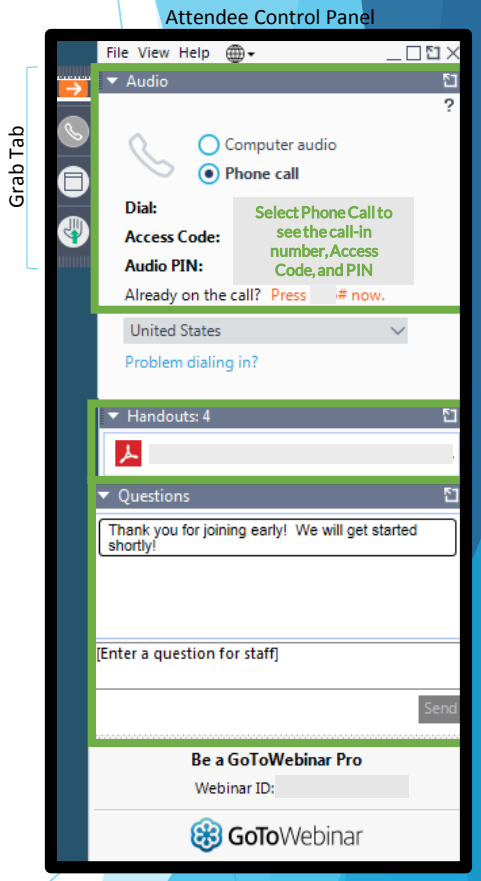
Welcome to today's webinar:
WESTAR-WRAP Air Quality Data and Decision Support Systems at Colorado State University / Cooperative Institute for Research in the Atmosphere

- The presentations are available in the **Handouts** pane of your control panel.
- Attendees may submit written questions through the **Questions** pane or **Chat** box on the control panel. You may also **Raise your hand** using the hand icon on the grab tab to be unmuted to ask your question.
- If you do not have a microphone for your computer and would like to ask your question, you may select "Phone Call" in your audio pane for a call-in number, access code, and audio pin #. Once the organizer unmutes your line, you will have the ability to mute/unmute yourself using the microphone button on the grab tab.



WRAP Contact: Tom Moore, tmoore@westar.org
ITEP Contact: Mehrdad Khatibi, Mehrdad.Khatibi@nau.edu

This webinar is being recorded.

Emma Ruppell, Air Quality & Meteorology Specialist, Bishop Paiute Tribe and WRAP Tribal Data Work Group Co-chair

- Emma has served since 2015 as staff of BPT's Air Program, which operates 2 continuous FEM particulate monitors, a continuous calibrated ozone monitor, and a meteorological station, outputs real-time data to the public, provides backyard burn permits, and works with other Tribal programs, departments, and neighboring Tribes and local/state/federal partners on projects to protect and improve air quality. She has background in earth and geospatial sciences, environmental monitoring and data collection, pollution controls, and regulatory topics.
- Email: emma.ruppell@bishoppaiute.org

Webinar Overview

- **Demonstration of WRAP Tribal Data map elements:** *Emma Ruppell*, 10 mins https://www.wrapair2.org/

- **Intro to the CIRA Air Data Management System:** *Shawn McClure*, 45 mins

Shawn McClure, Software Engineer and P.I. Intermountain West Data Warehouse, CIRA, Colorado State University

- Shawn is a software engineer for the Cooperative Institute for Research in the Atmosphere at Colorado State University and the P.I. of the Intermountain West Data Warehouse and the WRAP Technical Support System, which provide online access to monitored air quality data, gridded modeling products, and emissions data to help assess air quality in the Intermountain West. Shawn has been with CIRA/CSU for 17 years and has developed an extensive system of database, software, and website components to help researchers and planners explore and analyze a wide variety of air quality data via an integrated suite of tools.
- Email: Shawn.McClure@colostate.edu

Air Quality Data and Decision Support Systems At CSU/CIRA

ITEP Webinar

December 4th, 2019 10:30 a.m. (PDT)

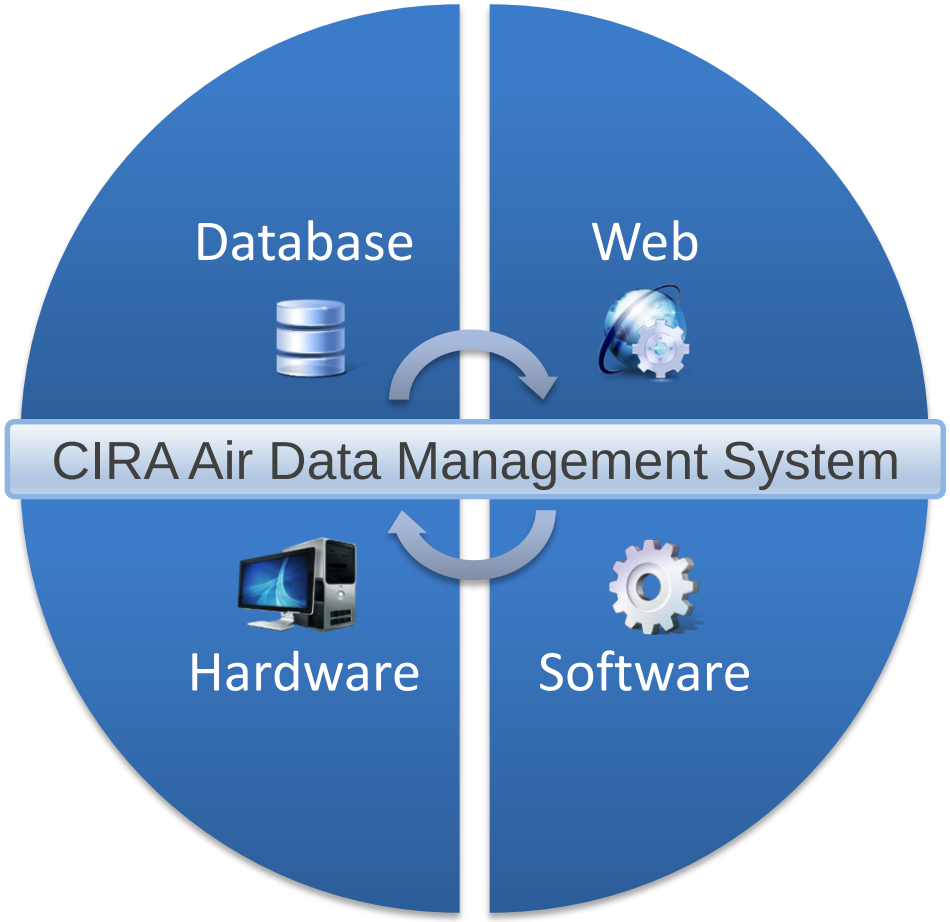
Shawn McClure, CSU-CIRA

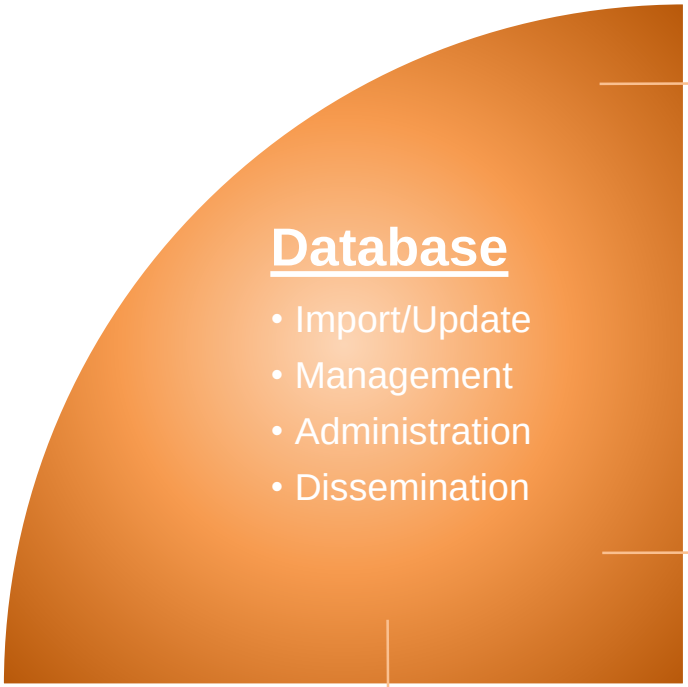
Presentation Outline

ADMS
Air Data Management System

- Overview of the CIRA Air Data Management System (~10 minutes)
  - Database framework
  - Web framework
  - Software framework
  - Hardware framework
  - Architectural Details
  - Web ecosystem (websites that leverage the CIRA ADMS)
- Tour of selected web tools (~25 minutes)
  - Federal Land Manager Environmental Database (FED)
  - WRAP Technical Support System (TSS)
  - Intermountain West Data Warehouse (IWDW)
- Summary (~10 minutes)
  - Short term roadmap
  - Registered users
  - Website traffic
  - Links and contacts
  - Questions

Overview of the CIRA Air Data Management System





Relational Database:

- Over 1 billion records
- 62 air quality monitoring networks
- 5 dozen water quality projects
- 24 modeling and satellite datasets
- 15 emissions inventories

Data Warehouse:

- 250+ TB of online files
- 120+ TB of offline files
- 400+ TB downloaded/transferred
- 500 TB current storage capacity
- 12 modeling platforms/scenarios

Monitoring Datasets:

- IMPROVE (and special studies)
- IMPROVE RHR and Impairment
- AQS (Most of the available datasets)
- CASTNET (Dry deposition, O_3)
- NADP (NTN, AIRMoN, MDN, Derived)
- USFS Water Quality
- more…

CIRA Air Data Manager
Software

Websites:

- IWDW
- WRAP TSS
- FED
- IMPROVE
- SEMAP
- NASA ROSES
- VIEWS

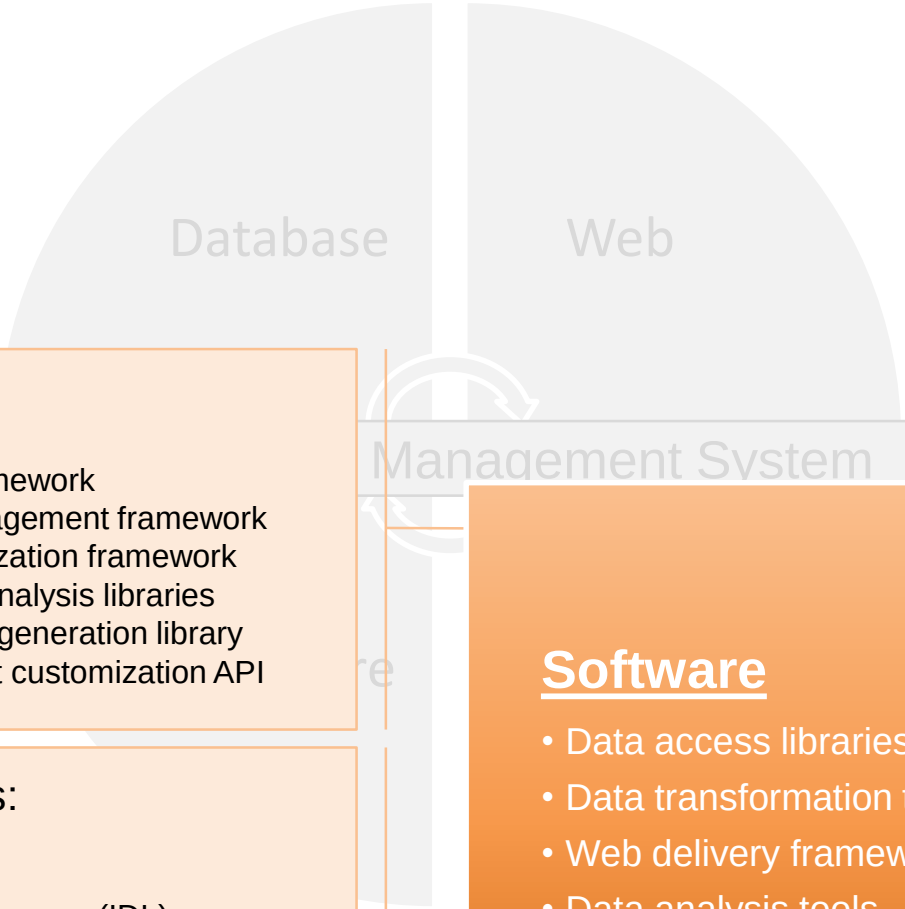
Service Consumers:

- FETS
- DataFed
- UNC
- Ramboll
- ESIP
- NPS

Web

- Visualization tools
- Analysis tools
- Mapping tools
- Query & retrieval tools
- Web services

Management System
Hardware
Software



Code base:

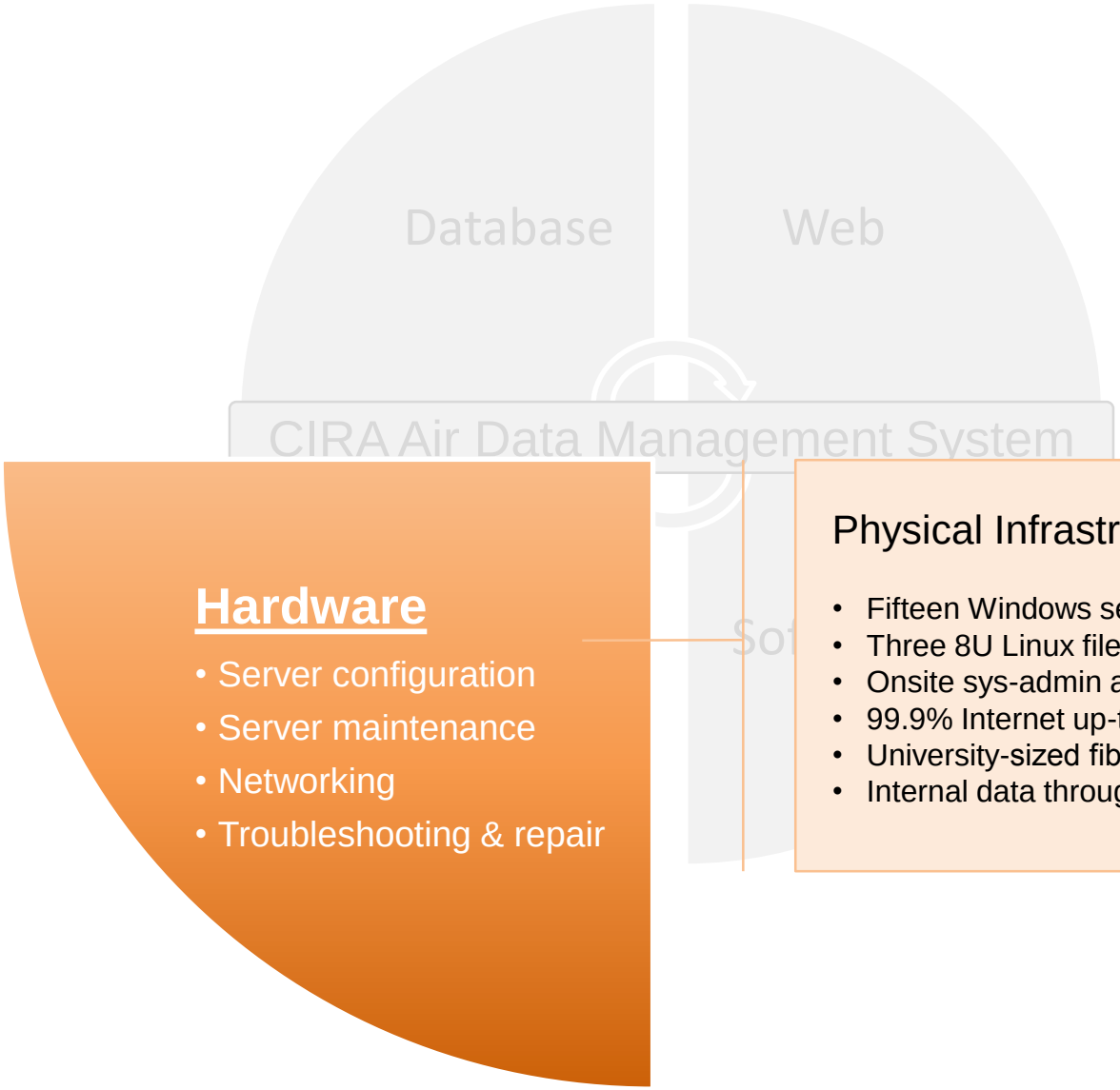
- Microsoft .NET Framework
- Custom query management framework
- Custom data visualization framework
- Custom air quality analysis libraries
- Optimized graphics generation library
- Parameterized chart customization API

Specialized Tools:

- ESRI ArcGIS
- Interactive Data Language (IDL)
- Statistical Analysis System (SAS)
- MATLAB
- Mathematica
- ENVI

Software

- Data access libraries
- Data transformation tools
- Web delivery framework
- Data analysis tools

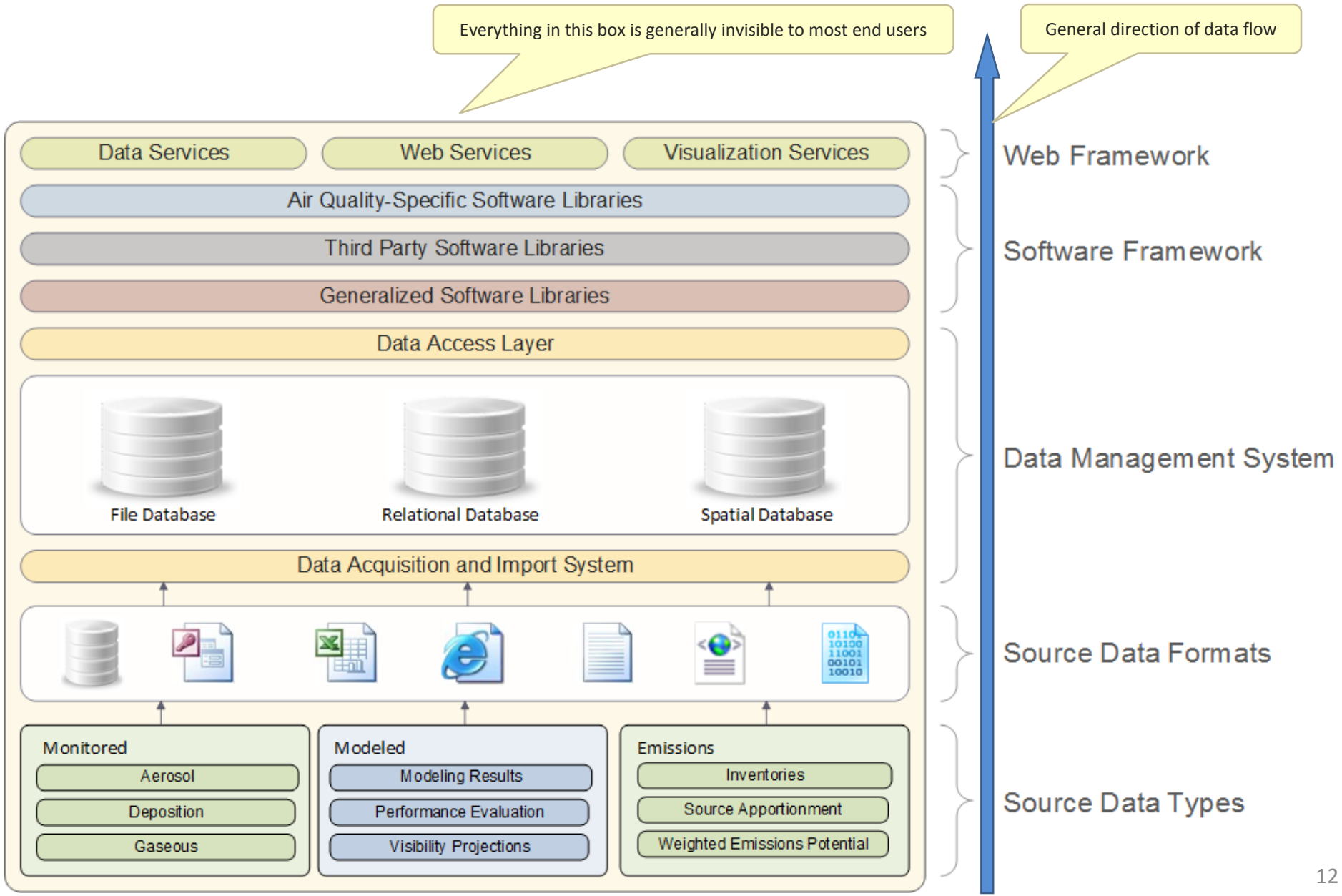


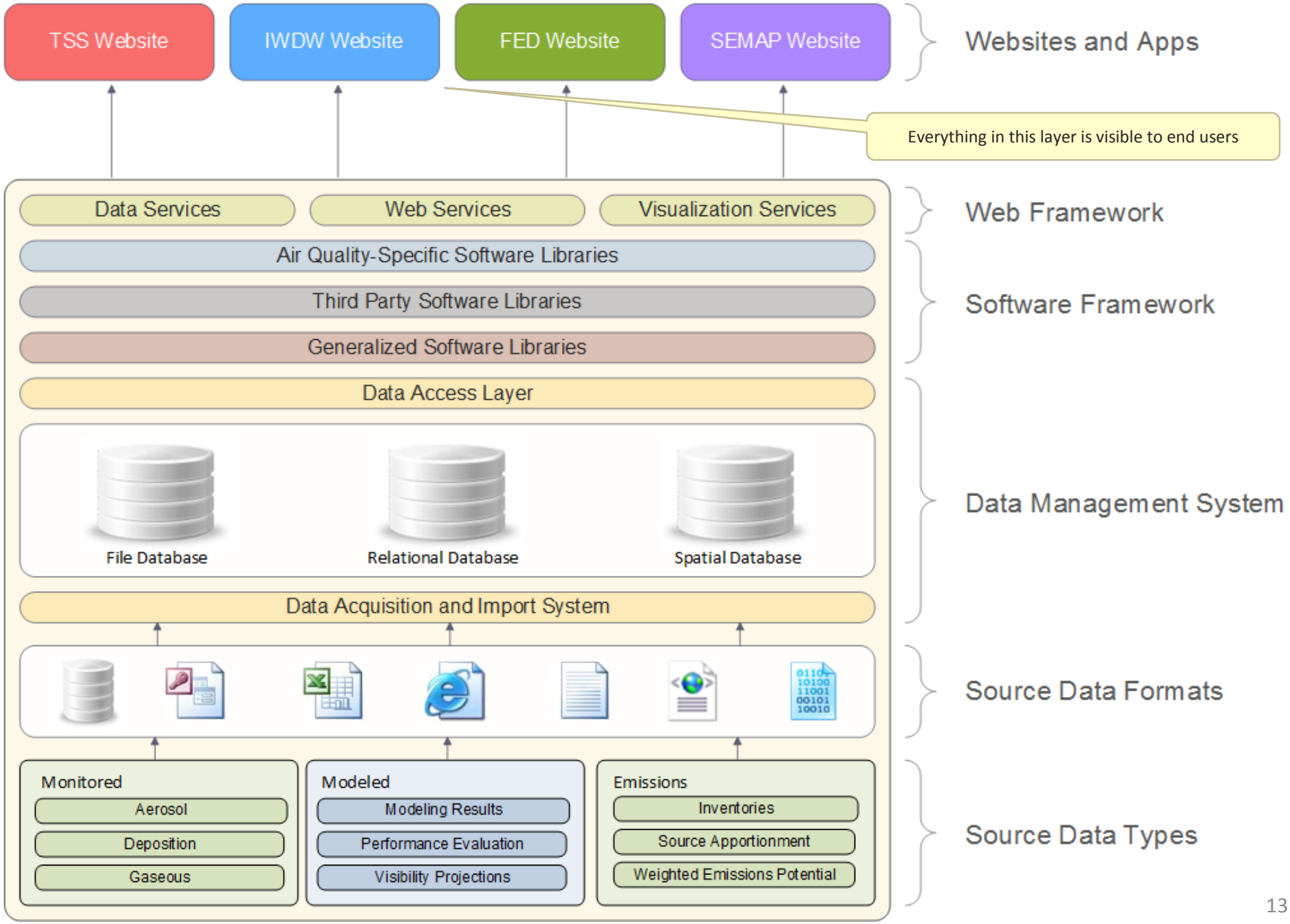
Physical Infrastructure:

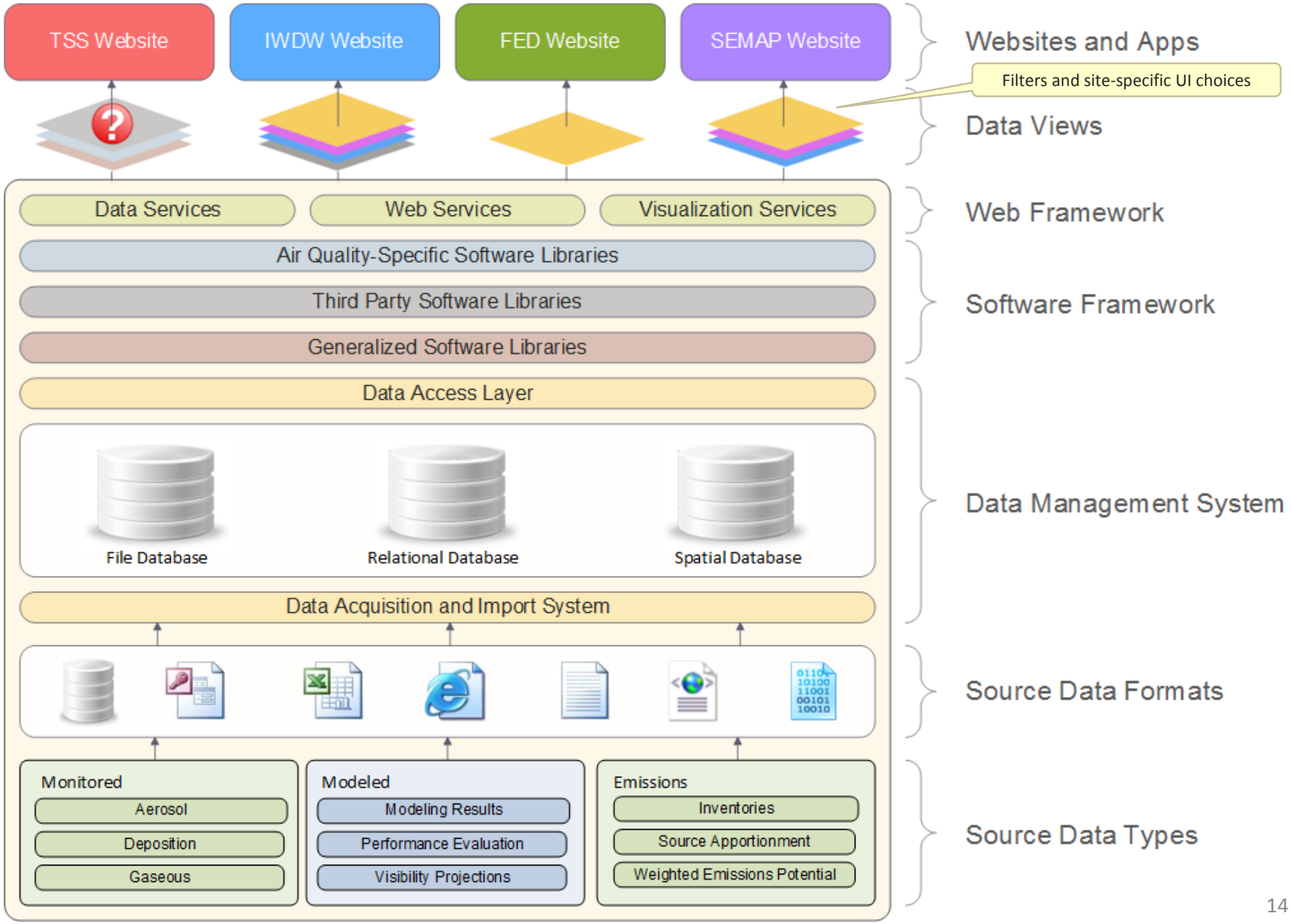
- Fifteen Windows servers
- Three 8U Linux file servers
- Onsite sys-admin and service
- 99.9% Internet up-time
- University-sized fiber optic Internet “pipe”
- Internal data throughput of +1000 GB/s

CIRA Air Data Management System Details

ADMS
Air Data Management System




TSS Website
IWDW Website
FED Website
SEMAP Website
Websites and Apps
Everything in this layer is visible to end users
Data Services
Web Services
Visualization Services
Web Framework
Air Quality-Specific Software Libraries
Third Party Software Libraries
Generalized Software Libraries
Software Framework
Data Access Layer
File Database
Relational Database
Spatial Database
Data Management System
Data Acquisition and Import System
Source Data Formats
Monitored
Aerosol
Deposition
Gaseous
Modeled
Modeling Results
Performance Evaluation
Visibility Projections
Emissions
Inventories
Source Apportionment
Weighted Emissions Potential
Source Data Types


TSS Website
IWDW Website
FED Website
SEMAP Website
Websites and Apps
Filters and site-specific UI choices
Data Views
Data Services
Web Services
Visualization Services
Web Framework
Air Quality-Specific Software Libraries
Third Party Software Libraries
Generalized Software Libraries
Software Framework
Data Access Layer
File Database
Relational Database
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Source Data Types

CIRA Air Data Management System Ecosystem

ADMS
Air Data Management System

Intermountain West Data Warehouse (IWDW)

Currently funded

Partners: NPS, BLM, USFS, EPA, Sta

WRAP Technical Support System (TSS)

Currently funded

Partners: NPS, USFS

OGEC Repository

Partners: EPA, States

NASA ROSES

Partners: NASA / NPS

VIEWS

Partners: EPA / States

NASA NAAPS

Partners: NASA / NPS

FLM Environmental Database (FED)

Currently funded

Partners: NPS, USFS

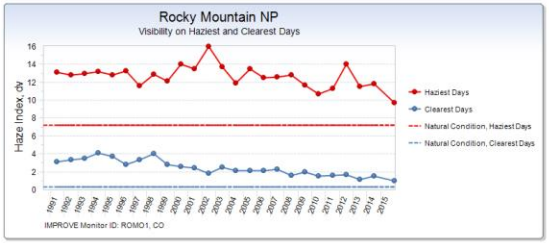
Southeastern Modeling, Analysis, and Planning (SEMAP)

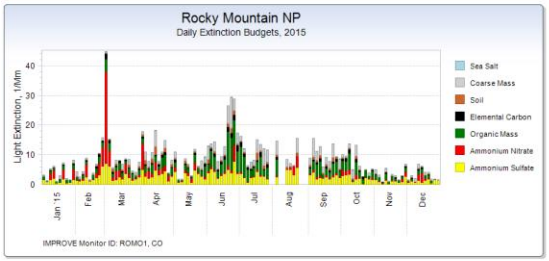
Partners: EPA, Southeastern States

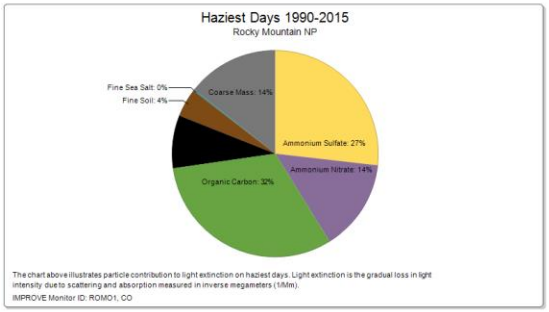
ADMS Tool and Product Categories

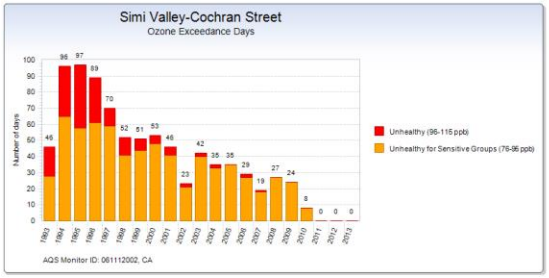
ADMS Air Data Management System

Monitored

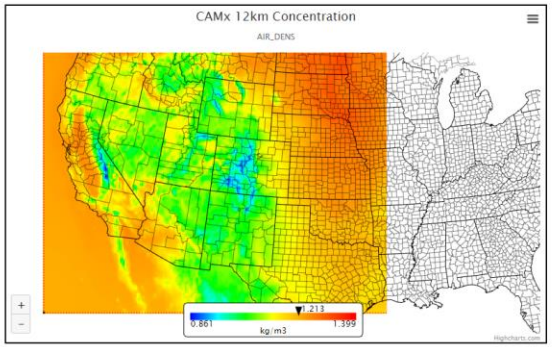


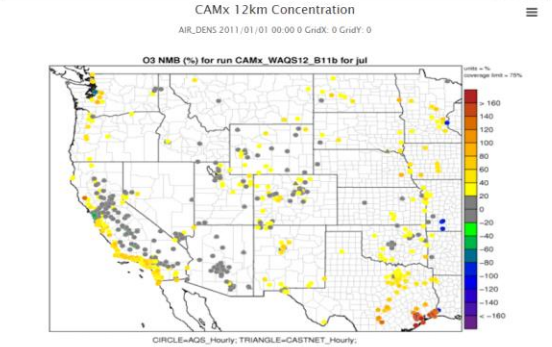


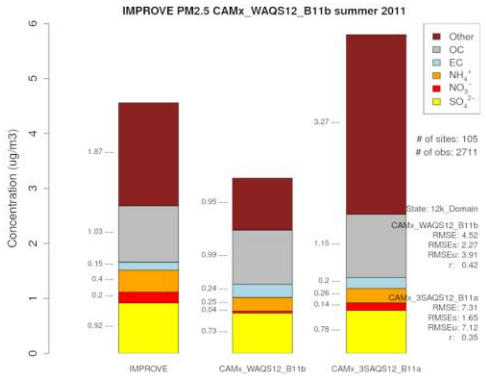




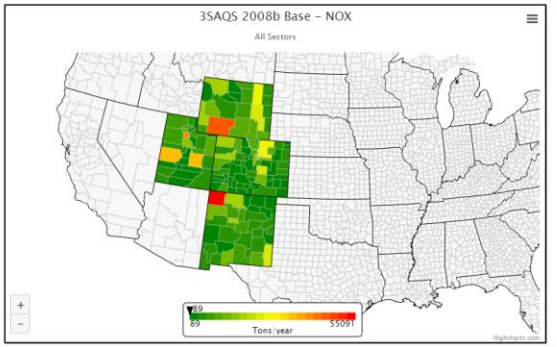
Modeled

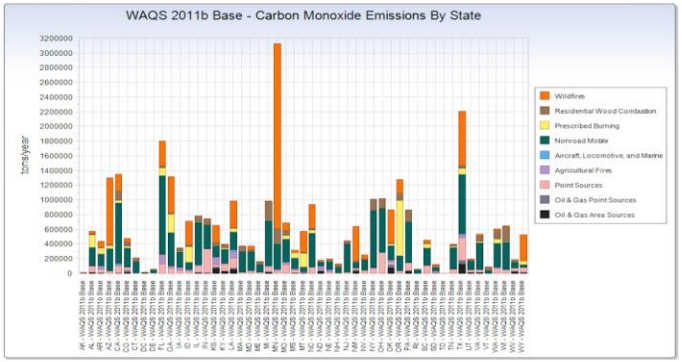


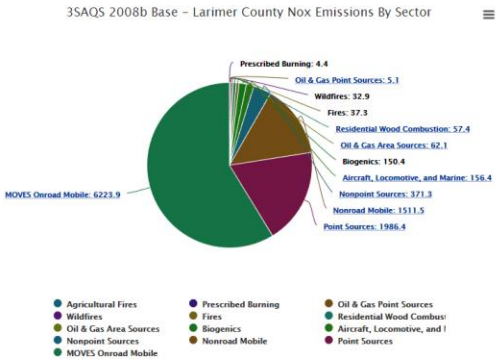




Emissions







Summary of Data, Tools, and Other Resources

ADMS Air Data Management System

Bulk Data

Request Modeling Platform Data
Submit a request for IWDW modeling data by selecting modeling platform components and describing your intended use of the data.

Get Monitoring Data
Use the Database Query Wizard to selectively download data and metadata from the integrated monitoring database by specifying datasets, sites, parameters, date ranges, and other criteria.

Monitoring Data Tools

Visibility Summary
View line and bar charts of deciview trends and aerosol haze budgets on the clearest and haziest days based on data from the IMPROVE Aerosol monitoring network.

Ozone Summary
View line and bar charts of the 4th Highest 8-Hour Daily Ozone Average, the W126 Exposure Index, and the SUM06 Exposure Index based on data from the EPA's Air Quality System (AQS).

Wet Deposition Summary
View line and bar charts of wet nitrate, wet ammonium, and wet sulfate trends and composition based on data from the National Atmospheric Deposition Program (NADP).

Dry Deposition Summary
View line and bar charts of dry nitric acid, ammonium, nitrate, and sulfate trends and composition based on data from the EPA's Clean Air Status and Trends Network (CASTNet).

Modeling Data

Modeling Studies
View a high level listing of modeling studies housed in the Data Warehouse.

Modeling Platforms
View 3SAQS/WAQS modeling platform. File browser allows file level examination of platforms components. Listing include platform components for the 2008b, 2011a, and 2011b modeling platforms.

Reference Documentation

Data Documents
View a list of key documents that describe the modeling platforms and monitoring data supported by the warehouse.

Project Documents
Links to documents that describe the IWDW-WAQS Project, including objectives and policies. Access is restricted to IWDW-WAQS Project Cooperators.

Literature
Publications relevant to emissions inventories and air quality studies in the Intermountain West.

Modeling Data Tools

Model Performance Evaluation Plots
View a wide variety of scatter plots, soccer plots, bar charts, and maps demonstrating model performance for several modeling scenarios in the Three-State Air Quality Study (3SAQS).

Model-To-Observation Comparison Tool
View network-wide and site-specific time series charts of modeled and observed parameters from several different air quality monitoring networks in the Intermountain West region.

Source Apportionment Visualization Tools and Resources
Links to Visualization Tools for 2008b, 2011a and 2011b based Source Apportionment tools; Source Apportionment data download and documentation.

Emissions Data Tools

Emissions Review Tool
View charts and graphs of annual emissions totals for States, Counties, and Source Classification Codes (SCCs) from several different 3SAQS modeling scenarios.

Emissions Review Map
View spatial display of annual emissions totals for States, Counties, and Source Classification Codes (SCCs) from several different WAQS modeling scenarios.

Metadata Tools

Monitoring Site Browser
View the locations of monitoring sites and explore monitoring site metadata for all the available monitoring networks in the IWDW database using an interactive map.

Community and Support

Forums
Review announcements, ask questions, have discussions, and browse topics and threads relevant to data warehouse contents and operations.

Wiki
Browse a growing repository of supporting documentation and information regarding modeling platforms, modeling protocols, air quality studies, projects, procedures, and processes that are relevant to the warehouse.

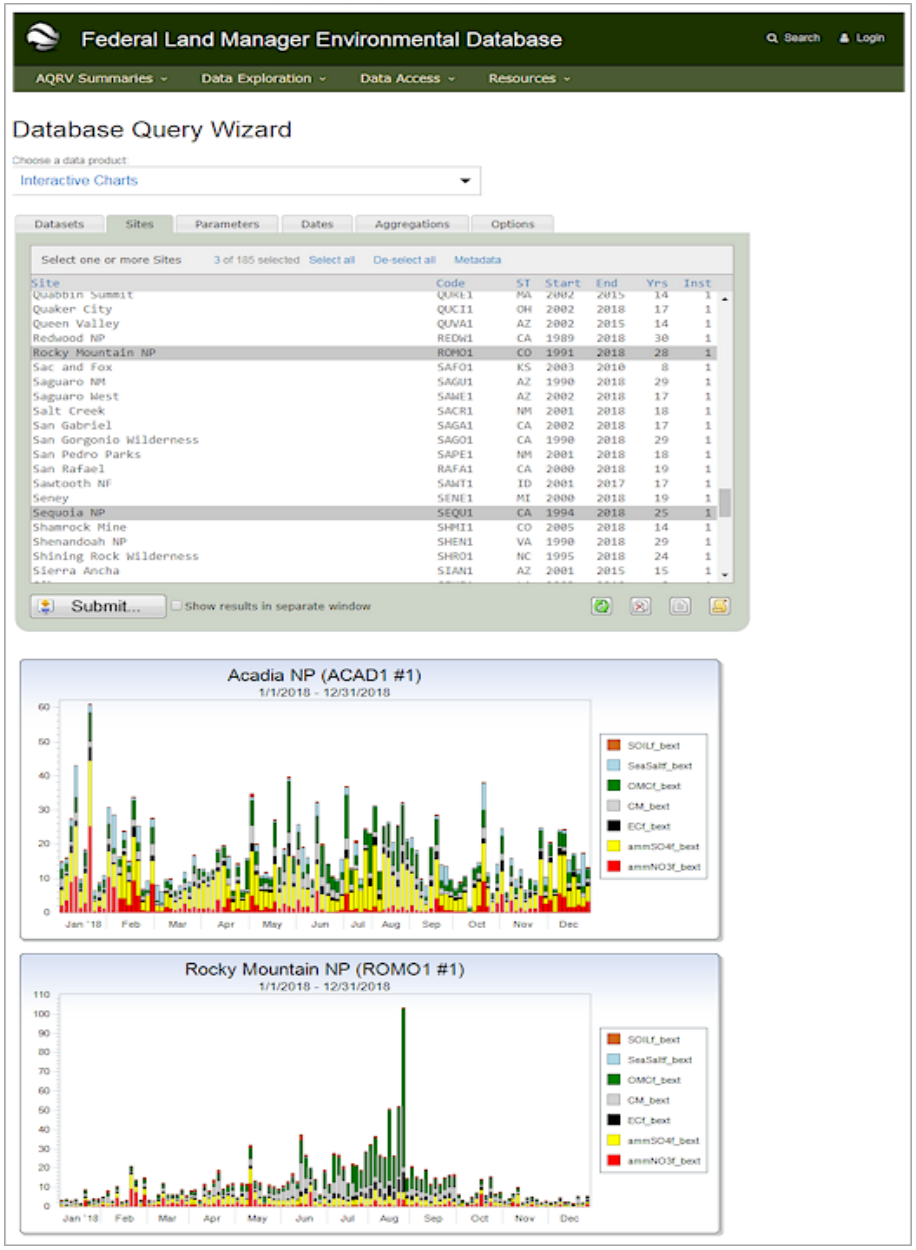
Updates
View a list of dated updates to modeling data components, warehouse wiki pages, and study documents

Site Index
Index of IWDW Website and IWDW-WAQS Wiki

Citation Formats
Examples of how to cite modeling platform and observational data obtained from the IWDW.

Federal Land Manager Environmental Database (FED)

ADMS Air Data Management System



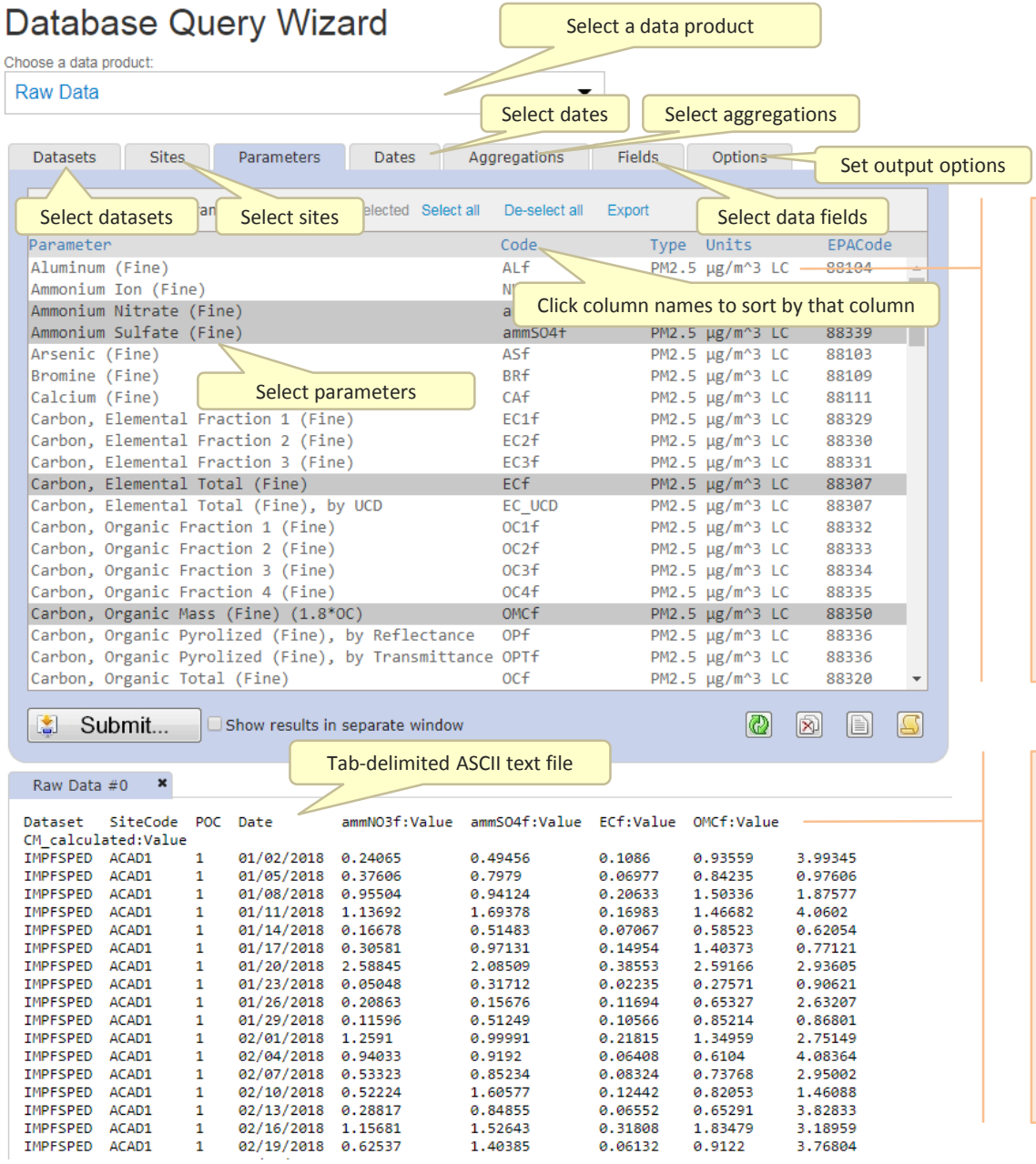
Provides:

- All raw air quality monitoring datasets
- All IMPROVE special studies
- Derived IMPROVE datasets (RHR, Imp.)
- NPS-specific ozone metrics
- All USFS water quality data
- Unrestricted geographical area
- Low-level analysis tools

Collaborators:

- National Park Service (NPS)
- U.S. Forest Service (FED)

Raw Data Query and Download



Purpose:

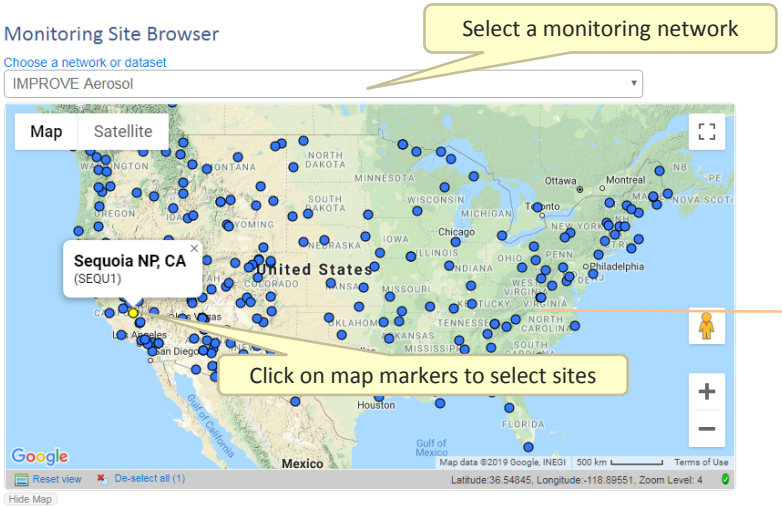
To enable the fine-grained selection and download of raw air quality data by allowing the user to select sites, parameters, dates, aggregations, data fields, and output options. Data can be output to a variety of file formats, including CSV, Microsoft Excel, and HTML.

