

## 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
DeclViews	4	7	11	14	18	23	30	34
V.R. (km)	200	130	100	65	40	20	13	10

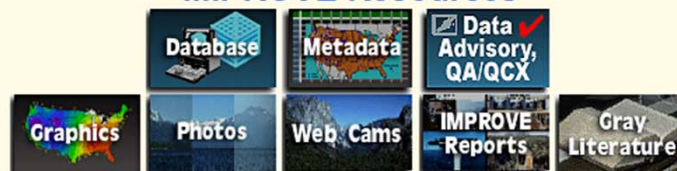
< Stop Loop >

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.

### Website Categories



### IMPROVE Resources



### Bulletins

Three new data advisories have been added addressing the redelivery of IMPROVE data from 2005 - 2014; change to how organic artifacts are corrected for; and a change in the reporting of filter absorption

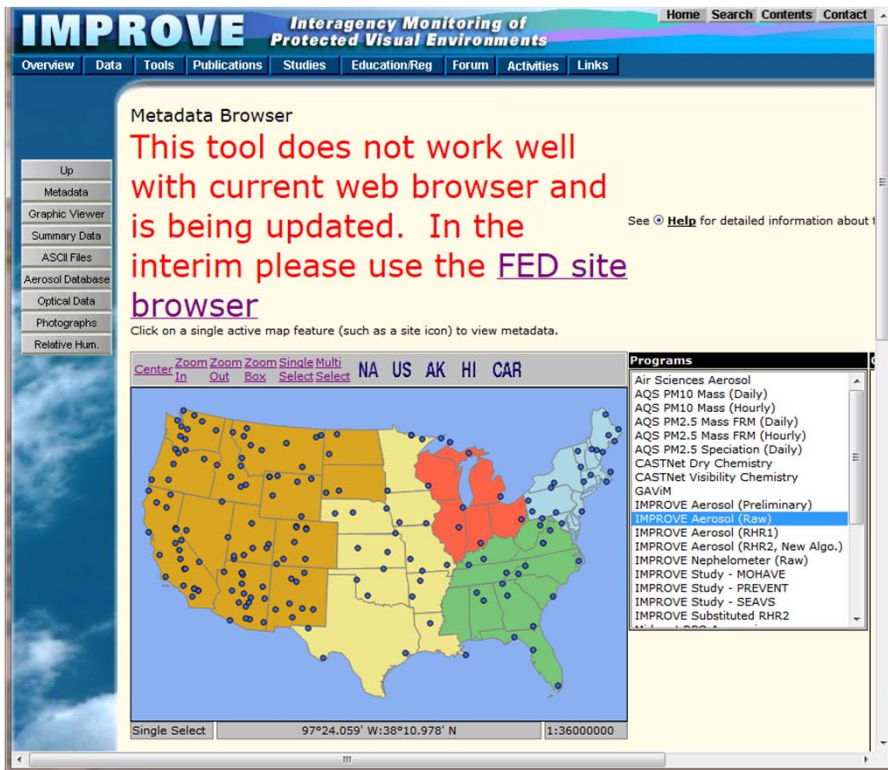
- After 15 years still soldering on and works – mostly
- Added lots of stuff, this year
  - Data advisories
  - Updated SOPs
  - IMPROVE data
  - 2014 Calendar
  - Photos of haze trends
- Didn't add lots of stuff
  - 2014 IMPROVE presentations
  - more

IMPROVE  
Community



↑  
Dr. BS

# Getting old and showing its age



Outdated Tools that may not work

## Frustrated Users:

e.g. Dave Maxwell:

- “Earlier this year I tried to access basic data from some IMPROVE sites in Idaho, Oregon, and Nevada. It was a time-consuming effort....”
- “..in trying to access basic graphs or numbers on standard visual range (SVR) for several IMPROVE sites in Idaho and one each in Oregon and Nevada to present in a public document, was that the web site was not user-friendly...”

# Rethinking the IMPROVE Website

## Needs:

- A system that works – always
  - Simple and robust and will last another 15+ years
- Easily updated and maintained
  - Distributed web content management system
- Meets IMPROVE objectives
  - Data description and use
    - Organize the wealth of IMPROVE data, metadata and information
    - Facilitate proper use of IMPROVE data and products
  - Support IMPROVE monitoring program
    - Document steering committee activities, process and exchange information between IMPROVE steering committee members, laboratories and public
- Inform and educate public on visibility/aerosol issues, science and regulations (maybe)

# Moving Forward

- Tony





Glacier National Park

[AQRV Summaries](#)[Webcams and Photographs](#)[Data Visualization and Exploration](#)[Metadata and Reference](#)[Database Query Wizard](#)[Web Services and Tools](#)

FED

[Page status](#)[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.

