

Western Air Quality Studies, Western Air Quality Data Warehouse and WRAP Regional Technical Center

March 18, 2015

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WESTAR Council

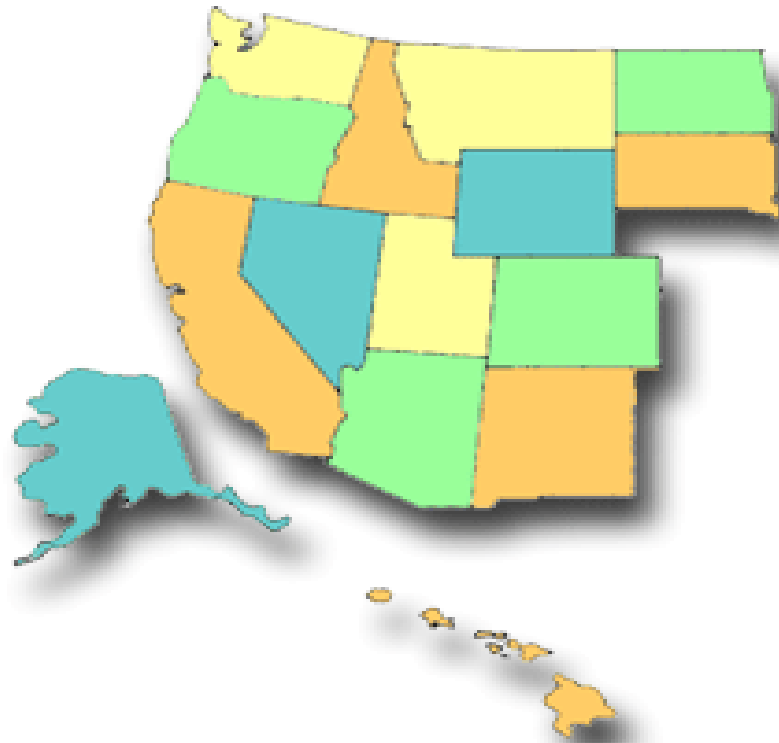
Idaho Department of Environmental Quality, Air Quality Program
Western Air Quality Workshop
Boise, ID



Topics

- Overview of the WESTAR/WRAP organization
 - Key issues and areas of focus
 - Western Regional Studies and Projects
 - Planning Applications for Regional Analysis
 - Building the WRAP Regional Technical Center
- WestJumpAQMS regional modeling study results:
 - Ozone and PM source apportionment
- Fire Impacts and Analysis Tools – hands-on activity

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

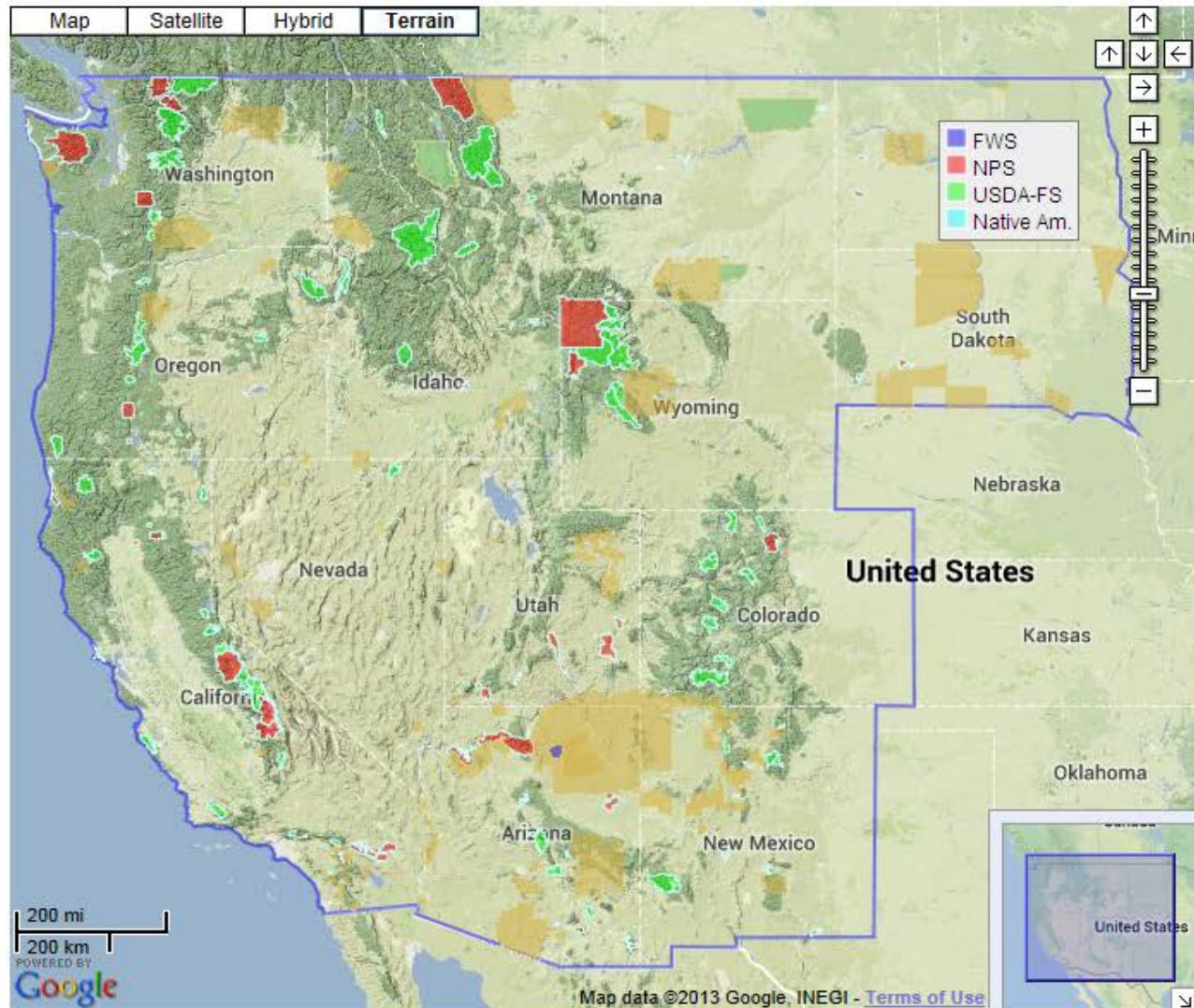
- Training
- Provide a forum for discussion
- Inform policy-related discussions
- (new) Provide technical support (esp. regional)

Overview of WESTAR/WRAP (cont'd)

WRAP = Western Regional Air Partnership

- www.wrapair2.org
- Same 15-state region as WESTAR
- Virtual organization, not incorporated
- 65 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

About WESTAR/WRAP (cont'd)



- 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

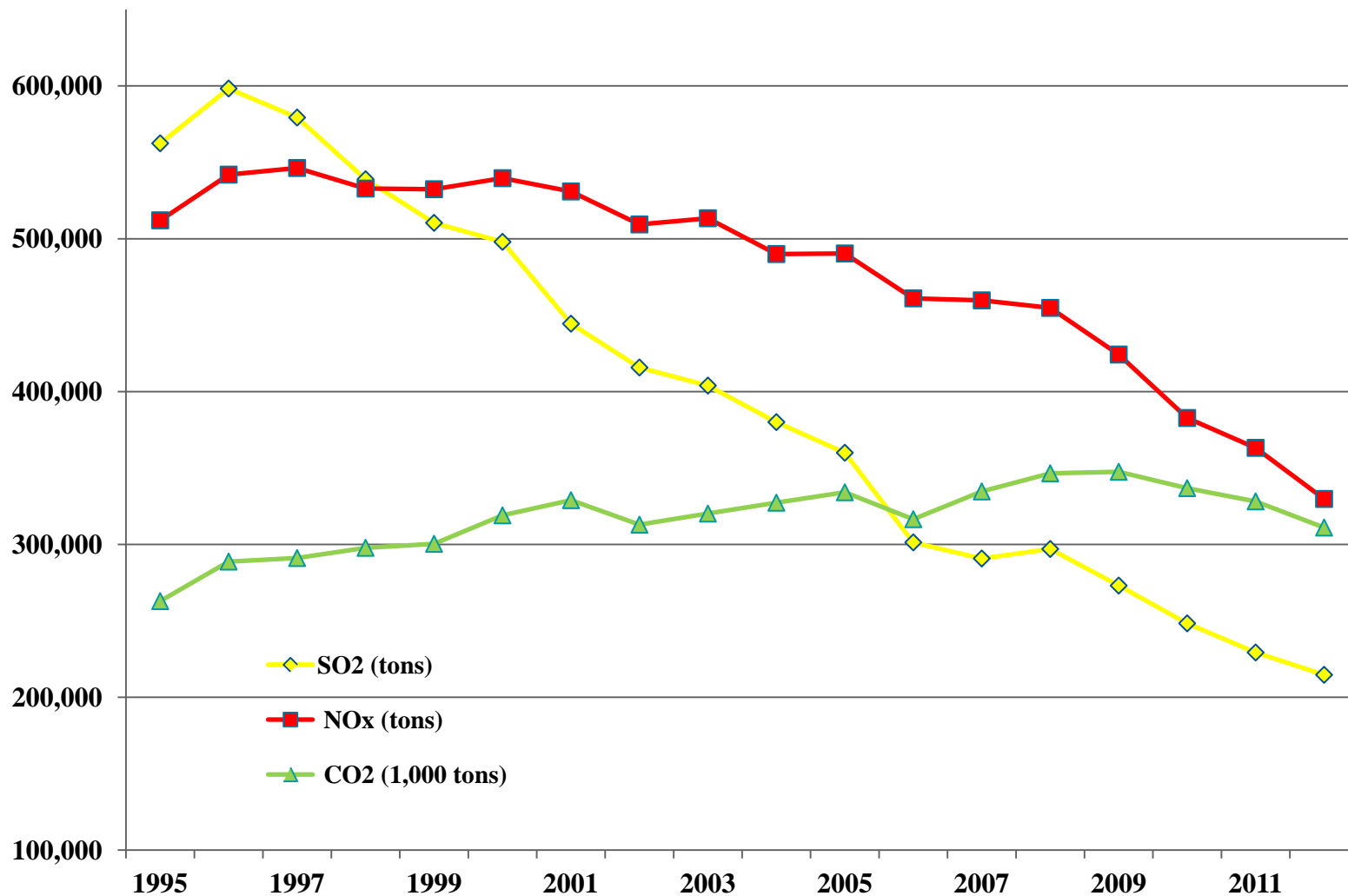
- NAAQS Implementation and Maintenance
 - Data for future infrastructure and transport SIPs
- Exceptional Events
 - Develop technical support data and analysis protocols
- Implementation of Regional Haze SIPs
 - Identify and execute technical work needed for 2018 plans
- Needs of sub-regional groups 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





Smoke/Fire & the Ozone and PM NAAQS, Regional Haze Rule

Fire



The Big Picture

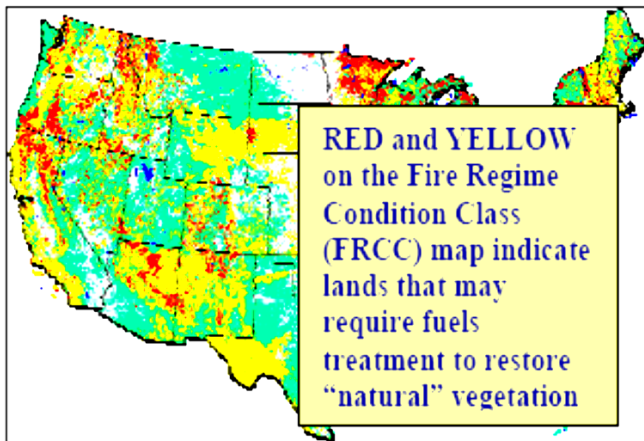
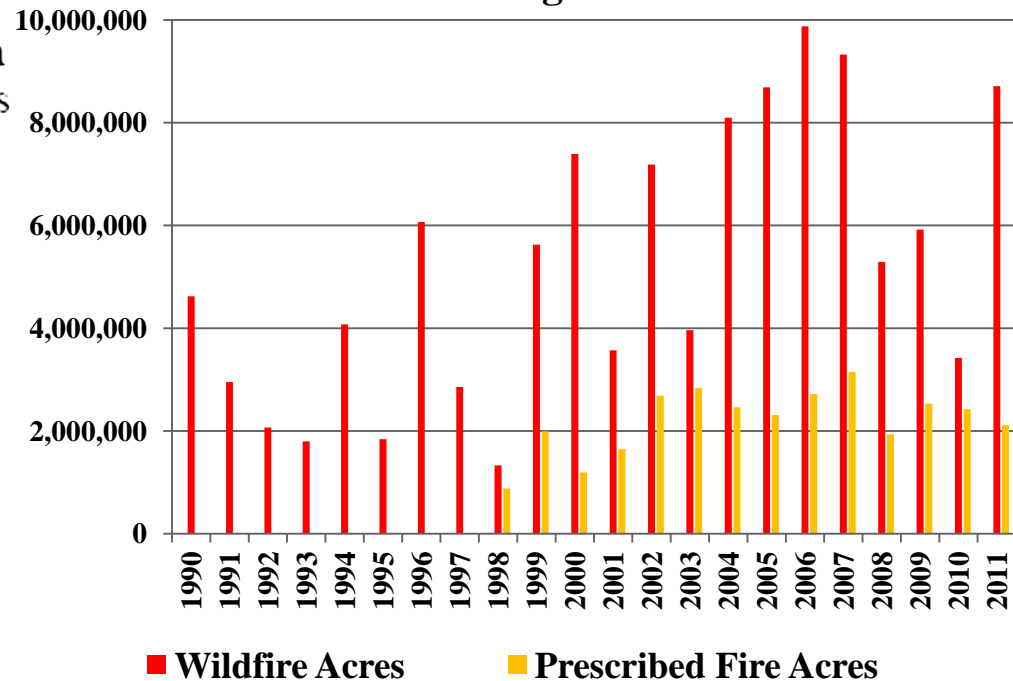
Technical Products for air quality planning & management as required by the Clean Air Act



Future emissions, efforts to avert emissions & health/visibility impacts, & adapt to a changing/varying climate

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



EPA national Ozone Standard

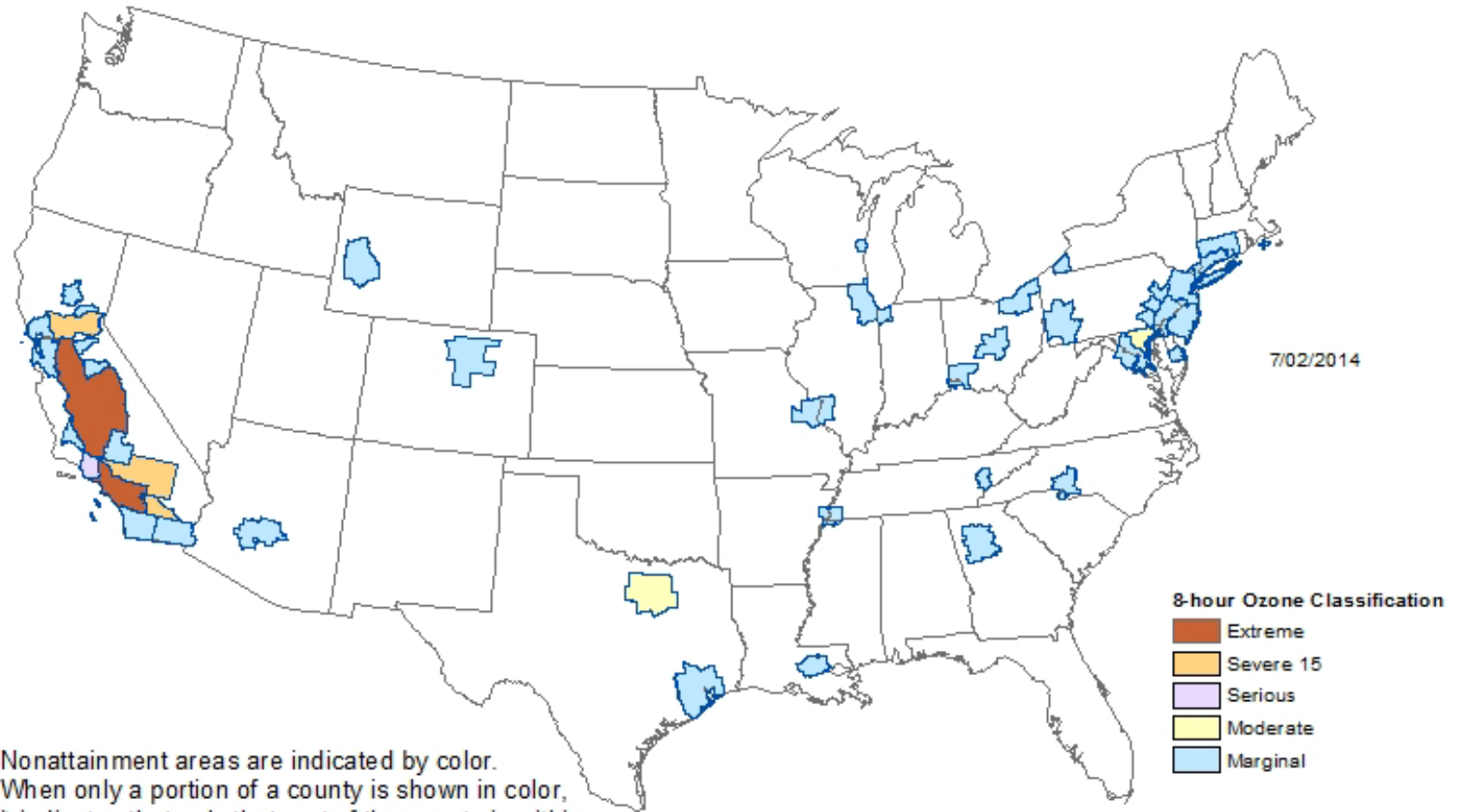
- Measured at ground station sites, highest 8-hour average each day
- 4th highest values each year are averaged over 3-year periods to determine compliance (e.g., 2007-09, 2008-10)
 - Statistic is called a “Design Value” for that site for that time period
- Current Ozone health standard level is 75 ppb
- EPA proposed a revised Ozone health standard in a range of 65 to 70 ppb
- EPA proposed a secondary Ozone standard for ecosystem protection at the same range
 - Proxy for a growing season / daylight hours-weighted cumulative metric

What are (some of) the sources and control issues in the West related to new Ozone standard(s)?

- Urban and rural reactivity
- Transport and formation – how much / how important?
- Public lands with large biogenic emissions and fire activity
 - How to characterize for effects of drought and climate variation ?
- Federal and state mobile fuel and tailpipe controls
- Upstream Gas NSPS rules in place in 2015
 - Industry practices changing rapidly, e.g., green completions
- Point sources (dominated by EGUs for SO_2 , NO_x)
 - Significant NO_x BART by ~2018
 - Less coal-fired electricity supply due to climate change rule?
 - 17+ million acres of public lands leased in last 5 years for O&G exploration and production

Counties with Monitors Violating Primary 8-Hour Ground-Level Ozone Standard (0.075 ppb)

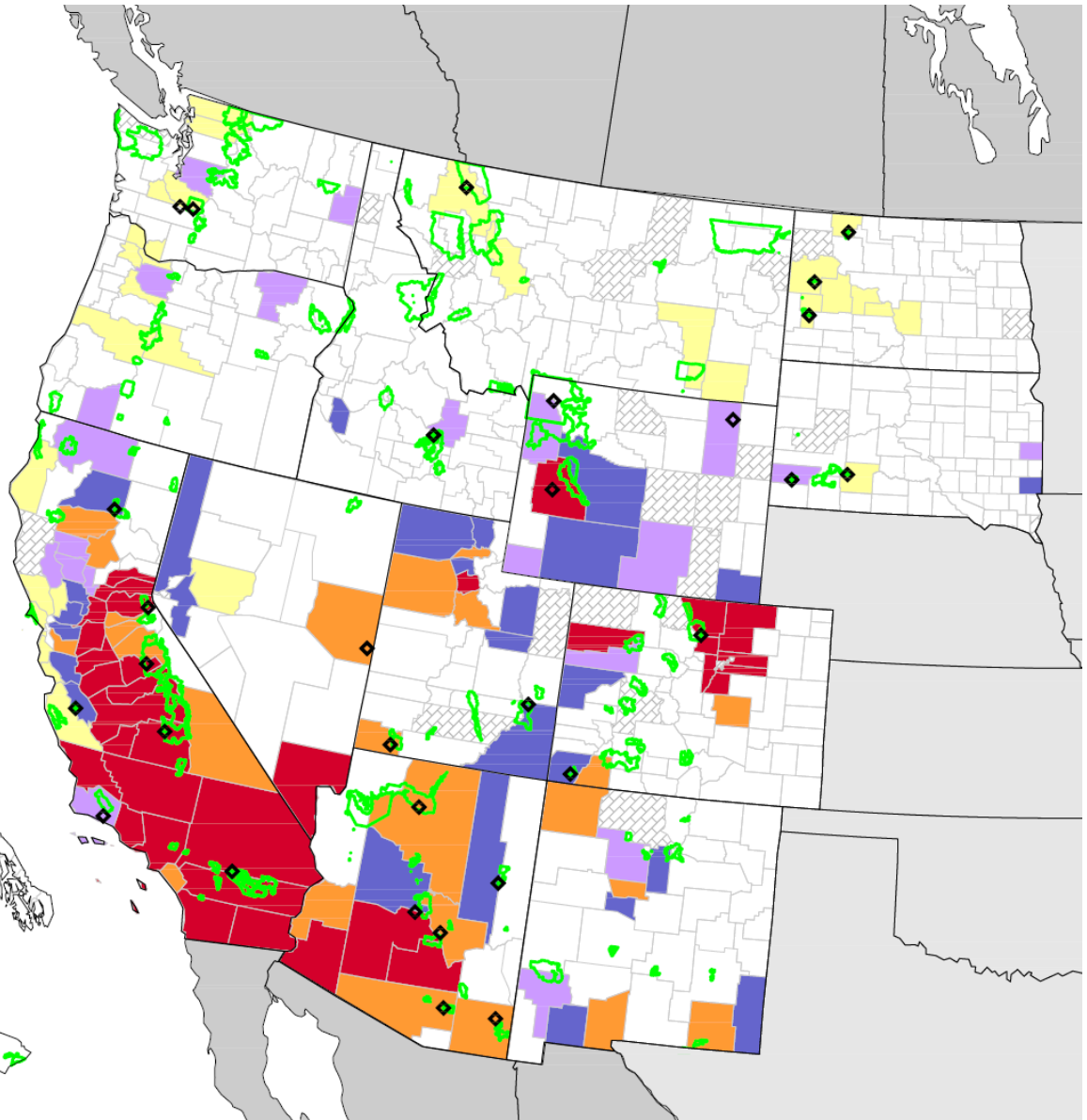
(Based on 2011-2013 Air Quality Data)



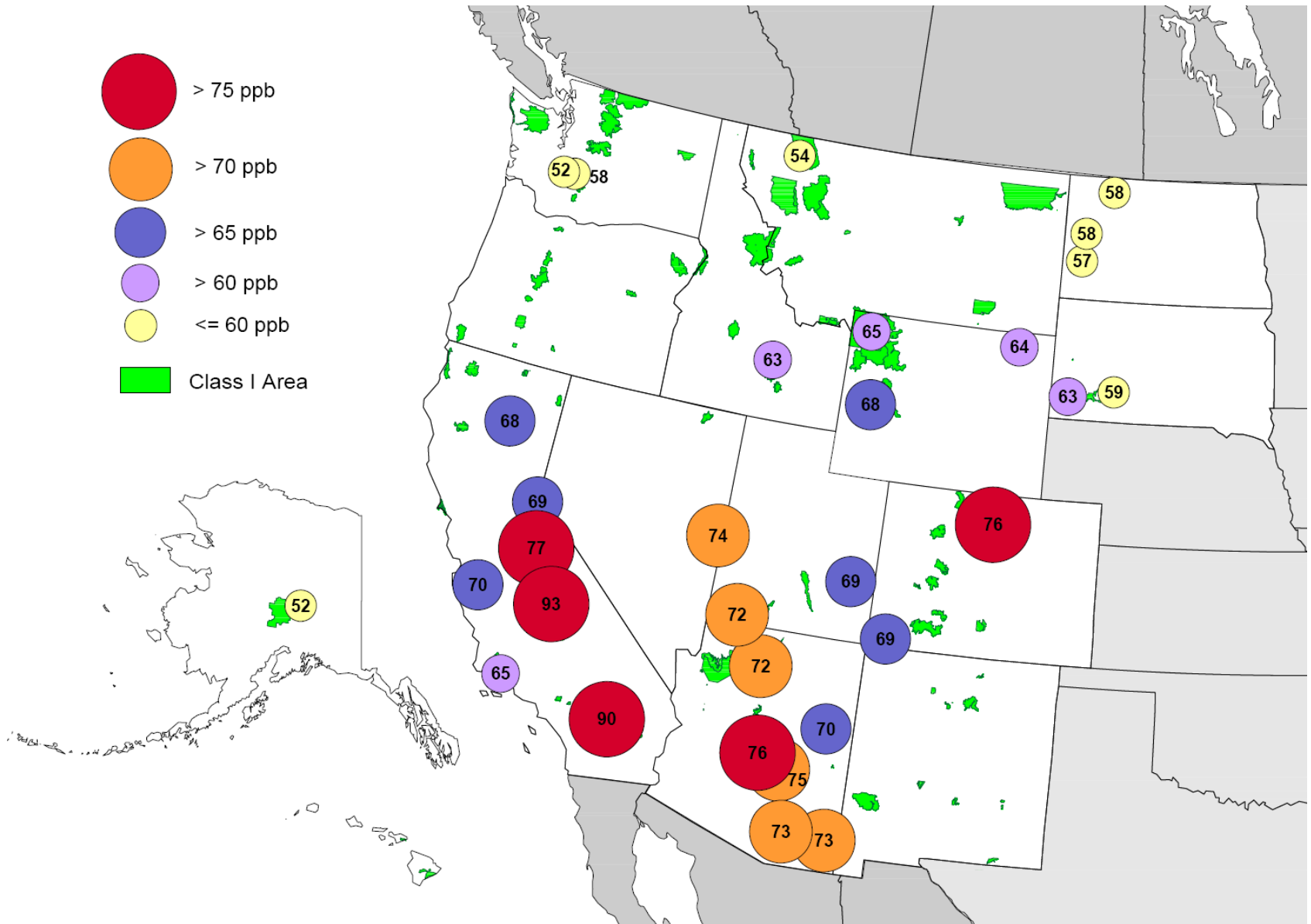
Nonattainment areas are indicated by color. When only a portion of a county is shown in color, it indicates that only that part of the county is within a nonattainment area boundary.

