

*WRAP Regional Analysis:
Intermountain West Data Warehouse –
Western Air Quality Study (IWDW-WAQS) efforts
and Greater San Juan Basin updates*

**Four Corners Air Quality Group
Update Meeting
December 1, 2016**

Tom Moore
WRAP Air Quality Program Manager
WESTAR Council



www.westar.org



www.wrapair2.org





Volume 43, Fall/Winter 2015
College of Engineering



[Click to view the Fall/Winter 2015 CIRA Magazine](#)

Intermountain West Data Warehouse – Western Air Quality Study (IWDW-WAQS)

Applying the geographic and technical scope of the IWDW-WAQS for Air Quality analysis and planning.

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

CIRA is a cooperative institute that is also a research department within **CSU's College of Engineering**, in partnership with the **Department of Atmospheric Science**. Its vision is to conduct interdisciplinary research in the atmospheric sciences by entraining skills beyond the meteorological disciplines, exploiting advances in engineering and computer science, facilitating transitional activity between pure and applied research, leveraging both national and international resources and partnerships, and assisting

Current Conditions

Temp:	75.6 F
Dew Point:	43.6 F
Relative Humidity:	32 %
Wind:	3.0 mph (NE)
Precip:	0.00 in
Barometer:	29.554 in

NPS Air Quality
Conditions & Trends Tools
(nps.gov)

Partners: NPS/ARD

Federal Land Manager
Environmental Database
([FED](#))

Partners: NPS, USFS

Databases



Websites



Hardware



Software



Intermountain West
Data Warehouse
([IWDW](#))

Partners: NPS, BLM, USFS, EPA,
CO, WY, UT, NM

Southeastern
Modeling, Analysis, and
Planning
([SEMAP](#))

Partners: EPA, AL, FL, GA, KY, MS,
NC, SC, TN

NPS Air Quality
Conditions & Trends
(nps.gov)

Partners: NPS

Databases

- Schema design
- Data import & update
- Administration
- Query design



Relational database:

- 800,000,000 records
- 62 air quality networks
- 63 water quality networks
- 24 modeling and satellite datasets

Partners: NPS, USFS

File server:

- ~107 Terabytes of online data
- ~100 Terabytes of offline data
- ~85 Terabytes downloaded/transferred
- 7 complete modeling platforms

Hardware

Software

Intermountain West
Data Warehouse

Partners: NPS, BLM, USFS, EPA, CO,
WY, UT, NM

Southeastern
Modeling, Analysis, and
Planning
(SEMAP)

Partners: AL, FL, GA, KY, MS, NC, SC,
TN

NPS Air Quality
Condition
(nps.gov)

Partners: N

Websites:

- FED
- SEMAP
- IWDW
- NPSCAT
- TSS
- IMPROVE

Websites

- Website design
- Web hosting
- Tool development
- Web services



al Land Manager
ental Database

Partners: NPS, USFS

Hardware

Software

Intermountain West
Data Warehouse

Partners: NPS, BLM, USFS, EPA, CO,
WY, UT, NM

Southeastern
Modeling, Analysis, and
Planning
(SEMAP)

Partners: AL, FL, GA, KY, MS, NC, SC,
TN

NPS Air Quality
Conditions & Trends Tools
(nps.gov)

Partners: NPS

Federal Land Manager
Environmental Database

Partners: NPS, USFS

Databases

Websites



Hardware



Software

- Data access libraries
- Data manipulation
- Visualization tools
- Data analysis

Intermountain West
Data Warehouse

Partners: NPS, BLM, USFS, EPA, CO,
WY, UT, NM

Southeastern
Analysis, and
Planning
(SEMAP)

AL, FL, GA, KY, MS, NC, SC,
TN

NPS Air Quality
Conditions & Trends Tools
(nps.gov)

Partners: NPS

Federal Land Manager
Environmental Database

Partners: NPS, USFS

Databases

Websites



Hardware



- Server configuration
- Server maintenance
- Networking
- Troubleshooting & repair

Intermountain
Data Warehouse

Partners: NPS, BLM, U.S. Forest Service,
WY, UT, NM

Software

Southeastern
Modeling, Analysis, and
Planning
(SEMAP)

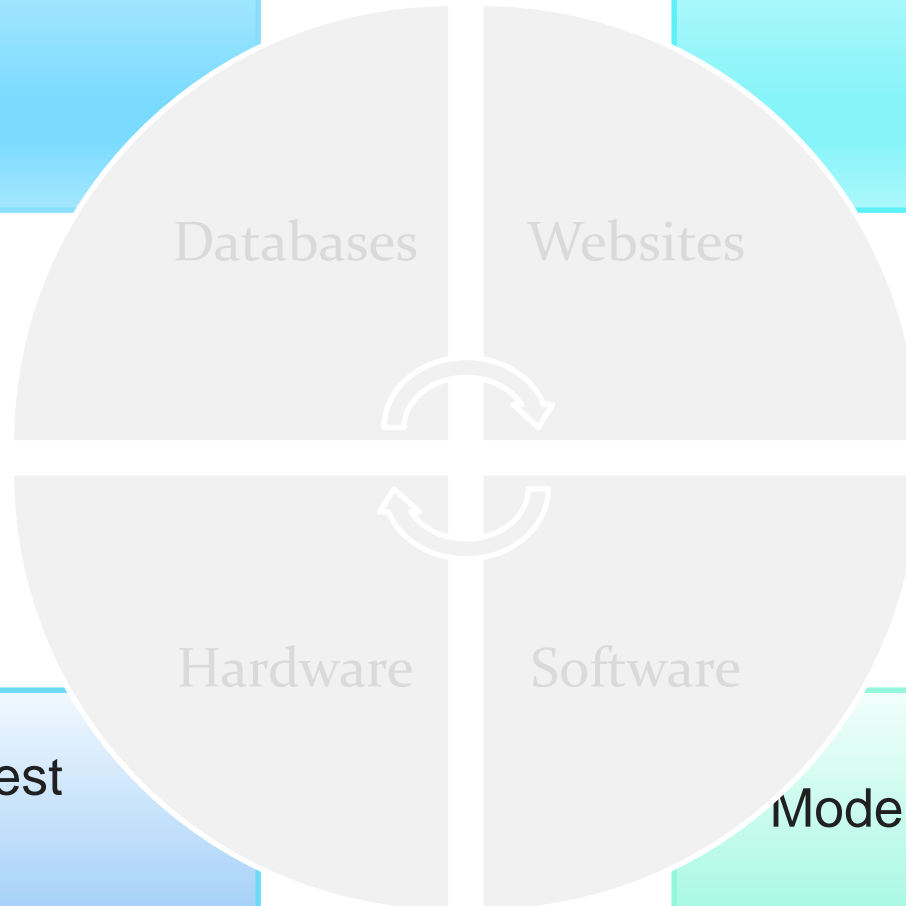
Partners: AL, FL, GA, KY, MS, NC, SC,
TN

NPS Air Quality
Conditions & Trends Tools
(nps.gov)

Partners: NPS

Federal Land Manager
Environmental Database
([FED](#))

Partners: NPS, USFS



Intermountain West
Data Warehouse
([IWDW](#))

Partners: NPS, BLM, USFS, EPA,
CO, WY, UT, NM

Southeastern
Modeling, Analysis, and
Planning
([SEMAP](#))

Partners: EPA, AL, FL, GA, KY, MS,
NC, SC, TN

NPS Air Quality
Conditions &
(nps.gov)

Partners: NPS

Intermountain
Data Warehouse

Partners: NPS, BL,
WY, UT, NM

Federal Land Manager Environmental Database

Sign In | Register

AQRV Summaries Data Exploration Data Access Resources

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 Options

Select one or more Sites 2 of 213 selected

Site	Code	ST	LAT	LOD	ELEV	START	END
Acadia NP	ACAD1	ME	44.3773	-68.281	157	1984	2004
Addison Pinnacle	ADPT1	WV	42.4912	-77.2059	512	2001	2010
Agua Tibia	AGTI1	CA	33.4636	-116.9706	507	2000	2014
Andler	ANBL1	NE	47.8993	-107.8628	77	2003	2004
Arches NP	ARCH1	UT	38.7833	-109.8323	1722	1988	1992
Arendtsville	ARENL	PA	39.9232	-77.3079	267	2001	2010
Badlands NP	BADL1	SD	43.7435	-101.9412	794	1988	2014
Baltimore	BALTI	MD	39.2847	-76.7093	78	2004	2006
Bandelier NM	BAND1	NH	39.7797	-106.2664	1988	1988	2014
Barrier Lake	BALAL	AB	51.029	-119.0336	1391	2011	2014
Big Bend NP	BIBEN1	TX	29.3827	-109.378	1606	1988	2014
Bliss SP (TOPA)	BLISS1	CA	38.9761	-120.1025	2130	1990	2014
Blue Mounds	BLMO1	WI	43.7168	-84.1913	473	2002	2014
Bondville	BOVD1	IL	40.052	-88.3733	263	2001	2014
Bosque del Apache	BOASP1	NH	33.8895	-106.852	1389	2000	2014
Boulder Lake	BOUL1	WY	42.88	-109.64	2266	2009	2014
Boundary Waters Canoe Area	BOUAL	MI	47.9466	-91.4955	526	1991	2014
Bratton	BRATT1	LA	29.1183	-93.2066	11	2000	2004

Show Report Log Immediate Mode Submit...

