



# **Sources of Haze in the West**

Emissions Inventories – Lessons Learned Workshop

September 25-26, 2007

# Objectives

- **Summarize EI work**
- **Questions & answers**
- **Identify strengths & weaknesses**
- **List uses & limitations**
- **Document for planning purposes & next steps**

# Questions to be answered

- **Where did we start?**
- **How did it get done?**
- **What has been learned?**
- **Where next?**

# Emissions Analysis History

- **Point source data**
  - **SO2 Annex for §309 SIPs**
  - **BART**
  - **Complete accounting for haze planning**
- **Several projects 1997 through 2002**
- **Point & area projects since then:**
  - **2002**
  - **2018 base case projections**
  - **2018 Preliminary Reasonable Progress projections**
  - **Revised and final 2002**
  - **In 2008 (when BART done): Final 2018 Reasonable Progress**
  - **Oil & Gas: Phases I & II**

# **Emissions Analysis History, continued**

- **Dust**
  - **Important fraction of Class I haze, particularly in Southwest**
  - **Data were incomplete and missing completely in some cases**
  - **Data and tools for haze planning**
- **Projects really got going in 2004:**
  - **Windblown dust: Phases I & II**
  - **Definition of natural and anthropogenic dust**
  - **Studies and revised Fine/Coarse ratio**
  - **Dust Pilot SIP**
  - **Dust held constant in 2018 analyses**

# **Emissions Analysis History, continued**

- **Mobile source data**
  - **WRAP Board supported federal mobile rules**
  - **2003 analyses for §309 SIPs**
  - **Comprehensive emissions reductions adopted by EPA**
  - **Complete accounting for haze planning**
- **Mobile emissions projects:**
  - **On-Road**
  - **Off-Road**
  - **Planes, Train, and Ships**
  - **Road Dust**

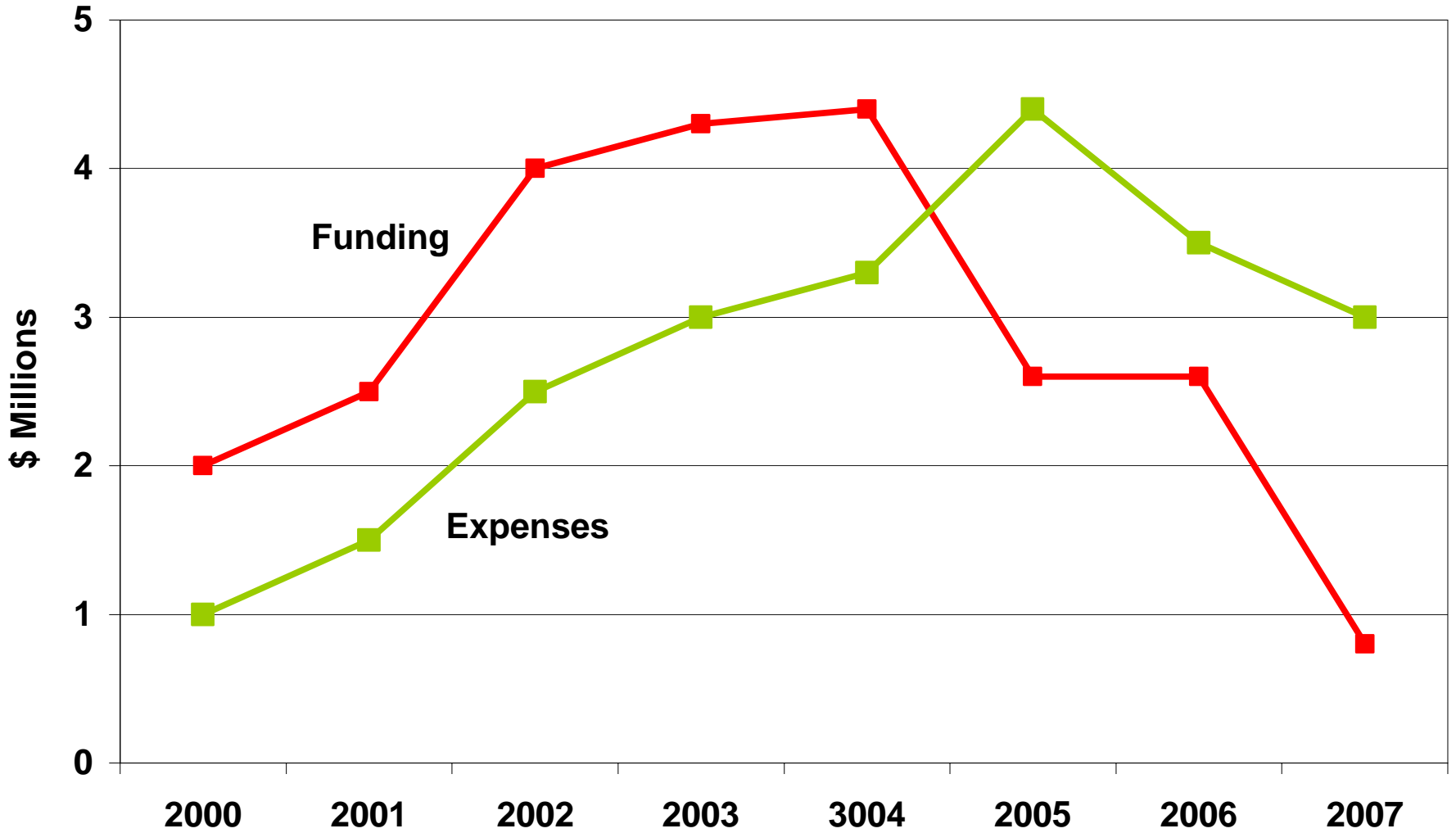
# **Emissions Analysis History, continued**

