

IMPROVE Website

Status and Great Things to Come

Presented to the IMPROVE Steering Committee Mammoth Cave,
KY September 2006
B.A. Schichtel

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.

Diminishing View
Diminishing View
Diminishing View
Diminishing View

West Elk Mountains, Colorado



B _{ext} (Mm ⁻¹)	20	30	40	60	100	200	300	500		
Deciviews	4	7	11	14	18	23	30	34	37	39
V.R. (km)	200	130	100	65	40	20	13	10	8	

< Stop Loop >

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.

IMPROVE and Visibility Overview

Data Resources Tools Publications Special Studies Visibility & Regulation Education

IMPROVE Resources

Database Metadata Graphics Photos Web Cams IMPROVE Reports Grey Literature

Bulletins

- Data
- Tools
- Publications
- Special Studies
- Education
- Activities

IMPROVE Website Purpose

- 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)

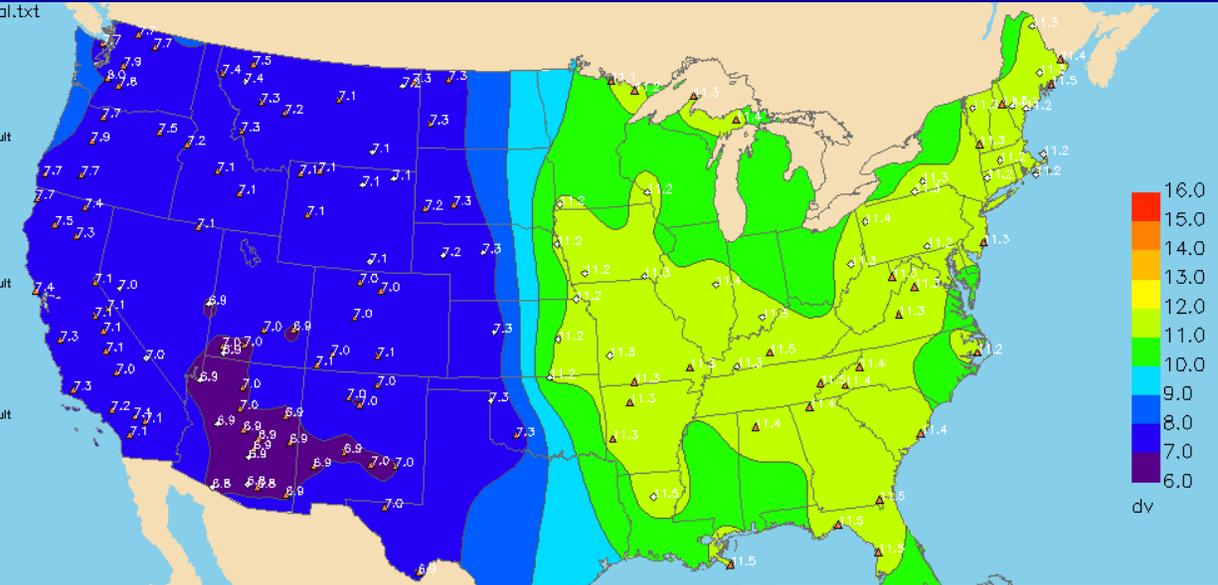
Additions - Data

- 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

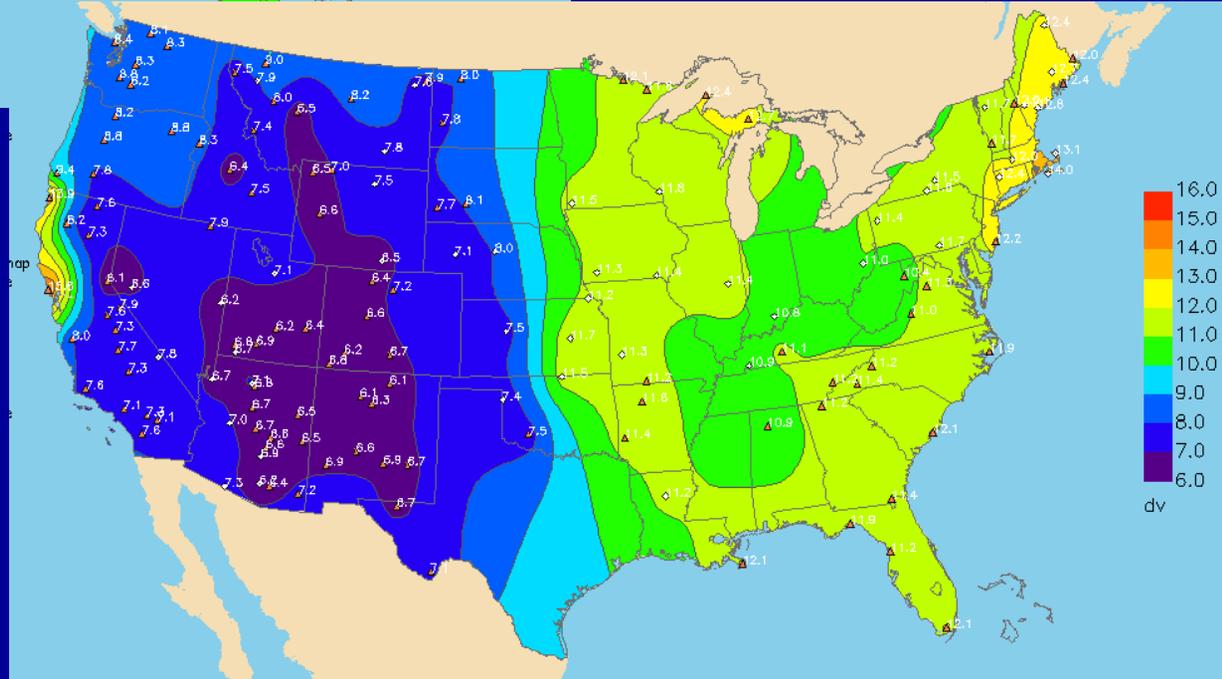
- Regional Haze Rule Metrics: best and worst 20% haze days
 - RHR data available through 2004
 - Updated the RHR metrics with the 2000-2004 resubmission Network: IMPROVE Aerosol (RHR1)
 - Added a second RHR network using the new IMPROVE algorithm Network: IMPROVE Aerosol (RHR2, New Algo.)
 - Substitute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

Additions - Data Advisory Section

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 indorsed by the IMPROVE steering committee, National Park Service, CIRA or others.

Contact [Bret Schichtel](#) to submit a data advisory.

1-in-6-day Cu contamination from foreign samplers	Submitted by: W.H. White	On: 9/2006	Doc # da0007
Sites: ATLA, BADL, BRMA, PMRF, ROMA, others	Time Period: 2002 -	Module/Species: Al Cu	