Selections Report #1

Acadia NP (ACAD1) 1/1/2014 - 12/31/2014

Big Bend NP (BIBEN1) 1/1/2014 - 12/31/2014

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

d

Federal Land Manager
Environmental Database
(FED)

Partners: NPS, USFS

osites

ware

Southeastern
Modeling, Analysis, and
Planning
(SEMAP)

Partners: AL, FL, GA, KY, MS, NC, SC,
TN

NPS
Cond
(nps.gov)
Partners

SESARM SEMAP
Southeastern States Air Resource Managers | Southeastern Modeling, Analysis, and Planning

Sign In | Register

SEMARP TWS Home | Page status | Printer friendly view | Contact us

The SEMAP Technical Website

This website serves as the primary source for the emissions and air quality modeling results, source data, and associated documentation for the Southeastern Modeling, Analysis, and Planning (SEMAP) Project of the Southeastern States Air Resource Managers, Inc. (SESARM). SESARM is a nonprofit corporation formed respectively by the local and state air pollution control agencies located in the southeastern states of Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee.

- Query Wizard**: Query raw data with an interactive tool for specifying filters.
- Site Browser**: View monitoring site locations and metadata on a map.
- File Explorer**: Find and download source data files from the file system.
- Emissions Browser**: Explore charts and tables of modeled emissions data.
- Model-to-Obs Tool**: View and compare modeled data with monitoring data.
- Image Browser**: Browse charts, graphs, and maps of modeled data.

Choose a network or dataset:
IMPROVE Aerosol

Map | Satellite | URI

Map data ©2016 Google, INEGI | 200 km | Terms of Use
Reset view | Latitude:32.1965135, Longitude:-82.7616684, Zoom Level: 5

Copyright © 2013 SEMAP Technical Website (STWS) | Terms & Conditions | Privacy Policy | Contact Us

Federal Land Manager Environmental Database

Partners: NPS, USFS

Intern
Data Warehouse

Partners: NPS, BLM, USFS, EPA, CO,
WY, UT, NM

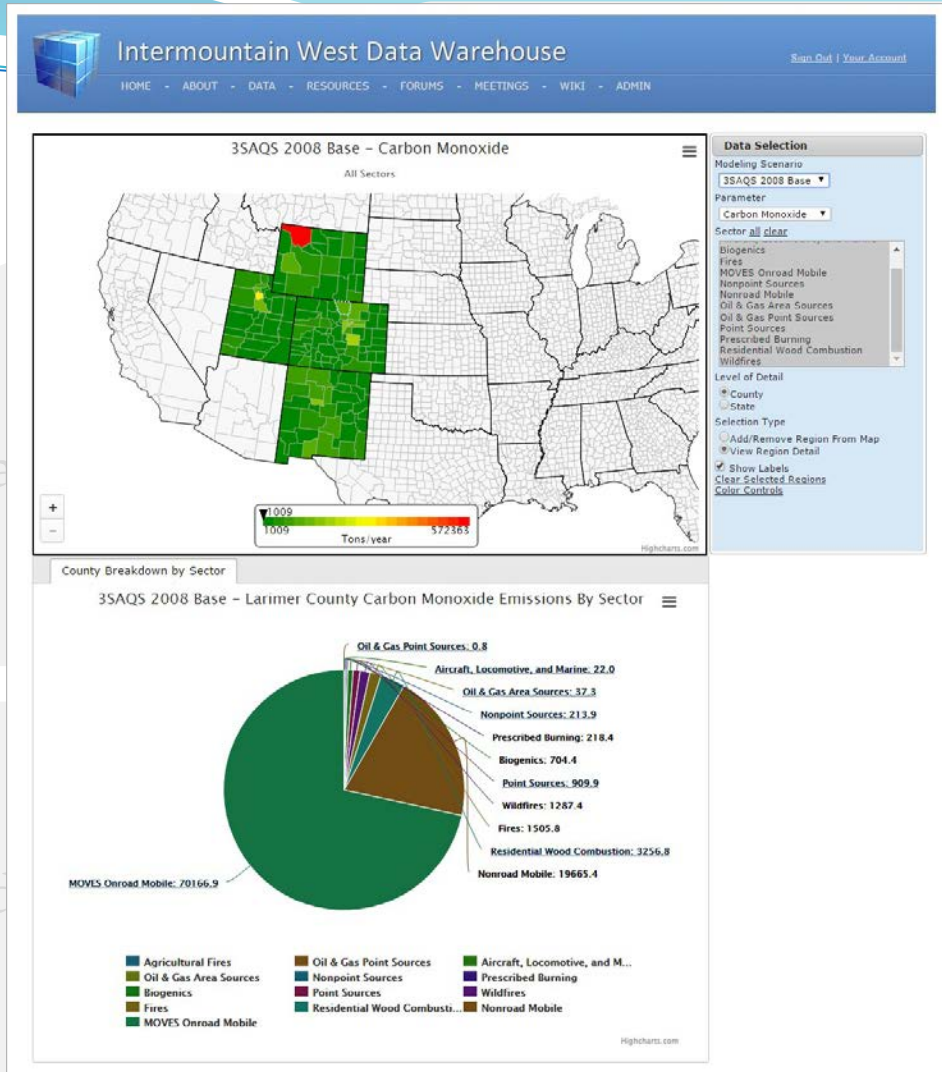
<http://views.cira.colostate.edu/semap>

Southeastern Modeling, Analysis, and Planning (**SEMAP**)

Partners: EPA, AL, FL, GA, KY, MS,
NC, SC, TN

NPS Air Quality Conditions & Trends Tools (nps.gov)

Partners: NPS



Intermountain West Data Warehouse (IWDW)

Partners: NPS, BLM, USFS, EPA,
CO, WY, UT, NM

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

Partners: AL, FL, GA, KY, MS, NC, SC,
TN

NPS Air Quality Conditions & Trends Tools (nps.gov)

Partners: NPS/ARD

Intermountain West Data Warehouse

Partners: NPS, BLM, USFS, EPA, CO, WY, UT, NM

National Park Service
National Park Service
U.S. Department of the Interior

[Find a Park](#) [Discover History](#) [Explore Nature](#) [Working with Communities](#) [Get Involved](#) [Teachers](#) [Kids](#) [About Us](#)

AIR RESOURCES

- Air Quality in Parks
- Basics
- Data Products
 - Air Quality by Park
 - National Report
 - Air ASAs
 - Live Data
- Laws & Policy
- Monitoring & Data
- Permit Applications
- Photos & Multimedia
- Planning
- Publications
- Studies
- Students & Teachers
- Web Cameras
- Who We Are

Air Quality Conditions & Trends

by Park

Find and visualize park-specific air quality data, conditions, and trends based on NPS analysis methods.

Find products for: End year:

About:

Overall Air Quality
 Ozone
 Visibility
 Nitrogen Deposition
 Sulfur Deposition

Acadia NP - Visibility

Visibility is a measure of how far and how well we can see color and detail in distant views ([learn more](#)). Fine particles and gaseous air pollution form haze in the atmosphere that reduces visibility. The Clean Air Act visibility goal requires improvement on the 20% haziest days and no degradation on the 20% clearest days. Look at the tabs below to learn how visibility has changed over time, what is in the air on the clearest and haziest days, and the status of visibility at the park.

10-Year Trends
Long Term Trends
Clearest Days Composition
Haziest Days Composition
Summary Table

Haze on the Clearest Days

Clearest Days by Year

Acadia NP

Note: Clearest days are the 20% of sampled days where visibility is most clear.

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

IMPROVE Monitor ID: ACAD1, ME

+ Show chart data Chart data in Microsoft Excel

Components of Haze on Clearest Days

Acadia NP

Note: Clearest days are the 20% of sampled days where visibility is most clear.

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

**Natural visibility conditions are those estimated to exist in a given area in the absence of human-caused visibility impairment.

IMPROVE Monitor ID: ACAD1, ME

+ Show chart data Chart data in Microsoft Excel

nps.gov
EXPERIENCE YOUR AMERICA™

[U.S. Department of the Interior](#)
 [FOIA](#)
 [Privacy Policy](#)
 [Disclaimer and Ownership](#)
 [USA.Gov](#)
 [NPS Home](#)
 [Accessibility](#)