- **Fire**
  - **Very important fraction of Worst Class I haze days, highly variable in space and time**
  - **Data were incomplete and missing completely in some cases**
  - **Data and tools for haze planning**
- **Projects have been steady & ongoing 1997 to 2006:**
  - **Several smoke/fire policies - definition of natural and anthropogenic fire among others**
  - **Planning tools for smoke**
  - **Emissions inventories addressing variety of scenarios**
  - **Modeling studies of fire impacts**
  - **Fire addressed, but essentially held constant in 2018 analyses**

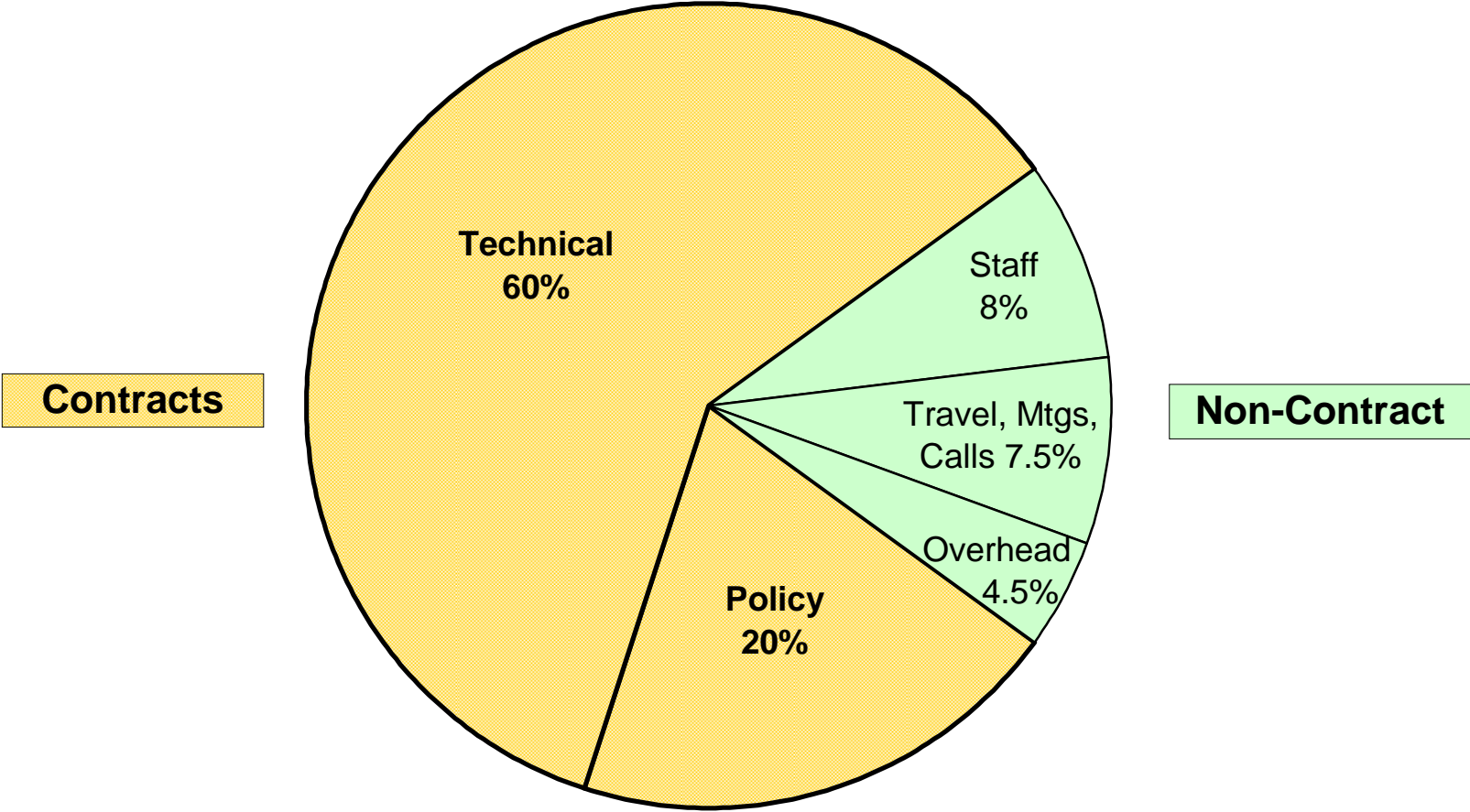
# Next Steps

- **Analyses of last 5+ years for haze planning provide a broad basis for:**
  - **Future studies**
  - **Continued regional analyses at various scales**
  - **Addressing emerging topics**
    - **In-kind support and staff participation by members invaluable**
    - **Nature and content of studies are member-defined**
- **WRAP members will face ongoing air management issues**
  - **Implement haze plans**
  - **Address changes to health standards and exposure measures**
  - **Integrate multiple values of ecosystem and aesthetic protection**
  - **How can WRAP adapt and enhance to meet these needs in the future?**

