Western U.S. Air Quality Analysis and Planning Work

Tom Moore
WRAP Air Quality Program Manager, WESTAR

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WEST Associates Meeting

WESTERN REGIONAL AIR PARTNERSHIP

WESTAR
Western States Air Resources Council

Topics

- About WESTAR and WRAP
- What We Do
- Current and future projects and priorities

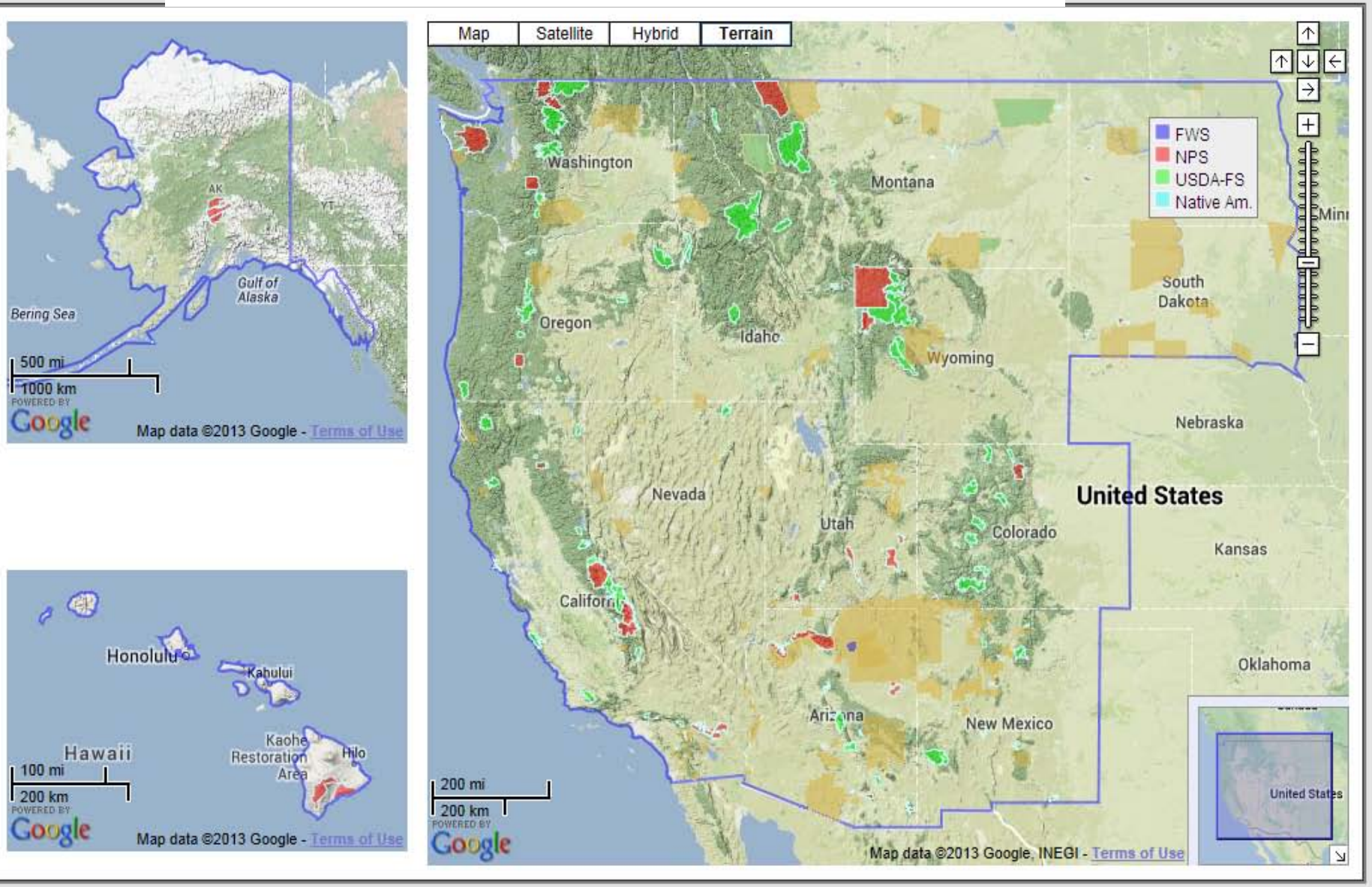
About WESTAR and WRAP

www.westar.org **www.wrapair2.org**

About 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)

About WESTAR/WRAP (cont'd)



WRAP - 65+ members (15 states, federal land managers and EPA, tribes, and local air districts)
Regional technical analyses and planning support for Western sources and air quality impacts

WRAP – what we do

- 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

WRAP regional technical support – what we do (cont'd)

- National air quality standards
  - Regional aspects of state implementation plans
  - Key topic: transport
- EPA Exceptional Events Rule
  - Develop technical support data and analysis protocols
- Implementation of Regional Haze Rule state plans
  - Execute regional 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

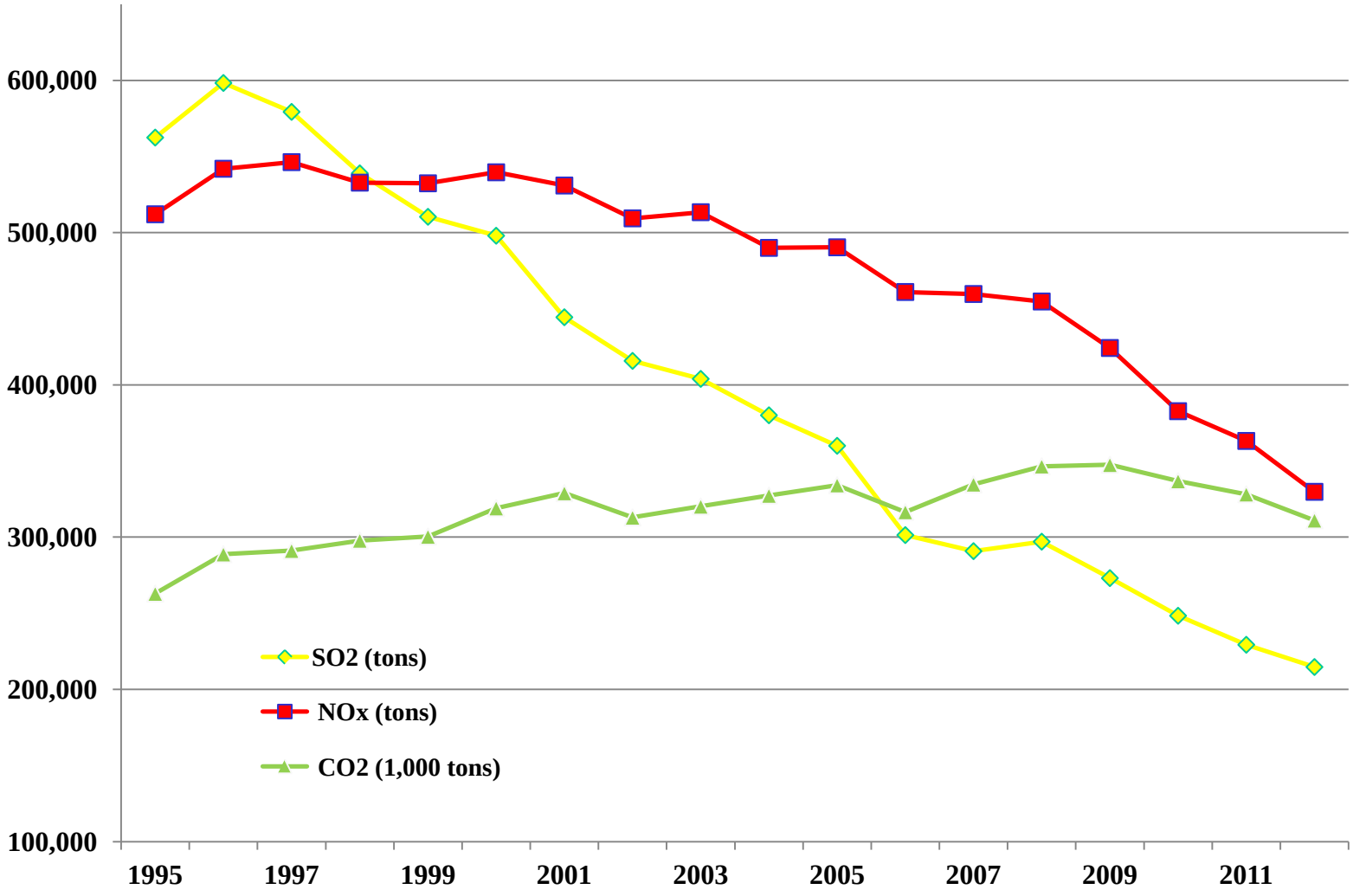
Western regional topics – current projects and priorities

- Interstate and international transport under more stringent air quality standards
- Source contributions for regional haze planning
  - 2018 plans from each state for 2028 milestone
- Planning for Section 111(d) rule requirements
- Regional analysis and planning activities needed for state plans under proposed Ozone standards