3-year Average 4th Highest 8-Hour Ozone value by County 2011-2013

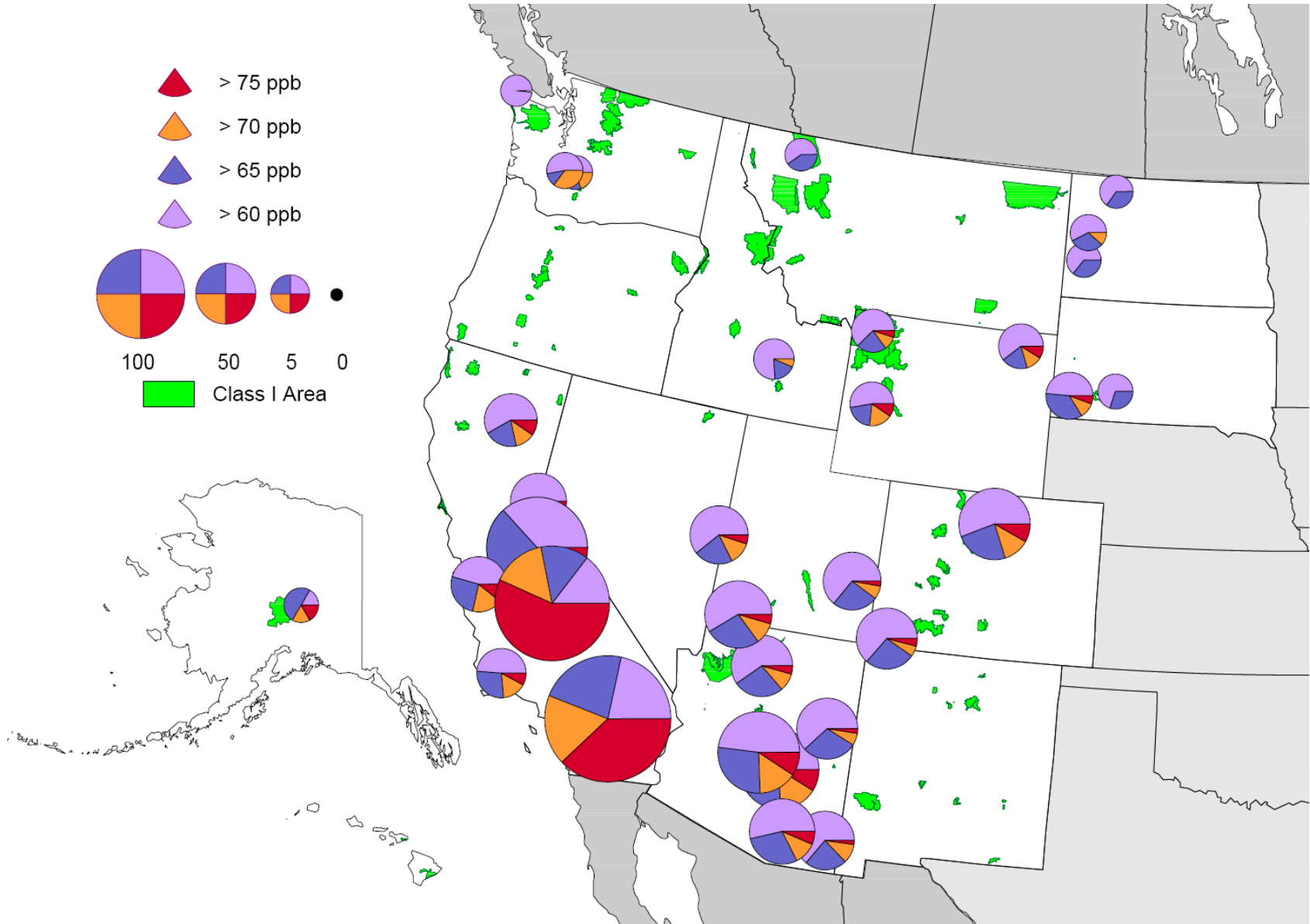
- > 75 ppb
- > 70 ppb
- > 65 ppb
- > 60 ppb
- <= 60 ppb
- Insufficient Data
- No monitoring data available
- Rural/Class I Site
- Class I Area



3-year Average 4th Highest 8-Hour Ozone value for Rural/Class I Sites 2011-2013



Average Annual Count of Days with 8-Hour Ozone Averages >60 ppb for Rural/Class I Monitoring Sites – 2004 through 2013





Western Regional Studies and Projects

- Planning Applications for Regional Analysis
- Fire and Exceptional Events (after break)

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



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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

Forum	Topics	Posts	Last Post
Forum Discussions			
Announcements Information about new releases and fixes. Moderators: Administrators	0	0	No Posts
Requests Post requests you might have in this forum. Moderators: Administrators	0	0	No Posts

DOCUMENT NEEDS REVIEW !

3SAQS WRF 2011
Meteorological Model
Performance Evaluation



DOCUMENT NEEDS REVIEW !

CAMx Photochemical Grid CAMx
Model Draft Model Performance
Evaluation

DRAFT DOCUMENT AVAILABLE

3SAOS WRF



DATA & METADATA



Data



Studies



Documents



Literature

PROJECTS & PLANNING



Projects



Meetings



News

TOOLS & RESOURCES



Image Browser



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*

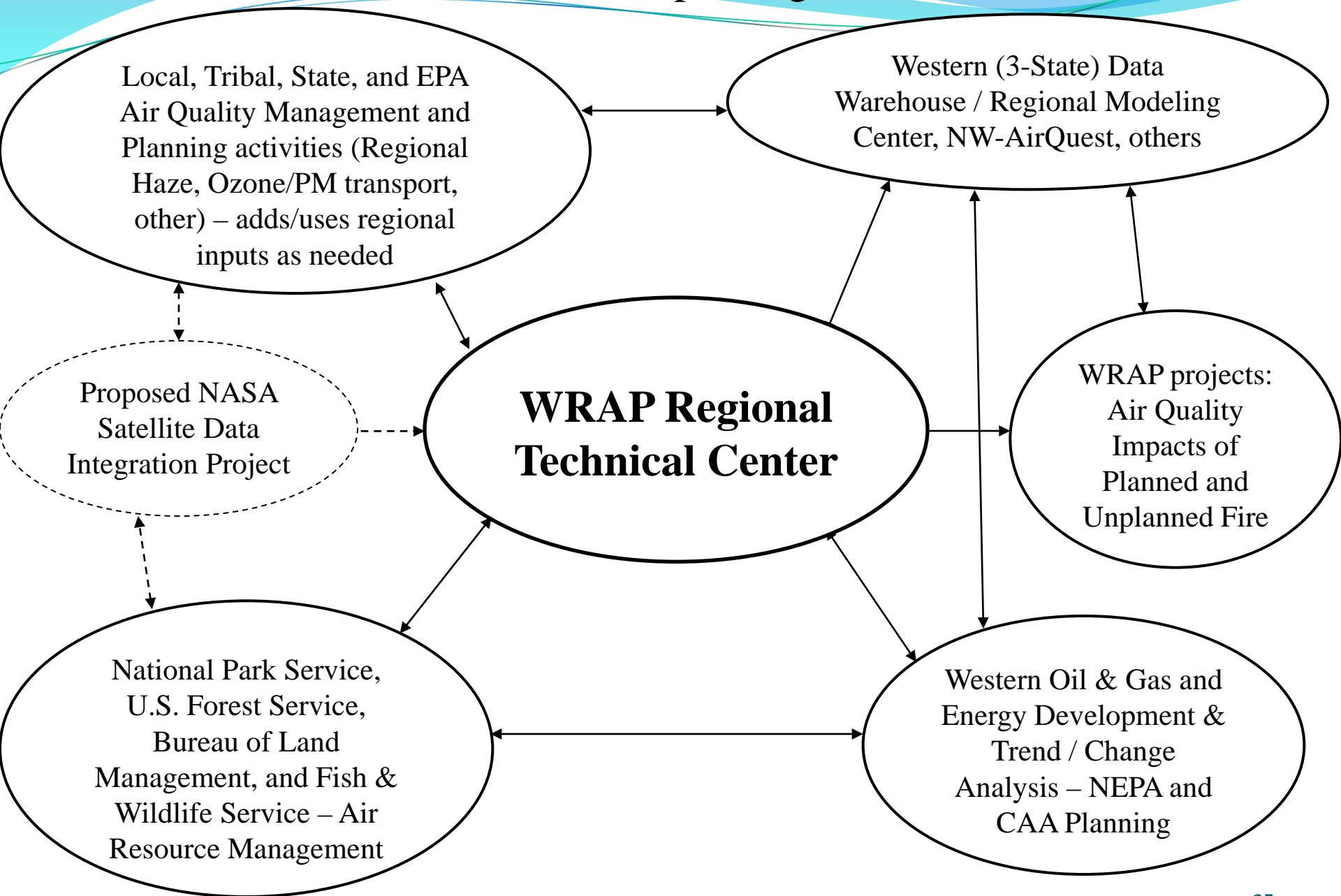
Necessary Regional Activities

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

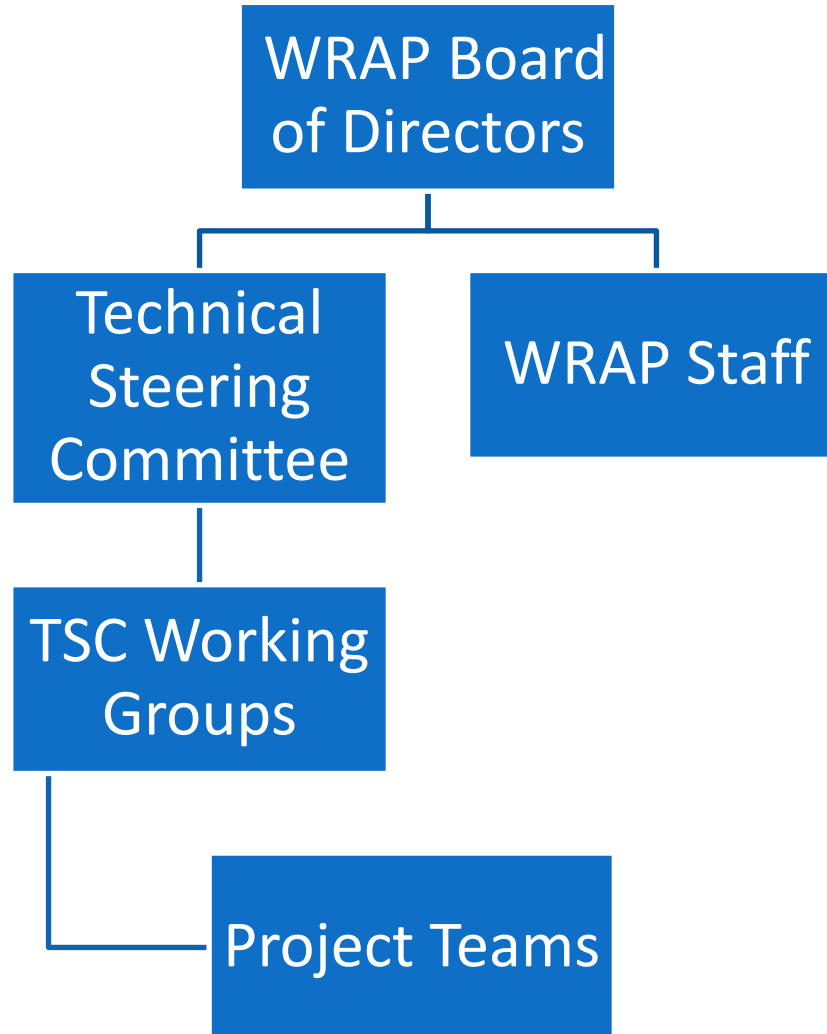
Required Foundational Activities

*(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



WRAP Work Plan - organizational structure



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 2015-18 Integrated Work Plan – development, review , and adoption process

- All materials at: [2015-18 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 underway, planned adoption Spring 2015



WestJumpAQMS regional modeling study results:

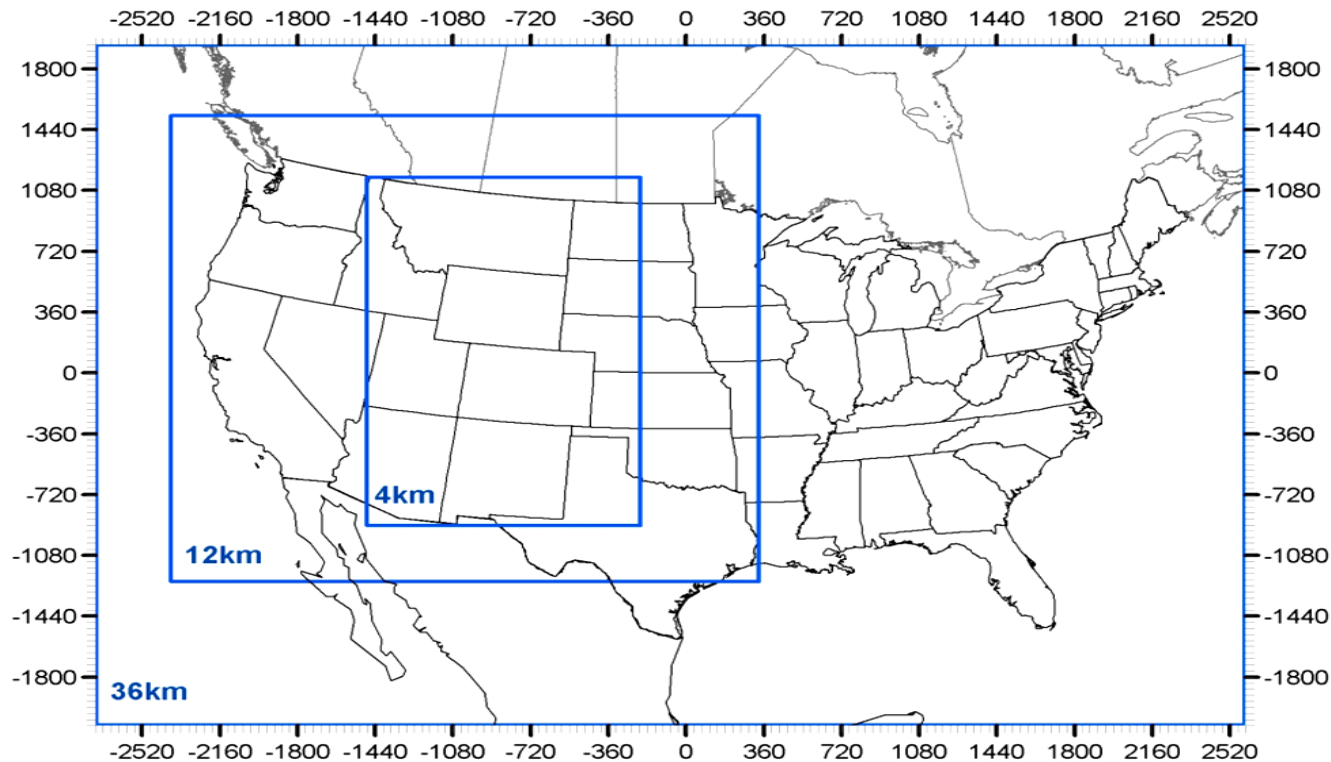
- Ozone and PM source apportionment



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 Western 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)

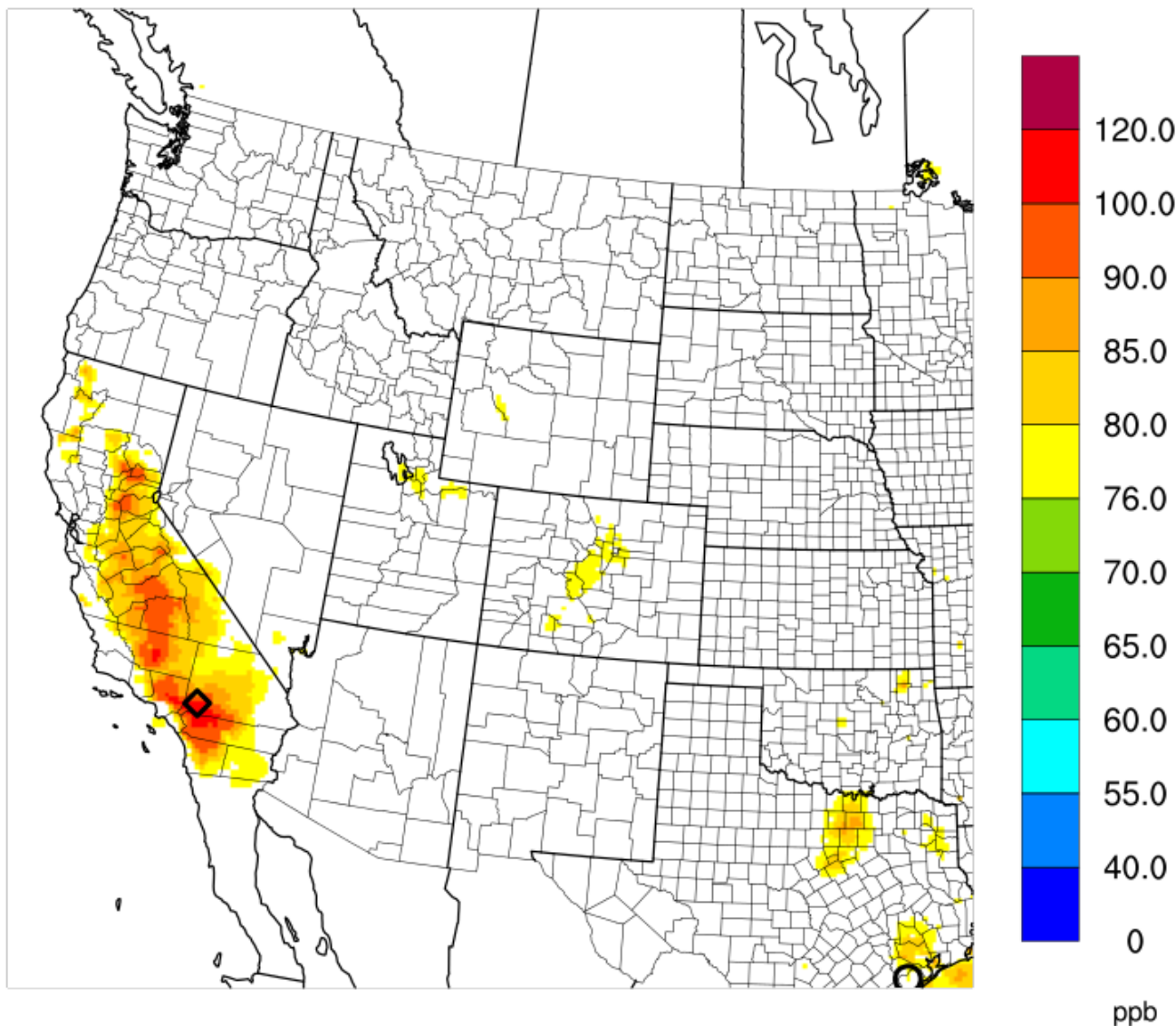
12km*: 227 x 230 (-2388, -1236) to (336, 1542)

04km*: 317 x 515 (-1480, -904) to (-212, 1156)

* includes buffer cells

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

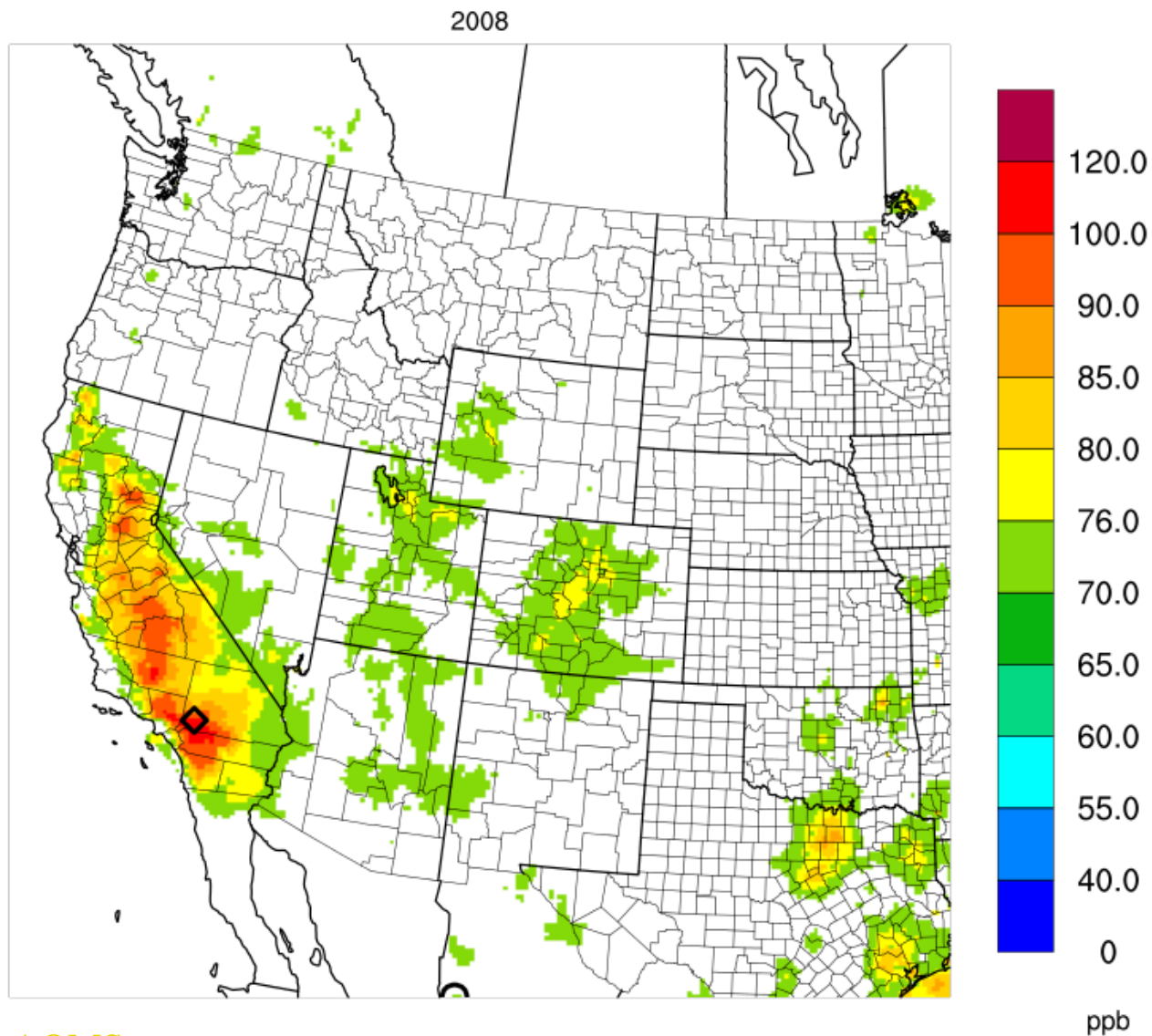
2008



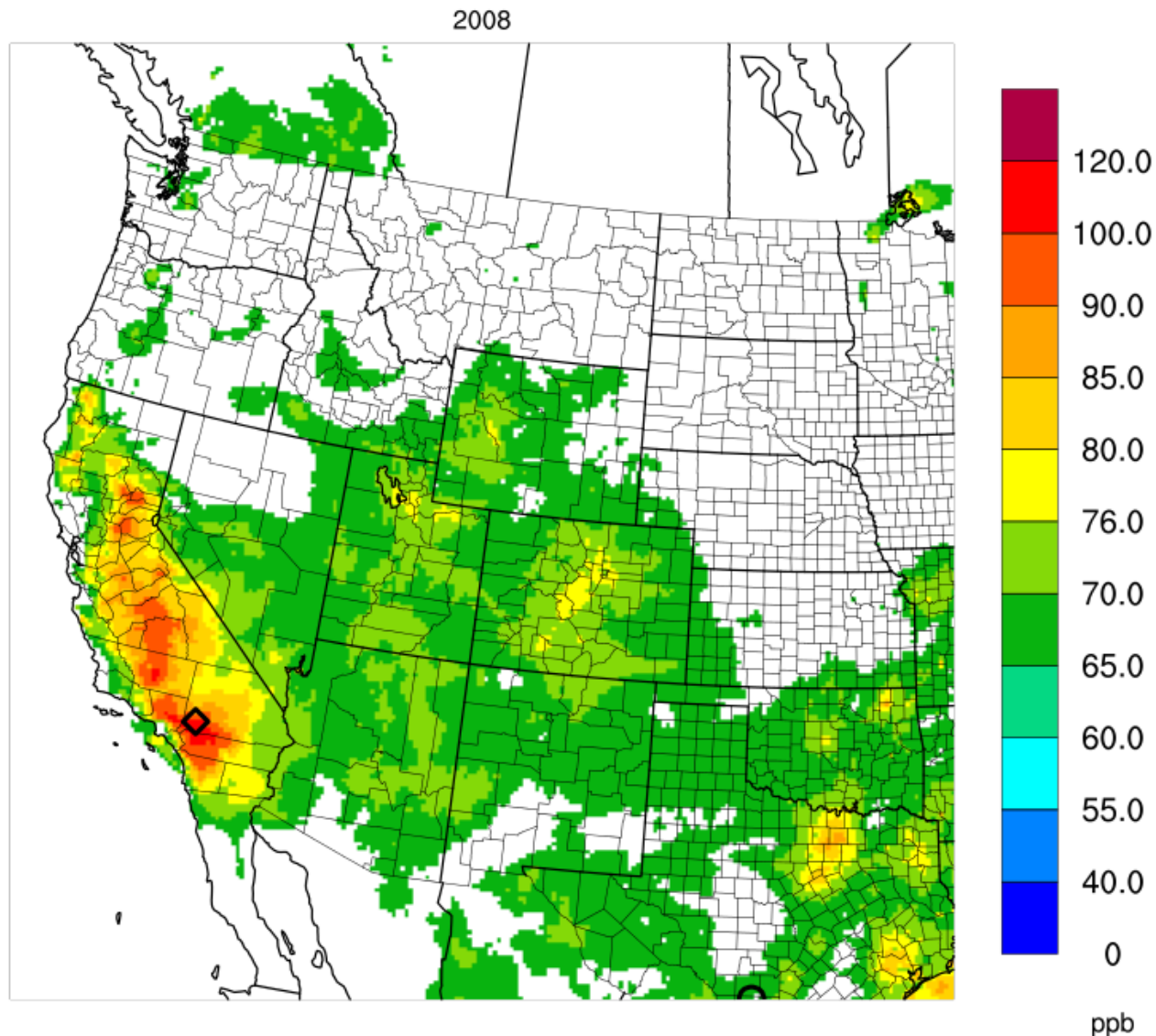
Source: [WestJumpAQMS](#)

