

IMPROVE Interagency Monitoring of Protected Visual Environments

Home Search Contents Contact

Overview Data Tools Publications Studies Education/Reg Forum Activities Links

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.

Diminishing View
Diminishing View
Diminishing View

West Elk Mountains, Colorado

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

< Stop Loop >

Website Categories

Data Resources Tools Publications Special Studies Visibility & Regulation Education IMPROVE & Visibility Overview

IMPROVE Resources

Database Metadata Data Advisory, QA/QCX Graphics Photos Web Cams IMPROVE Reports Gray Literature

Bulletins

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

<http://vista.cira.colostate.edu/IMPROVE>

IMPROVE Website Purpose

- Transparency
 - Document IMPROVE activities: committee, laboratories, users
 - Inform users of data QA/QC activities and issues
- Traceability
 - Document and provide access to ancillary data
 - **Database version control with documentation**
 - **IMPROVE network operations metadata access/links**
 - **Calibration factors, Blank corrections**
- Accessibility
 - Provide access to data, metadata and data products
- Community
 - Facilitate collaborative projects and interaction with others
 - Provide access to educational material and documents on visibility issues, science and regulations

IMPROVE International User Community

- 1866 unique visitors in an average month (2200 in 2009)
 - 205000+ unique visitors since 2004
- Visitors from 179 different countries (164 in 2009)
 - China – 3767
 - Korea – 1544
 - Saudi Arabia - 328
- Hundreds of other websites Link to **IMPROVE/VIEWS/FED**

Additions - Data

- IMPROVE aerosol data update - periodically
 - Final data is available through **December 2012**
 - Jan –Feb, 2013 any day now
 - Regional Haze Rule data – through 2011
 - 2012 data soon
- Optical data updates
 - Nephelometer scattering data (quarterly)
 - 1993 through **Mar 2013** data available from online database.
 - Apr-Jun, 2013 will be available soon
 - Transmissometer extinction data - discontinued

Additions – Data Continued

- Adhoc committee to cleaned up, documented and maintain IMPROVE derived composite data
 - All RHR data reimported, will combine derived, patched and substituted data used in State SIP plans. All data will be flagged
 - Fixed mis-mapped data
 - Adding substituted data and flags - in progress
 - 2000-09 data have been frozen
 - Calculated values will be removed from the IMPROVE raw dataset
 - New IMPROVE composite derived dataset
 - Strip calculated values from the IMPROVE dataset
 - Contain multiple versions of composite values, e.g. $OM=1.4*OC$ and $1.8*OC$

Additions – Documents

- 2012 IMPROVE Steering Committee Meeting Presentations
- 2013 IMPROVE Calendar – (last one)
- 2013 IMPROVE newsletters (behind) - (last ones)
- SOPs
 - Carbon: updated TOR/TOT
 - Particle: updated Sample Handling and technical doc
updated Optical Absorption Analysis
- No new gray literature since 2010
- Data Advisory – no new advisories since 2010. Any pending?

Additions – Educational Interactive Tutorials

- Monitoring Changing AQ in the Edwin B. Forsythe NWR (BRIG)

US Fish and Wildlife Service
Monitoring Changing Air Quality in the Edwin B. Forsythe National Wildlife Refuge

Welcome to Our Town!
What You Can Do!

Air pollution is a chronic problem at this refuge. Since 1991, the U.S. Fish and Wildlife Service and the New Jersey Department of Environmental Protection (NJDEP) have worked together cooperatively to monitor and control air pollution. The refuge is in a highly industrialized air shed, with air pollution from many sources. If we don't protect air quality, wildlife and scenic values will be threatened.

Look out of the window to locate the refuge's air quality monitoring site, then explore what we monitor and why.

Did you know...?
(Press to find out more.)

Air Quality Monitoring Site

Touch the buttons below to see an instrument and a brief description. Touch them again for more information.

- Visibility
- Particles
- Sulfur, Fine Particles
- Acid Deposition
- Ozone
- Mercury
- Meteorology

- Working on an Acadia AQ tutorial and two more for FWL



Glacier National Park

Search:

[AQRV Summaries](#)[Webcams and Photographs](#)[Data Visualization and Exploration](#)[Metadata and Reference](#)[Database Query Wizard](#)[Web Services and Tools](#)[FED Home](#) [Page status](#) [Printer friendly view](#) [Contact us](#)

Federal Land Manager Environmental Database (FED)

This website provides access to an extensive database of environmental data and an integrated suite of online tools and resources to help Federal Land Managers assess and analyze the air quality and visibility in Federally-protected lands such as National Parks, National Forests, and Wilderness Areas.



AQRV Summaries

View graphical summaries and reports of the status and trends of air-quality-related values (AQRVs) and other metrics that have been chosen by Federal Land Managers (FLMs) for assessing air quality in protected federal areas.



Webcams and Photographs

See live video from webcams at select rural and urban vistas, and examine sequences of photographs from selected monitoring sites that demonstrate the range of visual conditions at each site over time.



Data Visualization and Exploration

Use a variety of interactive tools and applications to visualize, explore, filter, and download raw and aggregated air quality data and relevant metadata from the integrated database in a variety of customizable formats.



