Western Air Quality Data Warehouse and WRAP Regional Technical Center

December 18, 2014

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WESTAR Council

EPA Region 9 Managers Meeting
San Francisco, CA
Topics

- Overview of the WESTAR/WRAP organization
- Key issues and areas of focus
- Looking back: Results from recent projects and studies
- Looking ahead: Building the WRAP Regional Technical Center
Overview of WESTAR/WRAP

www.westar.org  www.wrapair2.org
Overview of WESTAR/WRAP (cont’d)

- **Purpose**
  - Service organization
  - Assist members in achieving their air quality management goals

- **Approach**
  - Training
  - Provide a forum for discussion
  - Inform policy-related discussions
  - (new) Provide technical support (esp. regional)
Overview of WESTAR/WRAP (cont’d)

WRAP = Western Regional Air Partnership

- [www.wrapair2.org](http://www.wrapair2.org)
- Same 15-state region as WESTAR
- Virtual organization, not incorporated
- 60+ member agencies include 15 state air agencies, NPS, FWS, BLM, USFS, EPA, and interested tribes and local air agencies/districts in the WRAP region
- Board has State and Tribal co-chairs, with representatives across states, tribes, federal, and local agencies.
- Formed in 1997 to implement Grand Canyon Visibility Transport Commission recommendations
  - Led Regional Haze planning effort 1997-2009 for the West
  - 75 % of Class I areas in the WRAP region
- 15 states, federal land managers and EPA, tribes, and local air districts
- Regional analyses for Western sources and air quality impacts
Overview of WRAP

• Since 2010, WRAP working as regional technical center to support and coordinate Regional Analysis and Planning

• Develop and facilitate use of western air quality data:
  • Make improvements
  • Ensure consistency and comparability
  • Increase transparency and access
  • Track trends for better, reproducible analyses
  • Interconnected series of regional technical projects
  • Manage emissions and modeling studies
Key Issues and Areas of Focus

• NAAQS Implementation and Maintenance
  • Data for future infrastructure and transport SIPs

• Exceptional Events
  • Develop technical support data and analysis protocols

• Implementation of Regional Haze SIPs
  • Identify and execute technical work needed for 2018 plans

• Needs of sub-regional groups of states
  • Currently oil and gas, fire
  • Similar efforts in past – dust, BART, other topics
WRAP current projects and priorities

- precursors to Ozone, Particulates, and Regional Haze - key western sources
  - Power plants
  - Mobile sources
  - Fire activity and effects
  - Biogenics (natural) emissions
  - Oil and gas exploration and production
- All sources studied in comprehensive regional modeling analysis
  - West-wide Jumpstart Air Quality Modeling Study (WestJumpAQMS)
Power Plant Emissions Trends – Western Interconnect

Data Source: EPA Clean Air Markets Division
The quantity of forest fuels and composition of vegetation in the wildlands of the Western U.S. motivate the land managers to increase the application of prescribed fire to the landscape (from 650,000 acres in 2002 to a projection of up to 3.6 MM acres in 2018).

U.S. Wildfire and Prescribed Fires Acres Burned - 1990 through 2011
Counties with Monitors Violating Primary 8-Hour Ground-Level Ozone Standard (0.075 ppb)

(Based on 2011-2013 Air Quality Data)

http://www.epa.gov/airquality/greenbook/map8hr_2008.html
3-year Average 4th Highest 8-Hour Ozone value by County 2011-2013

AQS Federal Reference Method data from the monitoring site in each County with the highest Ozone values
3-year Average 4th Highest 8-Hour Ozone value for Rural/Class I Sites 2011-2013

AQS Federal Reference Method data from rural or Class I area monitoring sites
Average Annual Count of Days with 8-Hour Ozone Averages >60 ppb for Rural/Class I Monitoring Sites – 2004 through 2013

AQS Federal Reference Method data from rural or Class I area monitoring sites
3-year Average 4th Highest 8-Hour Ozone Design Value for Selected Urban Counties currently in Attainment – 2011 through 2013