This tool is also available on the IWDW and TSS.

Example:

In this example the user has selected the IMPROVE Aerosol dataset, the IMPROVE monitoring site at Acadia National Park, several pollutants, the year 2018, and some basic data fields, and has specified that the results be output to a tab-delimited ASCII text file.

Monitoring Site Metadata



The specific website that this example was taken from

Purpose:

To provide a quick and easy way to browse monitoring sites by air quality monitoring network or dataset. Site details like latitude, longitude, and elevation are displayed, as well as any site photographs that may be available. A high-level summary of the statistics for each parameter measured at the site is also displayed.

Site Info

Monitoring site details

Monitoring site photos

Sequoia NP (SEQU1)

SiteID:	98
SiteCode:	SEQU1
SiteName:	Sequoia NP
SiteTitle:	Sequoia NP (SEQU1)
Country:	United States
State:	California (pop. 29760021)
Location:	Residence area, park HQ, Ash Mountain water tank
Latitude:	36.4894
Longitude:	-118.8291
Elevation:	519m above MSL
EPA Code:	061071001
Agency:	National Park Service
Sponsor:	NPS
Region:	Sierra Nevadas
Land Use:	Unknown
Dates:	3/1992 - Present
SiteID:	98
Site Type:	IMPROVE Regulatory
Class I Areas:	Sequoia National P

Monitoring site data statistics and summaries

Parameters Monitored

Parameter	ParamCode	Start	End	Rows	Min	Max	Avg
Aluminum (Fine)	ALf	03/04/1992	12/25/2018	2982	-0.001	4.0201	0.1015
Ammonium Nitrate (Fine)	ammNO3f	03/04/1992	12/25/2018	2489	-0.0116	27.9749	1.6871
Ammonium Sulfate (Fine)	ammSO4f	03/04/1992	12/25/2018	3002	-0.0111	9.0892	1.595
Arsenic (Fine)	ASf	03/04/1992	12/25/2018	2982	0	0.0067	0.0002
Bromine (Fine)	BRf	03/04/1992	12/25/2018	2982	-0.0001	0.0139	0.0028
Calcium (Fine)	CAf	03/04/1992	12/25/2018	2982	0	0.7861	0.051
Carbon, Elemental Fraction 1 (Fine)	EC1f	07/10/1993	12/25/2018	2800	0	10.4023	0.647
Carbon, Elemental Fraction 2 (Fine)	EC2f	07/10/1993	12/25/2018	2800	0	0.6217	0.0813
Carbon, Elemental Fraction 3 (Fine)	EC3f	07/10/1993	12/25/2018	2800	-0.0162	0.1262	0.0065
Carbon, Elemental Total (Fine)	ECf	07/10/1993	12/25/2018	2800	-0.0018	2.6999	0.3481
Carbon, Elemental Total (Fine), by UCD	EC_UCD	01/01/2017	12/25/2018	232	-0.0018	2.6964	0.3045
Carbon, Organic Fraction 1 (Fine)	OC1f	07/10/1993	12/25/2018	2800	-0.0665	6.1924	0.1459
Carbon, Organic Fraction 2 (Fine)	OC2f	07/10/1993	12/25/2018	2800	-0.005	10.4505	0.4504
Carbon, Organic Fraction 3 (Fine)	OC3f	07/10/1993	12/25/2018	2800	0.0226	8.9483	0.7527
Carbon, Organic Fraction 4 (Fine)	OC4f	07/10/1993	12/25/2018	2800	0.0167	3.7641	0.4379
Carbon, Organic Mass (Fine) (1.8*OC)	OMCf	07/10/1993	12/25/2018	2800	0.0727	59.7447	3.9123
Carbon, Organic Pyrolized (Fine), by Reflectance	OPf	07/10/1993	12/25/2018	2800	-0.3666	8.1476	0.3867
Carbon, Organic Pyrolized (Fine), by Transmittance	OPTf	08/01/2015	12/25/2018	398	0.007	9.0941	0.5909
Carbon, Organic Total (Fine)	OCf	07/10/1993	12/25/2018	2800	0.0404	33.1915	2.1735
Carbon, Organic Total (Fine), by UCD	OC_UCD	01/01/2017	12/25/2018	232	0.0904	33.1915	2.7646
Carbon, Total (Fine)	TCf	08/01/2015	12/25/2018	398	0.0791	35.8879	2.8261

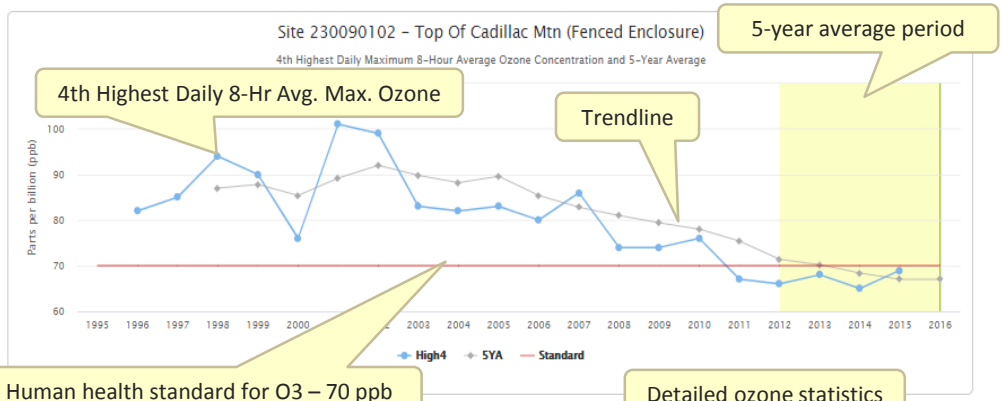
Ozone Data and Statistics

FED

4th Highest Daily 8-hr Avg. Max. Ozone Concentration, 5-Year Average

Select a monitoring site:

230090102 - Top Of Cadillac Mtn (Fenced Enclosure)



5-year average period

4th Highest Daily 8-Hr Avg. Max. Ozone

Trendline

Human health standard for O3 – 70 ppb

Detailed ozone statistics

Summary By Year:

Parameter	2012	2013	2014	2015	2016
5-Year Average	71.4	70.2	68.4	67	67
4th Highest	66	68	65	69	-999
% Complete	99	99	97	86	16
Valid Days In Season	181	182	177	157	29
Total Days In Season	183	183	183	183	183
# of Exceedance Days	0	2	1	2	1
Validity Code	VAL	VAL	VAL	VAL	FSC
POC	1	1	1	1	1
4th Highest Date	Jul 13	Apr 29	Jun 09	Jun 11	Apr 21
O_3 Season Start Date	4/1	4/1	4/1	4/1	4/1
O_3 Season End Date	9/30	9/30			9/30

Daily 4th Highest values

Details By Year:

Month	Date	2012	2013	2014	2015	2016
April	1	47	53			39
	2	45	48			42
	3	40	47			40
	4	47	53			41
	5	41	56	46		42
	6	44	51	52		47
	7	42	53	57		44
	8	41	43	48		40
	9	42	43	49		39
	10	49	38	52		40
	11	47	47	62		49
	12	37	47	49		49
	13	46	39	50		42
	14	53	40	46		49
	15	69	37	46		48
	16	58	44	46		47
	17	54	48	42		52
	18	38	48	42		50
	19	40	38	46		45
	20	59	40	46		45
	21	41	45	51		
	22	33	42	52		71
	23	40	42	42	41	39
	24	46	50	37	31	46
	25	53	48	40	33	48
	26	57	50	42	37	41
	27	44	55	37		49
	28	46	58	39		39
	29	50	68	43	38	40
	30	45	63	39	40	

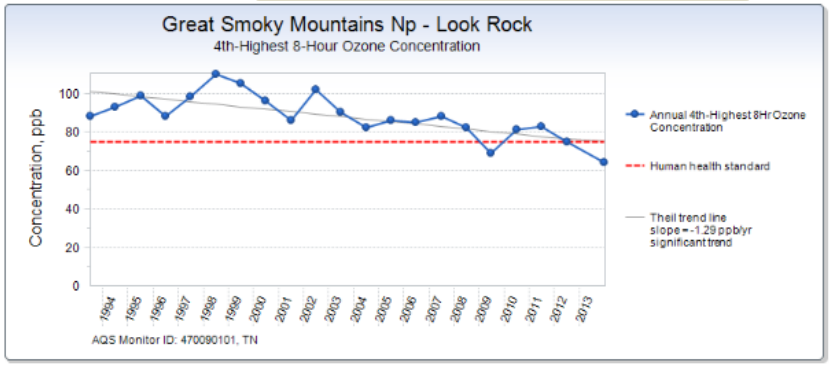
Exceedance day

Highlights:

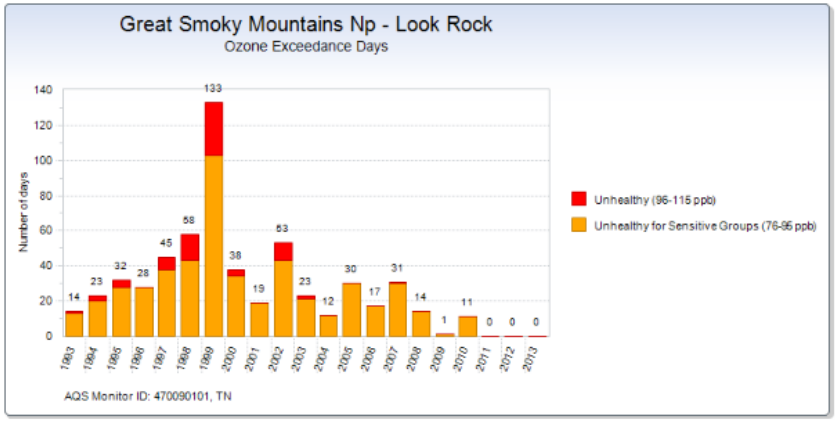
- 4th Highest Daily 8-Hr Avg. Max. Ozone
- W126 Ozone Exposure Index for Vegetation
- Human Health Standard Reference
- Ozone Exceedance Days

Ozone Trends

Click on "info" icons to get more details or help

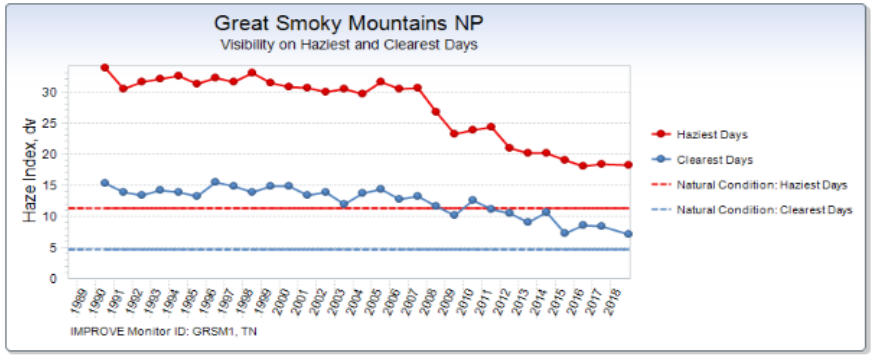


Number of days that ozone reached unhealthy levels

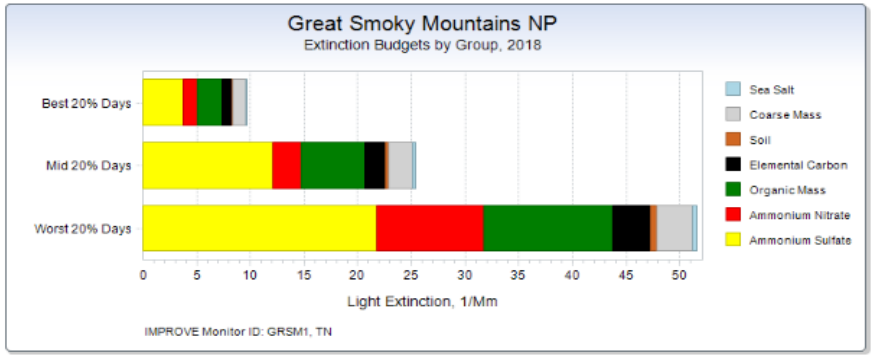


Visibility Data and Statistics

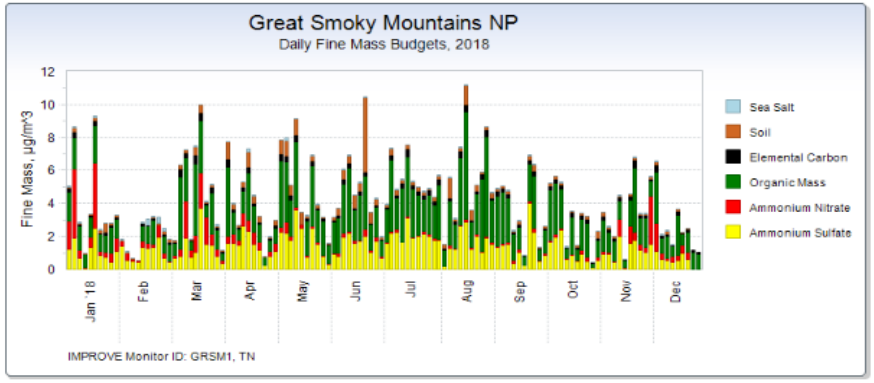
Visibility Trends



Extinction Budgets by Group



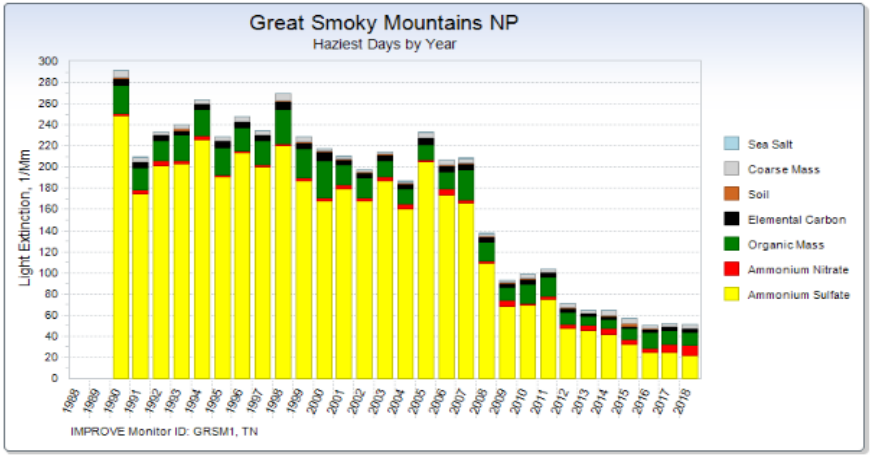
Daily Fine Mass Budgets



Highlights:

- Visibility on the haziest, clearest, and M.I.D.
- Daily and yearly extinction budgets by group
- Daily and yearly fine and total mass budgets
- Haziest, clearest, and M.I.D. by year
- Raw Regional Haze Rule (RHR) data
- Raw Impairment data

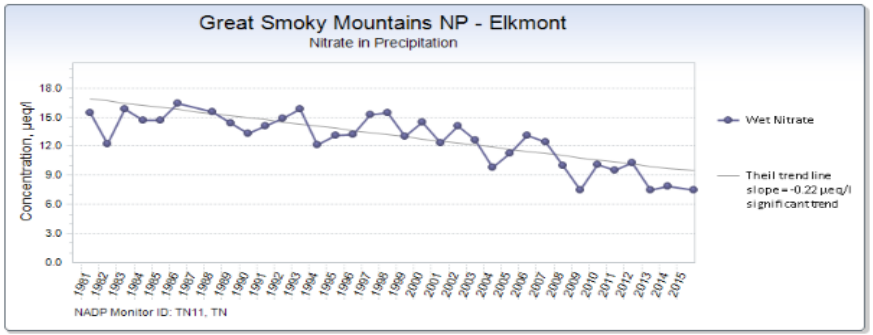
Light Extinction Summary - Haziest Days



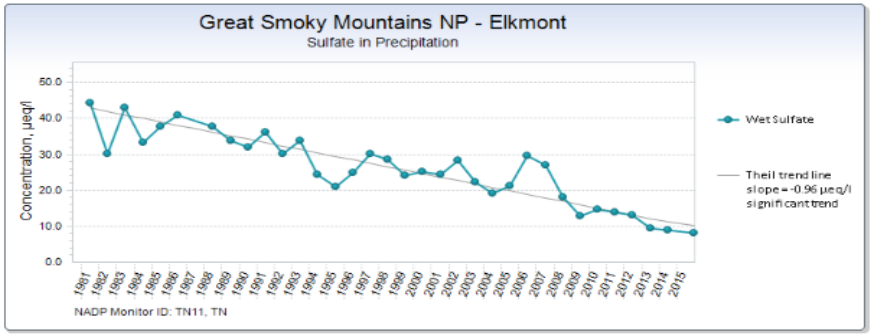
Wet Deposition Data and Statistics

FED

Wet Nitrate Trends



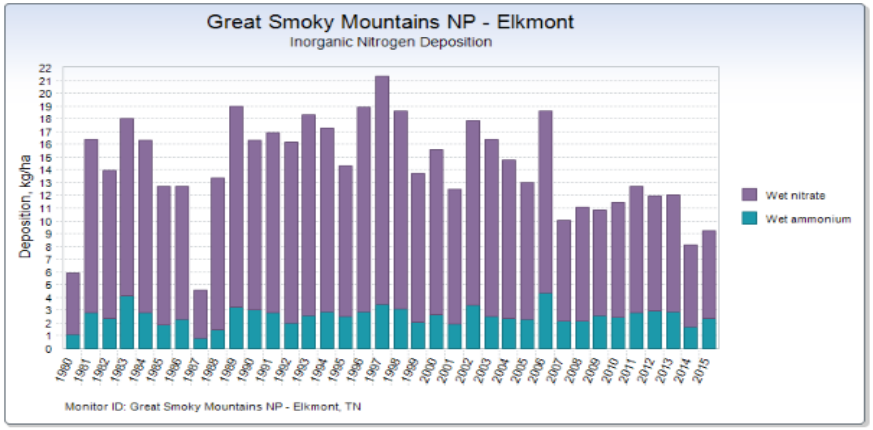
Wet Sulfate Trends



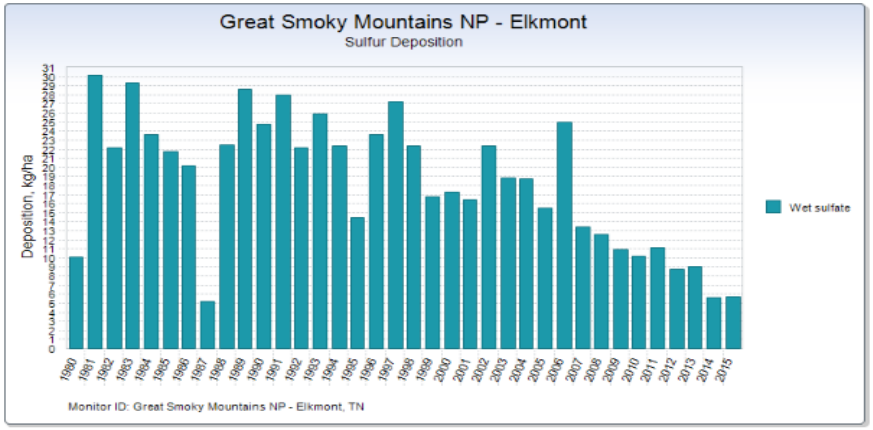
Highlights:

- Long-term wet Nitrate trends (NO_3, $AmmNO_3$)
- Long-term wet Sulfate trends (SO_4, $AmmSO_4$)
- Wet nitrogen composition (daily, annual, total)
- Wet sulfur composition (daily, annual, total)

