitute data are **NOT** patched data
  - Substitute data use surrogates to estimate aerosol species concentrations. Methods adopted by States and submitted for review by Monitoring and Data Analysis Workgroup
  - Patched data are derived following specific patching algorithms specified in the RHR Tracking Progress document.
- Substitute data and products are available from the VIEWS Annual Summary Trends and Composition Pages
bSO4 Contribution to Worst 20% bext