WRAP current projects and priorities

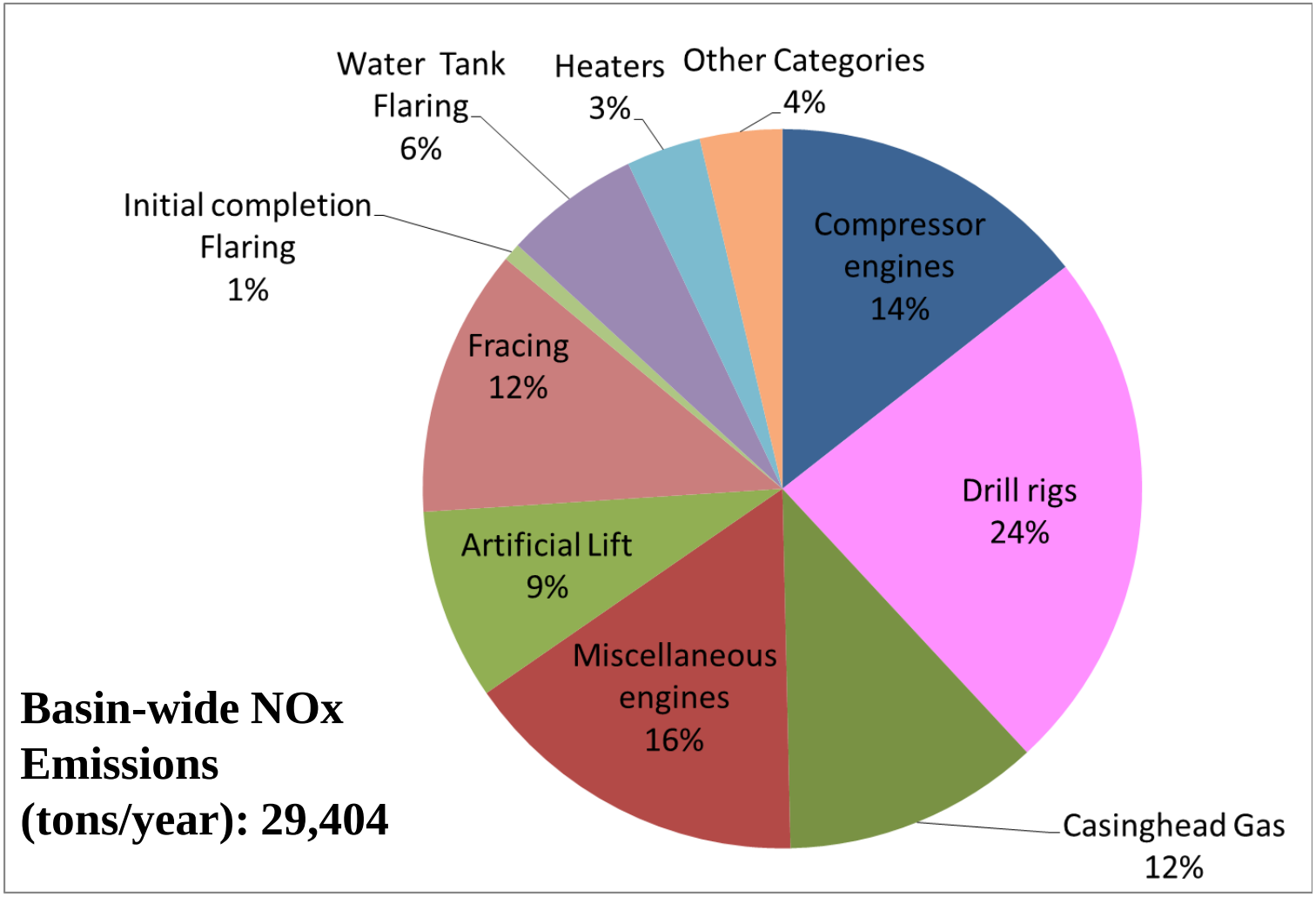
- precursors to Ozone, Particulates, and Regional Haze - key western sources
- "one-atmosphere" analysis – all sources and regional impacts
  - Fire activity and effects
  - Oil and gas exploration and production
  - Biogenics (natural) emissions
  - Power plants
  - Mobile sources
  - All sources recently studied in comprehensive regional modeling analysis
    - West-wide Jumpstart Air Quality Modeling Study (WestJumpAQMS)

Power Plant Emissions Trends – Western Interconnect

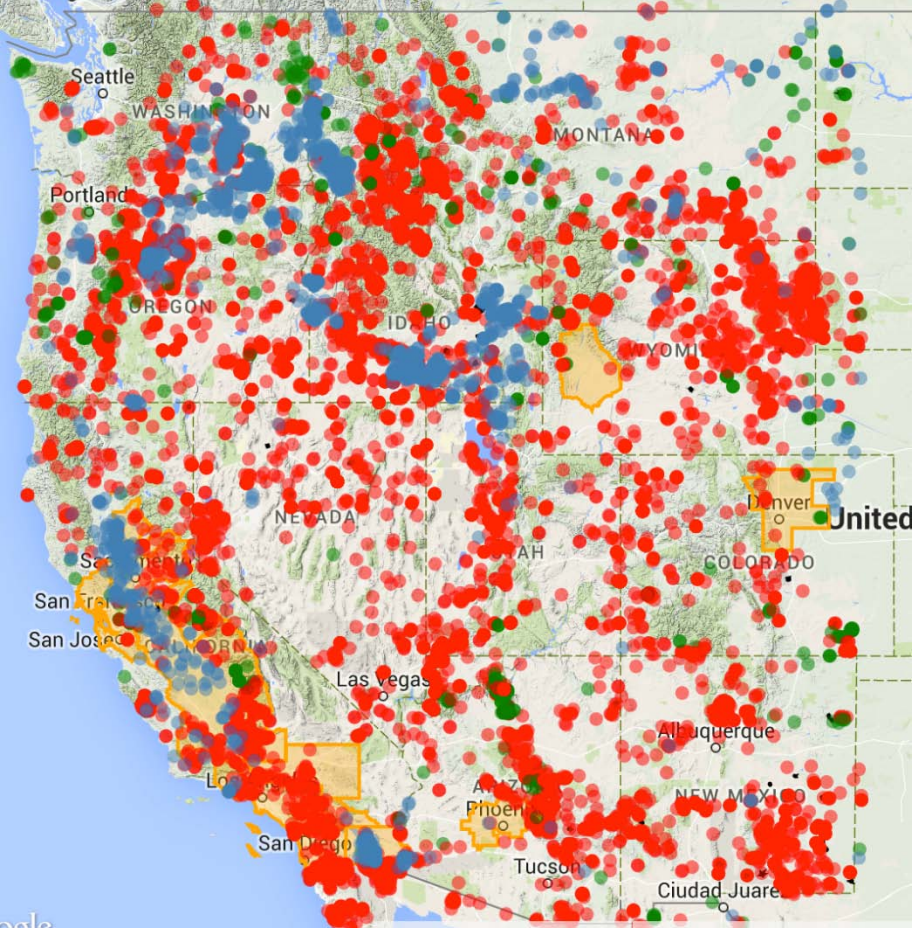


Source: EPA Clean Air Markets Division

Williston Basin 2011 Baseline Results
NOx Emissions By Source Category



Source: [BLM/WRAP Oil and Gas Inventory project]



2011 fire example

6/21 – 9/21

Limited by bounding box

***Obtained additional small wildfire data for this inventory**

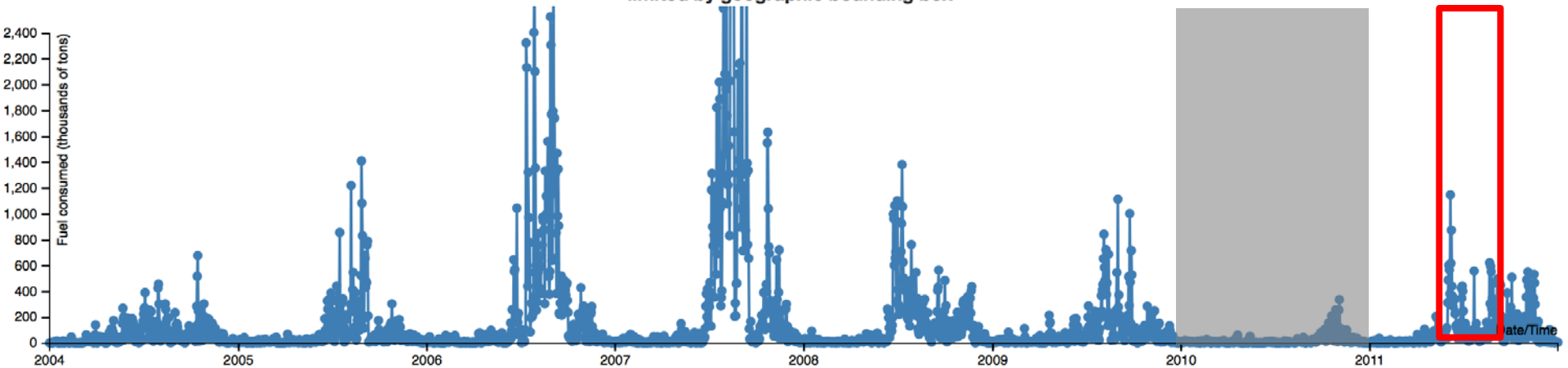
Source: [WRAP Fire Tools]

Agriculture

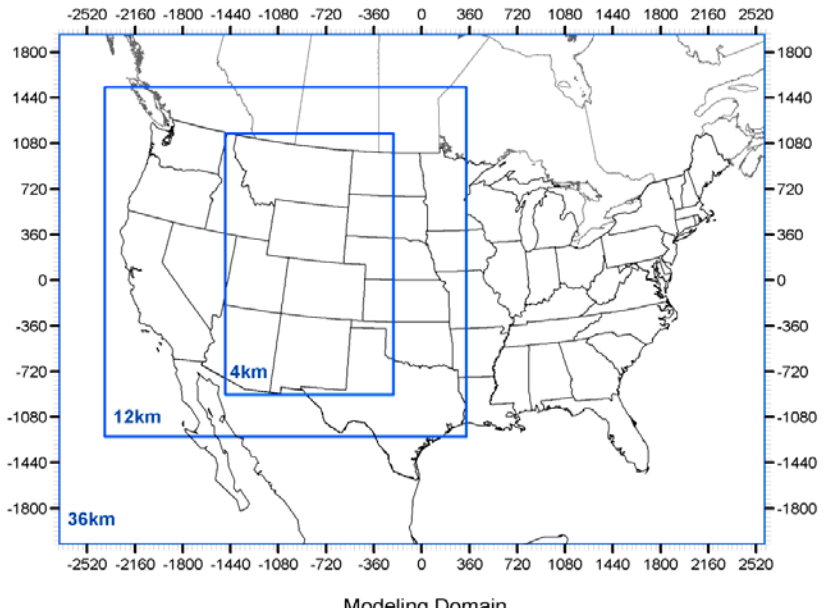
Prescribed

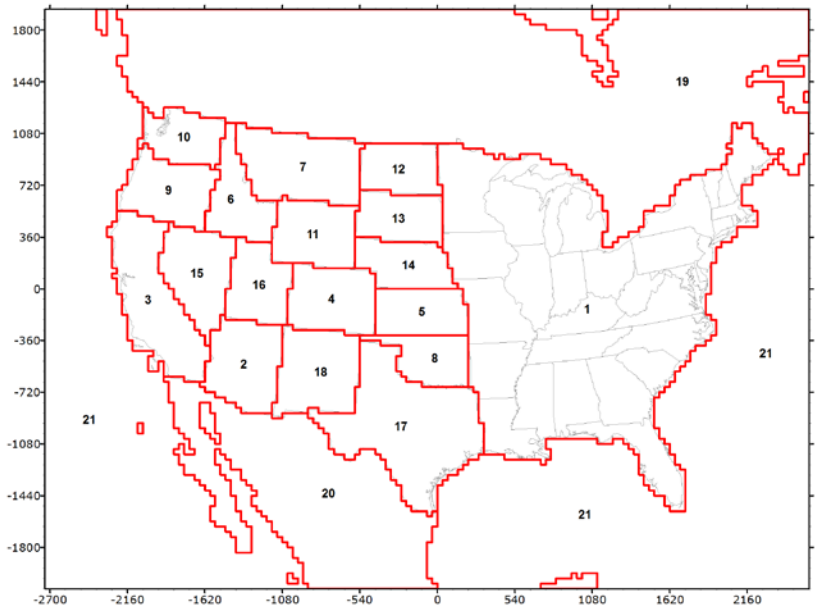
Wildfires

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



West-wide Jumpstart Air Quality Modeling Study (WestJumpAQMS)