Wet Nitrogen Composition

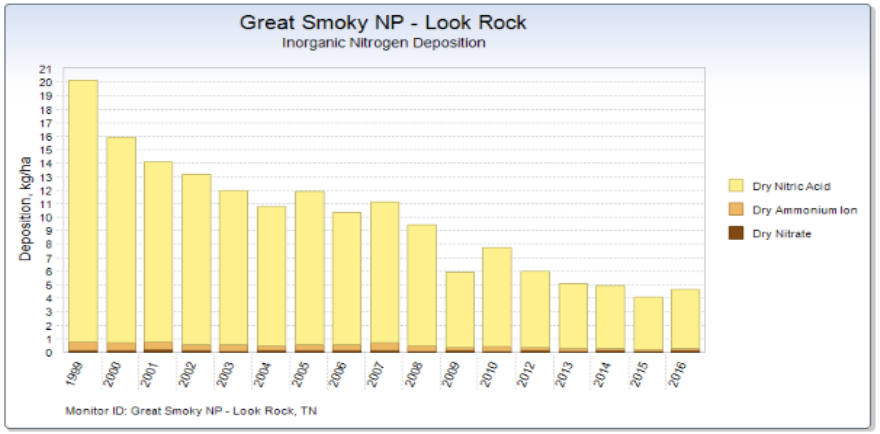


Wet Sulfur Composition

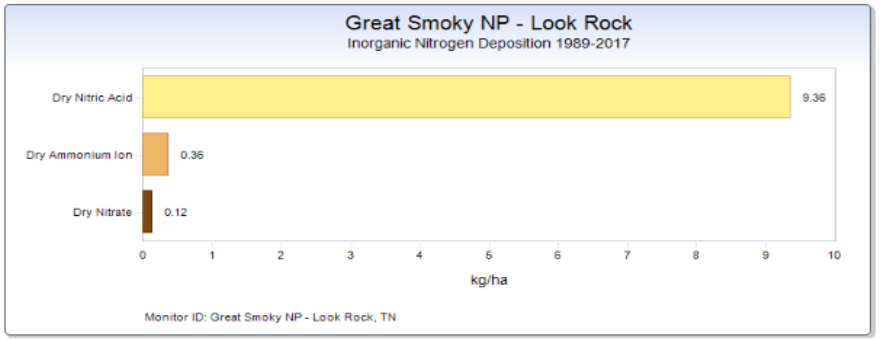


Dry Deposition Data and Statistics

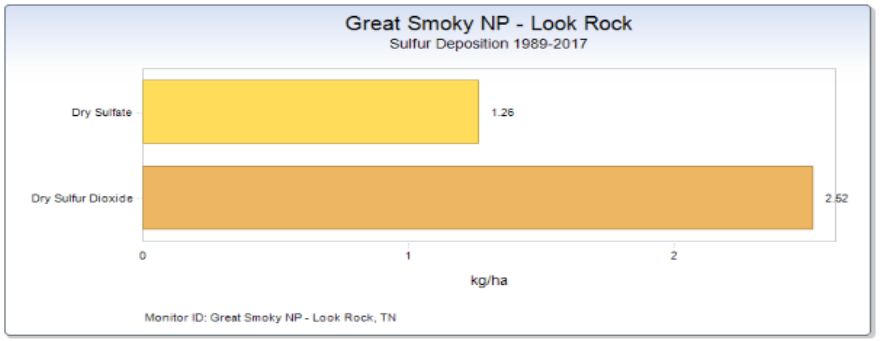
Dry Inorganic Nitrogen Deposition - Yearly



Dry Inorganic Nitrogen Deposition - Total



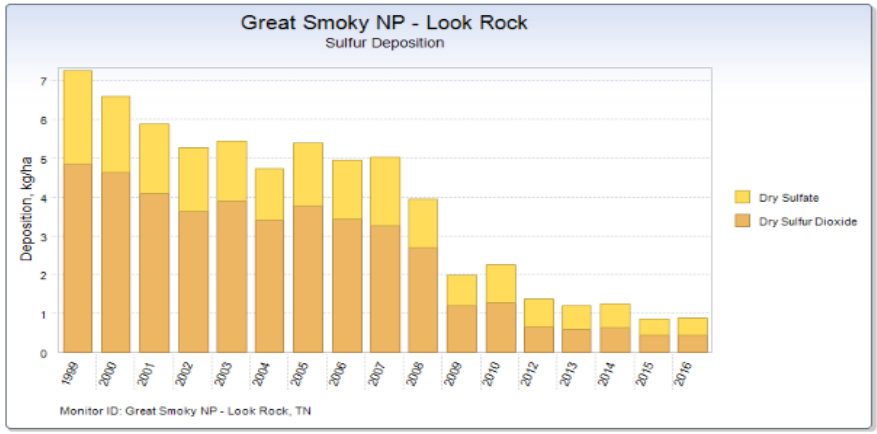
Dry Sulfur Deposition - Total



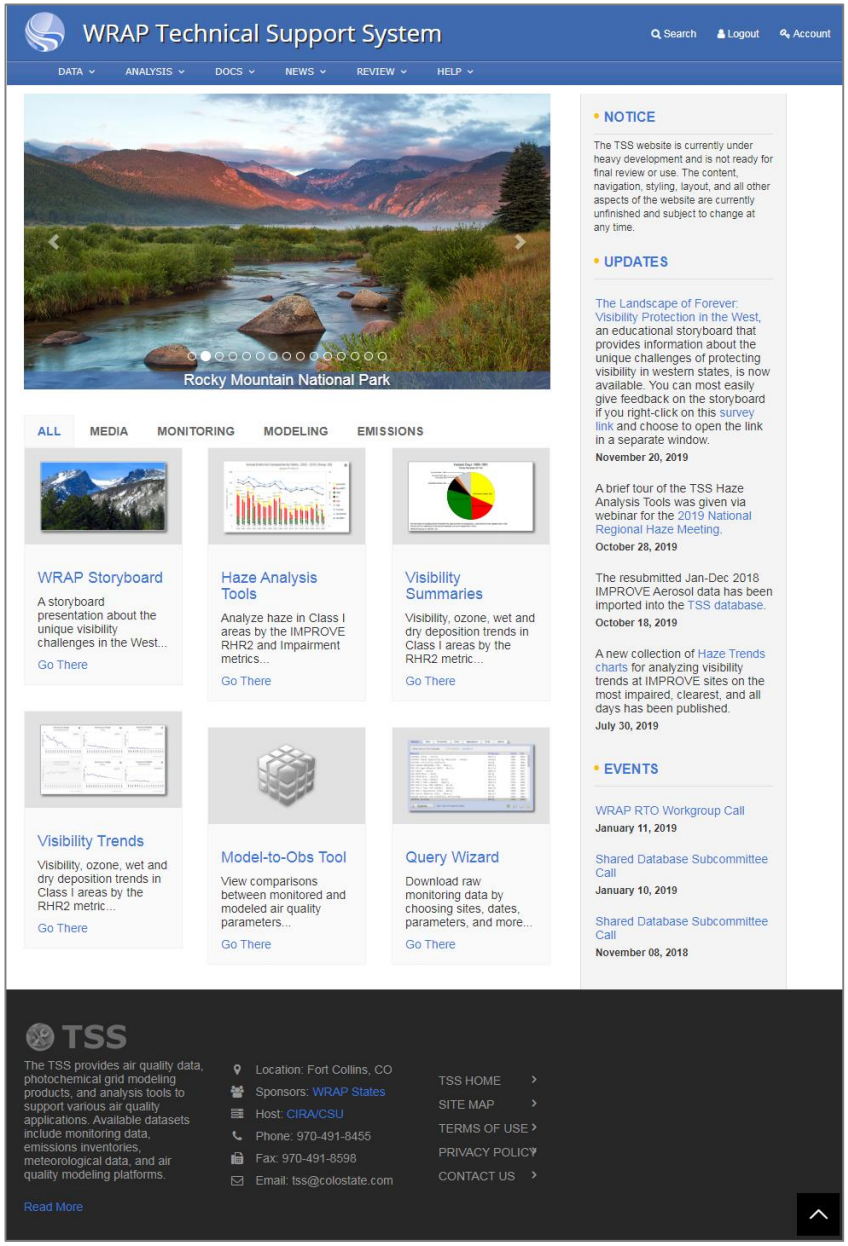
Highlights:

- Dry inorganic Nitrogen composition – yearly
- Dry inorganic Nitrogen composition – total
- Dry Sulfur deposition – yearly
- Dry Sulfur deposition - total

Dry Sulfur Deposition - Yearly



WRAP Technical Support System (TSS v.2)



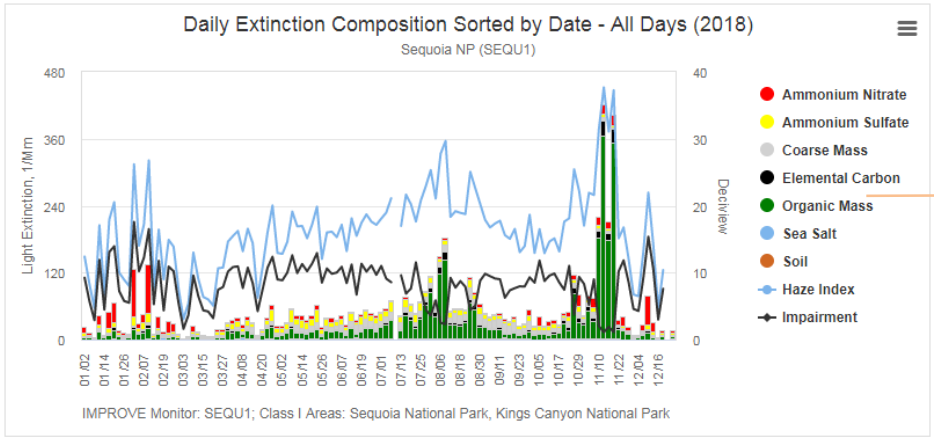
Provides:

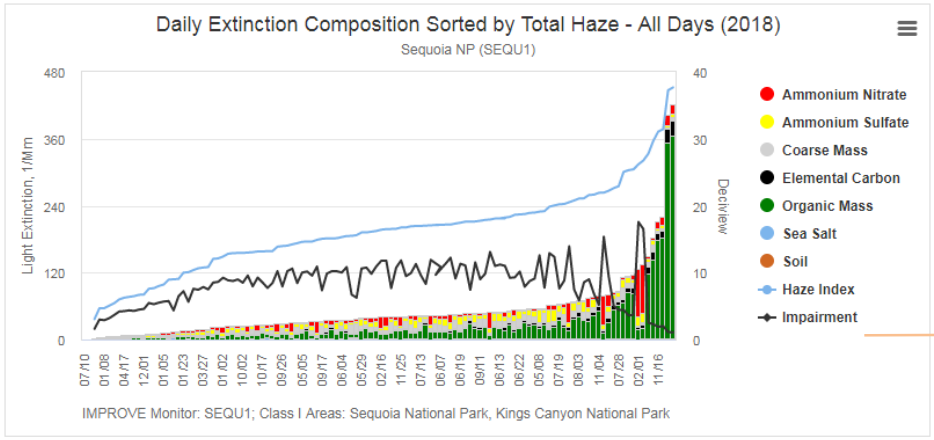
- Regional haze planning support
- Visibility progress tracking support
- Support for State Implementation Plans (SIPs)
- Support for Tribal Implementation Plans (TIPs)
- Haze analysis tools
- Visibility summaries

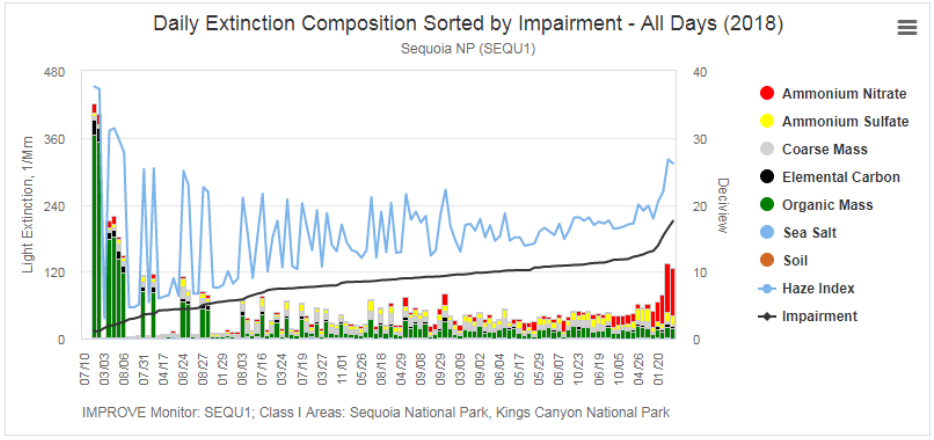
Collaborators:

- 15 Western States: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington, Wyoming
- WESTAR/WRAP

Comparison of Daily Extinction Composition, Sorted by Metric







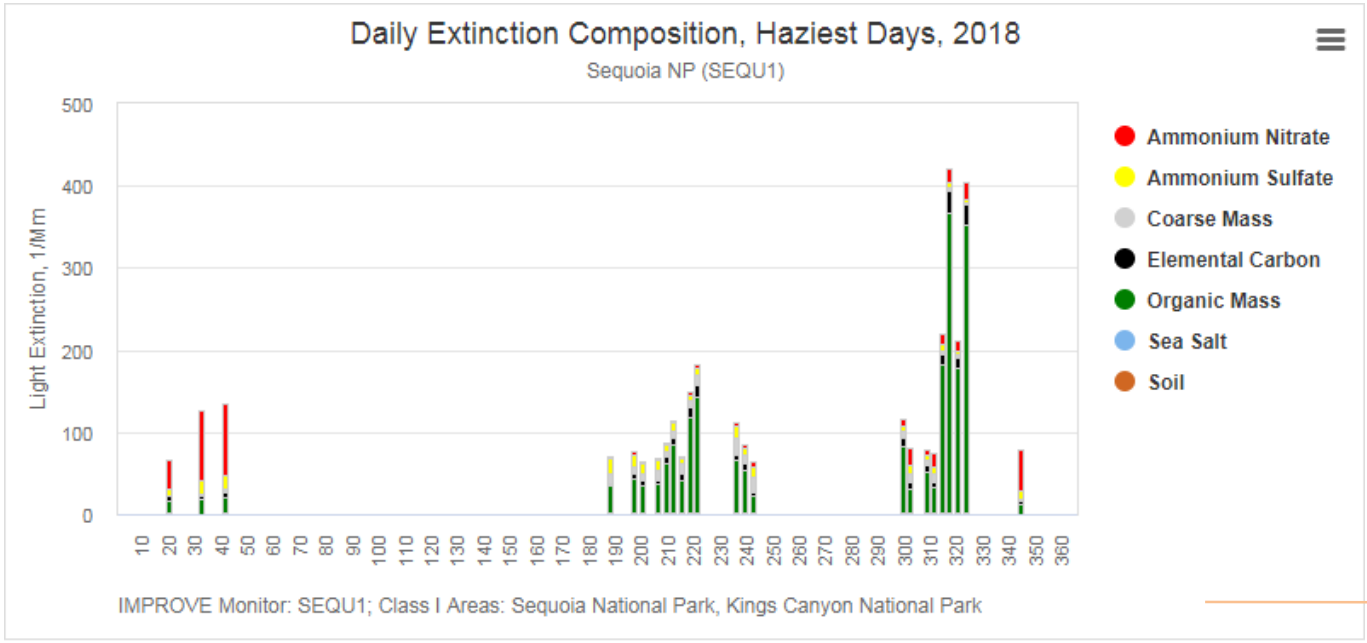
Purpose:

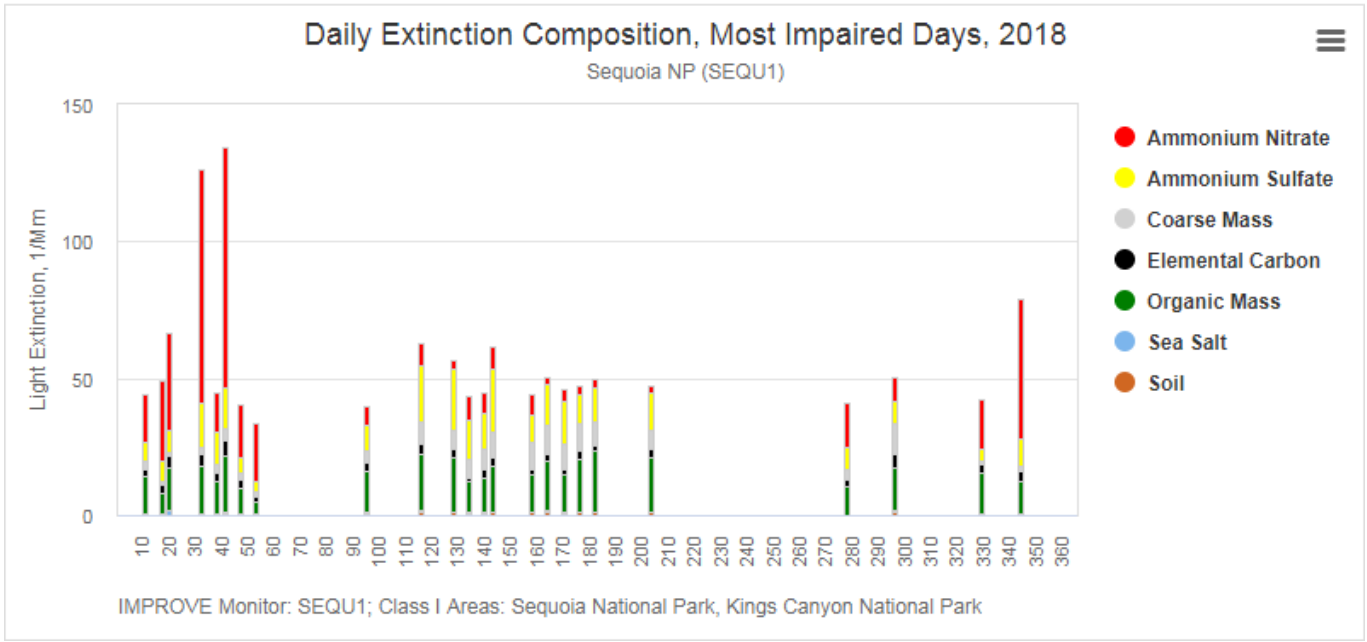
To illustrate the difference between the days selected as the “haziest days” under the previous guidance versus the days selected as the “most impaired days” under the current guidance by sorting the days from a single year in three different ways – chronologically by date, by total haze (previous guidance), and total impairment, shown top to bottom here.

Features:

You can set the year for the report across the entire available record of IMPROVE data, and you can selectively choose the extinction parameters to show on the charts. You can also quickly show and hide individual parameters by clicking the legend items, and you can easily download the raw data used to create each chart in a variety of tabular formats, including CSV and Microsoft Excel.

Comparison of Daily Extinction Composition on the Haziest Days and M.I.D.

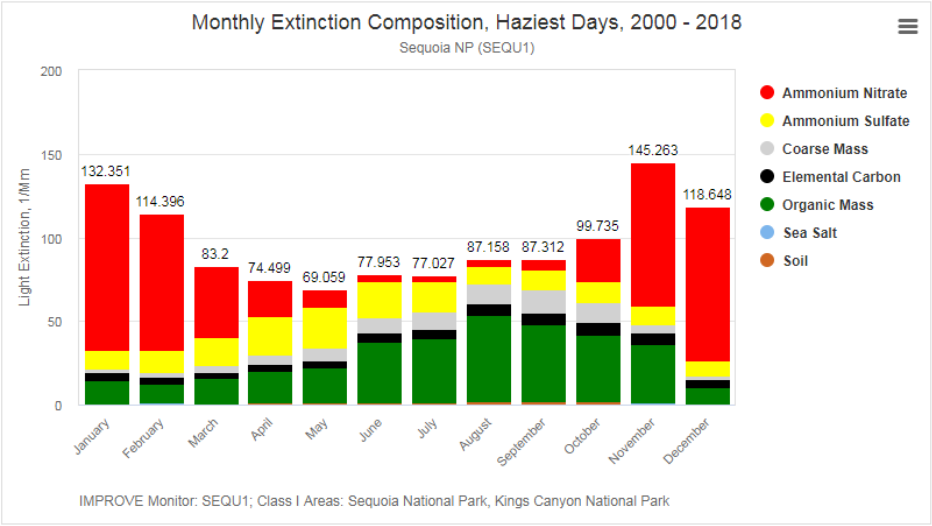


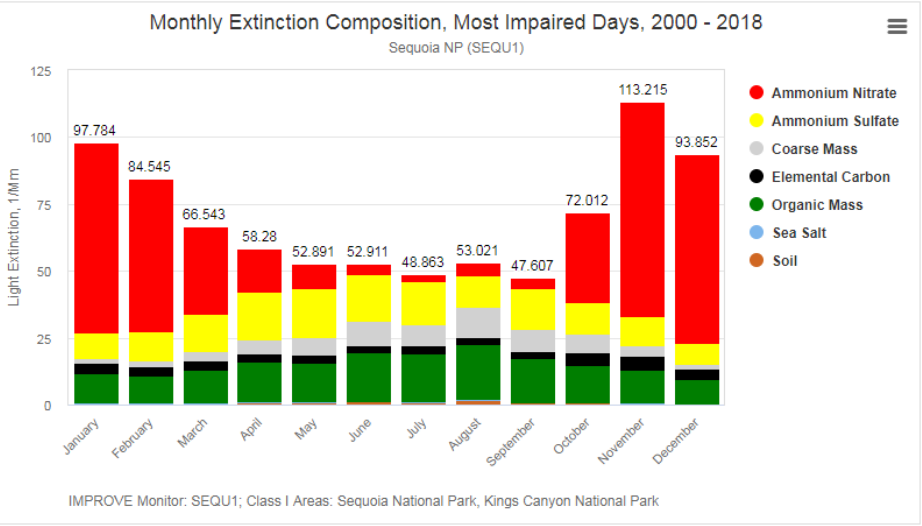


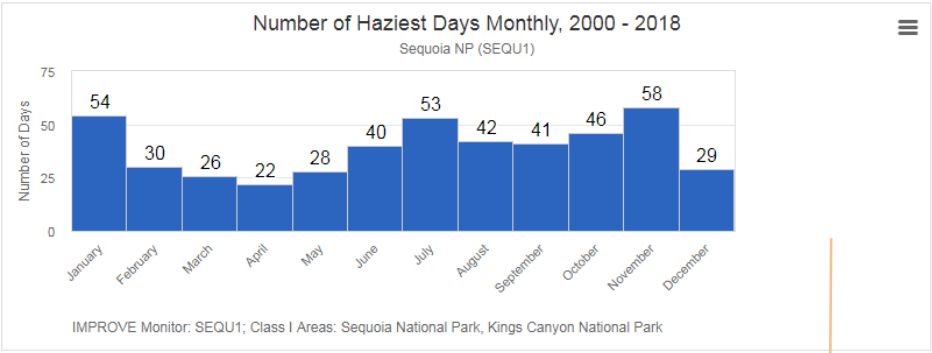
Purpose:

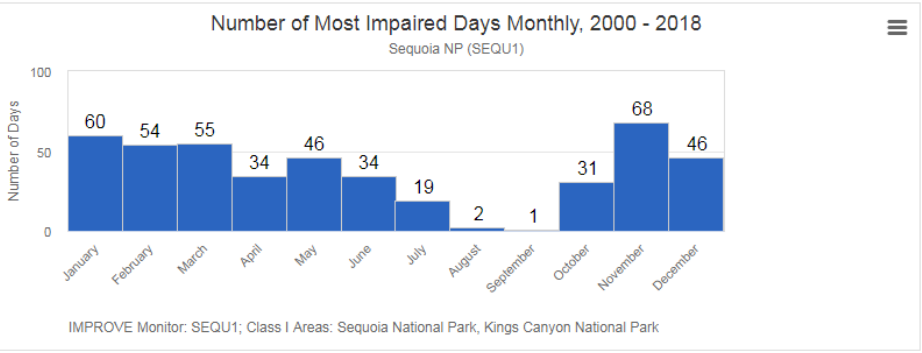
To illustrate the difference between the days selected as the “haziest days” under the previous guidance versus the days selected as the “most impaired days” under the current guidance by showing only those two sets of days – one set on each chart – while excluding all other days.