○ 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



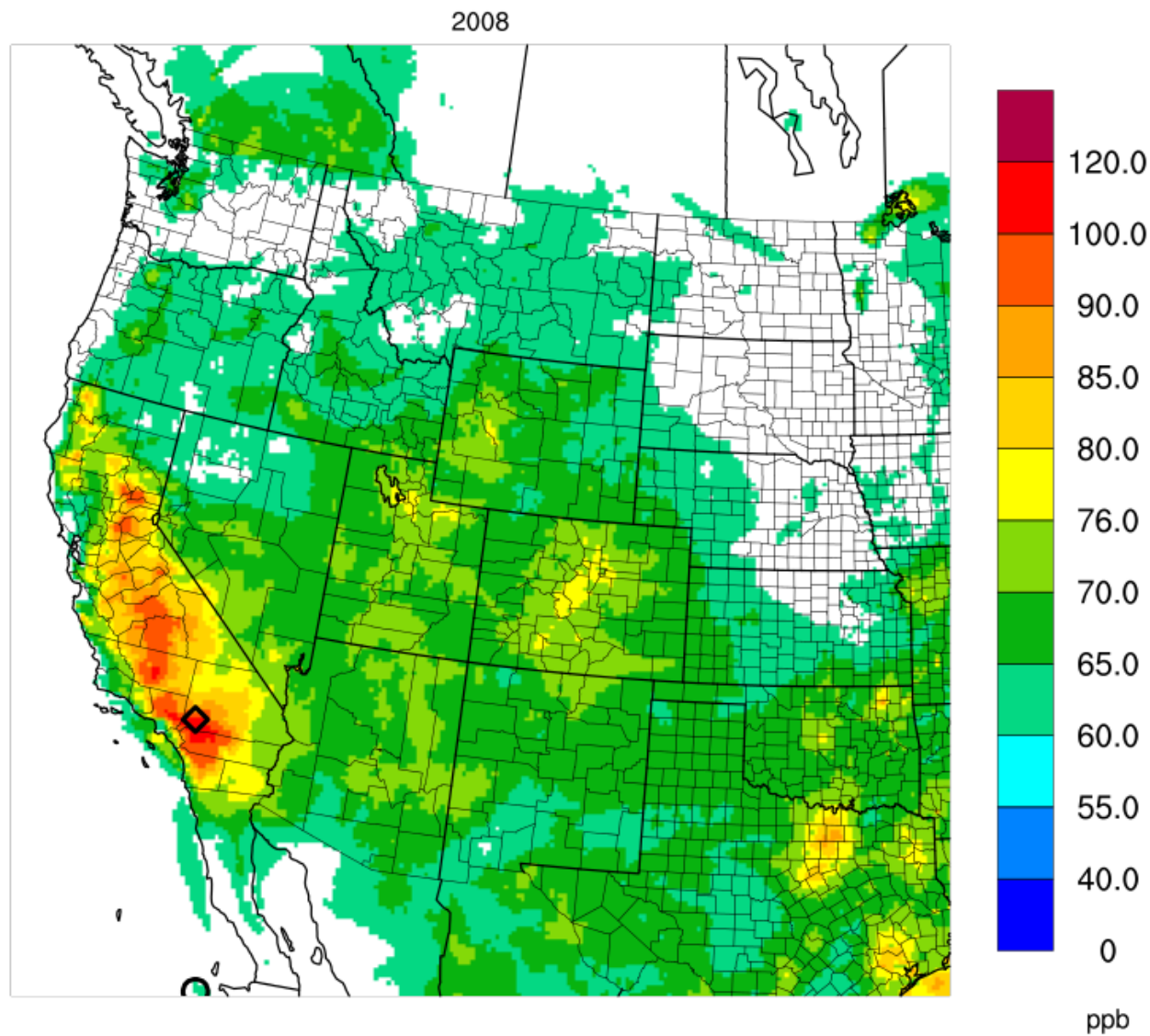
Ozone Modeled Attainment Test Software – Unmonitored Area Analysis with Design Value (2006-2010) ≥ 65 ppb



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) ≥ 60 ppb



○ Min(45,2) = 60.00, ◇ Max(45,67) = 113.30

WestJumpAQMS Products

- Final Report
 - 15 Electronic Appendices
 - Response-to-Comments
- Ammonia Emissions Recommendations Memo
- Modeling Protocol
 - Response-to-Comments
- WRF Application/Evaluation Report
 - Evaluation down to individual monitoring site
 - Response-to-Comments
- 16 Technical Memorandums on Emissions
 1. Point Sources
 2. Area + Non-Road
 3. On-Road Mobile
 - 4a-e. Oil and Gas (5 geographic areas)
 5. Fire (WF, Rx & Ag)
 6. Fugitive Dust
 7. Off-Shore Shipping
 8. Ammonia
 9. Biogenic
 - 11 Mexico/Canada
 12. Sea Salt and Lightning
 13. Emissions Modeling Parameters

All information on WestJumpAQMS web page:

<http://www.wrapair2.org/WestJumpAQMS.aspx>

Ozone, PM, Deposition, and Visibility Source Apportionment Resources from WestJumpAQMS

WestJumpAQMS - Reports

West-Wide Jump-Start Air Quality Modeling Study (WestJumpAQMS) – Final Report ([PDF 15MB](#)), September 30, 2013

- Response-to-Comments for Draft Final Report ([PDF 1MB](#)), September 30, 2013

List of Appendices and directions for use ([PDF](#))

Appendix A: CSAPR-Type Analysis for 2008 Upwind State Highest Contribution to Average and Maximum Ozone Design Values at any Monitoring Site in up to 5 Downwind States using MATS ([XLSX 1MB](#))

Appendix B: State Contributions to Daily Maximum 8-Hour Ozone Concentrations on 10 Highest Modeled Ozone Days in 2008 by Monitoring Site ([XLSX 19MB](#))

Appendix C: Spatial Maps of State-Specific Anthropogenic Emissions Contributions to Highest and Fourth Highest Modeled Daily Maximum 8-Hour Ozone Concentrations during 2008 Greater than 76 (current NAAQS), 70, 65, 60 (potential future NAAQS) and 0 (maximum contribution) ppb across the 12 km WESTUS and 36 km CONUS Domains ([ZIP 37MB](#)) (**corrected files posted February 7, 2014**)

Appendix D: CSAPR-Type Analysis for 2008 Upwind State Highest Contribution to Annual PM_{2.5} Design Values in up to Five Downwind States using MATS ([XLSX 12MB](#))

Appendix E: State Contributions to Modeled Annual PM_{2.5} Concentrations in 2008 by Monitoring Site ([XLSX 23MB](#))

Appendix F: CSAPR-Type Analysis for 2008 Upwind State Highest Contribution to 24-Hour PM_{2.5} Design Values in up to Five Downwind States using MATS ([XLSX 12MB](#))

Appendix G: Spatial Maps of Modeled State-Specific Anthropogenic Emissions Contributions to Highest (1stmax) and Eighth (8thmax) Highest 24-Hour PM_{2.5} Concentrations during 2008 greater than 35 (current NAAQS), 30, 25, 20 and 0 (maximum contribution) $\mu\text{g}/\text{m}^3$ ([ZIP 13MB](#)) (**corrected files posted February 7, 2014**)

Appendix H: Source Category-Specific Contributions to 8-Hour Ozone Design Values at Monitoring Sites in the 4 km Detailed Source Apportionment Domain (DSAD) using MATS and Maximum Contribution to 8-Hour Ozone Design Values in Each DSAD State (CO, NM, UT and WY) due to Major Source Categories using MATS ([XLSX 1MB](#))

Appendix I: Source Category-Specific Contributions to Ten Highest Modeled Daily Maximum 8-Hour Ozone Concentrations at Monitoring Sites in the 4 km Detailed Source Apportionment Domain (DSAD) ([XLSX 2MB](#))

Appendix J: Source Category-Specific Contributions to Annual PM_{2.5} Design Values at Monitoring Sites in the 12 km WESTUS Domain using MATS ([XLSX 2MB](#))

Appendix K: Source Category-Specific Contributions to Modeled Annual PM_{2.5} Concentrations ($\mu\text{g}/\text{m}^3$) at Monitoring Sites in the 12 km WESTUS Domain ([XLSX 4MB](#))

Appendix L: Source Category-Specific Contributions to 24-Hour PM_{2.5} Design Values at Monitoring Sites in the 12 km WESTUS Domain using MATS ([XLSX 2MB](#))

Appendix M: Source Category-Specific Contributions to Ten Highest Modeled 24-Hour PM_{2.5} Concentrations ($\mu\text{g}/\text{m}^3$) at Monitoring Sites in the 12 km WESTUS Domain ([XLSX 10MB](#))

Appendix N: Annual Sulfur and Nitrogen Wet and Dry Deposition at IMPROVE Monitors by Species ([XLSX 1MB](#))

Appendix O: Western State-Specific Modeled Contributions to Visibility Impairment at IMPROVE Monitoring Sites for Modeled Worst (W20) and Best (B20) 20% Days during 2008 ([ZIP 46MB](#))

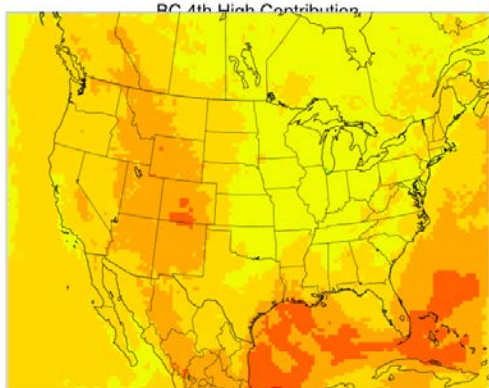
“Other Sources” Max Contrib. 4th High DMAX8 Ozone

Boundary Conditions

Natural

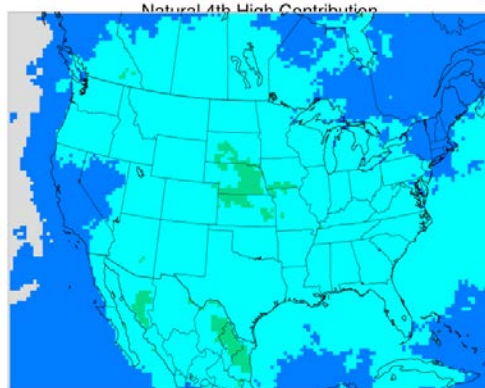
Anthropogenic

Contrib. to CAMx Daily Max 8-Hour Ozone ≥ 0 ppb



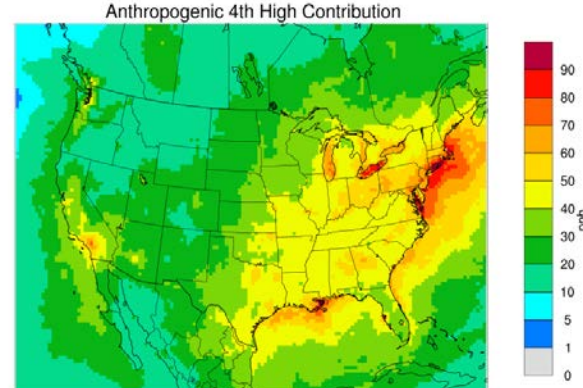
BC 4th High Contribution
Max(82,2) = 80.37

Contrib. to CAMx Daily Max 8-Hour Ozone ≥ 0 ppb



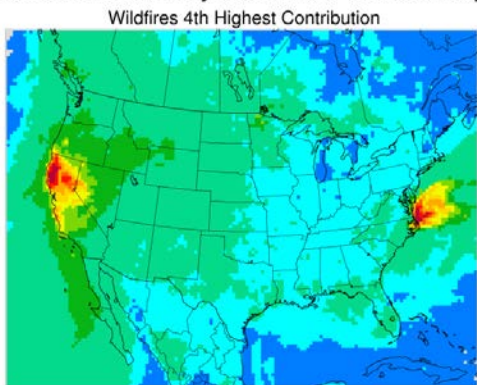
Natural 4th High Contribution
Max(70,11) = 12.84

Contrib. to CAMx Daily Max 8-Hour Ozone ≥ 0 ppb



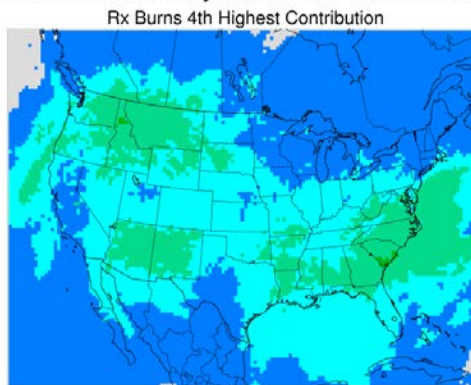
Anthropogenic 4th High Contribution
Max(133,70) = 110.89

Contrib. to CAMx Daily Max 8-Hour Ozone ≥ 0 ppb



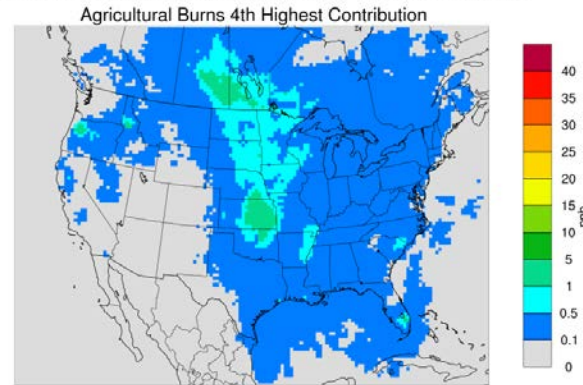
Wildfires 4th Highest Contribution
Max(129,53) = 60.13

Contrib. to CAMx Daily Max 8-Hour Ozone ≥ 0 ppb



Rx Burns 4th Highest Contribution
Max(116,41) = 6.16

Contrib. to CAMx Daily Max 8-Hour Ozone ≥ 0 ppb

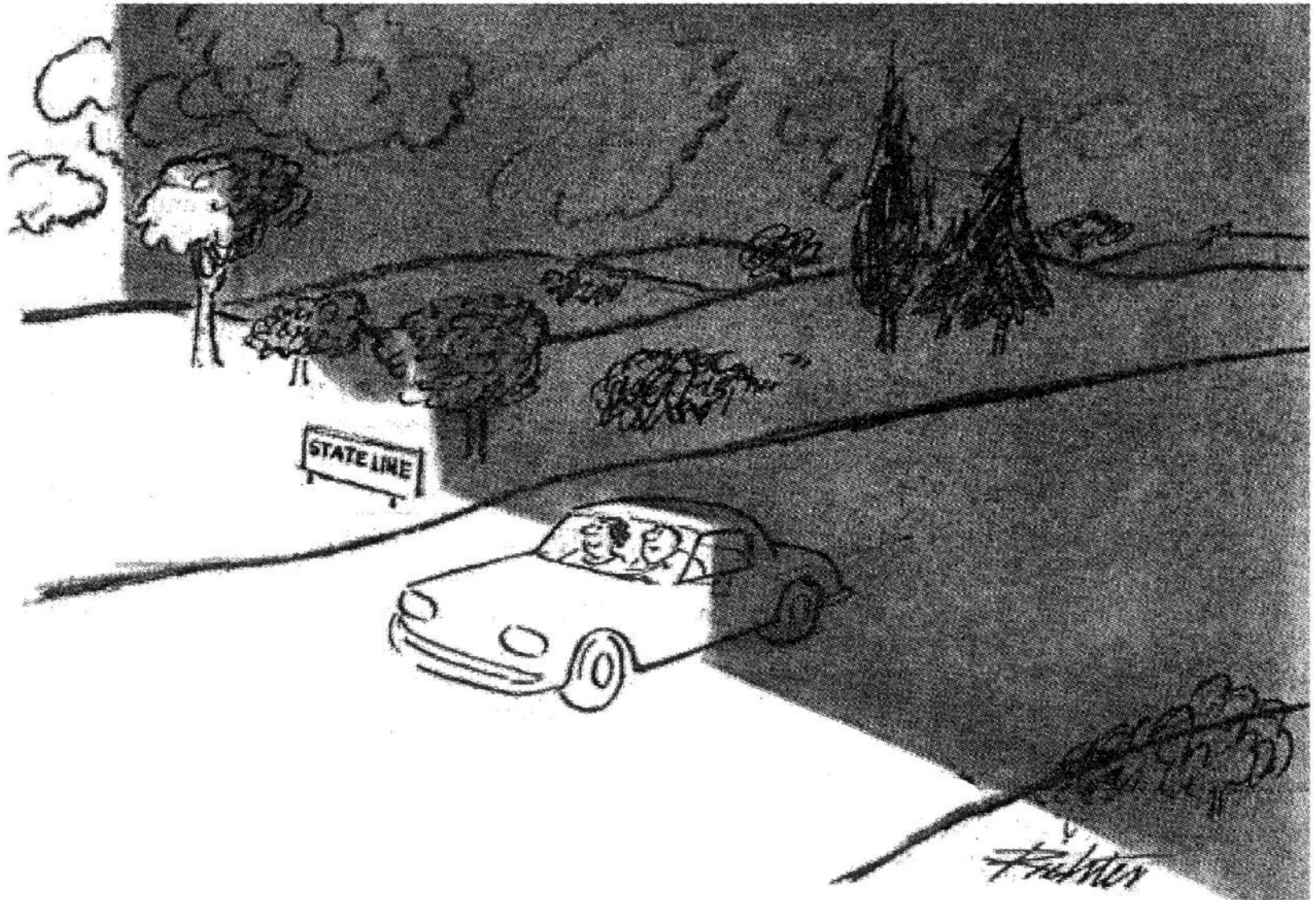


Agricultural Burns 4th Highest Contribution
Max(79,51) = 3.15

Wildfire

Prescribed Fire

Agricultural Fire



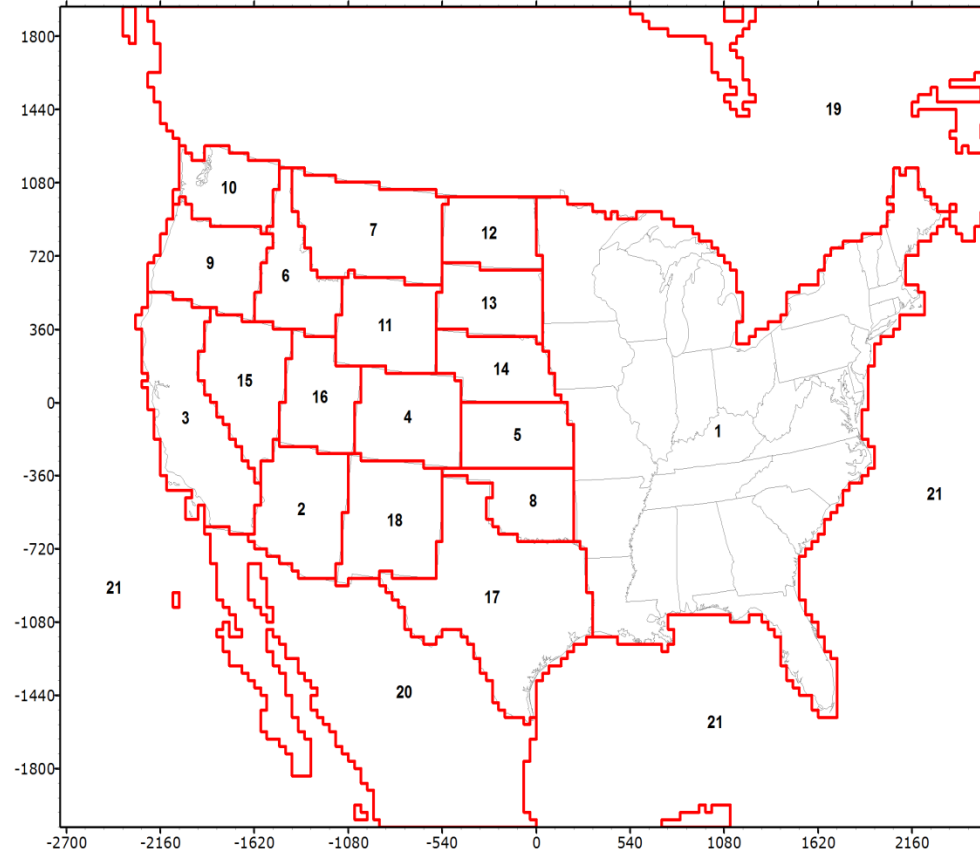
“They have very strict anti-pollution laws in this state.”

State-Specific Ozone Source Apportionment

- Purpose: To provide information on the role of ozone transport to exceedances of the current and potential future ozone NAAQS in the western U.S.
- Approach: Analyze ozone apportionment several ways:
 1. Upwind state contribution to downwind state nonattainment using Cross State Air Pollution Rule (CSAPR-type) approach
 - Use EPA method for projecting ozone Design Values (RRFs)
 2. State contributions to modeled high ozone DMAX8 ozone at monitors in 12 km WESTUS domain
 - Spatial extent of modeled state contributions to 1stmax and 4thmax DMAX8 ozone greater than current and potential future NAAQS
 - Source category analysis (Natural, Fires & Anthropogenic)
 3. Detailed Source Category-Specific Source Apportionment
 - 6 key source categories across 4 states in intermountain West
 - 2-way nesting between model domains

State-Specific Ozone Source Apportionment

- 2008 36/12 km Base
- 17 Western States
 - Plus EasternUS, Can, Mex & Off-Shore
- 5 Source Categories
 - Natural (Biogenics+Lightning+WBDust+SeaSalt)
 - WF, Rx and Ag Fires
 - Anthropogenic
- 107 Source Groups (21 x 5 + 2)
 - 4 Extra Species for each Group
 - 428 additional species
 - Standard Model = 70 species
 - Computationally Demanding

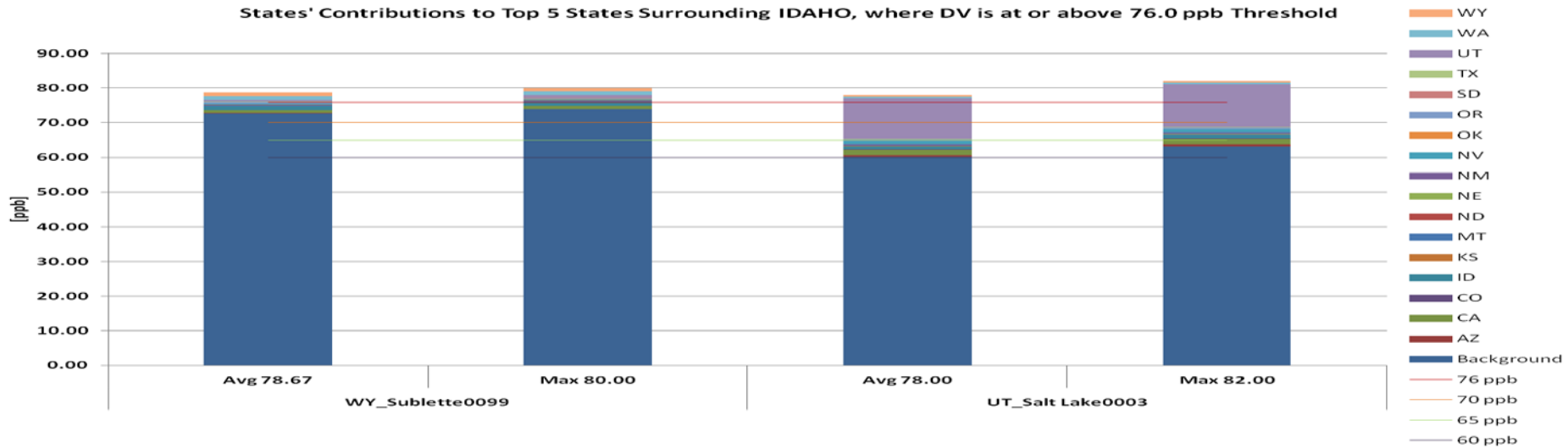


CSAPR-Type Analysis for current (76 ppb) and potential future (70 and 65 ppb) NAAQS levels

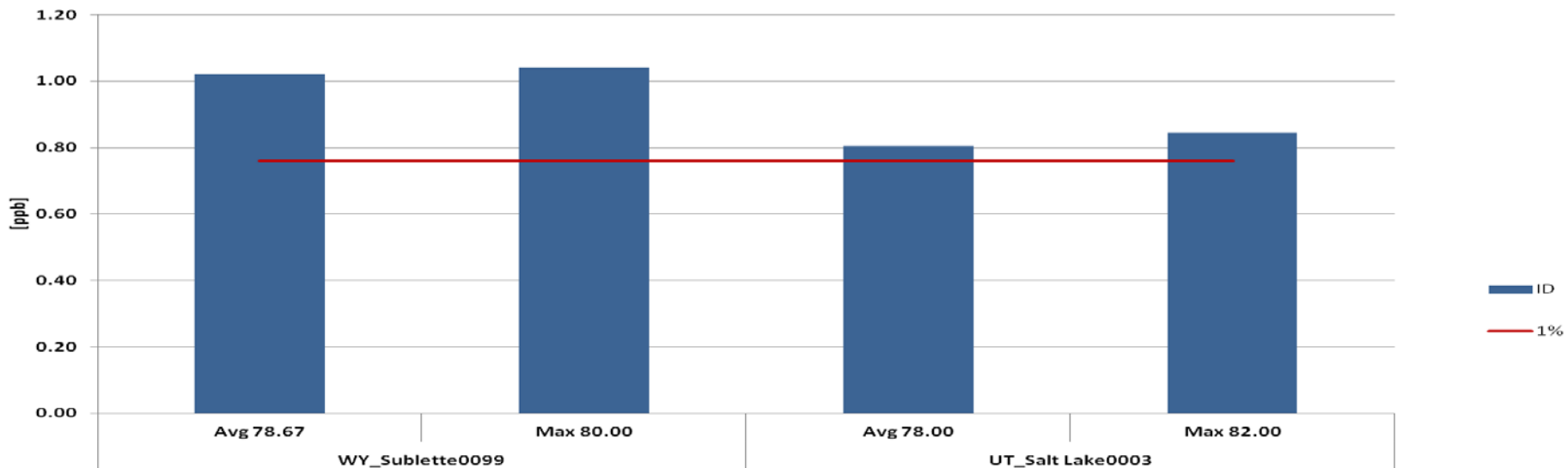
- CSAPR looked at contributions to:
 - Average Design Value = Average of DVs from 2006-2010
 - Max Design Values = Max DVs from 2006-2010
- 136 ozone monitors in 12 km WESTUS domain with Average Design Value exceeding 76 ppb NAAQS
 - 86 sites (63%) in California
- For 17 upwind western states examine 2008 contribution to DMAX8 ozone Design Value in downwind states
 - CSAPR used a 1% NAAQS significance threshold (≥ 0.76 ppb)
- **This analysis is for 2008 and is not a regulatory analysis that would have to examine a future year**

Idaho CSAPR-Type Ozone Analysis for current 75 ppb NAAQS (from WestJumpAQMS Appendix A)

States' Contributions to Top 5 States Surrounding IDAHO, where DV is at or above 76.0 ppb Threshold