and Managerial Database
Partners: NPS, USFS

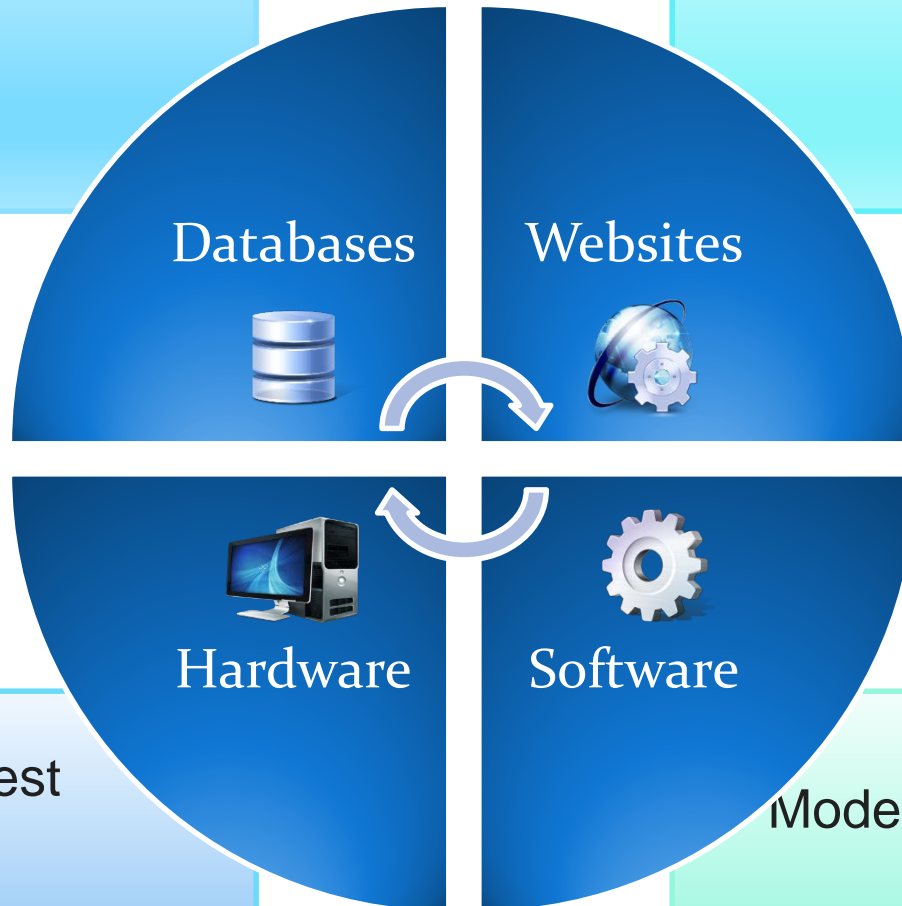
southeastern analysis, and Planning (SEMAP)
KY, MS, NC, SC,

NPS Air Quality
Conditions & Trends Tools
(nps.gov)

Partners: NPS/ARD

Federal Land Manager
Environmental Database
([FED](#))

Partners: NPS, USFS



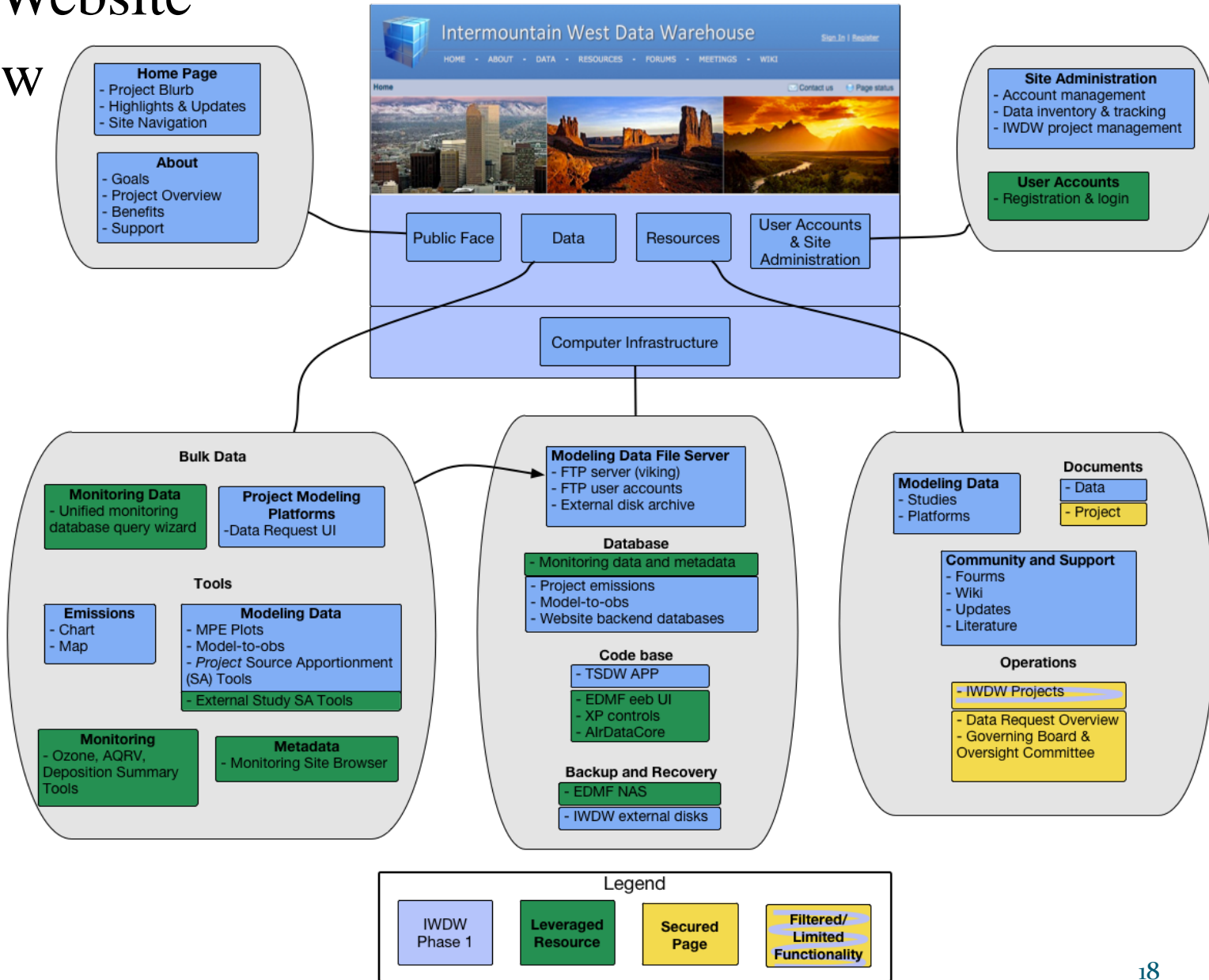
Intermountain West
Data Warehouse
([IWDW](#))

Partners: NPS, BLM, USFS, EPA,
CO, WY, UT, NM

Southeastern
Modeling, Analysis, and
Planning
([SEMAP](#))

Partners: EPA, AL, FL, GA, KY, MS,
NC, SC, TN

IWDW Website Overview



IWDW Website Home Page



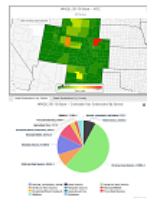
The [IWDW](#) has been fully supported by multiple federal and state agencies, with assistance from [WESTAR-WRAP](#), since its creation through the [3SAQS Pilot Study](#). The IWDW provides air quality data, photochemical grid modeling products, and analysis tools to support various air quality applications. Available datasets include emissions inventories, meteorological data, air quality modeling platforms, and monitoring data.

IWDW Highlights

ABOUT PAGES

- IWDW-WAQS Background & Overview
- Study Cooperating Agencies
- Benefits and cost savings to data users

EMISSIONS REVIEW TOOLS



- Dynamic map display of WAQS emissions inventory data
- County level and source category drill down
- Customizable graphics

MODEL-TO-OBS TOOL

WAQS Updates

2011b MODELING PLATFORM

- 2011 Base Case and 2025 Future Case emissions and model I/O
- Model-ready CAMx and CMAQ input
- Met

MPE CRITERIA DOCUMENTS

- 2011b Model Performance Evaluation and Application
- 2011b Release Memo and model application recommendations from WAQS Cooperators
- 2011b Winter Meteorology MPE
- 2014 WRF Meteorology MPE

ABOUT

- Goals
- Overview
- Benefits
- Support

DATA

- Get Modeling Data
- Get Monitoring Data

- Emissions
- Air Quality Modeling
- Source Apportionment
- Monitoring Data

RESOURCES ¹⁹

IWDW Website

About Page

About

Multiple federal and state agencies identified the need to more efficiently and expeditiously collect air quality data and conduct air quality modeling to assess the expanding number of oil and gas development on state or other lands. The participating agencies entered into an Memorandum of Understanding in 2011 to initiate a project to address this need. The initial name of the project was known as the Three State Air Quality Study (3SAQS), and is currently referred to as Intermountain West Data Warehouse - Western Air Quality Study (IWDW-WAQS).

The federal and state agency offices that are party to the MOUs, hereinafter referred to as the "Cooperators", include:

- U.S. Environmental Protection Agency Region 8 Office (EPA);
- Bureau of Land Management State Offices, Colorado, Wyoming and Utah and New Mexico (BLM);
- U.S. Forest Service, Rocky Mountain Region, Intermountain Region, and Southwestern Region (FS);
- National Park Service Intermountain Region (NPS);
- Fish and Wildlife Service, Mountain-Prairie Region 6 (FWS);
- Colorado Department of Public Health and Environment (CDPHE);
- Wyoming Department of Environmental Quality (WDEQ);
- Utah Department of Environmental Quality (UDEQ); and
- New Mexico Environment Department (NMED).

The Western Air Quality Study, with assistance from WESTAR-WRAP, develops state-of-the-art air quality data and photochemical grid modeling products to support studies assessing the air quality in the intermountain west region, including:

- National Environmental Protection Act (NEPA) modeling studies;
- State Implementation Plan (SIP) modeling for ozone, particulate matter, and haze planning; and
- Research studies that require comprehensive and up-to-date emissions inventories and air quality modeling platforms.

Cooperating Agencies

The Cooperators of the Study also develop and operate the Intermountain West Data Warehouse that contains documentation on the Study's organization and air quality products, provides a portal to access all the air quality monitoring and model data, and offers a suite of visualization tools to explore model results and ambient monitoring data.