2008 Modeling Year

2008 NEI Emissions
WRAP O&G, Biogenic, Fire Emissions

Modeling Domains:

36 km CONUS
12 km WESTUS
4 km Intermountain West

State-Specific Source Apportionment:

- 17 western states
- Natural
- Manmade
- 3 fire types (WF, Rx and Ag)
- also Global Boundary Conditions

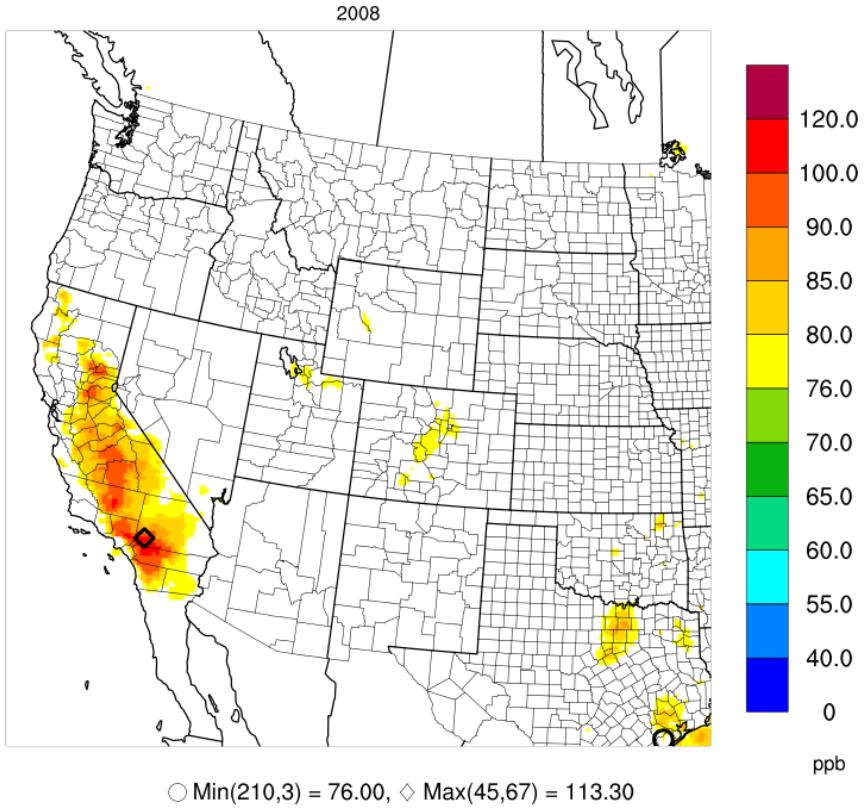
(total of 4 Cardinal Directions + top)