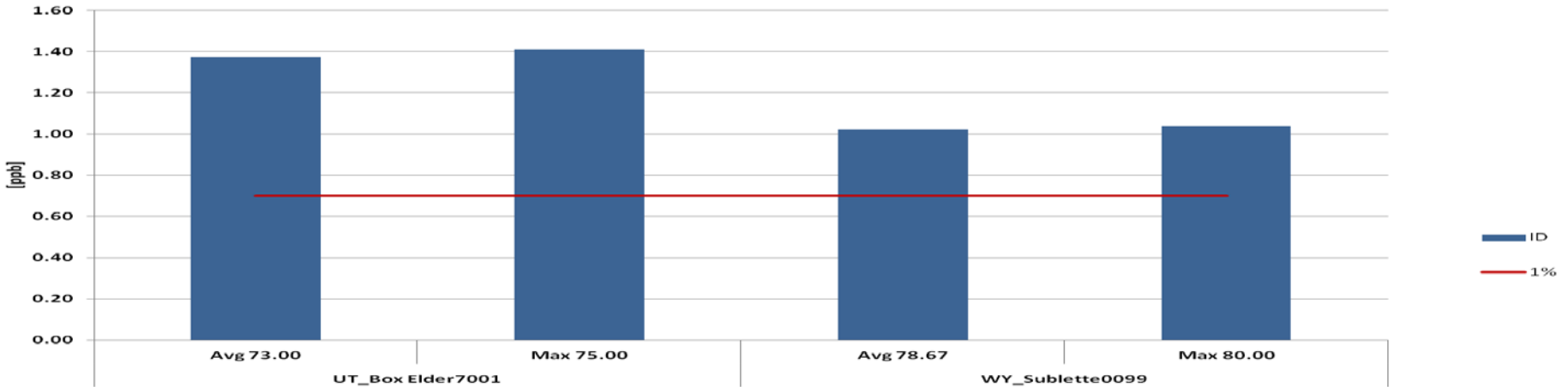


IDAHO's Contributions to Top 5 States Surrounding IDAHO, where DV is at or above 76.0 ppb Threshold

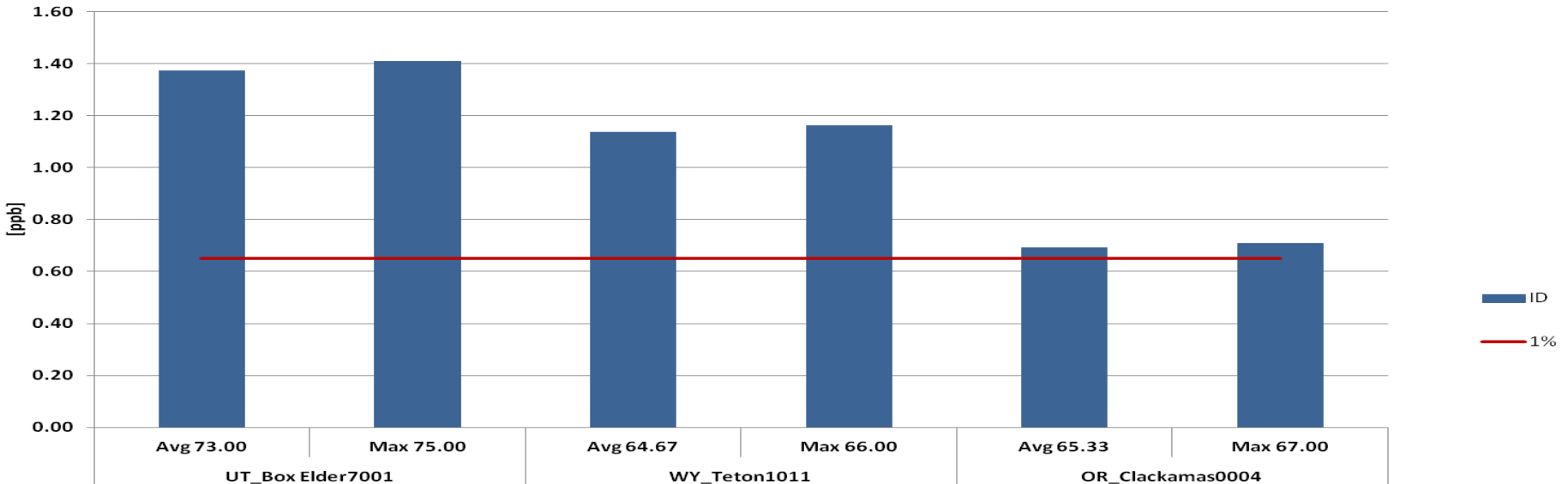


Idaho CSAPR-Type Ozone Analysis for potential 70 and 65 ppb NAAQS (from WestJumpAQMS Appendix A)

IDAHO's Contributions to Top 5 States Surrounding IDAHO, where DV is at or above 70.0 ppb Threshold

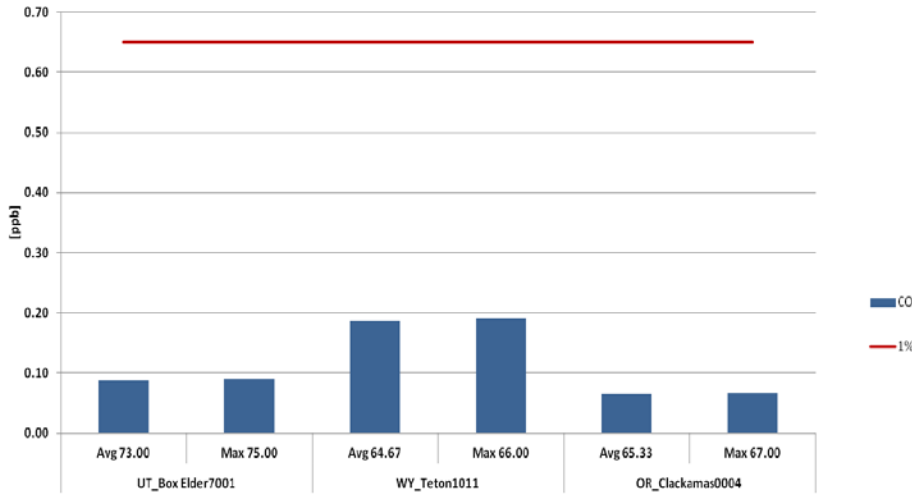


IDAHO's Contributions to Top 5 States Surrounding IDAHO, where DV is at or above 65.0 ppb Threshold

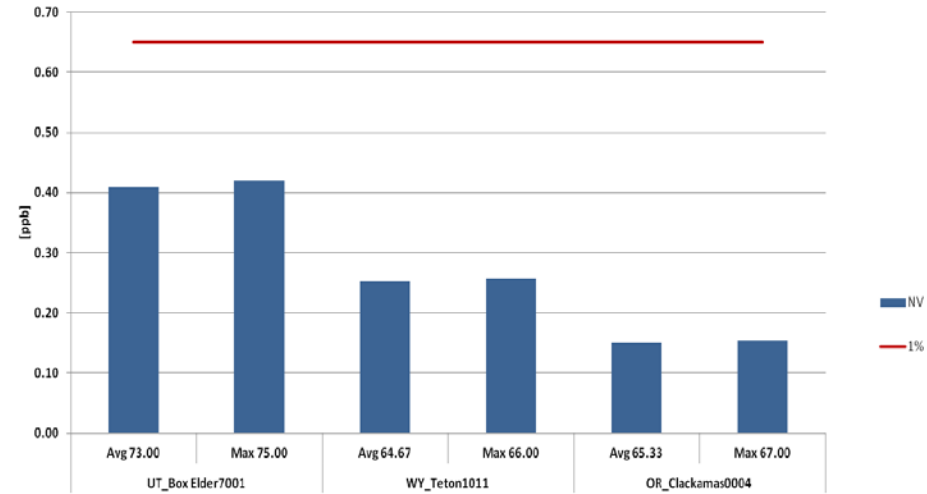


CSAPR-Type Ozone Contribution Analysis - "states near ID" at potential 65 ppb NAAQS (from WestJumpAQMS Appendix A)

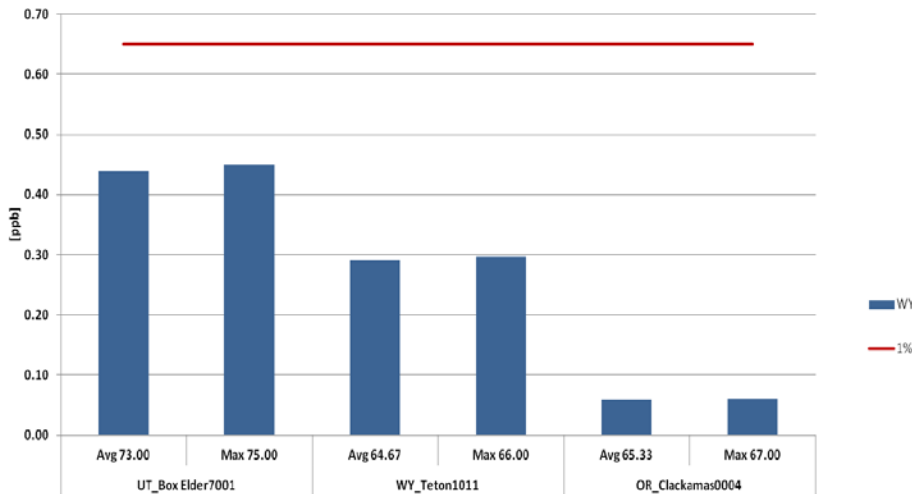
COLORADO's Contributions to Top 5 States Surrounding IDAHO, where DV is at or above 65.0 ppb Threshold



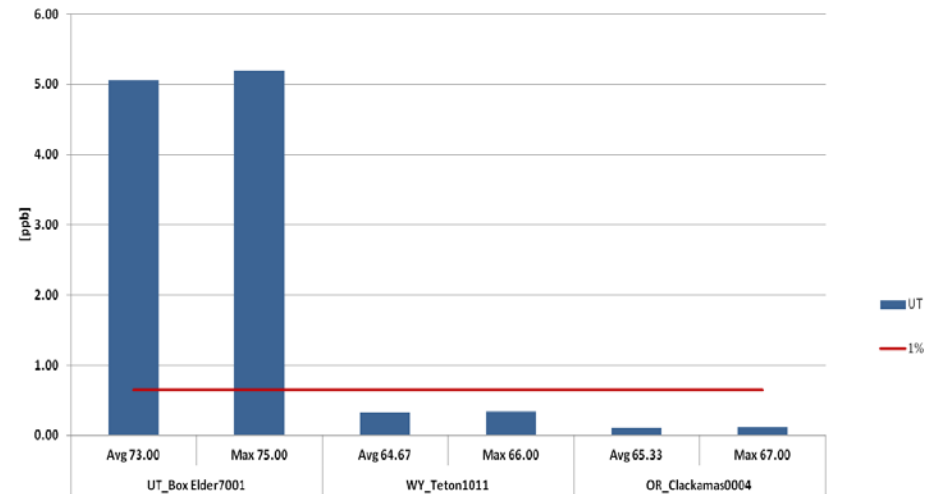
NEVADA's Contributions to Top 5 States Surrounding IDAHO, where DV is at or above 65.0 ppb Threshold



WYOMING's Contributions to Top 5 States Surrounding IDAHO, where DV is at or above 65.0 ppb Threshold

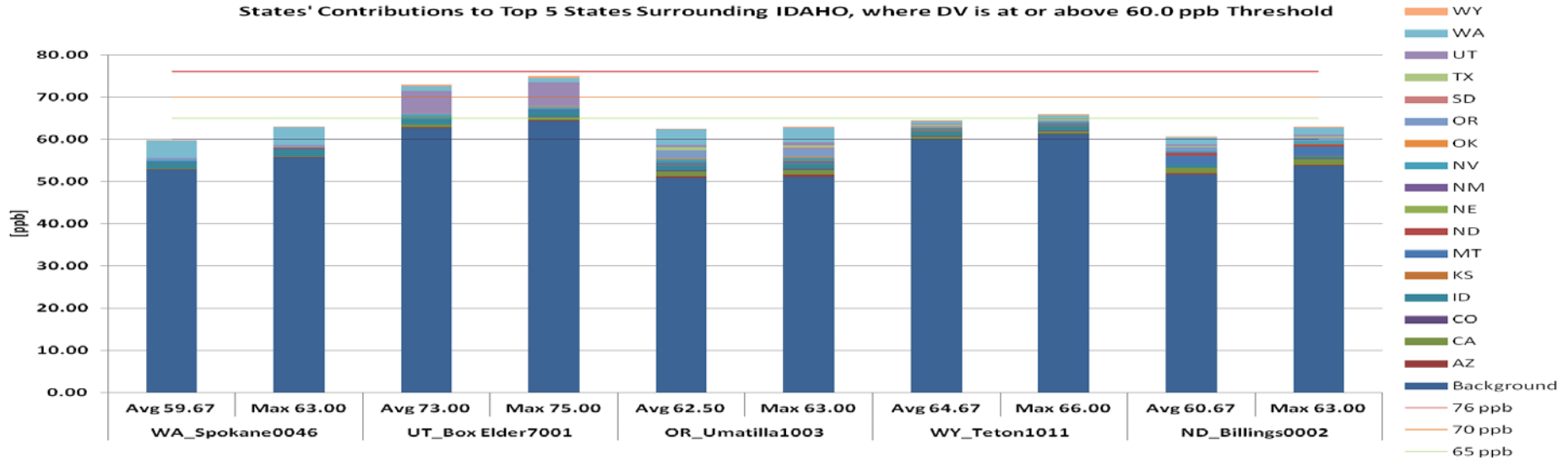


UTAH's Contributions to Top 5 States Surrounding IDAHO, where DV is at or above 65.0 ppb Threshold

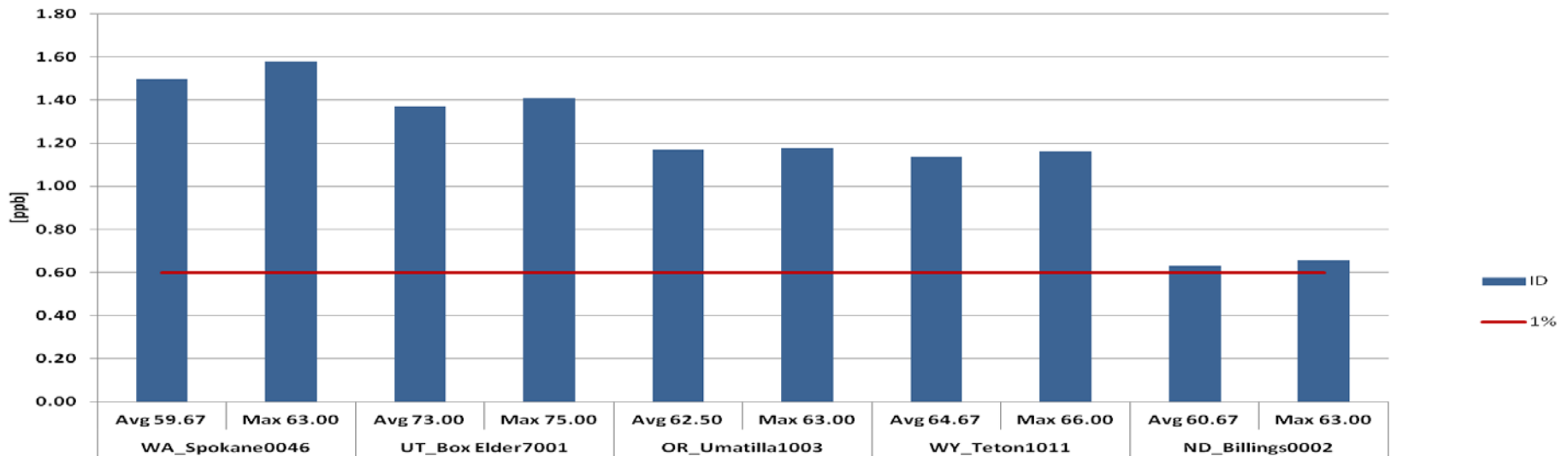


Idaho CSAPR-Type Ozone Analysis for potential 60 ppb NAAQS (from WestJumpAQMS Appendix A)

States' Contributions to Top 5 States Surrounding IDAHO, where DV is at or above 60.0 ppb Threshold

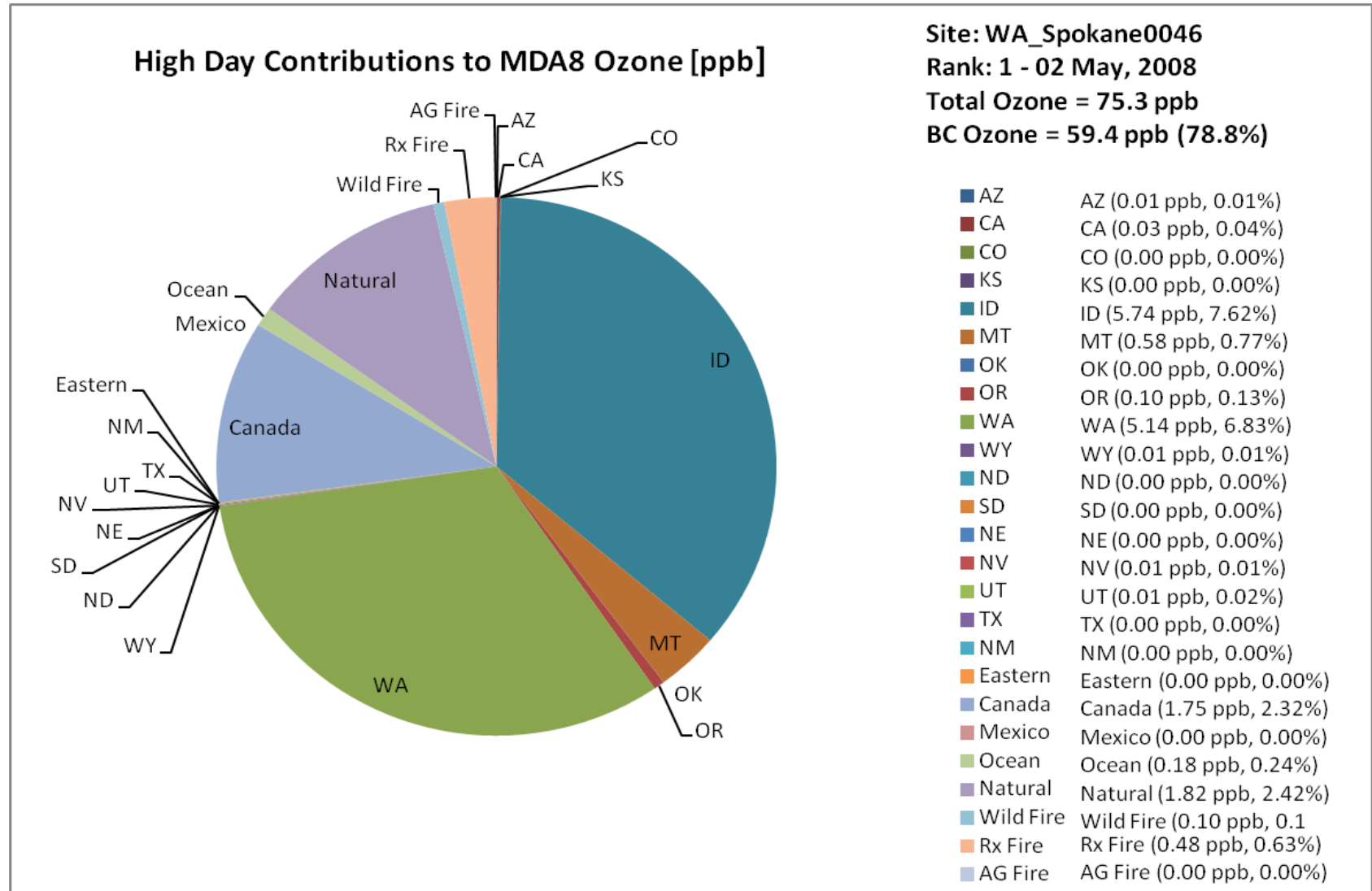


IDAHO's Contributions to Top 5 States Surrounding IDAHO, where DV is at or above 60.0 ppb Threshold



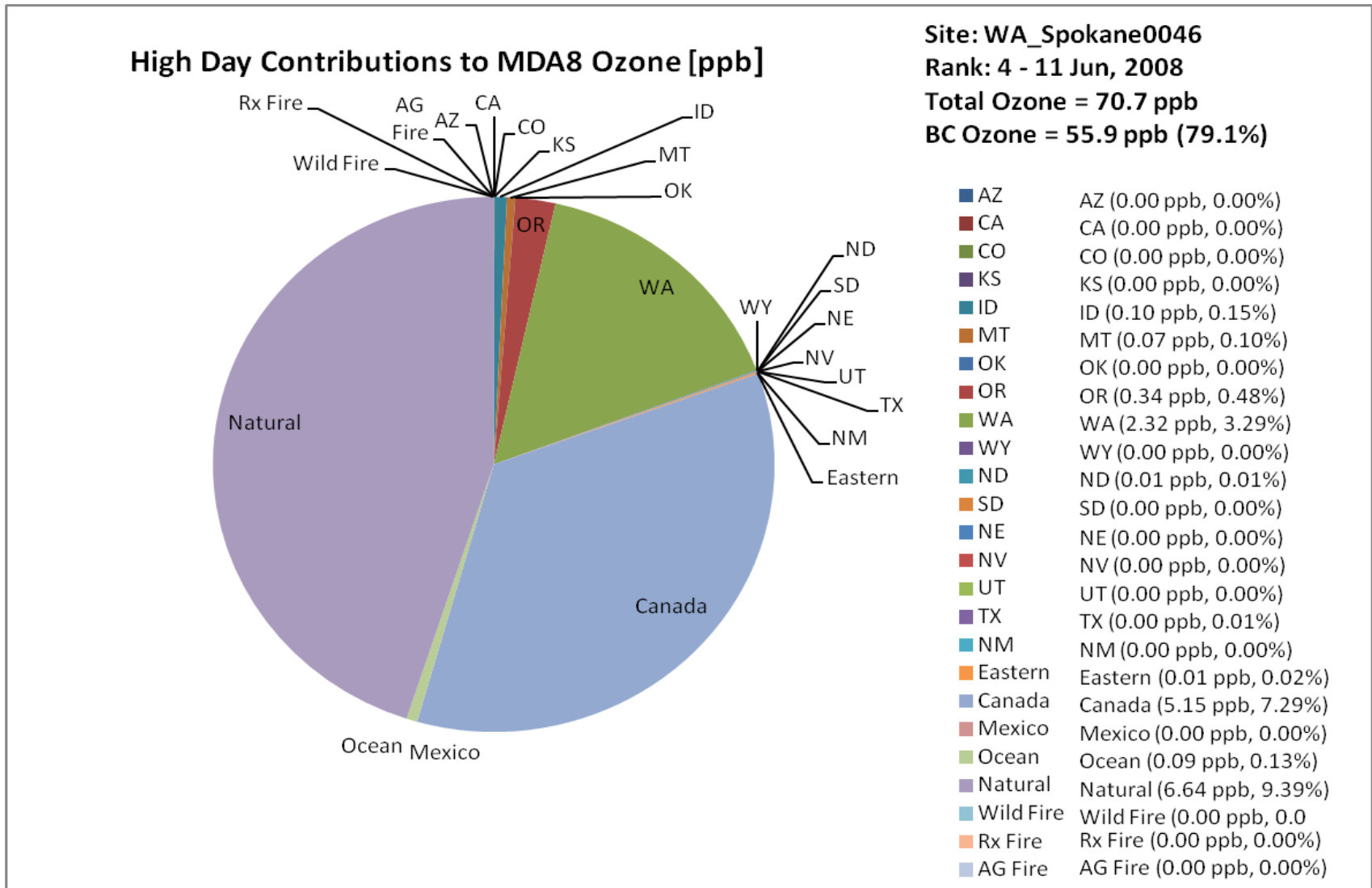
State Contributions to Modeled 10 Highest DMAX8 Ozone Days (from WestJumpAQMS Appendix B)

Highest Modeled DMAX8 Day at Spokane E 9814 Greenbluff Rd. site (53-063-0046)



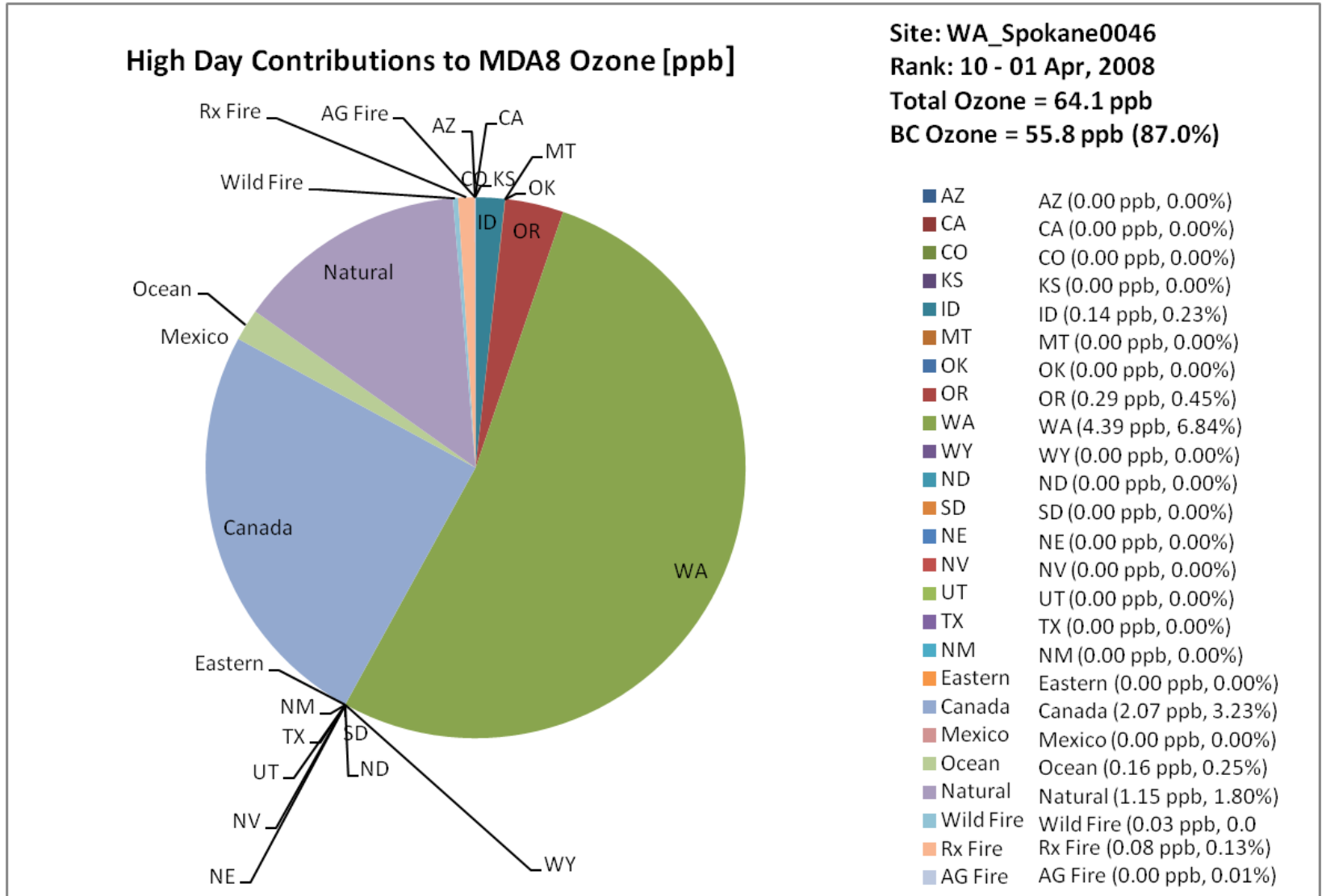
State Contributions to Modeled 10 Highest DMAX8 Ozone Days (from WestJumpAQMS Appendix B)