Comparison of Monthly Extinction Composition on the Haziest Days and M.I.D.





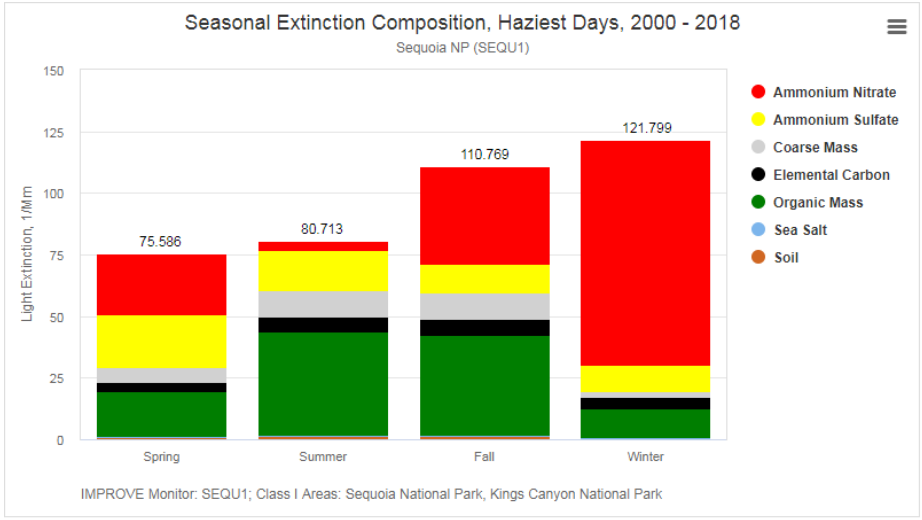


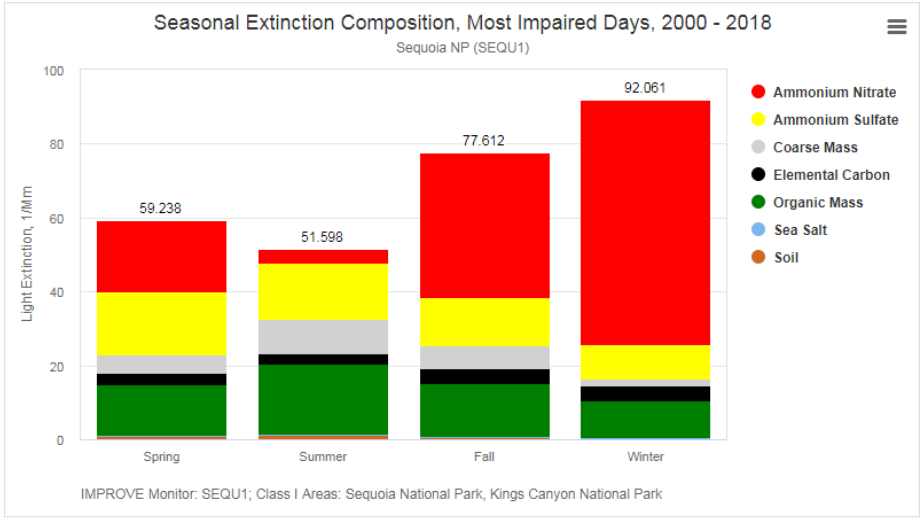


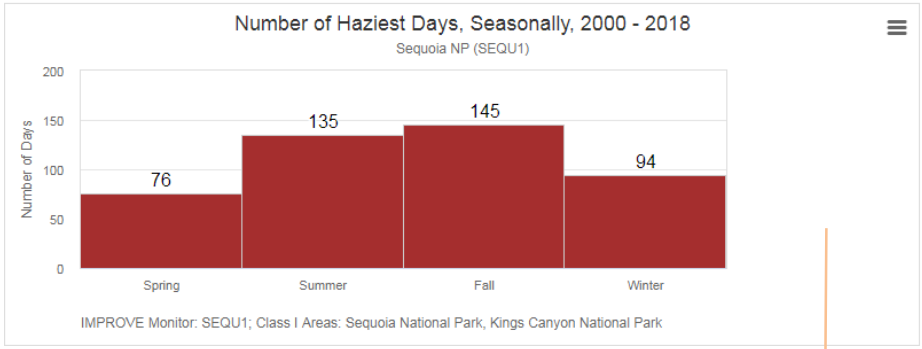
Purpose:

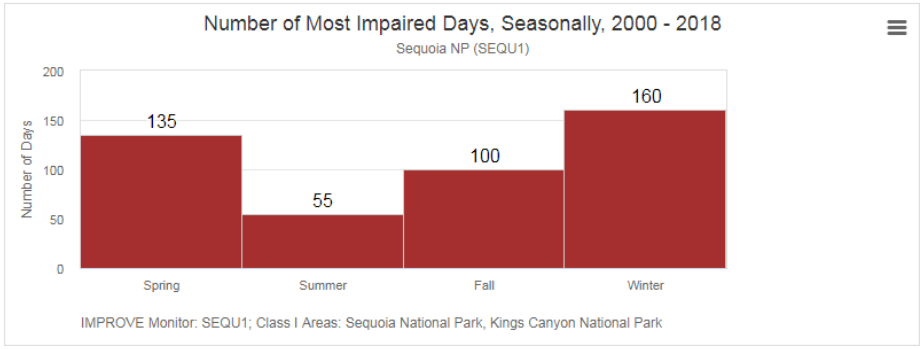
To illustrate the effect on monthly extinction composition by the choice of guidance metric applied. The charts in the left column above show monthly extinction composition on the haziest days (top) and the total number of haziest days per month (bottom). The charts in the right column show monthly extinction composition on the most impaired days (top) and the total number of most impaired days per month (bottom).

Comparison of Seasonal Extinction Composition on the Haziest Days and M.I.D.





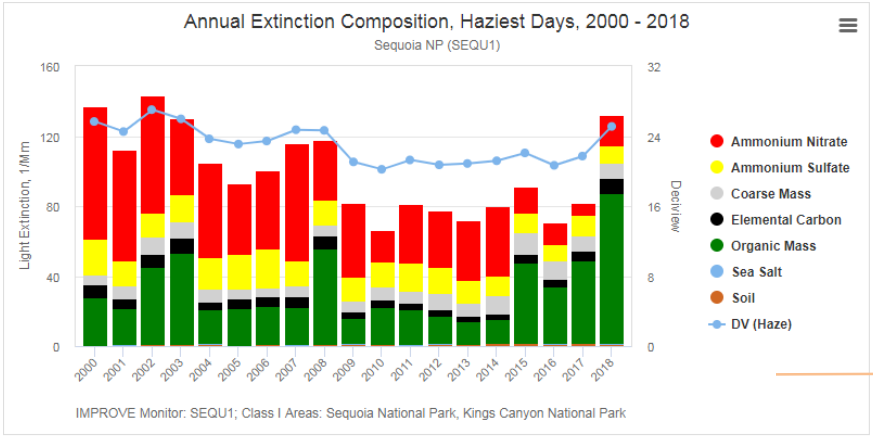


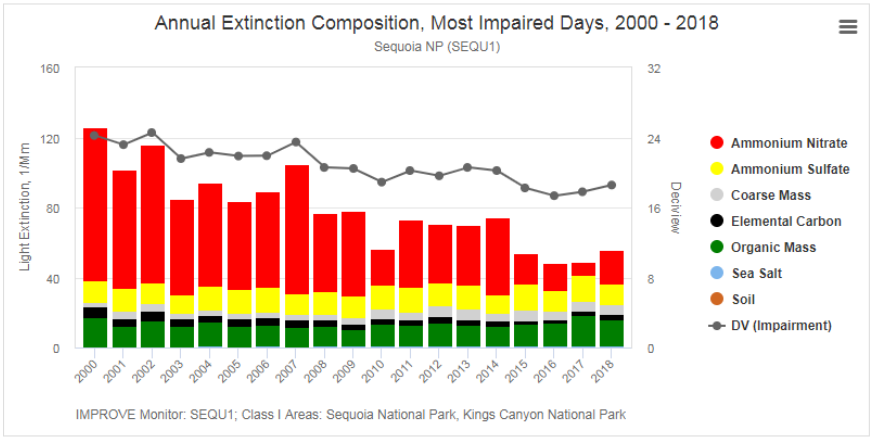


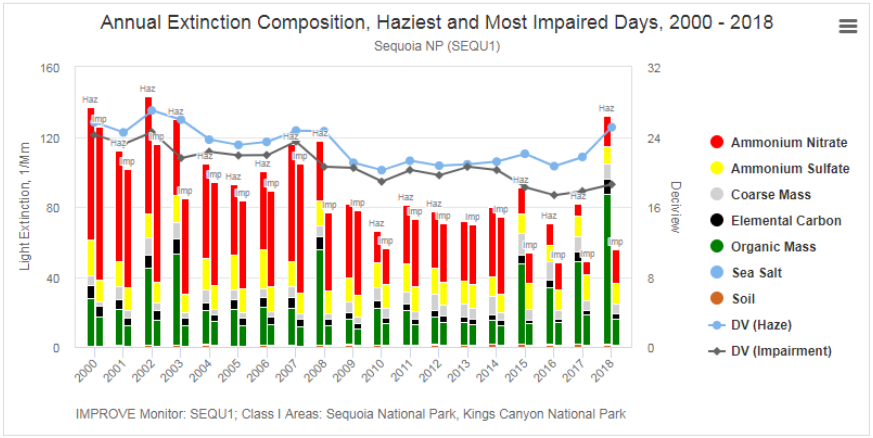
Purpose:

To illustrate the effect on seasonal extinction composition by the choice of guidance metric applied. The charts in the left column above show seasonal extinction composition on the haziest days (top) and the total number of haziest days per season (bottom). The charts in the right column show seasonal extinction composition on the most impaired days (top) and the total number of most impaired days per season (bottom).

Comparison of Annual Extinction Composition on the Haziest and M.I.D.



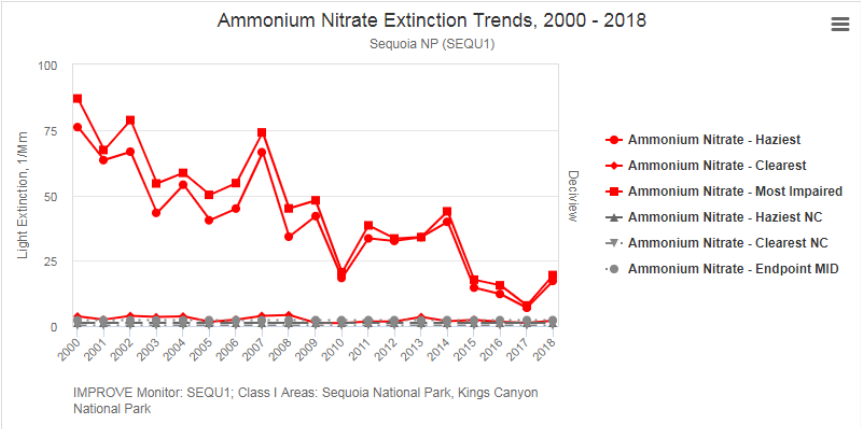


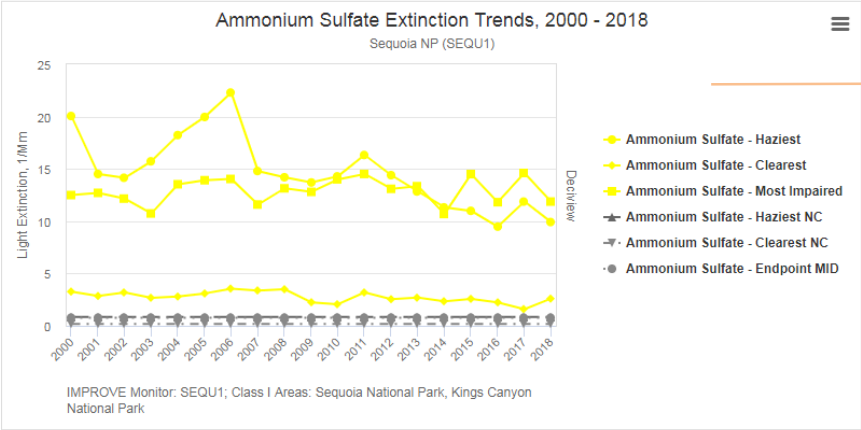


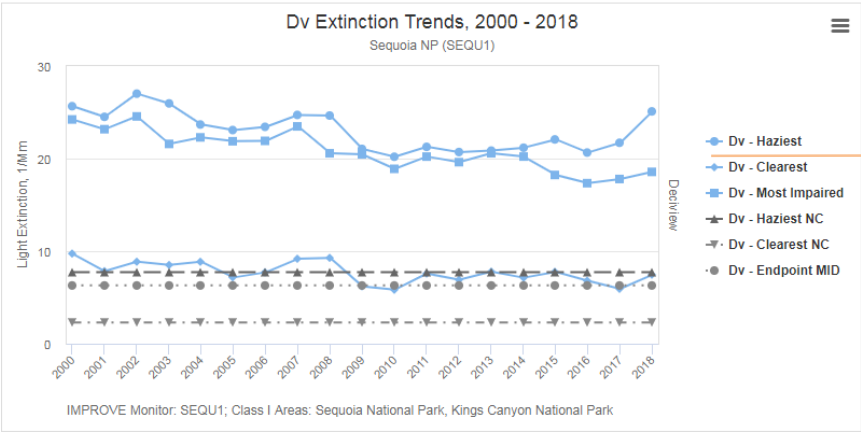
Purpose:

To illustrate the effect on annual average extinction composition by the choice of guidance metric. The top chart shows annual average extinction composition on the haziest days with total haze overlaid as a time series, the middle chart shows annual average extinction composition on the most impaired days with total impairment shown as a time series, and the bottom chart shows the two views combined, with the haziest and most impaired bars arranged side-by-side.

Comparison of Long Term Extinction Trends on the Haziest and M.I.D.







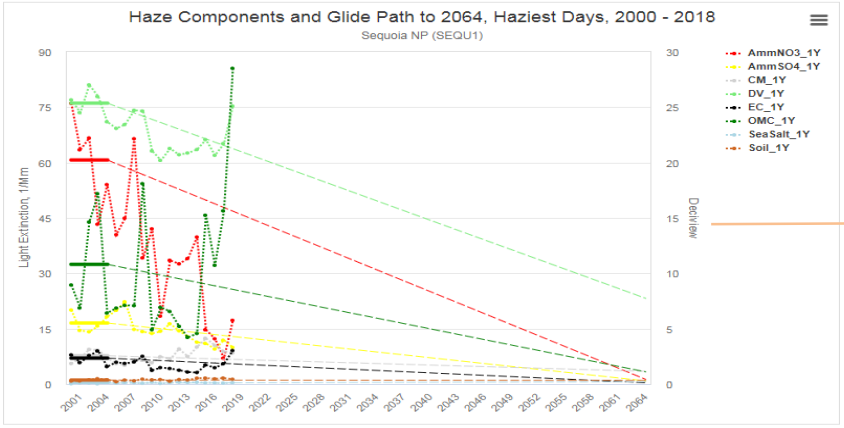
Purpose:

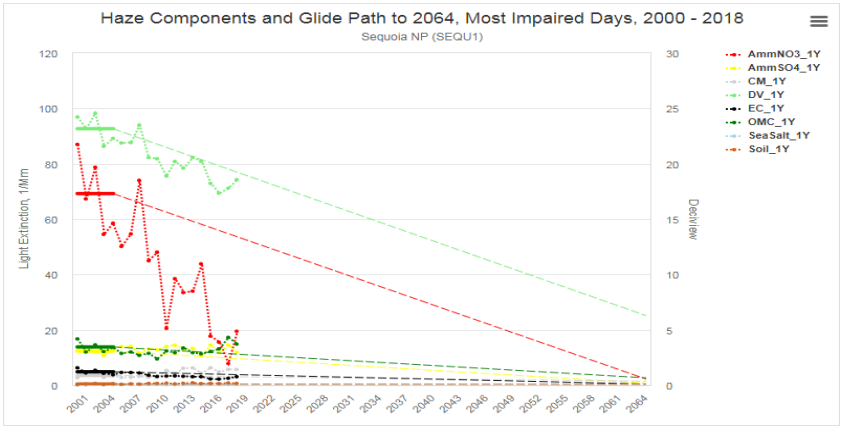
To illustrate long term trends in annual average extinction composition on the haziest and most impaired days, together with reference lines for natural conditions on the haziest and clearest days, as well as a reference line for the “endpoint” estimate of the current guidance. All seven of the primary extinction parameters can be selected, but only ammonium nitrate, ammonium sulfate, and deciview are shown in this example.

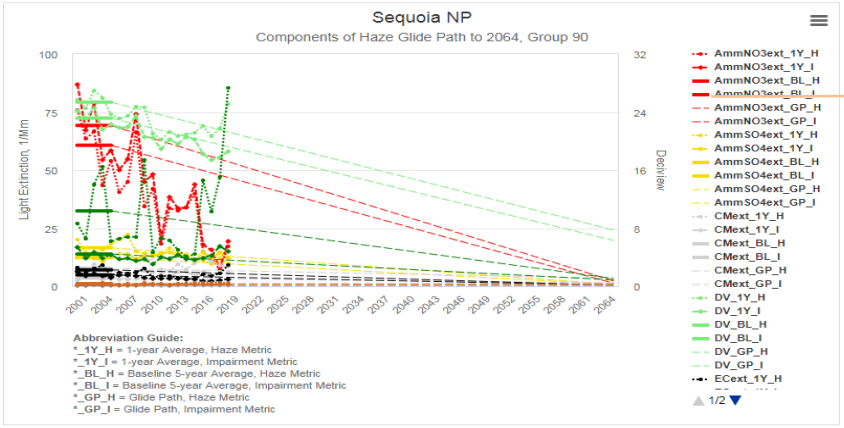
Feature Note:

To simplify any chart for viewing, you can click on a given entry in the legend in order to temporarily remove the corresponding series from the chart.

Uniform Rate of Progress Glide Paths on the Haziest and M.I.D.







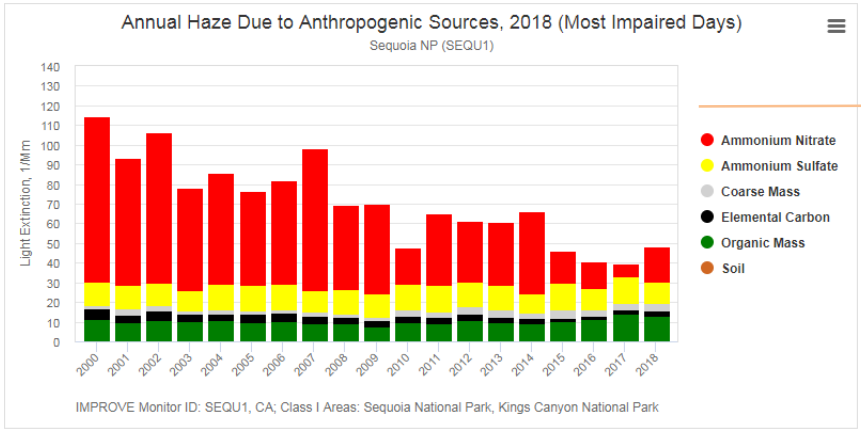
Purpose:

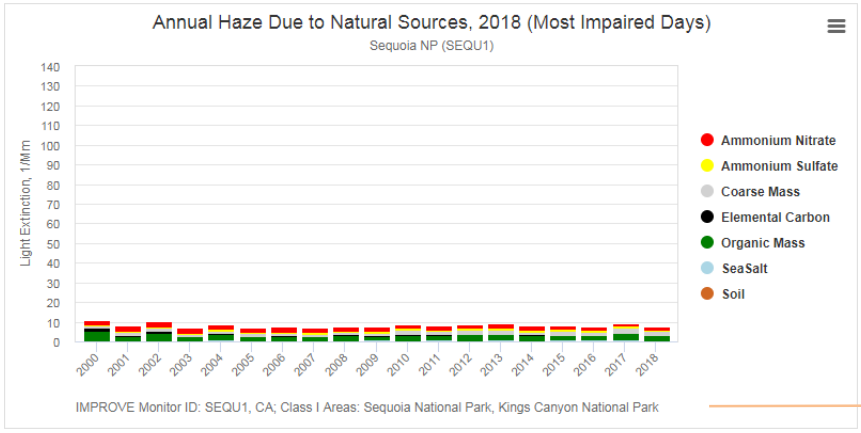
To illustrate the “glide path” or “uniform rate of progress (URP)” line from the first and second baseline periods (2000-2004 and 2005-2009) to natural conditions and/or the “endpoint” for the primary extinction parameters. Annual average extinction is also shown as a time series for each selected parameter for the period of record. The top chart shows the URP glidepath for species extinction on the haziest days, the middle chart shows the same thing for the most impaired days, and the bottom chart combines the two views so that you can more easily compare the haziest and M.I.D. glide paths.

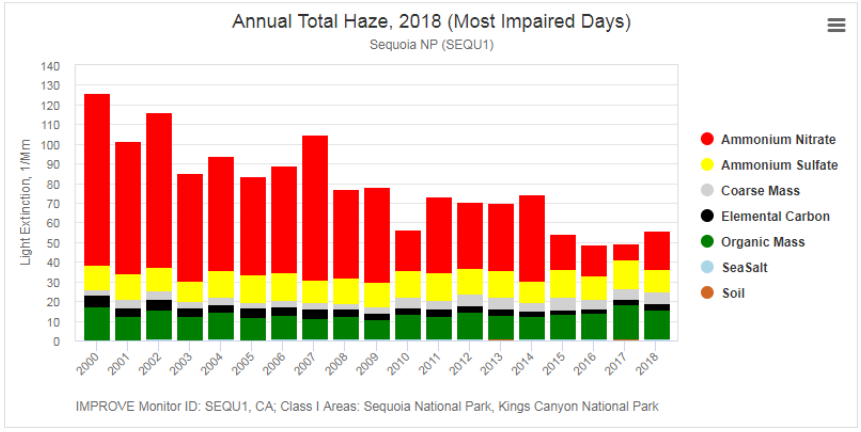
Feature Note:

While the all-parameter view of this report is visually “busy”, you can easily simplify each chart by clicking on a given entry in the legend in order to temporarily remove the corresponding series from the chart.