High concentrations attributable to documented wildfire	Submitted by: W.H. White	On: 9/2006	Doc # da0006
Sites: PORE	Time Period: 10/12/04	Module/Species: Al K; Cl OC EC	
Sporadic contamination by Zn	Submitted by: W.H. White	On: 9/2006	Doc # da0005
Sites: Entire network	Time Period: 2004 known to be affected; earlier years may have been affected	Module/Species: Al Zn	
Underestimation of Sulfur Concentrations During High Loadings and Humidity Conditions in the Eastern US	Submitted by: B.A. Schichtel	On: 9/2006	Doc # da0004
Sites: Sites in the Eastern United States	Time Period: 1992-1994	Module/Species: Al Cu	
A Discontinuity in the Nitrate Ion Time Series at June 1996	Submitted by: B.A. Schichtel	On: 9/2006	Doc # da0003
Sites: Entire network	Time Period: 6/1996	Module/Species: Al Cu	
Significant Loss of Ion Concentrations in 1998 Due to Clogging of Module B Nylon Filters	Submitted by: B.A. Schichtel	On: 9/2006	Doc # da0002
Sites: Entire network	Time Period: 1998	Module/Species: B/ SO4, NO3	

Up

Advisory

History

Aerosol

Optical

NPS

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

VIEWS
Visibility Information Exchange Web System

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Dedicated to reducing **Regional Haze** in **Class 1 Areas** through the exchange of **Data, Tools, and Ideas**

VIEWS
Visibility Information Exchange Web System

The Visibility Information Exchange Web System is an online exchange of visibility data, research, and ideas designed to support the Regional Haze Rule enacted by the U.S. Environmental Protection Agency (EPA) to reduce regional haze in national parks and wilderness areas. In addition to this primary goal, VIEWS supports global efforts to better understand the affects of air pollution on visibility and to improve air quality in general.