ABOUT

- Goals
- Overview
- Benefits
- Support

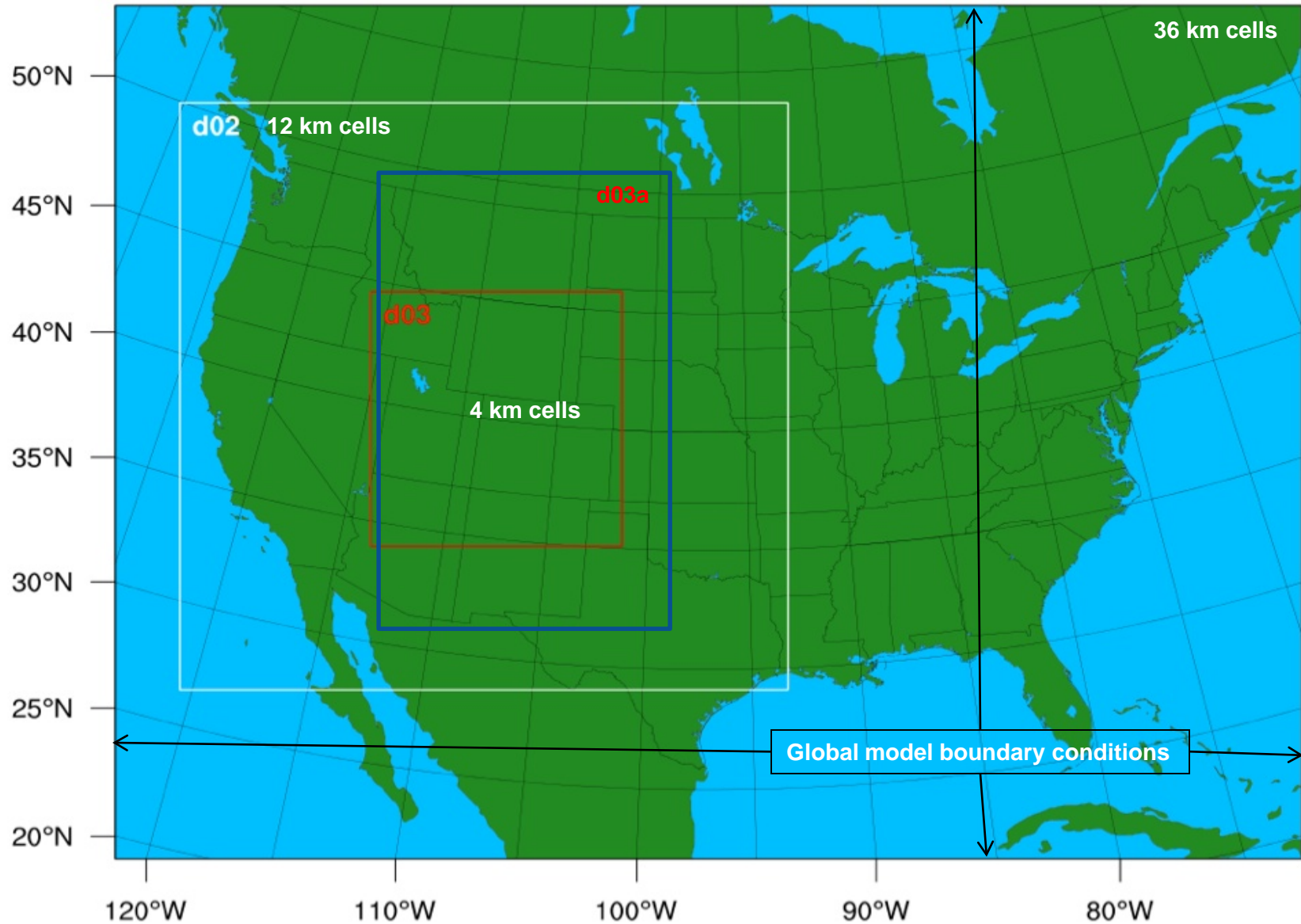
DATA

- Get Modeling Data
- Get Monitoring Data
- Emissions
- Air Quality Modeling
- Source Apportionment
- Monitoring Data

RESOURCES

- Meetings
- Documents
- How-To
- Modeling Studies
- Projects

IWDW-WAQS nested 36/12/4 km WRF/CAMx and CMAQ domains



WAQS Monitoring Network Assessment

Outline

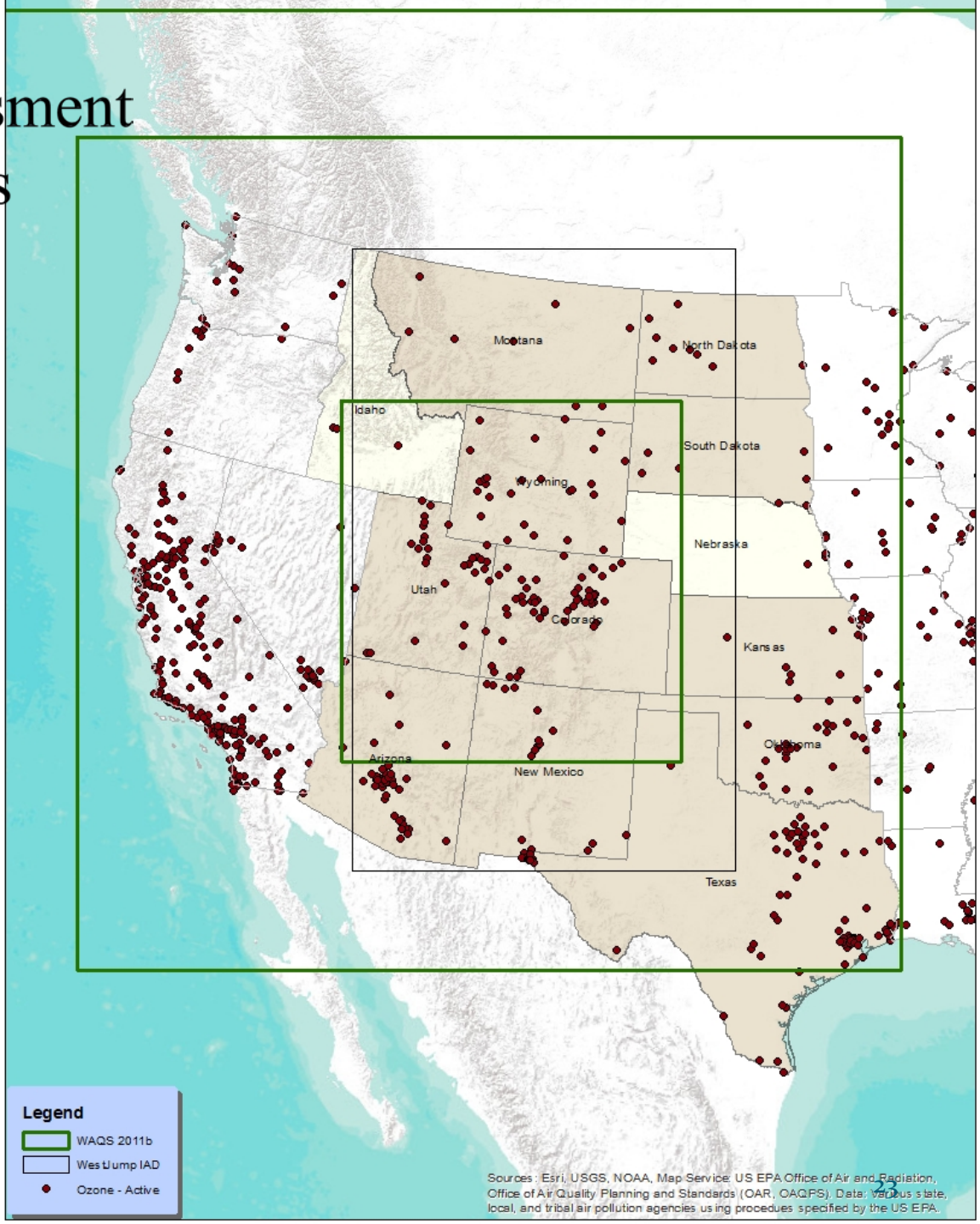
- Objectives
 - Consider AQ monitoring and modeling needs of Study Cooperators
 - AQ regulations to consider (NEPA studies & Regional Haze and Ozone SIP planning)
- Tasks
- Monitoring Sites
 - Status of current network (solicit input from Cooperators)
 - Possible WAQS expansion (outreach to additional states)
- Analysis
 - Spatial analysis
 - NAAQS Design Values
 - Emissions & AQ modeling
- Cost Analysis
- Recommendations
- Timeline
- Background
- Working Group Action Items

WAQS Network Assessment

Ozone Monitoring Sites

- Modeling domain progression
- AQS sites included in respective 4km and 12 km domains