Source: WestJumpAQMS

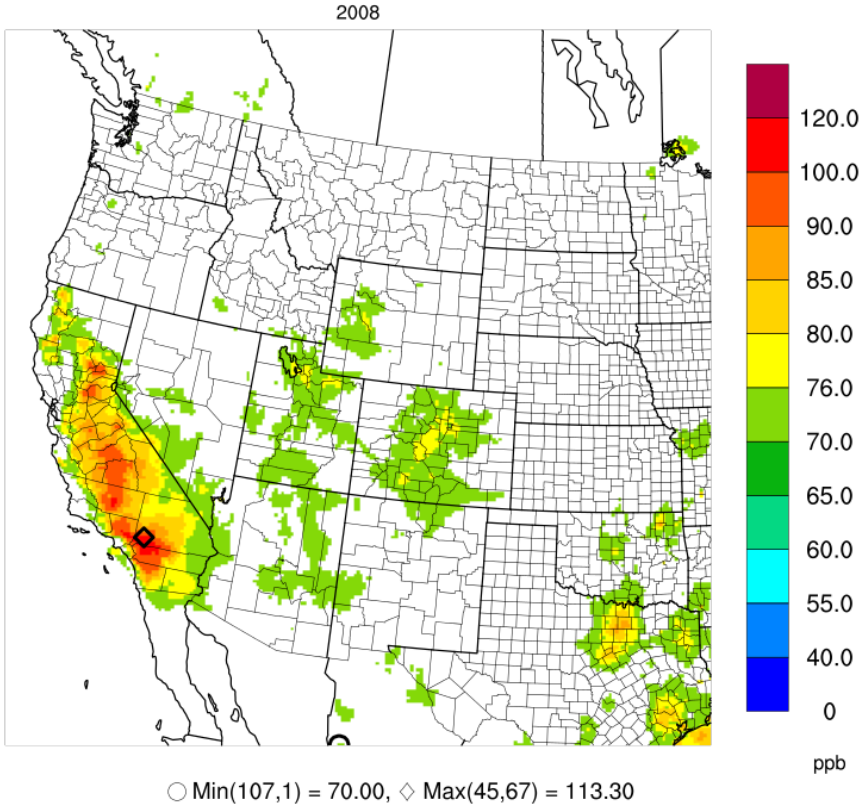
Modeled Attainment Test Software

Interpolated 2006-2010 Ozone Design Values

Ozone ≥ 75 ppb



Ozone ≥ 70 ppb

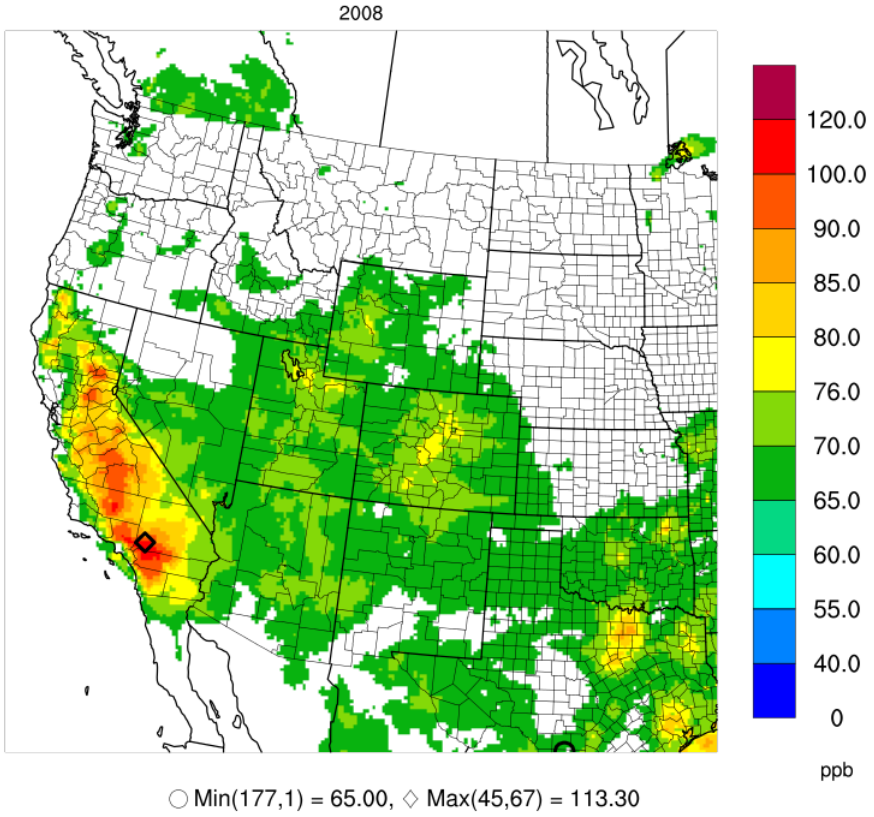


Source: WestJumpAQMS

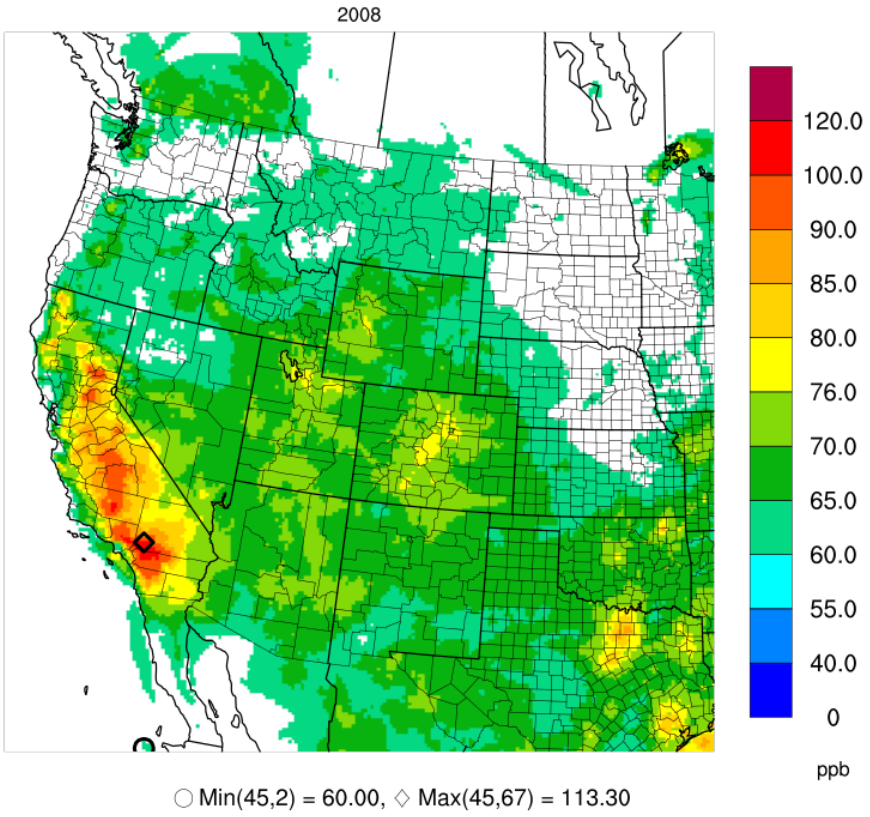
Modeled Attainment Test Software

Interpolated 2006-2010 Ozone Design Values

Ozone ≥ 65 ppb

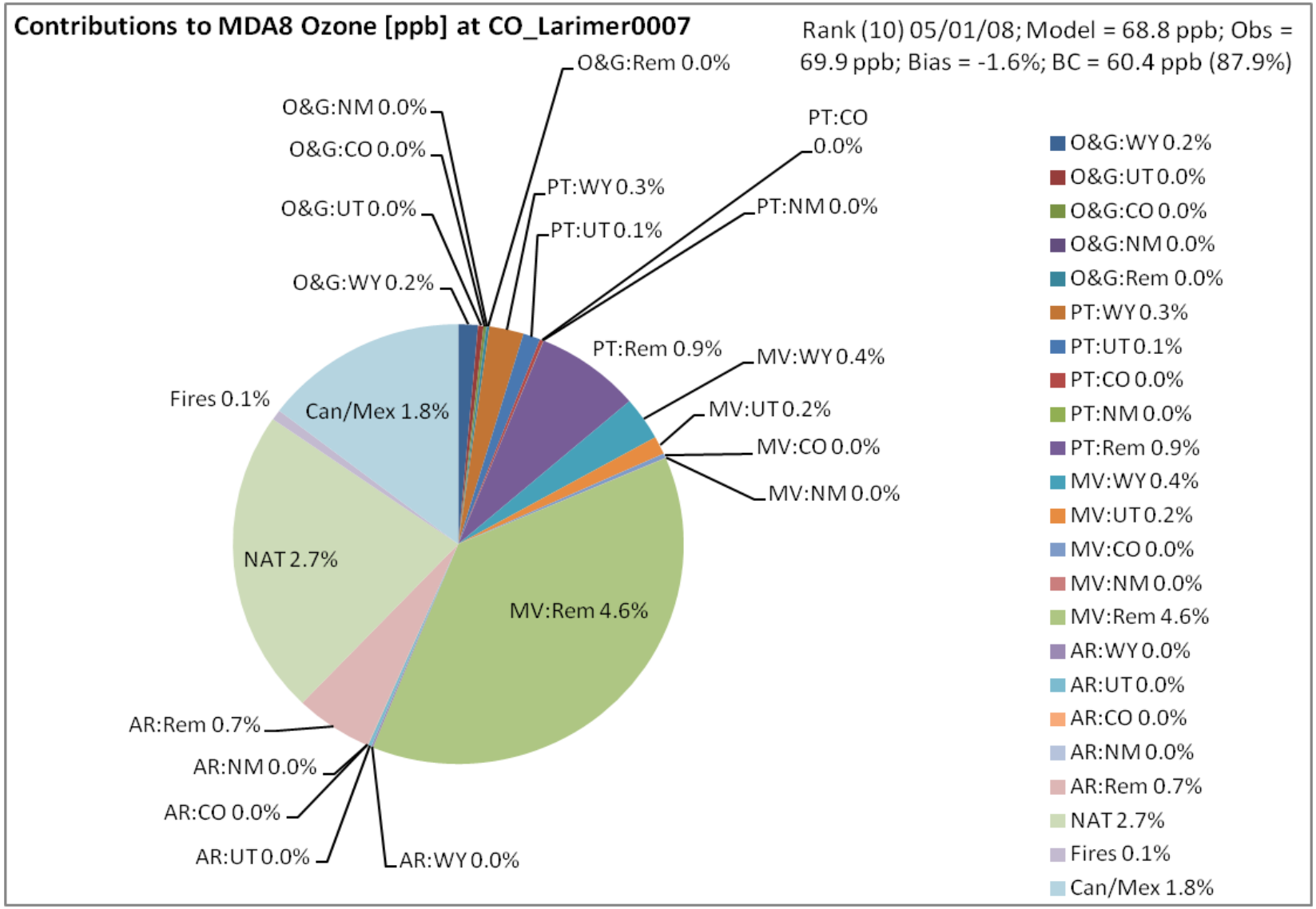


Ozone ≥ 60 ppb



Source: WestJumpAQMS

Contributions to Ozone at Rocky Mountain National Park



Source: [WestJumpAQMS]

Collaborative Drill Rig 1-Hour NO_2 Impacts and Model Evaluation Study

WESTERN REGIONAL AIR PARTNERSHIP

Other

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

INDUSTRY

energy API

Other state and local agencies

Study Concepts

- Collaborative effort between BLM, EPA, States, other FLMs and the Oil and Gas Industry to better predict 1-hour NO_2 impacts from drill rigs through a field study

- Western Regional Air Partnership (WRAP) coordinating the project

Monitoring

- **NO_2 concentrations at multiple locations near operating drill rigs**
- **Meteorological conditions (i.e., met stations)**

Measuring

- **Drill rig emissions (stack testing w/ CEMS)**

Modeling

- **Model using data from monitoring and measurements**

Study Benefits

- **Collection of ambient and emissions rate data to inform model performance evaluation**
- **Improves NEPA analysis by providing scientific basis and accurate public disclosure of drill rig impacts**
- **Provides data for evaluation of performance of the OLM, PVMRM and other methods to more accurately determine 1-hour modeled NO_2 impacts**
- **Collaborative approach allows for input and funding from federal agencies, states and industry, all who need better information about NO_2 impacts**

Future Work – Analysis & Planning Support

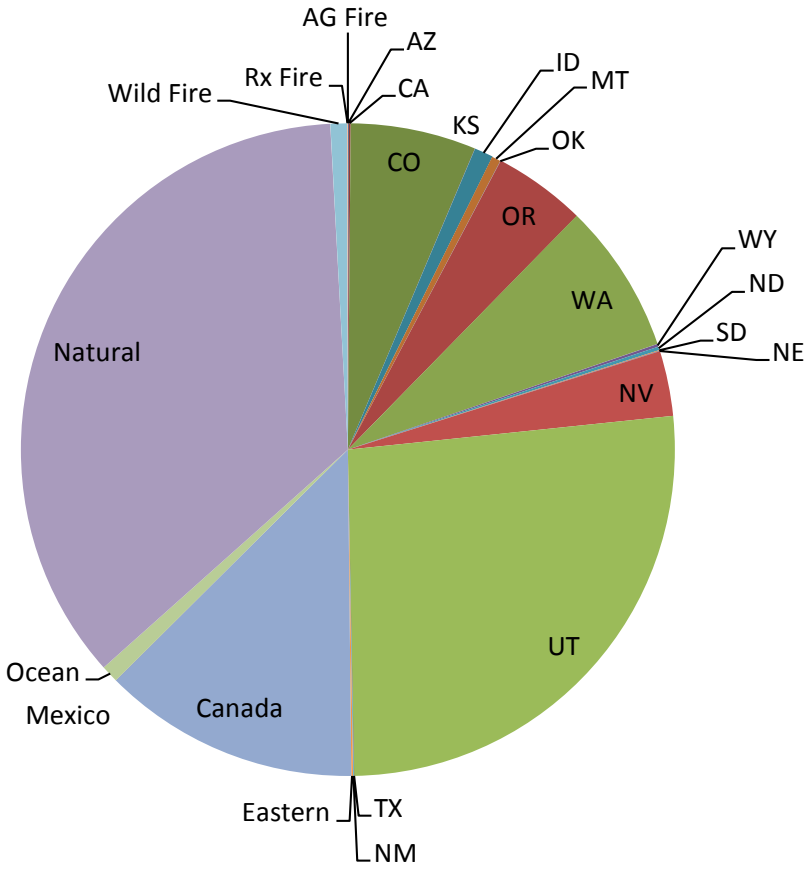
Recent EPA Actions

- Nov 2014: Proposed Ozone Standard (65-70 ppb)
  - Current 2008 Ozone Standard = 75 ppb
  - "New" Standard – finalize Oct. 2015
- Dec 2014: Draft Ozone Modeling Guidance
  - Comments due in March 2015
- Jan 2015: "Good Neighbor" 2008 Ozone Standard Transport Memo
  - AZ, CA, UT and WY contribute significantly?
- Feb 2015: Implementation Guidance for 2008 Ozone Standard
  - Dec 2014 Court decision vacates EPA's timeline
  - New timeline moves up deadlines 6-12 months