### QUICK LINKS

[Query Wizard](#)[Site Browser](#)[Haze Summary](#)[Ozone Summary](#)[Webcams](#)[Photographs](#)

# FED's Objective

Web-based integrated environmental database and data delivery, aggregation, and visualization tools to support and facilitate

- Data analysis –new knowledge
- Data driven decision making

- 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 datasets
  - Liberate data analysts from redundant, tedious, and laborious activities

# FED's Objective

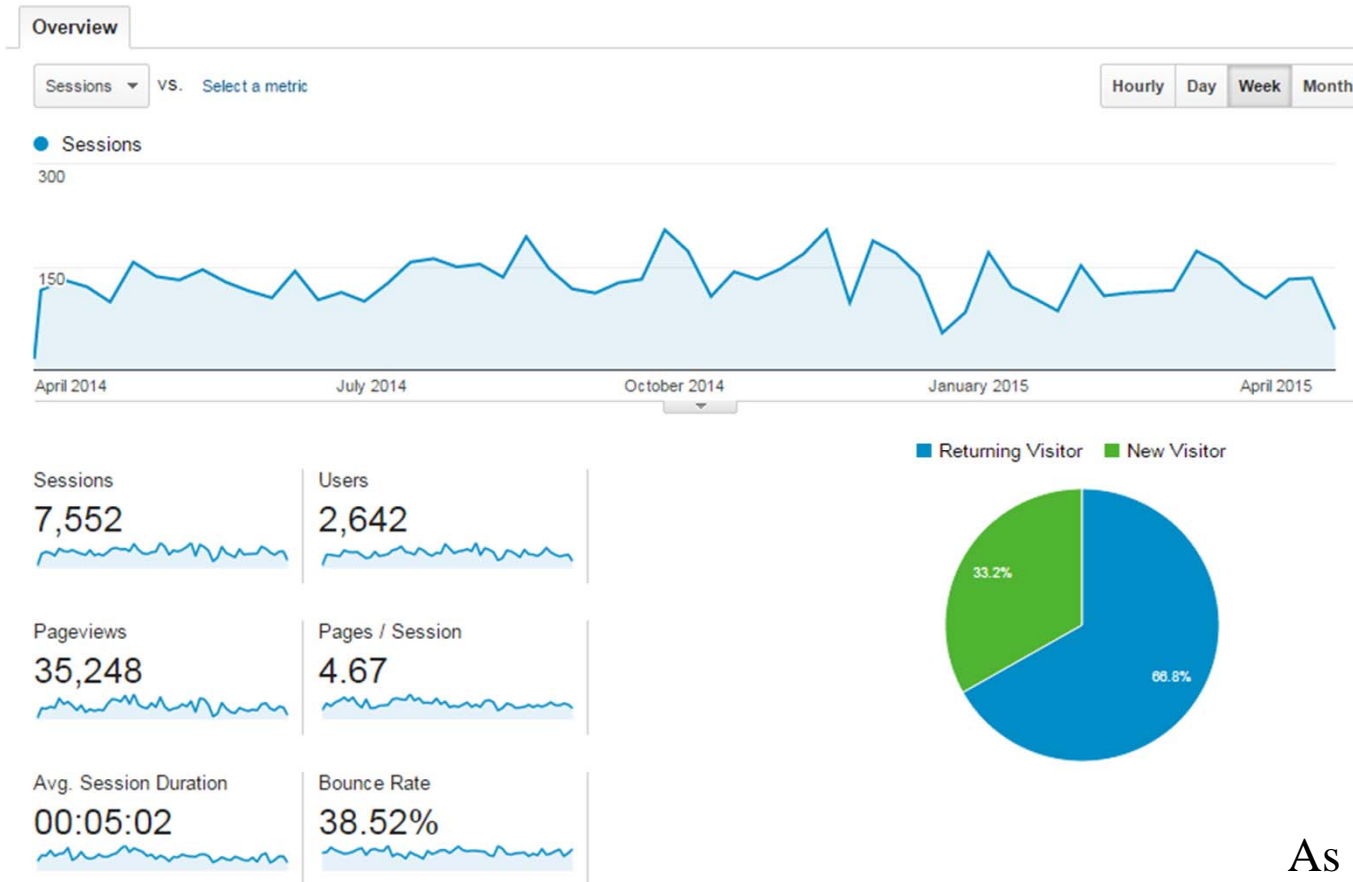
- Underlying Shawn McClure, database and infrastructure is designed to support multiple organizations and projects including NPS and FS air quality programs and IMPROVE data distribution.
- Currently, the system directly supports:
  - NPS website: air quality summary data products
  - Forest Service water chemistry data/metadata delivery
  - NPS-FS RHR data summary needs
  - IMPROVE data/metadata delivery



# Spring Cleaning

- Last spring reorganized and simplified to:
  1. Search/Find: Explore the content of the integrated database
  2. Access: download subsets of raw and aggregated data from one or more monitoring network
  3. Explore: Visualize raw and aggregated data and their relationships within and across the data space, time and parameter dimensions
  4. Summarize: Fixed and refined graphical summarize of the status and trends of air quality at monitored locations.