Annual Anthropogenic vs. Natural vs. Total Extinction on the M.I.D.







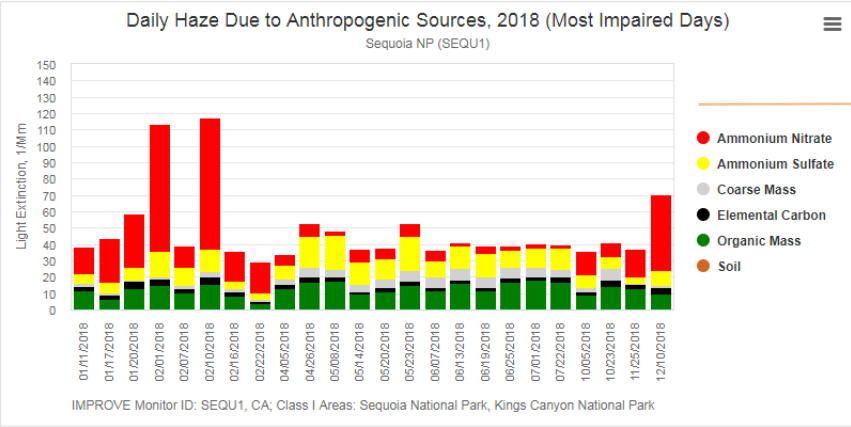
Purpose:

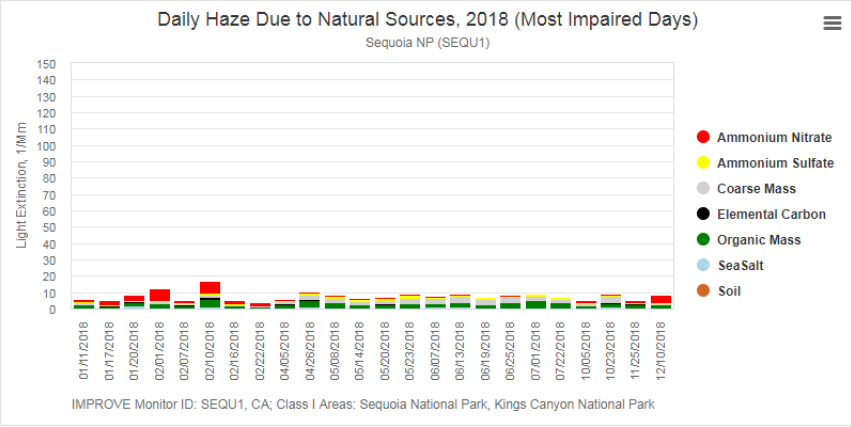
To illustrate and compare annual haze due to anthropogenic sources versus natural sources on the most impaired days. The top chart shows annual average haze for the primary extinction parameters due to anthropogenic sources, the middle chart shows annual average haze for the primary extinction parameters due to natural sources, and the bottom chart shows total annual average extinction (i.e. extinction due to all sources).

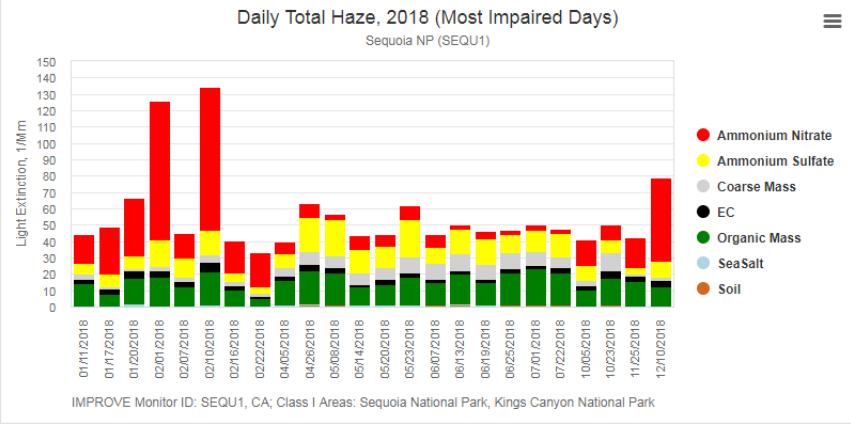
Feature Note:

At the bottom of each chart, the Class I Areas for which the selected monitoring site is considered “representative” are shown. Most sites are associated with a single Class I Area, but quite a few sites are considered representative for multiple Class I Areas.

Daily Anthropogenic vs. Natural vs. Total Extinction on the M.I.D.



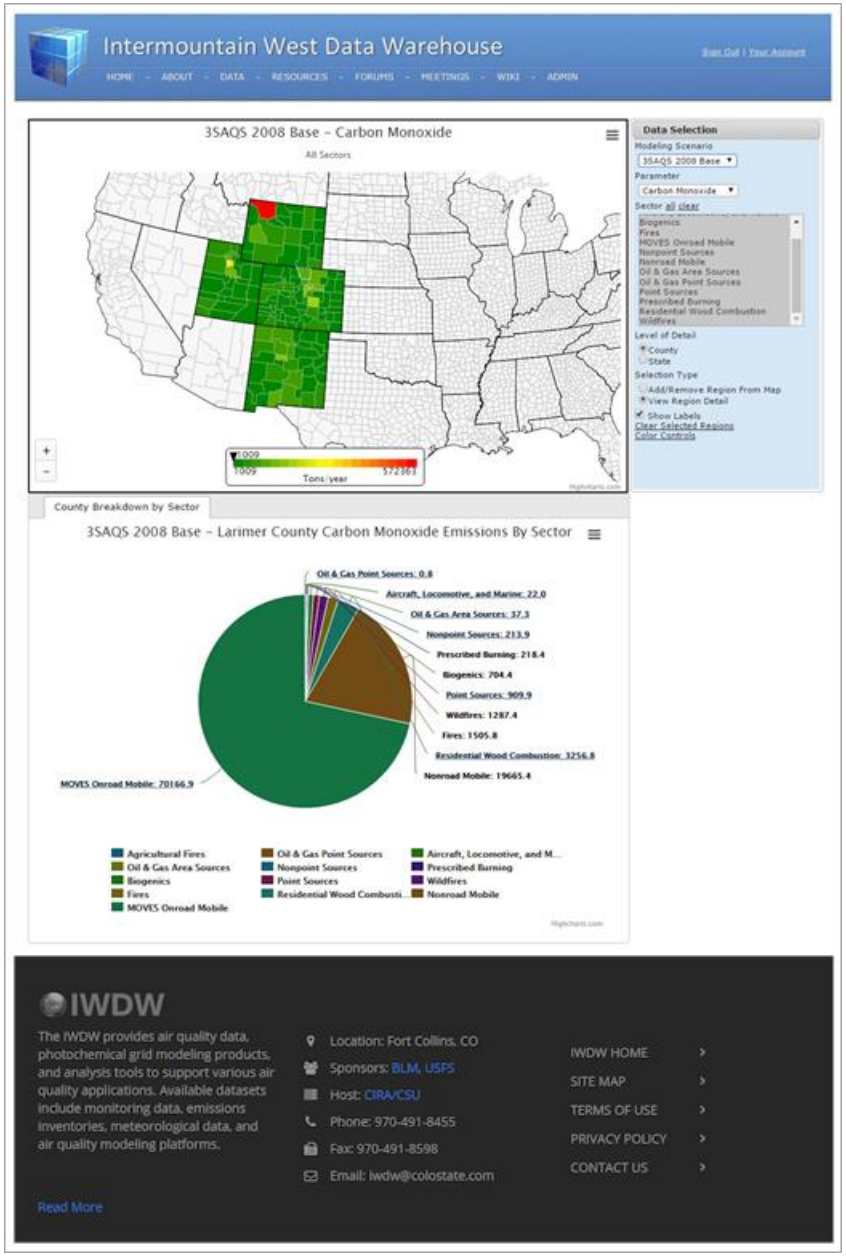




Purpose:

To illustrate and compare daily haze due to anthropogenic sources versus natural sources on the most impaired days. The top chart shows daily average haze for the primary extinction parameters due to anthropogenic sources, the middle chart shows daily average haze for the primary extinction parameters due to natural sources, and the bottom chart shows total annual average extinction (i.e. extinction due to all sources).

Intermountain West Data Warehouse (IWDW)



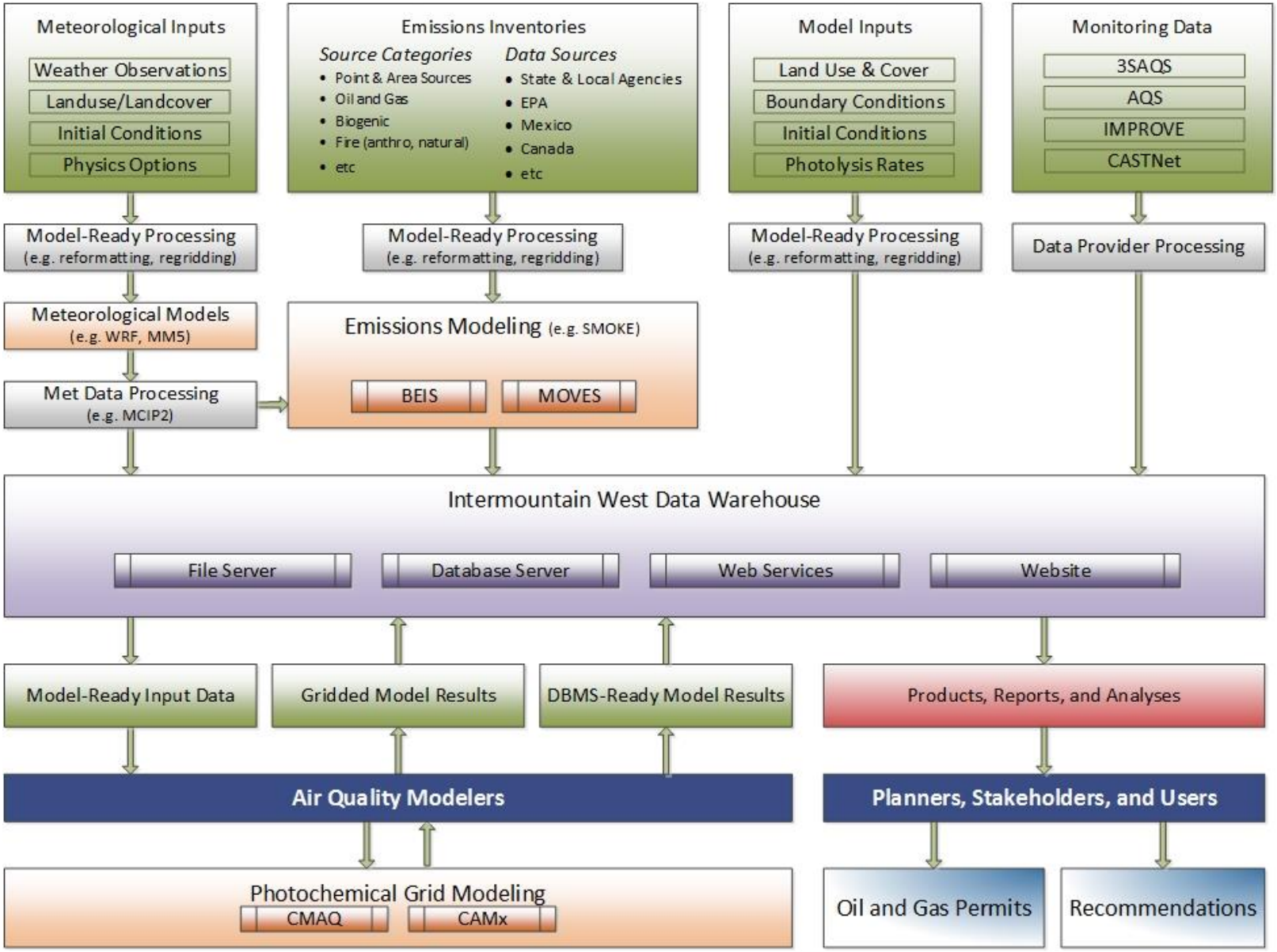
Provides:

- Complete air quality modeling platforms
- Individual modeling platform components
  - Modeling input data (met, emissions)
  - Boundary and initial conditions
  - Modeling software and configuration files
  - Air quality modeling results
- Model performance evaluation tools
- Model-to-obs comparison tools
- Emissions review tools

Collaborators:

- National Park Service (NPS)
- U.S. Forest Service (USFS)
- Bureau of Land Management (BLM)
- States: Colorado, Wyoming, Utah, New Mexico
- U.S. Environmental Protection Agency (EPA)
- WESTAR/WRAP

Data Warehouse Dataflow Diagram



Modeling Platform Data Request Form

IWDW

Notes

October 18, 2018

The Intermountain West Data Warehouse – Western Air Quality Study (IWDW-WAQS) is in the process of developing an updated air quality
2014. The WAQS 2014 modeling platform components, as described below, will be reviewed and approved by the IWDW-WAQS Cooperatin
are being developed for use in regional air quality modeling studies by the cooperating agencies and for external users accepting the terms
Agreement and authorized by the Cooperators.

The 2014 WAQS modeling platform is based on EPA's 2014 NEIv2 with updates for emissions sectors affecting regional AQ modeling, partic
impact ozone modeling, and PM emissions that may impact modeling for Regional Haze Planning. Base 2014 modeling uses WRF meteorolo
cover/snow depth data and versions of WRFCAMx and CAMx with specialized dynamical and chemical parameterizations for areas covered

Modeling Software

	Name	Description	Notes	Source	Status
	WRF v3.6.1	WAQS 2014 WRF modeling software	NCAR/UCAR WRF.		Pending
	WRF v3.8	EPA 2014 WRF modeling software	NCAR/UCAR WRF.		Pending
☐	SMOKEv4.5	Processing scripts and emissions inputs used in WRAP emissions processing	CMAS SMOKE. SMOKE processing scripts and input package. Includes all WRAP v1 and updated NEIv2 inventories and SMOKE-ready inputs.		Available
	CAMx v6.4				Pending
	CMAQ v5.2				Pending

Shows the status of the component

Emissions Data

	Name	Description	Notes	Source	Status	Size	Files	Available
☐	Base 2014 Inputs	2014 NEIv2 modeling platform inputs	Includes modeling platform inputs and scripts from EPA	EPA	Available	49Gb	97	12/5/2018
☐	Base 2014 Inputs	Updates to 2014 NEIv2 for WRAP modeling	Updates re for WRAP 2			6.7Mb	22	12/28/2019
☐	Base 2014 Unmerged	Unmerged emissions (12km and 36km)	Includes anthropogenic sectors (processed by SMOKE) and modeled natural emissions (generated by Ramboll). Natural sources added on 3/15/2019.	WAQS	Available	559Gb	82	1/25/2019
☐	Base 2014 Merged	Model ready merged emissions	12km model ready emissions. Includes 36km sector inputs for 12km boundaries.	WRAP	Available	844Gb	396	3/1/2019

Shows the estimated size of the component

Shows the total number of files

Shows the expected availability date

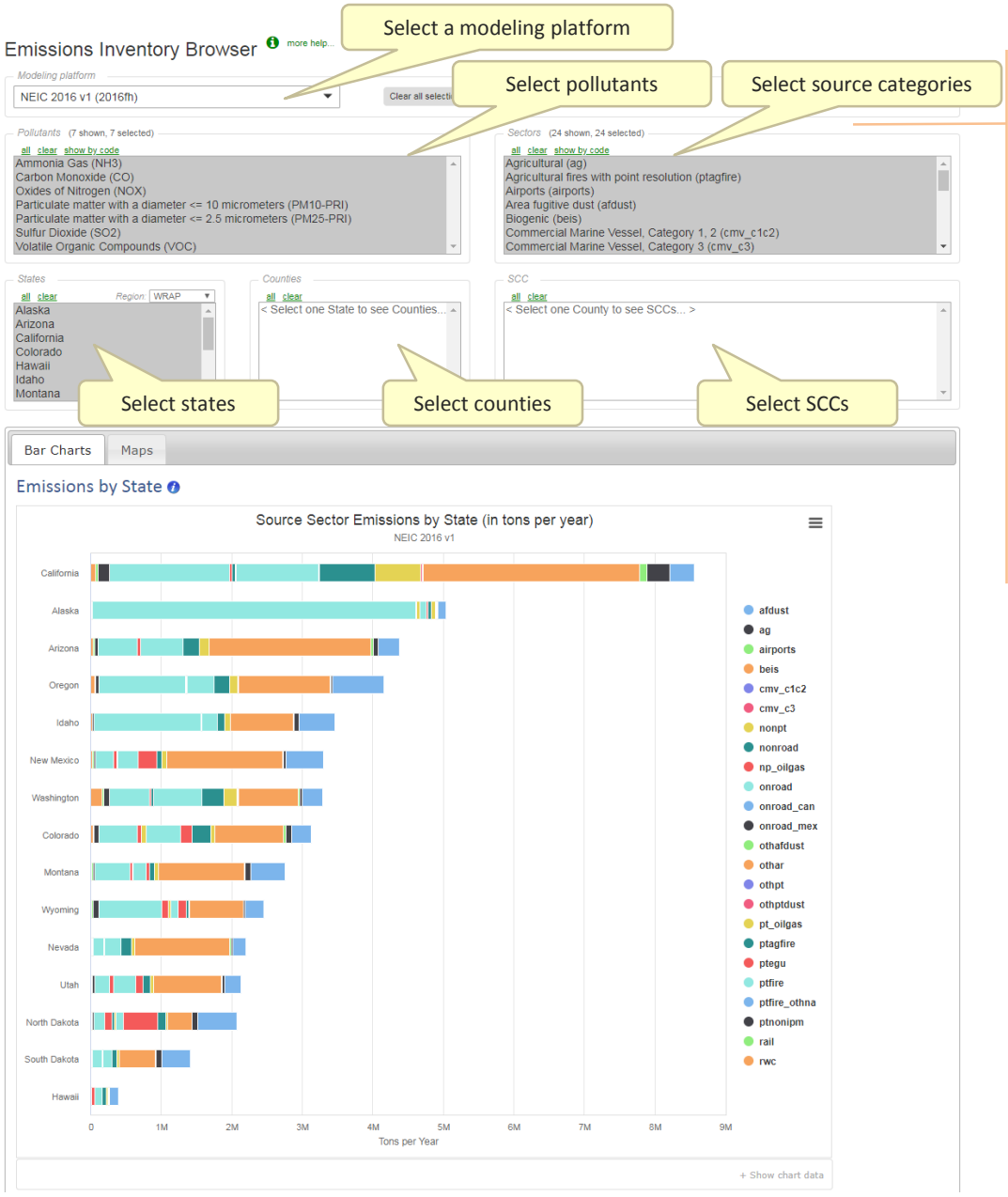
Meteorology Data

	Name	Description	Notes					Available
☐	Meteorology v2014 - WRF	2014 WRF meteorology	4km, 12km, and 36km	WAQS	Available	3.2Tb	163	11/16/2018
☐	Meteorology v2014 CAMx	2014 meteorology prepared for CAMx with WRFCAMx	4km, 12km, and 36km WRFCAMx. Includes CMAQ kv files.	WAQS	Available	838Gb	2406	11/16/2018
☐	Meteorology v2014 CMAQ	2011 WRF meteorology prepared for CMAQ with MCIP	4km, 12km, and 36km MCIP files	WAQS	Available	2.1Tb	2392	11/16/2018
☐	Meteorology v2014 - WRF	2014 WRF meteorology	EPA's 12km ConUS WRF simulation. Model	EPA	Available	2.0Tb	153	11/16/2018

Purpose:

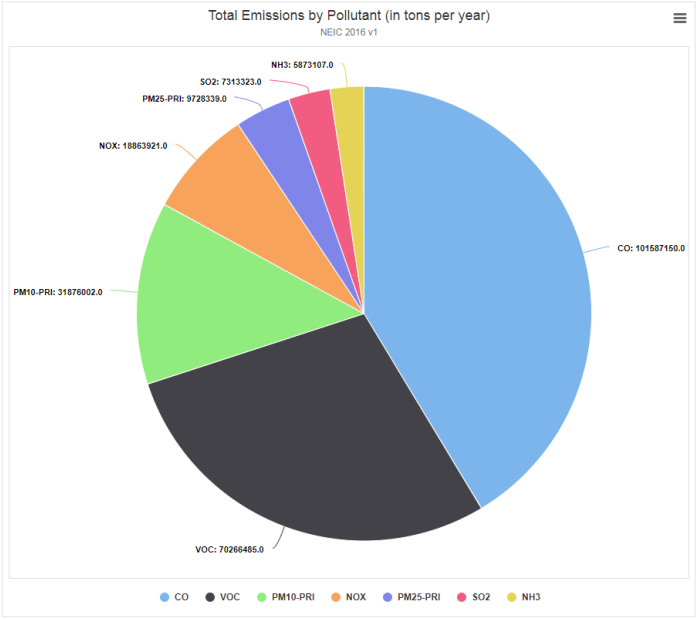
To facilitate the browsing, selection, and download of entire modeling platforms or individual modeling platform components, and to illustrate the expected roadmap for creating and distributing modeling platforms and individual platform scenarios. Platform components can be accessed and downloaded via SFTP, HTTP, and Globus, and extremely large-volume data requests can be delivered on physical hard drives via regular mail service.

Emissions Review Tool

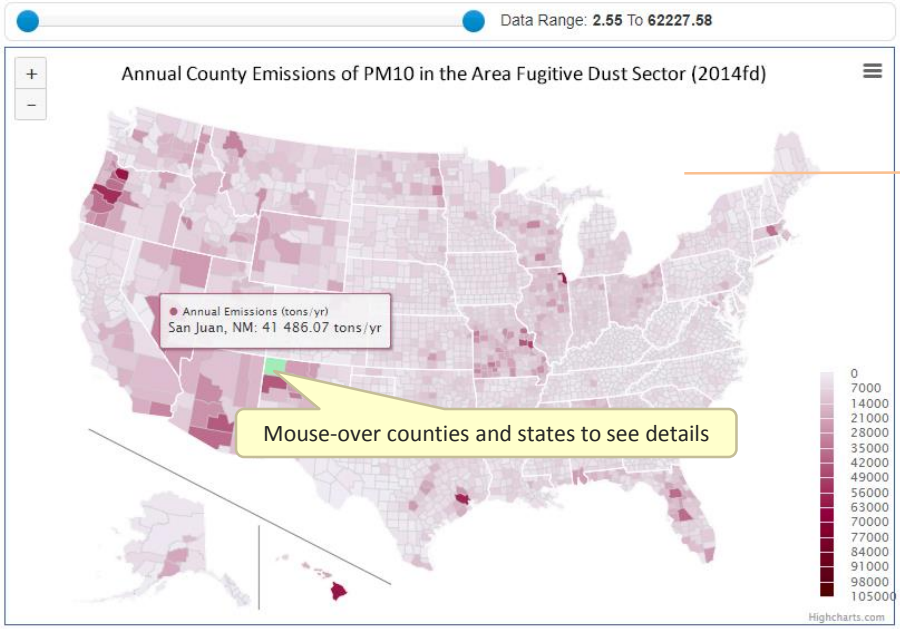


Purpose:

Provides a detailed summary of annual emissions totals by state, county, and source category via a variety of interactive maps and charts. The emissions inventory data used for ten different modeling scenarios is available, and emissions totals from multiple scenarios can be selected and visualized at the same time with multiple side-by-side charts or multiple side-by-side stacked bars on the same chart.