# WRAP Funding History



# WRAP Funding By Category (2003 - 2006)

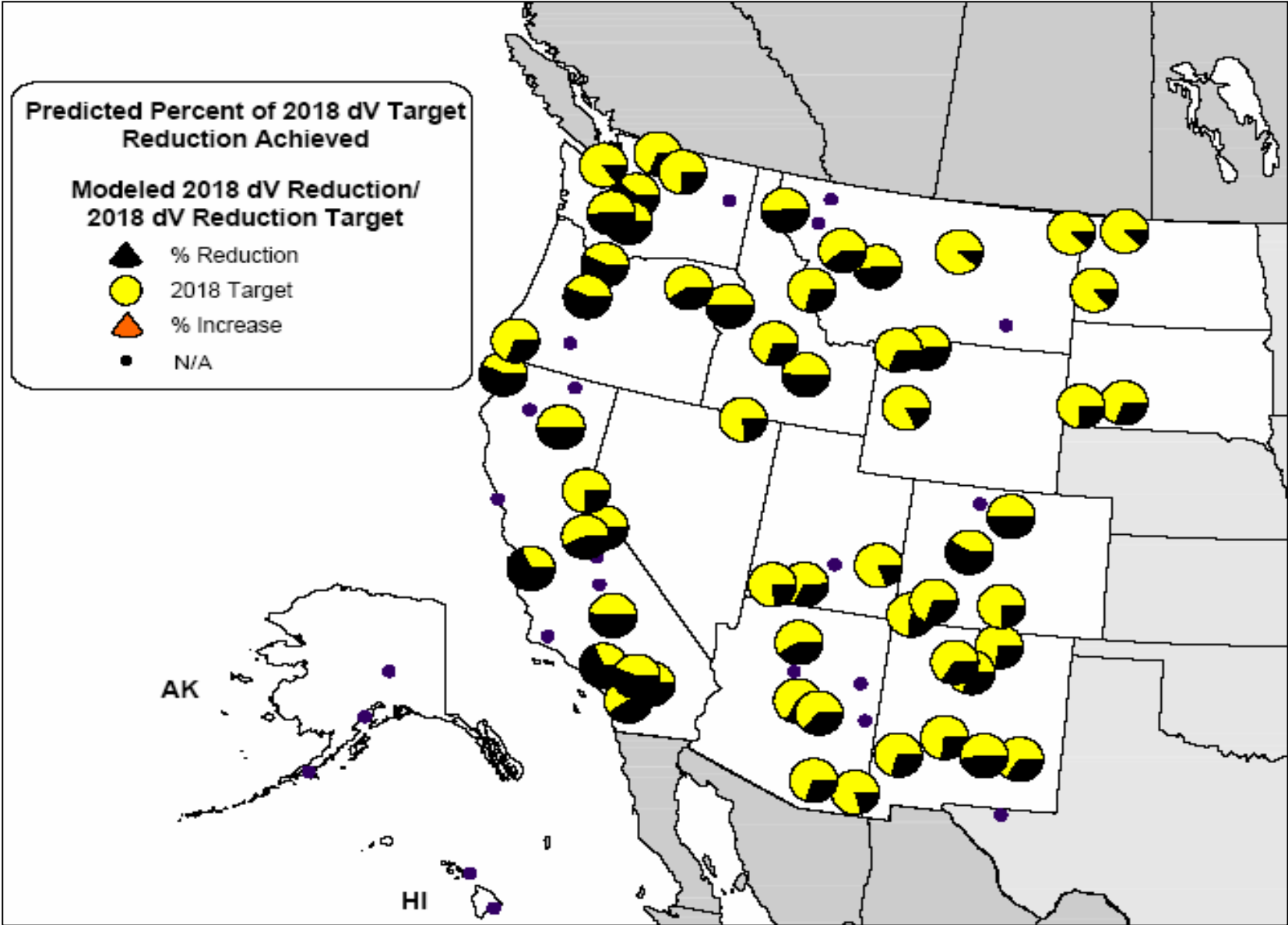


# Technical Analysis Results

- WRAP analyses:
  - Comprehensive & complete emissions inventories
  - Monitoring data analysis for all western Class I areas
  - Regional photochemical aerosol modeling
  - Multiple source apportionment methods
  - Results summarized & available for planning

**2018 visibility projections are significantly shy of the  
“Uniform Rate of Progress”**

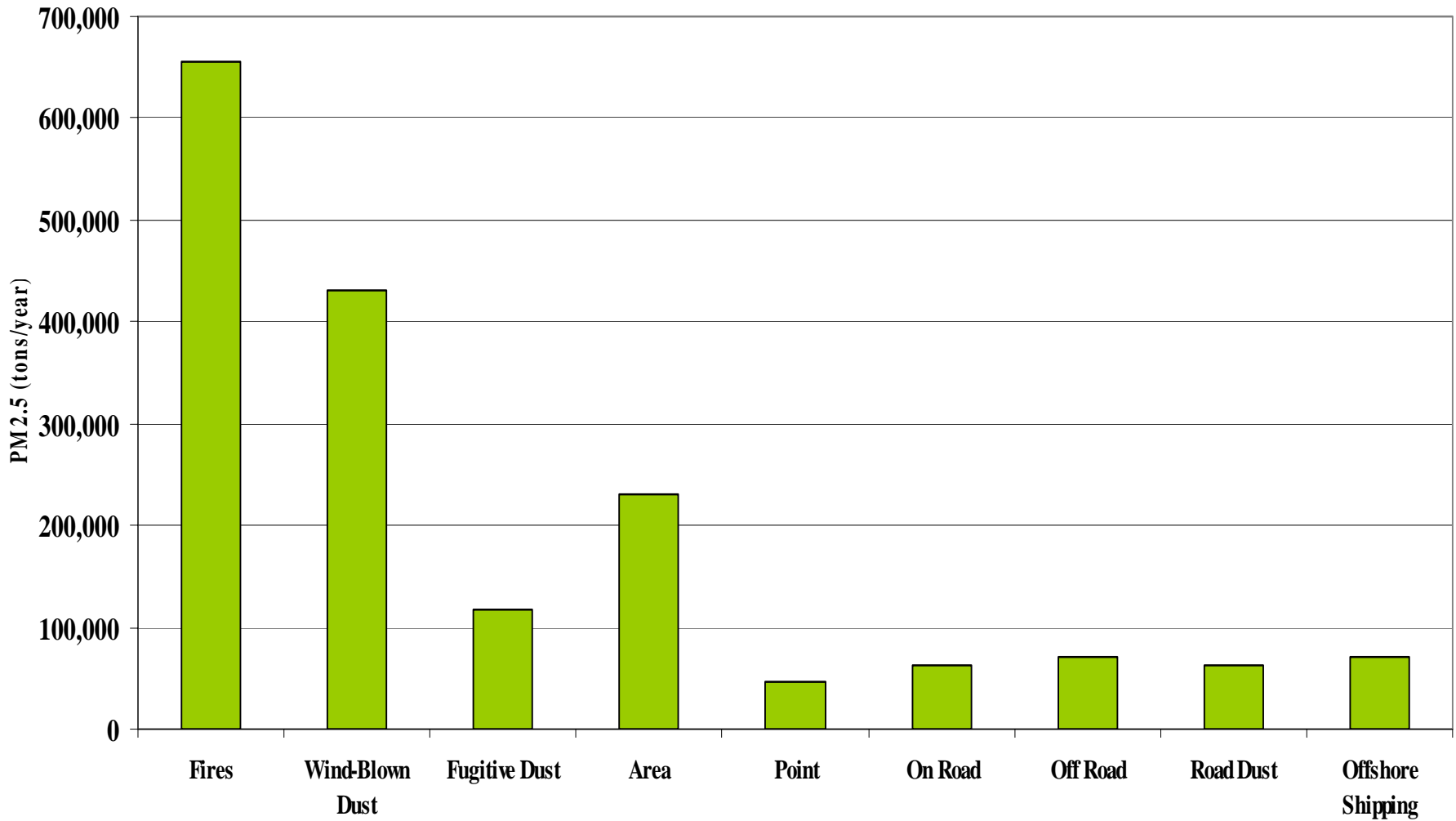
# 2018 Base Case Visibility Projections (deciviews)