4th Highest Modeled DMAX8 Day at Spokane E 9814 Greenbluff Rd. site (53-063-0046)



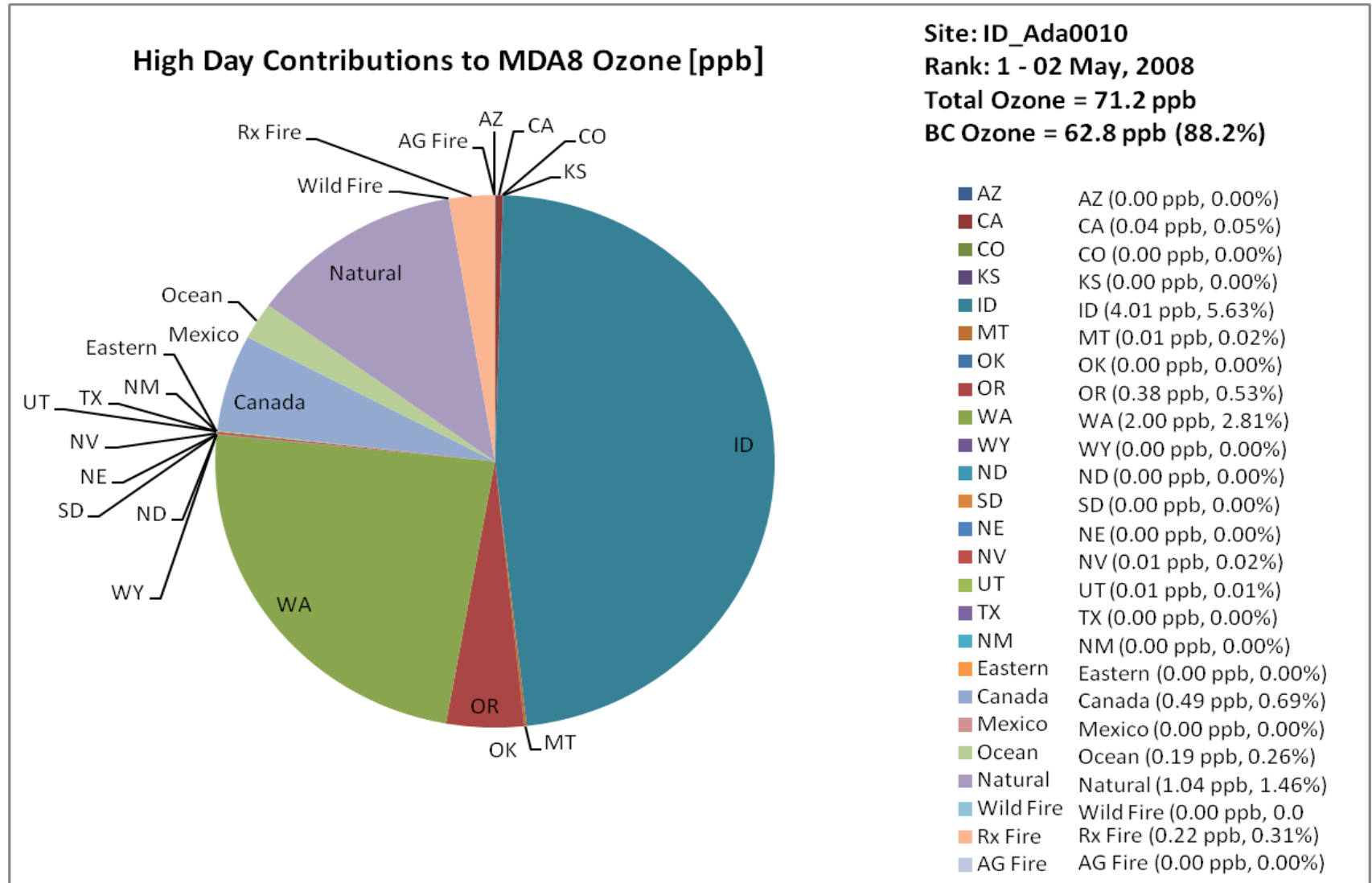
State Contributions to Modeled 10 Highest DMAX8 Ozone Days (from WestJumpAQMS Appendix B)

10th Highest Modeled DMAX8 Day at Spokane E 9814 Greenbluff Rd. site (53-063-0046)



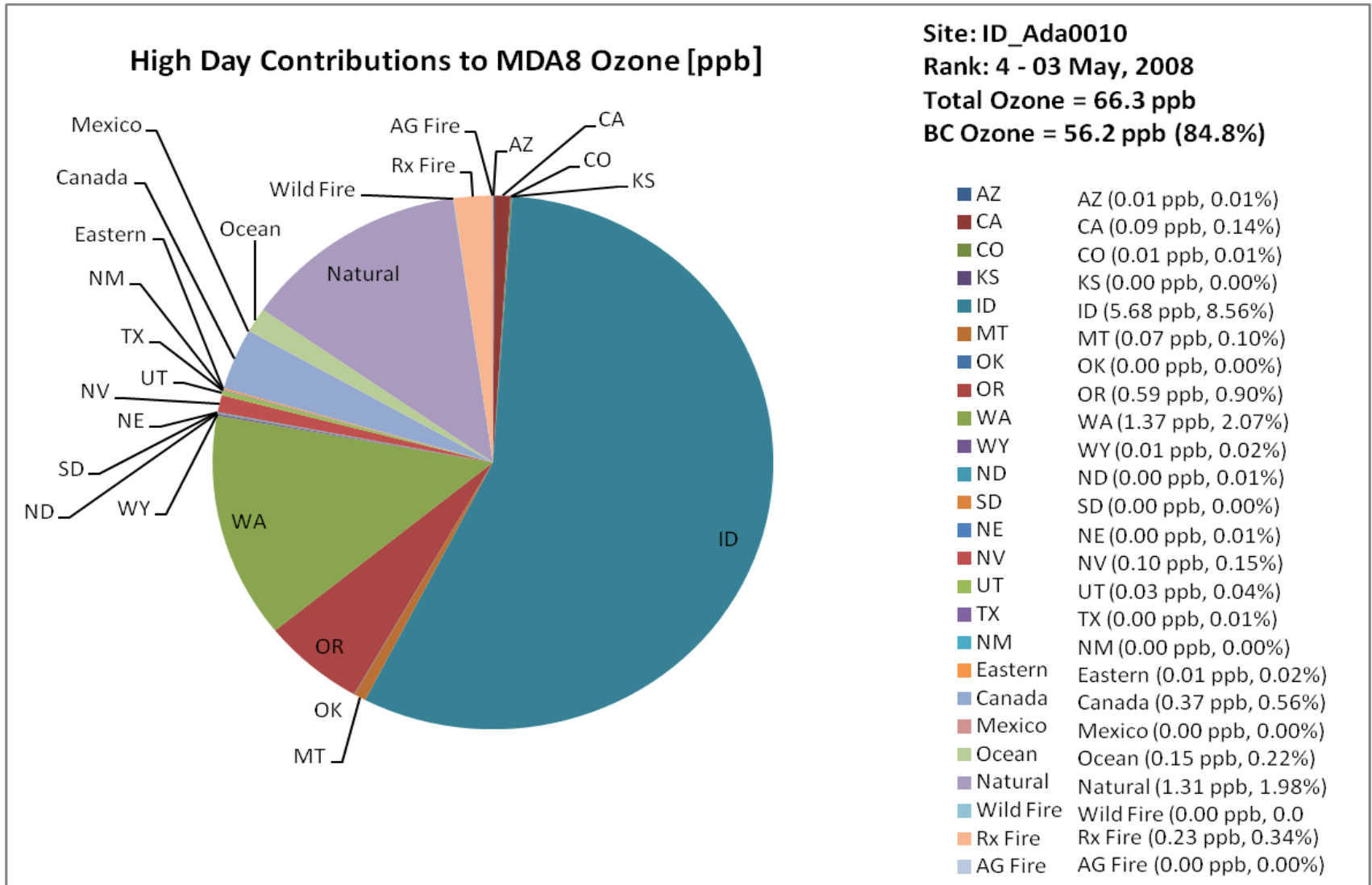
State Contributions to Modeled 10 Highest DMAX8 Ozone Days (from WestJumpAQMS Appendix B)

Highest Modeled DMAX8 Day at Meridian, 520 S. Eagle Road (St. Lukes Site, 16-001-0010)



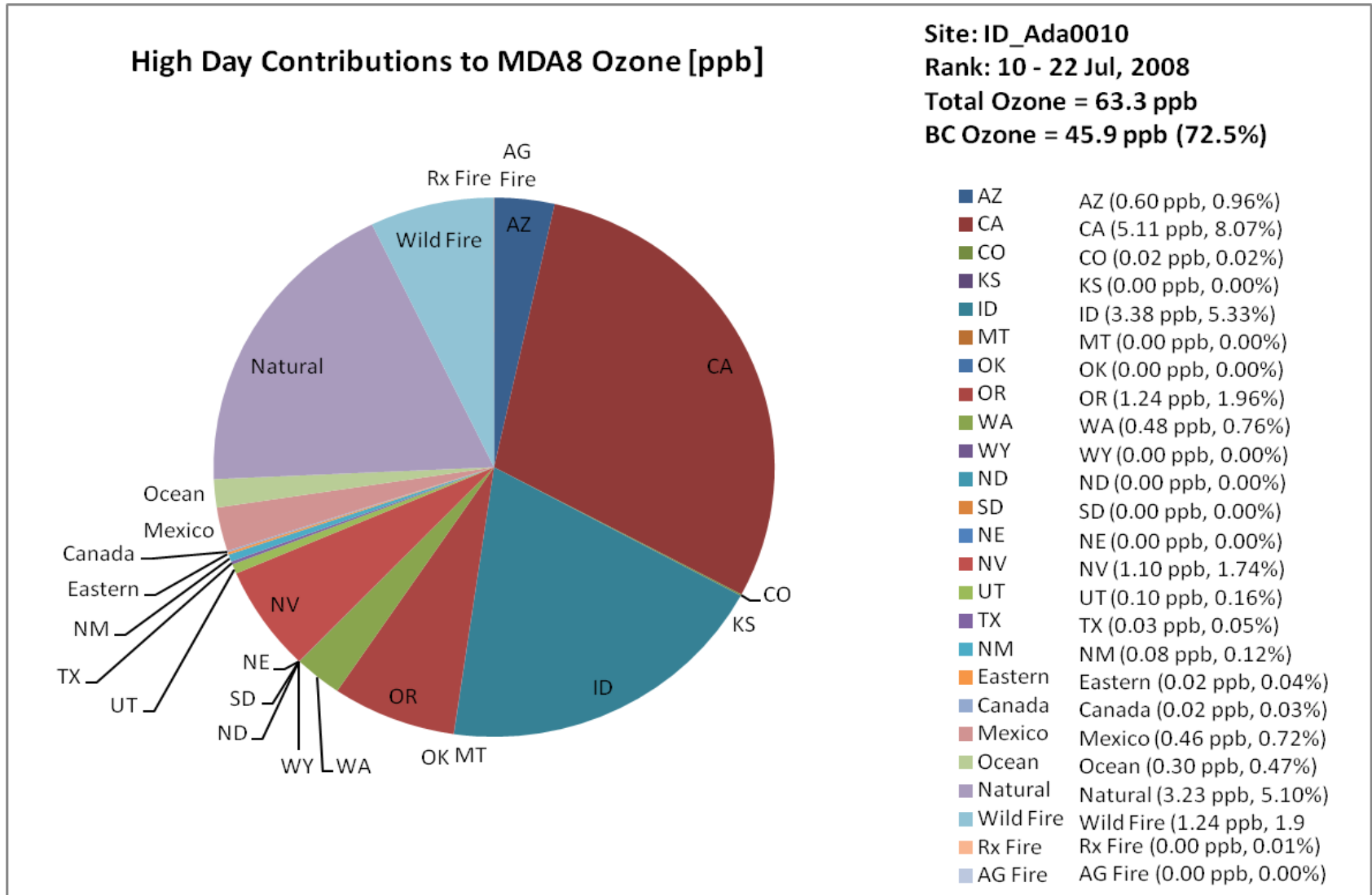
State Contributions to Modeled 10 Highest DMAX8 Ozone Days (from WestJumpAQMS Appendix B)

4th Highest Modeled DMAX8 Day at Meridian, 520 S. Eagle Road (St. Lukes Site, 16-001-0010)



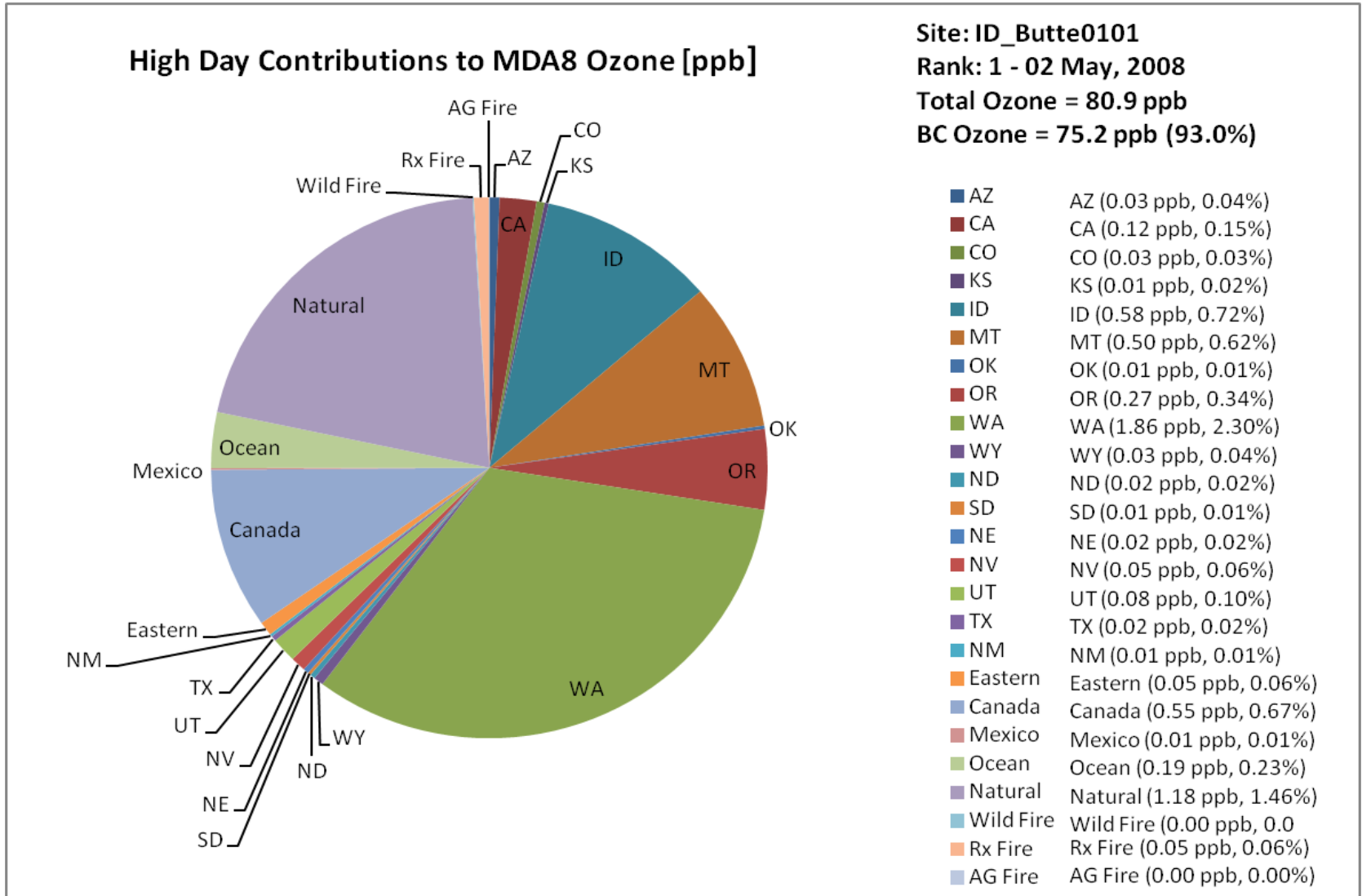
State Contributions to Modeled 10 Highest DMAX8 Ozone Days (from WestJumpAQMS Appendix B)

10th Highest Modeled DMAX8 Day at Meridian, 520 S. Eagle Road (St. Lukes Site, 16-001-0010)



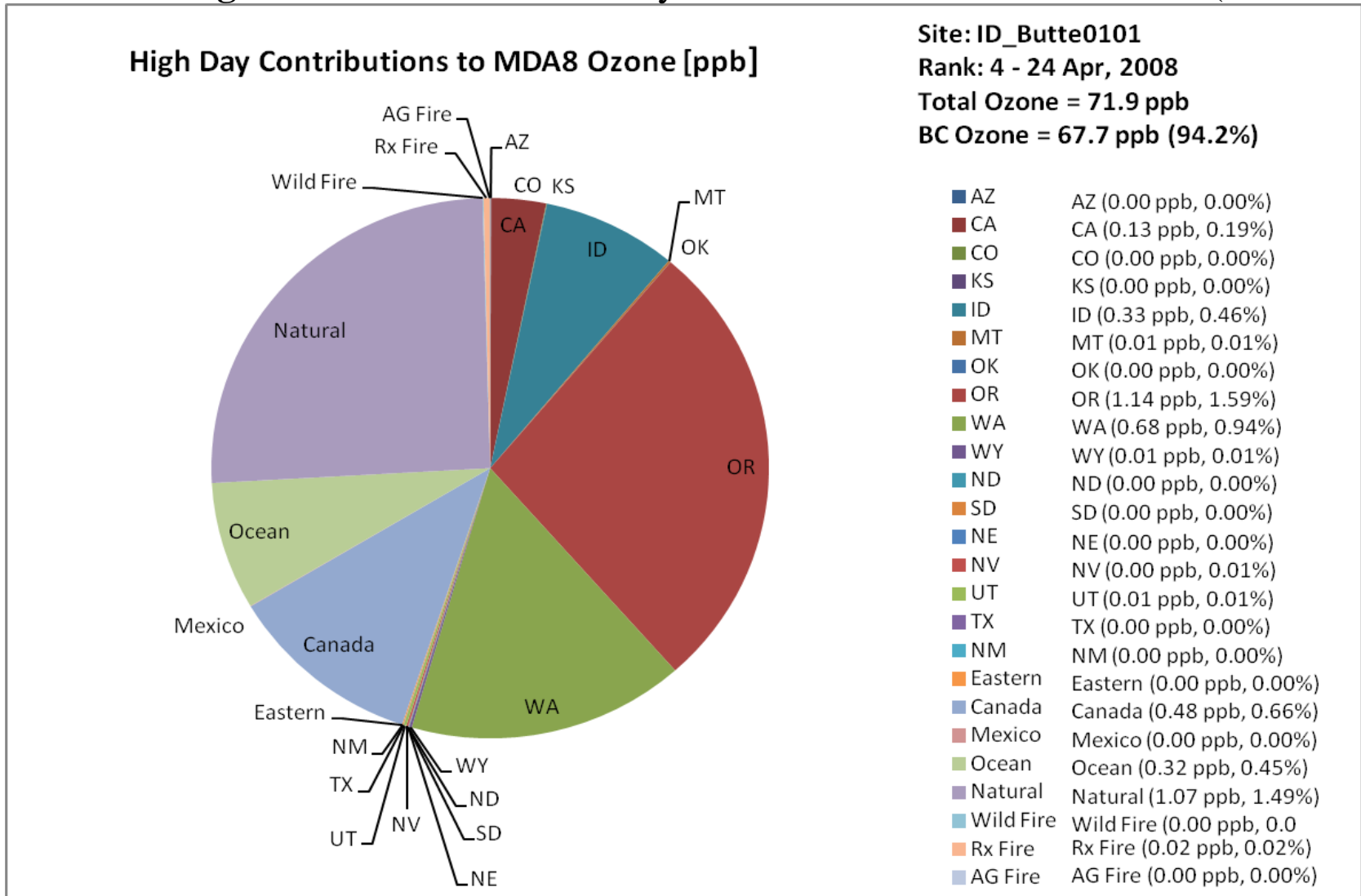
State Contributions to Modeled 10 Highest DMAX8 Ozone Days (from WestJumpAQMS Appendix B)

Highest Modeled DMAX8 Day at Craters Of The Moon NM site (16-023-0101)



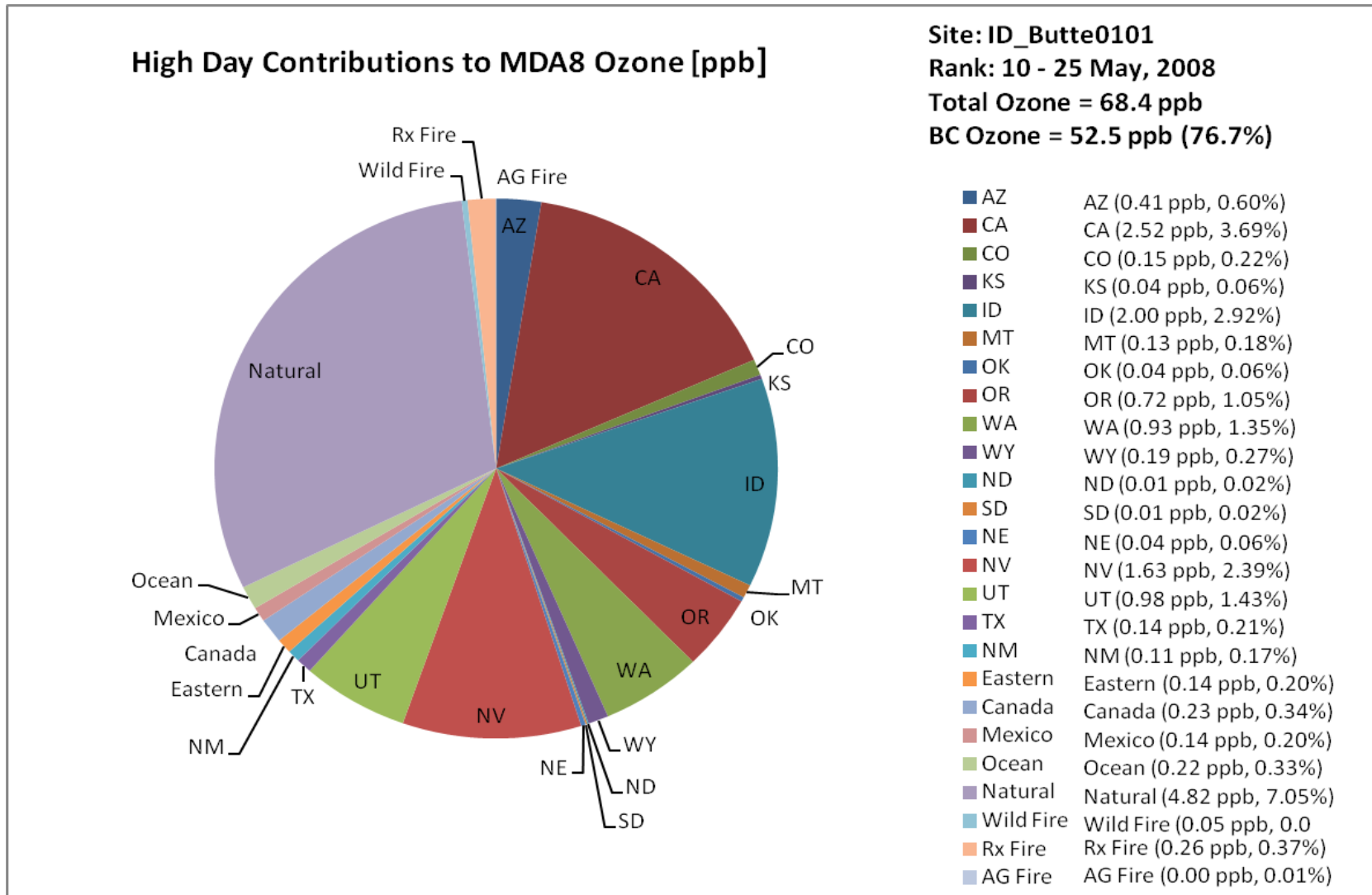
State Contributions to Modeled 10 Highest DMAX8 Ozone Days (from WestJumpAQMS Appendix B)

4th Highest Modeled DMAX8 Day at Craters Of The Moon NM site (16-023-0101)



State Contributions to Modeled 10 Highest DMAX8 Ozone Days (from WestJumpAQMS Appendix B)

10th Highest Modeled DMAX8 Day at Craters Of The Moon NM site (16-023-0101)



Spatial Distribution of State Ozone Contributions

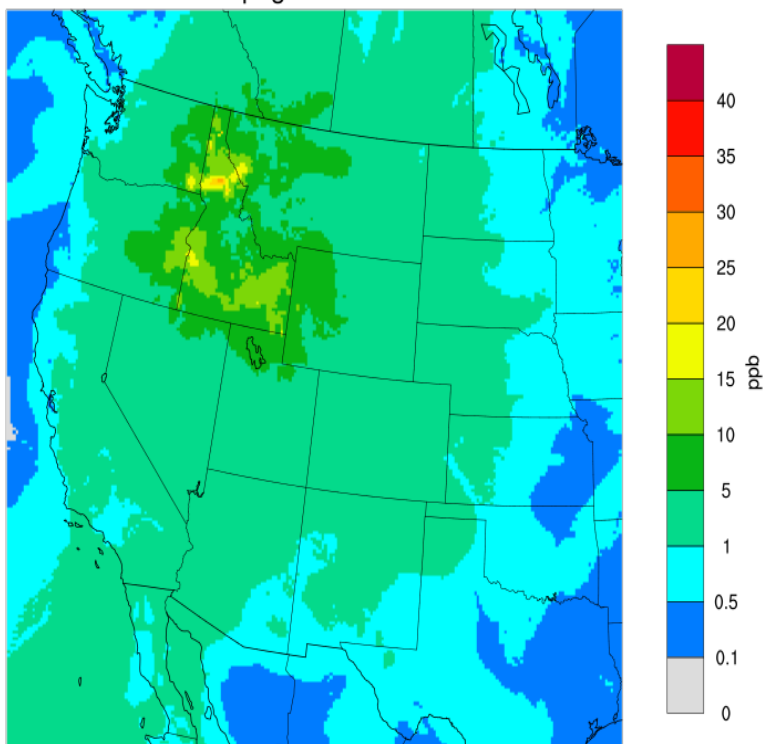
- Spatial distribution of state's ozone contribution to DMAX8 ozone concentrations greater than or equal to:
 - 76 ppb (current NAAQS)
 - 70 ppb; 65 ppb and 60 ppb (potential future NAAQS)
 - 0 ppb (highest contribution in year)
- Two types of metrics:
 1. Maximum modeled contribution to Highest and 4th Highest DMAX8 ozone (from WestJumpAQMS Appendix C)
 2. Attainment Test Unmonitored Areas projection contribution to 8-hour ozone design value (not shown in this presentation)
- Examples for Idaho next:
 - Maximum contribution to highest DMAX8 ever and at 76 ppb (current NAAQS)
 - Maximum contribution to 4th high DMAX8 for 76, 70, 65, and 60 ppb