Metadata and Reference

Find and explore detailed metadata about datasets, monitoring sites, parameters, sampling and analysis protocols, processing methods, data flags, and other aspects of the air quality data in the integrated database.



Database Query Wizard

The query wizard allows you to selectively download data and metadata from the FED integrated database by specifying datasets, monitoring sites, parameters, date ranges, data quality flags, and other criteria. You can request data in variety of output formats.



Web Services and Tools

Discover web services, online utilities, and developer tools for accessing data at the database, and learn about the low-level components of the FED infrastruc...

Featured Substance

Bauxite

Name:	Bauxite
CASNum:	1318-16-7
ACXNumber:	X1027249-2

Featured Term

CenSARA

Central States Air Resource Agencies.
Represents the states of Nebraska, Kansas, Oklahoma, Texas, Minnesota, Iowa, Missouri, Arkansas, and Louisiana.

Air Quality News

News feed is unavailable at this time.

FED's Objective

Web-based integrated environmental database and data aggregation delivery and visualization tools to support and facilitate environmental data assessments and reports by the National Park Service and Forest Service

- Facilitate the analysis of environmental datasets for NPS and FS resource managers, scientist and general public
- Increase the use of the environmental datasets
- Reduce costs, increase efficiency and minimize conflicting data analyses often associated with individual and hand crafted analyses
 - Liberate data analysts from redundant, tedious, and laborious activities

FED's Objective

- Underlying database and infrastructure is designed to support multiple organizations and projects including NPS and FS air quality programs and IMPROVE data distribution.
 - NPS website provide summary data
 - Graphical products for NPS reports
 - Forest Service websites
 - IMPROVE website

Environmental Data

- Raw datasets
 - IMPROVE aerosol, optical
 - NPS and SLAMS PM2.5, PM10
 - NPS and SLAMS ozone
 - NADP wet deposition
 - CASTNet dry deposition
 - Forest Service water quality data
 - Other regional networks, e.g. SEARCH
- Aggregated data values
 - RHR metrics
 - NAAQS metrics
 - Deposition metrics

Database Query Wizard

The query wizard allows you to selectively download data and metadata from the integrated database by specifying datasets, sites, parameters, date ranges, data quality flags, and other criteria. You can request raw data and graphical reports in variety of output formats, including delimited text files, Excel files, charts, graphs, and maps. Click through the tabs from left to right to select the data you want.

Reports
Datasets
Sites
Parameters
Dates
Aggregations
Fields
Options

<input type="checkbox"/>	Guelph Aerosol and Visibility Monitoring	Monitored; Speciation	Daily	1994	2001
<input checked="" type="checkbox"/>	IMPROVE Aerosol	Monitored; Speciation, Visibility	Daily	1988	2012
<input type="checkbox"/>	IMPROVE Aerosol, Preliminary	Monitored; Speciation, Visibility	Daily	2012	2012
<input type="checkbox"/>	IMPROVE Aerosol, RHR (New Equation)	Monitored; PM2.5 Species & Mass, Haze...	Daily	1988	2011
<input type="checkbox"/>	IMPROVE Aerosol, RHR (Orig. Equation)	Monitored; Speciation, Visibility, RHR	Daily	1988	2004
<input type="checkbox"/>	IMPROVE Fine Total Carbon Source Contribution S...	Modeled; Fine Carbon	Daily	2006	2008
<input type="checkbox"/>	IMPROVE Natural Conditions II, Baseline (00-04)	Calculated; Deciview, Light Extinction	N/A	2000	2005
<input type="checkbox"/>	IMPROVE Nephelometer	Monitored; Light Scattering	Hourly	1993	2013
<input type="checkbox"/>	IMPROVE RHR 5-Yr Averages	IMPROVE Calculation of RHR 5-y	Annual		
<input type="checkbox"/>	Midwest RPO Ammonia	Monitored; Gaseous	Daily	2003	2005
<input type="checkbox"/>	MOHAVE Special Study	Monitored; Speciation	Daily	1992	1992
<input type="checkbox"/>	NADP AIRMoN	Monitored; Deposition, Ion Species	Weekly	1992	2010
<input type="checkbox"/>	NADP National Trends Network	Monitored; Deposition, Ion Species	Weekly	1978	2011
<input type="checkbox"/>	NADP NTN Precipitation-Weighted Means	Monitored; Wet Deposition, Ion Species	Annual	1978	2011
<input type="checkbox"/>	NADP NTN Total Wet Deposition	Monitored; Wet Deposition, Ion Species	Annual,Seasonal	1978	2011
<input type="checkbox"/>	NPS GPMP	Monitored; O3, NOx, CO, PM, and meteo...	Hourly		
<input type="checkbox"/>	NPS Ozone Daily 8hr Max	Monitored; Aggregated Ozone	Daily	1987	2011
<input type="checkbox"/>	NPS Stacked Filter Unit Aerosol	Monitored; Speciation	Daily	1979	1993

Submit...