**Note: Fire & Dust emissions held constant**

## 2000-04 Annual Average WRAP Region PM<sub>2.5</sub> Emissions (13 States)

(Does not include out-of-region sources)



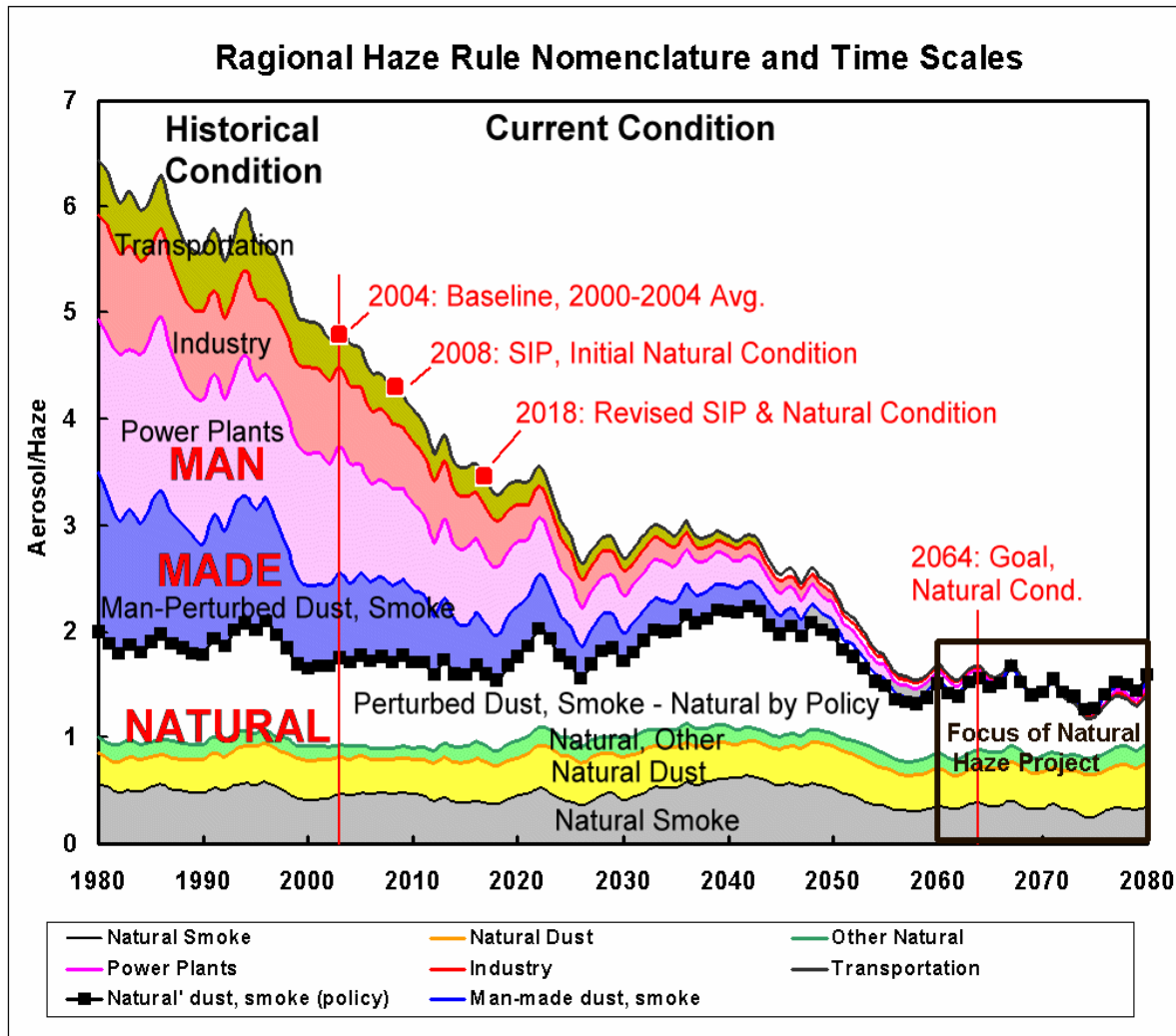
# Why A Species-Based Approach to understanding PM & Regional Haze Planning?