2008 Idaho 8-Hour Ozone Contribution

from WestJumpAQMS Appendix C

Highest Modeled Contribution

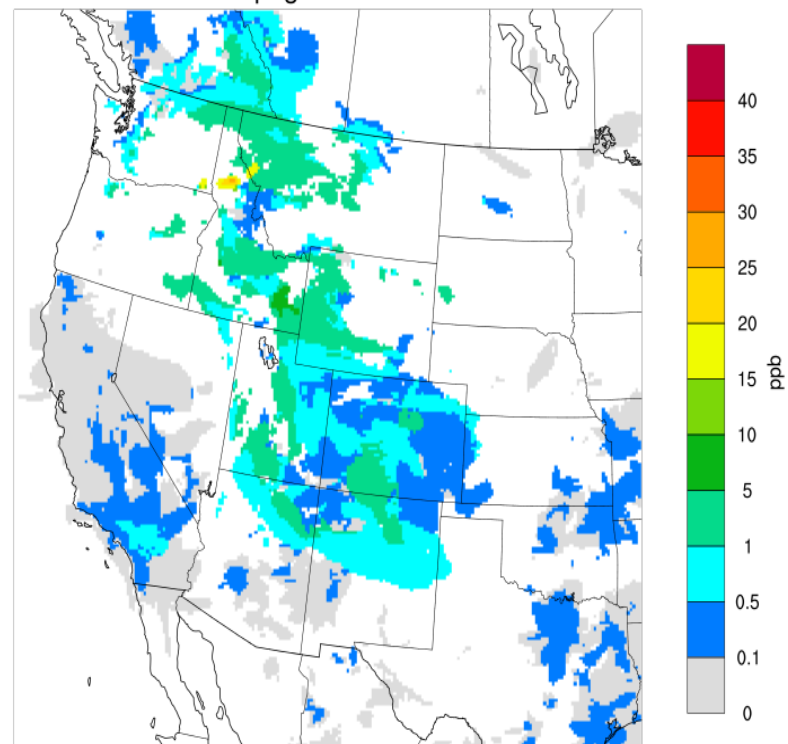
Contrib. to CAMx Daily Max 8-Hour Ozone ≥ 0 ppb
ID Anthropogenic Max Contribution



Max(80,177) = 26.00

Modeled DMAX8 Ozone ≥ 76 ppb

Contrib. to CAMx Daily Max 8-Hour Ozone ≥ 76 ppb
ID Anthropogenic Max Contribution



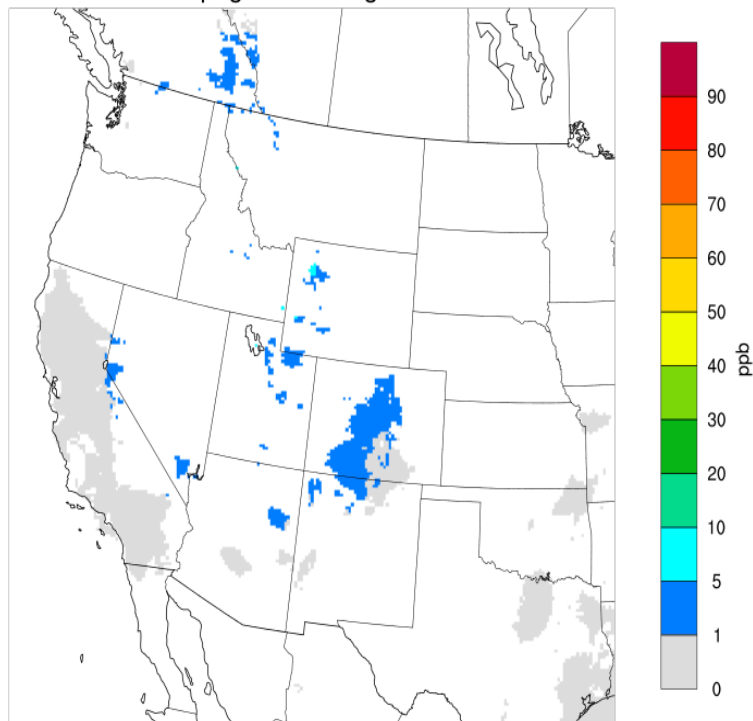
Max(80,177) = 26.00

2008 Idaho Contribution to 4th High DMAX8 Ozone from WestJumpAQMS Appendix C

4th Highest DMAX8 Ozone ≥ 76 ppb

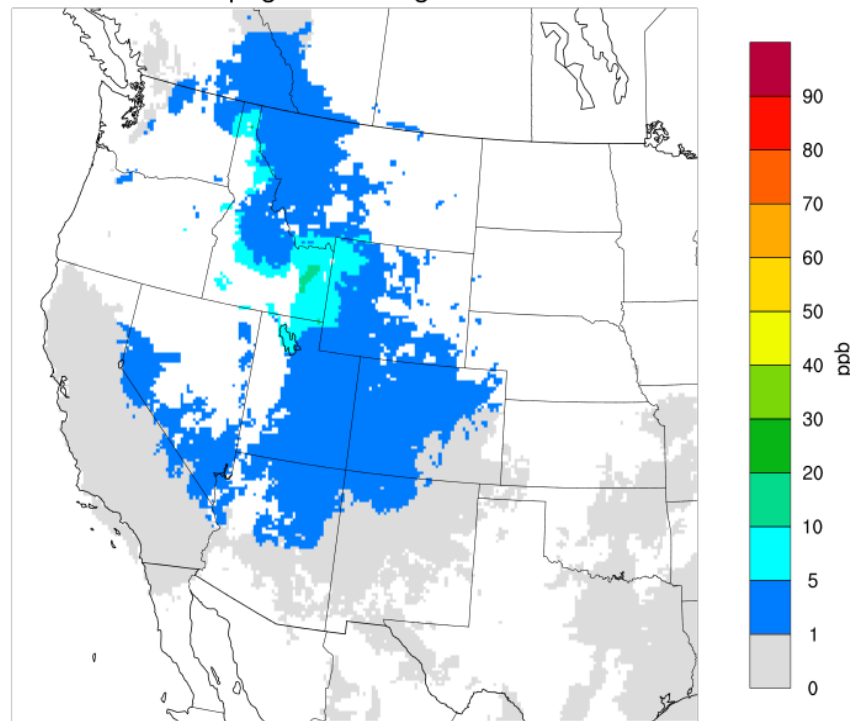
4th Highest DMAX8 Ozone ≥ 70 ppb

Contrib. to CAMx Daily Max 8-Hour Ozone ≥ 76 ppb
ID Anthropogenic 4th Highest Contribution



Max(103,134) = 7.92

Contrib. to CAMx Daily Max 8-Hour Ozone ≥ 70 ppb
ID Anthropogenic 4th Highest Contribution

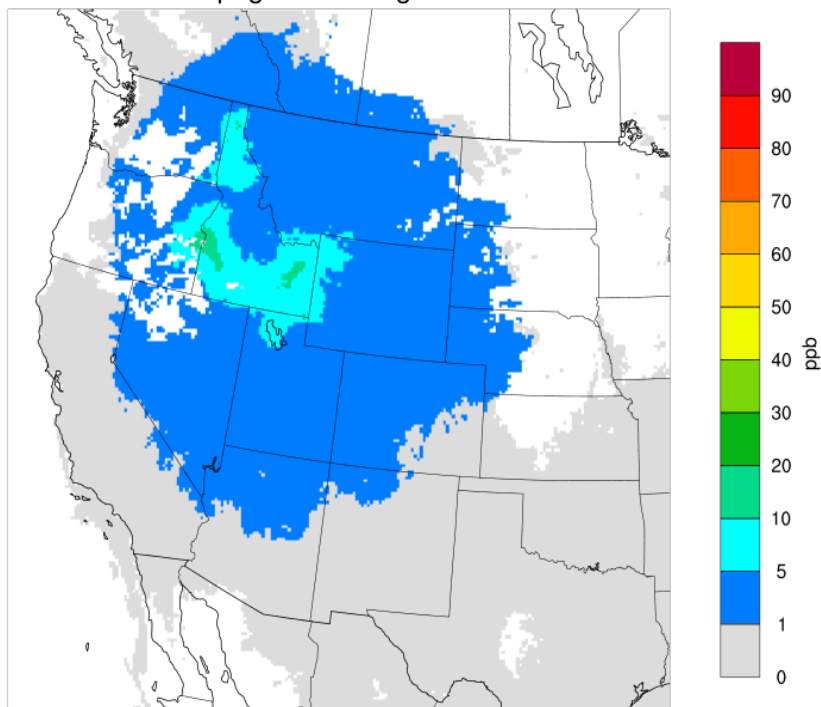


Max(80,192) = 20.53

2008 Idaho Contribution to 4th High DMAX8 Ozone from WestJumpAQMS Appendix C

4th Highest MAX8 Ozone ≥ 65 ppb

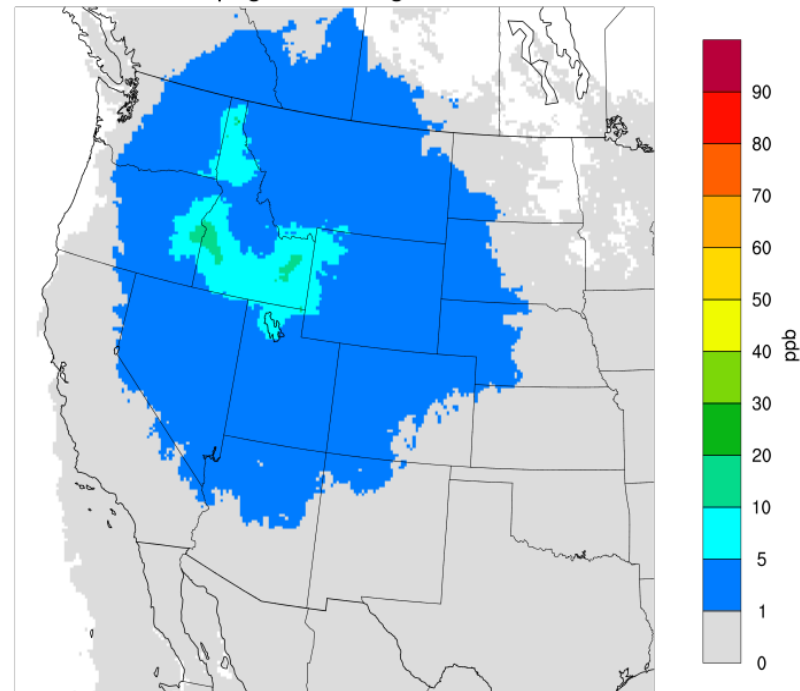
Contrib. to CAMx Daily Max 8-Hour Ozone ≥ 65 ppb
ID Anthropogenic 4th Highest Contribution



Max(80,192) = 20.53

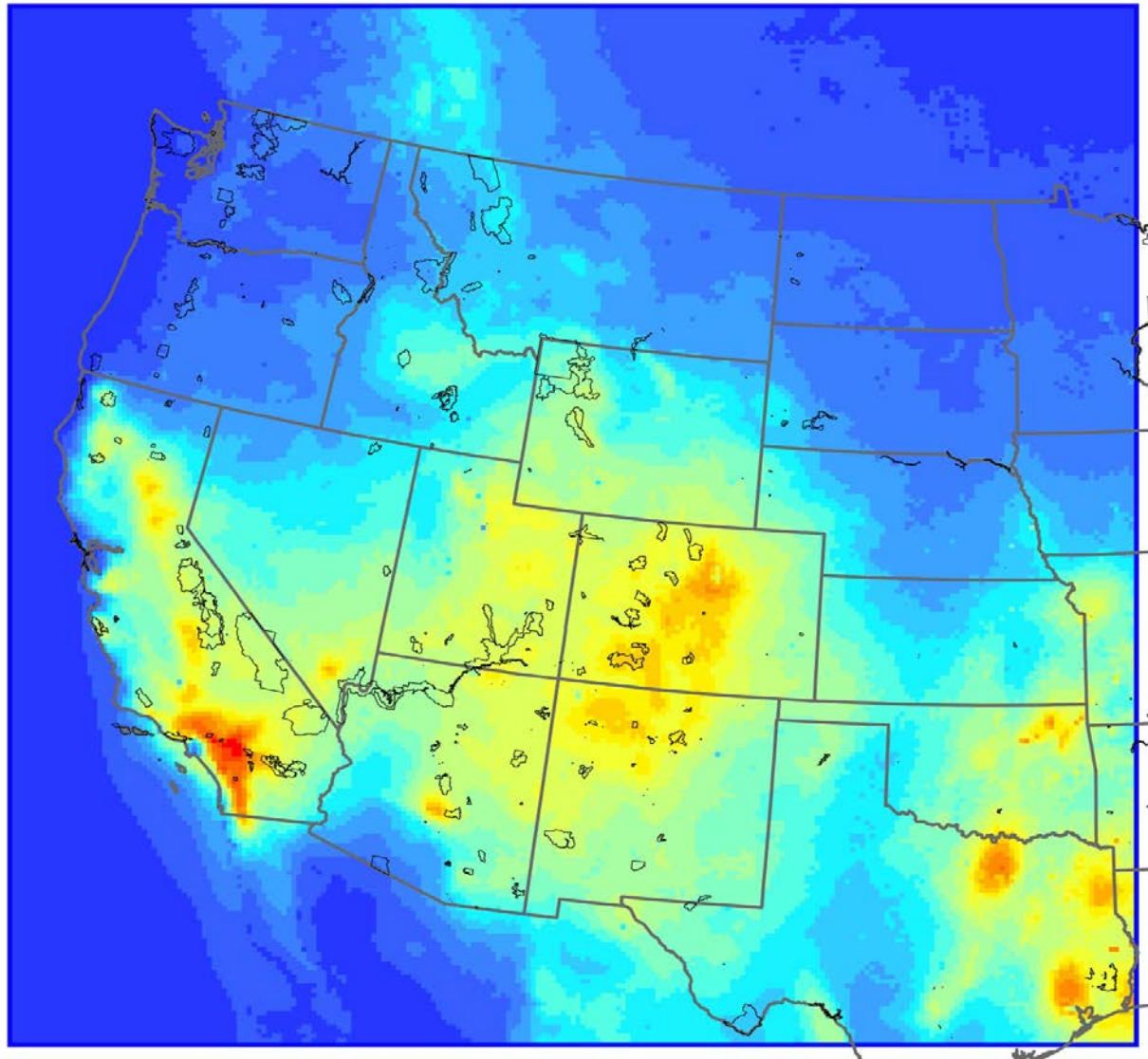
4th Highest DMAX8 Ozone ≥ 60 ppb

Contrib. to CAMx Daily Max 8-Hour Ozone ≥ 60 ppb
ID Anthropogenic 4th Highest Contribution



Max(80,192) = 20.53

WestJumpAQMS Maximum Ozone Season W126 (ppm-hrs)



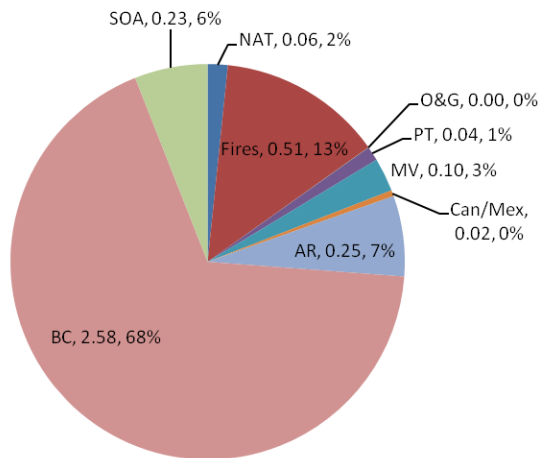
Max W126 (ppm-hrs)

BC_w126



Source Contribution to Annual Average PM2.5 in ug/m3
ID_Custer0002

PM2.5 = 3.80 ug/m3; PM2.5 = 3.80 ug/m3 (100.0%)



Annual Average PM_{2.5} (ug/m³)
Sawtooth NF Ranger Station site (16-037-0002)

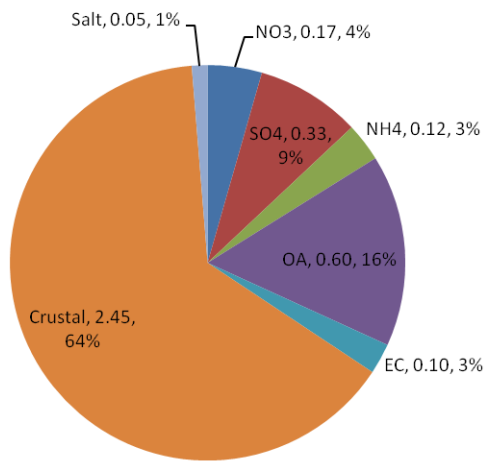
Sources

Composition

Source category
Composition example

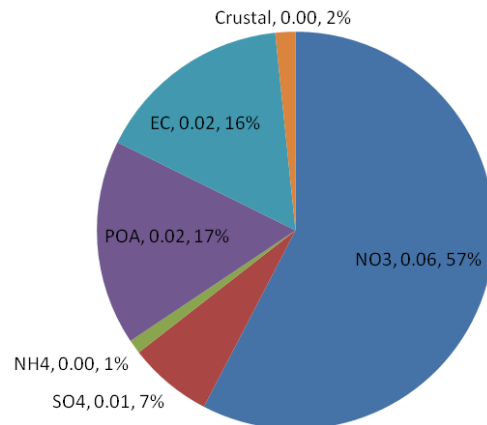
Composition of Annual Average PM2.5 in ug/m3
ID_Custer0002

PM2.5 = 3.80 ug/m3



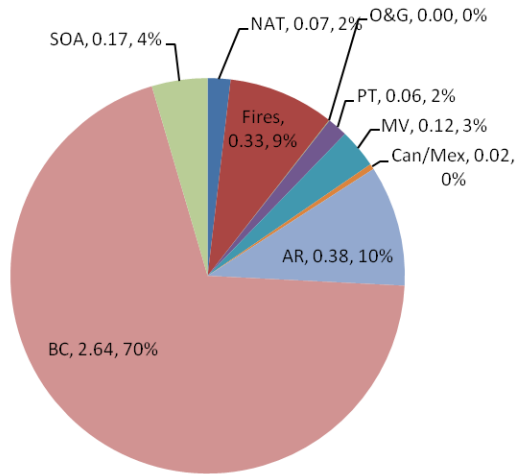
Composition of Annual PM2.5 from Mobile in ug/m3
ID_Custer0002

PM2.5 = 3.80 ug/m3; Mobile = 0.10 ug/m3 (2.8%)



**Source Contribution to Annual Average PM2.5 in ug/m3
ID_Butte0101**

PM2.5 = 3.79 ug/m3; PM2.5 = 3.79 ug/m3 (100.0%)



**Annual Average PM_{2.5} (µg/m³)
Craters Of The Moon NM site (16-023-0101)**

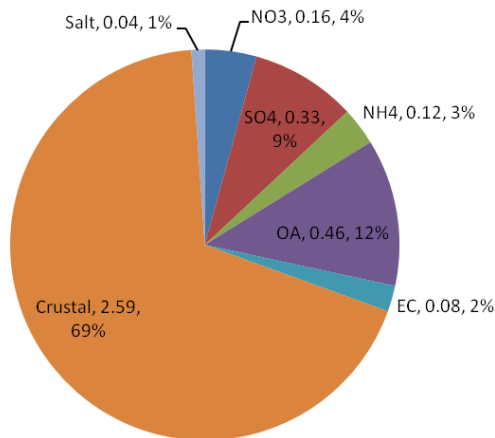
Sources

Composition

Source category
Composition example

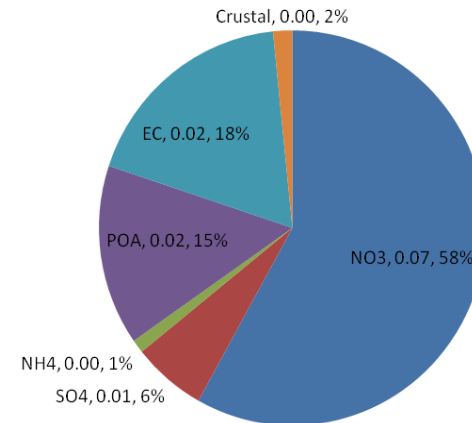
**Composition of Annual Average PM2.5 in ug/m3
ID_Butte0101**

PM2.5 = 3.79 ug/m3



**Composition of Annual PM2.5 from Mobile in ug/m3
ID_Butte0101**

PM2.5 = 3.79 ug/m3; Mobile = 0.12 ug/m3 (3.2%)



WestJumpAQMS Benefited From

- WRAP Regional Modeling Center (2002 Platform)
- Four Corners Air Quality Task Force (2005 Platform)
- Continental Divide-Creston EIS (2005/2006 Platform)
 - NEPA O&G EIS using PGM for far-field AQ/AQRV
- Denver Ozone SIP Modeling and Follow-On
- 2008 National Emissions Inventory (2008 NEIv2.0)
 - Cornerstone to 2008 emissions
- WRAP Phase III O&G Emissions Study
 - Projected to 2008 plus add Permian Basin
- WESTAR-funded MEGAN Biogenic Emissions Enhancement Study
- DEASCO₃ 2008 Fire Emissions

Benefited from WestJumpAQMS

- Colorado Air Resource Management Study (CARMMS)
 - 2008 4 km Modeling Platform
- Deterministic & Empirical Assessment of Smoke's Contribution to Ozone (DEASCO₃)
 - 2008 36/12 km Modeling Platform
- PMDETAIL -- Smoke contributions to PM
 - 2011 36/12 km Modeling Platform
- Western Air Quality Data Warehouse (WAQDW) and Three-State Air Quality Study (3SAQS)
 - 2008, 2011, 2014 36/12/4 km Modeling Platform; database for DW
- Additional Follow-On Studies
 - NPS, BLM, states, locals, etc.



Thanks –

Tom Moore, WRAP Air Quality Program Manager
Western States Air Resources Council (WESTAR)

e: tmoore@westar.org | o: 970.491.8837

Western Regional Air Partnership | www.wrapair2.org



extra slides

Fire Impacts – introduction to analysis tools

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
 - FLM Joint Fire Science Program projects enable continuing operation of WRAP's Fire Emissions Tracking System (<http://www.wrapfets.org/>)
 - 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

Fire's Effects on Elevated Regional Ozone & PM

Deterministic & Empirical Assessment of Smoke's Contribution to Ozone (DEASCO₃) – completed Summer 2013

and leveraged companion study underway:

Prescribed and Other Fire Emissions: Particulate Matter Deterministic & Empirical Tagging & Assessment of Impacts on Levels (PMDETAIL)

Funding for both from FLM Joint Fire Sciences Program

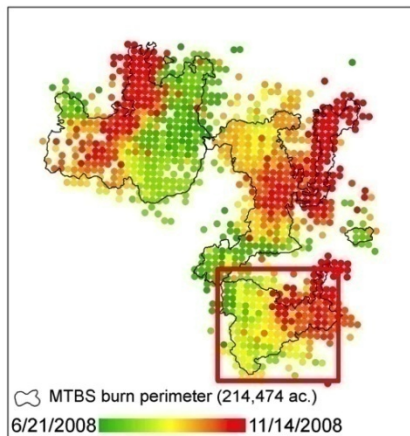
Both projects, analysis toolbox / data, and FETS access at:
<http://wraptools.org/>

New proposal to be funded early 2015 by JFSP :

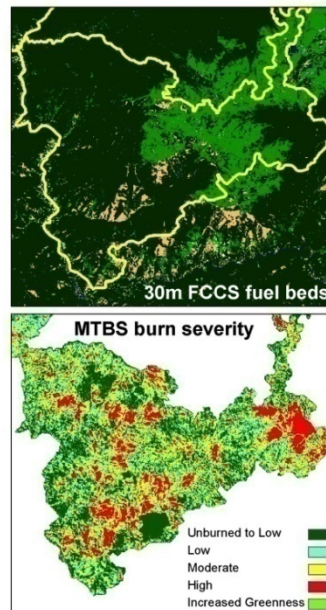
Contribution of Smoke Emissions to Secondary Organic Aerosols (SOA): Read-World Evaluation of Fire SOA Emissions Factors from Fires in a Data Management System (REFERS-DMS)

Smoke and Emissions Inventory Research

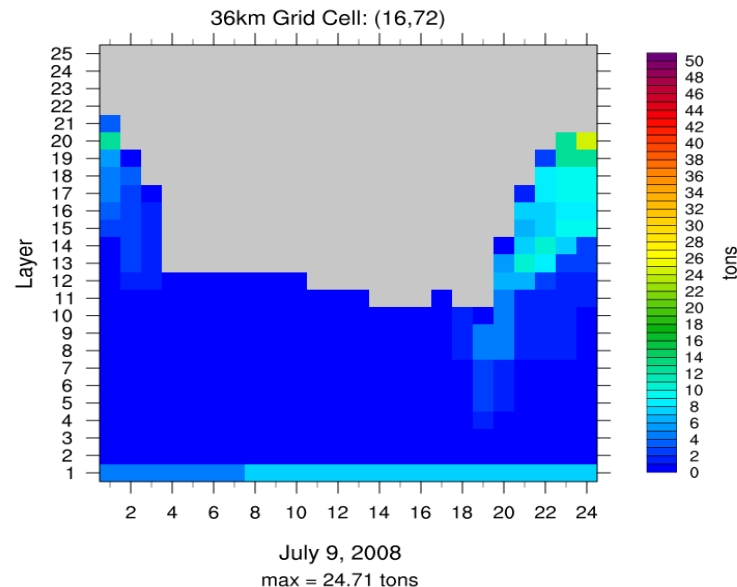
Source: [WRAP Fire Tools](#)



- Acres constrained by perimeter
- Daily growth & composite fuel loading
- Consumption scaled by severity



DEASCO3 NOx Fire Emissions



Smoke and Populations

Federal Land Manager Database (FED) Sign In | Register

Home | Summaries | Data | Metadata | Resources

Search:

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

Glacier National Park

FED Home Page status | Printer friendly view | Contact us

Federal Land Manager Environmental Database (FED)

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

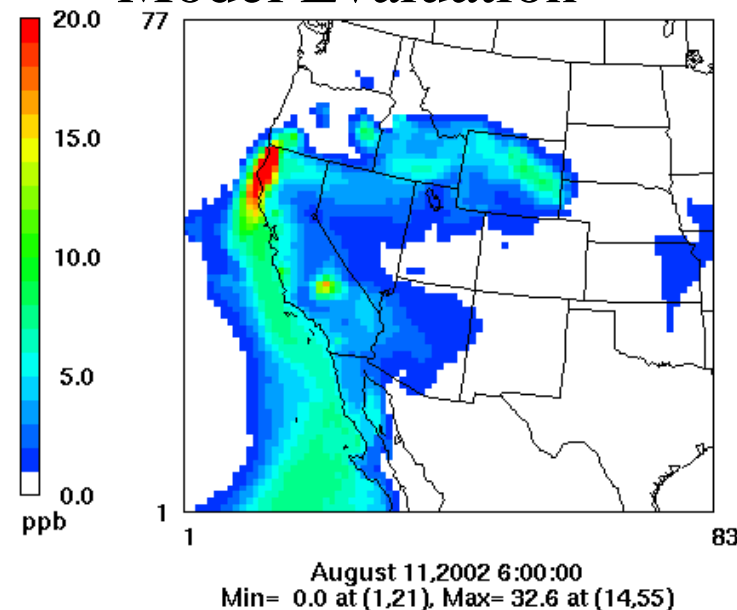
AQRV Summaries
View graphical summaries and reports of the status and trends of air-quality-related values (AQRVs) and other metrics that have been chosen by Federal Land Managers (FLMs) for assessing air quality in protected federal areas.