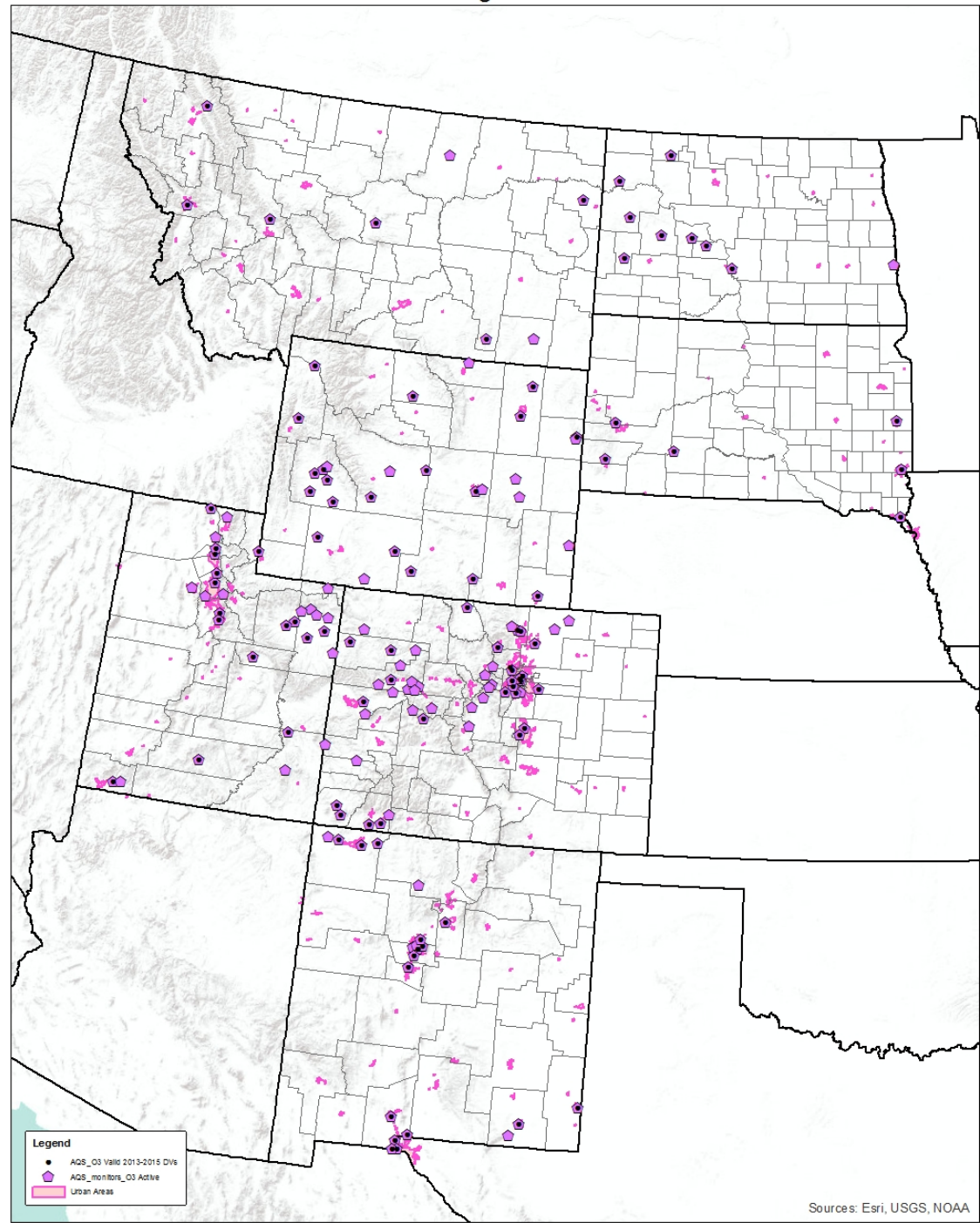
<u>State</u>	<u>AQS O3 monitoring sites</u>
Texas	76
Arizona	45
Colorado	33
Wyoming	33
Utah	31
Oklahoma	28
New Mexico	26
Kansas	11
North Dakota	9
Montana	8
Nebraska	6
South Dakota	6
Idaho	3



Sources: Esri, USGS, NOAA, Map Service; US EPA Office of Air and Radiation, Office of Air Quality Planning and Standards (OAR, OAQPS). Data: various state, local, and tribal air pollution agencies using procedures specified by the US EPA.

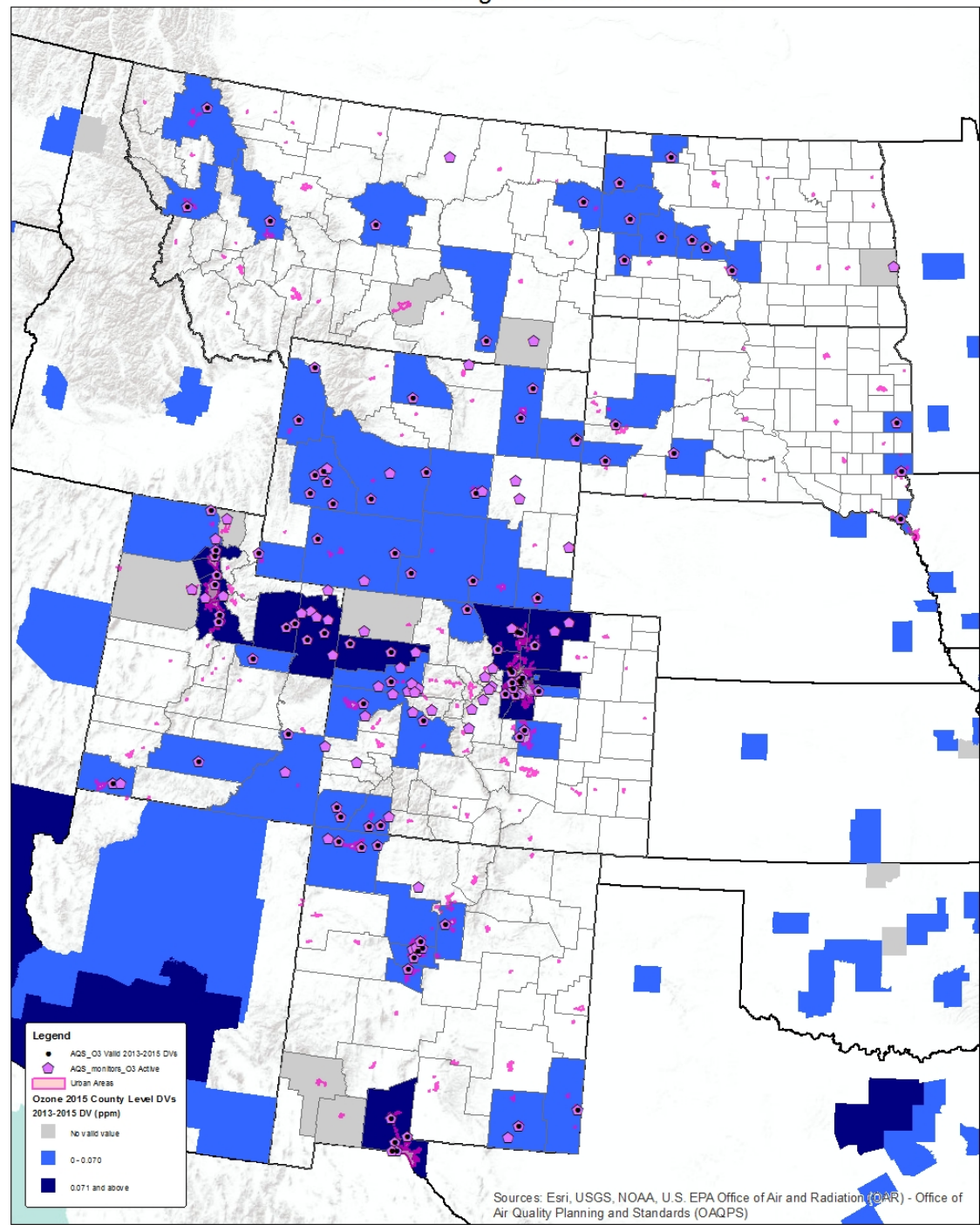
Map Features

- WAQS 7-state region
- Urban Areas
- Active ozone monitors
- Sites reporting valid 2013-15 ozone DVs