- Species differ significantly from one another:
  - Contribution to visibility impairment
  - Spatial and seasonal distributions
  - Source types
  - Contribution from natural & international sources
  - Emissions data quality & completeness
  - Atmospheric science quality
  - Tools available for assessment and projection

# WRAP Region Emissions/Air Quality Projections Data for Haze Planning

	SO <sub>2</sub>	NO <sub>x</sub>	OC/EC	Fine Soil/CM
<b>Emission Sources</b>	Almost entirely anthropogenic. <i>Mostly point sources</i>	Mostly anthropogenic. <i>Mix of combustion sources</i>	Diverse. <i>Mix of anthropogenic, fire, and biogenic VOC sources</i>	Diverse. <i>Very difficult to partition windblown dust into natural vs. anthropogenic</i>
<b>Emissions Data Quality</b>	Very good overall. <i>Activity data less good for area sources</i>	Good. <i>Activity data less good, some coding concerns w/ smaller point, area, and O&amp;G sources</i>	Fair. <i>Good activity data &amp; confidence in PM<sub>2.5</sub> emissions, but uncertain chemistry of PM<sub>2.5</sub> &amp; biogenic VOCs</i>	Poor, except for some locales. <i>Categorically complete but accuracy very uncertain</i>
<b>Emission Projections</b>	Very good. <i>Uncertain about area sources</i>	Good. <i>Uncertain about offshore and O&amp;G</i>	Fair. <i>What to expect from fire?</i>	Fair. <i>What to expect from windblown dust?</i>
<b>Atmospheric Science Quality</b>	Very good. <i>Meteorology probably largest uncertainty</i>	Fair. <i>Chemistry more complex, but meteorology too</i>	Fair. <i>Most complex, least understood, but model performance okay</i>	Fair. <i>No major chemistry, but model resolution &amp; meteorology insufficient</i>
<b>WRAP Technical Tools for Haze Planning</b>	Emission Inventories Modeling Projections Modeled Source Apportionment	Emission Inventories Modeling Projections Modeled Source Apportionment	Emission Inventories Modeling Projections Receptor Modeling Weighted Emissions Potential	Emission Inventories Weighted Emissions Potential Causes of Dust Analysis