VIEWS Data
The VIEWS website provides access to a wide variety of visibility data resources, including metadata from several networks of air quality monitoring sites, an integrated aerosol database, graphical summaries of data analyses, extensive catalogs of air quality information, and many others. (Mouse-over the icons above for more info.)

QUICK VISITOR'S GUIDE

- Use the top navigation bar for general information about the website.
- Use the left navigation area to browse and search for **data**.
- Click on the photographs at the very top to find out more about selected Class I Areas.
- Learn about the Regional Planning Organizations by following the "**Partners**" links.
- Click on the VIEWS logo to to download the logo in various formats and sizes.

VIEWS BULLETINS AND NEWS

- All Bulletins and News**

New Presentation

- VIEWS Presentation at the 2003 AQS Conference**
The presentation describes the nature, purpose, and overall design of the VIEWS system and provides an update on the current status of ongoing tasks as of April, 2003. Recently released features are explored, and plans for future development are presented.

PARTNERS

- Western Regional Air Partnership
- CENRAP
- Midwest RPO
- VISTAS
- Regional Haze MANE-VU web site
- Environmental Protection Agency

OF INTEREST

- Visibility
- About Air Pollution
- Regional Haze Rule
- Class I Areas
- IMPROVE Program
- RPO Information
- Software Tools
- Our Staff
- Fire & Air Presentations

NEWSLETTER

Signup for the VIEWS newsletter to receive bulletins and updates periodically by email:

Sign Me Up!
Please Remove Me

FEEDBACK

Data

- All Data
- Metadata
- Query Wizard
- ASCII Data Files

Annual Summary

- Spatial Patterns
- Composition
- Trends
- Back Trajectories
- Summary Data
- Archived Graphics

Catalogs

- Air Quality Catalog
- Weather Catalog
- Emissions Catalog

Imagery

- Visibility Photos
- Class I Webcams
- Forest Service

Guest List

For best results, please use:
Internet Explorer 5 (or higher)
Netscape 6 (or higher)
[more info...](#)

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

Substitute Data Page

Sites with data completeness issues during the 2000-2004 baseline period



VIEWS
Visibility Information Exchange Web System



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- Data & Metadata
- Query Wizard
- Metadata Browser
- Site Browser
- ASCII Files
- Data Repository
- Annual Summary
- Trends
- Composition
- Spatial Patterns
- Back Trajectories
- Visibility Grid
- Summary Data
- Archived Graphics
- Resources
- Air Quality Catalog
- Weather Catalog
- Emissions Catalog
- IEWS Docs
- RHR Planning Docs
- CAPITA Tools
- Imagery
- Visibility Photos
- Class I Webcams
- Forest Service
- Development
- Metadata Browser
- New Data Browser

For best results, please use:

- IE 5+
- Firefox 3+
- Netscape 7+

Site Statistics:



IMPROVE Sites with data completeness issues during the 2000 - 2004 baseline period:

Number of Valid Years	Site	Name	State	RPO	Site Start Date	Sponsor	Class I Area(s)	Substitute data Available In VIEWS	Contact
0	BRET1	Breton	Louisiana	CENRAP	6/18/2000	FWS	Breton		
1	MIN01	Mingo	Missouri	CENRAP	5/24/2000	FWS	Mingo		
2	KAIS1	Kaiser	California	WRAP	1/26/2000	USFS	AnselAdams; Kaiser; JohnMuir		
2	BOWA1	Boundary Waters Canoe Area	Minnesota	CENRAP	8/14/1991	USFS	Boundary Waters Canoe Area	✓	Scott Copeland
2	CAP11	Capitol Reef	Utah	WRAP	3/28/2000	NPS	Capitol Reef		
2	CHU11	Cohutta	Georgia	VISTAS	5/24/2000	USFS	Cohutta		
2	BALD1	Mount Baldy	Arizona	WRAP	2/29/2000	USFS	Mount Baldy		
2	NCCA1	North Cascades	Washington	WRAP	3/1/2000	NPS	North Cascades; Glacier Peak		
2	SAMA1	St. Marks	Florida	VISTAS	6/13/2000	FWS	Saint Marks		
2	RAFA1	San Rafael	California	WRAP	2/2/2000	USFS	San Rafael		
2	SHRD1	Shining Rock Wilderness	North Carolina	VISTAS	7/20/1994	USFS	Shining Rock		
2	SWAN1	Swanquarter	North Carolina	VISTAS	6/8/2000	FWS	Swanquarter		