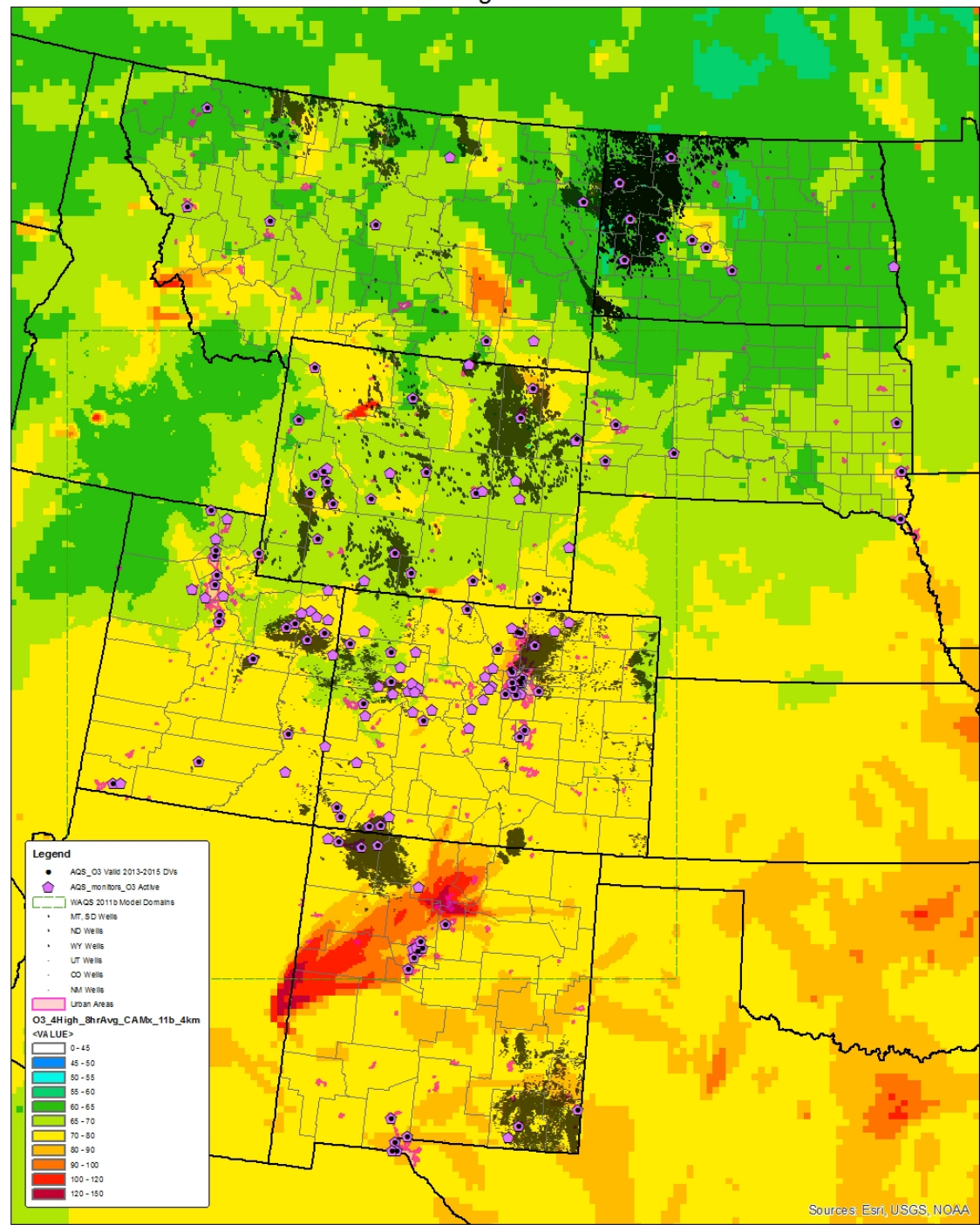
Map Features

- WAQS 7-state region
- Urban Areas
- Active ozone monitors
- Sites reporting valid 2013-15 ozone DVs
- County level 2013-15 ozone DVs



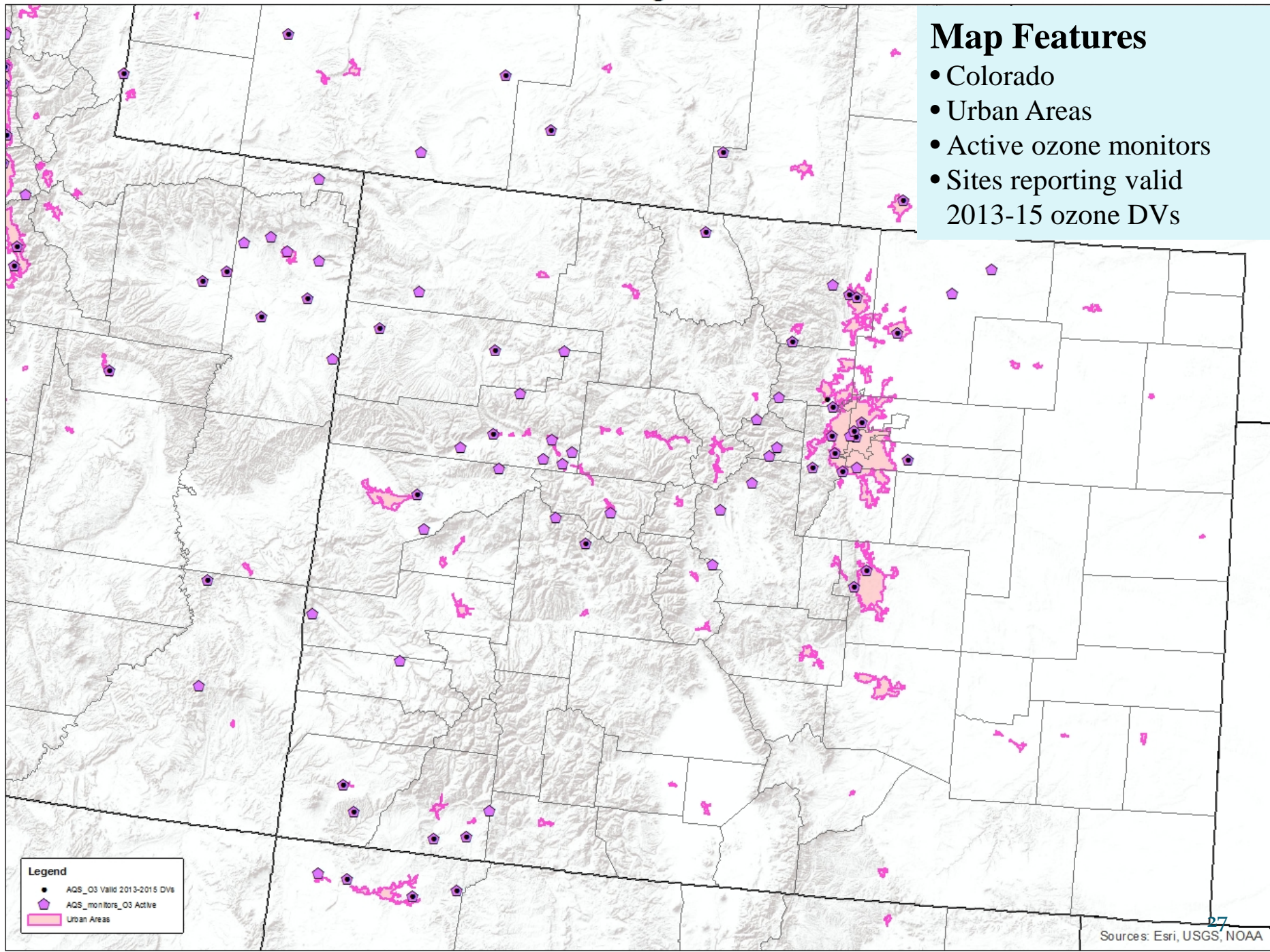
Map Features

- WAQS 7-state region
- Urban Areas
- Active ozone monitors
- Sites reporting valid 2013-15 ozone DVs
- WAQS 2011b 4th highest 8-hr ozone
- Active O&G wells



Map Features

- Colorado
- Urban Areas
- Active ozone monitors
- Sites reporting valid 2013-15 ozone DVs