# Likely actual western glide path

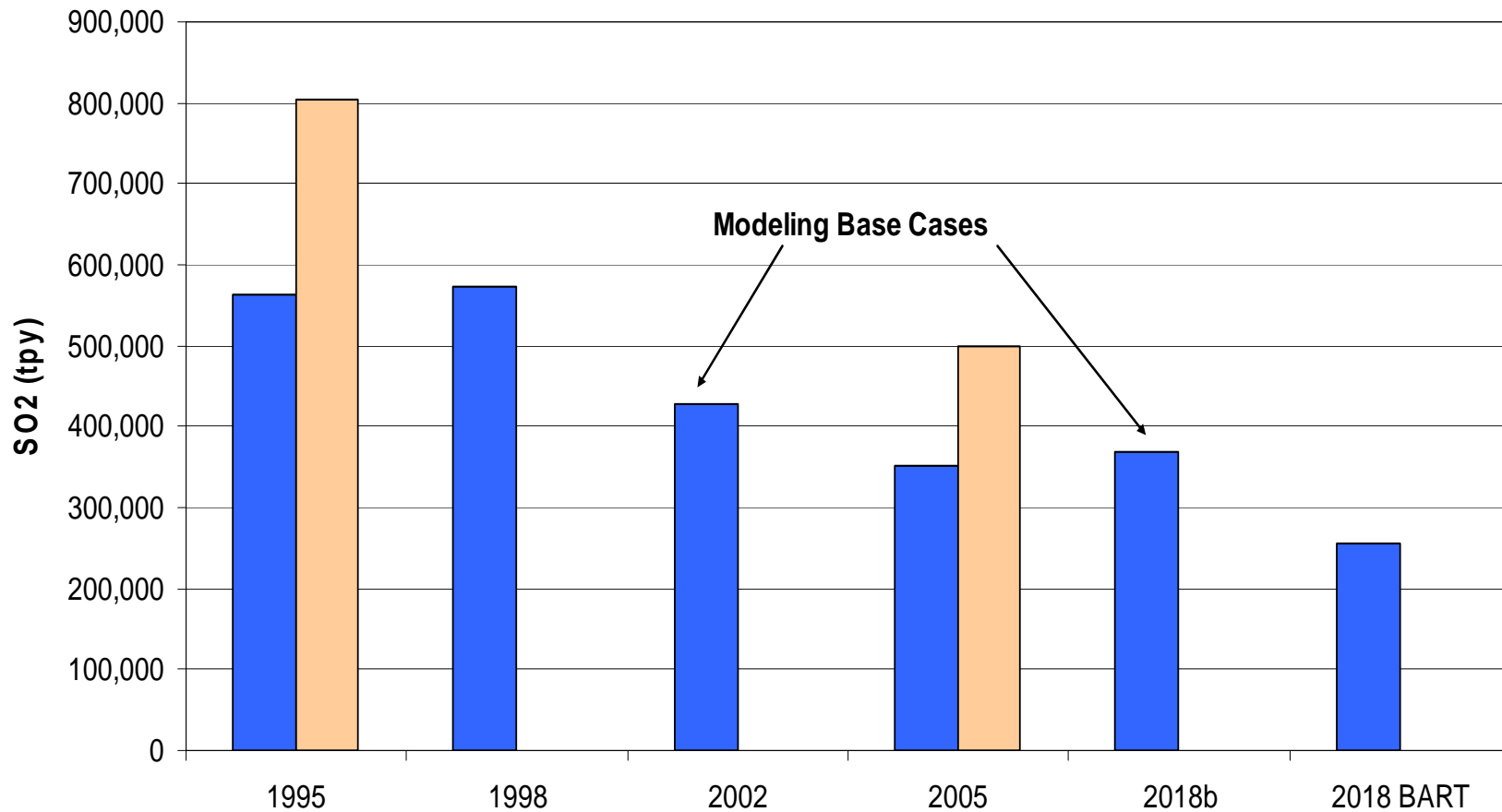


**WRAP region EGU SO<sub>2</sub> emissions are declining**

# WRAP region EGU SO<sub>2</sub> emissions

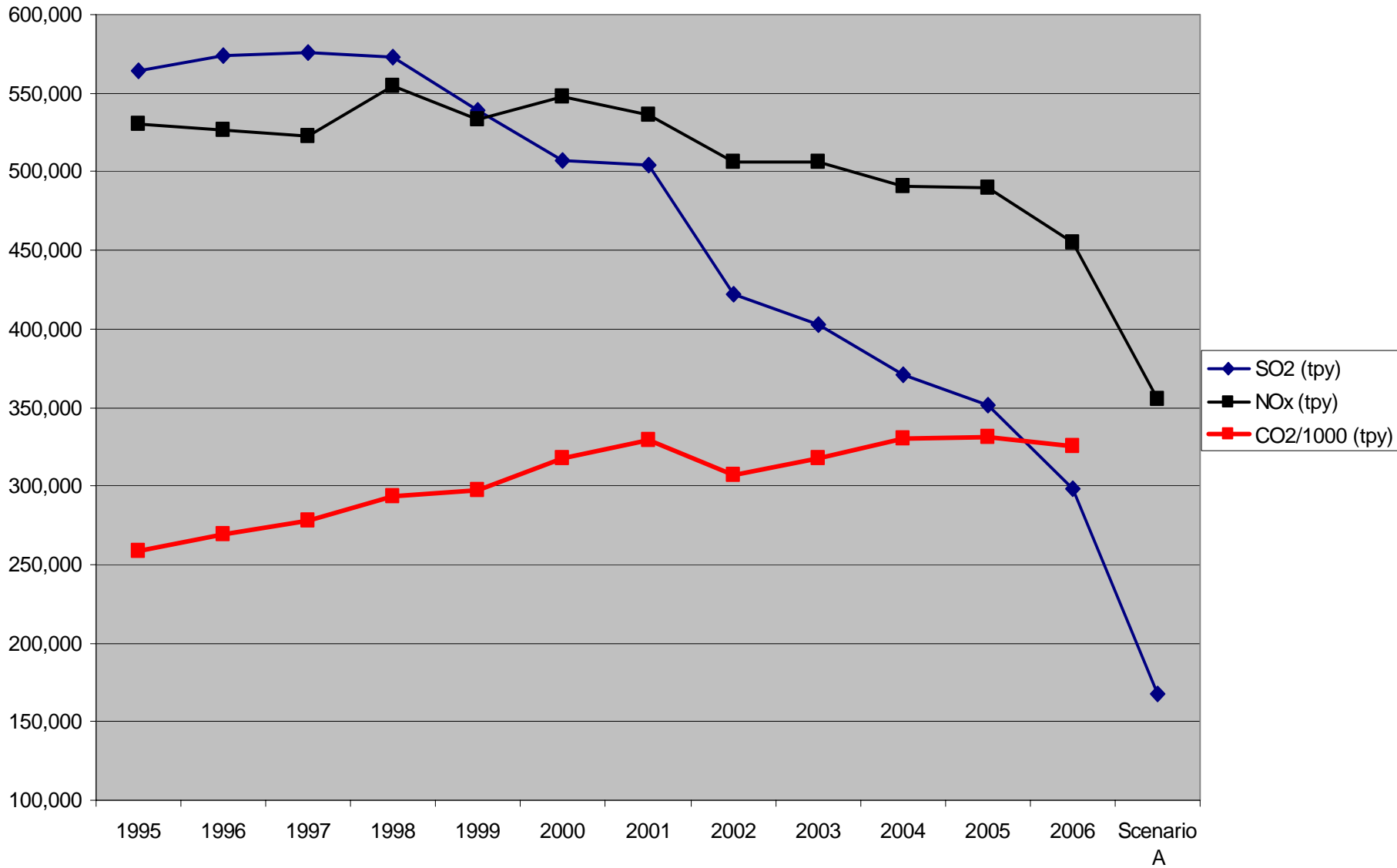
## EGU SO<sub>2</sub> Emissions Trend

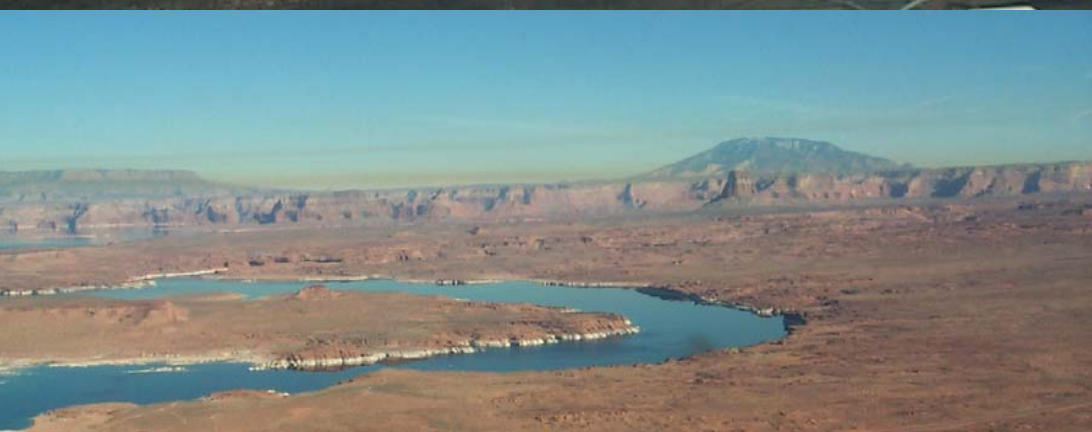
■ 11-States ■ 13-States