AQS Federal Reference Method data from the monitoring site in each County with the highest Ozone values
Looking back: Results from recent Western Regional Studies and Projects
Example Oil & Gas Study: Williston Basin 2011 Baseline Results

NOx Emissions By Source Category

Basin-wide NOx Emissions (tons/year): 29,404

- Compressor engines: 14%
- Drill rigs: 24%
- Casinghead Gas: 12%
- Miscellaneous engines: 16%
- Artificial Lift: 9%
- Fracing: 12%
- Other Categories: 4%
- Heaters: 3%
- Initial completion Flaring: 1%
- Water Tank Flaring: 6%

Source: BLM/WRAP Oil and Gas Inventory project
West-Wide Jumpstart Air Quality Modeling Study

• Regional results provide data and context for state and federal planning
  • Uses most current transport and background studies
  • Meteorological and emissions modeling
    • Regionally consistent, High resolution, Comprehensive
  • Photochemical modeling
    • 2008 base case model performance evaluation with Ozone / PM source apportionment
  • Most up-to-date and complete characterization of Western U.S. air quality available

• Study completed September 2013
  • Emissions and Modeling data foundation of 3-State Data Warehouse
  • All materials at: http://www.wrapair2.org/WestJumpAQMS.aspx
  • Advances goal to provide a regional modeling framework
WestJumpAQMS Area

Modeling Domain

36km: 148 x 112 (-2736, -2088) to (2592, 1944)
12km*: 227 x 230 (-2388, -1236) to (336, 1542)
04km*: 317 x 515 (-1480, -904) to (-212, 1156)

* includes buffer cells

Source: WestJumpAQMS
Ozone Modeled Attainment Test Software – Unmonitored Area Analysis with Design Value (2006-2010) ≥ 76 ppb

Source: WestJumpAQMS

Min(210,3) = 76.00, Max(45,67) = 113.30
Ozone Modeled Attainment Test Software – Unmonitored Area Analysis with Design Value (2006-2010) ≥ 70 ppb

Source: WestJumpAQMS

Min(107,1) = 70.00, Max(45,67) = 113.30
Ozone Modeled Attainment Test Software – Unmonitored Area Analysis with Design Value (2006-2010) ≥ 65 ppb

Source: WestJumpAQMS

Min(177,1) = 65.00, Max(45,67) = 113.30
Ozone Modeled Attainment Test Software – Unmonitored Area Analysis with Design Value (2006-2010) $\geq 60$ ppb

Source: WestJumpAQMS

Min(45,2) = 60.00, Max(45,67) = 113.30
Contributions to Ozone at Rocky Mountain National Park

Contributions to MDA8 Ozone [ppb] at CO_Larimer0007

- MV:Rem 4.6%
- MV:UT 0.2%
- MV:NM 0.0%
- MV:CO 0.0%
- MV:WY 0.4%
- PT:Rem 0.9%
- PT:UT 0.1%
- PT:NM 0.0%
- PT:CO 0.0%
- PT:WY 0.3%
- PT:UT 0.1%
- PT:CO 0.0%
- PT:WY 0.3%
- O&G:Rem 0.0%
- O&G:UT 0.0%
- O&G:NM 0.0%
- O&G:CO 0.0%
- Fires 0.1%
- Can/Mex 1.8%
- NAT 2.7%

Rank (10) 05/01/08; Model = 68.8 ppb; Obs = 69.9 ppb; Bias = -1.6%; BC = 60.4 ppb (87.9%)

Source: WestJumpAQMS
Tracking and Managing Smoke

- Significant impacts to both local and regional air quality
  - Large summer wildfires
  - Prescribed and agricultural burns in spring and fall

- States, locals, and tribes manage both planned burns & wildfire impacts
  - Used daily by western states, tribes, and federal agencies to track planned fire and manage smoke
  - FETS
    - Used by states and OAQPS to evaluate 2008 NEI
    - Fire activity and emissions data used by EPA contractor for 2011 NEI
    - Will be applied in 2014 NEI
Track activity and emissions

Fire Activity Data (acres/day)