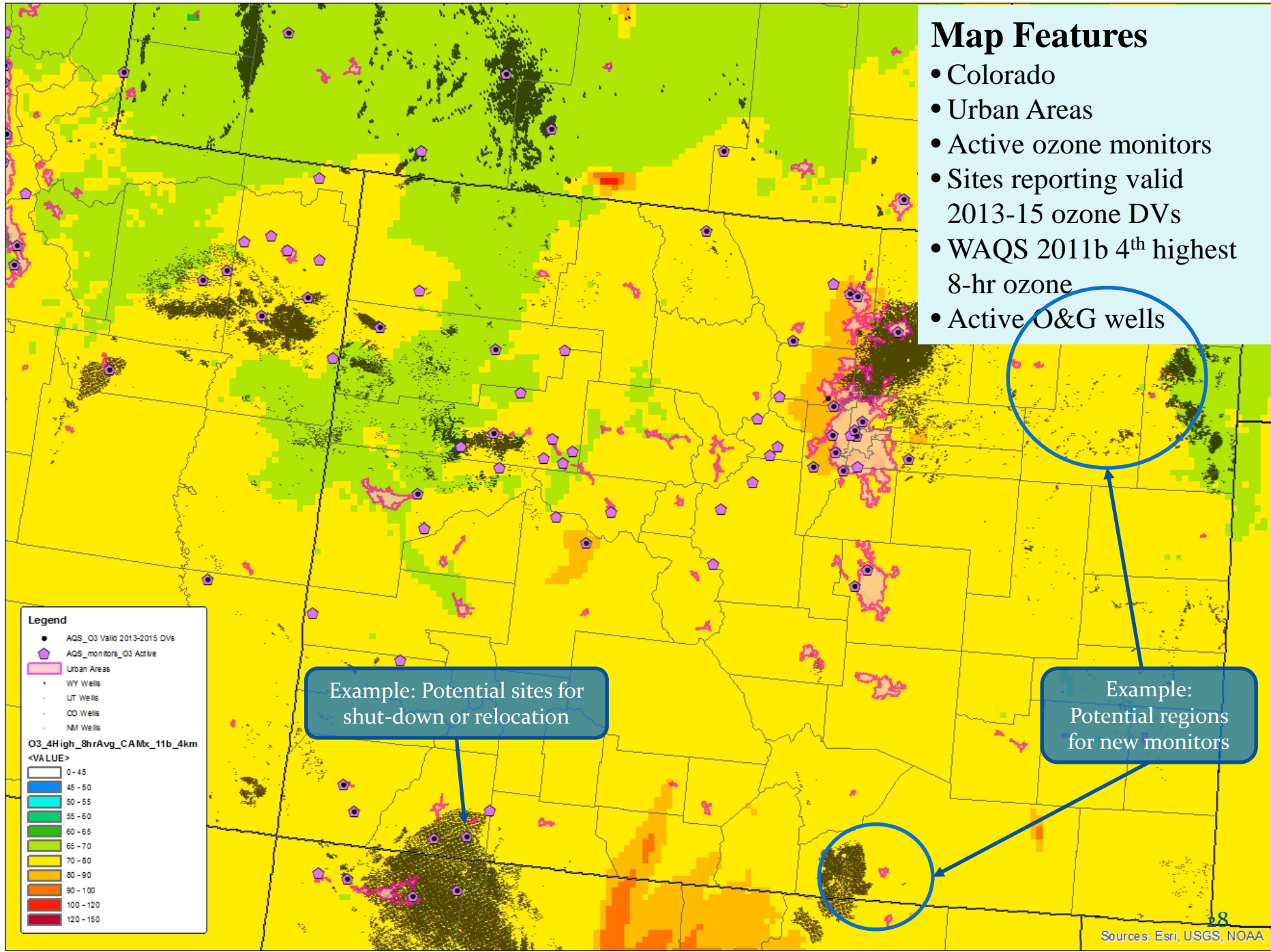


Legend

- AQS_O3 Valid 2013-2015 DVs
- AQS_monitors_O3 Active
- Urban Areas

Map Features

- Colorado
- Urban Areas
- Active ozone monitors
- Sites reporting valid 2013-15 ozone DVs
- WAQS 2011b 4th highest 8-hr ozone
- Active O&G wells



Example: Potential sites for shut-down or relocation

Example: Potential regions for new monitors

Legend

- AQS_O3 Valid 2013-2015 DVs
- ◡ AQS_monitors_O3 Active
- Urban Areas
- WY Wells
- UT Wells
- CO Wells
- NM Wells

O3_4High_8hrAvg_CAMx_11b_4km
<VA LUE>

0 - 45
45 - 50
50 - 55
55 - 60
60 - 65
65 - 70
70 - 80
80 - 90
90 - 100
100 - 120
120 - 150

IWDW Website

Emissions Review Tool

Scenario: Parameters: Source Category:

3SAQS - 3SAQS 2008b Base
 3SAQS - 3SAQS 2011a Base
 3SAQS - 3SAQS 2018 11
 3SAQS - WAQS 2011b (2025)
 3SAQS - WAQS 2011b Base

Methane
 NH3
 NOX
 PM 2.5
 PMC

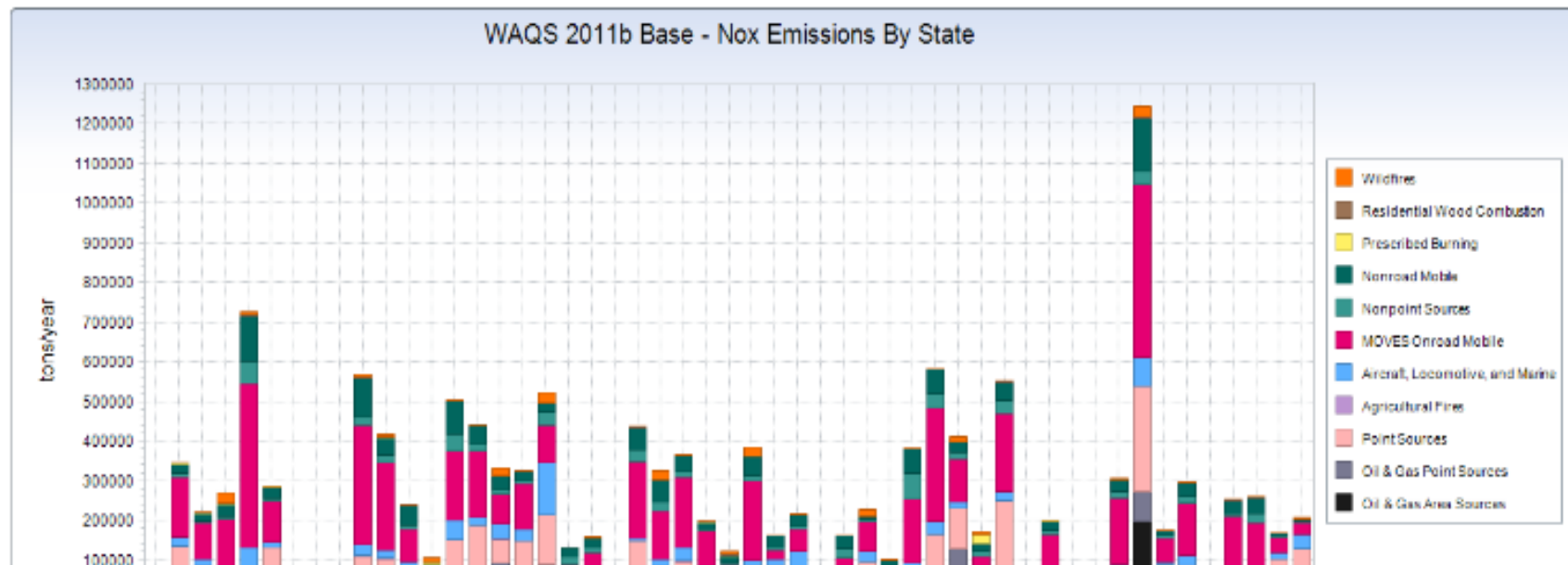
Agricultural Fires
 Aircraft, Locomotive, and Marine
 MOVES Onroad Mobile
 Nonpoint Sources
 Nonroad Mobile

State: County: SCC:

AK - Alaska
 AL - Alabama
 AR - Arkansas
 AZ - Arizona
 CA - California

< Select a single State in order to see Counties... >
 < Select a single County in order to see SCCs... >

chart options



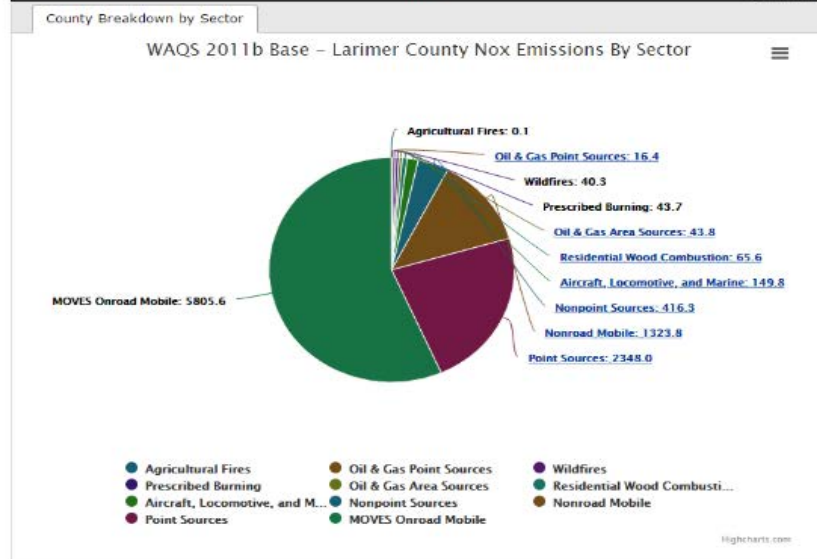
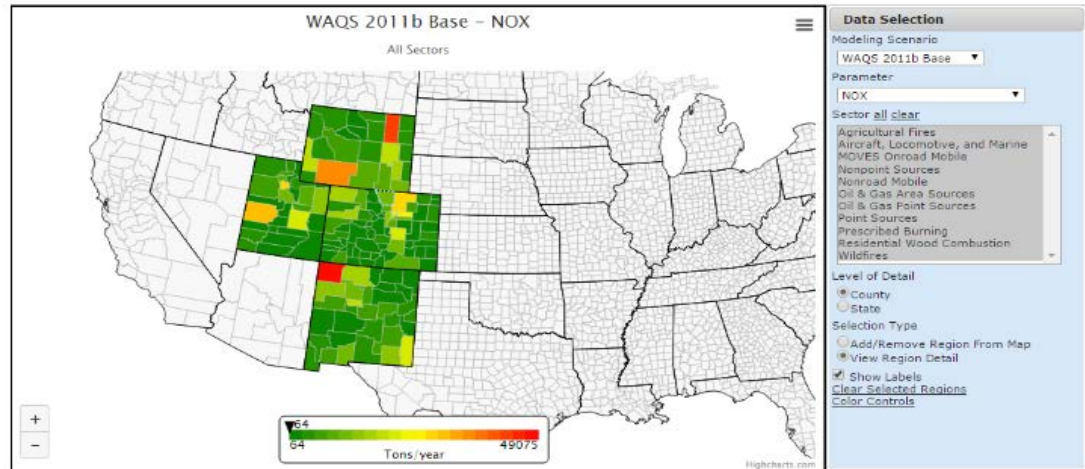
IWDW Website

Emissions Review Map

Intermountain West Data Warehouse

HOME - ABOUT - DATA - RESOURCES - FORUMS - MEETINGS - WIKI - ADMIN

[Sign Out](#) | [Your Account](#)



Greater San Juan Basin 2014 Oil and Gas data

Oil and gas activity by county (counties without oil and gas production are not shown).