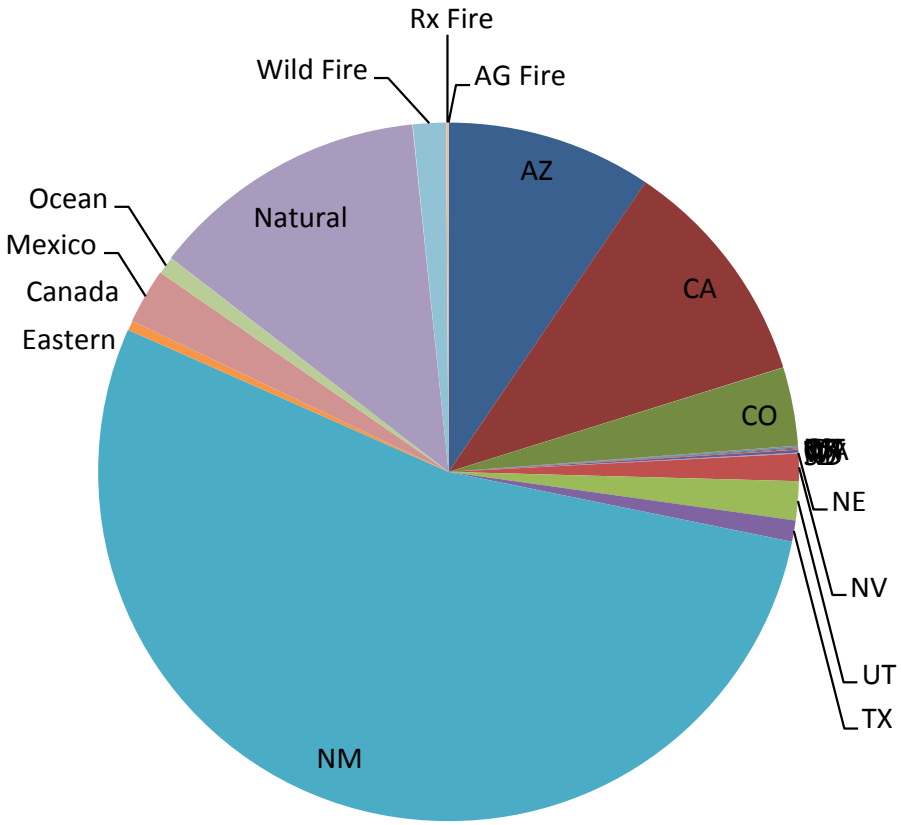
2008 - Two Highest DMAX8 Ozone @ Mesa Verde

Past (urban-oriented) Attainment Approaches Ineffective

Rank: 1 - 13 Jun, 2008
Total Ozone = 80.6 ppb
BC Ozone = 71.2 ppb (88.4%)



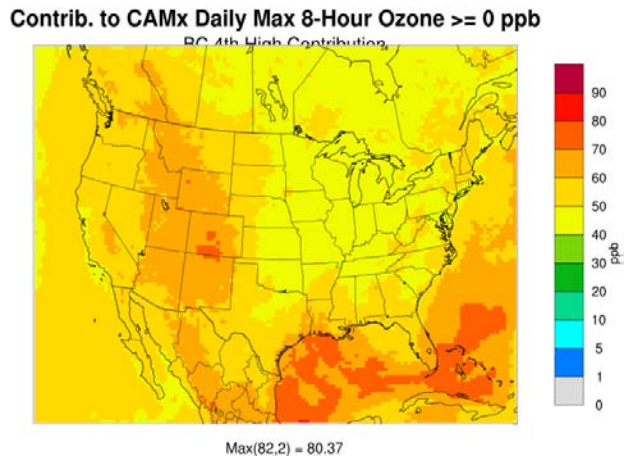
Rank: 2 - 01 Aug, 2008
Total Ozone = 76.3 ppb
BC Ozone = 38.5 ppb (50.5%)



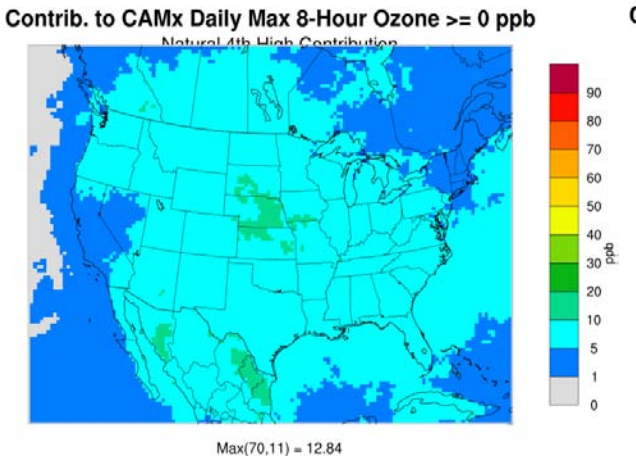
Max Source Contributions 2008 4th High Modeled Ozone

(Top -- Yellow > 40 ppb; Bottom -- Yellow > 15 ppb)