**Data Sources:** 1995, 1998, and 2005 from EPA Clean Air Markets Division, 2002 emissions and 2018 projections by Eastern Research Group, and 2018 BART assuming presumptive limits in EPA BART rule on units > 200 MW

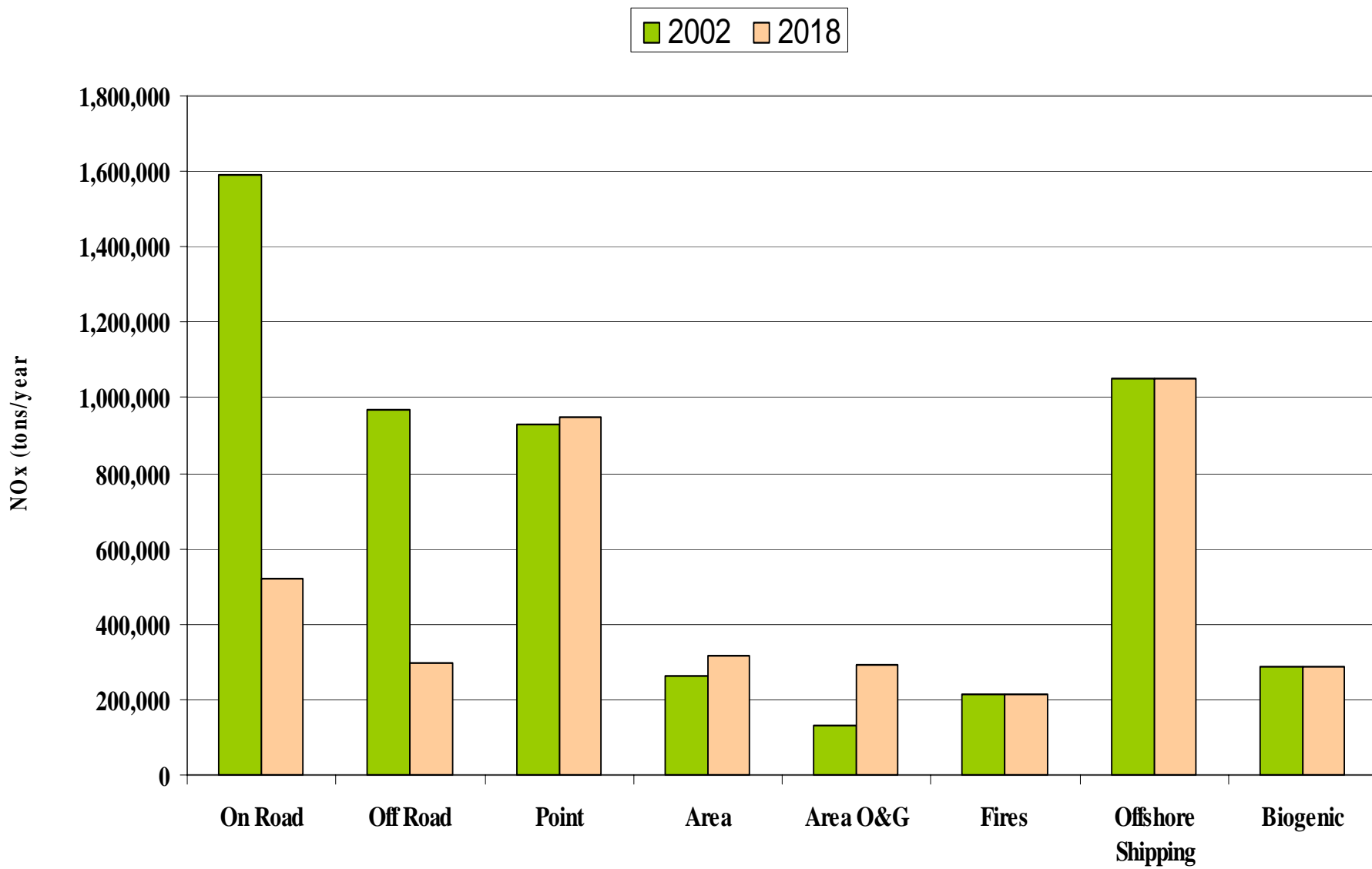
Wester State Power Plant Emissions (1995-2006)