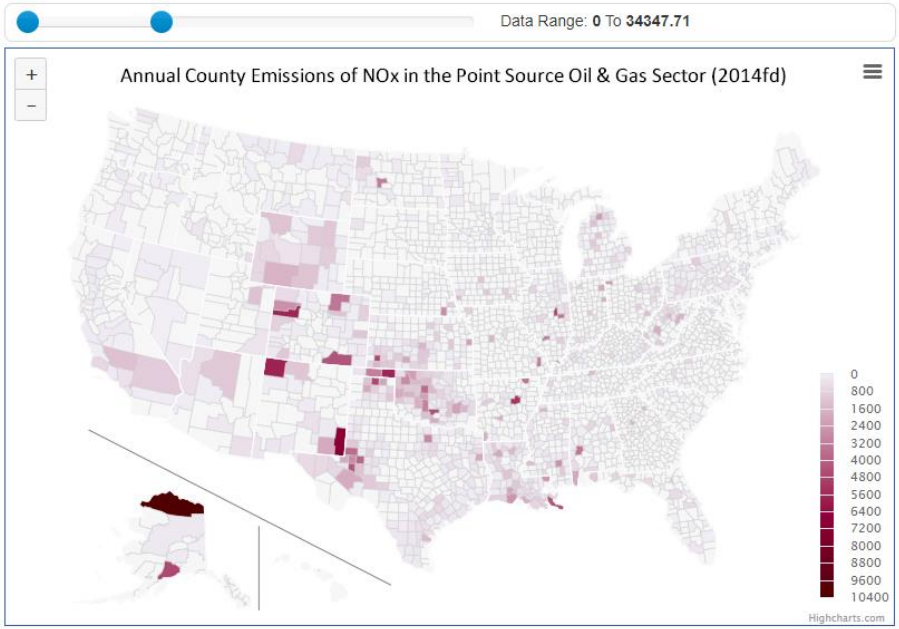


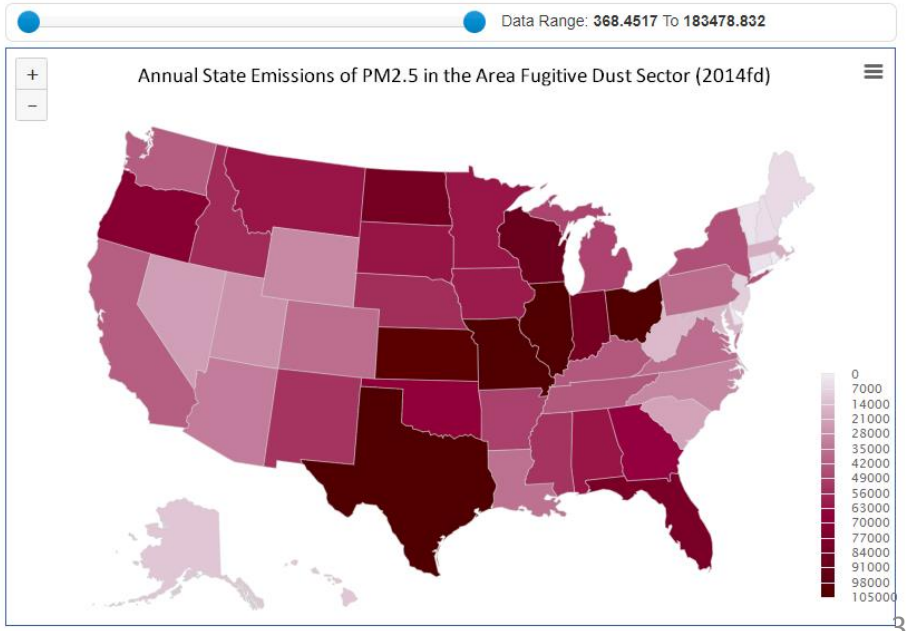
State and County Emissions Maps



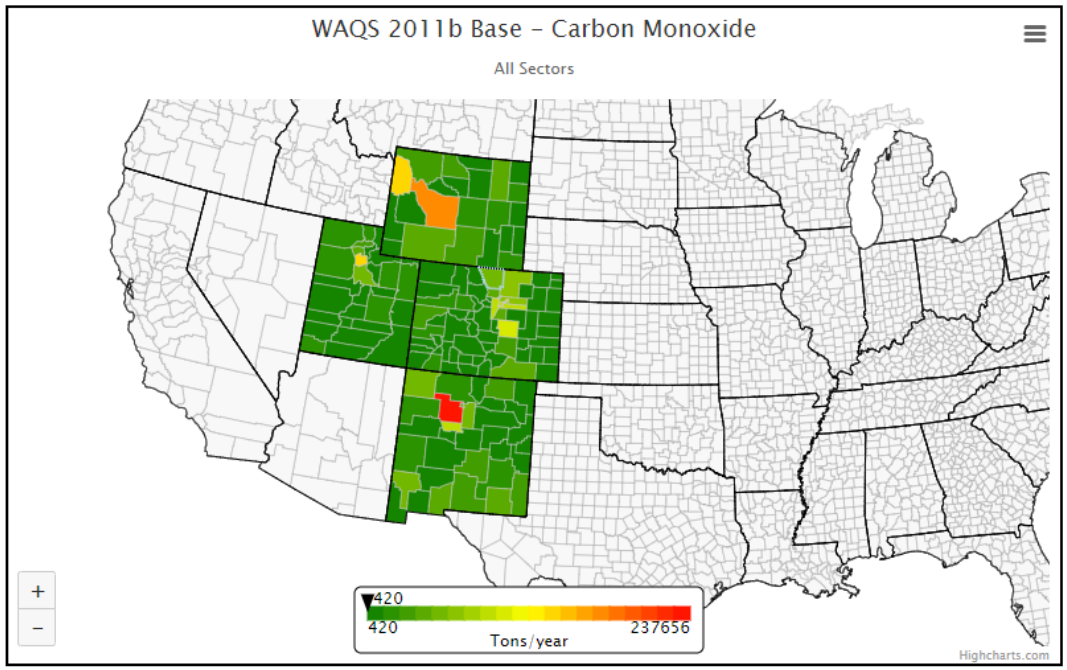
Purpose:

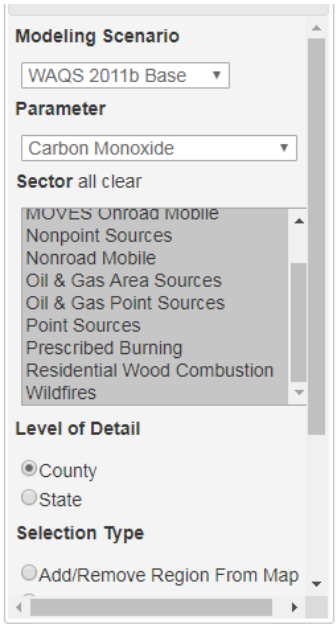
To display state- and county-level annual emissions totals for the selected states, pollutants, and source sectors. You can mouse-over individual states and counties to display more detail, and you can use the "Data Range" slider bars to specify a range of total emissions in tons per year in order to filter out large numbers of low and/or high values and thus change the visual contrast and separation of the map colors.



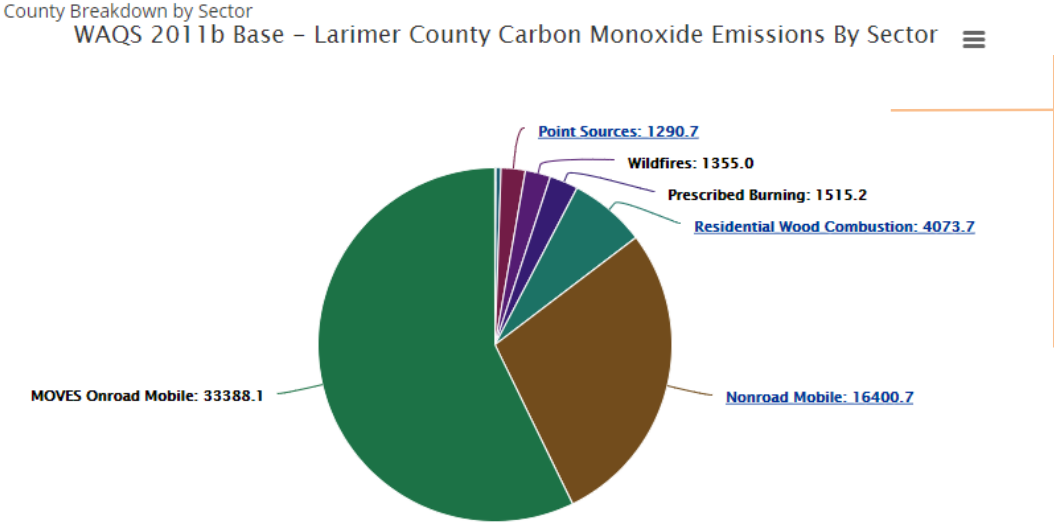


Emissions Exploration Map





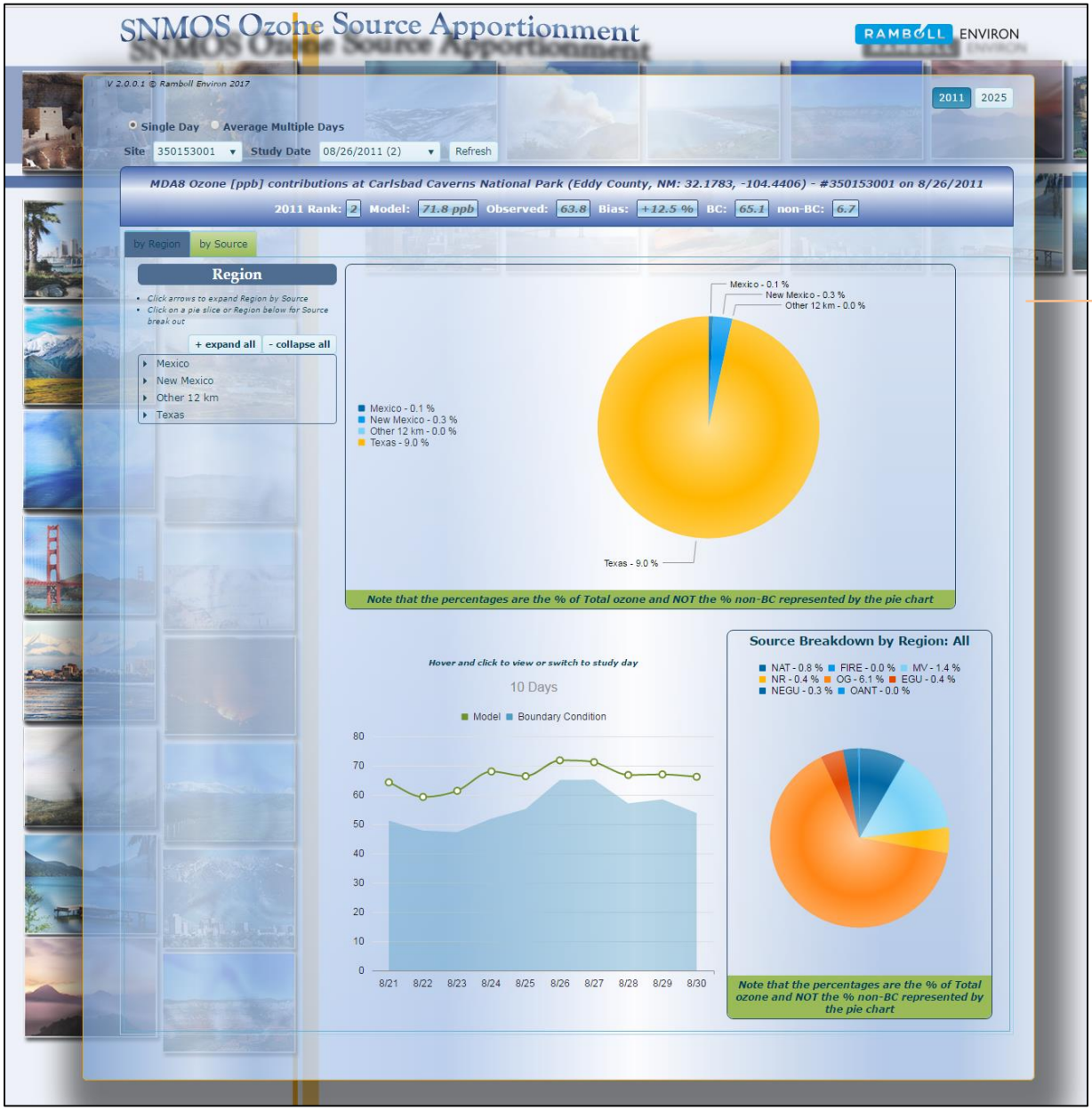
County Breakdown by Sector



Purpose:

Provides a detailed breakdown of annual emissions totals by state, county, and source category via a variety of interactive maps and charts.

Source Apportionment Tools



Purpose:

Provides a variety of charts and graphs for analyzing source attribution for modeled parameters on specific days and/or for specific time periods.

IWDW

Model-To-Observation Comparison Tool

Make selections from the lists below to view a wide variety of time-series charts, scatter plots, bar charts, maps, and other graphics that will help you visualize and evaluate the performance of the atmospheric models that were applied to each modeling scenario hosted by the warehouse.

Comparison Type: By Network

Modeling Scenario: WAQS - 2011b - CAMx - 12K

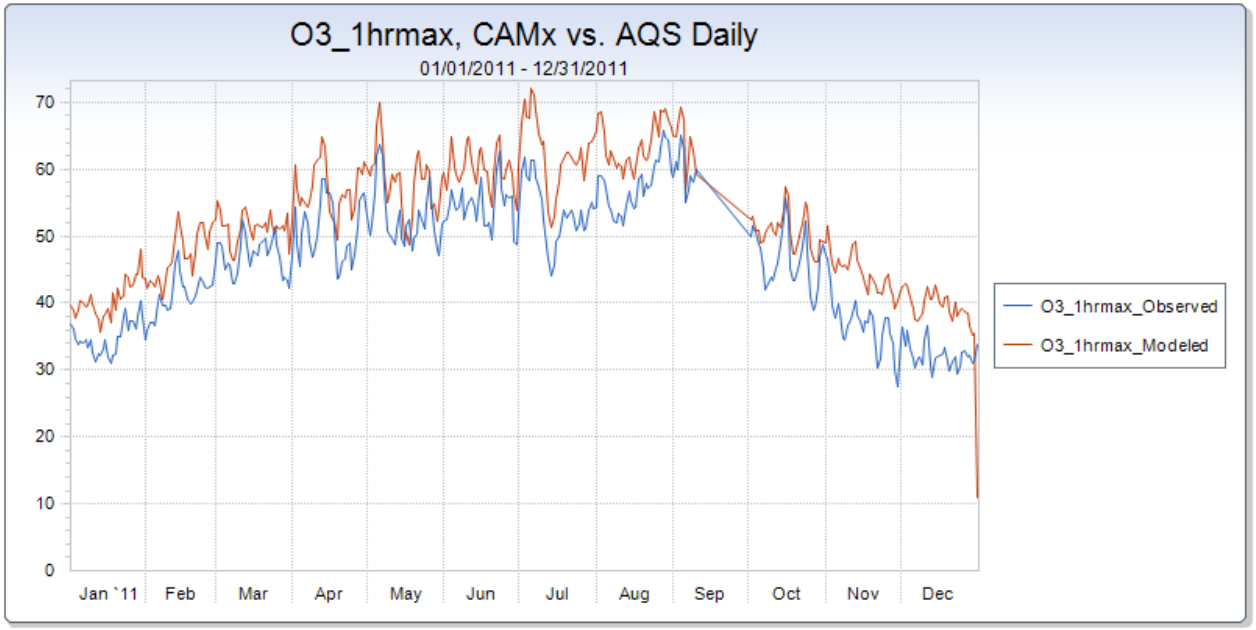
Start Date: 01/01/2011

End Date: 12/31/2011

Network/Dataset:
- AQS - Daily
- AQS - Hourly
- CASTNET - Daily
- CASTNET - Hourly
- CASTNET - Other
- CDPHE - Other
- CSN - Other

Parameter:
- O3_1hrmax
- O3_8hrmax
- PM25_TOT - Mass, PM2.5 (Fine)
- W126

chart options



Purpose:

Provides a variety of site-specific plots of modeled vs. observed values in order to help evaluate model performance.

Model Performance Evaluation Plot Browser

Model Performance Evaluation Graphs

View a wide variety of scatter plots, soccer plots, bar charts, and maps demonstrating model performance for several modeling scenarios in the Western Air Quality Study (WAQS).

2011 | Base11b | plots | AQ | 12km | NM

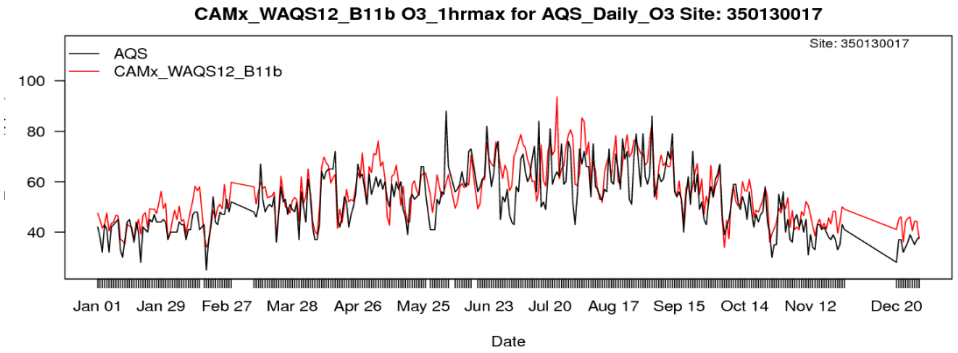
Choose an analysis set (193 available):

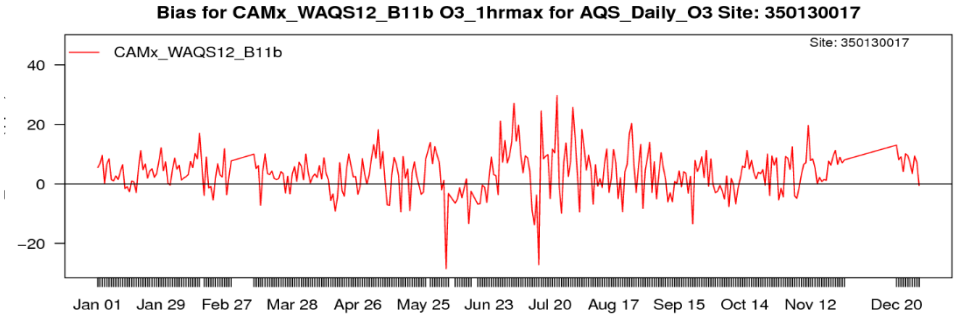
	Network	Pollutant	Region	Grouping	PlotType	Count
◉	AQS_Daily_O3	O3_1hrmax	All	site	timeseries	1
○	AQS_Daily_O3	O3_1hrmax	All	site	timeseries	3
○	AQS_Daily_O3	O3_1hrmax	NM	site	timeseries	26
○	AQS_Daily_O3	O3_1hrmax	NM	site	timeseries	26
○	AQS_Daily_O3	O3_1hrmax	NM	site	timeseries	26
○	AQS_Daily_O3	O3_1hrmax	NM	site	timeseries	24

Choose an image (1 available):

CAMx_WAQS12_B11b.AQS_Daily_O3.O3_1hrmax.350130017.All.ann.timeseries.png

Folder: http://vice.cira.colostate.edu/files/iwdw/modeling/3SAQS/2011/Base11b/plots/AQ/12km/NM/
Image: CAMx_WAQS12_B11b.AQS_Daily_O3.O3_1hrmax.350130017.All.ann.timeseries.png

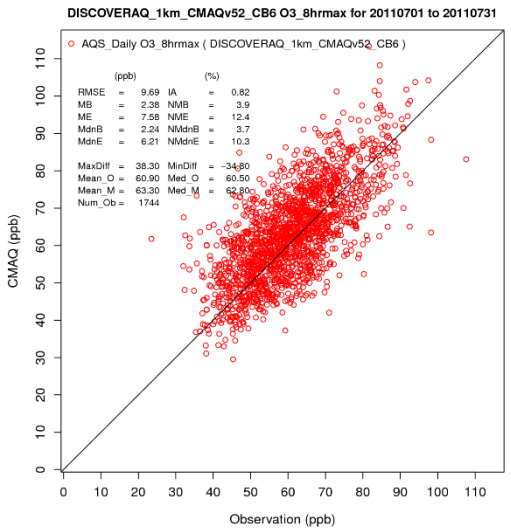


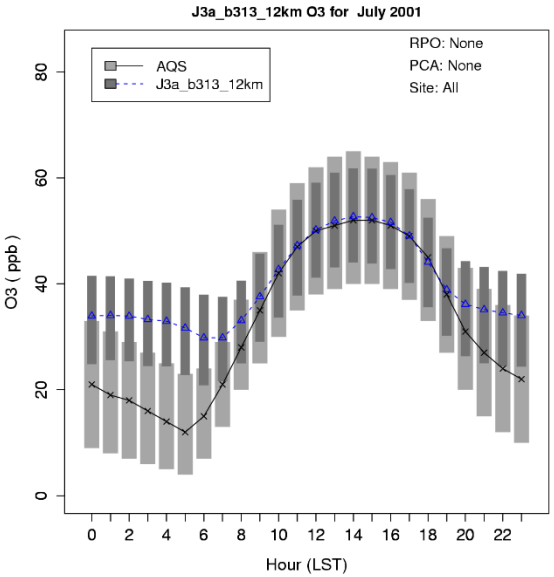


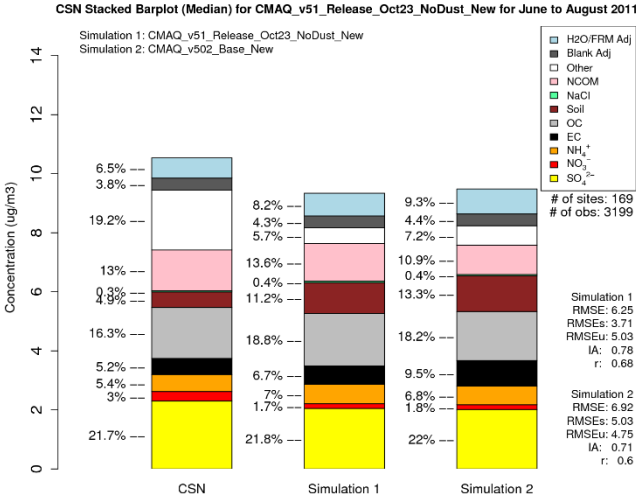
Purpose:

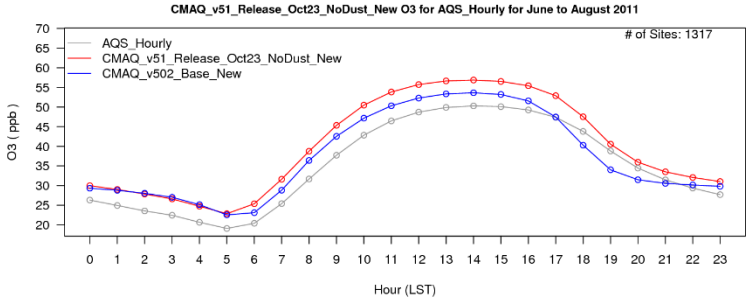
Provides a simple interface for browsing and viewing the static plots generated by external model evaluation tools like AMET.