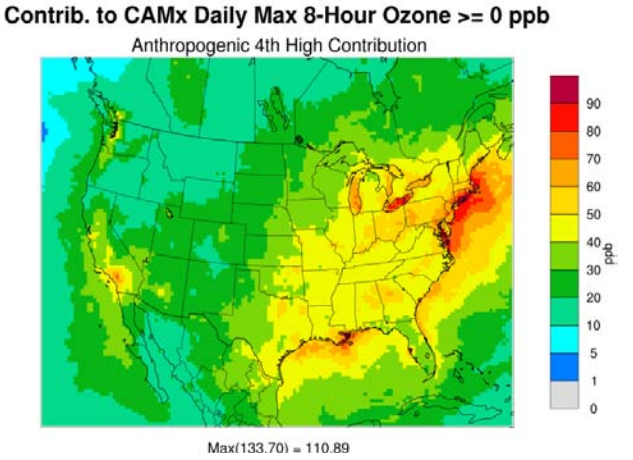
Boundary Conditions

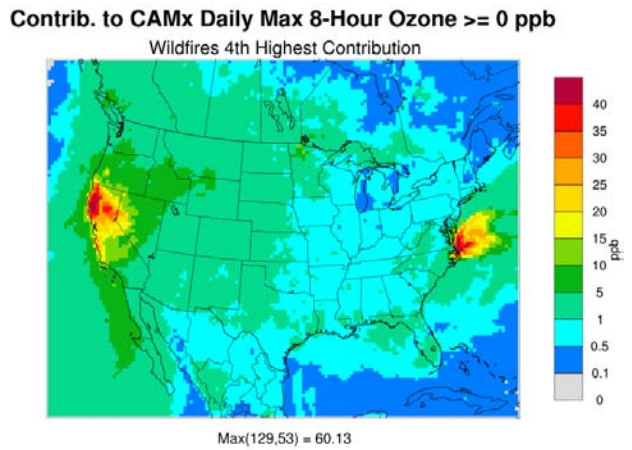


Natural

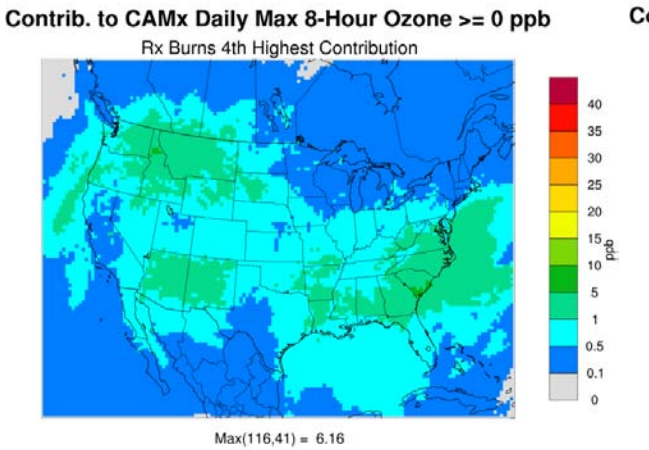


Anthropogenic

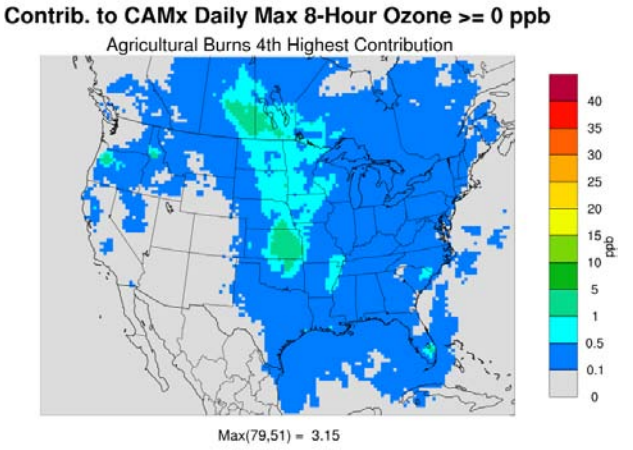




Wildfire



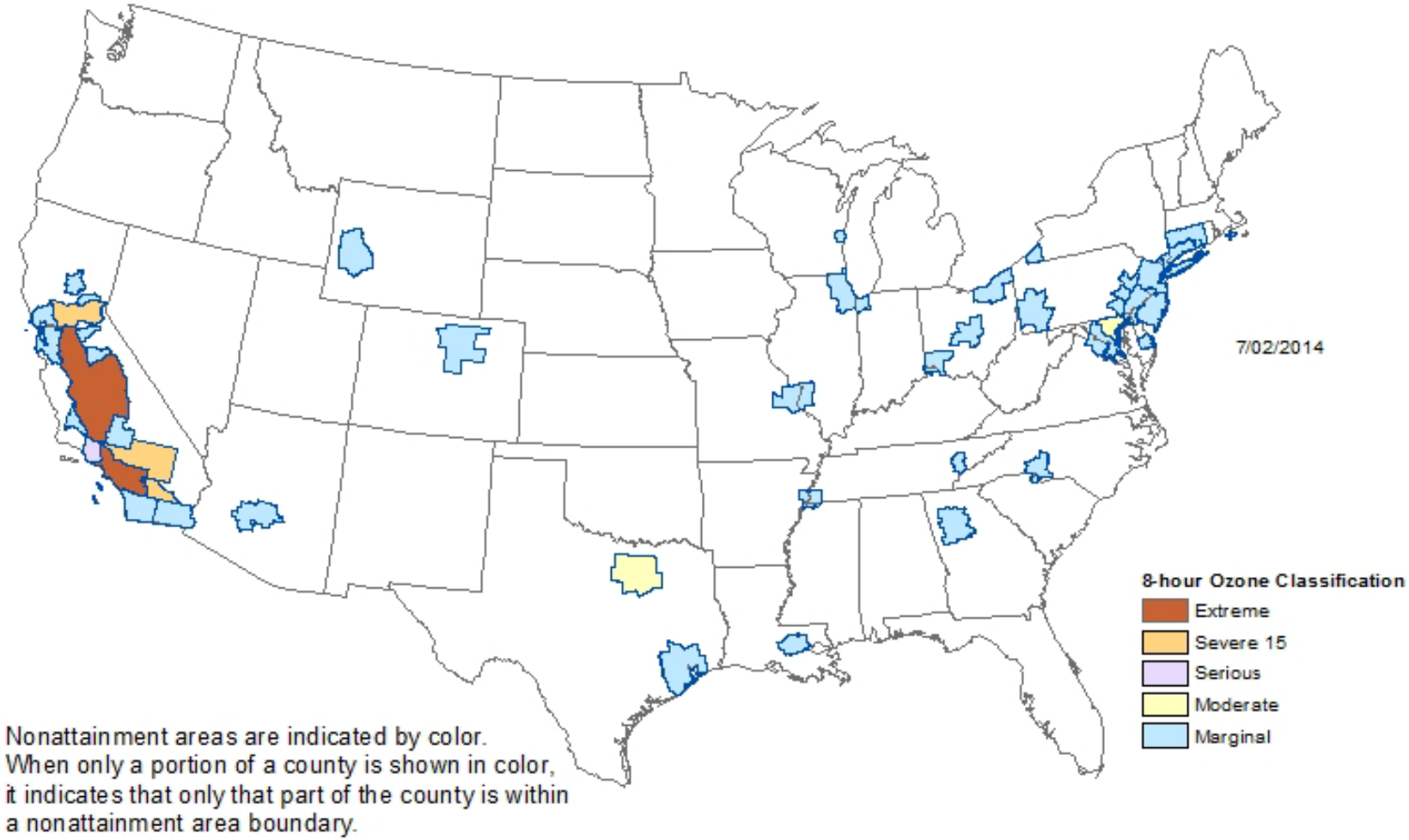
Prescribed Fire



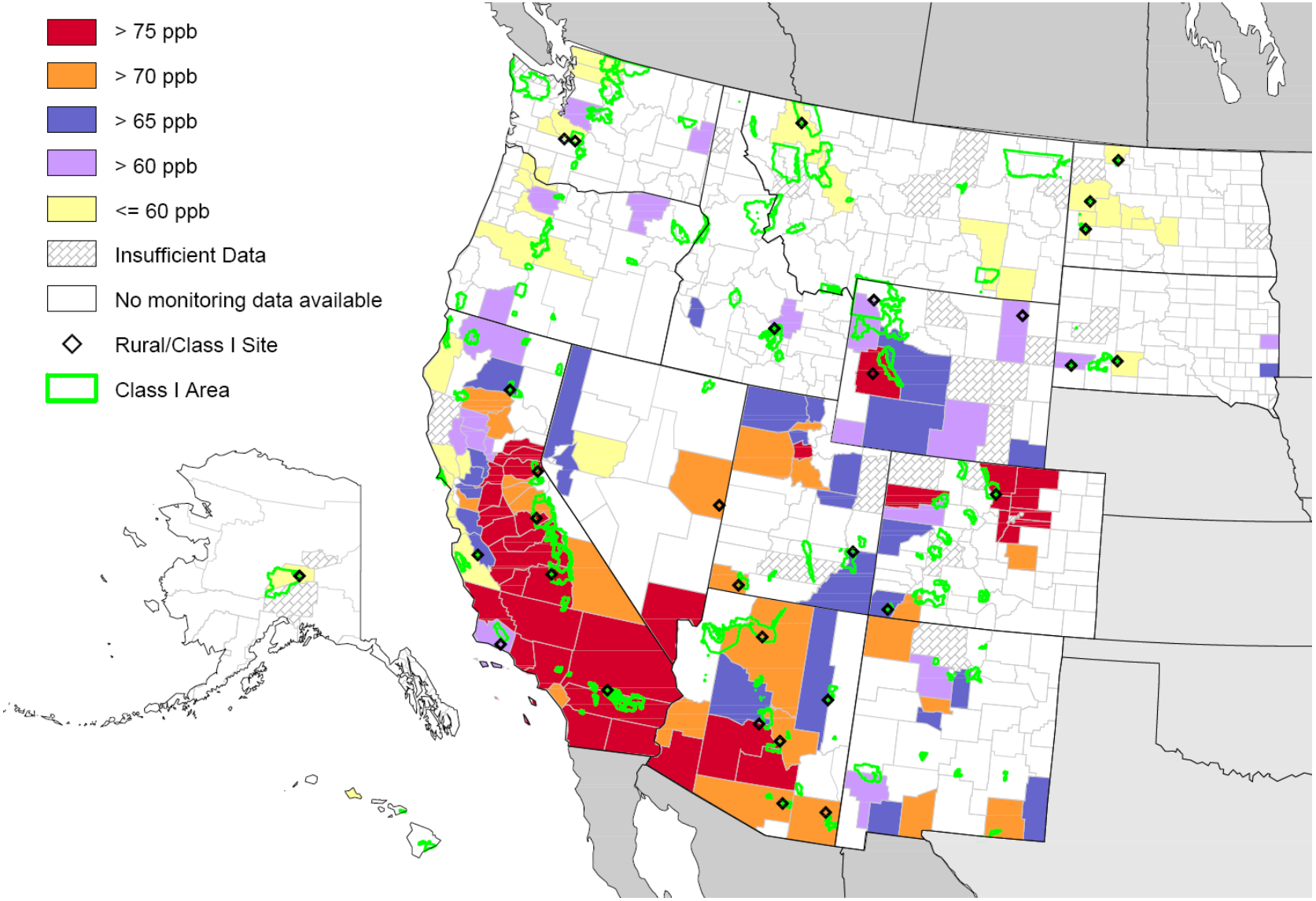
Agricultural Fire

Ozone Nonattainment Counties violating Current 75 ppb Ozone NAAQS

(based on 2011-2013 observations)

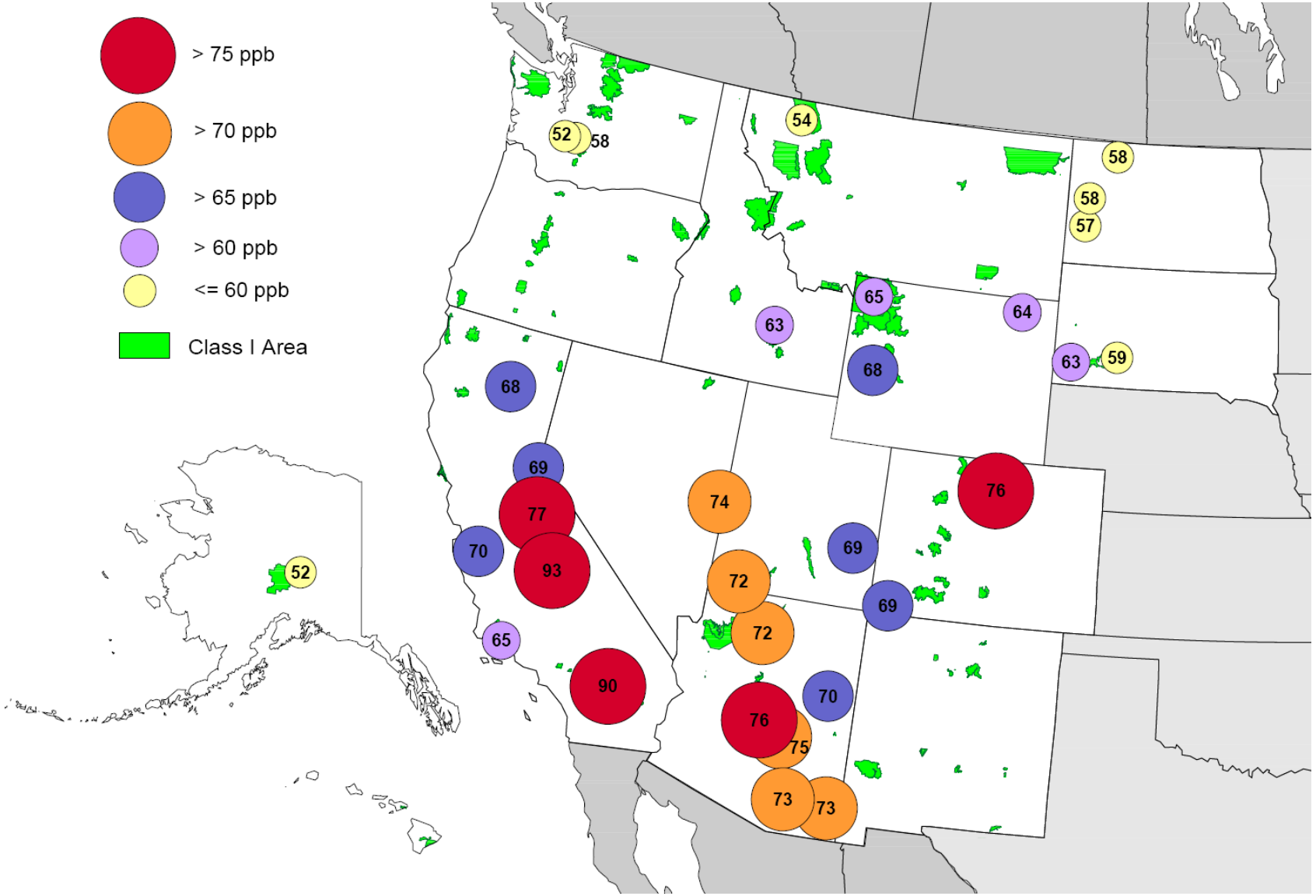


Counties Violating Current and Proposed Ozone NAAQS
(2011-2013 observations)