Selections

Selected Monitoring Networks:

IMPROVE Aerosol

Selected Monitoring Sites:

Acadia NP

Selected Measurement Parameters:

Show selections by:

- Name
- Code
- Database ID

Datasets to be included

- IMPROVE aerosol data
- Forest Service NRIS-Water quality data
- hourly ozone concentrations (ppb) from continuous ozone monitors, including all EPA/AQS monitors, CASTNET monitors, NPS portable ozone monitors, 1988 to present
- weekly passive ozone concentrations (ppb) from NPS passive ozone samplers
- hourly meteorological parameters, including temperature, relative humidity, scalar wind speed, scalar wind direction, vector wind speed, vector wind direction, dew point, solar radiation, rainfall, and barometric pressure
- hourly PM_{2.5} concentrations
- hourly PM₁₀ concentrations
- hourly NO₂ concentrations
- hourly SO₂ concentrations
- hourly CO concentrations
- CASTNET model estimates for hourly concentrations, dry deposition velocity, and dry deposition flux
- weekly wet deposition concentrations, including Ca, Cl, K, Mg, Na, NH₄, NO₃, SO₄, and Hg (mg/l and meq/l)
- weekly wet deposition, including Ca, Cl, K, Mg, Na, NH₄, NO₃, SO₄, and Hg (kg/ha)
- nephelometer visibility measurements
- Night sky brightness imagery

Derived Values

- **IMPROVE Derived Values and Statics:**

- missing data estimated using algorithms specified in the Regional Haze Rule guidance documents
- daily IMPROVE ambient particulate concentrations for ammonium nitrate, ammonium sulfate, coarse material, soil, organic mass, soot, sea salt, gravimetric PM_{2.5}, and gravimetric PM₁₀
- daily IMPROVE extinction estimates for ammonium nitrate, ammonium sulfate, coarse material, soil, organic mass, soot, sea salt, Rayleigh, total extinction, and deciview
- daily IMPROVE visibility estimates in kilometers
- annual mean, best days, median days, and worst days IMPROVE ambient particulate concentrations for ammonium nitrate, ammonium sulfate, coarse material, soil, organic mass, soot, sea salt, gravimetric PM_{2.5}, and gravimetric PM₁₀
- 3- and 5-year averages of annual mean, best days, median days, and worst days IMPROVE ambient particulate concentrations for gravimetric PM_{2.5}
- annual mean, best days, median days, and worst days IMPROVE extinction estimates for ammonium nitrate, ammonium sulfate, coarse material, soil, organic mass, soot, sea salt, Rayleigh, total extinction, and deciview
- annual mean, best days, median days, and worst days IMPROVE visibility estimates in kilometers

- **Ozone Statistics**

- daily maximum 1-hour ozone concentrations
- annual maximum 1-hour ozone concentrations
- annual 2nd highest 1-hour ozone concentrations
- 3- and 5-year means of the annual 2nd highest 1-hour ozone concentration
- daily maximum 8-hour ozone concentrations (calculated in accordance with EPA protocols)
- annual maximum, 2nd highest, 3rd highest, and 4th highest 8-hour ozone concentrations, occurring during the local ozone monitoring season (determined in accordance with EPA protocols)
- 3- and 5-year averages of the annual maximum, 2nd highest, 3rd highest, and 4th highest 8-hour ozone concentrations
- 3-year average of the annual 4th highest 8-hour ozone concentrations (determined in accordance with EPA protocols)
- 5-year average of the annual 4th highest 8-hour ozone concentrations
- annual 90th percentile of 1-hour ozone concentrations
- 3- and 5-year averages of the annual 90th percentile of 1-hour ozone concentrations
- annual highest 3-month maximum ozone SUM60 (calculated in accordance with EPA protocols)
- 3- and 5-year averages of the annual highest 3-month maximum ozone SUM60
- annual highest 3-month maximum ozone W126 sum (calculated in accordance with EPA protocols)
- 5-year averages of the annual highest 3-month maximum ozone W126 sum
- 3-year average of the annual highest 3-month maximum ozone W126 sum (calculated in accordance with EPA protocols)
- annual mean 1-hour ozone concentration
- annual mean 1-hour ozone concentration, calculated over the ozone season
- 5-year average 1-hour ozone concentration
- number of hours with 1-hour ozone concentration over 100 ppb during ozone season

- **Dry and Wet Deposition Statistics**

- annual mean deposition concentrations, including Ca, Cl, K, Mg, Na, NH₄, NO₃, SO₄, and Hg (mg/l and meq/l)
- 3- and 5-year averages of annual mean deposition concentrations (mg/l), including Ca, Cl, K, Mg, Na, NH₄, NO₃, SO₄, and Hg
- annual total wet deposition, including Ca, Cl, K, Mg, Na, NH₄, NO₃, SO₄, and Hg
- 3- and 5-year averages of annual total wet deposition, including Ca, Cl, K, Mg, Na, NH₄, NO₃, SO₄, and Hg

- **Trend Statistics**

- trend slope and p-value for monitors in and near parks, including 10-year trends for 3-year averages of the annual 4th highest 8-hour ozone, and annual wet deposition concentrations of NH₄, NO₃, and SO₄, and visibility conditions on the best and worst days
- annual values used to compute 10-year trend slopes

- **Other Derived Datasets**