County, State	Active Well Count			Liquid Hydrocarbon		Gas Production (MMCF/yr)			Spuds
	Gas	Oil	CBM	Condensate	Oil	Natural Gas	Associated Gas	CBM	
Archuleta, CO	3	6	93	0	2	609	0	15,011	1
La Plata, CO	858	80	2,154	7	23	22,962	40	311,200	19
Colorado Subtotals	861	86	2,247	7	25	23,571	40	326,211	20
McKinley, NM	2	112	8	17	51	0	0	181	0
Rio Arriba, NM	6,746	729	1,057	638	871	190,228	8,926	84,916	24
Sandoval, NM	149	203	33	42	1,849	565	7,889	1,162	26
San Juan, NM	8,289	595	3,753	950	1,618	212,426	6,978	197,307	52
New Mexico Subtotals	15,186	1,639	4,851	1,647	4,389	403,219	23,793	283,566	102
Basin-wide Totals	16,047	1,725	7,098	1,653	4,413	426,789	23,833	609,777	122

Greater San Juan Basin percent of 2014 oil and gas activity by mineral designation.

Mineral Designation	Active Well Count			Liquid Hydrocarbon		Gas Production			Spuds
	Gas	Oil	CBM	Oil	Condensate	Natural Gas	Associated Gas	CBM	
Private/State	18%	19%	34%	22%	14%	19%	18%	45%	25
Tribal	15%	30%	13%	12%	12%	12%	16%	19%	14
Federal	67%	51%	54%	66%	74%	69%	66%	36%	61

Greater San Juan Basin 2014 Oil and Gas Emission Inventory Inputs (1 of 2)

- **Final Report completed Nov. 2016**
- **Project website (<https://www.wrapair2.org/SanJuanPermian.aspx>)**
- Next step is to prepare 2014 and projection year inventories
- Beyond inputs collected, recommendations to improve inventories:
 - EPA could make all underlying data in GHGRP Subpart W reporting available so that more source category inputs could be sourced from GHGRP Subpart W data;
 - Improve accuracy of the inputs (produced gas compositions, tank flashing gas compositions, and equipment profiles and operations) through additional operator participation in the wellsite survey efforts.
 - Need input factors for potential fugitive emissions from oil and gas pipelines from well heads to the main compressor stations.

Greater San Juan Basin 2014 Oil and Gas Emission Inventory Inputs (2 of 2)

- Recommendations beyond current inputs collected, continued:
 - Some compressor stations are missing from the current midstream permit data emissions because either these facilities do not meet state or federal reporting criteria or emissions estimates were not readily available from the state or federal agency. Including those sources through would enhance inventory completeness.
 - Data for certain wellsite source categories (amine units, truck loading at gas and NGL processing plants, and water disposal pits) were not collected but including data for these categories would enhance inventory completeness.
- **Preparation of 2014 and projection year inventories**
 - Inventory inputs will be used to prepare a comprehensive by county and SCC emission inventory for the Greater San Juan and Permian basins for a base year of 2014 and forecasted to a future year.
 - The inventories will be developed using the inventory input data collected
 - Work to be completed in Spring 2017 timeframe

Typical Sources affecting Visibility

	Source	Controllability	Trend	Variability
Anthropogenic	US Anthropogenic	Some emissions are controllable	Downward as sources are controlled	Relatively stable
		Some emissions will remain after all reasonable controls implemented	Could rise because of population increases	Relatively stable
	International Anthropogenic	Not controllable by state or federal regulations	Likely increasing due to increased development worldwide and rising population	Relatively stable
Natural	Fire, Dust, Sea Salt	Natural, not controllable	Increases due to <u>climate change</u>	Highly variable
	Volcanic	Natural, not controllable	Unpredictable	Highly variable
	Other Natural Sources	Not controllable	Potentially affected by climate change, e.g., changes in temperature	Relatively stable

Table Note: Shaded areas represent emissions that states cannot control.

Preliminary Draft WESTAR-WRAP Work Plan for Regional Haze SIP Revision for 2028 Reasonable Progress Goals

*All dates for individual tasks would be updated, shifted three years ahead

2014 Inventory – Base Case				2016			2017			2018			2019			2020			2021																							
2011 Base Case				2013			2014			2015			2016			2017			2018																							
Task	Days	Start	Finish	J	A	S	O	N	D	J	F	M	A	M	J	A	S	O	N	D	J	F	M	A	M	J	A	S	O	N	D	J	F	M	A	M	J	A	S	O	N	D
Template/Outline	360	12/13	12/14																																							
Analysis	1354	7/13	3/17																																							
Meteorological Modelling - 2011	270	1/14	9/14																																							
Identify sectors for additional studies	89	1/14	3/14																																							
Additional sector studies	360	3/14	3/15																																							
Emissions Inventory - 2011	360	7/13	6/15																																							
Emissions Modeling - 2011	270	3/15	12/15																																							
AQ Modeling - 2011	360	9/15	9/16																																							
ID existing controls implemented by 2018	180	1/14	6/14																																							
Emissions Inventory - 2018	270	1/14	6/15																																							
Emissions Modeling - 2018	270	3/15	12/18																																							
AQ Modeling - 2018	450	9/15	12/16																																							
ID existing controls implemented by 2028	360	1/14	12/14																																							
Identify "What If" Control Strategies - 2028	450	1/14	3/15																																							
Emissions Inventory - 2028	270	1/14	6/15																																							
Emissions Modeling - 2028	360	3/15	3/16																																							
AQ Modeling - 2028	450	9/15	12/16																																							
Identify how to do 4-Factor Analysis	360	1/14	12/14																																							
4-Factor Analysis	720	12/14	12/16																																							
Finalize State and Regional Control Strategies	270	6/16	3/17																																							
Establish 2028 Reasonable Progress Goals	1200	1/14	4/17																																							
Decide if going to reconsider natural conditions	89	1/14	3/14																																							
Reconsider natural conditions	450	3/14	6/15																																							
Identify emission reductions to 2028	100	9/16	3/17																																							
Evaluate glide slope & set 2028 goal	120	12/16	4/17																																							
Evaluate Previous Period's Progress	1170	1/14	3/17																																							
Last year of monitoring data collected	360	1/14	12/14																																							
Data analyzed	540	12/14	6/16																																							
Haze analysis	180	6/16	12/16																																							
Determine if 2018 goal met	90	12/16	3/17																																							
State Adoption Process (calculates backwards)	450	5/17	7/18																																							
Draft SIP	60	5/17	7/17																																							
FLM comment period	60	7/17	9/17																																							
Revised based on comments, respond to comments	60	9/17	11/17																																							
Public comment period	30	11/17	12/17																																							
Revise based on comments, respond to comments	30	12/17	1/18																																							
State approval process (CO needs to start 1/1/18)	210	1/18	7/18																																							
Submit to EPA	1	7/18	7/18																																							

Regulatory required time periods
Flexible dates

WESTAR must finish regional work by Spring 2020 if SIPS due Summer of 2021

Sources of O₃ in the Western U.S.

O ₃ Source	Meteorological Characteristics	Chemical characteristics	CAA Controllable
Local photochemical buildup	Stagnation, high temperatures.	CO/NO _x /VOCs/PM consistent with local sources	Y
Regional transport (domestic sources)	Regional transport from major source regions (e.g., California) - <u>currently not well characterized</u>	CO/NO _y /VOCs consistent with upwind sources + chemistry	Y
Upper trop/Lower strat intrusions (UTLS)	Post-cold front Broad spatial distribution (high O ₃ in non-urban areas)	Very dry air.	N
Very long-range transport (VLRT)	Important at higher elevation. Subsidence and mixing into the boundary layer can enhance local concentrations.	Dry. Can be hard to distinguish from UTLS without good chemical data.	N
Wildfire smoke	Warm. Can be stagnant or not. Can be regional or large distant fires.	Chemistry complex & different from typical urban. O ₃ enhancements not always seen. O ₃ -PM often poorly correlated. PM/CO/NO _y always well correlated and ratios very different from typical urban.	N

Reducing uncertainty for air quality planning through analysis

- Regional Haze planning
 - Enable choices of cost-effective controls that improve visibility
 - Assessments of natural and uncontrollable – ever more important
- Ozone background and transport
 - Local vs. regional / less controllable vs. uncontrollable
- Exceptional Events - how important will these be?
 - Resources to analyze
 - EPA decides which to act on
 - Sources causing these events are large and not infrequent
- Western O&G supply chain value proposition
 - Price of commodities
 - Regulatory programs have been increasing
- Fire and O&G impacts for regional haze and ozone
 - Projections of all emissions for future year ozone & regional haze planning

Regional analysis timelines for regional haze and ozone transport

- Regional Haze
 - Final Rule late 2016
 - Final guidance early 2017
 - Regional analyses in 2017
 - 2014 base year
 - 2028 rules on the books
 - Associated air quality modeling
 - 2018 and 2019 analyses
 - Evaluation of reasonable progress controls
 - Associated air quality modeling
 - Plans due July 2021
- Ozone transport and planning
 - 70 ppb standard on Oct. 1, 2015
 - Implementation Guidance proposed Nov. 2016
 - Comments for 60 days on:
 - nonattainment area classification thresholds & deadlines for planning,
 - implementation of emission controls,
 - attainment
 - Transport “good neighbor” SIPs due 2018 for 2023 projection year
 - Marginal/Moderate nonattainment plans in 2023 then reduce both local and transport emissions