# Fed Usage



As of last spring

- 100 – 200 unique users a week
- 2642 unique users for year
- ~5 pages viewed per visit

# Browser Stats

Operating System	% Sessions
1. Windows	72.51%
2. Macintosh	15.11%
3. Android	5.74%
4. Linux	2.72%
5. iOS	1.81%
6. (not set)	1.21%
7. Nokia	0.60%
8. Windows Phone	0.30%

- Rise of the mobile user

# Websites

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

<http://views.cira.colostate.edu/fed/>

## Visibility Summary - IMPROVE Aerosol, Regional Haze Rule (RHR) New Equation

Select a monitoring site: **ME - ACAD1 - Acadia NP** Start year: **2003** End year: **2013**

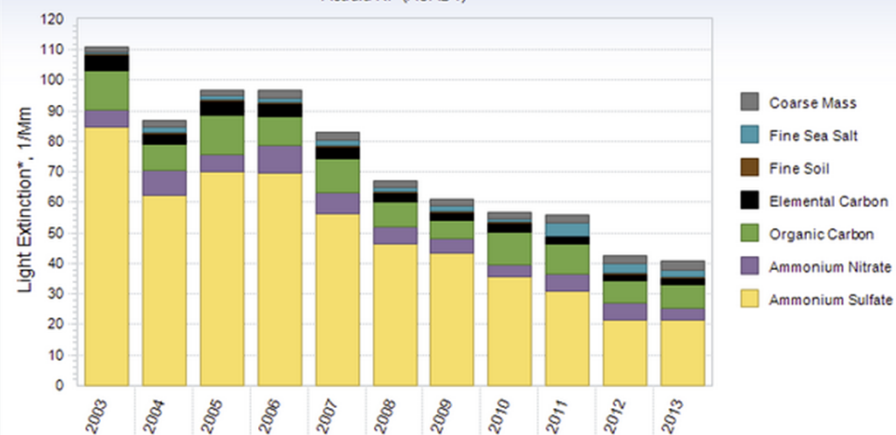
Deciview Trends

Light Extinction, Clearest Days

Light Extinction, Haziest Days

### Light Extinction on the Haziest Days, by Year

Acadia NP (ACAD1)

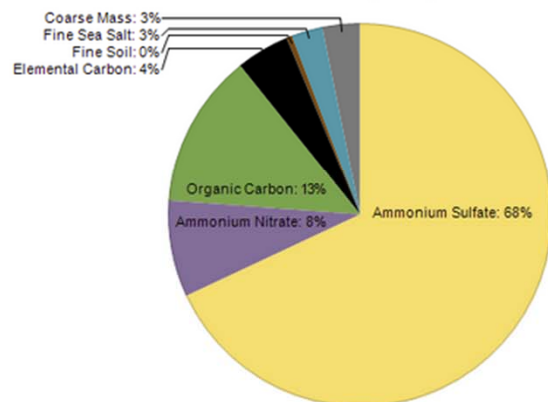


\*Light extinction: the loss in light intensity due to scattering and absorption measured in inverse megameters (Mm<sup>-1</sup>).

Monitor ID: ACAD1, ME

### Haziest Days 2003-2013

Acadia NP (ACAD1)



The chart above illustrates particle contribution to light extinction on haziest days. Light extinction is the gradual loss in light intensity due to scattering and absorption measured in inverse megameters (Mm<sup>-1</sup>).

Monitor ID: ACAD1, ME

## Ozone Summary - EPA AQS Ozone Network

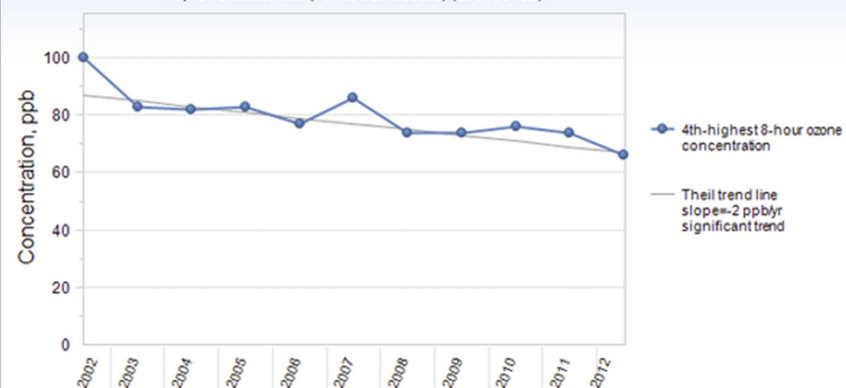
Select a monitoring site: **ME - 230090102 - Top Of Cadillac Mtn (Fenced Enclosure)** Start year: **2002** End year: **2012**

Ozone Trends

Ozone Exceedances

### Ozone Concentration

Top Of Cadillac Mtn (Fenced Enclosure) (230090102)



Monitor ID: 230090102, ME

### SUM06 Ozone Exposure Index for Vegetation

Top Of Cadillac Mtn (Fenced Enclosure) (230090102)



The SUM06 sums all hourly ozone concentrations  $\geq 0.060$  ppm during daylight hours over three months during the growing season.

Monitor ID: 230090102, ME

### W126 Ozone Exposure Index for Vegetation

{rename}

1/15