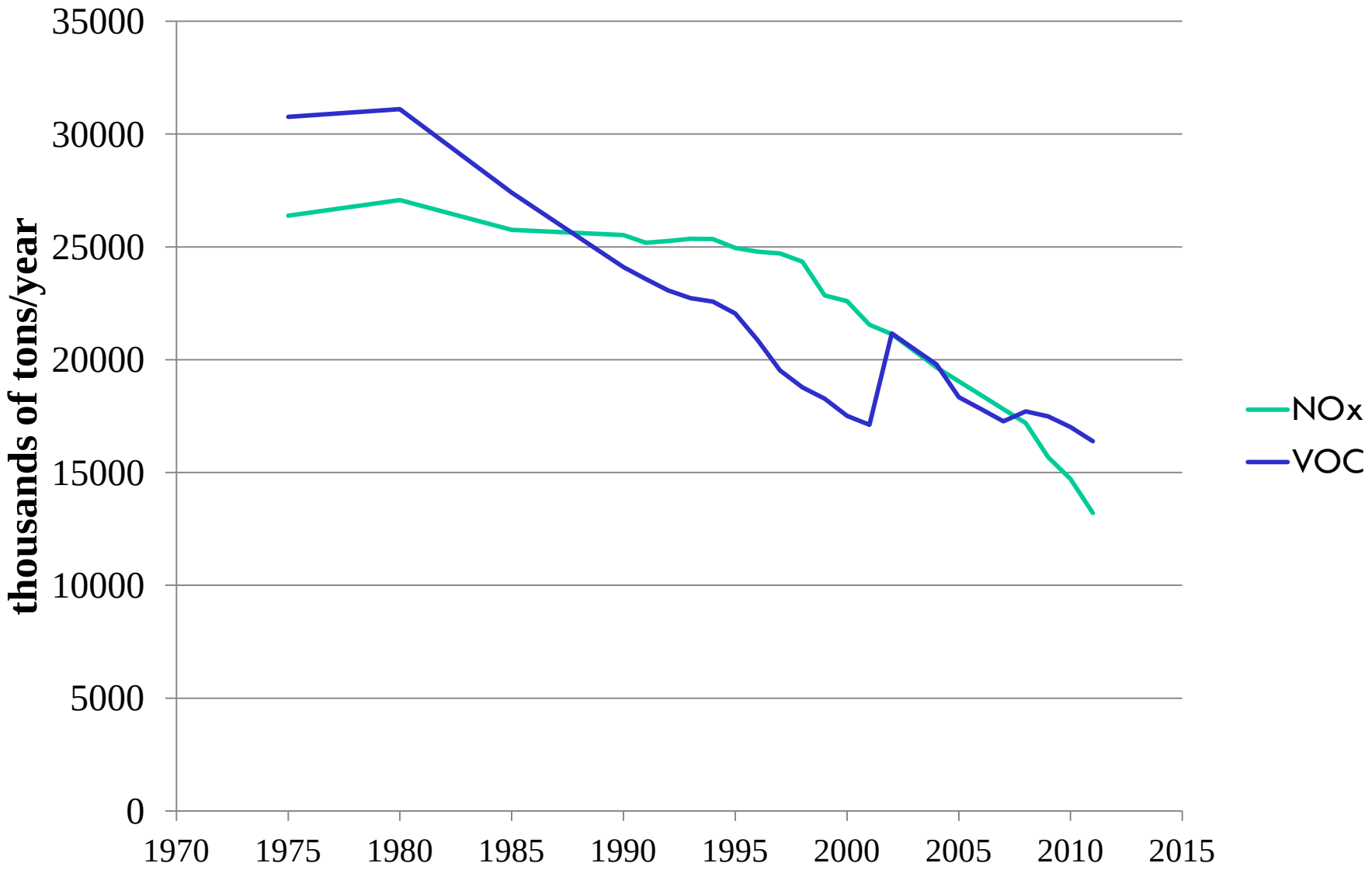
Rural Ozone Design Values (2011-2013)

Past (urban-oriented) attainment approaches ineffective



National Emission Trends 1970 - 2012

Source: EPA NEI Inventory



January 2015 EPA Ozone Transport Analysis Results

- In the western U.S. there were numerous 2018 Nonattainment (NA) and Maintenance (MA) monitoring sites in California
  - Arizona was determined to contribute significantly to nonattainment at a NA monitoring site in California

- Outside of California there were no other NA monitoring sites in the western U.S. and one MA monitoring site in Douglas County, Colorado in the Denver Metropolitan Area
  - California, Utah and Wyoming were found to contribute significantly to the Chatfield MA monitoring site in Colorado with contributions to the 2018 Maximum DV as follows (≥ 0.76 ppb):
    - CA = 1.17 ppb
    - UT = 0.92 ppb
    - WY = 1.29 ppb

Interstate Transport "Good Neighbor" Provision for the 2008 Ozone Standard under Section 110(a)(2)(D)(i)(I)

- Nonattainment (NA) monitor if the projected 2018 Average Design Value (AvgDV) ≥ 76.0 ppb

- Maintenance (MA) monitor if the projected AvgDV < 76.0 ppb and projected 2018 MaxDV ≥ 76.0 ppb

  – Upwind state's ozone contribution ≥ 0.76 ppb to the AvgDV at a NA monitor in downwind state - then upwind state contributes significantly to nonattainment of the Ozone Standard.

  – Upwind state's ozone contribution ≥ 0.76 ppb to the MaxDV at a MA monitor in downwind state, then upwind state contributes significantly to interfering with maintenance of attainment of the Ozone Standard

2008 Standard – current Planning issues

- DC District Court vacated EPA's ozone schedule and the Moderate nonattainment area attainment date was moved forward one year to 2017.

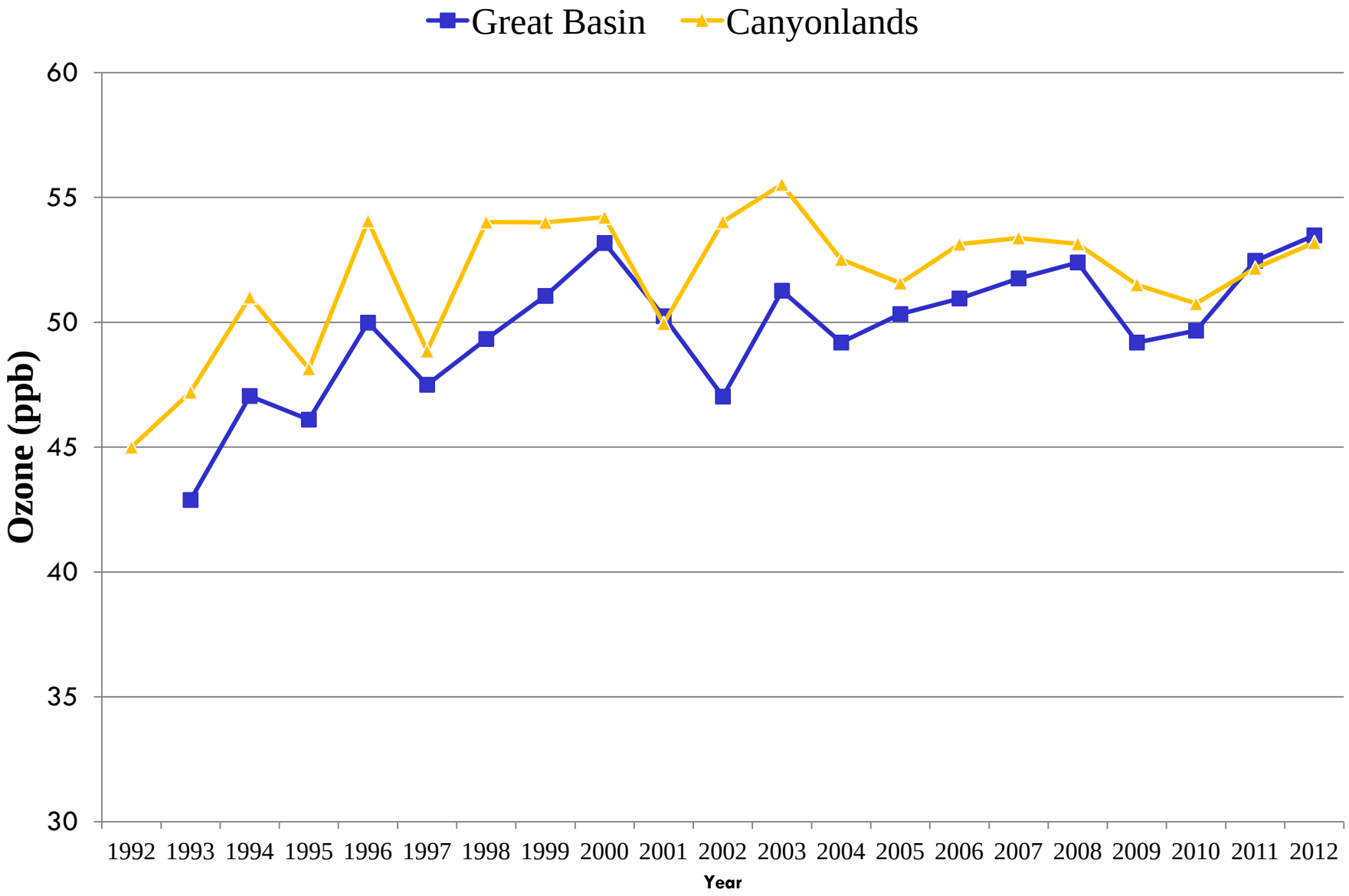
- Other technical matters
  - Fire and Stratospheric Instrusion exceptional events affecting design values at some sites?
  - Do emissions used in EPA modeling representing the future year account for all "rules on the books"?
    - Are the projections representative of Western U.S. sources?