Loading

Moisture

Emissions Model

Determine source impact / contribution

distribute emissions

DEASCO₃ & PMDETAIL

Chemical Profiles

loft emissions
Smoke and Emissions Inventory Research

Source: WRAP Fire Tools

Smoke and Populations

Federal Land Manager Database (FED)

Federal Land Manager Environmental Database (FED)

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

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

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

Featured Substance
Ammonium sulfate

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<th>Name</th>
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<tr>
<td>Formula</td>
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Fire and Smoke Model Evaluation

DEASCO3 NOx Fire Emissions
36km Grid Cell: (16,72)

July 9, 2008
max = 24.71 tons

August 11, 2002 6:00:00
Min= 0.0 at (1,21), Max= 32.6 at (14,55)
Temporal Analysis Tools

Model Evaluation

Fire Contributions to AQ Impacts

Inter-annual Observational Analysis

Source: WRAP Fire Tools
2004

6/21 – 9/21
Limited by bounding box

Source: WRAP Fire Tools
2005

6/21 – 9/21

Limited by bounding box

Source: WRAP Fire Tools
2007
6/21 – 9/21
Limited by bounding box

Source: WRAP Fire Tools
2008

6/21 – 9/21
Limited by bounding box

Source: WRAP Fire Tools
2009

6/21 – 9/21
Limited by bounding box

Source: WRAP Fire Tools
6/21 – 9/21
Limited by bounding box

*Obtained additional small wildfire data for this inventory

Source: WRAP Fire Tools
Exceptional Events Support

The following case studies are related to the Exceptional Events Support analysis type. To begin click on one of the case studies to review it, or select Start a New Analysis to begin creating your own study.

The purpose of this analysis tool is to assist with understanding whether fire might have contributed to an ozone exceedance; and assist with knowing what kind of information might be helpful to a state for preparing an Exceptional Event demonstration package(s) for air quality excursions affected by fire and smoke. The effects of wildland fire on ozone are complex, and meeting the exceptional events requirement is difficult for most if not all fire occurrences. This is, in part, because wildland fires occur at the same time of high ozone caused by anthropogenic emissions. Thus, separating the contribution of wildland fire from anthropogenic emissions is challenging: the but-for test. Yet, EPA requires this for their concurrence. Using the combination of observed ozone and CMAX model output, this tool examines selected cases—planned, unplanned, and combinations of the two—fires contribution to ozone impacts.

Exceptional Events Support Overview

A State Exceptional Event demonstration package must provide evidence that:

A. The event affects air quality, is not reasonably controllable or preventable, and is an event caused by human activity that is unlikely to recur at a particular location or a natural event;
B. There is a clear causal relationship between the measurement under consideration and the event that is claimed to have affected the air quality in the area;
C. The event is associated with a measured concentration in excess of normal historical fluctuations, including background; and
D. There would have been no exceedance or violation but for the event.

States are responsible for demonstrating to EPA that unplanned fires or certain planned fires were responsible for an exceedance of the ozone standard at a particular monitoring site or group of sites. In attempting to make this demonstration, a state may request certain information from land managers. This might include: the smoke emissions; particulate monitoring particular to the fire or photographs; the timing of the burn along with how it was distributed through the day in terms of combustion and smoldering; and to what extent air quality management regulations were complied with.

Review a Related Analysis

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<td>Chatfield, CO July 2004-2007</td>
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<td>Chatfield, CO July 2008</td>
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<td>Evans Road Wildfire (Pocosin NWR) / Peat burning</td>
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<td>Fall burning in southern Louisiana, 2008</td>
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<td>Flint Hills</td>
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<td>McNally Wildfire</td>
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<td>Missionary Ridge &amp; Hayman Wildfires</td>
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<tr>
<td>Northern California Wildfires, 2008</td>
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edit list

These are the current analyses associated with Exceptional Events Support. To review an
Regional Haze: Reasonable Progress Reports + July 2018 SIP

- WRAP produced a comprehensive, regionally-consistent technical report – completed Summer 2013
  - Regional, state, and Class I area reports
    http://www.wrapair2.org/reghaze.aspx
  - Monitoring and emissions data analyses as required by Regional Haze Rule
  - Western states will use as a common basis in preparing individual SIP revisions – adding status of state actions to implement controls
  - Progress report SIP revisions are due in the 2013-16 timeframe