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

Featured Substance
Ammonium sulfate

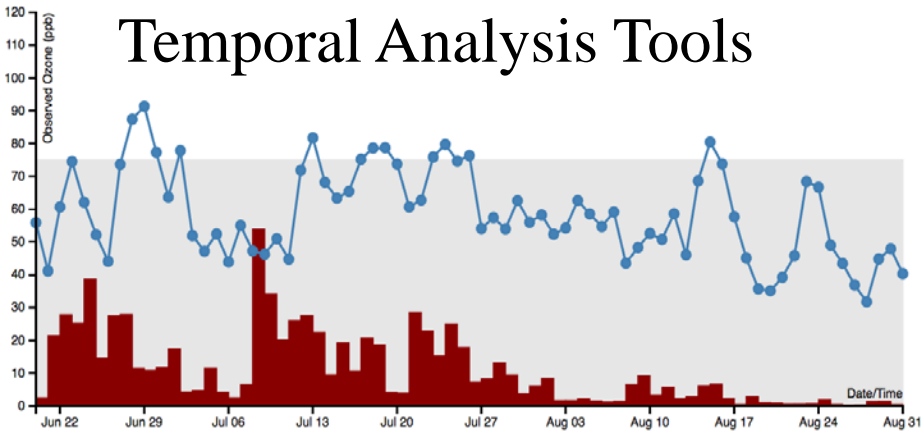
Name:	Ammonium sulfate
FormulaHTML:	H ₄ N ₂ O ₆ S
CASNum:	7783-20-2
ACXNumber:	X1002153-5
Density:	1.769
Comments:	colorless crystals or white granular powder
MolecularWeight:	132.1342
MeltingPoint:	280
WaterSolubility:	soluble

Fire and Smoke Model Evaluation

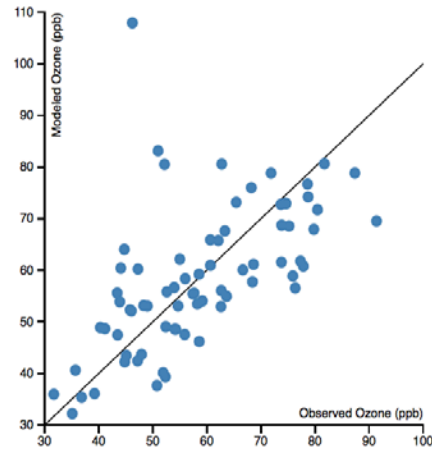


Observed Ozone paired with modeled max 8-hour fire contribution 06/20/2008 to 08/31/2008
Shasta County, CA - 06_089_0007

Temporal Analysis Tools

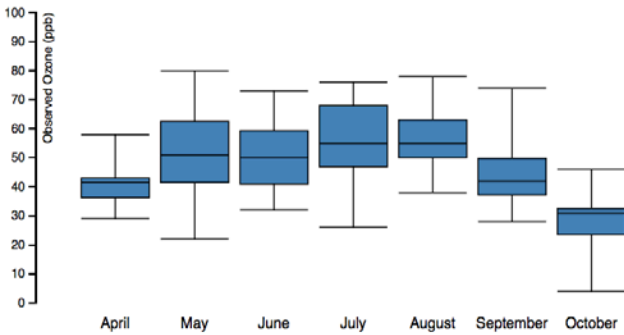


Max 8-hour Ozone, Observed vs. Modeled, 06/20/2008 to 08/31/2008
Shasta County, CA - 06_089_0007



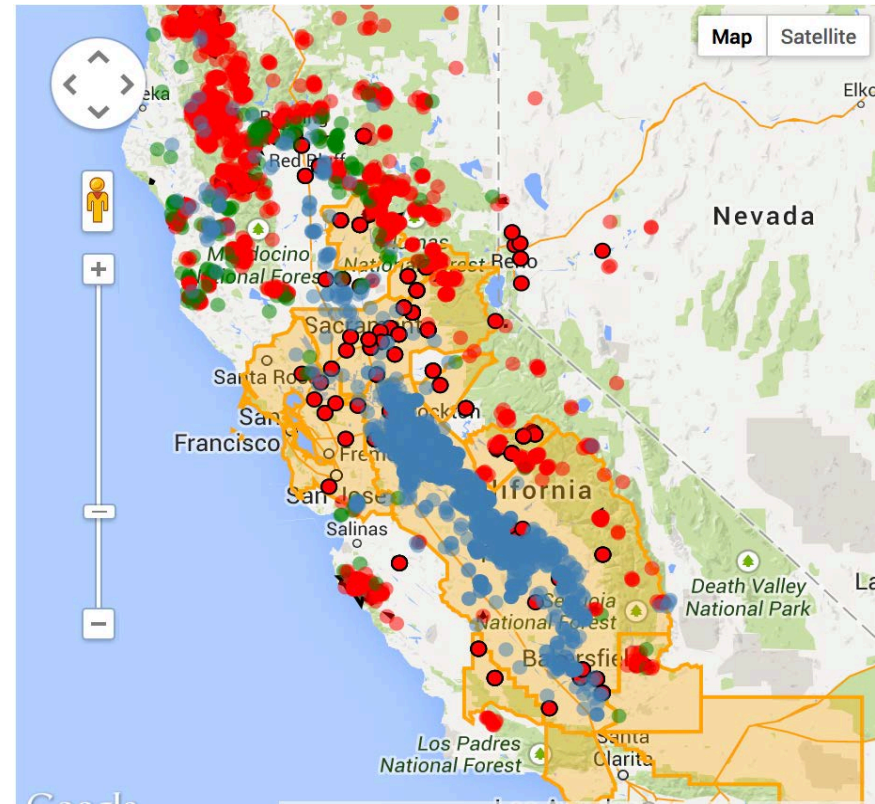
Model Evaluation

Observed Ozone by Month, 04/01/2007 to 10/31/2007
Shasta County, CA - 060890007



Inter-annual Observational Analysis

Fire Contributions to AQ Impacts



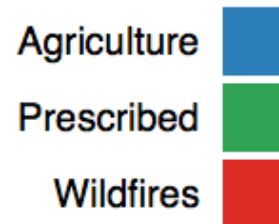
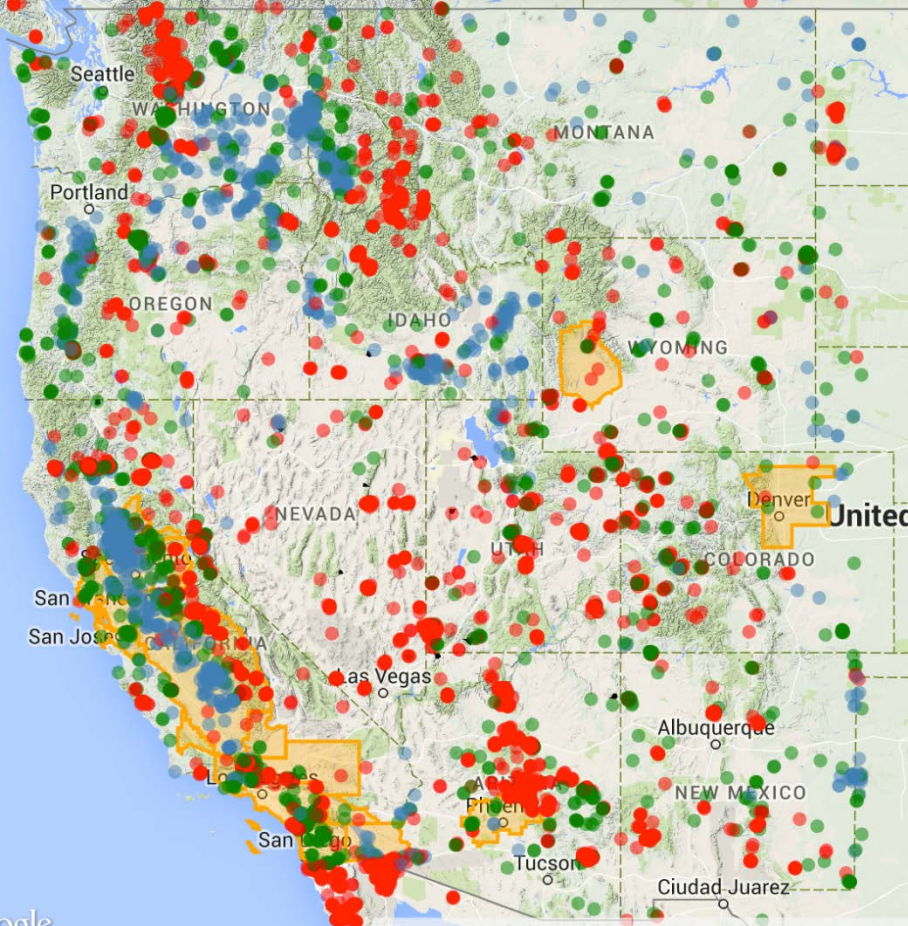
Source: [WRAP Fire Tools](#)

2004

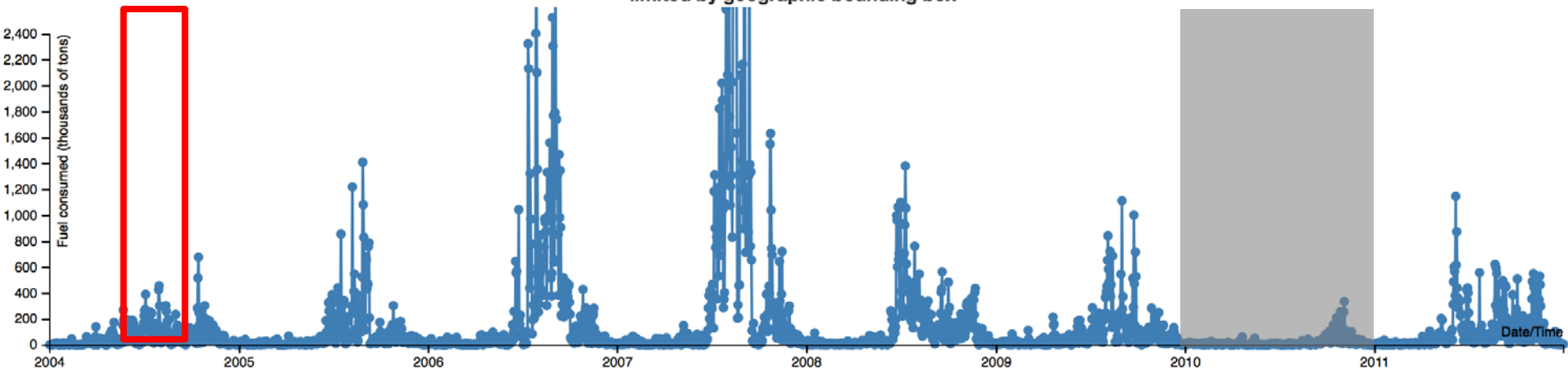
6/21 – 9/21

Limited by bounding box

Source: [WRAP Fire Tools](#)



FETS estimated fuel consumed for all fire types 01/01/2004 to 12/31/2011
limited by geographic bounding box

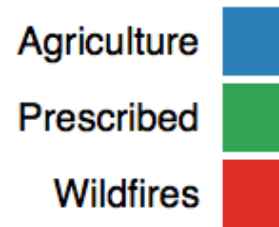
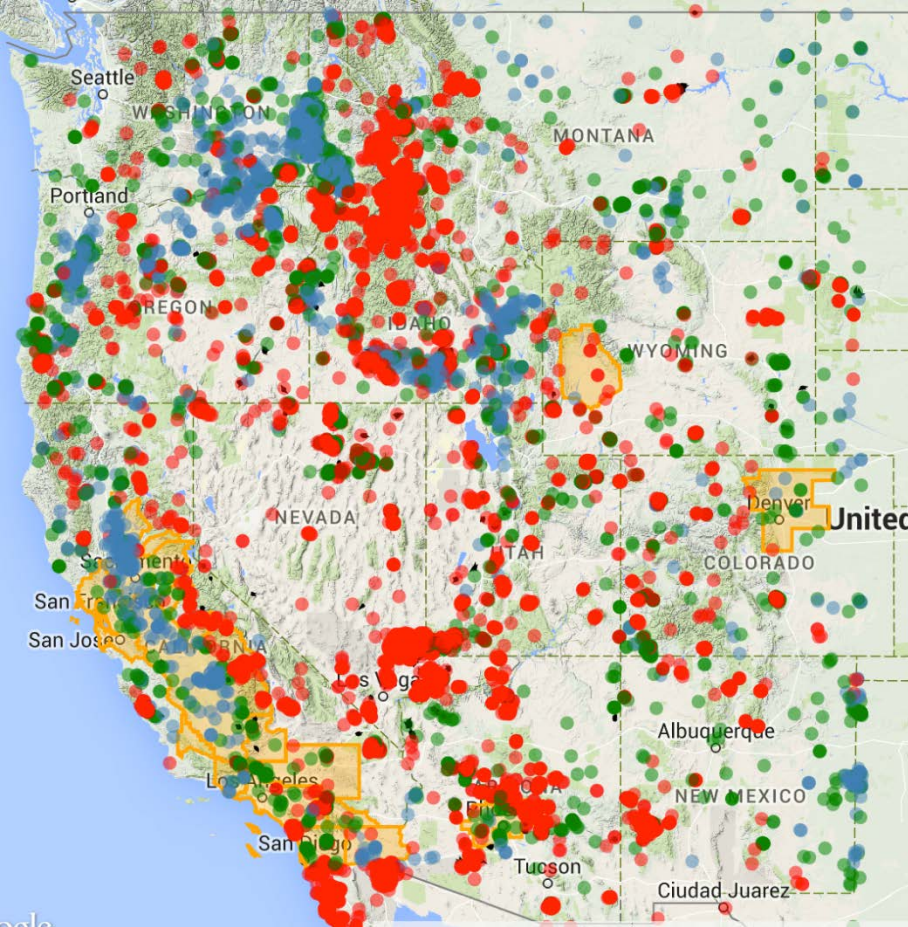


2005

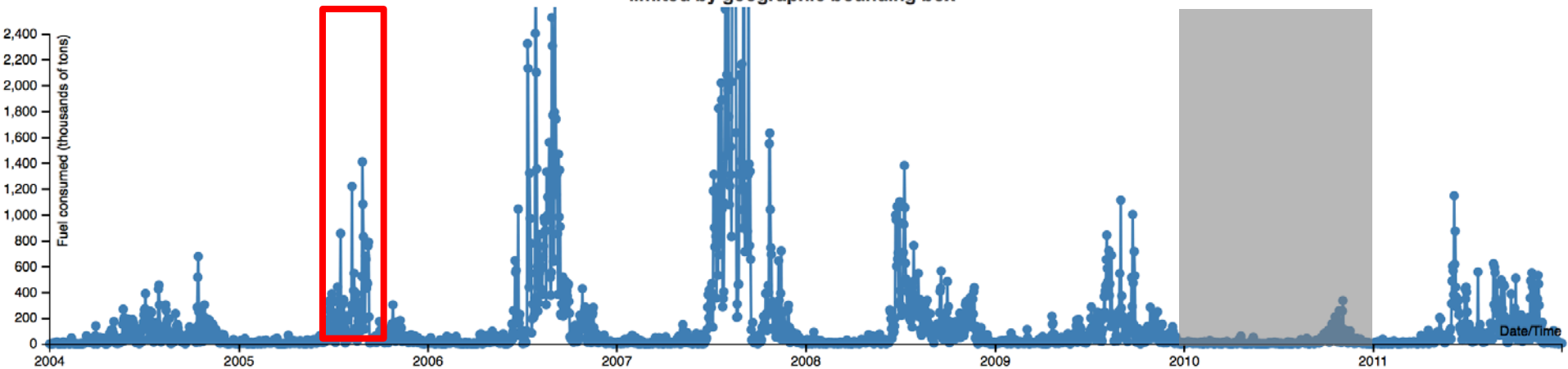
6/21 – 9/21

Limited by bounding box

Source: [WRAP Fire Tools](#)



FETS estimated fuel consumed for all fire types 01/01/2004 to 12/31/2011
limited by geographic bounding box

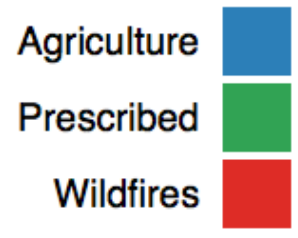
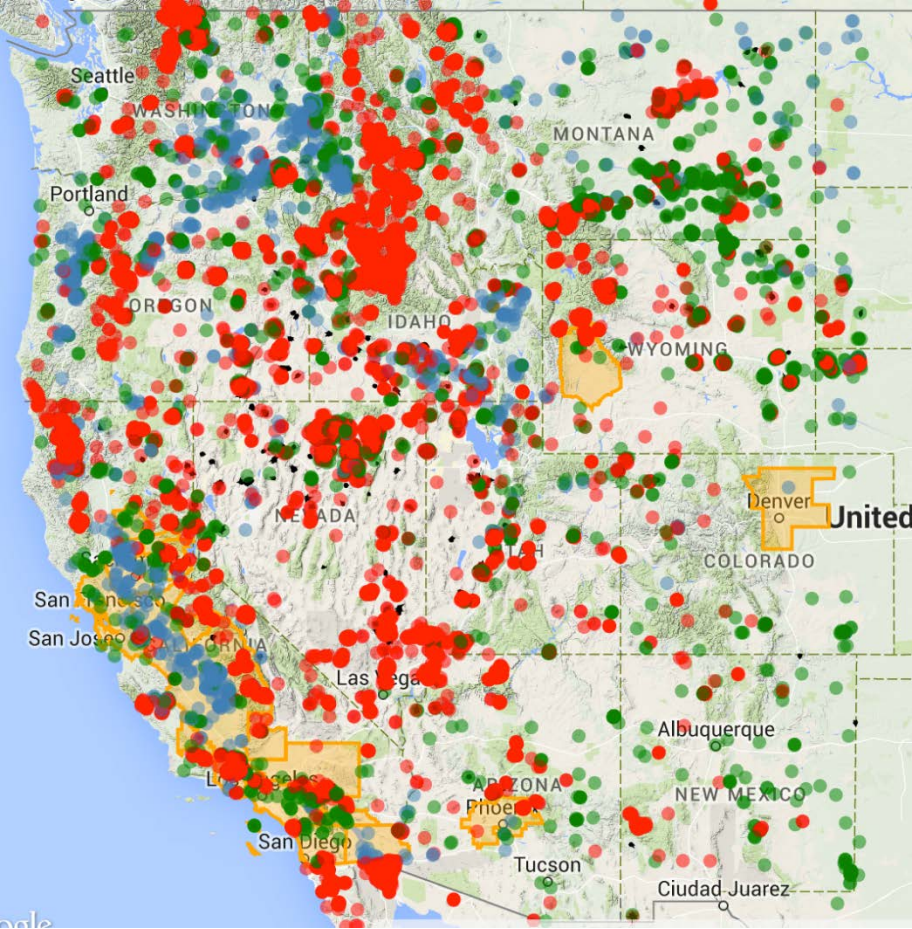


2006

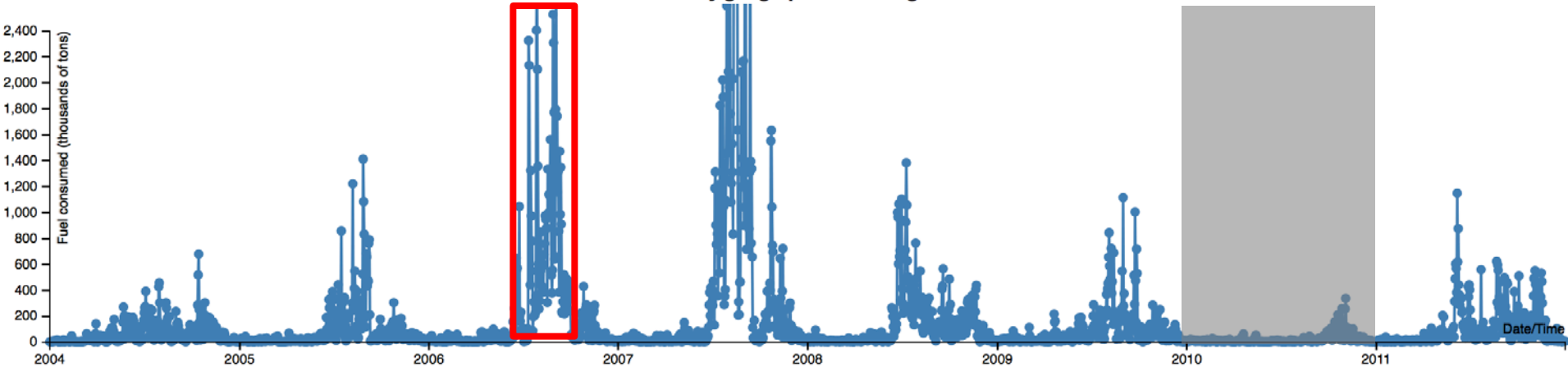
6/21 – 9/21

Limited by bounding box

Source: [WRAP Fire Tools](#)



FETS estimated fuel consumed for all fire types 01/01/2004 to 12/31/2011 limited by geographic bounding box

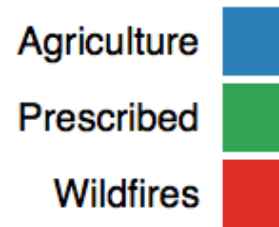
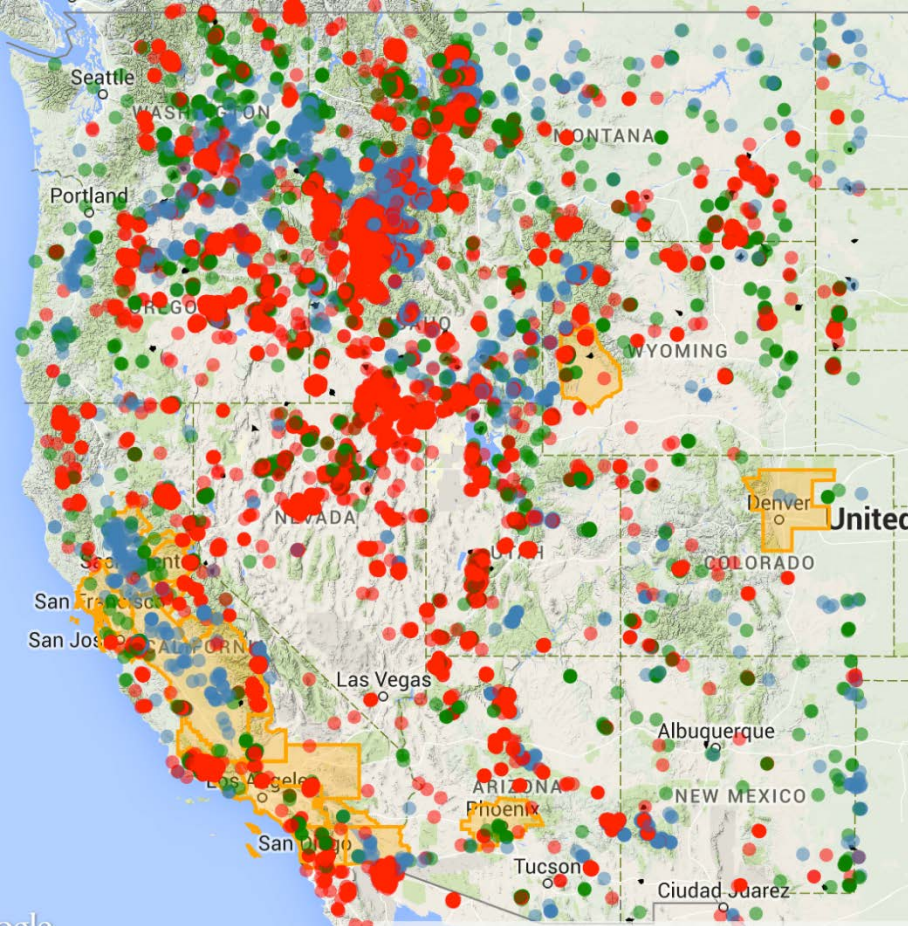


2007

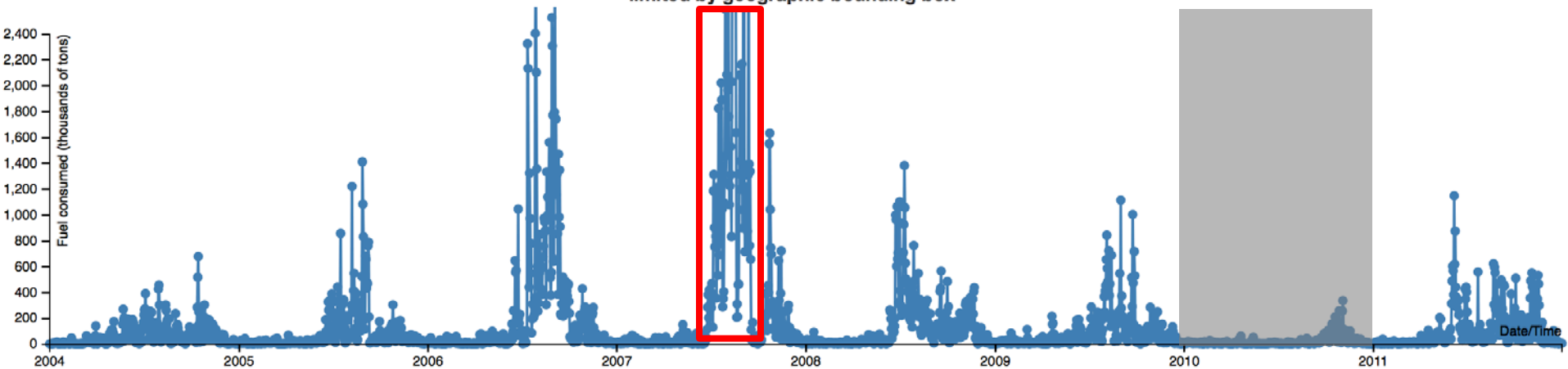
6/21 – 9/21

Limited by bounding box

Source: [WRAP Fire Tools](#)