Future Ozone Planning Issues
(making the SIP process more challenging)

- Complete Assessment of how Boundary Conditions are Characterized in Global Transport Models
  - Lack of Usable Guidance on how to Incorporate New Global Data into Model Boundaries
- Role of Stratospheric Intrusions
- Methods for Projecting Ranges of Future Wildfire Emissions
  - Representing Exceptional Events in Modeling

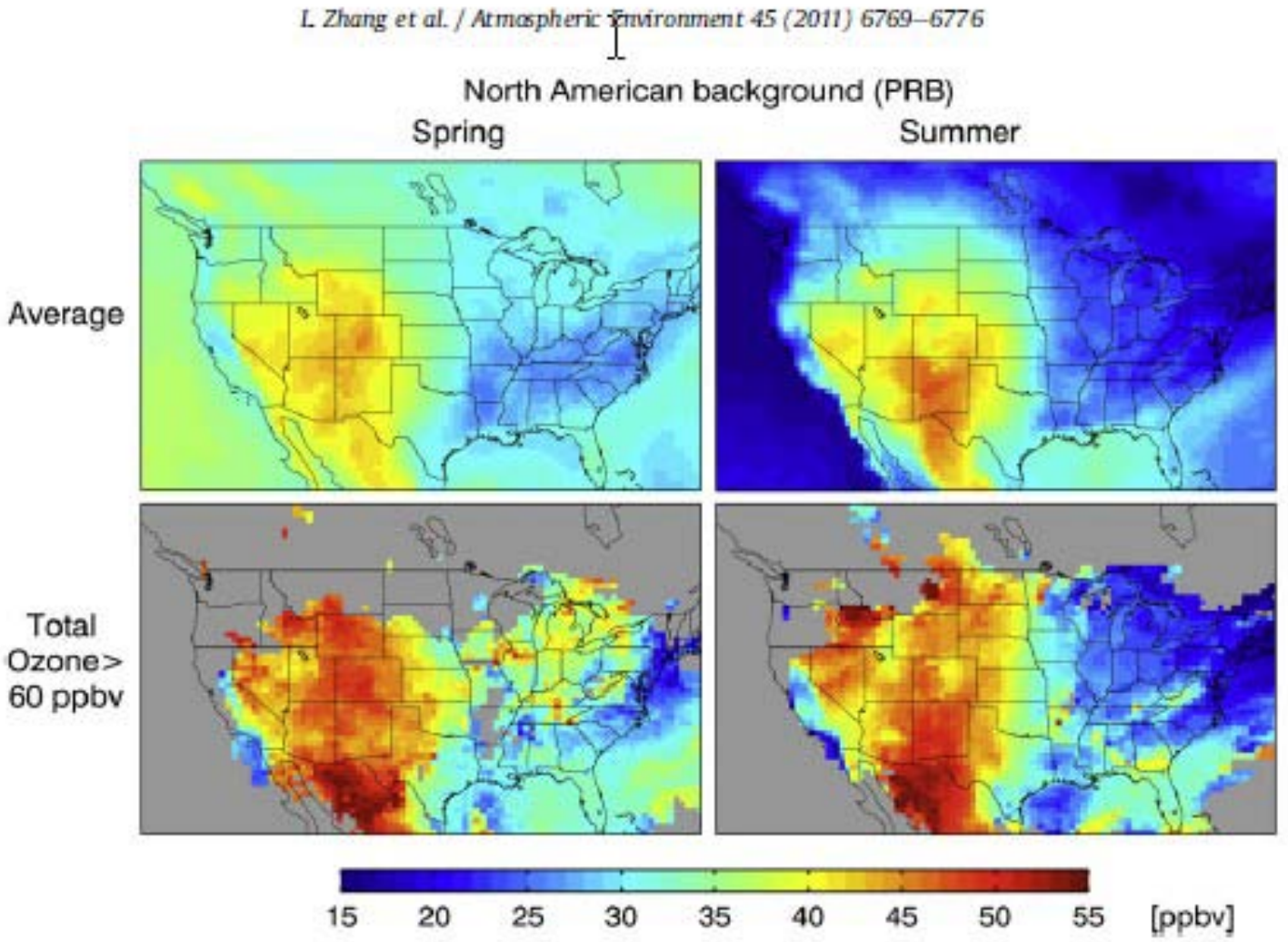
- More Complete and Available Evaluation Tools are Needed
- Resources Necessary to Implement are Extensive / Costly
  - Selecting Appropriate Modeling Tool
  - Acceptable Standards of Model Performance
  - Address Model Biases for Planning

Average Ozone April-September 1992-2012



Background Ozone values in the West are high

- Asia impact increasing by 0.63 ppb/yr (Cooper et al., 2010 Nature)
  - Impact is concentrated in western U.S.
  - Site elevation and topography are important factors in ozone levels
- Stratospheric intrusion can have a significant impact, especially at higher elevation sites
  - Wildfires have a significant impact on ozone levels
  - Interannual variability corresponds to variability in fire (Jaffe, Wigder, 2012 Atmospheric Environment)
- Background levels in the intermountain West are increasing (Cooper et al., 2012 Journal of Atmospheric Sciences)



Zhang, et al., 2011 used GEOS Chem modeling to show North American background ozone. Values are significantly higher in the intermountain West.

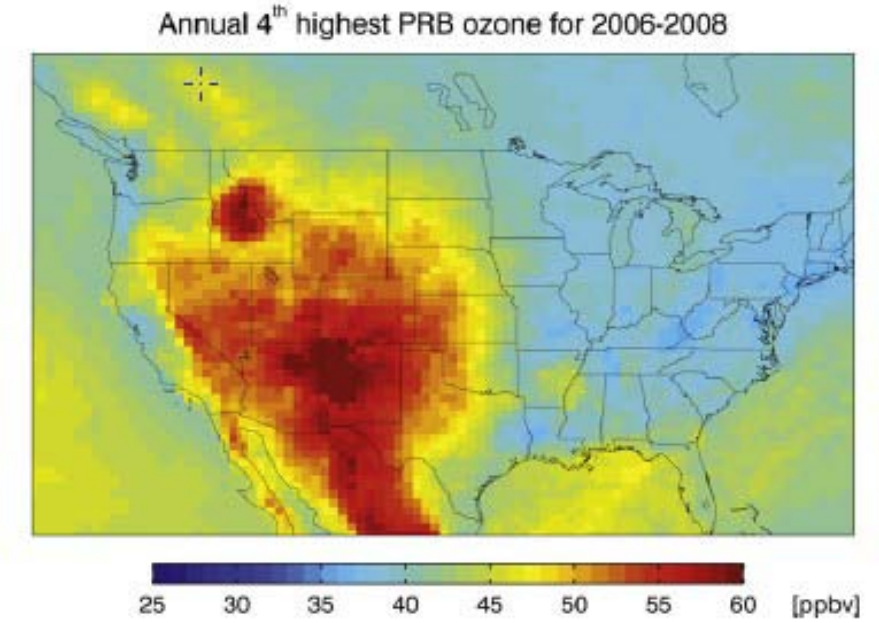


Fig. 7. Annual 4th-highest value of North American background ozone (PRB) calculated in GEOS-Chem as daily 8-h max and averaged for 2006–2008.

Zhang et al., 2011
Atmospheric Environment

North American background represents the minimum standard achievable through suppression of North American anthropogenic emissions.

"The high international background values in [the Intermountain West] compared to the proposed revisions of the ozone NAAQS (60-70 ppbv) suggest that special consideration may be needed in the NAAQS-setting process."

Ozone Planning - Clean Air Act Requirements

- Mandatory measures required by the CAA
  - Designed to solve urban ozone problem - 1990 Act
  - Focus on mobile sources and fuels
  - Nonattainment NSR
  - Mandatory VOC reductions
  - Transportation and general conformity
- Background levels are high – it may not be possible to show attainment in many areas
  - Mandatory bump-ups require more urban area controls
- If a state can't demonstrate attainment, then sanctions are applied

Regional Haze Analysis and Planning

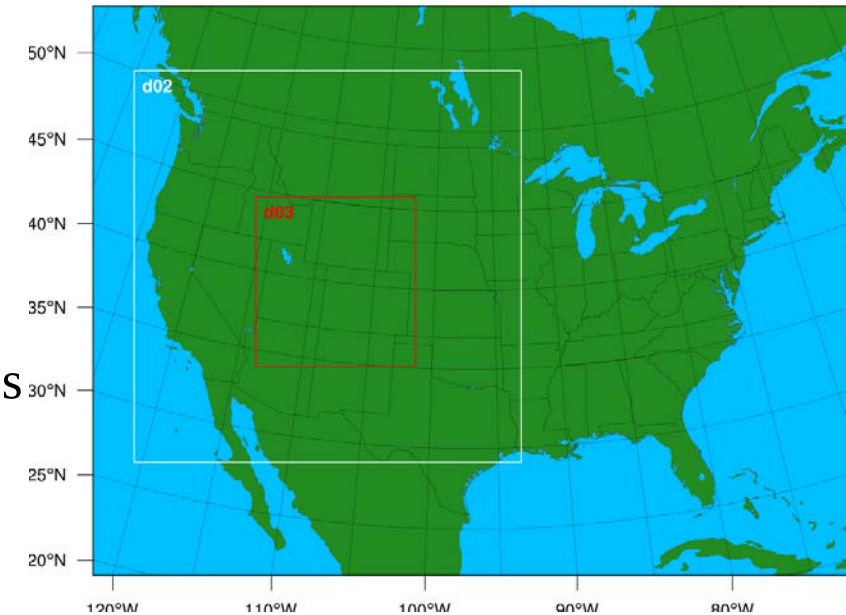
- Many western plans delayed and now recently approved for BART and reasonable progress goals

- Next “full control analysis” plans:
  - Currently due July 2018
  - EPA considering extension of due date, perhaps other limited changes
  - Next round of controls still to be in place by 2028

- Many (most) anthropogenic sources already reasonably well-controlled
  - Challenge to sort out natural, uncontrollable sources, while -
  - Looking at cost-effective controls that improve visibility
  - Requires regional modeling and control strategy analyses

Western States Air Quality Study (WSAQS)

- 2008, 2011 and 2014 Modeling Years
  - CAMx and CMAQ Photochemical Grid Models
  - 36/12/4 km Modeling Domains
  - O&G Emissions Development
  - Model Performance Evaluation
  - Sensitivity Modeling
    - MOZART vs. GEOS-Chem GCM BCs
  - 2020 Future Year Emissions



- Results archived in WAQDW
  - Monitored and Modeling Data
  - Reports and Analysis

Western Air Quality Data Warehouse

- Provides air quality, meteorological and emissions data for western states
- Archives and makes available WSAQS data:
  - 2008 modeling data now available
    - Used in NEPA O&G studies
  - 2011 data available soon
    - Portions used for Denver ozone SIP modeling
    - Other planning studies
  - 2014 modeling data under development

Contact info

- Tom Moore, Western States Air Resources Council (WESTAR)
  WRAP Air Quality Program Manager (www.wrapair2.org)
  970.491.8837
  tmoore@westar.org

- Dan Johnson
  WESTAR Executive Director (www.westar.org)
  206.254.9145
  djohnson@westar.org