- Regional Haze Planning
  - WRAP providing western 2008, 2011, and associated projections (as well as eventually 2014) emissions data
  - Modeling platform leveraged from WestJumpAQMS
  - States will use to evaluate changes in monitored visibility

- Regional technical support for July 2018 SIPs in WRAP Work Plan
3-State Air Quality Study - Objectives

- Combined effort of States of CO, WY, UT, and NPS, BLM, EPA, and USFS
- Facilitate more complete and consistent AQ Analysis for NEPA and other AQ decisions such as SIP planning
- Improve timeliness and collaboration
- Reduce duplication of AQ analysis resulting in lower costs
- Improvements include:
  - Six new monitoring sites
  - More region-specific modeled emissions
  - More current base case and better future case air quality modeling
  - A data warehouse to contain all this improved information and future data for access by agencies and those they approve to use it
The Western Air Quality Data Warehouse provides air quality data and analysis tools to support regulatory, research, and academic applications. Available datasets include emissions inventories, meteorological data, monitoring data, and air quality modeling platforms. Available modeling platforms support consistent photochemical grid modeling for National Environmental Policy Act projects and other modeling studies.

**GET DATA**
Access a wide variety of monitored, modeled, emissions, and met data.

**USER FORUMS**

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**DOCUMENT NEEDS REVIEW!**

3SAQS WRF 2011 Meteorological Model Performance Evaluation

CAMx Photochemical Grid CAMx Model Draft Model Performance Evaluation

**DRAFT DOCUMENT AVAILABLE**

3SAOS WRF
Looking ahead:
Building the WRAP Regional Technical Center
Attributes of the WRAP Regional Technical Center

Desirable Capabilities
Remote sensing/Satellite data,
Improved technical resolution for international transport,
Efficient regional data and decision support systems, et cetera

Necessary Regional Activities
Regional Haze Planning Support,
Tracking and Analysis of Controls, et cetera

Required Foundational Activities
(WRAP Regional Technical Center,
Tracking and Projection of Regional Emissions,
Preparation/delivery of ready-to-use Datasets, e.g., Monitoring, Meteorology, et cetera)
WRAP members and relationship to regional technical activities

Local, Tribal, State, and EPA
Air Quality Management and Planning activities (Regional Haze, Ozone/PM transport, other) – adds/uses regional inputs as needed

WRAP Regional Technical Center

Western (3-State) Data Warehouse / Regional Modeling Center, NW-AirQuest, others

Western Oil & Gas and Energy Development & Trend / Change Analysis – NEPA and CAA Planning

WRAP projects:
Air Quality Impacts of Planned and Unplanned Fire

Proposed NASA Satellite Data Integration Project

WRAP Work Plan - organizational structure

WRAP Board of Directors

- Technical Steering Committee
- WRAP Staff
- TSC Working Groups
- Project Teams
Opportunities for Western Data Warehouse and Applying Regional Modeling Results from Western Regional Technical Studies

- Leveraged studies address both regulatory planning needs and fill gaps where data are needed
  - Working for the users of the data

- Tracking key western source categories / source areas
  - Regionally consistent, comparable, transparent, and reproducible

- Modeling analyses of Ozone and PM background and transport on a routine basis and during elevated episodes
  - NEPA air quality studies
  - Background data for SIP planning
  - Impacts of fire on ozone and PM across West

- Better oil & gas, fire, biogenics emissions data
  - Improves assessment of natural vs. anthropogenic contributions
WRAP 2014-18 Integrated Work Plan – development, review, and adoption process

- All materials at: 2014-18 Integrated Work Plan
- Led by Technical Steering Committee
- Plan prepared during 2014
- High-level Work Plan for Board and agencies’ decision makers
  - Keeping detailed documentation as Appendices
- Board review Nov. through Jan., planned adoption early 2015
Thanks –

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Western Regional Air Partnership | www.wrapair2.org