**Mobile Source NO<sub>x</sub> emissions are declining**

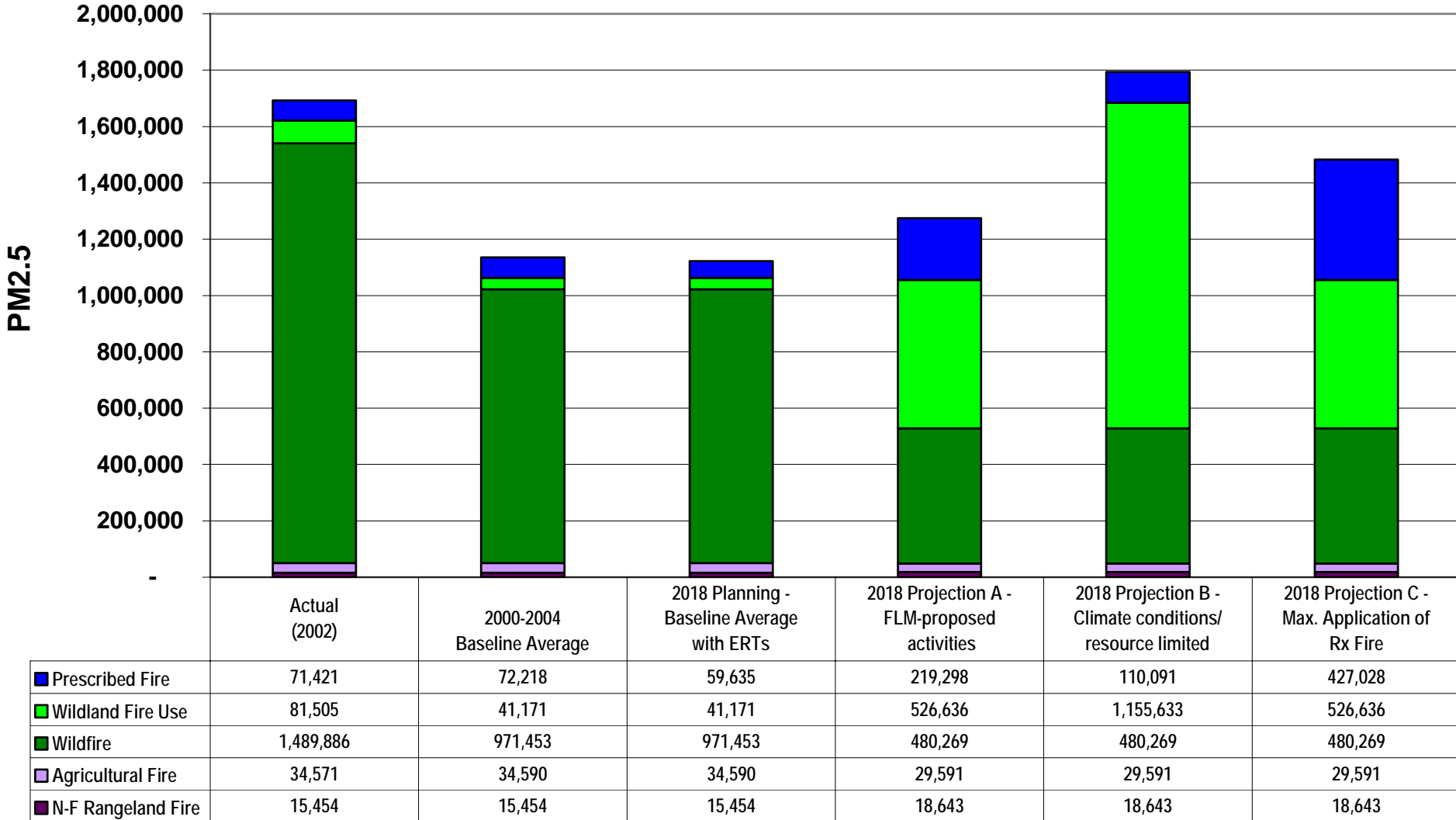
# WRAP region NO<sub>x</sub> emissions by source category



Data Sources: WRAP Forums' emissions inventories and biogenics from BEIS model

# Fire Emissions

# WRAP Region Fire PM2.5 Emissions Scenarios (tpy)



# Lessons Learned Workshop Process

- **Draft “white paper” outlines developed Summer 07**
- **Review and comment by Forums in August**
- **Draft 4-page white papers posted on interactive agenda for meeting at:**  
**<http://www.wrapair.org/forums/toc/meetings/070925m/index.html>**
- **Gather comments from workshop – Final white papers in late October**

# Fire Emissions Joint Forum Projects

- Annual Emission Goal
- Basic Smoke Mgmt. Programs
- Emissions
  - Phase I Fire EI
  - Phase II Fire EI
  - Phase III/IV Fire EI
  - Inter-RPO Wildfire EI
- Emissions Reduction Techniques
- Enhanced Smoke Management Programs
- Fire Tracking Systems
- National Fire Emissions Technical Workshop
- Natural Background
- Non-Burning Alternatives on Agricultural Lands
- Non-Burning Alternatives on Wildlands
- Prescribed Fire Plan Assessment
- Public Education and Outreach
- Regional Coordination
- TWIST (Technical WRAP-up Implementation Support Team)

# Dust Emissions Joint Forum Projects

- [New Mexico Pilot](#)
- [Definition of Dust](#)
- [Fine Fraction of Fugitive Dust](#)
- [Causes of Dust Analysis](#)
- [Fugitive Dust Emissions from Wind Erosion](#)
- [Fugitive Dust Handbook](#)

# Emissions Forum Projects

- [Oil/Gas Area Source Emissions/Controls](#)
- [Stationary/Area Source Emission Projections](#)
- [Stationary and Area Source Pivot Tables](#)
- [Updating Mobile Source Emissions](#)
- [AK Aviation Inventory](#)
- [Mexico NEI Project](#)
- [WRAP EDMS](#)
- [EDMS Operations & Maintenance](#)

# Stationary Sources Joint Forum Projects

- **Stationary/Area Source Emission Projections**
- **Stationary/Area Source Data Pivot Tables**
- **Oil/Gas Area Source Emissions/Controls**
- **EGU NO<sub>x</sub> Controls**
- **General BART Information**
- **Identifying BART-Eligible Sources**