Specific Issues that have been identified, their resolution, and availability of substitute datasets in VIEWS (note - Substitute data are those in which steps outside the RHR Guidance have been followed to replace missing data. Substitute data differ from patched data, the latter of which are produced following specific algorithms outlined in the RHR Tracking Progress Guidance):

Steps to obtain substitute data from VIEWS:

- Navigate to either the Trends or Composition pages in the VIEWS Annual Summary
- Select site from the site selection tools
- Once selected, two distinct 'methods' will appear in the methods pane on the tool control panel. Select on the 'Substituted Data' method
- Select the desired IMPROVE algorithm. The substitute data set are available for both the Old and New IMPROVE algorithms (IRHR1 and IRHR2 programs, respectively)
- Download aggregated data from the trends tabular data section or the Composition page 'Pie Chart Data' Section
- Download daily data from the Composition page tabular data section

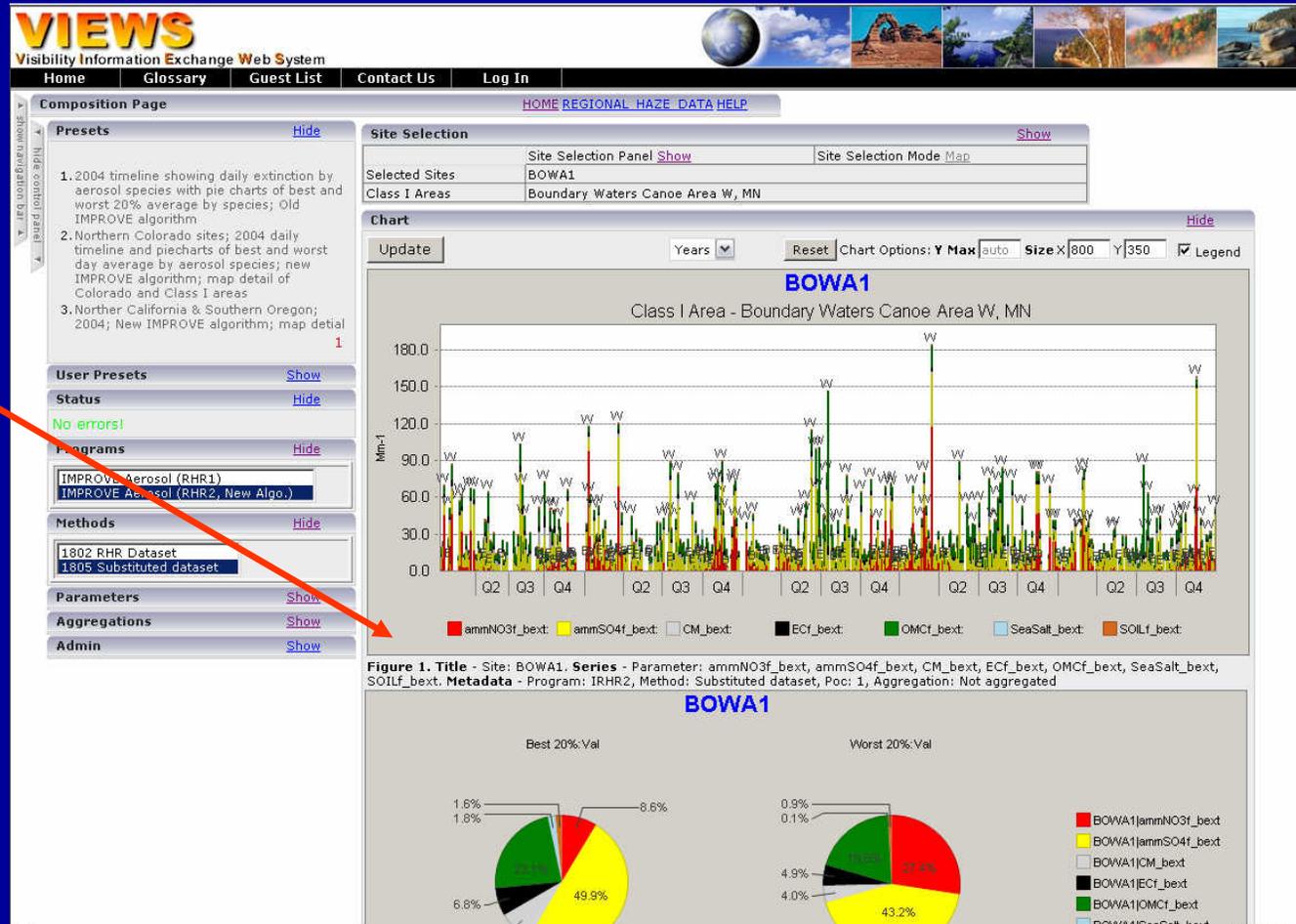
Steps to submit substitute data to VIEWS:

- Issues pertaining to incomplete data at each site and specifics of the substitution method applied should be presented for review by the Monitoring and Data Analysis Workgroup prior to submission to VIEWS. Ultimately it will be up to EPA in their SIP review/approval process to officially accept or reject any specific data substitution method.
- Only one substitution method per site will be hosted by VIEWS
- Please review the following templates for substituted data submission:
 - o Old IMPROVE algorithm [template](#)
 - o New IMPROVE algorithm [template](#)
- email completed and reviewed datasets to VIEWS rames@cira.colostate.edu

Sites with data completeness issues and substitution methods reviewed by the Monitoring and Data Analysis Work Group:

BOWA1 - Boundary Water Canoe Area

Composition Page



Composition view of substitute data (see method in figure caption) and method selection option in control panel

Trends Page

VIEWS
Visibility Information Exchange Web System

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Trends Page [HOME](#) [REGIONAL](#) [HAZE](#) [DATA](#) [HELP](#)

Presets [Hide](#)

- Baseline dv; worst 20%; Isle Royale NP and Seney NWR
- 17 California IMPROVE sites; best and worst 20% dv baseline and glide slopes
- Annual worst 20% light extinction by aerosol species
- Annual worst 20% light extinction by aerosol species, 5-yr attainment values, and estimated species natural conditions (chart series legend removed)
- Trend analysis showing worst 20% aerosol extinction and deciview, 2000-2004 baseline, 5-year attainment values and natural conditions

User Presets [Show](#)

Status [Hide](#)

- Unable to calculate baseline, insufficient data during baseline years: BOWA1 IRHR2|1|dv|87|1802

Programs [Hide](#)

IMPROVE Aerosol (RHR1)
IMPROVE Aerosol (RHR2, New Algo.)

Methods [Hide](#)

1802 RHR Dataset
1805 Substituted dataset

Parameters [Hide](#)

Parameter Group

Reconstructed Fine Mass (RCFM)
 Reconstructed Total Mass (RCTM)
 Aerosol Bext Components

RHR Parameters

Code	Units	MProc
aerosol_bext	Mm-1	1
annW03f	ug/m3 LC 1	1
annW03f_bext	Mm-1	1
annW04f	ug/m3 LC 1	1
annW04f_bext	Mm-1	1
CH_bext	Mm-1	1
CH_calculated	ug/m3 LC 1	1
dv	dv	1

Site Selection [Show](#)

Site Selection Panel [Show](#) Site Selection Mode [Map](#)

Selected Sites: BOWA1
Class I Areas: Boundary Waters Canoe Area W, MN

Chart [Hide](#)

Update Chart Options: Y Max auto Size X Y Legend

Figure 1. Title - Site: BOWA1. Series - Method: RHR Dataset, Substituted dataset, RHR Dataset 2000-2004 Baseline, Substituted dataset 2000-2004 Baseline. Metadata - Program: IRHR2, Poc: 1, Parameter: dv, Aggregation: Worst 20%

Spreadsheet [Hide](#)

Update Lat/Lon Units Flags **Download Spreadsheet:** Excel Word Power Point

site	Year	RHR Dataset	Substituted dataset	RHR Dataset 2000-2004 Baseline	Substituted dataset 2000-2004 Baseline
BOWA1	1992	21.91			
BOWA1	1993	20.5			
BOWA1	1994	21.81			
BOWA1	1995	19.27			
BOWA1	1997	20.51			
BOWA1	2000	19.93	19.93	19.93	19.59
BOWA1	2001	20.04	20.04	20.04	19.59
BOWA1	2002		20.11	20.11	19.59
BOWA1	2003		20.07	20.07	19.59
BOWA1	2004	17.79			19.59

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)

VIEWS updates: 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
 - Glide slopes by dv and aerosol species
 - NIA values addition to VIEWS forthcoming
- 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% best