FETS estimated fuel consumed for all fire types 01/01/2004 to 12/31/2011
limited by geographic bounding box

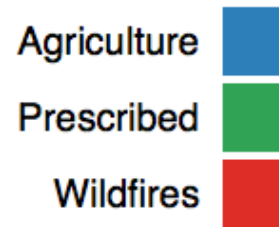
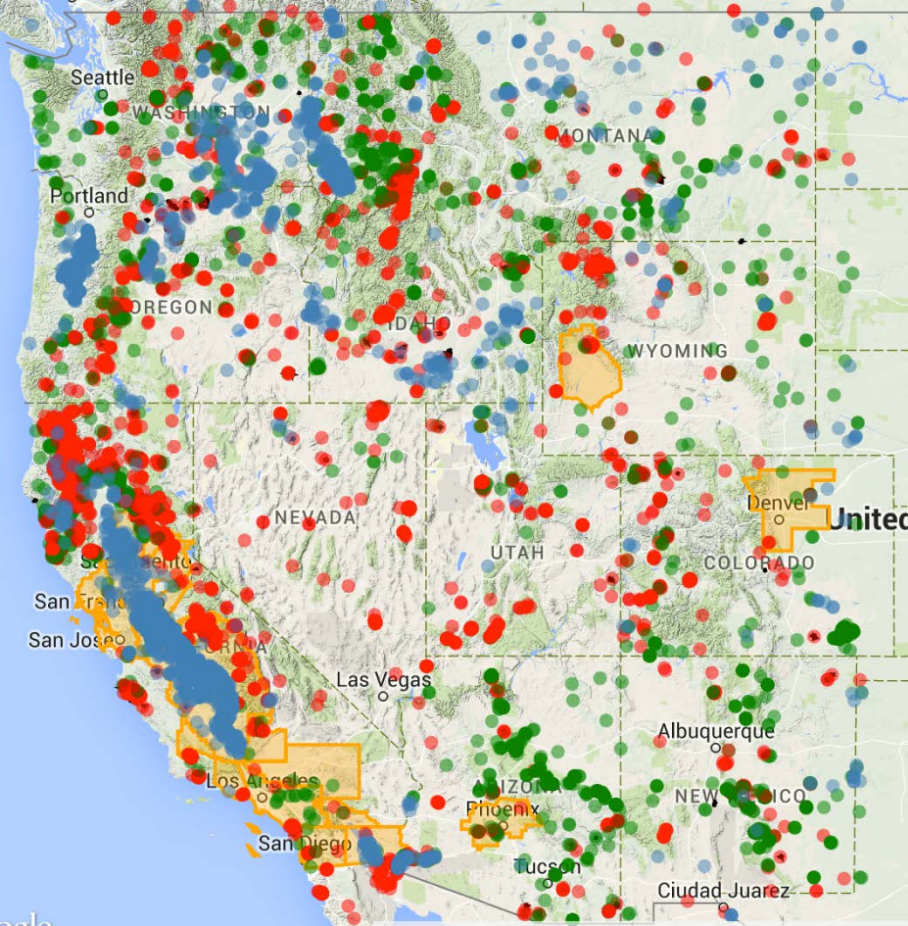


2008

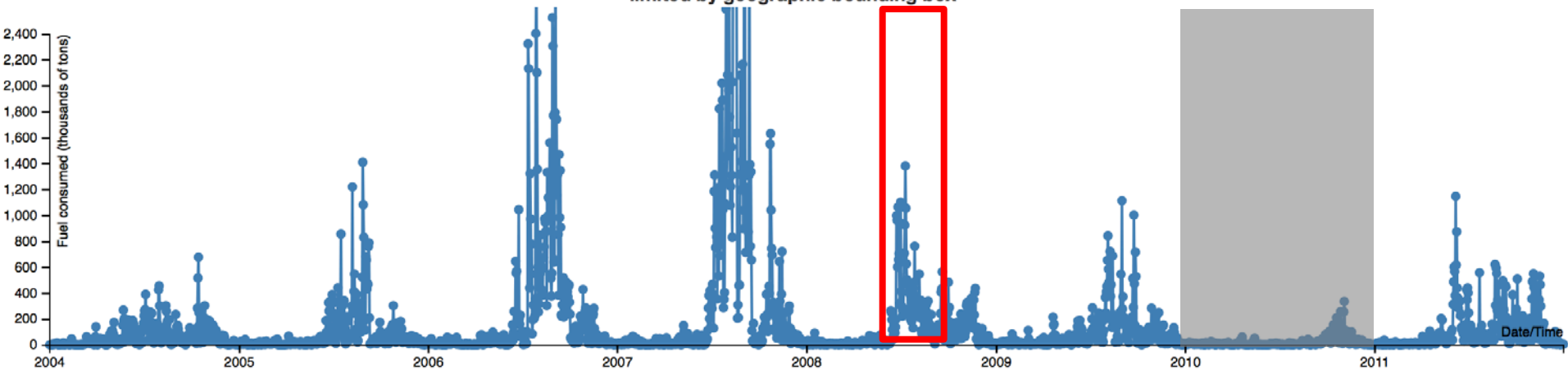
6/21 – 9/21

Limited by bounding box

Source: [WRAP Fire Tools](#)



FETS estimated fuel consumed for all fire types 01/01/2004 to 12/31/2011
limited by geographic bounding box

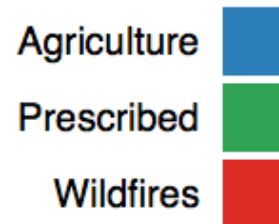
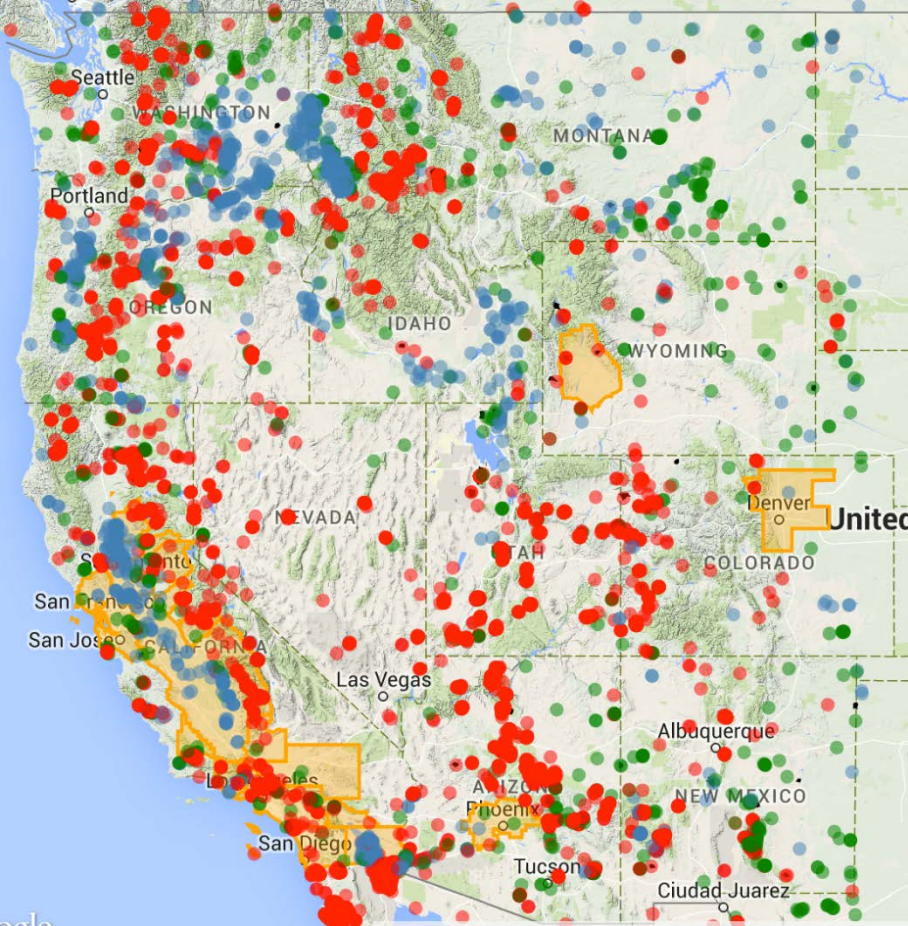


2009

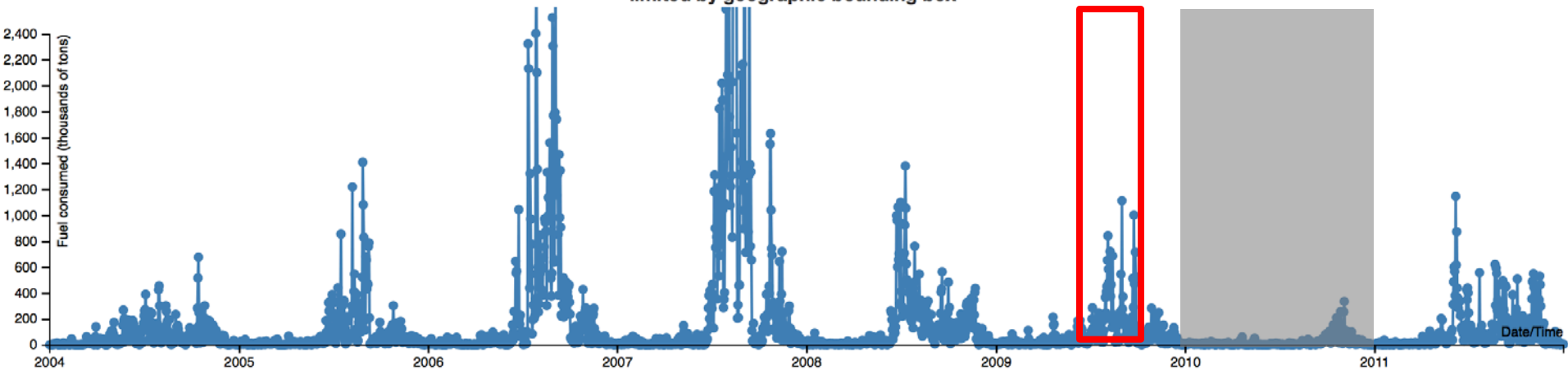
6/21 – 9/21

Limited by bounding box

Source: [WRAP Fire Tools](#)



FETS estimated fuel consumed for all fire types 01/01/2004 to 12/31/2011
limited by geographic bounding box



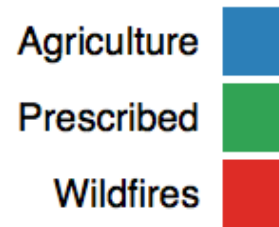
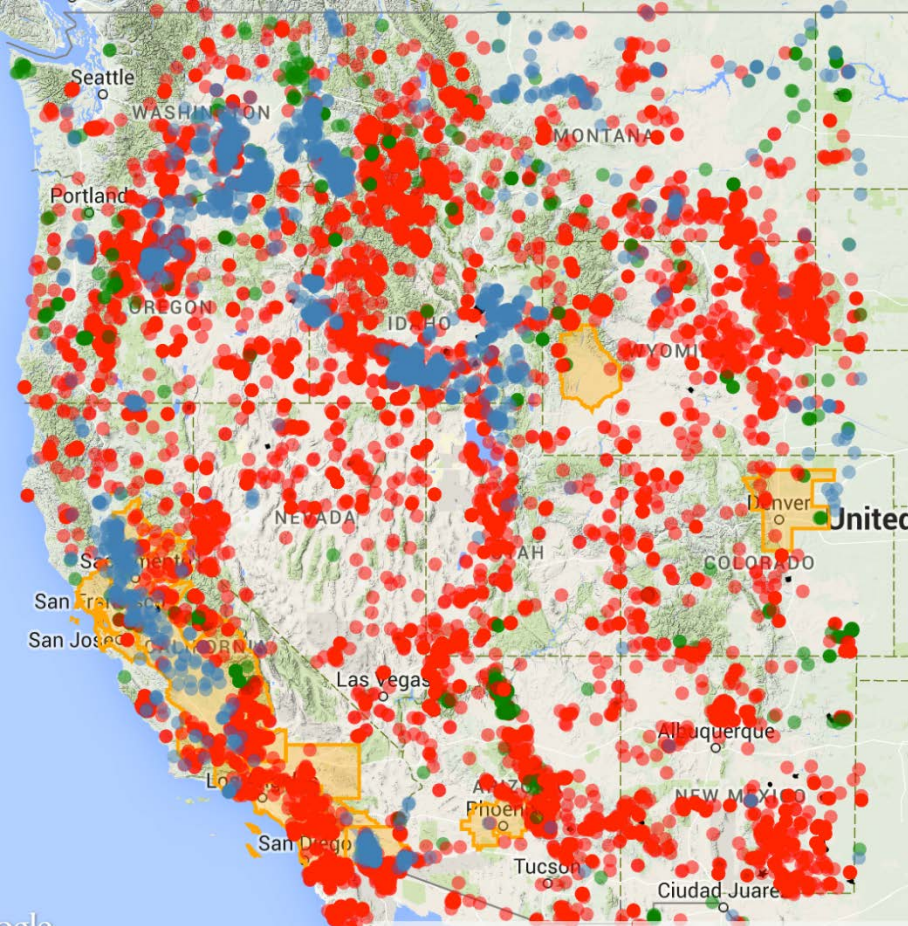
2011

6/21 – 9/21

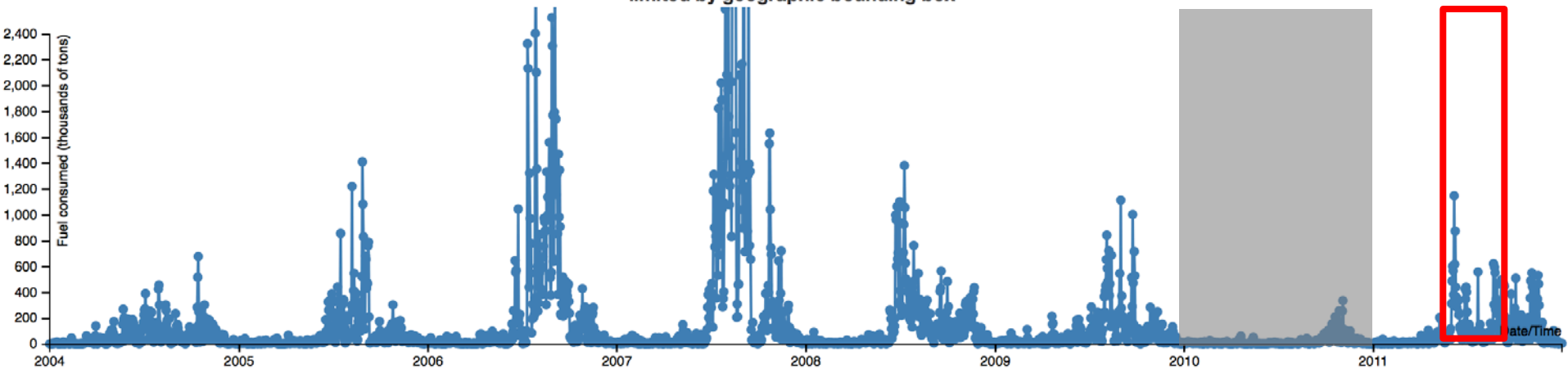
Limited by bounding box

*Obtained additional small wildfire data for this inventory

Source: [WRAP Fire Tools](#)



FETS estimated fuel consumed for all fire types 01/01/2004 to 12/31/2011 limited by geographic bounding box



Exceptional Events Support

Source: [WRAP Fire Tools](#)

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 smoke management regulations were complied with.

Review a Related Analysis

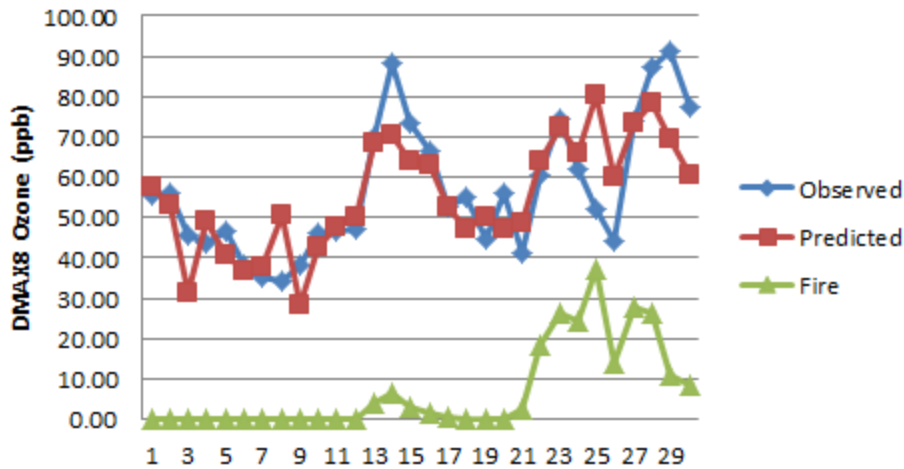
Title	Sections
Biscuit Wildfire	10
Chatfield, CO July 2004-2007	16
Chatfield, CO July 2008	12
Evans Road Wildfire (Pocosin NWR) / Peat burning	12
Fall burning in southern Louisiana, 2008	9
Flint Hills	8
McNally Wildfire	6
Missionary Ridge & Hayman Wildfires	7
Northern California Wildfires, 2008	17

[edit list](#)

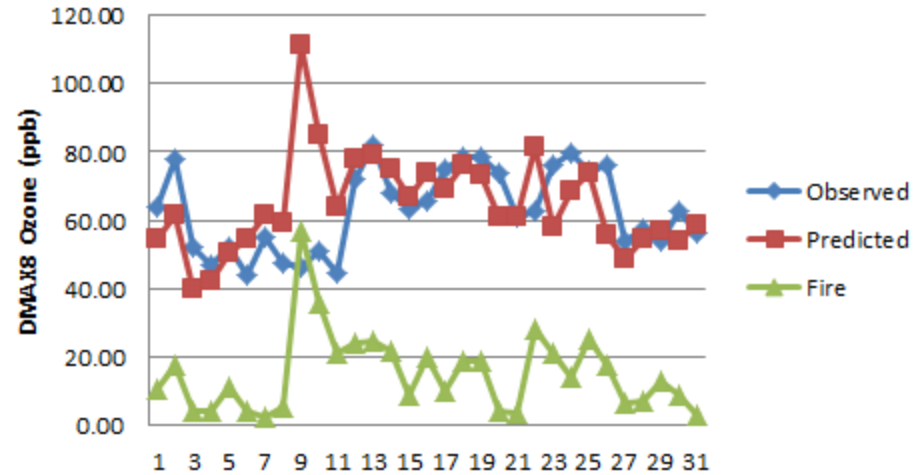
These are the current analyses associated with Exceptional Events Support. To review an

Northern California Wildfires June-July 2008

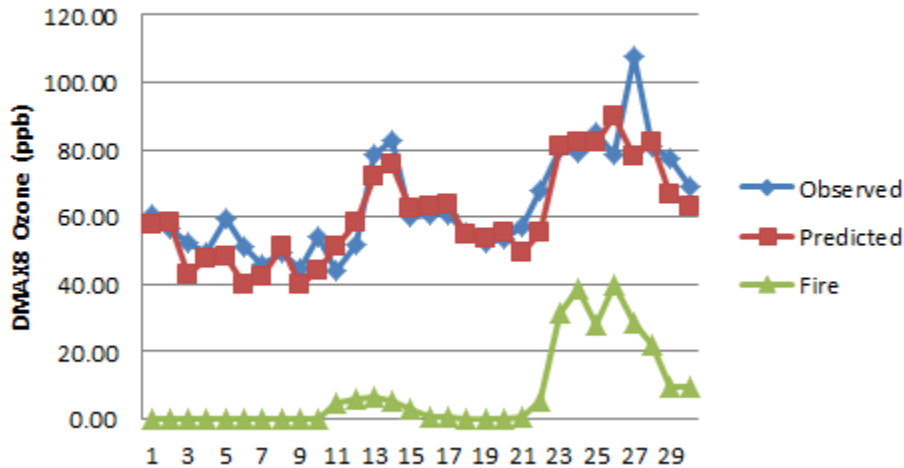
June Base08c DMAX8 Ozone Shasta 0007



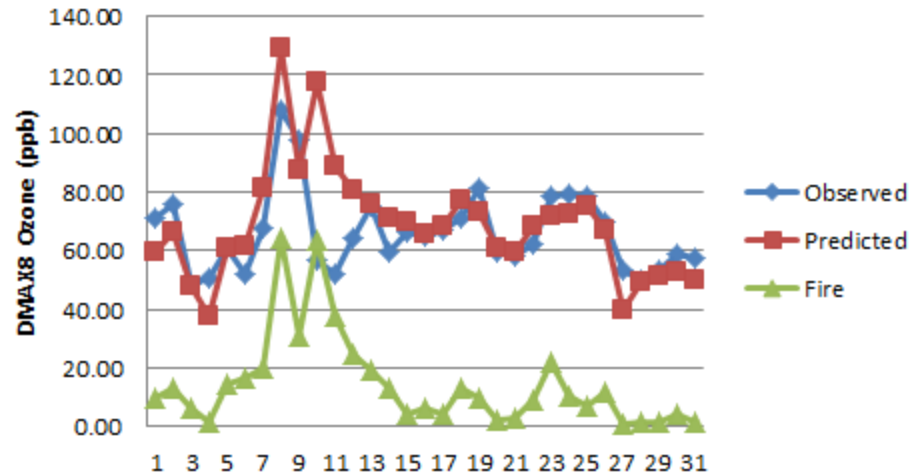
July Base08c DMAX8 Ozone Shasta 0007



June Base08c DMAX8 Ozone Butte 0007

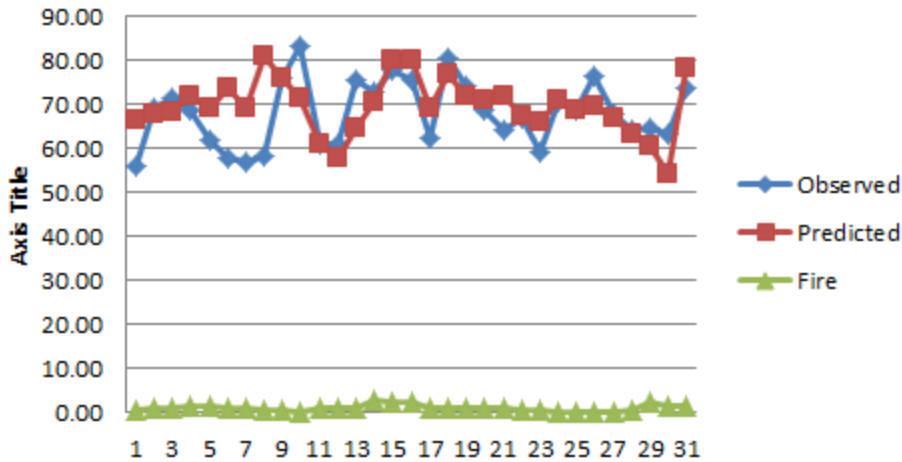


July Base08c DMAX8 Ozone Butte 0007

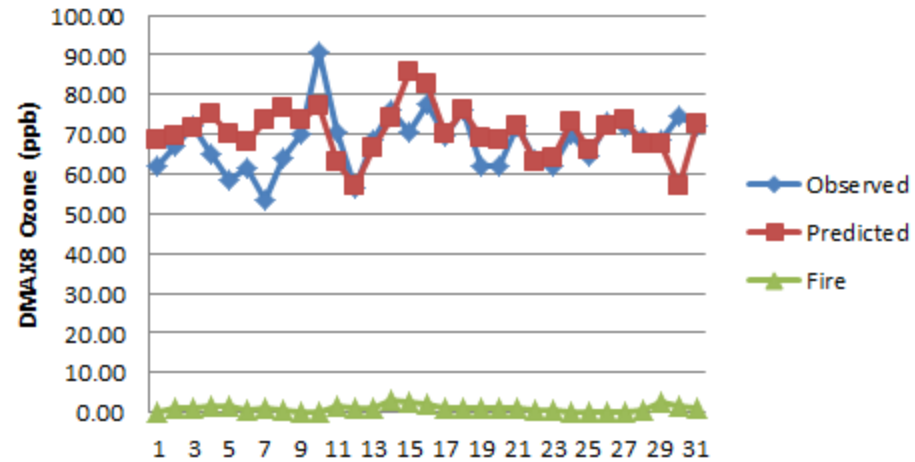


Denver Ozone Monitors July 2008

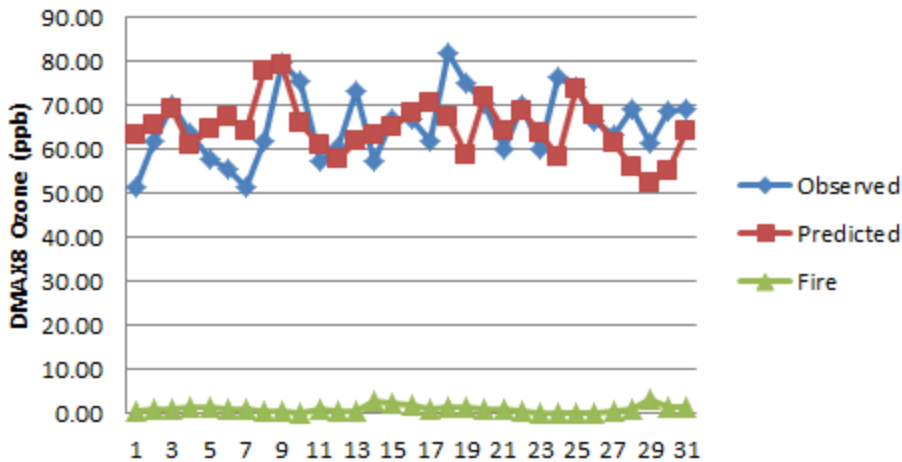
Jul DMAX8 Ozone Rocky Flats No



Jul Base08c DMAX8 Ozone Chatfield



Jul Base08c DMAX8 Fort Collins West



Jul Base08c DMAX8 Greeley