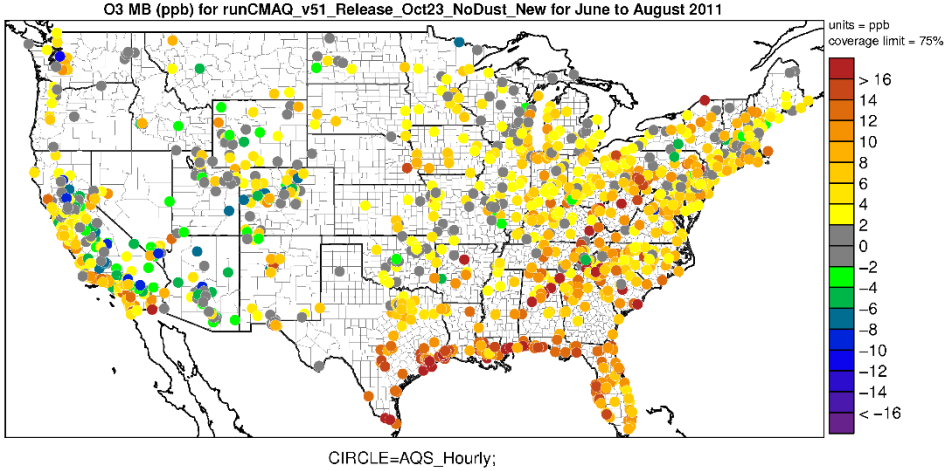
Model Performance Evaluation Plot Browser *(continued)*











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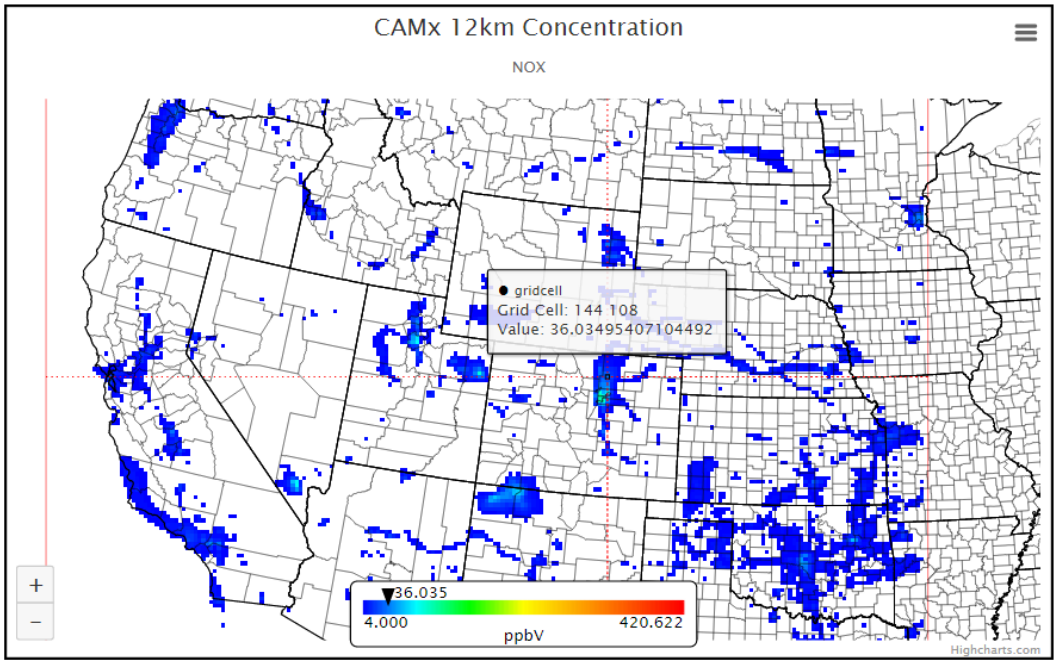
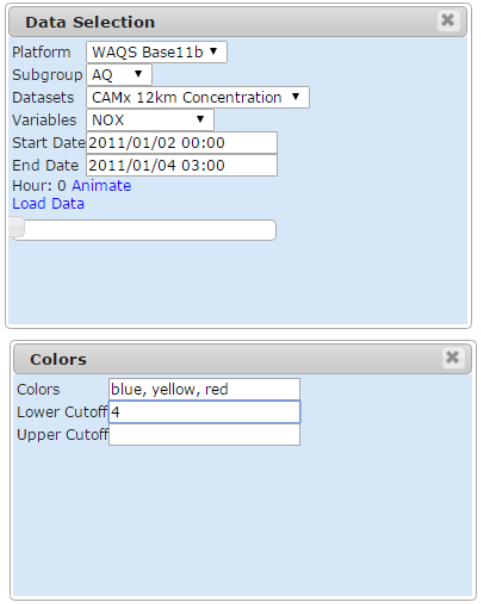
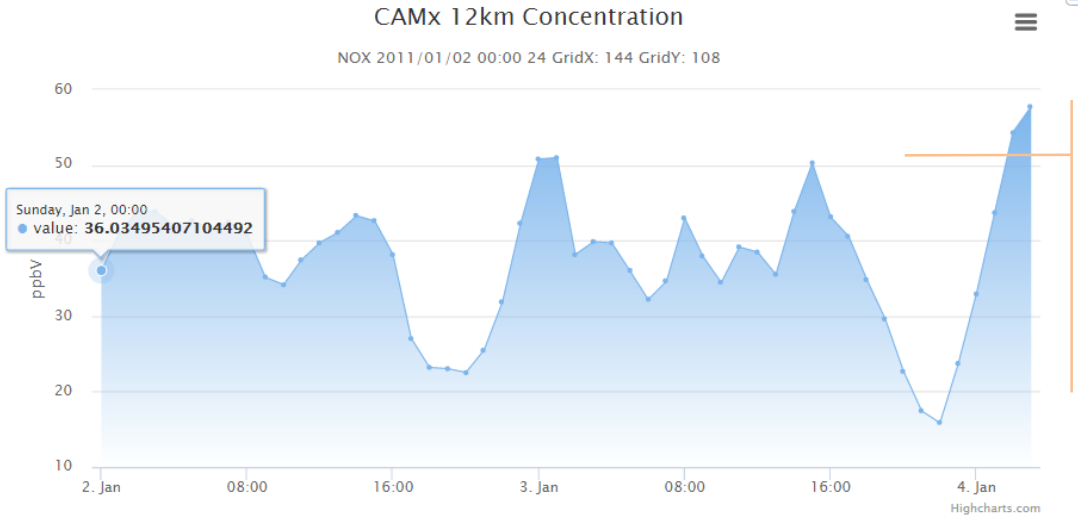
Model Data Browser



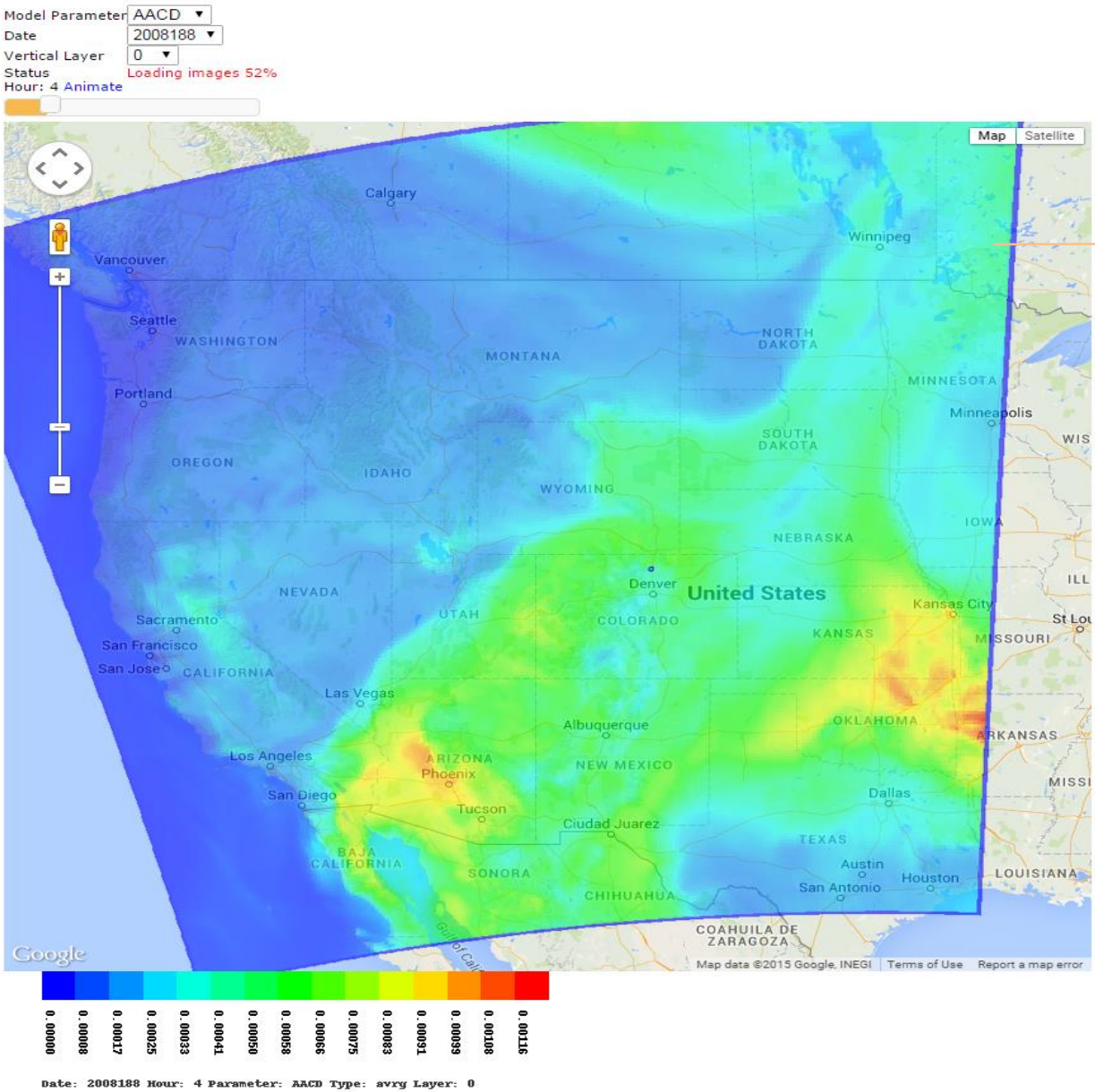




Purpose:

Provides an interactive display of gridded modeling data and detailed drill-down to the individual modeling grid cell level.

Gridded Data Visualization Tool



Purpose:

Provides an interactive map of gridded data down to the level of individual model days. A series of maps can be animated over a selected time period.

Short-Term Roadmap

ADMS
Air Data Management System

- Finalize the WAQS 2014 modeling platform
  - Emissions summary tables (2002, 2014v2 and RepBase)
  - Dynamic evaluation visibility results at Class I Areas
  - Gridded 2028 OTB a&b emissions
  - Gridded 2028 OTB a&b annual/seasonal concentrations
  - Gridded residence time fields for all Class I Areas
  - Gridded WEP & emissions and point sources
- Finalize the USEPA 2016 modeling platform
- More SIP and TIP development tools and products
  - Add future year model projections to glide path products
  - Create simplified versions of existing tools specific to current guidance
  - Add high-level emissions and modeling results summaries
  - Further streamline the modeling platform data request pipeline
  - Develop additional gridded data display tools
  - Integrate proscribed fire data and associated tools
  - Incorporate satellite data
- Create full failover hardware and data redundancy
- Update and renew the various project agreements

Website Traffic Data *(past example)*

ADMS Air Data Management System

VisitDate	IpAddress	Organization1	Organization2	JobTitle	EmailDomain	Country	State	City	ZipCode
11/1/2017 8:04	50.194.133.33	McVehil-Monnett Associates, Inc.		Air Quality Meteorologist	mcvehil-monnett.com	US	Colorado	Greenwood Village	80112
11/1/2017 7:07	50.194.133.33	McVehil-Monnett Associates, Inc.		Air Quality Meteorologist	mcvehil-monnett.com	US	Colorado	Greenwood Village	80112
10/13/2017 17:28	128.138.65.193	University of Colorado Boulder			colorado.edu	US	Colorado	BOULDER	80303
10/12/2017 15:56	204.47.59.65	U.S. EPA		Environmental Scientist	epa.gov	US	Colorado	Denver	80202
10/12/2017 13:19	204.47.59.65	U.S. EPA		Environmental Scientist	epa.gov	US	Colorado	Denver	80202
10/10/2017 8:21	24.9.117.153	WRAP	WESTAR	AQ Program Manager	westar.org	US			
10/5/2017 14:57	128.138.65.129	University of Colorado Boulder			colorado.edu	US	Colorado	BOULDER	80303
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9/28/2017 14:11	128.138.65.129	University of Colorado Boulder			colorado.edu	US	Colorado	BOULDER	80303
9/28/2017 12:55	199.168.151.87	NYS Dept of Environmental Conservation		Research Scientist	dec.ny.gov	US	New York	Albany	12233-3259
9/28/2017 11:02	204.124.92.254	BLM		Air Specialist	blm.gov	US	New Mexico	Santa Fe	87508
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9/26/2017 12:04	128.138.65.129	University of Colorado Boulder			colorado.edu	US	Colorado	BOULDER	80303
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9/26/2017 7:06	134.67.29.16	U.S. EPA		Environmental Scientist	epa.gov	US	Colorado	Denver	80202
9/25/2017 10:40	128.138.65.129	University of Colorado Boulder			colorado.edu	US	Colorado	BOULDER	80303
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9/20/2017 12:07	165.83.32.99	National Park Service		Environmental Protection Specialists	nps.gov	US	Colorado	Denver	80225
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8/31/2017 8:55	128.138.65.139	University of Colorado Boulder			colorado.edu	US	Colorado	BOULDER	80303
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8/29/2017 9:17	128.138.65.139	University of Colorado Boulder			colorado.edu	US	Colorado	BOULDER	80303
8/28/2017 10:12	128.138.65.139	University of Colorado Boulder			colorado.edu	US	Colorado	BOULDER	80303

Registered Users *(small excerpt)*

ADMS Air Data Management System

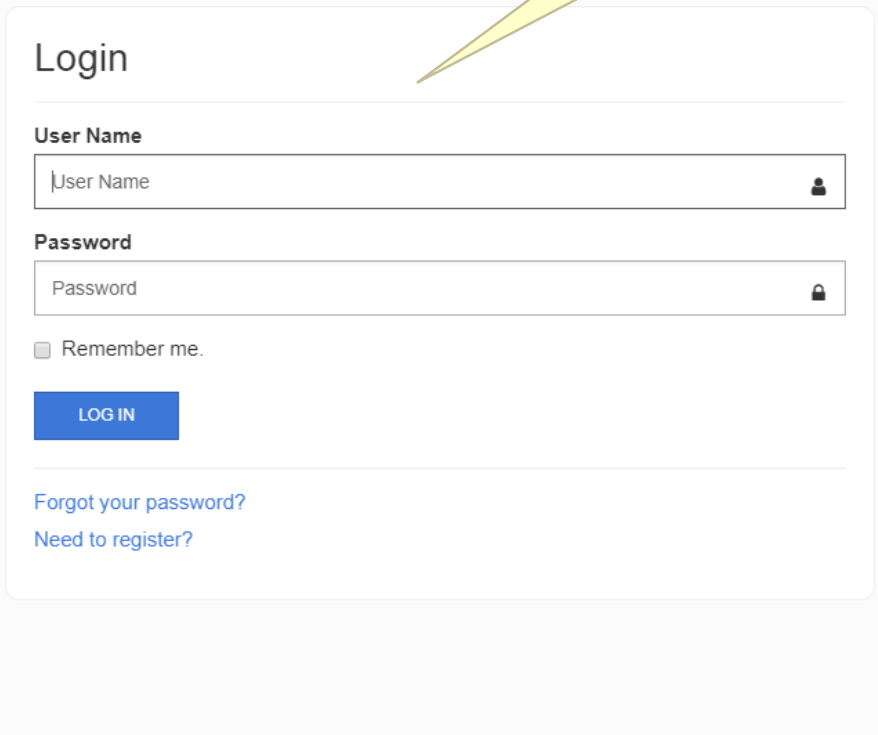
Organization1	Organization2	JobTitle	EmailDomain	Country	State	City	ZipCode
AECOM		Senior Enviornmental Scientist	aecom.com	US	Pennsylvania	Conshohocken	19428
AECOM		Air Quality Scientist	aecom.com	US	Colorado		
AECOM			aecom.com	US			
AECOM		PGM Manager	aecom.com	US	Colorado	Fort Collins	80525
AECOM		PGM Group Manager	aecom.com	US	Colorado	Fort Collins	80521
AECOM			aecom.com	US	Colorado		
AER		Senior Staff Scientist	aer.com	US	Massachusetts	Lexington	2466
Air Resource Specialists, Inc.		Project Scientist	air-resource.com	US	Colorado	Fort Collins	80525
Air Resource Specialists,Inc.		Software Developer	air-resource.com	US	Colorado	Fort Collins	80525
Alaska DEC			alaska.gov	US	Alaska	Juneau	99801
Alpine Geophysics, LLC		Partner	alpinegeophysics.com	US	Colorado	Arvada	80007
CPAGrip		CEO	aol.com	US	Illinois		
Atmospheric Sciences International			asi-sonoma.com	US	California	Santa Rosa	95405
Arizona State University		academic associate	asu.edu	US	Arizona	Tempe	85287
			atmos.colostate.edu	US			
Colorado State University			atmos.colostate.edu	US	Colorado	Fort Collins	80521
Arizona DEQ		Senior Environmental Engineer	azdeq.gov	US	Arizona	phoenix	
AZ Dept. of Environmental Quality		Planner	azdeq.gov	US	Arizona	Phoenix	85003
			bison-eng.com	US	Montana	Helena	59601
		engineer	bison-eng.com	US	Montana	billings	59101
BLM			blm.gov	US			
BLM		Air Specialist	blm.gov	US	New Mexico	Santa Fe	87508
BLM		Air Resource Specialists	blm.gov	US	Montana	Billings	59101
BLM		Air Resource Specialist	blm.gov	US	Colorado	Lakewood	80215
BLM		Air Resource Specialist	blm.gov	US	Utah	Salt Lake City	84101
BLM CO		Air Resource Specialist	blm.gov	US	Colorado	Lakewood	80215
Bureau of Land Management	Wyoming State Office	Air Resource Specialist	blm.gov	US	Wyoming	Cheyenne	82009
DOI/BLM		Air Quality Specialist	blm.gov	US	New Mexico	Santa Fe	87502
US Department of the Interior	Bureau of Land Management	National Air Quality Modeler	blm.gov	US	Colorado	Denver	80225
CenSARA			censara.org	US	Oklahoma		
			chevron.com	US			
			clarkcountynv.gov				
University of Colorado		Professor	colorado.edu	US	Colorado	Boulder	80309
University of Colorado Boulder			colorado.edu	US	Colorado	BOULDER	80303
University of Colorado, Boulder		Postdoctoral Research Associate	colorado.edu	US	Colorado	Boulder	80310

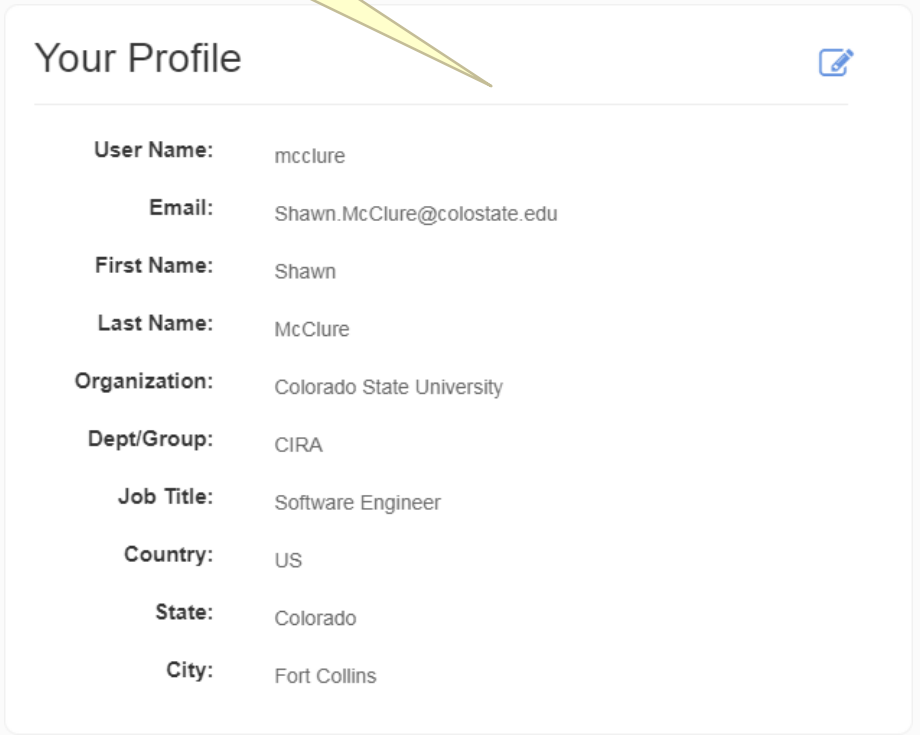
We Encourage You To Register!

ADMS
Air Data Management System

Login form

User account/profile form





ADMS Air Data Management System

Website Links:

Intermountain West Data Warehouse (IWDW):
https://views.cira.colostate.edu/iwdw

WRAP Technical Support System (TSS):
https://views.cira.colostate.edu/tssv2

Federal Land Manager Environmental Database (FED):
https://views.cira.colostate.edu/fed

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- Ted Friesner, CIRA-CSU: Ted.Friesner@colostate.edu

Thank You for Attending the Webinar!

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- Shawn McClure, Shawn.McClure@colostate.edu
- WRAP Contact: Tom Moore, tmoore@westar.org
- ITEP Contact: Mehrdad Khatibi, Mehrdad.Khatibi@nau.edu

WRAP Website: https://www.wrapair2.org/